THE
FAMILY SURVIVAL SERIES

TITLES IN THE FAMILY SURVIVAL SERIES

Volume 1
Fire Prevention and Protection for the House Owner
(Partly Completed)

Volume 2
Security and Burglary Protection for the House Owner
(Under Construction)

Volume 3
Safety in the Home
(Under Construction)

Volume 4
Automobile Safety and Security
(Under Construction)

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THE FAMILY SURVIVAL SERIES

VOLUME ONE

FIRE PREVENTION AND PROTECTION FOR THE HOUSE OWNER

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Volume 1

Fire Prevention and Protection for the House Owner.

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Automobile Safety and Security.

Volume 5

The Real World

PREFACE TO VOLUME ONE

I have found that people are usually more concerned about security than they are about fire safety, yet fire can be much more devastating and life-threatening. In fact, an average of 75,000 fires are reported in Canada each year, resulting in 740 deaths, 5000 injuries and a property loss in the order of $758 million. By far the majority of injuries and deaths due to fire occur in residential properties. It seems that too many Canadians do not know how to react when confronted by a fire, nor are they aware of their ability to prevent them from happening.

In order to provide the best possible protection for my family and property against the menace of fire, I set about collecting information. I gathered brochures where I could, spent hours at the local library, talked to the Fire Prevention Office, walked around hardware and speciality stores to see what types of protection equipment was available, wrote to manufacturers of devices for information, contacted protection agencies and standards associations, etc. One thing was perfectly clear - the information I wanted could not be found in any one place. I decided to jot down all the relavent information I could, and make this available to households across Canada.

In an effort to acquire comments on this publication before release, it was brought to my attention that this booklet would probably only appeal to individuals already concerned about fire safety, and not to those homeowners that need it the most (ie. those that are generally indifferent to the fire problem and unwittingly live in fire "traps"). Unfortunately, this is probably true. However, it is my hope that those that do acquire a copy will lend it to friends and relatives that may not ordinarily go out of their way to obtain a copy. Fire frequently causes desolation and suffering to people that never thought it could happen to them. More often than not, the tragedy could have been prevented.

David J. Smith

NOTE

This booklet should be considered as a guide, not a manual, to fire prevention and protection. In fact, it would be next to impossible to write a complete manual to cover all situations. Each homeowner has individual needs for fire prevention and protection based on the layout of his house, his needs and his habits - he should adapt the information in this booklet to his own situation.

The information in this document is general in nature - so, when installing, using and maintaining equipment be sure to always refer to the manual that comes with the device. The standards and regulations used to compile the information contained in this document may be ammended after this document is released - for current requirements contact the respective governing agency.

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Chapter One

Introduction

Fire

It is a fact that people are usually more concerned about security than they are about fire safety, yet fire can be much more devastating and life-threatening. Burglars will avoid conflict at all costs and will usually strike when they are convinced the house is unoccupied. Fires, on the other hand, can occur at any time, are usually caused by an act of carelessness, and most often develop while the house is occupied. You may lose everything during a fire, including personal items that insurance cannot replace (such as treasured photographs and letters); yet a burglar will steal only items that he can use or turn into ready cash. By all means, secure your home against burglary, but be aware of the greater danger of fire.

How fires start

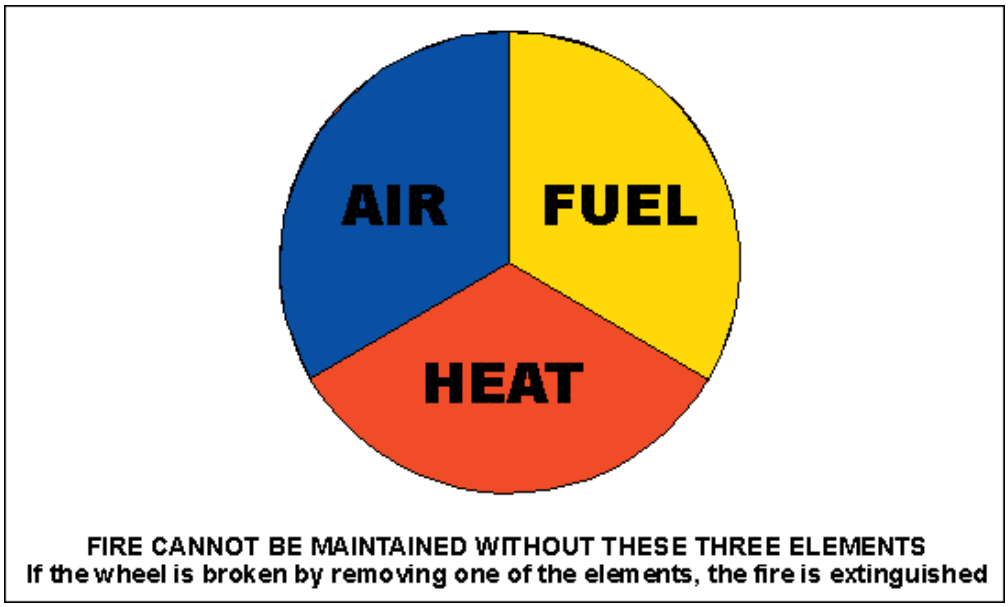
Three conditions must exist before a fire can be started. First, there must be a substance that will burn. Secondly, there must be plenty of oxygen. Thirdly, the substance must be raised to its kindling temperature. Different materials have different kindling points - for example, the kindling point of paper is 184 degrees Centigrade, that of cotton is 228 degrees, and that of wood is 260 degrees. Fires can be started naturally (e.g. by lightning), or can be man-made (either intentionally or accidentally). Whereas most intentional fires are set to perform a task (e.g. to heat or to illuminate), some may be the work of an arsonist intent on destruction. Accidental fires are usually caused by negligence or by lack of knowledge, and it is these that most affect us as house owners. These are the fires we have the ability to prevent and to protect ourselves against, and are the ones covered by the scope of this document.

The dangers of fire

When the kindling temperature of a material or substance is reached it will ignite, producing flame, smoke, heat and fire gases. Each of these products of combustion can cause injury or death. Burns can be caused by direct contact with flames, or by the heat radiated from flames, but flames themselves are responsible for relatively few of the reported fire deaths. Smoke frequently provides the early warning of fire and is likely to cause panic and consequential injury due to the very nature of its blinding and irritating effects. Heat is mostly responsible for the spread of fire, but exposure to heated air can be very injurious to the body's internal organs. However, it is generally recognized that the inhalation of heated, toxic and oxygen-deficient fire gases is responsible for the greatest number of fire fatalities. The chief danger in most fire gases is carbon monoxide (often called "the silent killer"), but many other poisonous fumes are produced by the burning of common household items. Gases given off by burning plastics and synthetic materials are particularly toxic. The victims usually do not sense the fire until it has gained some headway, by which time heat and smoke have made escape difficult. Often, people are overcome by smoke and toxic fumes while asleep or while trying to escape. Statistics indicate that, in one and two family residential dwellings, 74% of people die from asphyxiation, smoke inhalation, carbon monoxide poisoning, etc., while only 24% die from burns. The remaining 2% die from heart attack or other injuries. For this reason, early warning of a fire is essential.

Improving the odds

By analyzing the three conditions required before a fire can start, we should be able to reduce the chances of an accidental fire happening in our homes. Firstly, it is virtually impossible to eliminate all combustible materials and substances from a house - practically all of our possessions will burn to some degree when exposed to flame or extreme heat. We can, however, eliminate many combustible materials that are no longer required (e.g.. garbage, waste paper, old newspapers) and properly store flammable substances. We can also select textiles (e.g.. clothing, bedding) and construction materials (e.g.. wood, paint, wallpaper) carefully, when purchasing these items. Secondly, the oxygen required to keep a fire alive is also required to keep us alive, so it is obviously not something we can eliminate - but it is possible to limit the speed with which oxygen can be fed to a fire by keeping doors closed at all times except when actually being used. This may allow the occupants of a burning house precious extra seconds in which to escape. Thirdly, we must keep the temperature of combustibles below the kindling point by ensuring that potential sources of ignition (e.g.. smoking materials, heaters, electrical equipment) are not used carelessly. Although we can considerably reduce the chances of a fire occurring, we must still prepare ourselves for that one time when the unexpected can happen.



FIRE CANNOT BE MAINTAINED WITHOUT THESE THREE ELEMENTS
If the wheel is broken by removing one of the elements, the fire is extinguished

Fire in Canada

Carelessness and ignorance of fire safety have earned Canadians a ranking among the worst in the world for fire losses. In fact, an average of 75,000 fires are reported in Canada each year, resulting in 740 deaths, 5000 injuries and a property loss in the order of $758 million. Many of these fires could have been prevented with the proper knowledge, the proper equipment, and a little common sense.

The Power of Fire

The National Fire Protection Association produced a film entitled “Fire

Power", in which a two-storey wood-framed house was destroyed by fire as a demonstration. The progress of the uncontrolled fire was closely monitored.

Demonstration

The demonstration began when an ashtray with a smouldering cigarette was dumped into a wastebasket in the living room. Approximately two minutes later the contents of the wastebasket started smouldering and five minutes after this the wastebasket was in flames. From the moment of the first flame, the progress of the fire was timed in minutes and seconds.

0:30 Burning material from the wastebasket ignites the nearby couch.

1:04 Polyurethane cushioning from the couch starts to melt, spreading fire to the carpet. Smoke begins to fill the living room.

1:35 Toxic gases leaving the living room are measured at a temperature of 88 degrees Centigrade (190 degrees Fahrenheit).

1:47 Light smoke begins to move to the second floor where the bedrooms are located.

2:30 Temperature above the burning couch reaches 204 degrees Centigrade (400 degrees Fahrenheit).

2:48 Smoke pours into the adjacent dining room only four feet above the floor. Thick black smoke moves rapidly upstairs.

3:03 In the living room the temperature three feet above the floor reaches greater than 260 degrees Centigrade (500 degrees Fahrenheit). At this point no-one could survive in this room.

3:20 The upstairs hallway begins to fill with black acrid smoke, making escape difficult.

3:41 The energy in the living room suddenly ignites everything -FLASH-OVER! The temperature has reached over 760 degrees Centigrade (1400 degrees Fahrenheit). The living room windows break out and the entire room fills with flames, forcing smoke and toxic gases throughout the house. The upstairs hallway and the stairs are now impassable - a second escape route is the only way out.

4:33 Flames are now visible from outside the house - the first exterior appearance of a fire in progress. Flames climb up the outside of the house, entering the upstairs windows. Flames are also spread to the second floor between the walls. The fire proceeds so rapidly that the Fire Department may not be able to rescue anyone trapped inside

When the firefighters arrived they broke the windows to vent the smoke and axed the walls to check for fire spread. There is little left of the family home, and persons who did not wake up in time would not have survived. Not all fires behave like this one - some move faster, while others move slower.

Post-mortem

In this demonstration a few things became clear:

- ☞ Although flames never actually reached the upstairs hallway, the searing heat melted plastic objects. Smoke and heat cut off the family's main exit from the bedrooms in six minutes. At this time a few breaths in the childrens bedrooms (where the doors were left open) would have been fatal.

- ☞ Almost everything upstairs was damaged or destroyed. A closed door to the master bedroom warded off smoke and heat - while the temperature in the hallway reached over 150 degrees Centigrade (300 degrees Fahrenheit), the bedroom never went above 25 degrees Centigrade (77 degrees Fahrenheit). Photos, jewellery and other items of personal value in the master bedroom were undamaged. Thus, closed doors will give you precious extra seconds to find an alternate escape route, and may protect lives and property if the Fire Department are summoned promptly.

- ☞ A smoke detector placed at the bottom of the stairs would have sounded an alarm at 1:50, and one placed in the living room would have operated even earlier. By leaving immediately (without dressing or collecting valuables) the occupants would have been able to escape before the main exits became blocked.

- ☞ A method of controlling the fire would have been even more effective in saving lives and property - but not with a home fire extinguisher. By the time the occupants realized there was a fire, it would have been out of hand and impossible to fight with an extinguisher. A second identical demonstration was made, but this time a residential sprinkler system was installed in the house. At only 2:11 from the appearance of the first flame, the sprinkler in the living room turned on and controlled the fire well before conditions became life-threatening. Of course, the room was very wet, but the sprinkler had confined the damage to one relatively small area of the house.

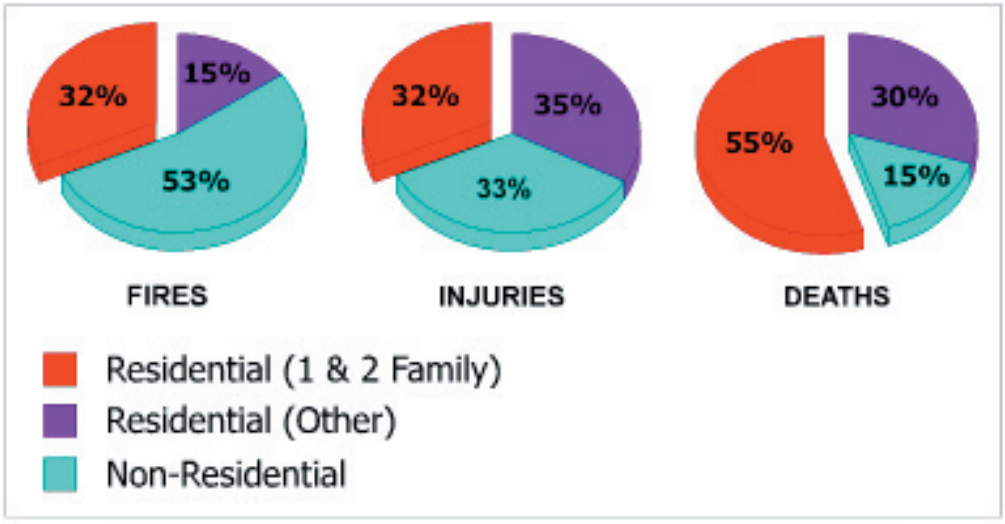
Conclusion

These demonstrations showed how smoke detectors, closed doors, escape plans and sprinkler systems can lessen the danger to you and your family. They buy time in the race against fire, but no matter what precautions are taken, or how small a fire may appear, its progress is rapid and its power awesome. Escape must be your top priority - all the fire fighters in the world cannot alter those few critical moments between the start of the fire and the time when escape becomes impossible. What happens in that time depends on you. The Annual Report of Fire Losses in Canada (1984) observes that "deaths in residential properties account for the majority of the nation's fire fatalities", and that "the use of smoke detectors and perhaps quick-response residential sprinkler systems could contribute significantly in reducing property and life losses". Of course, we all believe it will never happen to us, but why take chances when minimal protection costs so little. This document tries to simplify fire prevention and protection for the house owner wishing to keep his family and property safe

from harm.

Residential Fires

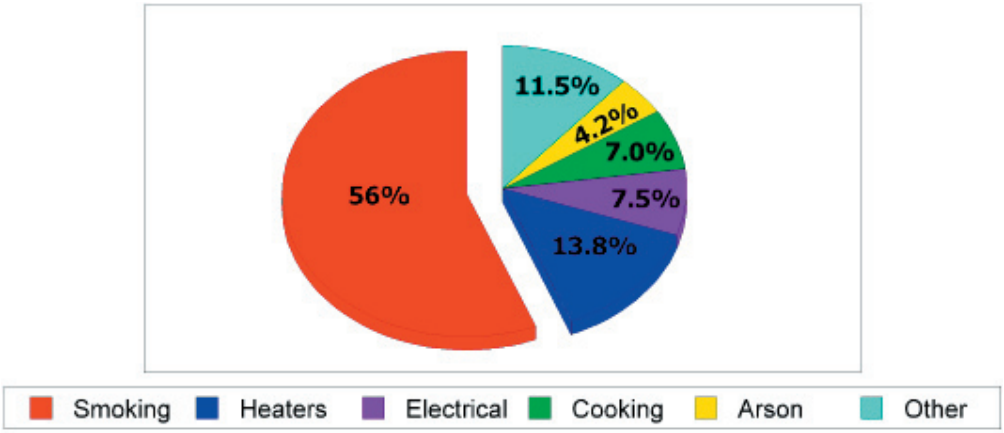
Occupancies such as one and two family homes, apartment buildings, mobile homes, hotels, etc. are defined as residential dwellings. According to statistics compiled by the Canadian Fire Commissioner, 47% of all fires reported in 1984 occurred in residential properties such as these. The same fires were responsible for 65% of all fire injuries and an incredible 85% of all fire deaths reported for that year. These statistics can be broken down further into the types of residential properties where the majority of serious fires occur.



EXTENT OF INJURIES AND FATALITIES IN ALL PROPERTIES

Causes of fatal residential fires

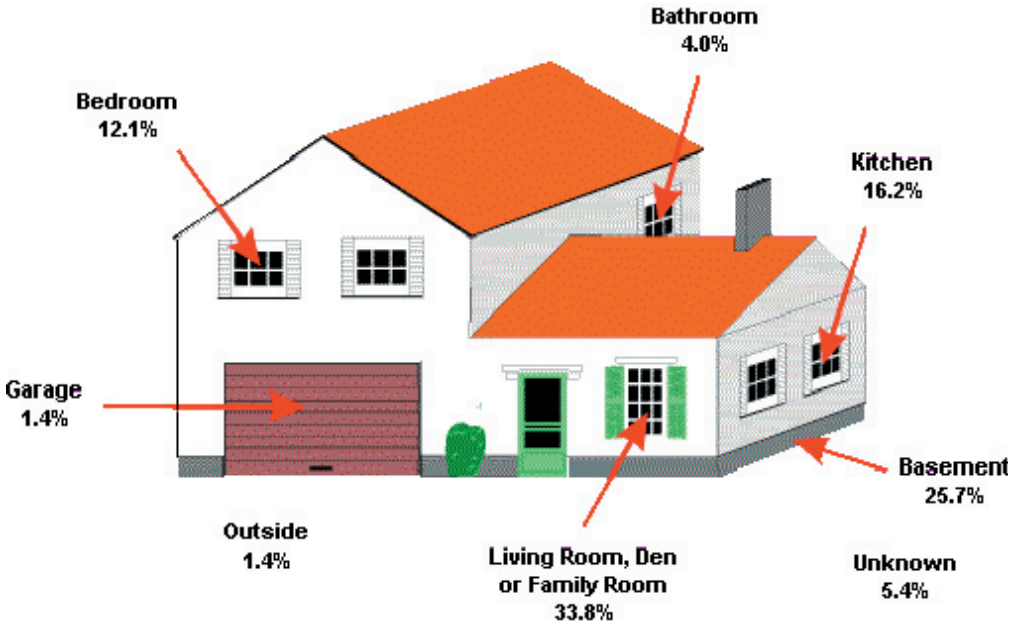
The National Fire Protection Association (NFPA) compiled a chart of general causes of residential fires resulting in one or more fatalities.



CAUSES OF RESIDENTIAL FIRES RESULTING IN FATALITIES

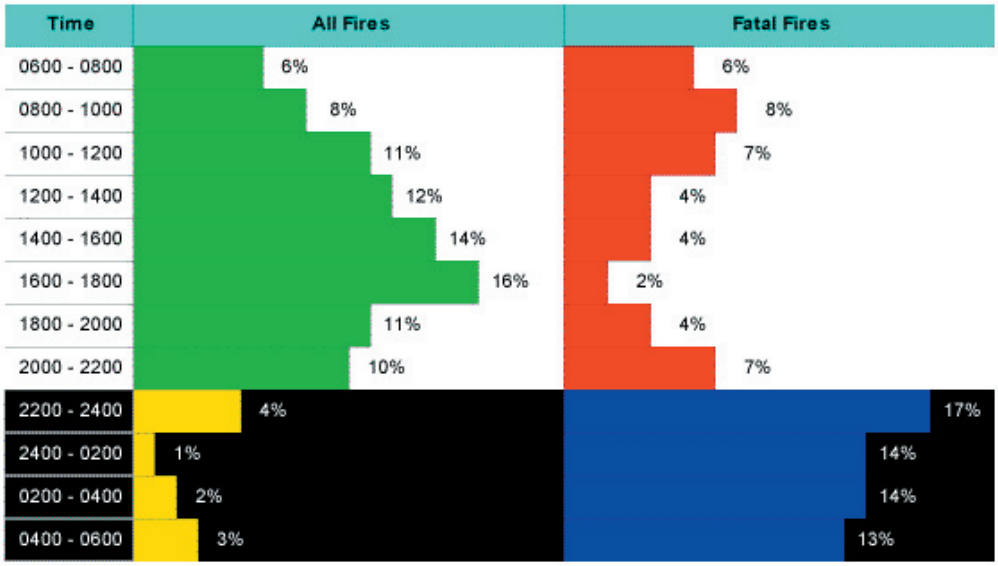
Locations where fatal fires start

Another compilation by the NFPA lists areas within one and two family homes where fatal fires have been known to originate.



Time distribution of residential fires

The NFPA also compiled a graph indicating the average distribution of fires over a 24-hour period.



This shows clearly that, although only 10% of residential fires occur between 10pm and 6am (when most people are sleeping), 58% of the fatalities occur at this time.

Smoking

According to the NFPA, careless smoking habits have been responsible for 56% of all residential fires in which loss of life has occurred. Of these fatalities, 46% resulted from burning bedding, 43% from burning upholstery, and 7% from

burning clothing. If you have a smoker in your household, it is clear from the statistics that you run a far greater risk of having a serious fire than if all your family members were non-smokers. It is, therefore, particularly important that you and your family be prepared for a fire situation. Ensure that the smoker(s) in your house, and smoking visitors to your house, use common sense, are not careless with their smoking materials, and adhere to the recommendations of Chapter 3.

Impairment

Excessive use of alcohol, drugs or medication is responsible for a fair number of residential fires in which fatalities occur. In fact, a study by the NFPA showed that, of 29 persons between the ages of 16 and 60 who died from fire, 24 (82.8%) were, or had been, consuming alcoholic beverages at the time of death. Lack of judgment and/or drowsiness while using smoking materials, cooking or electrical equipment can result in a fire situation. In addition, the sound of a smoke detector may not awaken a drugged sleeper and, even if it did, the person may not be able to make it to a safe exit.

Low Traffic Areas

A quarter of all fatal fires start in the basement, so ensure that smoke detectors are installed in areas that are normally unattended and that they are capable of wakening sleepers in all the bedroom areas. Also ensure that smoke detectors are installed in areas where fires can occur while you and your family are asleep. See Chapter 5.

Arson

Arson is Canada's fastest growing crime. In 1984 there were more than 9000 arson fires, causing 45 deaths and 474 injuries. That amounts to 13% of all reported fires for that year. Most of the losses are on industrial and commercial property - but many are on residential homes, and these are the ones where life is most threatened. Almost half of all arson fires are set by vandals, but some are set to defraud insurance companies, or to cover up a crime, or for revenge against employers, landlords or even neighbours. The average homeowner is more likely to be hit by vandals out to "have a good time". Arson is usually a crime of opportunity, so it is impossible to predict when and where the vandals will strike. However, you can take defensive measures to reduce the likelihood of you and your family becoming victims of the arsonist. These measures include carrying out the recommendations of this document, and taking the same steps to discourage the arsonist as you would to discourage a burglar (see "Volume 2 - Security and Burglary Protection for the Home Owner").

House Numbers

Make sure that police, fire and paramedics can find your home easily in a time of emergency. Have your house numbers clearly mounted on a high contrast background so that they are visible from the street, and have them illuminate at night.

Property Record

It is important to keep an accurate record of household and personal property for insurance purposes in the event of a fire or burglary. Record all your household and personal items on an inventory list, and include the make, model and serial numbers of the items if they are so marked. Save receipts from the purchase of your most valuable items and have expensive jewellery appraised. Record the actual or estimated replacement cost beside each item. Keep the inventory list (together with the receipts and appraisal certificates) in a safe-deposit box in your local bank, and update the list at least once a year, or when you acquire new items of value. A typical form is given in Figure 1. Property record forms are also available free of charge from the Insurance Bureau of Canada. You can also purchase inventory plan books that will allow you to combine a property list with photographs of your valuables.

Fire Insurance

While there are policies to cover practically every situation, the four primary home insurance policies are (a) the fire insurance policy, (b) the standard homeowner's package policy, (c) the comparable tenant's package policy, and (d) the condominium unit owner's package policy. The package policies all protect your dwelling and possessions against the same perils as the fire insurance policy, but also include theft and personal liability. One premium is paid for the overall coverage.

The fire insurance policy

This not only protects your dwelling and personal property against loss or damage by fire, but also covers loss or damage caused by explosion, falling objects, impact by vehicle, lightning, riot, water escape, vandalism, windstorm and smoke damage, all as defined in the policy. Under normal circumstances, in an urban area, there is no charge levied by the Fire Department when attending a fire within the same municipality as the fire hall. But, if fire trucks have to leave their home municipality, the homeowner may be charged a fee, and this is usually covered by the insurance company up to a specified limit (probably $500). In most urban areas all houses are within 1000 feet of a fire hydrant and within 5 miles of the nearest fire hall. If your house is outside these limits, as it might be in many rural areas, your insurance company may increase your basic premium based on the distances involved. The age of your home may also have a bearing on the premium you have to pay (for instance, a house that is less than 22 years old may qualify you for a 20% discount). Insurance companies

differ greatly in the cost of the basic premium and in the type of discounts that are available. Factors that may affect the premium of your insurance policy are given later in this section.

Insuring to value

This is buying sufficient home insurance to cover your dwelling and personal property for their full current value. In the case of your dwelling, it means the amount of insurance necessary to replace your building with one of similar type and quality. In the case of personal property, unless you purchase replacement cost insurance, you will only be covered for the actual cash value at the time of loss - this will usually be determined by taking the current value and reducing the amount by the appropriate devaluation. Replacement cost insurance is highly recommended, and is usually available as an option by endorsement. Personal property will then be covered without deduction for depreciation.

Amount of coverage

You should insure your dwelling and personal property to full replacement value. To determine the value of your dwelling, you should probably have it appraised by a qualified appraiser. Remember, you are not appraising the sale value of your property, but the present day rebuilding costs of the building (the land is not normally insured). To establish the value of your personal property, refer to your property record sheet (see Section 1.9). It may be necessary to purchase additional coverage for jewellery and other valuables if the replacement cost exceeds the limits of the policy for certain items.

Amount of coverage

It is important to "shop around" before selecting a home insurance package policy. You must take into account the basic premium, together with whatever discounts the insurance company offers for the type of construction of your home and the security measures you have taken to protect your home against fire and burglary. Factors that may affect your premium are as follows:

- do you require replacement cost insurance for personal property?
- what is the age of your house?
- how is your house constructed?
- are all permanent residents non-smokers (there could be a 10-15% reduction)?
- do you have a wood-burning stove installed?
- do you have a residential sprinkler system installed?
- do you have fire extinguishers?
- do you have smoke detectors installed?
- do you have a burglar alarm?
- is your fire/burglar alarm connected to a Central Monitoring Station?
- do our external doors have approved deadbolts?
- what is the distance from your house to the nearest fire hydrant?
- what is the distance from your house to the nearest firehall?

Further information

For further general information on home insurance refer to the booklet "Home Insurance Explained", which is available free from the Insurance Bureau of Canada.

Residential Occupancies Other Than House Owner

Although this document was written specifically for the person who owns his own single family detached house, it also applies in some degree to the apartment owner, apartment renter, house renter and mobile home dweller.

House renter

If you are renting the whole house, ask the owner if he would consider installing the necessary fire equipment outlined in this document - even if it only complies with the minimum requirements. If you are renting only part of a house, or a section of a duplex or fourplex, etc., ask the owner to install at least minimal protection devices in all areas of the building. If he will not do this, there is no reason why you (and your neighbours living in other areas of the building) can't install your own devices as long as you get permission to drill any necessary holes. The owner might consent to pay for the equipment if you install it - after all, it will be protecting his property as well. Remember that the fire safety precautions and escape plans are up to you, and can be carried out without approval.

Apartment owner

If you own a condominium-type or strata-title apartment, it is likely that the common property already has fire protection equipment installed. It is also possible that the apartments themselves are equipped with smoke detectors. Designate a member of your committee to be responsible for fire safety in your complex. He should check that the proper equipment is installed in the common property and that the proper safety precautions are adhered to. He may wish to hold meetings to advise owners on how best to prevent fires starting in their apartments and how to protect themselves should a fire start. Such information can be based on the methods contained in this document.

Mobile home owner or renter

If you reside in a mobile home or trailer, fire can be a real threat. At least two smoke detectors should be strategically placed in accordance with this document, and it is recommended that consideration be given to purchasing a propane gas-leak detector if this type of fuel is used. One ABC-type fire extinguisher should be centrally located near an exit doorway. More than one extinguisher is recommended. Adhere to the fire safety precautions and make escape plans per this report.

Regulations on the Sale and Use of Fire Safety Equipment

In order to ensure a standard of quality, performance and safety in products sold to and used by the consumer, certification services are provided by a number of organizations in Canada and around the world. These organizations will examine test and classify certain products and, upon the product meeting the requirements, will allow the product to be labelled appropriately. The consumer is urged to purchase and use only products that bear the certification markings (where applicable) for their own safety and to ensure that a standard of quality and performance is met. In many cases, a standard may be adopted

by a government agency or other regulatory body, so that the sale or use of a product that has not been certified may be prohibited under law.

Canadian regulations

In Canada, certification services are provided by The Underwriters' Laboratories of Canada (ULC), The Canadian Standards Association (CSA), The Canadian General Standards Board (CGSB), The Canadian Gas Association (CGA) and others. A few of the standards produced by these organizations are enforced by the Office of Consumer and Corporate Affairs in The Hazardous Products Act that may ban or regulate products not meeting the standards.

Provincial and municipal regulations

In addition to Canadian regulations and acts, the local governments enforce laws on the sale and use of potentially hazardous products. They may reference the standards of organizations offering certification services or create their own.

Regulations for fire safety

As an example, The Hazardous Products Act states that no person shall advertise, sell or import into Canada smoke alarms (and other types of fire alarm systems) for household use that do not meet the applicable standards of the ULC - hence, all such devices sold and used in Canada must bear the ULC logo. Also banned under this Act are products made of textile fibres and childrens' sleepwear that do not meet the flammability requirements of the CGSB. Although not a mandatory requirement of the Canadian government, it is highly recommended that you purchase only ac-powered electrical appliances that bear the CSA certification mark.

Chapter Two

Fire Safety Practices

General

It is interesting to note that, although less than half of all fires reported in Canada were in residential properties, most of the fatalities (85%) occurred in this type of building. This can be due to a number of factors. In properties other than residential (eg. business and industrial), although the number of fires reported is about the same, the buildings are usually required to meet more stringent standards of construction, have fire alarms and fire extinguishment equipment installed (including sprinkler systems), have regulated fire escape routes, and are routinely inspected by the Fire Department for equipment operation and Fire Code infractions. In addition, if it is a building with sleeping quarters (such as an institution or hospital), the occupants are never all asleep at the same time. Now there is no reason why we, as house owners, cannot raise our standards of fire safety close to those of non-residential property owners. To this end, a comprehensive program of fire safety requires actions which minimize the chance of a fire starting and maximize your chances of escape, should a fire start.

Prevention

Avoid hazards

Avoid hazardous situations by practicing proper storage and use of flammable materials, maintaining electric appliances and cords in good working order, not overloading electrical circuits, keeping stove and barbeque free from grease, not allowing garbage accumulation, properly using smoking materials, and keeping matches away from children. These are just a few examples of the steps that should be taken to alleviate hazardous situations - others are listed in Chapter 3.

Protection

Protect yourself

Keep doors closed: Keep internal doors closed whenever possible, particularly at night. Bedroom doors should be kept closed while the occupants are sleeping - but be sure that smoke detector alarms are loud enough to waken sleepers. This will delay the entry of toxic fumes into the room and also help keep out the heat in the event of a fire. Keep basement and utility room doors closed at all times. Closed doors will also delay fire growth by decreasing the feed of oxygen to the fire.

Establish and practice family escape plans: Planning and practising a rapid and safe exit from your house is important in the event of a fire. You and your family should know what to do in the event of a fire, and have a fire drill at least once every six months. Refer to Chapter 8.

Equip your home with smoke and heat detectors: Establish a fire alarm system around your house that will give an adequate early warning signal of a developing fire situation, and will waken you if you are asleep. Refer to Chapter 5.

Equip your home with gas detectors: If you have a gas fireplace, furnace, water heater, or any other natural gas appliance in your home, equip your house with one or more detectors that will sense an immediate gas leak. These are also recommended in mobile homes where propane gas is used. Refer to Chapter 4.

Equip your home with fire extinguishers: Allow yourself the ability to extinguish small fires before they get out of hand. Refer to Chapter 6.

Install a sprinkler system: In new homes, additions to old homes, and in old homes where you can justify the added expediture, install a quick-response residential sprinkler system. Refer to Chapter 7.

Inform the babysitter: Make sure your babysitter is familiar with these fire safety practices and knows the escape routes. Leave a telephone number where you can be reached in the event of an emergency. Also make sure regular visitors and overnight guests are familiar with your escape plans.

Protect valuable documents: Ensure that valuable documents, especially those related to fire insurance, are kept in a safety deposit box at a bank. If it is necessary to keep such documents at home, keep them in a fire- resistant container. See Chapter 3.

For the deaf and hearing impaired: Hearing loss affects more Canadians than any other physical disability. If a member of your household has some degree of hearing loss, it is important that you take special precautions to ensure that they have the same chances of escape as a person with normal hearing. This is discussed in more detail in Chapter 3.

Minimal Prevention and Protection

To implement all of the recommendations in this report may require more money than you can afford at the present time, and you may decide that the protection does not justify the expense. However, the avoidance of hazardous situations, together with the establishment and practising of family escape plans, costs nothing. The purchase of one or two self-contained smoke detectors (as recommended in Chapter 5.3) is highly recommended and the cost very little (less than $20 each) compared to the protection they will afford your family. In addition, at least one ABC-type fire extinguisher should be purchased and installed where it can be easily accessed from any area in the house (see Chapter 6). Other equipment (such as interconnected smoke detectors, system alarms and sprinklers) is highly recommended for complete protection.

Chapter Three

Fire Safety Precautions

General

The most common causes of home fires are carelessness with lighted matches and with smoking, and the misuse of electricity. Some other causes of home fires include faulty television sets, defective heating and cooking equipment, and accumulation of rubbish. Knowing how to recognize a potential fire hazard, along with learning the precautions to take, can save lives and property. The following list is by no means complete - but it does provide an idea of some of the safety precautions that can be taken to reduce the most common causes of residential fires.

Matches and Smoking

- ✓ Use large non-combustible ashtrays. When emptying an ashtray, make sure there is no live ash left in it. Emptying ashtrays into a garbage pail or wastebasket may cause a fire. It is preferable to empty them into a metal container with a tight lid.

- ✓ When discarding a lighted match, hold it for a second or so after blowing it out and then put it into an ashtray, never a wastebasket. Never carelessly toss away a lighted match or cigarette.

- ✓ Never strike a match in, or carry a lighted candle into, closets, attics, or other confined spaces where combustible materials are stored. Use a flashlight.

- ✓ Do not smoke while working near gasoline, oil drippings, or combustible vapours.

- ✓ Never smoke in bed. It is too easy to fall asleep and drop a lighted cigarette. Toxic gases from a fire can render one unconcious before the heat has a chance to waken a sleeper. If you must smoke before going to sleep, it is safer to sit in a chair.

- ✓ Before you go to bed, look under cushions for smouldering cigarettes. If a lighted cigarette is dropped in a couch or easy chair, remove it promptly, and ensure that the lighted end is still attached. If it drops through a crack, do not rest until the cigarette is found, or until certain it cannot smoulder. A heated cigarette end can smoulder for some time before actually igniting the upholstery material.

- ✓ Never leave small children where thay can gain access to matches or lighters. In the United States, it is estimated that 200 people die each year in fires associated with cigarette lighters - of these, 140 are children and 125 are under the age of four. In a review, it was disclosed that both boys and girls play with lighters and that children aged three and four can operate them. In fact, some children as young as one and two have used lighters to start fires.

✓ Be aware that disposable butane cigarette lighters can be a fire hazard. In fact, defective butane lighters have been proven to be responsible for many injuries and several deaths. They have been known to explode or self-ignite while carried in a pocket as well as during use.

House Wiring and Misuse of Electricity

✓ Have a competent electrician repair defective house wiring. Make certain your home is equipped with adequate electrical wiring and an adequate service entrance. If buying a new house ensure it is wired according to your local Electrical Code. Be sure wiring is adequate for such heavy appliances as electric ranges, clothes dryers and air conditioners.

✓ Buy only electrical appliances and cords approved by CSA (Canadian Standards Association) - the items should be marked with the CSA logo. Have appliances repaired if they are not working properly - they could be a potential fire hazard.

✓ One special hazard may be found in houses that contain wiring made from aluminum rather than copper. Aluminum wiring is safe if it is used with the appropriate devices (such as switches and receptacles) that are designed for it. Overheating and fire can occur if aluminum wire is connected to devices meant for copper wiring. If you are unsure whether your house uses copper or aluminum wire, look inside switch and receptacle boxes - aluminum wire is silvery instead of copper-coloured. If you find that aluminum wiring is installed, check all switches and receptacles to ensure that they are compatible with aluminum wiring.

✓ If your service entrance is equipped with replaceable fuses, ensure that they are replaced with the proper sizes and that they are not bypassed. When a fuse blows, or a circuit breaker operates, find the cause of the overload before replacing or resetting.

✓ Avoid the excessive use of extension cords and multiple-plug outlets, which increase the chances of overloading electrical circuits. Replace electrical cords of lamps, vacuum cleaners, appliances, etc. if they become worn or otherwise damaged. Do not splice broken or freyed wires and bind them with electrical tape. Do not cover freyed wires or broken insulation with electrical tape. This will result in delaying the proper replacement of damaged wiring, or in forgetting about it altogether.

✓ Do not run wires under rugs or over nails, or where they might be subjected to mechanical damage.

✓ Disconnect electric irons when not in use. Do not use electric toasters under drapes or near any other flammable material, and keep your eye on anything being

toasted to ensure it pops up at the right time and does not get stuck or start burning.

✓ Do not leave electric blankets turned on longer than necessary, and ensure that they are turned off while the house is unoccupied. Make sure that the blanket and wiring are in good condition and not worn or freyed in any way. Inspect them regularly.

✓ Always remove cords from electric sockets by grasping the plug, not the wire.

✓ Have dry hands when using electrical appliances. If an appliance gets wet, have it serviced.

Television Sets and Stereos

✓ If the TV or stereo is not working properly, have it checked out - it could be a potential fire hazard.

✓ Do not make home repairs on television sets, unless you are qualified to do so. This goes for any other appliance in the home. Fire or shock may result.

✓ TV sets and some stereos generate a considerable amount of heat and should have adequate ventilation. Do not obstruct ventilation. Do not place near opened heat vents. Cool air should be allowed to flow in from the direction of the floor, past the ventilation holes in the TV or stereo (where it will be warmed), and out towards the direction of the ceiling. Do not leave television sets or stereos on overnight.

✓ If you have a roof antenna, ensure that a lightning arrestor is installed (with an adequate ground). This will prevent damage and fire caused by a lightning strike to the antenna. During a thunderstorm, remove all antenna and cable connections to television and stereo sets.

Heating and Cooking Equipment

✓ Furnaces, as well as chimneys and all flues, can be a fire hazard when they are clogged or coated with soot. They should be cleaned at least once a year.

✓ Periodically examine gas furnaces, water heaters, fires, etc. and call a qualified gas fitter if there is the slightest indication that there might be a problem. Gas furnaces should have a maintenance inspection periodically. Areas near furnaces should be kept free of combustible materials such as rubbish and paints. If the gas leaks, call the gas company immediately.

✓ Gas fireplaces must have the chimney damper permanently secured in the

open position. This is a legal safety requirement.

✓ Ashes from a fireplace should be placed in a metal container. Keep a metal fire screen in front of every fireplace to prevent sparks escaping.

✓ Be sure your kitchen stove is in good repair. Oven, broiler, and burners should be kept free of grease. There should be sufficient clearance between electric ranges and combustible walls. Do not hang drapes, towels, or other combustible materials near or on the stove. Do not store things over the stove as people (and their clothes) can get burned reaching. Keep children away from the stove.

✓ Do not preheat the frying pan or cooking oil and walk away unless the burner is turned off and the pan moved to a cool burner. A very greasy broiler tray can catch fire if it is preheated, especially if excess fat has not been trimmed from the roast. If the oven (and broiler tray) needs cleaning, don't cook in it. Clean the oven at least once every six months.

✓ f you have a gas stove, never leave the house with it lit. Be sure the pilot light works properly. Wear tight sleeves when you cook as loose-fitting garments can catch fire. Tie up long hair.

✓ Turn off portable oil or gas heaters before retiring and before going out. Do not place portable heaters where they can easily be tripped over or overturned. They should be kept at least 0.9m (3 feet) from combustible materials, such as bedding, drapes and furniture, and away from areas where children play.

✓ Never throw flour or dust from a vacuum cleaner or dustpan into an open fire. Dust is explosive - wrap it up and dispose of it safely.

✓ If your blow dryer stops automatically under normal conditions, it is a warning that the unit is overheating and could become a fire hazard. Unplug the dryer and remove all hair, dust and lint from the dryer vents before trying the dryer again. Unplug your blow dryer, curling iron, styling brush, etc. when not being used. Make sure the appliance is cool before storing and do not wrap the cord around the appliance.

Utility, Workshop and Garage Areas

✓ Keep your clothes dryer in good working order and operate it in strict accordance with the manufacturers instructions. Make sure the lint tray is in place before using and clean it out regularly (preferably after every use). Lint and some types of anti-static sheets can become a fire hazard if they get too close to the motor.

✓ In the workshop, install enough electrical outlets, properly fused and in accordance with your local electrical codes, to eliminate the need for

extension cords.

✓ Store gasoline and other flammable liquids in tight metal containers. Do not store these, or propane cylinders, in the house. Do not use flammable liquids near heat, a pilot light, or while smoking.

✓ Clean up gas and oil spills in the garage or carport and either dispose of oily or greasy rags or keep them in a sealed metal can. Old paint cans should be discarded. Clean up sawdust immediately and discard away from the house.

✓ Paint, paint removers and solvents, if they must be stored in the house, should be stored in tightly closed metal containers. Use these liquids only in an area that is well ventilated (preferably outside).

Outdoors

✓ Propane barbeques must be kept away from the house at all times (in use and while stored). They can turn into giant blowtorches if the proper precautions are not taken. Before lighting, ensure that all gas fittings are properly tightened and do not leak. For further information on the safe use of propane appliances refer to Chapter 4.

✓ Do not use gasoline on a grill or barbeque fire ever. Once the fire has been started, never use lighter fluid either. Use dry kindling to revive the fire.

✓ Move the lawnmower (gas or electric) away from gasoline fumes before starting. Cool motor before refuelling gas lawnmower.

✓ Stacks of old newspapers should be removed. Find a school or organization that is collecting newspapers for recycling.

✓ Clean up the dead leaves in the yard, also any fallen branches or limbs. Remove broken glass and discard all piles of rubbish.

✓ Check the outside of the chimney for signs of cracks and inspect the chimney flue for creosote buildup.

✓ If backyard burning is allowed in your area, watch fires constantly and extinguish with water before leaving. Never allow children to play near outdoor fires or barbeques

Christmas

Throughout the year, there are infrequent occasions where special precautions need to be taken with regard to fire safety. One such occasion is Christmas, when a decorated tree and Christmas lights bring a special warmth to the holiday

season, and people are usually so caught up in the spirit of Christmas that they often overlook the most basic safety precautions. Each year tragedy strikes somewhere through electrical fires or other accidents, often caused by worn or defective equipment, or by sheer negligence. Proper selection and placement of the tree, together with the following of proper electrical practices, is essential to ensure adequate fire safety in the home at Christmas time.

Christmas trees

You may choose a real or an artificial tree but, whichever type you do use, keep it away from any potential source of heat or flame (such as the fireplace or TV), and do not use candles on or near the tree. Do not allow discarded gift wrappings or other combustible materials under the tree and use only non-flammable decorations on the tree. Do not allow the tree to block fire escape routes.

Real Christmas trees: Cut Christmas trees become extremely flammable when cut long in advance of use, and when brought indoors where heat and low humidity accelerate drying. To reduce the hazard, the tree (if you feel you must use a real one), should be kept indoors only as long as absolutely necessary. The trunk should be sawed off at an angle at least 2.5cm (1-inch) above the original cut end and kept standing in water during the period the tree is in the house. Water should be added at intervals to keep the water level above the cut. There are Christmas tree stands available that are specially designed for cut trees, having a water-filled base and often including a safety reservoir for added protection. Fire retardants do not work well on Christmas trees and are not recommended as a means of fire protection. Live Christmas trees (those with roots) are safer than cut ones, providing they are waterred regularly. Always dispose of a cut Christmas tree promptly after the holiday season - do not keep it in the house. Live trees should be transplanted outside as soon as possible.

Artificial Christmas trees: Only purchase an artificial tree that is labelled “non-flammable” or “fire-resistant” on the tree or on the box.

Christmas lighting

Always look for the CSA Certification Mark when buying new lights, lighted displays or extension cords. The lights may be either of the indoor or outdoor type, so ensure that you purchase the correct type for the purpose intended (indoor types should not be used outdoors). Always check old lighting sets before installing them - visually inspect them for worn insulation, broken plugs or loose bulb sockets and replace missing bulbs. Plug the lights in and confirm operation - replace any bulbs that do not light and do not install the set until all lights are working properly (this is particularly important with series strings where burned-out bulbs are often bypassed, increasing the voltage on other bulbs). When replacing burned out bulbs, always unplug the set from the wall socket first, then make sure the replacement bulb is the correct type and voltage (CSA requires that packages of replacement bulbs bear guidelines to assist in the selection of the correct bulb). The CSA also requires that the package of lighting sets must indicate the number of sets that can be safely strung together or operated from a single wall socket - if this warning is ignored, a fire hazard

could be created. On outdoor displays the sockets must be hung with the bulb pointing downward - use only insulated staples to hold the strings in place, or run them through hooks. Do not overload electrical sockets or extension cords and do not run cords where they can be tripped over. Always switch off tree lights at bedtime, or when leaving the house.

Halloween

Another infrequent occasion when special precautions need to be taken with regard to fire safety, is Halloween. Here the danger is from loose flowing costumes, candles and fireworks.

Costumes

Halloween costumes may be made at home, purchased or rented. They are often loose-fitting and flowing in accordance with the Halloween tradition of witches, goblins and ghosts. At this time of year, when open fires and candles are common, proper selection of costume material and design, as well as extra special care by the wearer, is essential in reducing the risk of fire injury. Do not allow costumes to be more loose-fitting and flowing than absolutely necessary and do not cook or perform tasks near open flames or candles wearing such apparel. In particular, children's costumes should be made of fire-resistant material or be treated with a fire retardant. Many plastic outfits are so marked. Refer to Sections 3.11 and 3.12 for selecting flame-resistant costumes or materials made of textile fibres. In addition, for wearing outdoors, "trick-or-treat" costumes should also be reflective or bear reflective markings visible from all directions.

Candles

Placing candles in carved pumpkin heads is a Halloween tradition, but many serious fires have been caused by carelessness in placing and lighting the candle. To reduce the hazard, ensure that the candle is placed in a stable, upright position within a pumpkin that is still moist (ie. one that has not been allowed to dry out). It is recommended that the candle be placed in a holder of some kind. Place the pumpkin on a stable base well away from drapes and any other loose-flowing or flammable material. Do not leave a pumpkin with a burning candle unattended inside the house - pets may knock over carelessly placed pumpkins, especially when spooked by the loud and strange sounds of Halloween. Light the candle with a long match or spill, preferably through one of the eyes of the pumpkin rather than through the top to prevent burning yourself or your clothing. Do not move the pumpkin with the candle lit, and always ensure that all candles are properly extinguished before going to sleep.

Fireworks

Conservative current estimates indicate that possibly 10 deaths and 4000 injuries are caused by fireworks each year in North America. In addition, many cases of property damage are reported. According to the National Fire Code of Canada, the manufacture, storage, transportation and sale of fireworks must conform to the "Explosives Act" and the "Explosives Regulations", as administered by the Explosives Branch of Energy, Mines and Resources Canada. In the Regulations, explosives are divided into seven classes, Class

7 being the fireworks class. Amongst other requirements of this section, it is stated that no person shall knowingly sell any firework (with the exception of caps for toy guns and model rocket engines) to a person who is under the age of eighteen, or who appears to be under the age of eighteen and does not produce evidence that he is of the age of eighteen or over. The NFC also states that the handling and discharge of fireworks shall conform to the "Manual of Display Fireworks", as published by the Department of Energy, Mines and Resources. In addition to these federal regulations, the provinces and municipalities may have their own specific regulations governing the sale and use of fireworks.

Regulations

Class 7 of the Explosives Regulations is divided and subdivided to cover the various types of fireworks as defined in the regulations. Class 7.2.1 refers to low-hazard "family" fireworks used for recreation (eg. small fountains, volcanoes, Roman candles, pin wheels, sparklers, Christmas crackers, caps for toy guns). Fireworks of this class will not explode violently and may be sold to an adult for his own use and enjoyment - he bears the responsibility for their safe use by himself and his family. Class 7.2.2 refers to high-hazard fireworks used for public displays (eg. rockets, large wheels and bouquets, fountains, batteries, candles, mines, firecrackers). Fireworks of this class present a special hazard and usually require a permit for their purchase and display. High-hazard fireworks must not be kept in private homes, apartments or any type of dwelling.

Safety

With the exception of sparklers, no fireworks are designed to be, or should be, held in the hand when lighted. As fireworks are a potential fire and health hazard, always read the instructions on each item carefully before using. Other safety tips for a family fireworks display are given below:

- ✓ Select a firing site free of overhead obstacles such as trees and wires, and away from combustible materials and substances, including houses and wooden fences.

- ✓ A large water container should be kept at the firing site for safety and to dispose of used fireworks. A hose, connected and ready for using, will provide a measure of added safety.

- ✓ One adult should be in charge of the display. Young children should not participate in the firing, but older children may help one at a time under close adult supervision.

- ✓ Read all instructions thoroughly, using a flashlight or electric light - never an open flame.

- ✓ Implanted fireworks must be secure. Buckets, boxes and wheelbarrows filled with earth or sand make a good firing base. Set fireworks at a 10 degree angle away from spectators and pack earth or sand around them firmly so that they will not fall over during the display. Long pieces should

be buried to half their depth.

- ✓ Glow ring igniters are recommended for lighting safety (although sparklers have to be started with matches or a lighter). Keep all spectators clear of the firing area while lighting the fuse and step back to a safe area quickly once the fuse is ignited.

- ✓ Do not approach a used firework or a firework that has not gone off until you are sure it is safe to do so. Do not attempt to relight a piece that has not gone off.

Power Failures

In the event of a power failure, use candles and gas lanterns wisely. Candles should be placed in a proper holder, secured in an upright position and not be placed where they may be knocked over - they should not be carried while lit. Do not use open flame devices in a closet or near flammable materials or substances. Use a flashlight where-ever possible. Use camping equipment (such as camp stoves) outside and away from the house. It is recommended that you purchase one or more power failure lights as described in Section 8.3.6 and place them in areas where they will be most useful in the event of a power failure (eg. to illuminate a hallway or stairway).

Textiles

Textiles are an intimate part of daily living. The clothes we wear, the chairs we sit on, the carpets we walk on and the beds we sleep in are examples of textiles used regularly in the home. Most textile fibres will burn, and the presence of flame near a flammable fabric of open or airy construction has in the past been sufficient to start tragic fires. Careless smoking has been responsible for many deaths caused by burning bedding and upholstered furniture, while spread of fire has resulted from flaming carpeting (lateral spread) and draperies (vertical spread).

Selection of textile products for the best fire rating is not an easy matter. To properly determine the fire hazard rating of a particular fabric, it is necessary to know the ease of ignition, surface flame spread, heat release, smoke obscuration and toxicity of combustion products. It is difficult, if not impossible, to obtain such ratings from dealers or manufacturers that will allow the consumer to select a textile product for fire safety. The many factors affecting the fire hazard rating of a textile product include the type of fibre used, whether the fibre is blended, the construction of the fabric, the design of the product, the type of filling material and the type of dye used. In addition, various chemicals may be applied to the fibres or to the fabric to add flame resistance to normally flammable materials - it should be noted, however, that the use of phosphate detergents, fabric softeners and bleach may render the flame-retardent finish ineffective after a number of washings). The Canadian consumer is protected to a degree by the Hazardous Products Act, which is administered by the Products

Safety Division of the Department for Consumer and Corporate Affairs. This act requires that clothing and certain textile products meet specified standards of flammability. More detailed information on finished products can be found in the following sections on *Clothing* and *Furniture and Furnishings*.

The following graphic provides a list of some of the basic fibres and their reaction to flame. The list does not consider the affect of dyes, blending or chemical finishes on the fabric.

SELECTING FIRE-RESISTANT TEXTILES

TYPE OF FIBRE		REACTION TO FLAME	Clothing	Bedspreads	Blankets	Sheets	Curtains	Drapes	Upholstery	Slipcovers	Carpet Face	Carpet Back	Area Rugs	Mats	Padding	Industrial
Cotton	V	FLAMMABLE: Ignites on contact. Continues burning on removal of flame.														
Linen (Flax)																
Sisal																
Jute																
Rayon	S															
Acetate																
Triacetate																
Acrylic (1)																
Olefin (2)	S	FLAME - RESISTANT: Melts or fuses away from flame. Burns slowly. Self-extinguishing.														
Nylon																
Polyester (3)																
Vinyon																
Saran																
Modacrylic																
Vinal																
Novoloid																
Aramid																
Wool	P	FLAME - RESISTANT: Curls away from flame. Burns slowly. Self-extinguishing.														
Silk																
Mohair																
Angora																
Glass	M	NON - FLAMMABLE: Will not burn.														
Asbestos																
Metal																

V	Vegetable (natural)
S	Synthetic
P	Protein (natural)
M	Mineral

Note 1:	Acrylic also melts.
Note 2:	Olefin continues to melt and burn when the flame is removed.
Note 3:	Polyester, when blended with a more flammable fibre, continues to burn on removal of flame.

Clothing

The worst burns usually involve clothing. Every year many deaths and severe injuries are attributed to peoples clothes catching fire. It happens especially to children and the elderly and, in most cases, the victims are dressed in sleepwear. Usually, it is the children's innate sense of curiosity that gets them into trouble

- they have come across a lighter or a book of matches, or they have managed to come too close to a fireplace or the hot element of a stove. In the case of adults, their clothing most often catches fire while they are cooking, smoking or handling combustibles.

Fabric composition

Clearly, any article of clothing (unless it is made from asbestos) will burn once it contacts a source of ignition. However, there are certain types of fibres and fabrics that are less likely to ignite than others, and some that will burn more slowly, reducing the risk of a serious injury. For clothing use, we are not as concerned about the toxicity of fabrics when burning as we are in the ability of the fabric to self-extinguish once the ignition source has been removed (so that, if a person trapped in a fire can get clear of the fire, his clothing will stop burning). Fabrics made of synthetic or protein fibre will do this, as will cellulistic fibres that have been treated with a fire-retardant. The problem with synthetic fibres is that they tend to melt in or near flame, increasing the severity of burns. Some clothing fabrics made of mineral fibres are non-flammable.

Garment design and construction

In addition to the type of fibre, fabric construction and finish as described above, the design and construction of the garment itself is important in reducing the fire hazard. Tests on sewn garments reveal that sewing threads can burn, causing ignition and burning in otherwise flame-retardant fabrics. Trimmings can have an even more pronounced effect. Long sleeves, flowing clothing and shirttails are very dangerous around stoves, barbeques and open fires. In some cases, a child or adult could be engulfed in flames in 30 seconds. Snug-fitting garments with tight waists, ankles and wrists are safer, as are tailored, fitted garments. They are less likely to contact ignition sources, and will burn slowly because the amount of oxygen available to feed the fire is limited. Victims, or those closeby, will have more time to react to smother the flames and limit the injury.

Regulations for childrens sleepware

The Minister of Consumer and Corporate Affairs has recently introduced more stringent flammability regulations for childrens sleepwear in order to reduce the incidence and severity of sleepwear burn injuries. The flammability of childrens sleepwear up to size 6X has been regulated under the Hazardous Products Act since 1971. Despite this regulation, a minimum of 21 children under the age of 9 were severely burned and one or two died each year due to sleepwear fires. The new regulations, made effective in 1987, apply to sleepwear which have been implicated in the most severe injuries (such as children's nightgowns, night shirts, dressing gowns, bathrobes, housecoats and robes, pyjamas and babydoll pyjamas in sizes up to and including 14X). Less hazardous styles of sleepwear, such as polopyjamas and sleepers, remain subject to the existing regulations. For an item to comply with the new regulations it must, among other requirements, pass a flame resistance test. Very briefly, the test consists of igniting the ends of five test specimens of the fabric 3-1/2" wide by 10" long. For the material to pass, the average char length for the five specimens must not exceed 7", and not more than one individual specimen is allowed to have a char length equal to the full length of the specimen (ie 10").

- ✓ To reduce the risk of a clothing or sleepwear fire adhere to the following safety tips:

- ✓ Consider the age, physical condition and mentality of the wearer, as well as the burning properties of the fibres and fabric, when evaluating the fire hazard potential of clothing.

- ✓ When buying or making clothes or sleepwear choose fabrics that are difficult to ignite, slow to burn, are self-extinguishing when the ignition source is removed and do not melt readily. Also select fabrics with a tight weave (such as denim and double-knits) that will limit the amount of oxygen that is able to flow through the fabric to fuel a fire should the fabric ignite.

- ✓ When buying or making clothes or sleepwear choose designs that fit snuggly (ie. are not long and flowing) so that the amount of oxygen available to fuel a fire from both sides is limited. For example, jogging suit styles of pyjamas are usually best for childrens nightwear.

- ✓ Keep matches, lighters and open flames out of the reach of children.

- ✓ Do not allow children to play near or climb on stoves, fireplaces or other heat sources.

- ✓ Do not wear loose-fitting garments when cooking or around fires, barbeques, or other heat sources.

- ✓ If you buy or make clothes that incorporate a flame-retardant chemical, ensure that you follow the laundering instructions exactly.

House Construction

There is probably little one can do about changing the existing construction of a house to improve the fire safety requirements - the cost would be prohibitive (except for maybe upgrading existing wood doors as described in Section 3.13.8). However, if you are having a house built, or are renovating or adding to an existing building, you may be able to ensure that the best possible protection is achieved. The first obligation of house designers is to meet the legal requirements of the National Building Code of Canada (NBC) and the National Fire Code of Canada (NFC). These codes are complementary. Together they contain the fire safety requirements for all buildings in Canada, and specify recognized fire and safety standards for building materials (such as CSA and ULC) by reference. In addition to the federal codes, provincial and municipal building and fire codes must be met. Additions and renovations must also comply with the building codes, hence the necessity for obtaining a permit before such construction can commence.

Construction materials

The structural framing of a building has little to do with the hazard from fire to the occupants. Most fires start in the building contents and create conditions that render the inside of the home uninhabitable long before the structural framing becomes involved in the fire. However, once the fire starts in the contents, the material of which the building is constructed can be of significant help in facilitating evacuation, fire fighting, and property protection. ULC have a series of standards for determining the non-combustiblity of building materials, and these are referenced in the National Building Code of Canada.

Wood construction

The gypsum board used commonly in residential construction, in combination with the wood-frame construction, inherently provides a fire endurance of at least 20-30 minutes in the worst case of a fully-involved fire. When exposed to fire, wood forms a self-insulating surface layer of char, which actually provides its own fire protection. Even though the surface chars (at an average rate of one inch in approximately 40 minutes), the undamaged wood underneath retains its strength. For this reason, heavy timber is often recommended for load- carrying wood members in order to attain an added measure of fire resistance. To lower the rate of surface flame spread and make the wood self-extinguishing if the external source of heat is removed, fire retardant chemicals may be impregnated in the wood. However, such chemical treatment is very expensive and probably not worth the extra cost for the amount of added protection it affords your property.

Preventing the spread of fire

Common construction methods are designed to prevent the spread of fire both horizontally and vertically in building interiors. Horizontal protection can be improved by using fire-resistant Type X gypsum wallboard covered with latex paint (which is less flammable than oil-base paint), using properly constructed and fitted interior doors (see Section 3.13.8), keeping unused doors closed, and carefully selecting wall coverings (see Sections 3.13.6 and 3.13.7). Vertical protection can be improved by using Type X gypsum wallboard covered with latex paint for the ceiling and firestopping any openings between floors. Blocking and sill plates can be placed horizontally between the studs at floor, ceiling and intermediate levels to interrupt the updraft between the walls that would otherwise carry fire, smoke, heat and toxic fumes to the upper storeys and to the roof. Openings around furnace chimney pipes, etc., should be properly filled, and stairways can be firestopped by using properly constructed doors (although this may not be possible with open stairways).

Fireplaces and chimneys

Chimneys should extend above the highest point of the roof and be solidly constructed with flue linings of fire clay or other approved insulating material. Unused flue holes should be safely closed with a non-combustible cap, not papered over or left open. Joists should not extend into the chimney. Fireplaces should be safely insulated with approved non-combustible material.

Wallpaper

Many synthetics (such as vinyl wallpaper) release smoke and toxic fumes when burned. One company has changed that liability into an asset by changing the composition of its vinyl wallcoverings so that they warn of impending fire even

before either smokeor flame appear. The new early warning wall coverings, when heated to 149 degrees Centigrade (300 degrees Fahrenheit), release a harmless, odourless and colourless vapour that activates ionization-type smoke detectors. This temperature threshold is well below the ignition point of many common materials, including paper, cotton and plastic foams. Officials of the manufacturing company say that the new wall covering will be especially useful in detecting electrical overloads and shorts that cause fires inside walls.

Paint

Fire-retardant paints are available that will slow down the spread of fire inside a house by puffing up into a foamy insulating layer when exposed to high temperatures. The insulation helps keep the paint from flaring - as most conventional paints will do - and also temporarily prevents flammable material underneath, such as wood studs and joists, from reaching the kindling point. This type of paint is known as intumescent paint and is particularly valuable in garages and basements. It is usually only available in flat latex and can be applied over any surface that is suitable for conventional flat latex paint. However, conventional paints should not be applied over intumescent paint because they impair its effectiveness. For maximum effectiveness, it is important to follow the manufacturers instructions exactly.

Interior wood doors

nterior doors should be kept closed when not being used, especially at night when the occupants are sleeping. This affords a measure of delay to fire, smoke, heat and toxic fumes. The length of delay, required to allow the occupants of the room to awaken and escape, is dependant on the construction of the door itself, the door frame and the fit of the door within the door frame. Solid core doors are the best protection, but are seldom used in the interior of normal residential homes. The fire resistance of existing hollow and wood panel doors within the home can be improved by adding 1/2” gypsum wallboard or plywood to the room side of the door. For full details on performing this modification contact your local Provincial Fire Commissioner’s Office.

Lightning protection

The probability of a building beingstruck by lightning and the resulting risk of loss can be calculated based on the type of structure (eg. single family residence less than 5000 sq. ft.), type of construction (eg. wood framework with composition roof), relative location (eg. a small structure in the area of higher structures), topography (eg. on flat land), occupancy and contents (eg. residential furnishings), and the lightning frequency (based on the mean annual number of days with thunderstorms for the area in question). Based on these factors for a single family residence in Canada, the risk of loss from lightning will be relatively light. Consequently, such residential buildings will not normally require lightning protection. As well as direct and indirect lightning strikes to the building itself, any metallic object protuding from the building (such as overhead cables or an antenna) are subject to strikes. Utility companies (such as power, telephone and cablevision) are required to install lightning protection arrestors where the cables enter the building. If you have a television antenna, or any other form of antenna, placed on or near your house, it should have a lightning protection system with an acceptable ground.

Fire protection equipment

f you are buying or building a new house, it is recommended that you have installed, during construction, either an ac powered system of smoke detectors wired for multiple operation (see Section 5.3), or a complete hardwired burglar/ fire alarm system (see Section 5.5). The detectors must be located and mounted per the recommendations of Section 5.3.10 and Section 5.3.11. Heat-activated and gas alarms should be installed as recommended in Section 5.4 and Section 4.4 respectively. You might also consider installing a quick-response residential sprinkler system (see Chapter 7).

Furniture and Furnishings

Attempts to improve fire safety through building code requirements have been continuing for many years, but they affect only the design and construction of the building itself. It is a fact that house furnishings play an even greater role in fire safety, as these are most often the items that ignite first and also pose the greatest immediate threat to life. In about 33% of the residential fire deaths reported in Canada, furniture and furnishings were identified as the articles first ignited. Over 80% of these items were upholstered furniture, bedding and mattresses, and 80% were caused by carelessness with smoking materials. Curtains, drapes and carpeting were mainly responsible for the spread of fire. It can be seen from these statistics that a substantial reduction in the number of fire deaths is possible by improving the ability of furniture and furnishings to resist ignition from small sources such as cigarettes and matches.

Bedding

Burning bedding (mattresses, sheets, blankets, pillows, etc.) results in approximately 46% of the fire deaths caused by carelessness with smoking materials. In many of these cases, the fire smouldered during the early stages at least, and the victim was killed by the fire gases rather than by burns. To reduce the fatality rate, products made in whole or part of textile fibres and designed for use on a pillow, or on a bed, cot, crib, or other furniture designed to be used for sleeping, are regulated under the Hazardous Products Act. Under this Act, mattresses have to pass a test that involves placing a lighted cigarette on the mattress assembly and ensuring that either (a) combustion of the mattress does not proceed further than 50mm (2 inches) from the original location of the cigarette or (b) that combustion ceases within ten minutes after the cigarette is extinguished. As people in bedding fires are more likely to die from inhalation of toxic fumes rather than from burns, it is better to choose items of bedding that are less toxic rather than less flammable. Synthetic fibres generally give off more toxic fumes when burning than do natural fibres. Because it is difficult to pin down the requirements for bedding fabrics, and because specifications of toxicity are not easy to comeby, it is recommended that the following safety tips be strictly adhered to:

✓ Do not smoke in bed.

✓ When buying or making bedding, choose fabrics and filling material made

of fibres that are difficult to ignite, slow to burn, are self-extinguishing once the ingition source is removed, and do not give off excessive toxic fumes when burning.

✓ Keep any heaters or possible ignition sources at least one metre away from the bed. When removing bedding from the bed keep it at the same distance.

✓ Keep matches, lighters and open flames out of the reach of children.

✓ Install a smoke detector in the centre of the bedroom ceiling.

✓ If you buy or make bedding that incorporate a flame-retardant chemical, ensure that you follow the laundering instructions exactly.

Upholstered furniture

Because many materials used in upholstered furniture burn rapidly and emit toxic gases, burning upholstery results in approximately 43% of the fire deaths caused by carelessness with smoking materials. Concerns about home fires caused by smouldering cigarettes prompted various groups interested in public safety to request action by the federal government. As a result of subsequent discussions, a voluntary industry program to test the flammability of upholstered furniture was approved by the federal government. In 1986 the Canadian Council of Furniture Manufacturers (CCFM) signed a formal agreement with the Upholstery Furniture Action Council (UFAC) in the U.S. to develop, in Canada, a voluntary initiative similar to the one in place in the U.S. since 1979. The UFAC program includes fabric classification, construction criteria, labelling and compliance procedures. The UFAC uses a hangtag, which assures consumers that the item bearing the tag is safer because it is made in accordance with the UFAC-recommended construction criteria. It also warns the consumer of the dangers of ignition by a burning cigarette regardless of the improvements of UFAC criteria. The distictive UFAC hangtag, which will become an increasingly common sight in Canadian stores, is shown in Figure 3. For further information on the UFAC voluntary action program contact the CCFM.

Whether you buy new furniture with the UFAC label or whether you continue to use your existing furniture, take special precautions if you have a smoker in your household, or frequent visitors who smoke. For example, it is advisable to select a “smoking” chair or couch which has few, if any, areas where a cigarette may lodge and burn. It is particularly important to avoid crevices where back, side and seat areas join. For this reason, seperate seat cushions should be avoided, as should seams used across the seat area that may tend to pull loose under heavy use, exposing the inner filling to possible ignition from a cigarette.

Window coverings

Curtains and drapes are words to describe two different types of window coverings. Curtains usually hang in front of the window, often above the sill

and inside the frame. Drapes, on the other hand, usually extend outside the window moulding and may extend all the way from the ceiling to the floor. These items, but particulary drapes, can be the prime material involved in the vertical spread of fire in a residential building. It is important to note that shaggy or loosely constructed fabrics encourage the spread of fire, whereas smooth, closely constructed fabrics resist flame spread. To reduce the risk of a fire in curtain and draperies adhere to the following safety tips:

- ✓ When buying or making curtains and drapes, avoid purchasing shaggy or loosely-constructed fabrics. Instead, choose smooth, closely-constructed fabrics which are more likely to resist the spread of flame.
- ✓ Keep any heaters or possible ignition sources at least one metre away from curtains and drapes.
- ✓ Keep matches, lighters and open flames out of the reach of children.
- ✓ If you buy or make curtains or drapes that incorporate a flame-retardant chemical, ensure that you follow the laundering instructions exactly.

Floor coverings

Carpets used to be a significant contributor to the lateral (horizontal) spread of a fire - mainly because flammable fibres were used in the carpet pile. But, since the advent of regulations under the Hazardous Products Act and with the stringent requirements of the Canada Mortgage and Housing Corporation (CMHC) and the National Building Code, residential carpets are no longer considered a major contributor to the spread of fire from a small fire source. Since the regulations were introduced, there have been many examples of residential room fires where furnishings were badly dmaged and the carpet remained intact. This has been accomplished by eliminating the most hazardous fibres, treating other fibres to make them flame-resistant, adding flame retardants to the latex adhesives in the carpet backing, and improving the non-flammable propertyies of underpads. Thus, any carpet currently available to the Canadian consumer will offer similar and adequate protection against fire spread in a residential home

Wood Burning Heaters and Stoves

Many fires have been attributed to the use of solid fuel, which is now showing increasing popularity as an alternative heat source in this age of energy conservation. If you are considering installing a wood-burning appliance, keep your family's safety and your homeowners insurance policy in mind. Although wood-fired appliances are not currently required by law to be certified, it is highly recommended that you purchase one that is. In fact, any solid fuel burning appliance that you buy should bear a certificaton mark (such as CSA) and be installed according to the CSA Installation Code for Solid Fuel Burning Appliances and Equipment (CAN3-B365-M84).

New installations

For proper selection and installation of a wood-burning appliance, use the following guidelines:

- ✓ Look for the certification mark on the label affixed to the appliance.
- ✓ Before buying the unit, advise your insurance agent that you are thinking of installing a wood-burning appliance - it could void your insurance or affect your premium.
- ✓ Contact your municipality and ask if a building permit is necessary.
- ✓ Make sure the installer is using the CSA Installation Code.
- ✓ Ask your local or municipal building or fire inspector to check the installation before using it.
- ✓ Ask your insurance agent to update your insurance policy.

Existing installations

If you already own a wood-fired appliance, take the following precautions:

- ✓ Check for a certification mark on your appliance, located near the manufacturer's nameplate.
- ✓ Have your installation checked by your local fire or building inspector, or by a reputable retailer/installer who uses the CSA Installation Code.
- ✓ If there are any installation deficiencies, have them corrected or the unit reinstalled properly.
- ✓ Call your insurance agent to advise him that your wood-burning appliance meets the CSA Installation Code requirements.

Maintenance and use

Maintenance of your certified and properly installed wood-burning appliance is also essential to its safe and efficient use:

- ✓ Always make sure your stove pipes and chimney are in good condition and check them regularly for creosote buildup. Shiny creosote deposits which look like black paint are an indication that your wood -fired system is not working properly. Call a chimney sweep for help.
- ✓ Burn seasoned wood to minimize creosote buildup. Wood which is cut, split and stacked under cover to air dry in the spring will be seasoned and ready for burning in the fall. Longer storage times, however, are preferable.
- ✓ When a wood furnace is the sole heat source, ashes must be removed at least once a week. Used as supplemental heating, it may require emptying once a month. The ashes, once removed, should be placed in a metal container and

stored outside, away from any combustible material.

✓ During and after the heating season, check that the hinges, doors, latches, gaskets, and operating controls of the appliance are functioning properly.

✓ Do not load the appliance with too much wood. This can cause the wood to smoulder which, in turn, contributes to excessive creosote buildup.

Further information

For more information on the installation, maintenance and safe operation of wood-burning appliances refer to a booklet entitled "Residential Wood Heating: A Homeowner's Guide". This is available free from Energy, Mines and Resources Canada.

Fire-resistant Containers

Large amounts of cash should never be kept at home - neither should valuable documents (such as bonds, shares, certificates and insurance policies), unused jewellery, coin and stamp collections, and other items of value. Financial institutions and private vault firms can offer far greater protection from fire and burglary than can ever be attained in your home. However, there may be some items of value that you feel you must keep at home. These items should be protected against fire and theft. Unfortunately, safes that provide the best protection against burglary do not necessarily provide the best protection against fire damage and vice versa.

Types of safes

The type of safe that will resist burglary attempts will make things tough for thieves trying to break through the box, but the steel - and often copper - walls are excellent heat conductors that can quickly bring interior temperatures up to incendiary levels when exposed to fire. Fire-resistant safes, on the other hand, afford protection against heat, smoke and flame for your records and documents, but offer only minimal security against the skilled burglar with tools. Safes offering a combination of construction and materials that will protect against both fire and burglary attempts are available, but these are often too expensive for the average homeowner. The best compromise is probably to find a good quality fire-resistant safe, because these do offer some degree of theft protection, whereas burglary-resistant safes often offer little in the way of fire protection.

Requirements for a fire-resistant safe

Standards for the classification of fire-resistant safes have been written by a number of organizations around the world. For example, certification services are provided by JIS in Japan and UL in the U.S. In Canada, the degree to which an insulated safe is affected by fire and heat (ie. the quality of the product) is determined by the results of three ULC tests. Once these tests have been successfully completed, the safe will be listed under the Label Service of the ULC and will bear the ULC logo, together with one of three classification levels. The tests required for each classification level are given in the following list - they ensure that paper inside the safe will not ignite and will remain pliable and legible at the various degrees of exposure to heat. The highest classification

level is Class 177C-4h, followed by Class 177C-2h and Class 177C-1h.

Fire Endurance Test: The safe is exposed to an external source of heat (applied per classification level) before an internal temperature of 177é Centigrade was reached (as measured 150mm from the top and back of the interior, and 25mm from the side walls and door).

CLASS	EXPOSURE LEVEL	PERIOD
177C-4h	1093°C	4 hours
177C-2h	1010°C	2 hours
177C-1h	927°C	1 hour

Explosion Hazard: The safe is exposed to a sudden heating of 1093é Centigrade for 30 minutes without producing an explosion sufficient to cause an opening into the interior. This is the same for all classifications.

Fire Impact Test: The safe is heated (per classification level), dropped 9145mm (30 ft.), then reheated (per classification level) in the inverted position. It must remain intact and the papers inside must still be usable after the test.

CLASS	FIRST EXPOSURE		SECOND EXPOSURE	
	LEVEL	PERIOD	LEVEL	PERIOD
177C-4h	1093°C	1 hour	1093°C	1 hour
177C-2h	1010°C	45 minutes	1010°C	30 minutes
177C-1h	927°C	30 minutes	927°C	30 minutes

Selecting a fire-resistant safe

Safes come in a wide variety of sizes, types, grades and prices. To ensure adequate protection in the event of a fire, it is recommended that the product be ULC-listed and bear the ULC logo (or, at least, be rated by one of the world-wide classification services). A safe rated Class 177C-1h by the ULC should be adequate for normal residential use and a fair bit cheaper than one with a higher rating. To select the required size, gather up everything you want to protect, put all of it into a carboard box, and measure the space the things take up.

Special Precautions for the Physically Challenged

Many people have physical disabilities that present special problems with relation to fire safety - they may not be able to hear the sound of a fire alarm or respond to the warning and escape as easily as a non-handicapped person. It is important to immediately notify your local fire department that there is a disabled person in your household and the nature of the disability. Many fire departments have established programs to register people with special needs and, in the event of a fire, this information could help the firefighters ensure that all occupants are evacuated safely.

The deaf or hearing impaired person

Public fire safety programs are essentially structured around the need of individuals who can hear. However, there are over 2.2 million hearing impaired Canadians. Hearing loss can vary from a mild loss to profound deafness. There are technical aids available that are designed to help the hearing impaired person cope with daily living. These include devices that will ensure a person with a hearing loss is warned in the event of a fire alarm or will allow them to communicate with the fire department. Fire alarm signals for the hearing impaired are discussed in Section 5.3.9. Because communication is vital in an emergency, be sure that your home is equipped with an amplified telephone handset or a Telephone Device for the Deaf (TDD). Install one or other of these devices in a location that can be easily accessed by that person in the event of an emergency and place a list of emergency numbers on or near the device. Some TDDs can be pre-programmed with a message for the fire department. For more information on technical aids for the person suffering from a hearing loss contact the Canadian Co-ordinating Council on Deafness.

The blind or vision impaired person

The

Chapter Four

Gas Safety

General

Many homes use natural gas to fire furnaces, water heaters, outdoor pool heaters and appliances (such as kitchen stove or clothes dryer). In addition, the use of propane for outdoor patio cooking is becoming increasingly popular. Both these forms of gas can be extremely dangerous and are potential sources of fire. The proper precautions must be taken when handling appliances using these forms of fuel.

Natural Gas

An underground distribution network feeds a metered supply of natural gas to your home. Natural gas is non-toxic but is explosive. It is lighter than air and usually has a strong odour added by the supply company, so that a leak can be easily and quickly detected. Although it is non-toxic, the products of combustion (fumes) are toxic and must be taken out of the building by the vent or chimney system. Most recent accidents involving gas appliances have been related to a faulty vent or chimney. For these reasons, rigid inspection procedures are adhered to, and all installations and modifications must comply with Canadian Gas Code B149.1.

Installation and modification

Before embarking on the installation or modification of gas-fired appliances, homeowners should be aware that they are dealing with a potentially hazardous undertaking. It is recommended that you employ a professional gas fitter to install natural gas equipment in your home. However, if you do decide to do it yourself, it is important to note that inspections are required at several stages of installation, and that the gas must not be turned on until clearance is obtained from the gas inspector. Contact the Ministry of Labour Gas Inspection Office in your area for more information.

Furnace operation and maintenance

Most gas-fired heating systems use a small, burning pilot light to ignite the main burner when the room thermostat calls for heat. As a safety measure, a device is installed in the furnace that will prevent gas being supplied to the main burner if the pilot light is out. You may wish to turn off the pilot light in the summer (a pilot light can account for 5-8% of yearly gas consumption). In any case, relighting the pilot light can be hazardous and it is recommended that a qualified gas fitter be called. If you find this is not practical and decide to do the job yourself, instructions for relighting the pilot usually appear on the furnace identification plate and should be followed very carefully. If, after following the relighting procedure, the pilot light fails to remain lit, a service mechanic should be called. Aside from changing or cleaning the air filter periodically, there is no other servicing operation that can be done safely by the householder. It is generally recommended that the furnace be serviced yearly, but the age and condition of the equipment, and the advice of a gas serviceman, will help you decide on the frequency of service. A brief yearly inspection is more economical if it can be combined with a necessary function, such as the relighting of the pilot after a summer shutoff. Air filters should be cleaned

or replaced once a month during the heating season - they should be ULC approved and new filters should always be placed proper side up.

Other gas appliances

If you have a gas-fired water heater (or other appliance), have the serviceman inspect it at the same time he inspects the furnace. He should take any steps necessary to ensure its safe and efficient operation. A gas fireplace must have the chimney damper permanently secured in the open position, even if the fire is not used.

Leakage

A strong odour is added to natural gas by most supply companies for the protection of their customers. Fortunately, leaks are rare with modern gas equipment. However, if you suspect a leak, do not touch electric light switches or appliances and do not allow the lighting of any flame in the house. Open some doors and windows, clear the house and call the gas utility from a neighbour's phone as soon as possible.

Propane

Propane, also known as Liquified Petroleum Gas or LP Gas, is a hydrocarbon chemical formed deep within the earth's crust and brought to the surface, like other petroleum substances, through wells. Propane is non-toxic, odourless, and heavier than air. However, odour is added to ensure that its presence can be readily detected in the event of a leak. Propane is stored in liquid form, under pressure, in metal cylinders. When released with the proper controls, it comes out of the cylinder as a usable vapour. Because large volumes of propane gas can be stored as a liquid in relatively small cylinders, propane has become a convenient, portable form of energy. It is commonly used in the area of the home to fuel gas barbecues, but it may also be used for fuelling in-home appliances such as room heaters, refrigerators, gas ranges, water heaters and clothes dryers. Propane installations must comply with Canadian Gas Code B149.2.

For specific information on the installation and use of in-home propane appliances refer to a booklet entitled "Basic Instructions for the Operation of Simple Propane Gas Systems", distributed free of charge by the Propane Gas Association of Canada.

Storing and handling propane

Because it is so very combustible and under pressure, special precautions must be taken in handling, storing and using propane.

✓ While propane cylinders are sturdily built, they should not be subjected to mechanical damage by dropping or rough handling - dents could weaken welded joints. Dented or corroded cylinders must be checked by a gas supplier to ensure their safety.

✓ The outlet valve allows the gas to be turned on and off at the cylinder. It

must never be exposed to damage and, on most cylinders, it is protected by a permanently fixed metal ring. Where there is no such ring, a protective metal cap must be screwed over the valve when moving the cylinder.

✓ The pressure relief valve will release some of the propane vapour from the cylinder if the pressure inside the cylinder becomes greater than a preset limit. Such an event will occur if the cylinder is overfilled or if the temperature is high enough to expand the gas beyond its normal limits. If the relief valve is damaged or the nozzle is clogged so that it does not release at the proper pressure, the cylinder and/or fittings may rupture resulting in an extremely hazardous situation. The valve should never be tampered with.

✓ Cylinders must always be upright, whether in storage, during transportation, or in use. This will ensure that, in the event of excess pressure, vapour escapes and not liquid propane. Liquid propane, released to the atmosphere, would immediately vapourize, expand 270 times in volume and be 270 times as dangerous as a vapour release.

✓ Never store a propane cylinder indoors where there is a possibility it will be heated, expanding the propane and releasing it through the pressure release valve. This will cause an explosive situation in your home. In fact, cylinders over 5lbs capacity are not permitted to be used or stored in the home - if violation of this regulation was found to be the cause of a fire, your insurance could become void. Even in an unheated garage or shed, a release of vapour could occur waiting for a spark from a starting engine or scraping tool to ignite it. The best place to store propane is upright in a shady area, away from the house, protected from vandalism and physical damage. When stored, the outlet valve should be closed and a safety plug installed.

✓ The regulator automatically opens and closes to ensure that the gas delivered to the appliance is at the required pressure. It is screwed into the cylinder outlet valve via a left-handed thread and must be wrench-tight. If the regulator is likely to be exposed to excessive sleet, snow, ice or mud, the vent opening on the regulator should be shielded to prevent plugging.

✓ When appliances are not in use, the outlet valve should be completely closed, even when the cylinder is empty. This will prevent water vapour from entering the cylinder and causing possible freeze-up under freezing conditions.

✓ When transporting propane cylinders to be filled take the following precautions:

- plug the valve outlet with a plastic plug.
- screw on the valve protection cap.

- transport in a ventilated space in a vehicle trunk (preferably with the trunk open).

✓ secure in an upright position.

Filling

Cylinders should never be overfilled. When filled to rated capacity, there is always a vapour space left. This is important to allow for expansion of the liquid propane as the temperature varies. Some cylinders are equipped with a liquid-level bleed valve that indicates when rated capacity has been reached. If the liquid, through expansion, exceeds the volume of the cylinder, the relief valve would release liquid propane. Propane should not be transferred from one cylinder to another except at an approved station.

Maintenance

✓ Before being put into service for the first time, periodically during storage, and before every use, the system should be checked for leaks. This can be easily done by putting soapy water over hoses and connections - if bubbles occur there is a leak that must be corrected.

✓ The regulator is preset to ensure that the proper pressure is delivered to your appliance. Never try to repair a regulator, or operate an appliance if the regulator is damaged in any way.

✓ It is mandatory that a cylinder be requalified after ten years of service. Cylinders are date stamped, usually on the protective collar. To requalify the cylinder, it must be inspected and the valve and relief valve replaced by a qualified gas supplier. In practical terms, it is usually easier to simply buy a new tank because it costs about the same as replacing the valve and requalifying an older tank.

Leakage

When propane gas escapes from a cylinder, hoses, connections or appliances, because it is heavier than air, it flows to the lowest point it can and accumulates on the floor. Because it is naturally odourless it is given a foul odour so that it can be detected when there is a leak. If you smell propane, take the following precautions.

✓ remove all sources of ignition, such as cigarettes.

✓ do not turn lights on or off as it could cause arcing and ignition.

✓ shut off all appliances and cylinder valves.

✓ evacuate the area of all people.

✓ provide as much ventilation as possible to allow the gas to escape an enclosed space.

✓ if the leak continues after the valves have been shut off, seek qualified help

(look under "Gas" in the Yellow Pages).

Purchasing and using propane barbecues

This section also applies to other appliances that use propane, although barbeques are probably the largest single use of propane around the home - and the most potentially dangerous if the proper precautions are not taken.

- ✓ Only appliances approved and certified by the Canadian Gas Association (CGA), Canadian Standards Association (CSA) or the Underwriters' Laboratories of Canada (ULC) should ever be fuelled by propane. Where flexible hoses are required for portable systems, only approved synthetic hoses may be used. The appliance and hoses should bear an appropriate approval label.

- ✓ It is recommended that you purchase a safety valve that monitors the amount of gas flowing through your propane system. The device is easily inserted between the outlet valve of the cylinder and the regulator. If the flow of gas increases beyond the preset capacity of the safety valve, due to a broken or ruptured line, the valve will instantly shut off the gas at the cylinder and prevent a hazardous situation.

- ✓ Always locate the barbeque away from the house and any combustible wall or fence.

- ✓ Hoses should never be a simple friction-fit, but should be wrench tight. Check all hoses and connections for leaks before lighting the burners. This can be done by fully opening the outlet valve on the cylinder, then putting soapy water over the hoses and connections - if bubbles occur there is a leak that must be corrected.

- ✓ When properly connected, it is important to completely open the outlet valve on the cylinder when the appliance is in use. The outlet valve is not designed to regulate gas flow and may interfere with the proper operation of the appliance if partly closed.

- ✓ Occasionally, some appliances may produce a slight odour for a short period when lighted, but which disappears rather quickly. If the odour persists, the appliance should be taken out of service until corrected.

- ✓ Propane burns with a hot, clear, blue flame when mixed with the proper amount of air. The proper mixture of propane and air is very important. Occassional flashes of yellow, caused by dust particles, are no problem. If the flame is continuously yellow, it should be corrected, usually by increasing the air intake until the yellow disappears and the flame burns a clear blue.

Gas Detectors

If you have a Natural Gas or Propane appliance in your home (such as furnace, water heater, fire or stove) it is worth considering an alarm system that will warn you of a leak before an explosive situation arises. Gas fume detectors that are capable of sensing leaks from propane or natural gas equipment in the home are available at some gas equipment suppliers. They will sound a loud alarm well before dangerous levels of gas are present, and are usually easily installed by plugging into an electrical wall outlet.

Connection to a fire alarm system

It is recommended that the alarm of the gas detector (which will usually be in the basement, close to the furnace) be extended into your overall fire alarm system to ensure that it will be heard in the living and sleeping areas of your home when activated. Types are available that can be hardwired from a compatible system alarm panel - with dc power supplied by the control panel. An alternative approach would be to place a fire alarm interface device (as described in Section 5.5.4) near a normal gas detector so that, when the detector is activated, it will "hear" the siren and send a wireless signal to the system alarm control panel for operation of the fire zone. For information on the features of a system alarm refer to Chapter 5.

Location

The detector should be placed in close proximity to the furnace or other appliance to be monitored. Natural gas is lighter than air, so the detector should be placed on or close to the ceiling above the appliance being monitored. On the other hand, propane is heavier than air, so the detector should be placed close to the floor or ground near the appliance being monitored.

Testing and maintenance

Most gas detectors are equipped with a test button that will check the electrical circuitry of the device when pressed. A weekly test is advisable. At least once a year use a vacuum cleaner to remove dust from the openings of the detector. Refer to the instruction manual that comes with the detector for the proper maintenance procedure.

Chapter Five

Fire Alarms

General

Statistics compiled by the NFPA indicate that 40% of accidental fire victims are asleep at the time of the fire and are overcome by smoke and fumes before they can awaken. It is also a fact that, in British Columbia in 1985, no fire alarms were installed in buildings where 70% of residential fires were reported. These same fires were responsible for 70% of the total residential injuries and 81% of the total residential deaths in that year. In a full-scale bedroom fire test sponsored by the National Science Foundation, flashover (ie. the complete involvement of a room and all its combustibles in flame) occurred just seven minutes after the start of the fire. Actually, after only five minutes, chances for survival would have been very small because of the toxic fumes. By installing a system of smoke and heat detectors, members of the household will be alerted (particularly when they are asleep) to a developing fire situation. Recent developments in fire and smoke alarms have resulted in these alarms becoming available at very modest cost. If every home were equipped with smoke detectors, there would be a marked reduction in residential loss of life due to fire.

Fire Department Policy

It is important to note that fire officials are continually citing smoke detectors as saving lives in residential fires. At the time of writing, fire alarms are only mandatory in residential occupancies if the number of permanent occupants exceeds 10 persons (per National Building Code). There has been much discussion over the proposed addition of a clause in the National Fire Code that deals with the mandatory installation of smoke alarms in all existing dwelling units. However, although a desirable objective, it was felt that there were too many administrative enforcement problems associated with undertaking such a policy - so the clause was not adopted. After this decision, fire officials were “hopeful that increased public education will result in more people installing smoke alarms on a voluntary basis”.

Smoke Alarms

Smoke causes the majority of fire-related deaths. It contains deadly killer gases, such as carbon monoxide, and, when smoke is produced, life-sustaining oxygen is consumed. Most fire victims die from these factors, frequently before they awaken. A smoke detector, when properly located and maintained, can give early warning of fire and provide you and your family with precious extra seconds to escape a developing fire situation and notify the Fire Department. Smoke alarms work by sensing the rising smoke from a fire and sounding an alarm. They can detectsmoke far from the origin of the fire and are most valuable at night, alerting family members to the presence of fire when they are asleep. It is important to remember that, in most cases, the sound of a smoke detector is the only means of alerting a sleeping person to the existence of fire,

and detectors can save lives only if people hear them. The Hazardous Products Act states that household smoke detectors used as part of a fire alarm system, or indivually, must meet the applicable requirements of the ULC if they are to be advertised, sold or imported into Canada. Therefore, all smoke detectors used in Canada must bear the ULC certification mark.

Method of detection

There are currently two types of detection methods available - the photoelectric method and the ionization chamber method. Whichever type you use, it is important that you read the instruction manual that comes with the detector carefully before installing it.

Ionization Smoke Detectors: By using a tiny, harmless, quantity of radio-active material, the ionization smoke detector can sense both visible and invisible products of combustion created by fires. Air molecules in the sensing chamber are ionized to create a small electric current flow between two charged plates. When combustion particles accumulate in the chamber they cause the current flow to drop below a critical level and the alarm is activated. Humidity and temperature changes may also cause a reduction in current flow, resulting in a possible false alarm. In order to combat this problem, most detectors have dual ionization chambers (a sensing chamber and a reference chamber), which help compensate for normal atmospheric changes in the home. Ionization detectors respond quickly to smoke from clean-burning fires of paper and wood. However, they tend to to sound false alarms when exposed to normal household fumes and kitchen smoke.

Photoelectric Smoke Detectors: This type of alarm contains a light source and a special photosensitive cell in a darkened chamber. It will employ one of two possible methods of detection. The “light obscuration” detector directs the beam from the light-source onto the cell. If smoke particles enter the chamber and partially block the beam, the reduction in light reaching the cell causes the circuitry to initiate an alarm. The “light scattering” detector is far more common and directs its light beam within the smoke chamber, but not onto the cell. If smoke enters the chamber, the smoke particles reflect light onto the cell and the alarm is sounded. As the photoelectric smoke detector is reliant on visible products of combustion to operate, it is better at sensing smouldering fires than flaming ones. Thermal versions that incorporate built-in fixed temperature heat detectors are also available. Photoelectric detectors are not as readily available, or as cheap, as most ionization types, but they respondquicker to the slow-burning smouldering fires that occur most frequently in homes, and are not as prone to false alarms.

Combined Ionization/Photoelectric Smoke Detectors: Smoke alarms are available that combine both methods of detection. These provide the best overall protection, sensing fast, flaming fires as well as slow, smouldering ones. They usually contain one ionization chamber and one photoelectric chamber making them much more stable and far less prone to false alarms. However, they are generally more expensive. Some combined detectors may have two test buttons -

one for checking the ionization sensor and one for checking the photoelectric sensor.

Self-contained smoke alarms

The average smoke detector, available at the local hardware store, requires no adjustment, is battery-operated (takes one 9V battery), easily installed without any external wiring, has a loud siren, a built-in test circuit, and is listed by Underwriters' Laboratories of Canada (ULC). They are available in ionization, photoelectric and combination models. Some detectors have a built-in lamp to help you find your way if the power should fail during a fire (these take an extra 9V battery). There are also portable detectors available that can be carried with you and mounted on the door of your hotel room, etc. All self-contained smoke detectors will let you know if the sensor battery starts to run low, usually with an occassional beep of the detector's horn - when this happens the battery should be replaced as soon as possible (although the detector may still operate for several days after the beeping starts). A few have a "hush button" which allows instant silencing of false alarms.

AC powered smoke alarms

This type of detector is connected to the 117Vac house wiring. Smoke alarms operating from household current usually have a light to indicate that the detector is powered. The ac powered alarm is most often installed during construction of a new home, or during renovation. It should be both CSA certified and ULC listed. The ac alarms should be mounted as close to the centre of the ceiling as possible and wired to a junction box in a similar manner to a ceiling lamp. Wiring must comply with the requirements of the Canadian Electrical Code and your local codes. It is recommended that the detectors be wired together (two wires) on a separate circuit (one with no other lights or appliances connected to it). This circuit must be one that cannot be turned off by a switch or ground fault interrupter. Some ac-powered detectors have a back-up battery which will keep the unit operating in the event of a power failure - this is highly recommended.

Multiple operation

On some ac powered and self-contained detectors, a single wire or pair of wires is used to connect a number of similar detectors together, so that smoke sensed by one detector will cause an audible alarm from all detectors. To help identify the originating detector in multiple alarm systems, the power light on that detector may be turned off when the system is activated. This type is recommended where several detectors are to be installed in a house and there is a danger that some, when activated, will be too far away from the sleeping areas to awaken members of the household. An example is the smoke detector located in the basement.

Relay outputs

A few available ac powered and self-contained detectors provide relay contacts that open and/or close when the alarm is activated. This enables the unit to be wired to a central control panel that may be part of a burglar alarm system, or directly to a bell, horn, light, telephone dialler or digital communicator. The relay output may also be wired to a battery operated transmitter used with some burglar alarm systems. Often, the operation of the relay is delayed a few seconds to prevent false alarms and to prevent tests from causing system alarms.

Dual alarm comparator

A few ionization smoke detectors incorporate a timing mechanism that allows the device to be highly sensitive without sounding annoying nuisance alarms caused by smoke resulting from such things as burning toast or bacon. In a flaming fire situation, where there is little visible smoke, the timing mechanism will be bypassed and the alarm sounded immediately. If the unit senses a low level of smoke, the timing mechanism is triggered and the alarm will wait for a preset length of time (probably eight minutes) before operating. If the smoke clears within that time (as it would with normal cooking operations) the timer will be reset and the alarm will not sound. In a smouldering fire, the alarm will sound well before the time limit has expired. If, at any time during the timer countdown, the detector senses higher levels of smoke or other combustion products, it immediately bypasses the timer and sounds the alarm.

Alarm signal:

ULC requires that smoke detectors approved by them provide an A-weighted sound pressure level of at least 85dB at a distance of 3.05m (10 ft) from the device. Types of furnishings, the distance, the number of floors, walls and doorways, whether doors are open or closed, and many other factors, will reduce the level of sound available at the ear of a person that the detector is required to inform. In addition, how soundly a person sleeps and the quality of their hearing will affect their ability to hear the signal and awaken. It is unfortunate that the optimum location of a smoke alarm for early detection of a fire is not the same as the optimum location to ensure that the alarm is loud enough to be heard and to awaken sleepers. In fact, conditions that are required to delay the passage of toxic fire gases (such as closed doors) will also reduce the level of sound and thus could delay, or prevent, a safe exit. This problem can be overcome in several ways. One method would be to make the alarm louder, but this may risk hearing damage for people close to the detector when it is activated. Another is to have a number of smoke detectors interconnected for multiple operation (as described in Section 5.3.5), with one detector in each bedroom acting as an alarm signal. A third method would be to place the smoke detector in the optimum location for detecting a fire (as described in Section 5.3.10), and extend the alarm signal to the optimum location for wakenning a sleeper (as described in Section 5.3.12).

Alarm signals for the hearing impaired

The proper fire safety precautions can mean the difference between life and death in an emergency. But many of the precautions which hearing people consider adequate, such as installing fire alarm systems, are quite useless to people with a hearing loss, unless an effective signalling device is also installed. These devices range from those which turn on lights when an alarm sounds, to tactile alarms (which warn people by way of the sense of touch) or combination audible-visual alarms. Visible alarms may use continuous or flashing lights to alert hearing impaired people of emergency situations. The flashing light may be an incandescent bulb but, more commonly, will be a strobe light. The tactile alarms may be a fan, a pillow vibrator or a mattress bed vibrator. Any of these devices may be operated directly from the alarm system, or may be operated by sensing the sound from a smoke detector or alarm system.

Location of smoke detectors

The location of detectors is critical for true life safety protection. Detectors should be located on every level of your residence. In particular, between each sleeping area and potential sources of fire such as kitchen, garage (or carport), basement or utility room. A suitable location for a detector would be in a hallway connecting the bedrooms. They should also be located in every bedroom where a smoker sleeps, where the door is kept closed, or where an electrical appliance is operated. While conforming with the other requirements, try to position a smoke detector near the top of stairways, but not in an updraft. They should not be placed near fireplaces, in dusty or dirty environments, in insect infected areas, within 1.5m (5 ft) of a flourescent light fixture, or within 4.6m (20 ft) of a furnace, hot water heater or gas space heater. Smoke detectors should not be installed where turbulent air from doors, windows, fans, forced air heaters, or air conditioning ducts may prevent combustion particles from entering the sensing chamber. In rooms with simple sloped, peaked or gabled ceilings, install smoke detectors on the ceiling 1 metre (3 feet) from the highest point of the ceiling. Smoke detectors can be used in most areas of the home - except kitchens (smoke from cooking may cause a nuisance alarm), bathrooms (excessive steam from a shower or bath can cause an unwanted alarm) and garages (products of combustion are present from running an automobile engine which can cause a false alarm). If in doubt, it should be remembered that an alarm that sometimes goes off when there is no danger is a lot better than having no alarm in an area where it may be needed. It may help to regard nuisance alarms as necessary, though unscheduled, tests of the detector. A false alarm should only occur when a member of the household is awake (otherwise it should not be considered a falsealarm), and fanning the smoke away from the detector will usually silence it quickly. NEVER remove the battery to silence an alarm.

Mounting of smoke detectors

The detector should be mounted on the ceiling, as close to the centre of the room, or hallway, as possible. If it is not practical to mount a detector in the centre of the ceiling, it should be located on the ceiling as far away from any wall as possible - but definitely at a distance of more than 10cm (4 inches) from any wall. If placed within 10cm of a corner, dead air space will prevent smoke from reaching the detector. Wall mounting is not recommended but, if you have no other choice, the top edge of the detector must be located between 10 to 15cm (4 to 6 inches) down from the ceiling.

Location of alarms

Most smoke detectors have built-in audible alarm signals but, unless you have all detectors interconnected and a detector in each bedroom, there is no guarantee that every alarm will be loud enough to waken all sleepers in the event of a fire. An alarm must be placed in every room where a person sleeps and must be loud enough to waken the heaviest sleeper. There should be no wall, door, floor or other obstacle between the alarm and the sleeper to reduce the signal level.

Testing and maintenance

Smoke detectors may fail to alarm as required because their sensitivities have

been altered over a period of time by dust, grease, corrosive fumes, moisture and other contaminates in the air. Further, aging is a factor contributing to malfunctions. Most manufacturers nowadays provide a test button on the housing of the detector to test the electronic circuitry within the unit, but this test button will not check the air passages to the sensing chambers. An environmentally-safe aerosol spray is available which simulates the full range of fire conditions by emitting smoke particles of all sizes. A brief one or two second spray will provide assurance that the smoke detector will respond under actual fire conditions. An alternative method is to blow smoke into the sensing chamber from a lighted cigarette, snuffed candle or burning string, but these methods can themselves be a fire hazard and are not recommended. A weekly check of smoke detectors is advisable using both the aerosol spray and the test button. If you are connected to a Central Monitoring Station (as described in Section 5.6) you should discuss testing with the company involved. At least once a year use a vacuum cleaner to remove dust from the openings in the detector cover. Refer to the instruction manual that comes with the detector for the proper maintenance procedure.

Heat-activated Alarms

In kitchens and garages, and in other areas where a smoke detector cannot be used, a heat-activated detector can be installed. These devices often come with a warning that they do not protect life against fire and smoke. In most fires, hazardous levels of smoke, heat and toxic gases can build up before a heat detector would initiate an alarm. Independant studies indicate that heat detectors should only be used when property protection alone is involved. Always use smoke detectors where possible.

Types of heat-activated alarms

Rate-of-rise heat detectors: If the temperature sensed by this type of detector increases faster than a specified rate, an alarm will be initiated. A typical rate may be 8.3 degrees Centigrade per minute. In most such detectors, when the rate of rise element alone has been activated, the detector is self-restoring.

Fixed-temperature heat detectors: If the temperature at the detector rises to the detector's rated temperature, an alarm is initiated. Often, when actuated by the fixed temperature element, the detector is non-restorable and must be replaced. A typical set temperature might be 57.2 degrees Centigrade.

Combined rate-of-rise/fixed-temperature heat detectors: Some heat detectors combine both features, providing warning when the rate-of-rise and/or the absolute temperature is exceeded.

Location of heat detectors

Heat detectors can provide a good secondary system for raising the overall level of protection in your home. They should be located only in areas where smoke detectors will be subjected to continuous false tripping, or in buildings not connected to the house. They should not be used in place of smoke detectors

to protect the bedroom areas.

Mounting of heat detectors

As most heat-activated detectors are ac powered, each one should be wired to a junction box in a similar manner to a ceiling lamp. Wiring must comply with the requirements of the Canadian Electrical Code and your local codes. It is recommended that the detectors be wired together (two wires) on a separate circuit (one with no other lights or appliances connected to it). This circuit must be one that cannot be turned off by a switch or ground fault interrupter. For maximum coverage the detector should be mounted in the centre of the ceiling. It should be both CSA certified and ULC listed.

Testing and maintenance

Unlike smoke detectors, heat-activated detectors usually are not equipped with a test button. The requirements for testing and maintaining heat detectors are covered in ULC S536 Standard for Testing, Inspection and Maintenance of Existing Fire Alarm Systems. Because they are subject to reduced sensitivity over time, the manufacturer often recommends conducting a rate-of-rise test at least once a year. This test should be conducted by a qualified fire protection specialist. Tests cannot be performed on fixed temperature detectors. When testing combined rate-of-rise/fixed temperature detectors, the specialist must take care to prevent operating the non-restorable fixed temperature element. If this element is operated the entire unit must be replaced.

Fire Alarm Systems

Fire detection is often available as part of a complete burglar alarm system. The smoke/heat detectors may be wireless-fed or hardwired back to a control unit which can be used to activate a number of reporting devices. This type of alarm system is required to protect your property (and pets) while you are away from home, and is also able to summon the Fire Department for immediate action whether you are at home or away. It is, naturally, more expensive than a series of independant detectors, but it does provide many attractive features, and may be worth the additional cost, especially if you are planning to install a burglar alarm system anyway. According to the Hazardous Products Act, smoke and heat detectors for use in household fire alarm systems must meet the applicable requirements of the ULC if they are to be advertised, sold or imported into Canada.

Hardwired vs wireless systems

The hardwired system involves running a wire, or pair of wires, from each of the detectors to the control panel which will usually be placed at some distance from the detectors. Wires may be run between the detectors, with a single pair of wires running to the control panel. As detectors are supposed to be mounted in the centre of the ceiling this could involve some “messy” wiring practices. The wireless detector incorporates a small radio transmitter which, when activated by the sensor, sends a signal directly to the control panel where it is received and made to activate the 24-hour fire alarm zone. This is the more common system as it is simple to install. The system transmits and receives signals that are coded by the owner so that interference from other similar signals is very

unlikely. The wireless system may be "polled" periodically to test its operation.

Detectors

Many of the previously described types of smoke and heat detectors are available as part of an alarm system package. They may be hardwired or, more often, they will incorporate a radio transmitter that will send a signal back to the control panel to activate the alarm. The detector must be compatible with the control panel used. Detectors with a relay output (see Section 5.3.6) can be connected to a transmitter for feeding back to the system control panel, or can be wired directly to the panel.

Fire alarm interface

Some alarm systems have a smoke alarm interface which, when placed close to an existing detector, will "listen" for the sound of the alarm signal without the need for interconnecting wiring. It is battery operated and will, when it "hears" the siren of a ULC-approved smoke or heat detector, send a radio signal back to the control panel to activate the 24-hour fire alarm zone. This will allow selection of the best type of detector for your purpose and have it integrated into an alarm system. It will also allow existing self-contained detectors to be used with your alarm system.

Control panel

This panel will accept inputs (wireless and/or hardwired) from various intrusion, fire and panic sensors. It will process an alarm condition and provide outputs for operating indoor/outdoor sirens, a strobe light, a telephone dialler, a digital communicator, etc. It usually operates from your house wiring, but will have battery-backup in case the power should fail. In addition, the panel will have a facility to test the system and an input, from a keyswitch or digital keypad, to silence the alarm. It may be designed for wall-mounting, or it may be housed in an asthetically pleasing cabinet for sitting on a shelf.

The Fire Zone

The fire alarm usually occupies one zone of a multi-zoned burglar alarm system, and is armed 24-hours a day regardless of whether the burglar alarm is armed or not. When any detector is triggered it either opens or closes a loop (hardwired system), or sends a radio signal (wireless operated system), to the control panel which, in turn, will operate one or more output/reporting devices.

Indoor siren

One or more indoor sirens can be installed in areas where they are most likely to waken sleepers, while the detectors may be on the other side of closed doors or at some distant location, such as the basement or workshop.

Outdoor siren

The loud outdoor horn will alert you if you are in the yard or at a neighbour's. It will also alert the neighbours if you are away or are trapped by the fire and require immediate assistance. The siren may be simply a horn-shaped loudspeaker that converts an electrical tone generated by the control panel into a loud audible signal, or it may have a built-in tone generator that provides an audible signal when fed with a dc voltage from the control panel. The loudspeaker type will allow different tones produced by the control panel to indicate various alarm functions (eg. a burglary may produce a warbling tone, while a fire may produce a steady tone). Be sure to inform your neighbours which type of tone applies to

which emergency.

Lighting interface

Some alarm systems may be able to turn on one or more lights automatically when the alarm is activated. A few systems have an interface that will allow them to be connected to a home control system that will turn on lights, or appliances (such as TV, radio or tape recorder), in various parts of the house using signals transmitted over the house wiring.

Strobe light

Placed in some high and easily visible location outside your house, this flashing light will help the fire department, police or paramedics find your home quickly during an emergency.

Telephone dialler

A telephone dialler can be attached that, in the event of a fire (or burglary, or medical emergency), will automatically dial several pre-programmed telephone numbers in succession until an answer is received. It will then transmit a prerecorded message to indicate that an emergency exists at your home.

Digital communicator

If you require your system to register an alarm condition at a Central Monitoring Station (see Section 5.6), a Digital Communicator will need to be installed between the outputs of your alarm system and the telephone line. It will be triggered by an alarm condition (either fire, burglary, medical, panic, or other emergency) and will dial the monitoring station. A code will be sent, in a predetermined format, to indicate the type of emergency and your location. The proper emergency department will then be notified by the monitoring station.

Central Monitoring

A service is provided in many communities that will allow an alarm condition in your home to be detected at a Central Monitoring Station and the necessary emergency department summoned. In the case of a fire, this will ensure an automatic and immediate response by the Fire Department whether you are at home or away.

Digital communicator

This device may be built into your alarm system, it may be purchased as a seperate item, or it may be supplied by the Central Monitoring Station. In any case, your alarm system must have outputs that are compatible with the Digital Communicator you are going to use. There are usually seperate outputs for fire, burglary and panic. These special outputs are wired to the Digital Communicator, which is connected to your normal telephone line via a Demarkation Jack. In the event of an alarm, it will perform the following functions.

✓ sense that an alarm condition exists.

✓ determine the type of emergency (fire, burglary or panic).

✓ seize your telephone line and wait for dial tone.

✓ dial the monitoring station to which you subscribe.

- ✓ upon answer and acknowledgement, will transmit a digital code corresponding to your location (address) and the type of emergency.
- ✓ once the code has been received and understood at the monitoring station, it will release the telephone line.

Demarkation jack

This is a circuit that has to be installed by your local telephone company in order for the Digital Communicator to be legally connected to the telephone line. It is an 8-position modular jack that is placed ahead of all equipment connected to your telephone line. With nothing plugged into the jack a shorting bar will connect all your telephones in the normal manner. When the Digital Communicator is plugged into the jack, your telephone line is passed through the communicator and will operate normally unless there is an alarm. When the communicator senses an alarm condition it disconnects all other telephone equipment, listens for dial tone, then proceeds to dial the Central Monitoring Station. This will ensure that any incoming or outgoing telephone calls in progress at the time of an alarm will be dropped to give priority to the emergency. The telephone company will charge a flat fee (no monthly fee) of about $70 for installing the demarkation jack.

Installation

Some stations will only allow their services to be used if you have had them install your alarm system. Others will allow connection only after they have inspected your system. To ensure compatibility with their system, the monitoring station may insist that you use a Digital Communicator supplied by them. Central Monitoring Stations may be found in the Yellow Pages under “Fire Alarm Systems” or “Burglar Alarm Systems”. Select one that is ULC approved or uses ULC approved equipment. There may be a one-time setup charge for checking your equipment and installing the Digital Communicator, then a monthly rate of around $25 for 24-hour monitoring. Some stations will come and check your system operation every few months as part of their service. You can specify who you wish to be notified in the event of a particular emergency. For instance, in addition to the Fire Department, police department or paramedics, you may wish to be called at work, or a neighbour, friend or doctor called. In the event of a medical emergency you will want a neighbour called who has a key to admit the paramedics into the house. All this information is recorded in a computer data base.

Operation

In the event of an alarm, the monitoring station receives the information sent over the telephone line by the Digital Communicator. The digital information is fed into a computer, where it is decoded to determine the location and type of emergency. The computer then searches its data base for who to call. All the information is then fed to a television monitor, where it is read by an operator who notifies the required persons in sequence.

Recommendation

The generalized features of available smoke detectors are given in the flow chart opposite. Both the ionization and photoelectric smoke detectors perform the same general function and, as it is impossible to tell whether a fire will be fast flaming or smouldering, the choice is usually arbitrary. Combination detectors offer the best protection, but may be hard to find. Heat detectors should only be used in areas where property alone is in danger and where smoke detectors will be continually false-tripping. The smoke detectors should be placed where fires are most likely to start and where they are most likely to protect the bedroom areas, while the audible alarms should be placed where the sirens are most likely to be heard and waken sleepers.

Selecting and planning the best system

There are so many types of fire alarms on the market that you may have difficulty in selecting the system best suited to the layout of your home (and your pocket-book). The flow chart of Figure 5.9 on the previous page can be used as an aid in selecting the best system. Sections 5.3.10 through 5.3.12 summarize the placement of smoke detectors and alarms. Appendix B provides instructions (with an example) for planning the best type of system arrangement and the proper placement of detectors. It suggests that you draw a plan view of each floor of your house and note the best location of smoke, heat and gas detectors, and of alarms, based on the information in this Section. Will each detector (particularly those in distant locations, such as garage, basement, and workshop) be able to waken all sleepers - even with the bedroom doors closed? Will the detector be located in an area that will make it prone to false alarms? Decide whether you want to run in unswitched ac power (the answer will usually be no for existing homes). Decide on whether you plan to install a burglar alarm system which will include inputs for a fire alarm (a wireless type will be easier to install, but more expensive). Do you want your property protected while you are away from home - if so, decide whether you want a neighbour called (they may be out when a fire situation occurs) or a central monitoring station called (they will charge a monthly rate). Based on the complexity of the system chosen, you must decide whether to install it yourself, or pay to have it done. Shop around for estimates on the complete system - you may decide to reconsider some of the options.

Testing the initial installation

One member of the family should test the system one night when all other occupants are sleeping. He should press the test button on the detector farthest from the bedroom areas and ensure that all person are woken by the sound of the alarm.

Chapter Six

Fire Extinguishers

General

All areas of your home contain potential fire hazards. A well-placed fire extinguisher, if properly used, can prevent a small fire from getting bigger. They can also be used to reduce the intensity of a fire if it occurs in the only escape route. Fire extinguishers for the home are labelled according to the class and size of fire each is capable of putting out. There are rechargeable types and non-rechargeable types available. Whichever type you decide to purchase, it must be suitably approved. A clause in the National Fire Code states that a portable fire extinguisher shall not be sold or installed unless it conforms to one or more of four Canadian standards: ULC-S504, CAN4-S503, ULC-S512 and CAN4-S507. This clearly prohibits the sale of unapproved fire extinguishers. An additional method of extinguishing small fires is the reusable fire blanket, as described in Section 6.7.

This document does not include information on industrial extinguishers or large extinguishers that might be found in the common property areas of some apartment complexes.

Classification of Fires

There are three common types of fire that can occur in a residential home. Each type, or class, of fire must be fought with the proper type of extinguisher, so it is important to understand the classification of fires that can occur.

Class "A" This is a fire of ordinary combustible materials (such as paper, wood, fabric, rubber, certain plastics, and other solids). As a memory-aid, think of "A" for Ashes, which typifies what is left after wood and paper have been burned.

Class "B" This is a fire of flammable liquids (such as gasoline, cooking oils, greases, solvents, paints). Class B fires can be explosive. As a memory-aid, think of "B" for Boil, which is what liquids do when heated.

Class "C" A Class C fire is one that involves live electrical circuitry (such as fires started by a short-circuit or faulty wiring in motors, switches, home appliances, etc). As a memory-aid, think of "C" for Current, which is a measure of electricity.

Class "D" A fourth type of fire, which is uncommon in residential homes, is one that involves combustible metals (such as magnesium, sodium, potassium, etc.). It is included in this text for interest only and will not be considered further. A special extinguisher, not discussed in this document, will be required to put out a Class D fire.

Classifying and Labelling Extinguishers

Some extinguishers are designed to fight only one class of fire, while others are effective on two or all three common classes of fire. It is essential that

you select the right size and type for each class of fire, because the wrong extinguisher used on a fire can do more harm than good. The class or classes of fire an extinguisher is intended for should be clearly shown on the cylinder of the extinguisher. A classification number is often included as a guide to the size of each type of fire an extinguisher can put out - the higher the number, the greater its capability. The classification letter and number are assigned by Underwriters' Laboratories of Canada (ULC), who test and approve the extinguisher, then allow the manufacturer to display the ULC symbol on the cylinder.

Class A rating

To snuff a Class A fire you need to smother it and cool the burning material, otherwise the embers can rekindle as they gain oxygen and heat. That is why water is generally used to fight Class A fires. To earn a 1-A rating, an extinguisher is expected to put out a fire of 72 burning pieces of wood 4x4x50cm; 2-A can cope with a fire twice as big. Extinguishers suitable for Class A fires may be identified by a triangle containing the letter "A". If coloured, the triangle will be green. The extinguisher may have a pictorial marking label showing all three common classes of fires. If the extinguisher can be used on Class A fires, the picture will illustrate a burning trash can and logs on a blue background. If it cannot be used on Class A fires, the same picture will be on a black background with a red diagonal line across it.

Class B rating

A blanketing or smothering effect is essential in extinguishing this class of fire. Water will have no effect, and would tend to spread the fire by floating the burning liquids. To earn a 1-B rating, an extinguisher must discharge effectively for at least 8 seconds and snuff out 11L of flaming naptha in a 0.23 square-metre pan; 10-B can cope with a fire ten times as large. Extinguishers suitable for Class B fires may be identified by a square containing the letter "B". If coloured, the square will be red. The extinguisher may have a pictorial marking label showing all three common classes of fires. If the extinguisher can be used on Class B fires, the picture will illustrate a gas can and burning liquid on a blue background. If it cannot be used on Class B fires, the same picture will be on a black background with a red diagonal line across it.

Class C rating

In addition to its Class A and/or Class B rating, an extinguisher will have a Class C rating if it can be used on live electrical fires. A non-conductive agent is required to extinguish this class of fire. Water should not be used. When it is no longer electrically alive, a Class C fire becomes a Class A or Class B fire. There is no numerical value associated with a Class C extinguisher. Extinguishers suitable for Class C fires may be identified by a circle containing the letter "C". If coloured, the circle will be blue. The extinguisher may have a pictorial marking label showing all three common classes of fires. If the extinguisher can be used on Class C fires, the picture will illustrate a burning electrical plug on a blue background. If it cannot be used on Class C fires, the same picture will be on a black background with a red diagonal line across it.

Sizing of extinguishers

The Classification number will allow the user to determine the size of fire

that a particular extinguisher is capable of snuffing out, while the weight will allow the user to determine how easy it is to handle the extinguisher. The extinguisher must be heavy enough to contain the right amount of chemicals to adequately extinguish a small fire, but be light enough to be operated by any member of the household who is old enough to handle a fire.

Extinguishers for residential use

Fire extinguishers available for residential use are usually capable of fighting more than one class of fire. They are labelled either ABC or BC. The appropriate markings are shown below.

Selecting a Fire Extinguisher for Residential Use

Selecting a fire extinguisher for use in a 1 or 2-family residential home is an important decision. Fortunately, it is possible to narrow the selecting to two or three different types. Selection is dependent on the following criteria:

- ✓ Class of fire likely to be encountered.
- ✓ Size of fire likely to be encountered.
- ✓ Weight of extinguisher.
- ✓ Ease of operation.
- ✓ Certification.
- ✓ Equipped with an easily read pressure guage.
- ✓ Supplied with adequate mounting hardware.

Construction

Home fire extinguishers are composed of the cylinder holding a pressurized extinguishing agent, the head (which includes a valve, nozzle and pressure guage), a hand grip, and a mounting bracket (which is a requirement for extinguishers weighing over 1.4kg). The pressure guage lets you monitor the internal pressure inside the cylinder. When its needle is in the operating-pressure zone (usually green-coloured), the extinguisher is able to discharge properly.

Extinguishing agent

The cylinder may contain water (for Class A fires only), a liquified Halon gas (for Class B or C fires only), or a dry-chemical powder. The dry-chemical powders may be sodium or potassium bicarbonate (for Class B and C fires only), or ammonium phosphate (for Classes A, B amd C) - they have a range of about 3 metres, allowing you to stand a safe distance away, are non-toxic, and easy to vacuum after use. One disadvantage of dry-chemical powders is that they leave a residue that can damage electric motors, computers, television and stereo sets. A BCF or Halon 1211 gas extinguisher is a less damaging alternative for Class B and C fires - however, these are much more expensive and can be toxic in high concentration.

Rechargeable vs non-rechargeable extinguishers

Rechargeable extinguishers, although costing more, are generally better constructed and have a greater capacity for extinguishing fires than non-rechargeable types. Especially avoid types of non-rechargeable extinguishers that are not ULC approved, that come in a squeeze spray bottle, or that do not have a pressure indicator (some may have a plunger instead of a guage). Some non-rechargeable types are designed specifically for extinguishing BC-class fires in the kitchen and may be acceptable only for putting out small pan grease fires.

Selecting fire extinguishers for general use

For general use in the home, it is recommended that you consider purchasing only good-quality rechargeable types of fire extinguishers. The Consumers' Association of Canada suggests that a 2.3kg (5lb) multi-purpose (ABC-class) fire extinguisher be installed on each floor of the home. The extinguishers should be marked with the ULC logo and be easily operated by anyone in the household who is old enough to fight a fire. It must be equipped with an easy-to-read pressure guage and supplied with an adequate wall-mounting bracket. To successfully put out a fire, your extinguisher has to empty itself quite quickly and have good range. It must be able to be turned on and off several times during the course of fighting a fire and must not discharge its contents when dropped. Unfortunately, there are no regulations governing these latter requirements.

Selecting fire extinguishers for special areas

In addition to the general purpose ABC-class extinguisher recommended above, certain locations in your home may benefit from more specialized extinguishers. For example, in areas where you are concerned about fire in or near sensitive electronic equipment (computers, televisions, stereos, etc.) install a BC-class extinguisher which uses a BCF or Halon gas - this will not leave a damaging residue as would the dry chemical of an ABC-class extinguisher. In the garage, carport or automobile, where gasoline and grease fires are the major concern, install a dry chemical BC-class extinguisher.

Locating and Mounting the Extinguishers

For the ultimate protection, fire extinguishers should be placed in the kitchen,

workshop, garage or carport, and in hallways leading to the bedrooms and living areas. In general, there should be an extinguisher within about 50 feet of any part of the house. Install at least one fire extinguisher on each floor of your house. The extinguisher should be firmly mounted no higher than five feet (1.5m) from the floor and in an accessible spot away from any specific fire hazards, such as the stove, gasoline containers, paints, solvents, etc. It should be placed near an exit, so that the user does not become trapped by the fire they are trying to extinguish. Follow the mounting instructions and heed the warning labels included with the fire extinguisher. Refer to Appendix C for additional information.

Maintenance

When purchasing a fire extinguisher, check the pressure-guage and ensure that the needle is pointing to the green area on the dial. As soon as possible, attach the date of purchase to the extinguisher. Often, a maintenance report card comes with the extinguisher - write the date of purchase on this card.

Since extinguishers use pressurized gas to discharge, it is essential to know at all times whether there is sufficient pressure in the canister. For this reason, inspect the extinguisher at least once a month and, in particular, check that it is fully charged and not damaged in any way. It is usually recommended that a rechargeable extinguisher be discharged and refilled with fresh chemical agent at least once every six years. Once a rechargeable extinguisher has been discharged (even partially) it should be refilled. Leave recharging to a professional. A non-rechargeable extinguisher should be replaced once it has been used. If dropped, an extinguisher should be serviced or replaced.

The Fire Blanket

In areas where small fires are more likely to occur (such as the kitchen and workshop, or around the barbeque or firework display), and where a fire extinguisher of the correct classification is not immediately within easy reach, it may be advantageous to keep a fire blanket handy. This is a non-flammable sheet of material, kept in a small package, that can be thrown over a small fire to smother the flames. It is reusable, non-conductive and can be used on any class of fire. It can be used to smother a clothing fire in the early stages, while protecting the hands from being burned. It should not be purchased as a substitute for a fire extinguisher, but it can be used where speed in smothering a fire is of the upmost importance.

Fire Extinguisher Operation

Learn to use the extinguisher

Study the manual that comes with the fire extinguisher before you install it. Its effectiveness in protecting your family and property depends on you knowing what it can and cannot do, how to use it, where to install it, and how to maintain

it. Make sure the operating instructions are understood by everyone old enough to handle a fire. Don't wait for an emergency to learn how to use your extinguisher - it's worth the money (for recharging) to empty the cylinder once when you are cool and calm; but have it recharged immediately after using.

Deciding when to use the extinguisher

Most fires start small - except for explosions, fires can usually be brought under control if they are attacked correctly with the right type and size of extinguisher within the first two minutes. Before using an extinguisher to put out a fire ask yourself the following questions:

- ✓ How big is the fire?
- ✓ What is near the fire?
- ✓ Am I in danger?
- ✓ What is the type of fire?

If the fire is small, contained in one area (such as a waste basket), is not near any combustible material, and you are not in danger, you may consider fighting the fire yourself. Otherwise, evacuate the building and call the fire department immediately. If you have any doubts about fighting the fire yourself, then DON'T.

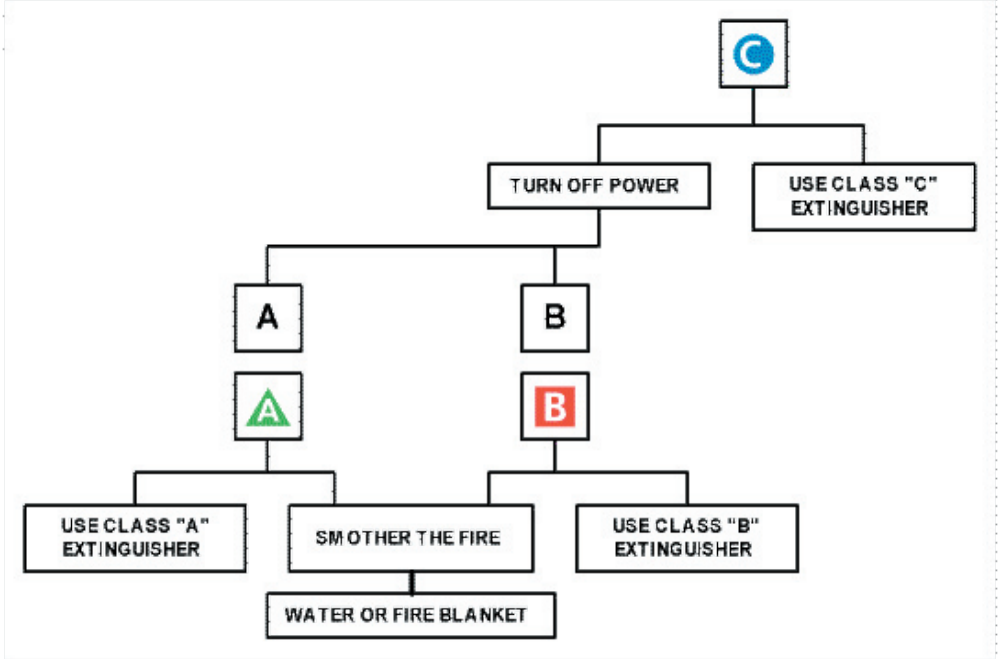
Fighting a small fire

There are a number of steps you should take when fighting a small fire by yourself. These are summarized in the following flow chart:

- ✓ If you are not alone, yell to other members of the household to leave the premises and call the fire department from a neighbour's phone - just in case you are unable to control the fire.
- ✓ If electricity is involved, whether it be the direct cause of the fire or just located near to the fire source, turn off the power and/or unplug the item(s) from the wall socket. Once this is done the fire can be treated as a Class A or Class B fire. However, if you are not able to disconnect the power, you must use a Class C extinguisher.
- ✓ Both Class A and Class B fires can be extinguished by smothering (ie. cutting off the supply of oxygen to the fire). This can be accomplished by using the appropriate extinguisher if the correct type is within easy reach. Alternative methods of smothering the fire include using a fire blanket, a metal pot lid or baking powder. After smothering a Class A fire, dowse the embers with water to ensure that they have cooled sufficiently to prevent rekindling.
- ✓ A small Class A fire, as long as it does not involve electricity, can be smothered and cooled at the same time by using water from a pitcher or a

hose. This can be done if a Class A extinguisher is not immediately available.

✓ If the fire does not extinguish quickly, or it starts spreading, don't continue fighting it yourself. Leave the building and call the fire department from a neighbour's phone (if this has not already been done).



Using a Fire Extinguisher

If you have decided that it is safe to use a fire extinguisher and you are not sure how to operate it, check the label on the extinguisher for instructions. As a general memory aid, recall the word "PASS" which stands for:

✓ **P**ull (the pin)

✓ **A**im (the nozzle at the base of the fire)

✓ **S**queeze (the trigger)

✓ **S**weep (from side to side)

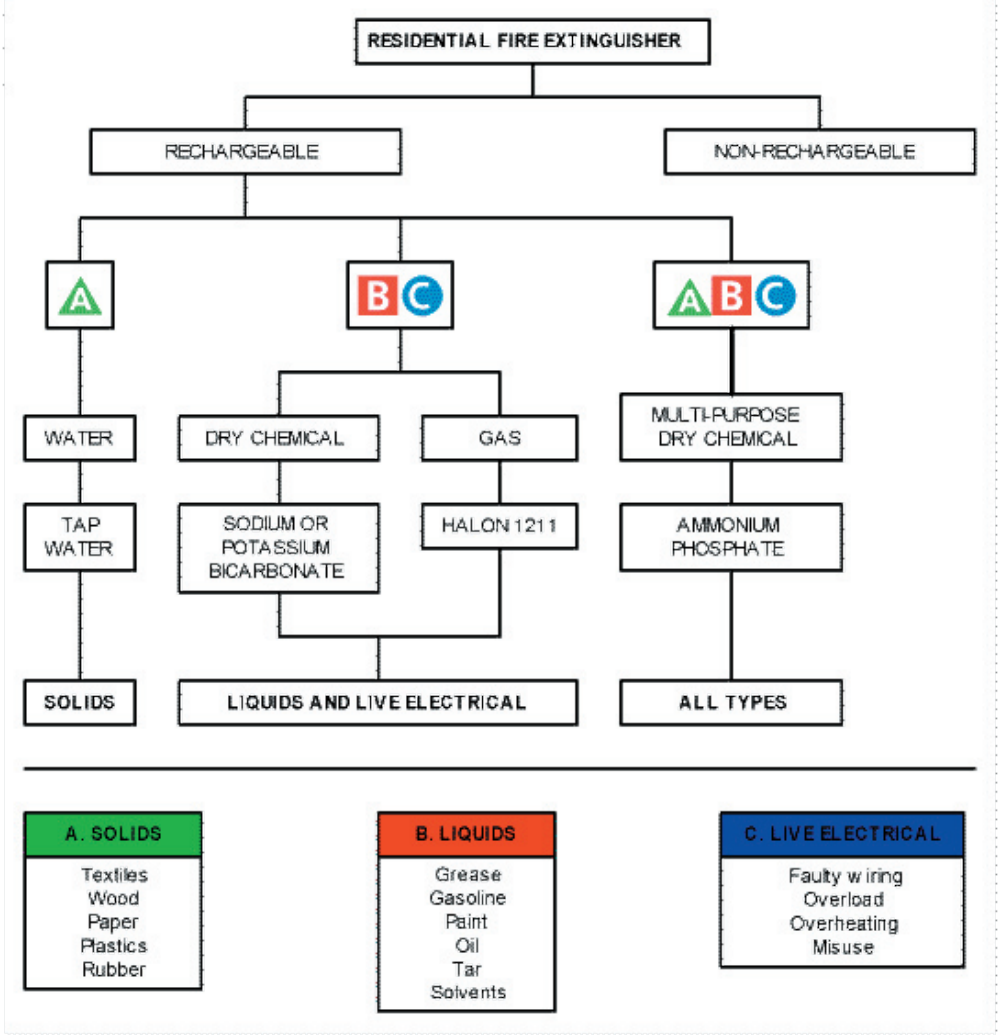
In general, hold the extinguisher upright, keep at least 1.8m (6 feet) from the fire and near an exit, then aim the nozzle at the base of the fire (not at the flames or smoke). Liquid fires call for a sweeping spray, but intermittent blasts are recommended for other types of fire. Play it safe! Keep away from the fire's fuel source and avoid breathing vapours, fumes and heated smoke as much as possible. Even when the fire is out, smouldering furniture should be soaked thoroughly. To be extra safe, put affected cushions and mattresses outdoors for several hours after they have been soaked.

After the fire

If you manage to extinguish the fire yourself and have made quite sure that it will not flare up again, remove the burned items from the house and clean up the mess. If you used an extinguisher (no matter how little) have it recharged as soon as possible and replace it in its mounting bracket.

Summary

The types of fire extinguishers for use in the home are summarized in the flow chart below. Appendix C will aid you in planning the placement of extinguishers. You may also wish to consider the purchase of one or more fire blankets for potentially hazardous areas and events.



Chapter Seven

Sprinkler Systems

General

As mentioned earlier, smoke detectors equipped in every home will reduce the loss of life due to fire. But a detector can only give a warning so that occupants can evacuate and call the Fire Department. These warnings may be short, because fires can develop rapidly and flashover may occur before evacuation can take place. Delays are possible when persons are infirm, confused or perhaps inebriated. The very young and the very old are especially vulnerable. It has been noted by the Office of the Fire Commissioner of Canada that a quick-response residential sprinkler system, when used in conjunction with smoke detectors, can contribute significantly in reducing property and life losses. The testimonial given in Appendix C supports this finding. Residential sprinkler systems are also recommended by The Wood Council of Canada and the National Research Council of Canada. In fact, some Canadian municipalities are currently considering making residential sprinkler systems mandatory in single-family houses.

Residential Sprinkler Systems

Sprinkler systems have long been used very successfully in commercial buildings to control fires, minimize damage and save lives. During the last few years there has been a significant breakthrough in sprinkler technology, which now makes possible a degree of home fire safety much greater than previously known and at a much lower cost. To make residential sprinklers systems affordable, regulations now permit connection to domestic water supplies. In addition, the new sprinkler technology has provided extended coverage sprinkler heads (providing a discharge that will not only cover a large area, but also provide wetting of the walls to a greater height) and quicker-acting sprinkler heads specifically designed for residential installations. Residential sprinkler systems are intended to suppress and contain the fire in the room or area of origin, thereby preventing the spread of fire and affording occupants, elsewhere in the building, additional time to react. Many supporters of the home fire sprinkler system call it the “instant firefighter”.

Falacies and costs

A popular falacy is that a sprinkler could be accidentally activated causing severe, unecessary water damage. However, records, which have been compiled for well over 50 years, prove the likelihood of this occuring is very remote. Furthermore, sprinklers have specific designs and rigorous tests to minimize such accidents. It has been feared that water damage from a sprinkler system will be more extensive than fire damage but, once activated, the sprinkler system will greatly limit the fire’s growth. Therefore, damage from a sprinkler system will be much less severe than the fire and smoke damage if the fire had gone on unabated. Also, damage caused by water from firefighting hoses can be far greater than water problems caused by sprinklers. Regarding cost, current estimates suggest that, if installed during construction of the house, a sprinkler system will cost about 1% of the total building price, and can often be amortized with the mortgage. If installed after construction, this cost will just

about double.

The wet-pipe sprinkler system

The type of system most often used in residential properties is the "wet-pipe sprinkler system". This employs automatic sprinkler heads attached to a piping system containing water and connected to a domestic residential water supply. Water discharges immediately from sprinkler heads opened by a fire. Only those sprinkler heads which have been operated by heat over the fire will discharge water. They have a large area of coverage so that, under normal circumstances, only one head is required in each room or hallway. Once a sprinkler has been activated, the passage of water through the pipes and over a flow-switch may operate an alarm bell.

Sprinkler Heads

Quick-response residential sprinkler heads contain a fusable link or heat-sensing element that allows water to be discharged when the temperature at the head reaches about 71 degrees Centigrade (160 degrees Fahrenheit). The water hits a deflector, resulting in a wide-area spray. They are usually low-profile, have a flush-style design and are aesthetically pleasing. They are available in a pendant-style for mounting on a ceiling (where the water is discharged in a hemispherical pattern below the deflector) and a horizontal sidewall-style for mounting on a wall just beneath the ceiling. Sprinkler heads must be ULC-approved.

Control Equipment

The sprinkler control equipment will usually be located near the water mains entrance to the house. It will include a pressure guage, an easily-operated shutoff valve, and may have a water-flow switch which can be connected to an alarm located elsewhere in the house.

Installation

The National Building Code of Canada states that, where a water supply serves both a sprinkler system and a system serving other equipment, control valves shall be provided so that either system can be shut off independently. The sprinkler heads may be connected to each other and to the household water supply by either copper or steel piping. The piping is concealed behind the walls with the control equipment usually located in the basement or utility room. All residential sprinkler systems should be installed professionally and in accordance with NFPA Standard 13D and any applicable local codes. The installation has to be inspected upon completion.

Operation

During the early stages of a fire one or more smoke detectors should operate to alert the occupants. When the temperature at any sprinkler head reaches about 71 degrees Centigrade, the head releases the water. The water hits a metal deflector plate causing a wide-area spray over the fire, which smothers the flame. As soon as water begins to flow in the pipes a flow-switch may operate,

sounding an alarm bell. Only the head activated by the extreme temperature releases water. No matter what the conditions of the fire, the occupants should leave the building immediately and call the Fire Department. When the fire fighters have determined that the fire is extinguished they will either turn off the sprinkler valve or ask the owner of the building to do it. Once a sprinkler head has been activated, all the water must be drained from the pipes and the head replaced.

Maintenance

Once installed, residential sprinkler systems require very little maintenance. The pressure guage should be checked regularly to ensure that the water pressure is maintained in the system. However, as explained earlier, once a sprinkler head has been activated, all the water must be drained from the pipes and the head replaced.

Chapter Eight

Escape Plans

General

Once a fire has started, it spreads rapidly - you may have only seconds to get out. Normal exits from bedrooms may be blocked by smoke or fire and you may not be able to get to members of your family to help them. Therefore, it is important to plan two exits from every room in the house, and make sure that everyone knows exactly what to do in the event of a fire. Ensure that the planned escape routes are kept clear at all times. If you have any doors with double-cylinder locks, leave a key in the inside cylinder as long as anyone is home and the door is locked. Second-storey or attic windows may need a rope or chain ladder to enable occupants to escape safely. In addition, you should practice escaping before a real emergency strikes. Some Fire Departments refer to these rehearsals as "EDITH" (Exit Drills In The House). Appendix B provides instructions (with an example) for planning escape routes from your home.

Planning

Sit down with your family today and make a step-by-step plan for an emergency escape. An hour of planning may save years of life.

- ☞ Make diagrams showing emergency escape routes.
- ☞ Plan for at least two escape routes from each room in the house, in the event that fire should block one of them off.
- ☞ Identify children's bedrooms with a red sticker placed in the upper left corner of the window. These are obtainable from some department or toy stores, or from your local Fire Department.
- ☞ Make sure that children, seniors and the infirm can work all the windows, escape ladders, etc, that they may have to use in the event of a fire. Check window screens to ensure they can be removed easily from the inside.
- ☞ Go over the entire escape route with your family and plan for a periodic fire drill.
- ☞ Put your Fire Department's telephone number on, or near, each of your telephones, so that the number can be easily found in an emergency. A typical form is given in Figure 5. Stickers with your local emergency number can be obtained from your Fire Department.
- ☞ Choose a safe place outdoors for everyone to meet for "roll call".
- ☞ Make sure that it is understood by everyone that no-one is to go back inside a burning building for any reason.

☞ Check your fire alarm and fire extinguishment system (if you have one) and make improvements if it is not adequate. If you do not currently have a fire alarm and fire extinguishment system, decide upon the best system for your particular situation based on the recommendations in this booklet - then install it!

Emergency Lighting

When an alarm is activated due to a fire, it may be difficult to locate family members and the fire exit due to lack of visibility (either caused by smoke or darkness). It may be difficult to locate a light switch or, in more severe cases, the fire may have caused a power failure. In any case, it is often easy to become disoriented when woken from a sound sleep, or when a panic situation arises, so it is recommended that a method be used to automatically light your way or provide bearings during a fire.

Smoke detector escape light

Many smoke detectors are equipped with a powerful built-in lamp that comes on when the detector is activated. In a self-contained unit, the lamp should be powered by its own 9V battery. The problem with this type of light is that it is more likely to lead you towards the source of the fire rather than away from it.

Remote escape light

A battery-operated light is available that will "listen" for the siren of a ULC-approved smoke or heat detector without the need for interconnecting wiring. When the alarm siren is activated the light will come on. The light may then be seperated from the wall-mounting bracket and automatically locked on so that it may be carried with you to help find family members and the escape route.

Home control system

Systems are available that will turn on and off any light in the house from one or more central control panels. There is usually a single button that will turn on all lights in the event of an emergency (such as fire or intrusion). These systems use control signals transmitted over normal house wiring. A control panel placed beside each bed will allow all lights to be activated when the occupants are woken by the sound of a fire alarm. Some home control systems may be connected to a personal computer terminal for added control.

System alarm lighting

Some alarm systems may be able to turn on one or more lights automatically when the alarm is activated. Others have an interface that will allow them to be connected to a home control system that will turn on lights in various parts of the house using signals transmitted over the house wiring. Still others may be connected to a computer terminal used to control the lighting in your home.

Power failure light

Lights are available that plug into a wall outlet and will automatically come on in the event of a power failure. When the power fails they are operated by internal batteries (usually rechargeable). Some such devices may be removed from the socket and used as a flashlight.

Location of lights

Lights should be located in the primary escape routes, but particularly outside the bedroom areas or in hallways leading to the bedroom areas. They should be located in areas that may be dangerous to traverse in the dark (such as stairways). If possible, the lights should lead you away from the fire, not towards it.

Escape Equipment

In addition to emergency lighting, other equipment may be desirable to allow easy egress from the building in the case of fire. Often, a ladder is recommended for use in the secondary escape route.

Rope or chain ladders

If you have planned an alternate escape route through a window that is greater than 3m (10 feet) above the ground, a method of safe exit will be required. Escape ladders, specially designed for such emergencies, are available at a cost of around $30. These should hang securely over the window-sill and away from the wall when in use, and can be bundled up and stored under the bed or in some other easily accessible location. They come in various lengths for second and third floor escape.

The Fire Drill

It is recommended that a fire equipment inspection and a fire drill be held at least once every six months. Keep a record of when these are performed - see Figure 5.

The Inspection

- ☞ Make sure that all planned escape routes are clear of clutter, and that all doors and windows in the escape path are not barred or obstructed, and are easily opened.
- ☞ Check for potential hazardous situations per Chapter 3.
- ☞ Check the operation of all fire alarms.
- ☞ Check the pressure of all fire extinguishers, and ensure that they are not damaged in any way. Check the pressure of your sprinkler system, if you have one.
- ☞ Check that all escape lights are in working order.
- ☞ Check that escape ladders and other escape equipment are where they are supposed to be, are easily accessible in an emergency and are operational.
- ☞ Ensure that all accesses to your property (roads, lanes, etc.) are clear for emergency vehicles. Refer to Section 11.5.

The Drill

This should involve every member of the household, and include the babysitter. Since closed doors hold back smoke and fire fighters are adept at rescue, the chances of survival are excellent if you do the right thing.

☞ Have the participants read and understand what to do in the event of a fire (see Section 9).

☞ Practice the STOP, DROP and ROLL technique. If an item of clothing you are wearing accidently catches fire, you will need to know how to smother the flames to prevent serious injury. Don't run! STOP where you are, cross your arms in front of your chest, DROP to the floor or ground and ROLL around to smother the flames.

☞ Tell members of your household that you are going to conduct two tests. In the first, they must feel the exit door and pretend it is cool to the touch - in the second, they must pretend the door is hot and impassible. The objective is to meet at the pre-arranged rendezvous outside.

☞ Have them lay on the beds in their respective rooms with the doors closed.

☞ If you have a smoke detector in the hallway outside the bedrooms, operate it by pressing the test button. If you do not have a smoke detector, use some other method to signal the first escape. If you like, start a stop-watch at this time.

☞ The participants should ROLL out of bed, feel the bedroom door, pretend it is cool to the touch, and slowly open it (with their shoulder against it in readiness to slam it shut should smoke, heat or flames come in).

☞ Once through the doorway, they should close the door behind them and find the quickest and easiest exit from the building. Practice keeping low to avoid breathing toxic fumes - in fact,

☞ you may consider asking the participants to crawl along the floor with their eyes closed to simulate the worst possible conditions of escape.

☞ Everyone should meet at the pre-arranged rendezvous. When the last person arrives, stop the timer. Note the time and try to improve on this the next time you have a drill.

☞ For the second test have everyone return to their bedrooms and close the doors. Then sound the alarm.

☞ They must feel the door, pretend it is hot and prepare themselves to use the alternate escape route. They should not attempt anything that could lead to injury at this time, but they should be able to demonstrate their ability to escape using whatever equipment is available.

Chapter Nine

In the Event of a Fire

General

☞ Don’t panic - escape may depend on clear thinking.

☞ If the fire is small, extinguish it with the appropriate fire extinguisher. Do not try to fight a big fire by yourself.

☞ If the fire cannot be extinguished immediately, get out of the house as soon as possible following the planned escape routes. Do not stop to dress or collect valuables.

☞ Keep doors and windows closed unless it is necessary to open them for escape. If you leave a room that is on fire, close the door behind you to limit the amount of oxygen available to the fire. If you leave a room that is not on fire, close the door to limit the amount of smoke and heat damage.

☞ If you are cut-off from your normal exit route, take refuge in a room with an outside window. Get as many closed doors between you and the fire as possible.

Specific Areas

In the kitchen

☞ If the fire is contained in a pan or pot, turn off the heat, then smother the flame by placing a lid over the fire or by dowsing it with baking soda. If contained in an oven, close the oven door. Watch out for yourself and clothing. Never move the pan or pot to the sink in an effort to pour the burning contents down the drain - moving it increases air flow and makes the fire flare. Never use water on a grease fire, or try to smother the flames with flour. Do not turn on an overhead fan during a grease fire as the fire and smoke will be carried through the exhaust vent and could contribute to setting the entire house on fire.

Escape from the bedroom

☞ If you suspect a fire, open the door carefully only after feeling it to see if it is hot. If it is hot, do not open - follow an alternate escape route. If the door is cool, brace your shoulder against the door and open it a crack. If smoke and heat come in, slam the door shut and use your alternate escape route.

☞ If you are in bed when the alarm sounds, ROLL out of bed. Keep close to the floor - smoke and hot gasses rise. Breathe through a cloth (wet, if possible) and take short, shallow breaths.

Clothing fire

☞ If your clothing catches fire remember the STOP, DROP and ROLL technique. Wrap yourself in a blanket, if possible. Cross your arms across the chest so that the right hand touches the left shoulder and the left hand touches the right shoulder. Drop to the floor and slowly roll over and over. Lying on the floor and folding the arms keeps the flames away from the face. Rolling over will help cut off air and extinguish the fire. Never run! That stirs more air towards the flames, causing them to intensify.

Trapped!

☞ If you are trapped in a room, close the door and stuff the cracks to keep the smoke out. If there is a phone in the room, call in your exact location to the fire department, even if they are already on the scene. Children should not hide. Wait at the window and signal with a sheet or flashlight. Exit through the window if within easy reach of the ground. Lower small children to the ground first, before you exit. If you go first, they may panic and be afraid to follow you. Do not jump from an upper-storey window, except as a last resort. Use an escape ladder, if you have one.

☞ If it is necessary to break a window, use a chair or other heavy object, shielding your face against flying splinters of glass. Remove jagged pieces of glass from the frame.

After Leaving the Home

☞ Meet at your pre-established meeting place after leaving your house.

☞ Have one member of your household call the Fire Department immediately from a neighbour's telephone. Speaking slowly and clearly, they should tell the Fire Department the location of the fire and should not hang up until they are certain it has been properly understood. If there is an injured or missing person, an ambulance should be called as soon as they finish speaking with the Fire Department.

☞ Never re-enter a burning building.

☞ Meet the firefighters when they arrive. Tell them if there are any missing persons and where you suspect the fire may have originated.

Chapter Ten

First Aid for the Fire Victim

General

First aid for a person whose hair or clothes are on fire consists of an immediate dowsing with water, milk, or other non-flammable liquid. If none of these is promptly available in large enough quantities, smother the flames with a blanket, rug, or heavy woolen coat. Stay with the victim and have someone call an ambulance (if this has not already been done). Determine the extent of the victim's injuries and see what you can do to make him more comfortable until medical help arrives. If possible without pulling at injured skin, carefully remove smouldering and burned clothing. Also, if possible, carefully remove any rings and bracelets before the skin starts to swell.

Burns

It is customary to describe burns according to the depth and extent of the injury. The depth of a burn is measured in degrees - there are first, second and third degree burns. First degree burns are the least severe and produce reddening of the skin surface. Second degree burns produce blistering, in addition to reddening of the skin. Third degree burns are marked by tissue destruction that extends deeper than the surface skin - underlying structures have a cooked or charred appearance. The extent of a burn refers to the area of body surface that is damaged, and is often measured as a percentage of the total body area. Never breathe on, cough on, or touch burns, and NEVER open blisters.

Minor burns

These may be first or second degree burns, involve a limited surface area of the skin, and present no special risk or threat to life. When the burn is confined to part of a limb, such as a hand or foot, some lessening of the pain may be achieved by immersing the injured area in standing clean, cold water. Pat the area dry, then apply a small non-stickable sterile dressing and bandage loosely. Other areas of the body that have been burned may be cooled by either immersing the victim in a bath, or by covering the infected area with a cloth or sheet that has been immersed in cold water. Keep the affected area cool and clean. Do not attempt to remove any clothing from the burned area and do not rub the infected area. Do not use snow to cool the burn except as a last resort - snow contains ice crystals which are abrasive to the skin. Do not rub ice over the burn and do not put the burn under running water. Wait for medical help to arrive.

Major burns

These may be second degree burns involving a larger surface of the skin than minor burns, or they may be third degree burns. Have the victim lie down, then cover the burned area with a non-stickable sterile dressing and bandage loosely. Do not put burn ointment or any greasy substance on serious burns. If the burns cover a large part of the body, it is sufficient to cover the area with a clean sheet soaked in cold water. The important thing is to exclude air and contamination from the injury. Do not allow the victim to drink any liquids. Anticipate circulatory shock (see Section 10.7). Wait for the ambulance to arrive.

Inhalation of Smoke and Fire Gases

Breathing of toxic fumes from the fire (such as carbon monoxide) may produce headache and loss of muscular power. Remove the victim to fresh air and give him strong coffee or tea. If breathing stops, administer Artificial Respiration immediately.

Heat Exhaustion

Overexposure to high temperature and high humidity causes the body to perspire heavily in order to maintain a normal surface temperature. The early symptoms of heat exhaustion are heavy perspiration, headache, dizziness, blurred vision, weakness, irritability, and mild muscular cramps. Nausea and vomiting are usually present. The pulse is weak, breathing shallow, and a brief period of fainting and unconsiousness may ensue. If the victim is consious, he should be placed on his back in a cool, well ventilated place and given a glass of cool water containing a teaspoon of salt to drink. If unconscious, see Section 10.8.

Coffee or tea may have stimulating and desirable effects. If he complains of feeling cold, keep him comfortably warm. Mild cases of heat exhaustion may pass over in a few minutes, though the victim may feel weak for several hours thereafter. Watch the victim closely in case the condition turns to heat stroke, which is much more serious.

Heat Cramps

These are of common occurance in firefighters. They result from heavy physical exertion in high temperatures and are characterized by a sudden onset of severe cramps in the abdominal, leg and arm muscles. The victim may be found lying on the floor or ground with his legs drawn up or thrashing around in excrutiating pain. Symptoms of heat exhaustion may also be present. The treatment for heat cramps is the same as that for heat exhaustion, with the addition of applying firm hand pressure on the spastic muscles to relieve the cramps.

Heat Stroke

This is a far graver condition than heat exhaustion and, although at the onset both conditions appear to be the same, heat stroke is the result of a cessation of sweating, which brings about a dramatic and life-threatening rise in body temperature. Body temperature must be reduced quickly. While waiting for the ambulance to arrive, the victim's clothing should be removed, then he should be placed in a bath of ice-cold water. If the body temperature is not decreased in time, the victim will inevitably collapse. If he begins to turn pale his condition has been complicated by circulatory shock (see Section 10.7).

Circulatory Shock

This should be anticipated in the event of severe burns or heat stroke. It is characterized by cold sweat, decreased pulse rate and breathing and, in some cases, collapse and unconciousness. The victim should be lying down and kept warm until the ambulance arrives.

If the Victim is Unconscious

If unconscious, maintain the airway by placing the victim in the recovery position, as shown below.

Chapter Eleven

The Fire Department

General

Fire Station

Estimate the time it would take for an emergency vehicle to reach your home from the nearest Fire Station.

Fire Call Box

Fire call boxes were used quite extensively in urban areas at one time. However, as the telephone has become more reliable and widely used, fire call boxes are being phased out. In addition, these boxes had problems with false alarms being triggered by changes in humidity and by pranksters. Now, when repairs are needed, the boxes are usually removed from service altogether and not replaced. No new boxes are being installed.

Fire Hydrant

The distance between fire hydrants is not covered by any Canadian standard. Each municipality has its own guidelines and, moreover, the spacing often varies with the population density. Check with the engineering department of your municipality to find out what the guidelines are in your municipality. If the nearest fire hydrant is greater than 1000 feet from your home you may have to pay an additional premium on your fire insurance.

Access

There should be at least one unobstructed access route for fire fighting equipment into and out of your property. The National Building Code of Canada specifies the following requirements for the portion of the roadway to be used by the Fire Department. You should check that these requirements are met and have any deficiencies corrected.

- ✓ There shall be a clear width of 6m (19.7 ft), unless it can be shown that lesser widths are satisfactory.
- ✓ The centreline radius shall not be less than 12m (39 ft).
- ✓ There shall be an overhead clearance of at least 5m (16.4 ft).
- ✓ The change of gradient shall not be more than 1 in 12.5 over a minimum distance of 15m (49 ft).

- ✓ The roadway shall be designed to support the expected loads imposed by fire fighting equipment and be surfaced with concrete, asphalt or other material designed to permit accessibility under all climatic conditions.
- ✓ Any dead-end portion of the access route shall have turnaround facilities exceeding 90m (295 ft).
- ✓ The access route shall be connected to a public thoroughfare.

Educating the Public

Fire Prevention Week

Chapter Twelve

After a Fire

General

When you call the Fire Department, the police are also informed and usually arrive at the fire scene to direct traffic and otherwise assist the Fire Department. They may also call for an ambulance as a matter of course. Watching your home burn can be a very traumatic experience and making rational decisions may be difficult. If in doubt, ask the police what you should do.

Securing the Building

It is normal practise for the Fire Department to secure the area once the fire has been extinguished. Broken doors, windows and holes in walls will be boarded up. This will prevent anyone from entering the building (including the owners) until an investigation has been made into the cause of the fire. If the cause is obvious, the building may not be secured by the Fire Department and it may be up to you to secure it (with help from the police). Ask the police to keep your house under periodic surveillance until you can retrieve all your salvageable belongings. Store these items in a safe place as soon as you can. If you do not secure your home as soon as it is safe to do so, and leave your house in a state of disrepair, vacant, and with salvageable items still inside, vandals and thieves may strike, removing or destroying items that might otherwise be saved.

Informing Your Insurance Company

As soon as possible, you should inform your insurance agent or broker. A claims adjuster may then be appointed to look after the details. You should be prepared to show them your property record. He or she will discuss your claim with you, investigate the circumstances of the fire in cooperation with Fire Department officials, assist you in arranging for repairs and report to your insurance company with the cost of damage. The adjuster is appointed and paid for by your insurance company as part of the service you get with your policy. Additional living expenses over and above your normal expenditures will be paid to you by your insurance company if it is necessary for you to live elsewhere until the damage is repaired.

Repairing the Damage

Smoke damage

Fire damage

Water damage

Chapter Thirteen

Fire-Related Organizations

General

There are a number of government offices, associations and testing laboratories that offer further information on fire prevention and protection. Many of these organizations assisted in the compilation of this document. Where the address of a "Head Office" is given, there are regional branch offices, one of which may be in your area. For the address of these offices refer to your local telephone directory.

Office of Consumer and Corporate Affairs

This Government of Canada department is concerned with the conduct of the marketplace and aims to increase its efficiency. It strives, through legislation and regulation, to balance the interests of consumers and business, and to maintain confidence in the integrity and viability of private enterprise.

Consumer protection and safety of consumer products (CCA-4)

The Product Safety Branch is responsible for enforcing compliance of products with the Hazardous Products Act. The act covers such consumer products as household chemicals, toys, furniture, and textile products. Specifically, with relation to fire protection and safety, it bans equipment for use in household fire alarm systems and smoke alarms that do not meet the applicable requirements of the Underwriters' Laboratories of Canada (see Section 12.5). It also bans products made in whole or in part of textile fibres that, when tested in accordance with ASTM method D1230-61, have a flame spread in excess of that specified by the Act for a particular product. Various forms of floor coverings (eg. carpets) will be banned if they do not comply with the applicable flammability regulations established by the Canadian Government Specifications Board.

Head Office

Consumer and Corporate Affairs Canada,
Ottawa, Ontario K1A 0C9.

Energy, Mines and Resources Canada

This objective of this Government of Canada department is to encourage the discovery, development, and intelligent use of Canada's mineral and energy resources. This includes alternative energy programs (such as the use of wood stoves). The Explosives Branch administers and enforces the Explosives Act in the interest of public safety and security. Through a system of tests, licenses, and permits supported by inspections, the Explosives Branch controls the certification, manufacture, importation, sale, purchase, possession, storage, and road transportation of explosives (incuding all types of fireworks and pyrotechnic devices).

Head Office

Energy, Mines and Resources Canada,
580 Booth Street, Ottawa, Ontario K1A 0E4.

The Canadian Standards Association

The Canadian Standards Association (CSA) provides certification service for manufacturers who wish to use the appropriate registered CSA Marks on certain products of their manufacture to indicate conformity with CSA Standards. CSA Certification is provided in the interest of maintaining agreed-upon standards of quality, performance, interchangeability and/or safety. CSA provides certification services for a great variety of product lines, including building products and structures, electrical equipment, fuel burning and heating equipment, health care technology, occupational health and safety products, plumbing products and recreational safety equipment. Approximately one-third of CSA's Standards have been incorporated by reference into provincial or federal government regulation, so that in these cases, compliance with the CSA Standard has been made mandatory.

Electrical Equipment

All electrical devices sold in Canada, that are to be powered from commercial power lines, must be tested and certified by CSA. Manufacturers of electrical equipment intended for the consumer market must submit the equipment for testing and approval by the CSA before it can be distributed and sold in Canada. The intent is to protect the consumer from harm by ensuring that the equipment, even under fault conditions, cannot become a fire hazard, cannot render an electrical shock to the user, cannot explode, etc. Once the equipment has been approved for distribution in Canada, it is certified and allowed to bear the CSA logo. Therefore, before purchasing any electrical appliance, tool, television set, stereo, extension cord, lamp, etc. ensure that it has the CSA certification mark. The mark usually appears on the model plate, along with the CSA file number. Equipment that is only battery-powered is exempt from these requirements.

Head Office

The Canadian Standards Association,
178 Rexdale Blvd.,Rexdale,Ontario M9W 1R3.

Warnock Hersy Professional Services

The WHPS certifies fire resistant construction such as fire doors, fire door frames and hardware, and wall assemblies. It also certifies fireplace and chimney systems, and the surface burning characteristics of building materials.

Address

Warnock Hersey Professional Services, Ltd.,

211 Schoolhouse Road, Coquitlam, British Columbia.

Underwriters' Laboratories of Canada

The ULC maintains and operates laboratories and a certification service for the examination, testing, and classification of devices, constructions, materials, and methods to determine their relation to life, fire and casualty hazards, or their value in the prevention of crime. It has no direct connection with the Underwriters' Laboratories, Inc. in the United States.

Fire Standards

ULC maintains standards for the manufacture of smoke and heat detectors, and of fire extinguishers. All such equipment should be marked with the ULC classification symbol. It also maintains standards for the installation of such equipment. An index to standards can be obtained, free of charge, from the Head Office.

Head Office

Underwriters' Laboratories of Canada,
7 Crouse Road, Scarborough, Ontario M1R 3A9.

The Canadian Fire Safety Association

This association is organized to promote the science and improve the methods of fire protection and fire prevention, to obtain and circulate information on these subjects, and to secure the understanding and cooperation of the Canadian public in establishing proper safeguards against loss of life and property by fire. It has also been instrumental in assessing and recommending new Canadian fire standards.

Address

The Canadian Fire Safety Association,
2175 Sheppard Avenue East, Suite 110, Willowdale, Ontario M2J 1W8.

Fire Commissioner of Canada

The Fire Commissioner of Canada has the primary responsibility of providing an acceptible level of fire protection to Government of Canada owned and controlled properties. This activity is aimed at reducing the risk of fires, safeguarding against loss of life or injury and minimizing interruptions to essential Federal Government operations and services. His office coordinates the work of the Provincial Fire Marshalls and Fire Commissioners, the Fire Marshall of the Yukon and Northwest Territories, the Canadian Forces Fire Marshall, Department of National Defense, the Federal Department of the Environment, the Provincial Departments of Forestry and Resources, and the Health and Welfare Division

of Statistics Canada. The office also issues an Annual Report of Fire Losses in Canada. For the regional office near you, refer to your local telephone directory.

Head Office

Office of the Fire Commissioner of Canada,
Sir Charles Tupper Building, Ottawa K1A 0M2.

Provincial Fire Commissioners and Fire Marshalls

The primary responsibilities of the Fire Commissioners and Fire Marshalls are to collect and disseminate information about fires in their respective provinces, to conduct investigations and to inquire into fires, to investigate conditions under which fires are likely to occur, to study methods of fire prevention, and to establish minimum standards for selection and training of fire services personnel. Most offices issue an annual report of Fire Losses in their province or territory.

Address

Refer to your local telephone directory.

Canadian Gas Association

The CGA, which represents all segments of the natural gas industry, has been accredited by the Standards Council of Canada and the Standards Advisory Committee to prepare National Standards of Canada in the area of equipment for use with natural gas and propane. It operates a certification program for gas appliances and equipment. The CGA certification mark appears on such items as gas barbeques, swimming pool heaters, gas furnaces and portable camping equipment.

Address

The Canadian Gas Association,
55 Scarsdale Road, Don Mills, Ontario M3B 2R3
Tel: (416) 447-6465)

National Research Council of Canada

The National Research Council is an independent research agency established by Parliament to promote scientific and engineering research in furthering Canadian development. The Institute for Research in Construction carries out studies on fire safety design. The Council also provides technical support for the National Building Code of Canada and the National Fire Code of Canada.

National Building Code of Canada

The NBC establishes the standard of fire safety for the construction of new buildings, the reconstruction of buildings, including

extensions or alterations, buildings involving a change of occupancy and upgrading of buildings to remove an unacceptible fire hazard.

National Fire Code of Canada

The NFC is essentially a set of minimum requirements respecting fire safety in existing buildings and within the community at large. Its primary purpose is the promotion of public safety through the application of uniform fire safety standards throughout Canada.

Head Office

The National Research Council of Canada,
Montreal Road, Ottawa, Ontario K1A 0R6.

Canadian General Standards Board

The CGSB is a standards - writing organization accredited by the Standards Council of Canada to develop National Standards of Canada. They manage qualificaton and certification listing programs for all three levels of government and for the private sector. A catalogue of standards and qualified products is available free of charge.

Address

Canadian General Standards Board,
c/o Department of Supply and Services,
Ottawa, Ontario K1A 0S5.

Fire Prevention Canada (Fiprecan) Association

Fiprecan is the public education arm of the Canadian fire service. Co-sponsored by the Association of Canadian Fire Marshalls and Fire Commissioners and by the Canadian Association of Fire Chiefs, Fiprecan is charged with the responsibilty of developing and distributing fire prevention materials and related media services in Canada. Fiprecan annually prepares and distributes a catalogue of fire prevention materials.

Address

Fire Prevention Canada (Fiprecan) Association,
1590-7 Liverpool Court, Ottawa, Ontario K1B 4L2.

Insurance Bureau of Canada

Provides insurance research, government and industry liaison, support of fire protection services and advice to members on insurance terms and conditions. Collects and analyzes actuarial and statistical information.

Head Office Insurance Bureau of Canada,
181 University Avenue, 13th Floor, Toronto, Ontario M5H 3M7.

Fire Underwriters Survey

Fire Underwriters Survey is a national organization financed and directed by the Insurance Bureau of Canada. Utilizing technical staff of Insurance Advisory Organization, the Survey provides data on public fire protection for fire insurance statistical work and underwriting by member companies of the Insurance Bureau. It also advises municipalities on deficiences in their fire defenses and recommends improvements to enable them to better deal with fire protection problems.

Head Office Fire Underwriters Survey,c/o Insurers' Advisory Organization,
180 Dundas Street West, Toronto, Ontario M5G 1Z9.

National Fire Protection Association

The NFPA is a scientific and educational membership organization concerned with the causes, prevention, and control of destructive fire in the United States. The purpose of the corporation is to promote the science and improve the methods of fire protection and prevention; to obtain and circulate information on these subjects; and to secure the cooperation of its members and the public in establishing proper safeguards against loss of life and property by fire. It develops, publishes, and disseminates standards, prepared by approximately 175 technical committees, intended to minimize the possibility and effects of fire and explosion, and conducts fire safety education programs for the general public. Many Canadian standards are derived from the NFPA.

Address The National Fire Protection Association,Batterymarch Park,
Quincy, MA 02269, USA.

American Society for Testing and Materials

The ASTM establishes voluntary consensus standards for materials, products, systems and services. It issues various awards for significant contributions in research and has developed more than 7300 standard test methods, specifications, classifications, definitions, and recommended practices now in use.

Address American Society for Testing and Materials,
655 15th Street N.W., Washington, DC 20005, USA.

Fire Retardant Chemicals Association

The FRCA provides membership to companies that manufacture and/or distribute chemicals and are active in fire safety through chemical technology, and to companies or organizations interested in fire retardants. It encourages greater fire safety through chemical technology and acts as a forum for dissemination of information on new developments, new applications, and current testing procedures.

Address Fire Retardant Chemicals Association,
851 New Holland Avenue, Box 3535, Lancaster, PA 17604, USA.

Canadian Co-ordinating Council on Deafness

Address 116 Lisgar Street, Suite 203, Ottawa, Ontario K2P 0C2.

Propane Gas Association of Canada

Address Propane Gas Association of Canada,
Suite 1202-500 Fourth Avenue S.W., Calgary, Alberta T2P 2V6.

Chapter Fourteen

References

Standards

- ✓ ULC CAN4-S503: Standard for Carbon Dioxide Hand and Wheeled Fire Extinguishers.
- ✓ ULC S504: Standard for Dry Chemical and Dry Powder Hand and Wheeled Fire Extinguishers.
- ✓ ULC CAN4-S507: Standard for 9-Litre Stored Pressure Water Type Fire Extinguishers.
- ✓ ULC CAN4-S508: Rating and Fire Testing of Fire Extinguishers.
- ✓ ULC S512: Standard for Halogenated Agent Fire Extinguishers.
- ✓ ULC CAN4-S524: The Installation of Fire Alarm Systems.
- ✓ ULC S525: Standard for Audible Signal Appliances for Fire Alarm Systems.
- ✓ ULC S527: Standards for Control Units for Fire Alarm Systems.
- ✓ ULC S529: Standards for Smoke Detectors for Fire Alarm Systems.
- ✓ ULC S530: Standards for Heat Actuated Fire Detectors for Fire Alarm Systems.
- ✓ ULC S531: Standards for Smoke Alarms.
- ✓ CSA C22.1: Canadian Electrical Code Part 1, Sec. 32 (Safety Standards for Electrical Installations - Fire Alarm Systems).
- ✓ CSA C22.2 No. 37-1964: Christmas Tree and Other Decorative Lighting Outfits.
- ✓ CSA CAN3-B365-M84: Installation Code for Solid Fuel Burning Appliances and Equipment.
- ✓ CGA B149.1: Installation Code for Natural Gas Burning Appliances and Equipment.
- ✓ CGA B149.2: Installation Code for Propane Burning Appliances and Equipment.
- ✓ ASTM D1230: Standard Method of Test for Flammability of Clothing Textiles.

- ✓ CGSB 4-GP-2:
- ✓ CGSB 4-GP-155: Standard for Flammability of Soft Floor Coverings.
- ✓ NFPA-13D: Installation of Residential Sprinkler Systems.
- ✓ National Fire Code of Canada.
- ✓ National Building Code of Canada.
- ✓ Hazardous Products Act.
- ✓ Explosives Act - Explosives Regulations.

Other References

- ✓ BRK Manual 156-210-00 “Applications Manual for System Smoke Detectors”.
- ✓ Canadian Consumer Magazine - August 1985: Fire Extinguishers.
- ✓ “Fire Losses in Canada Annual Report 1984”.
- ✓ “Fire Losses in British Columbia in 1985”.
- ✓ “Fire Power” - a movie produced by the NFPA.
- ✓ “Fire Protection Handbook” - NFPA.
- ✓ “Manual of Display Fireworks” - Energy, Mines and Resources Canada.
- ✓ “Residential Wood Heating: A Homeowner’s Guide” - Energy, Mines and Resources Canada.
- ✓ “The Guide to Textiles for Interior Design” by Dianne R. Jackman and Mary K. Dixon - Peguis Publishers Limited.
- ✓ “Fabric Science” by Joseph J . Pizzuto - Fairchild Publications.
- ✓ “Home Repair and Improvement - Home Security” by Time-Life Books Inc.
- ✓ “Basic Instructions for the Operation of Simple Propane Gas Systems” -

Propane Gas Association of Canada.

Chapter Fifteen

Summary

General

The information contained in this document has been compiled to educate the house owner in the many methods of fire prevention and protection. We can reduce the risk of fire by proper house maintenance and keeping unnecessary combustibles away from the house. However, we cannot eliminate all combustibles from the house entirely, so we must assume that a fire is possible and should design a scheme of fire protection accordingly. This involves making escape plans, installing fire alarms and extinguishers, and having regular fire drills. Probably the most difficult decision the home owner will have to make is in the selection of an appopriate fire protection system.

The Ultimate Fire Protection System

It has been shown that there are very many types and options of systems available, but I have learnt there is basically only one arrangement that will provide the best possible protection. In an existing home we must have a series of smoke detectors (preferably combined ion/photo smoke types) located as described in this document. If battery-operated, they must have a low-battery indication and a test feature. If ac-powered, they must have a backup battery and a test feature. They must be interconnected (by wireless, unless you do not mind running wires behind walls or running unsightly wires across the ceiling and down the walls), so that any one becoming activated will sound an alarm from all the units. There must either be an interconnected detector in each bedroom or, at least, a receiver that will operate an alarm in each of the bedrooms. The alarms must be loud enough to waken all sleepers - no matter how soundly they sleep. If a member of the household has a hearing impairment, this must be taken into consideration. Fire extinguishers should be installed as recommended. A residential sprinkler system would provide even more protection. Lights that come on automatically during a power failure or during a fire alarm should be installed in areas where darkness or smoke may impair visibility and cause a hazardous situation. The lights should lead you away from any hazard (such as fire or gas leak).

The Future

It is clear from my investigations that currently available fire protection equipment and fire prevention techniques for residential homes fall short of the ultimate system. In some areas improvement is already underway.

Wallpaper

As described in Section 3.13.6, one manufacturer has changed the composition of its vinyl wallpaper so that, if the temperature of the wallpaper rises above a preset limit, it will release a harmless vapour that will activate an ionization-type smoke detector well before actual combustion takes place. This will be ideal for providing early warning of electrical fire caused by faulty wiring between walls.

Textiles

At the present time, there is no way the consumer can select clothing, fabrics, draperies, upholstered furniture, etc., for resistance to fire. The Hazardous Products Act provides some protection for the Canadian consumer by regulating children's clothing, bedding and other textile products to some degree, but a method of rating products for fire safety is desirable. The fire rating should take into account ease of ignition, flame spread ability, heat release, smoke release and toxicity of combustion products.

Fire alarms

Sprinklers

Once triggered, standard automatic sprinkler heads (as described in Section 7) discharge water until the fire department has determined that the fire has been extinguished and that it is safe to turn off the sprinkler system. The unnecessary water flow can lead to increased damage and a longer cleanup time. To alleviate this problem, a new "smart" on-off sprinkler head has been designed for wet-type systems. This head includes a temperature sensing device that allows the unit to automatically shut off after a fire has been controlled and the ceiling temperature has been reduced to about 35 degrees Centigrade (95F). If the temperature rises again due to rekindling of the fire, the head will discharge water once more. It is hoped that these will soon be available for residential use.

Yellow Pages

For information on the various equipment or services that you may require, contact the suppliers by referring to the following headings in the Yellow Pages:

✓ Burglar Alarm Systems

✓ Fire Alarm Systems

✓ Fire Extinguishers

✓ Fire Insurance

✓ Fire Protection Consultants

✓ Fire Protection Equipment

✓ Fire and Water Damage Restoration

✓ Fireproofing

- ✓ Fireproofing Materials
- ✓ Sprinkler Alarm Systems
- ✓ Sprinklers - Fire Protection
- ✓ Central Monitoring Stations can be found by referring to Burglar Alarm Systems and Fire Alarm Systems headings.

Further Information

For general information on fire prevention contact your local Fire Department and ask for the Fire Prevention Office. For specific information contact one or more of the organizations listed in Section 13. If you cannot find what you need, either in equipment or information, write to me at the following address:

David J. Smith, P.O. Box 925,New Westminster,British Columbia,CANADA V3L 5C3.

If you have any comments or suggestions, or if you have any fire-related incidents to report, please write to me - they may be included in a later issue of this document, and they may save a life.