INCENDIARY BOMBS
AND
HOW TO DEAL WITH THEM

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OTTAWA CANADA
Your Air Raid Warden Is:

Telephone No.

The Warden's Post in Your Sector is at.

Telephone No.

EVERY ADULT MEMBER OF YOUR HOUSEHOLD SHOULD READ THIS BOOK

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A MESSAGE TO CANADIANS
from
THE MINISTER OF PENSIONS AND NATIONAL HEALTH

THIS is a direct, personal message to each of you as individuals. It is about Air Raid Precautions or, as some call it, Civilian Defence.

Air Raid Precautions are not directly concerned with fighting the enemy. That is the task of the Navy, the Army and the Air Force.

Air Raid Precautions are essentially your problem. They are measures that you have to take yourself for your own safety and for the safety of your family and fellow citizens.

Government direction there must be. But the work has to be done by you, the people, in your own homes, in your own neighbourhoods, in your own towns and cities. Our task, yours and mine, is concerned with those measures that we, ourselves, can take for the protection of civilians, for the rescue and care of civilian casualties and for the protection of property, especially, vital war industries.
That is why the Government decided that a civilian department—the Department of Pensions and National Health—should assume responsibility for the central direction of A.R.P. And that is why the Government asked the Provincial Governments and municipal councils to take the leadership in their own Provinces and communities.

We are trying to administer A.R.P. through the provincial and municipal authorities without unduly interfering with their local autonomy. We can do this if the spirit of mutual trust and co-operation is preserved even when we disagree on details.

We are fighting this war for freedom. But freedom involves a capacity for self-discipline. In no sphere of war activity are self-discipline and mutual co-operation more vital than in A.R.P.

And so I appeal to you, as citizens, each to do your part. Let us carry on—together!

Minister of Pensions and National Health

IMPORTANT FACTS ABOUT BOMBS AND BOMBING

If and when Canada is attacked from the air, we may expect three general types of missiles to be used—high explosive bombs, gas bombs and incendiary, or “fire” bombs.

So far the use of gas has not been resorted to generally by the enemy and it seems unlikely that Canada will be made the testing ground. Though gas bombs cannot be ruled out as a definite possibility and preparations must be made to protect ourselves against their effects, it is reasonable to suppose that in his first attacks, at least, the enemy will confine himself to the use of high explosive and incendiary bombs.

A bombing plane has a very definite limit of load weight—and, in the case of planes forced to travel long distances to reach their objectives or planes that must operate from temporary advance bases or aircraft carriers, this limit is greatly reduced.

High explosive bombs range in weight from about 100 to 3,000 or more pounds each. Therefore, the number any one plane can carry is small. Incendiary bombs, on the other hand, rarely exceed fifty pounds in weight and the type most commonly used weighs only about 2 1/4 pounds. Therefore, a single raider can carry as many as several thousand.

The effect of a high explosive bomb, though serious, is confined to a limited area. This is not so, however, in the case of a load of incendiary bombs of equal weight. It can be scattered over a wide area and, if not dealt
with promptly and properly, will start dozens of fires, that are likely to cause very extensive damage and destruction.

The high explosive bomb is sudden and shattering in its effect. Except in the case of delayed action bombs and apart from fires that may result, its work is done within a few seconds after impact. Nothing can be done to "deal with" a high explosive bomb. Only the results can be dealt with.

The incendiary bomb, on the other hand, presents no great danger and causes little or no damage until two or three minutes after it has fallen. Usually, if dealt with promptly and efficiently, it can be rendered ineffective before it can do much damage. The same is true of an entire incendiary bomb attack, no matter how extensive it may be.

In most Canadian cities and towns the average proportion of open spaces to built-up areas is, roughly, about five to one. Accordingly, for every six incendiary bombs dropped, one might be expected to hit a building and the remaining five to fall in streets, yards and open spaces where they would burn themselves out without doing any serious damage. Of those that hit buildings, about half might be expected to glance off roofs or fail to function so that only about eight per cent of the total number of bombs actually dropped would probably cause fires. Even so, a plane flying at a speed of 200 miles per hour at a height of 5,000 feet and releasing bombs at the rate of, say, twenty per second, would spread a load of 1,000 bombs over an area only a little less than three miles in extent and might be expected to start a fire every sixty or seventy yards. Compare this with the fact that, in most communities, two or three simultaneous fires will more than tax the capacity of the local fire-fighting services.

From these facts others of vital importance to the civilian population emerge. Chief amongst them are:

(a) In so far as Canada is concerned, incendiary bomb attacks are more likely to occur than any other form of hostile air raid.

(b) Incendiary bombs probably constitute a greater potential danger to a community than high explosive or gas bombs.

(c) Fires resulting from incendiary bombs constitute a much greater danger than the bombs themselves.

(d) Fighting fires that have taken hold is the job of the regular fire fighting services, but fighting incendiary bombs—and so preventing fires—is essentially the job of the ordinary citizen; otherwise the fires that can be started by an incendiary bomb attack will prove far too numerous and extensive for any fire-fighting force or water supply to cope with.

(e) Knowing how and promptness of action are the all-important factors in dealing with incendiary bombs.

(f) While civilians can take steps to safeguard themselves to some extent from the effects of high explosive or gas bombs, there is no way they can prevent those effects; on the other hand, they are able, not only to protect themselves from the effects of incendiary bombs but, by prompt, proper and concerted action on the part of everyone, they can render incendiary bomb attacks very largely, if not wholly ineffective.
THE INCENDIARY BOMB

By far the most effective incendiary agent used by the enemy is the small “Kilo” magnesium, or electron bomb illustrated on the opposite page. It consists of a thick-walled tube nine inches long and two inches in diameter, made of magnesium alloy. On one end of this tube is a tail, five inches in length, to steady its flight. On the other end, or the nose, is an igniter, itself filled with a highly inflammable priming composition. The casing is filled with compound of the thermite type.

The bomb weighs about 2 1/4 pounds and, with the exception of the tail, is wholly of incendiary material. Unlike most bombs, it is flat-nosed and not streamlined. It is designed to penetrate most ordinary types of roofs and lodge in upper storeys or “under-roof” spaces where it is both difficult to get at and deal with.

How It Functions

When the fire bomb strikes a hard surface such as the roof of a building or the floor below, the impact operates a fuse that ignites the thermite core. This burns at a very high temperature and, because it contains its own oxygen, cannot be extinguished by smothering. It quickly ignites the magnesium shell or casing which then burns fiercely and at a very high temperature. For about a minute, there is some spluttering during which the burning metal may be thrown as far as thirty feet and will set fire to anything within reach. After this, the bomb collapses into a small pool of molten metal which
continues to burn with intense heat, but without spluttering, for about ten minutes.

Some fire bombs have a small explosive charge which may de-tonate shortly after impact—usually within the first two minutes—throwing pieces of magnesium and fragments in all directions. The splinters are capable of caus-
ing fatal wounds at close quarters and serious wounds at thirty feet.

Protective Measures Against Fire Bombs

For greater damage can be done by fire than by bombs in most cities and towns, particularly those in which a large proportion of the buildings are of wood construction. A single enemy plane can carry as many as 2,000 incendiary bombs and, by means of them, can start as many as 200 fires at widely separated points. This imposes a staggering load on the fire services of any community, no matter how well they are organized and how efficient they may be.

Since there is an ever-present possibility of such fires spreading and razing whole blocks—as actually did happen in London—it is vitally important that every community, however small, should organize adequate measures to prevent fires caused by incendiary bombs from developing beyond the incipient stage. Such measures include the protection of roofs and the enrollment and training of a sufficient number of Fire Watchers, Fire Guards and Auxiliary Firemen. The protection of roofs, attics, or lofts, and the provision of an adequate number of Fire Watchers and Fire Guards, properly equipped, is the responsibility of the owners or occupants of each and every building, whether it is a resi-
dence, an apartment house, tenement building, a business premises, a church, a school, an institution or a factory. And now—not when an emergency de-
velops—is the time to plan and organize such protection.

Protection of Roofs, Lofts, Attics, Etc.

Fortunately, the great advantage of the small incen-
diary bomb—its light weight—is also its chief weakness. Incendiaries do not readily penetrate buildings, in fact, they appear to have been designed with poor powers of penetration so that they would lodge on or in roofs or the floors or ceilings immediately beneath.

The most obvious method of protection is to strengthen the roofs of buildings sufficiently to resist penetration. Unfortunately, in the case of most small buildings and a good many larger ones, this is not often practicable. To ensure non-penetration by a fire bomb, a roof would have to be covered with mild steel plate of at least \( \frac{1}{4} \) inch in thickness, reinforced concrete from 3 to \( 4\frac{1}{2} \) inches in thickness, sand or earth at least 6 inches in depth or a layer of closely packed sandbags. In most cases, the provision of such protection would also necessitate strengthening the roof supports to carry the added weight. Aside from the difficulty of obtaining the proper materials in these days of shortages, protection of this nature would prove too costly for most owners of buildings.
On the other hand, steps can be taken to prevent or, at least, to minimize the chances of incendiary bombs setting fire to buildings after penetrating the roof. This can be accomplished by covering the floor of the attic, loft or under-roof space with either corrugated iron, asbestos sheeting, a layer of closely packed sandbags or with dry sand, earth, ashes, foamed slag or some other fire-resistant material. In lofts or under-roof spaces where there is no floor, it will be necessary to lay boards to carry loose materials such as sand, earth or ashes but not if corrugated iron or asbestos sheeting is used.

As an added protection, rafters, joists, board trimming, etc., should be treated with fire-resistant plaster or paint. Even ordinary lime wash will give a certain amount of protection by delaying the ignition of timbers or woodwork.

**ELIMINATE FIRE HAZARDS**

There is no greater fire hazard, even in peacetime, than the untidy accumulations of old and leftover materials—most of it highly inflammable—that clutter up the attic or loft as well as odd holes and corners in most buildings. Especially is this true of homes and small business premises.

Such accumulations invite disaster for not only do they provide ready fuel for the fire bomb, but they are likely to be set ablaze so quickly that a major conflagration will have developed before such fire-fighting equipment as is readily available can be brought into action. Furthermore, in many cases, such accumulations, even though not particularly inflammable, prevent easy access to the source of the fire and seriously hamper the work of those attempting to deal with it.

Attics, lofts and roof-spaces should be cleared of everything inflammable and tidied up. In addition, ready access to all parts of them should be provided. This applies equally to all other parts of the building. Set to work now to do a thorough house-cleaning job from attic to cellar. And let it not be "too little and too late."
FIRE WATCHERS AND FIRE GUARDS

Incendiary raids are essentially indiscriminate and, therefore, a general threat to the whole community. They cannot be combatted successfully by spasmodic individual efforts. It takes the concerted efforts of a network of trained volunteers covering all vulnerable points.

In each A.R.P. sector a number of persons, considered to be best suited for the job, will be chosen to act as Fire Watchers and given special training in the work they will be called upon to perform. They will form part of the Warden's Service. When an air raid warning sounds, it will be their duty to take up pre-arranged stations on the tops of buildings and other vantage points to keep constant watch for falling bombs and to warn the occupants.

When an incendiary raid occurs, the majority of the fire bombs that fall dangerously will land on the roofs of buildings. Therefore, in addition to the regular Fire Watchers, the owners or occupants of every building should recruit an adequate number of volunteers to act as Fire Watchers and Fire Guards for that building.

During an air raid, those acting as Fire Watchers will take up positions on the top of the building to which they have been assigned, with their equipment, to spot and deal with any fire bombs that may fall upon the roof or roofs. In large premises, these Fire Watchers should be supplemented by teams of Fire Guards to deal with incendiaries and fires elsewhere on the premises.

HOW TO FIGHT INCENDIARY BOMBS

Tackling an incendiary bomb is a fairly simple matter for those who know how. It is a job that needs speed, coolness, training.

A burning bomb cannot be dealt with in the same manner as an ordinary fire. To throw a bucket full of water over it or to play a strong stream of water on it is dangerous because this will make the bomb splutter violently and molten metal will be thrown in all directions. Generally speaking, fire extinguishers are not useful for dealing with fire bombs (see page 21).

The quickest method of extinguishing a fire bomb is to apply a small jet of water from as close a range as possible. By this means the bomb can be disposed of in less than a minute and, where speed is the governing factor, this method should be adopted.

Although the jet of water will cause the burning magnesium to scatter, experience has shown that this involves less risk of personal injury than might be expected. As a general rule, it is better and safer to use a spray.

Fire bombs that fall in the open or in other places where they are not likely to set fire to anything else usually can be left to burn for two minutes before being dealt with. Those that fall where they are likely to cause a serious fire unless dealt with immediately, must be tackled at once and the risk that they may be of the explosive type must be accepted. In all cases, anyone approaching a burning fire bomb during the first two minutes, should do so behind the best cover obtainable.
The best method of dealing with it is to smother it with dry sand, earth or ashes. Normally, none of these will extinguish the bomb—it may continue to burn underneath for some time—but they will reduce the heat, glare and spluttering and prevent the bomb from setting fire to anything near it.

The easiest way to use sand, earth or ashes for this purpose is in sandbags or sandmats. The method is illustrated on the opposite page.

A sandbag should be only about half full. It is a good idea to tie the corners with string to form "ears" so that the bag can be grasped easily. A sandmat has the advantage of being lighter to handle. It is made by cutting an ordinary sandbag in half, filling the half with about 15 pounds of dry sand, earth or ash and sewing it up. This makes a loose cushion which can be grasped in the middle by one hand so that the fingers are not exposed.

If cloth or jute bags are not available, a fairly good substitute is a strong paper bag loosely filled with sand. It should not exceed twenty pounds in weight; otherwise it may be too heavy to handle properly. Sand bags, sand mats and paper bags filled with sand should be kept as dry as possible.

If a fire bomb falls close to a building where the use of sandbags or sandmats is impracticable, loose sand, earth or ashes may be used effectively providing you have a long-handled shovel or metal scoop with which to place it on the bomb. Basically, the method to be followed is the same as illustrated on the next page.
WHEN A FIRE BOMB FALLS INDOORS

Frequently a fire bomb may fall indoors and land where there is little danger of setting its surroundings ablaze quickly. If there is plenty of space, nothing inflammable close at hand and the floor on which it lands is either fireproof or not quickly ignited, then you may successfully use either the sand mat method or the sand scoop method illustrated on the opposite page.

The Use of Water

When a bomb falls where it will quickly ignite its surroundings, as, for instance, in a room where curtains, rugs and furniture will take fire immediately, an adequate supply of water, properly used, is the only effective method of dealing with it and the resulting fire.

The most effective and most easily operated apparatus with which to apply water to a fire bomb is the stirrup pump or its counterpart, the pump-operated water tank extinguisher, both of which are described and illustrated on the next page.

Facing either of these, a garden hose equipped with a spray nozzle is an effective weapon for fighting the fire bomb. Normally, a faucet with a threaded spout is necessary to attach the coupling of the hose, but such faucets are seldom found in the upper floors of dwellings. Therefore, to use garden hose, it will be necessary to have a threaded faucet installed or to obtain an adapter that will enable the hose to be attached to any tap. The hose should be long enough to reach all parts of the house and, particularly, the attic or roof-space. It should be stored, ready for immediate use, in a conveniently located place in the house, and not in the cellar or shed.

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THE STIRRUP PUMP

The stirrup pump is a simple hand pump designed for easy operation by one hand to draw water from a small container such as an ordinary pail and discharge it as a jet or a spray.

It will deliver about two gallons of water a minute, throwing a jet to a distance of about 30 feet and a spray to a distance of from 12 to 15 feet. A standard A.R.P. appliance in Britain, these pumps are now being manufactured in Canada but, as yet, production is on a limited scale.

The dual-purpose nozzle usually supplied with the stirrup pump is so designed that a simple pressure of the thumb changes the jet to a spray and a simple pressure of the forefinger changes the spray to a jet.

This enables the pump to be used alternatively on the bomb and fire, each of which requires separate treatment. The illustration shows the proper method of holding the dual-purpose nozzle when in use.

ABOUT FIRE EXTINGUISHERS

Many buildings are provided with fire extinguishers. These are useful for putting out fires caused by incendiary bombs but are not suitable for use on the bomb itself. Extinguishers containing chemicals such as Carbon Tetrachloride are not only ineffective but dangerous when used on a magnesium bomb because they may cause poisonous or harmful gases to be generated. It is best to use sand or water on the bomb and save the extinguisher for resulting fires.

A Word of Warning

Many "patent" liquids and powders for attacking fire bombs are being offered for sale now and, no doubt, many others will appear.

The British Ministry of Home Security has recently issued a circular recommending the use of plain water. This advice is based on long experimental work which shows that, in average circumstances, an incendiary bomb can be extinguished by this method in about one minute. Furthermore, it is pointed out, water costs nothing—an important consideration when it is remembered that the control of the bomb is of minor importance compared with the extinguishing of the fire likely to result from it.

The Ministry has tested a large number of specially prepared liquids and powders and has found that in no case did any liquid have any advantage over plain water or any powder show any advantage over dry sand.
1 A team of three persons is best. Number One, opens the door on hands and knees. Keeps his head behind it and holds it firmly to avoid possible bursts of flame and fumes.

2 Number Two, mans the pump. Number Three brings the water. They approach no nearer the fire than is absolutely necessary.

3 Number One crawls towards the bomb, head well down, face shielded. He takes advantage of whatever cover is available.

4 He deals with the fire first. Dampening it down with the jet. When the fire is fairly well controlled he turns the spray on the bomb. The two-way nozzle changes from jet to spray with a touch of the thumb.
HOW TO ATTACK THE BOMB AND FIRE

The stirrup pump requires about six gallons of water to control a small incendiary bomb and extinguish a fire in a room of medium size and average furnishings. When used on a burning bomb and surrounding fire, the jet and spray are used alternatively—the jet on the fire and the spray on the bomb. The spray, when played on the bomb, does not increase the sputtering as a jet or stream of water would do, but has the effect of speeding up combustion by supplying oxygen, so that the bomb burns out in about three minutes instead of ten.

However, under no circumstances should small fires in the room be neglected. The fire is always more dangerous than the bomb. Tackle the fire first. There is no point in putting out the fire bomb if your house burns down around it.

In approaching a burning bomb, care must be taken to protect yourself against the possibility of flying bits of hot metal and against excessive heat. Therefore, it is advisable to approach the bomb from behind some protective screen. An upturned table, a well-soaked blanket or even the cover of a galvanized iron garbage can will serve. An effective screen can be made from a piece of 3/8-inch plywood, fitted with loops at the back so that it can be carried like a Roman shield. Peep holes cut in the plywood enable the operator to see the fire while still protecting his face. Another hole for the nozzle will help protect the hands.

When both bomb and fire are thoroughly out, rake over the remnants of ashes, etc., to be perfectly sure there are no smouldering bits of fire left. If the fire has burned through the floor, check carefully, with the help of a good flashlight, to make sure there are no smouldering embers between the floor and ceiling.

Remember that the bomb might burn through a floor before you have had time to control it, and you might have to continue to deal with it on the floor below.

Which Bomb to Tackle First

Special watch should be kept for fire bombs in and on buildings and, normally, these bombs should be dealt with first. Bombs that fall in the open will often burn themselves out harmlessly, though if they have fallen where they can obviously start a fire—for instance, next to a gasoline tank—they must be dealt with at once. In deciding which fire bomb to tackle first it should be remembered that though isolated incendiaries in the open may make a dangerous glare for a few minutes, a burning building makes a much more dangerous glare and for a much longer time.

"Duds"

Unignited incendiary bombs are not dangerous if handled carefully. They should be dropped into water or else reported to the nearest Warden or Auxiliary Fire Services’ Post and left on the ground to be collected.
HOUSEHOLD PRECAUTIONS AGAINST FIRE

Check over the list of items which follows and be sure you have done everything possible to reduce the risk of fire gaining headway in your home by being ready to deal with it quickly.

Note these points carefully:

1. Have ready a supply of water in the bath and in buckets. During cold weather keep the water where it will not freeze. Place containers holding 4 gallons of water immediately outside or inside the main entrance of your premises, one of which should be capable of being used with a stirrup pump.

2. Have ready supplies of earth or sand, a shovel, a hatchet, and, if possible, a ladder or "steps," and a rake. Keep sand mats or pails full of sand on each landing and the other things together on the ground floor.

3. If you have a stirrup pump put a sign in your window and tell the Warden how to get the pump whether you are at home or not.

4. See that all members of your family obtain practical training in dealing with fire bombs, both with the stirrup pump and with sand.

5. When you go away, turn off gas and electricity at the main. Leave the curtains of upstairs rooms pulled back, so that a fire inside can be seen from the street.

6. Make sure that you and members of your family know where to get the Warden and Fire Brigade.

ESCAPE AND RESCUE

If the suggestions contained in this booklet and the instructions and advice given by your local A.R.P. officers are faithfully followed, it is hoped, and, indeed, it may be expected, that no serious damage will come to your home. But you must also be prepared for the unexpected. A fire starting in some other premises may attack your home or you may be called upon to help others in an emergency. Therefore, it is well to be familiar with these few simple rules for the guidance of those faced with the problems of escape and rescue:

1. When searching a house for its occupants, start at the top and work downwards.

2. When fighting a fire, escaping from fire or saving others, lie down and crawl to avoid smoke and heat.

3. Do not use burning passages or stairways when rescue can be effected through the window.

4. If you have to use a burning stairway or passage or cross a burning room, keep near the walls where there is greater support for the floor.

5. Keep doors and windows closed as much as possible in a burning building, to restrict the supply of fresh air to the fire. If you have to go into a burning room of which the door opens outwards, put your foot a few inches back from the closed door to control the swing, so that you can open the door steadily and use it as a shield against the outrush of flame, hot
gas and smoke. Then drop to your knees and, if necessary, crawl in, keeping close to the walls.

(6) If your clothing is on fire, clap your hands over your mouth, lie down and roll over and over on the floor.

(7) If someone else’s clothing is on fire, hold a blanket or overcoat in front of yourself, throw the other person on the ground, throw the blanket or coat over him and then roll him over and over until the flames are put out.

(8) To move an unconscious person along the floor, lay him on his back, tie his wrists together, then kneel astride him, put your head through the loop of his arms and, taking his weight round your neck, crawl forward slowly on your hands and knees.

(9) To move an unconscious person downstairs, put his face uppermost at the top of the stairs with his head towards the bottom, then support him under his armpits and move slowly backwards downstairs.
METHOD OF ESCAPE BY A WINDOW

Hurry to escape by dropping from an upstairs window. Serious injuries may result. It takes only seconds to climb out a window and drop if this becomes absolutely necessary. Remember skilled help may arrive at any moment to get you down safely.

(10) To escape from a window when there is no rope, put your legs outside and sit on the sill, then turn over with your stomach on the sill so as to face the wall, lower your body to the full extent of your arms and drop with knees bent. Never be in too great a

YOUR AIR RAID WARDEN

When the Air Raid Warden assigned to your neighbourhood calls, welcome him. He is your friend, anxious and willing to help you in any way he can.

He is a public-spirited citizen who has voluntarily undertaken responsibility for your protection and the protection of your family, your neighbours or your fellow-workers. Unselfishly, he has given long hours of his time to prepare himself so that he may advise and assist you in planning those measures that you, yourself, must take for your own safety.

Take him into your confidence. Answer his questions cheerfully and fully.

Show him over your premises from attic to cellar. Ask his advice as to how best to protect it—and act upon his advice.

Don’t hesitate to ask him questions. If he can, he will answer them gladly. If he cannot, he will see that you get reliable information from authoritative sources.

Get his name, address and telephone number so you can consult him further if you need advice on any particular matter pertaining to A.R.P.

Every Air Raid Warden is provided with an official card of identification. Ask to see it.

Remember—it is too late to prepare for an emergency when it happens. Act now!
This is a valuable booklet and the supply is limited. Please preserve carefully and have all members of your household read it.

This booklet is one of a series prepared and distributed for the guidance of the public by the Office of the Director of Civil Air Raid Precautions, Daly Building, Ottawa, Canada.