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FIRE GUARD INSTRUCTOR'S MANUAL

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FIRE GUARD
INSTRUCTOR'S MANUAL

OCD Publication 2017
JUNE 1943

FIRE GUARD UNIT
of the
AIR RAID WARDEN SERVICE
U. S. CITIZENS DEFENSE CORPS

Prepared by the Education Unit of the Fire Defense Section of the
United States Office of Civilian Defense

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, 1943

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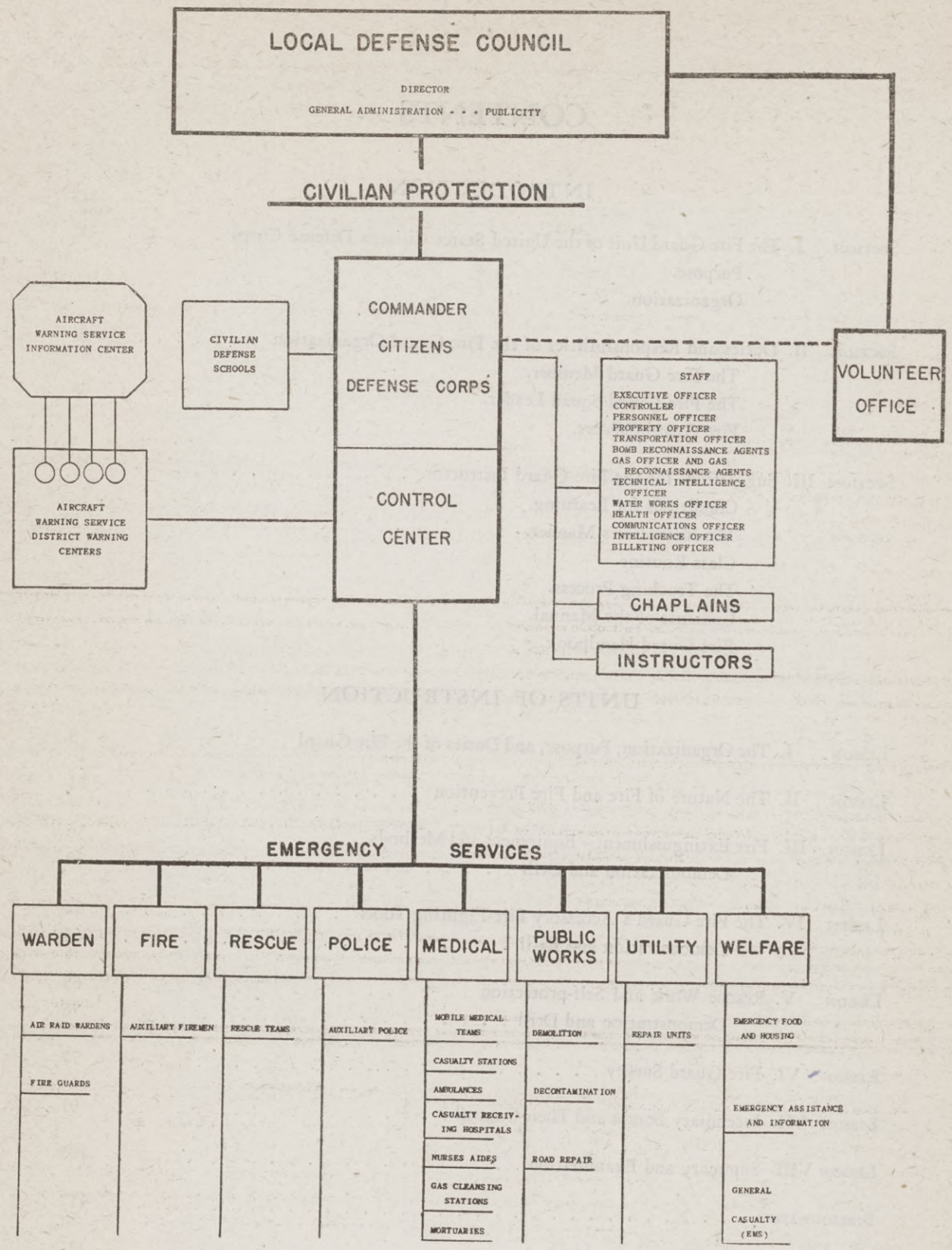
UNITS OF INSTRUCTION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SECTION I

The Fire Guard Unit of the United States Citizens Defense Corps

Purpose

Experience has shown that fire is the most destructive factor in an air raid. While high explosive bombs are responsible for the greater number of human casualties, the major destruction to structures, war plants, and residences is done by fire. Moreover, the number of fires started by incendiary bombs is many more than can be extinguished by the normal fire departments available.

In a total war any serious fire is an obstacle to the war effort. The destruction of a plant engaged in war production or any production upon which the civilian population is dependent, or the destruction of a large number of residences that afford shelter to war workers or civilians engaged in essential work, is not a temporary loss as in time of peace but is a permanent loss which cannot readily be replaced because of the shortage of critical materials, manufacturing facilities, and labor. In fact such a loss in wartime may be equivalent to the loss of a battle in its ultimate effect on military operations. Manifestly, it is important to have trained Fire Guards in each community that is playing an important role in the war effort, in order that destructive fires may be stopped promptly at their source and prevented from becoming conflagrations, whatever the causes of the fire.

To meet this need it was, therefore, decided to set up, within the Warden Service, Fire Guards especially trained in fire fighting. The Fire Watchers previously enrolled in the Citizens Defense Corps were amalgamated with the Fire Guards.

This manual is intended as a guide for the instructors who are to give the requisite training to the new Fire Guards. It is not intended nor expected that the contents of each lesson be given to each group verbatim. However, each instructor must be thoroughly familiar with the entire contents so that he may more intelligently present the required information. In order to perform their duties effectively and promptly, the Fire Guards should be equipped with the pump tank extinguishers loaned to each community, with stirrup pumps and such other portable hand equipment as can be purchased or improvised locally.

Organization

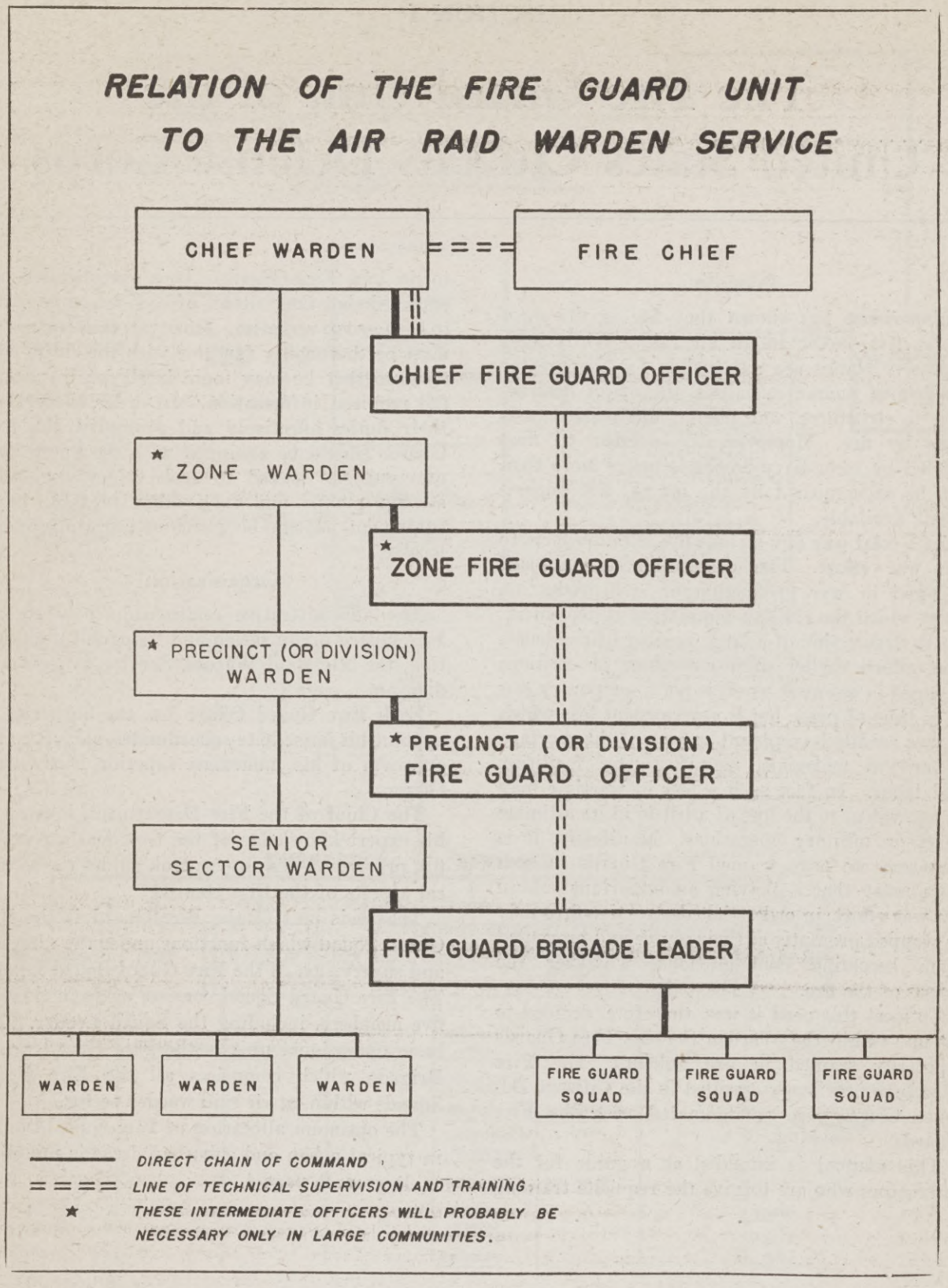
The administrative relationship between the Fire Guard organization and its parent organization, the Air Raid Warden Service, is shown in diagram 1, page 2.

Each Fire Guard Officer has the authority to appoint his immediate subordinates, subject to the approval of his immediate superior Fire Guard Officer.

The Chief of the Fire Department, because of his expert knowledge of the technical aspects of fire prevention and fire control, guides the technical aspects of the Fire Guard.

The basic unit of the Fire Guard is the Fire Guard Squad which functions under the direction and supervision of the Fire Guard Squad Leader. The Fire Guard Squad consists of from three to five members, including the Squad Leader. The basic operational unit is the Fire Guard Sector Brigade which comprises all the Fire Guard Squads within an air raid warden sector.

The optimum allocation of Fire Guard Squads in typical urban and suburban areas is presented in diagram 2, page 4.


RELATION OF THE FIRE GUARD UNIT
TO THE AIR RAID WARDEN SERVICE
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* ZONE FIRE GUARD OFFICER
* PRECINCT (OR DIVISION) WARDEN
* PRECINCT (OR DIVISION) FIRE GUARD OFFICER
SENIOR SECTOR WARDEN
FIRE GUARD BRIGADE LEADER
WARDEN
WARDEN
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FIRE GUARD SQUAD
FIRE GUARD SQUAD
FIRE GUARD SQUAD
DIRECT CHAIN OF COMMAND
LINE OF TECHNICAL SUPERVISION AND TRAINING
★ THESE INTERMEDIATE OFFICERS WILL PROBABLY BE NECESSARY ONLY IN LARGE COMMUNITIES.

DIAGRAM 1

SECTION II

Duties and Responsibilities of the Fire Guard Organization

The Fire Guard is a civilian organization, trained to perform the following functions:

1. To understand and evaluate fire hazardous conditions in local areas with respect to fire defense.
2. To use recommended fire defense equipment against fire and fire bombs.
3. To serve as a well-informed national service group for the prevention of fires of all types through public instruction in the local community.
4. To aid official and auxiliary fire fighting forces in the event of air attack.

The Fire Guard Member

The effectiveness of the Fire Guard organization in aiding in the defense of the Nation against fire, whether during air attack or other times, is fundamentally dependent upon the efficiency, cooperation, and seriousness with which the individual Fire Guard member learns, becomes skilled, and performs his assigned duties and responsibilities.

It is, therefore, of primary importance that the Fire Guard Instructor acquaint Fire Guard members, who have been enrolled and are taking the course of instruction, with program requirements and the duties and responsibilities which they will be expected to carry out when they are inducted as trained Fire Guards at the end of the course. These requirements are as follows:

1. To become skilled in—
(a) Observing the fall of fire bombs and locating the bombs;
(b) Recognizing and identifying the various types of fire bombs;
(c) Disposing of fire bombs;
(d) Extinguishing small fires started by fire bombs;
(e) Developing reserve water supplies;
(f) Operating and caring for fire defense equipment;
(g) Exercising personal safety precautions.
2. To become familiar with—
(a) Location of fire protection equipment and water supplies;
(b) Location of stairways, exits, telephones, etc.;
(c) Location and operation of fire alarm boxes;
(d) Location and nature of special fire hazards in the sector.
3. To become acquainted with—
(a) The principal home fire hazards;
(b) Methods of community fire hazard elimination;
(c) Techniques of securing the cooperation of home owners and building operators in the Fire Guard Defense Program.
4. To understand—
(a) The necessity for teamwork within and among Fire Guard Squads;
(b) The necessity for leadership in the Fire Guard Squad, as well as the prompt execution of commands;
(c) The need for continuous and regular service.

The Fire Guard Squad Leader

As leader of the basic functioning unit of the Fire Guard, the Fire Guard Squad Leader is a key person in the Fire Guard organization. Under his direction the essential functions of the Guard are performed. The interest, skill, and morale of Guard members are fundamentally dependent upon his ability to act as a leader, securing the confidence, cooperation, and the sustained efforts of those under his direction. He is the playing captain of the team, directing Fire Guard activities, but giving thorough consideration to suggestions and requests of Squad members.

The duties of the Fire Guard Squad Leader are as follows:

Normal Duties

1. To assist in recruiting Fire Guard members and to make replacements when necessary.
2. To issue equipment to his squad and to see that equipment is in good condition, properly marked and identified, and accessible to Fire Guards at all times.
3. To make duty assignments to his squad members and arrange squad "rallying points" preparatory for actions in emergencies.
4. To confer with the Air Raid Warden operating in his area for the purpose of properly correlating the activities of the two groups.
5. To conduct regular squad maneuvers and practice drills preparatory for emergency action.
6. To plan and direct survey and fire prevention activities to be carried on in the squad area.
7. To report to his Brigade Leader on fire hazards in the squad area, all squad activities and plans, the nature of community cooperation, status of squad personnel and equipment, etc.
8. To keep a record of names and addresses of Fire Guards in his squad.
9. To check available supplies of static water and see that they are properly maintained.
10. To maintain a duty log.

Operational Duties

1. To mobilize his squad at "rallying points," secure equipment, and make ready for immediate action.
2. To determine, upon arrival at the scene of a fire or location of a fire bomb, the safest and most efficient method of attack.
3. To take his place with squad members in operating equipment for the control of fire bombs and the extinguishment of fire.
4. To keep his Brigade Leader informed of progress in his squad area and to summon assistance when necessary.

Post Raid Duties

1. To check his squad's equipment and see that it is put away in good condition.
2. To report in detail the actions of his squad during an emergency, together with suggestions for greater squad efficiency.

Fire Guard Officers

Duties and responsibilities of Fire Guard Brigade Leaders and staff officers attached to each level of the Warden Service are discussed in the Fire Guard Leader's Handbook.

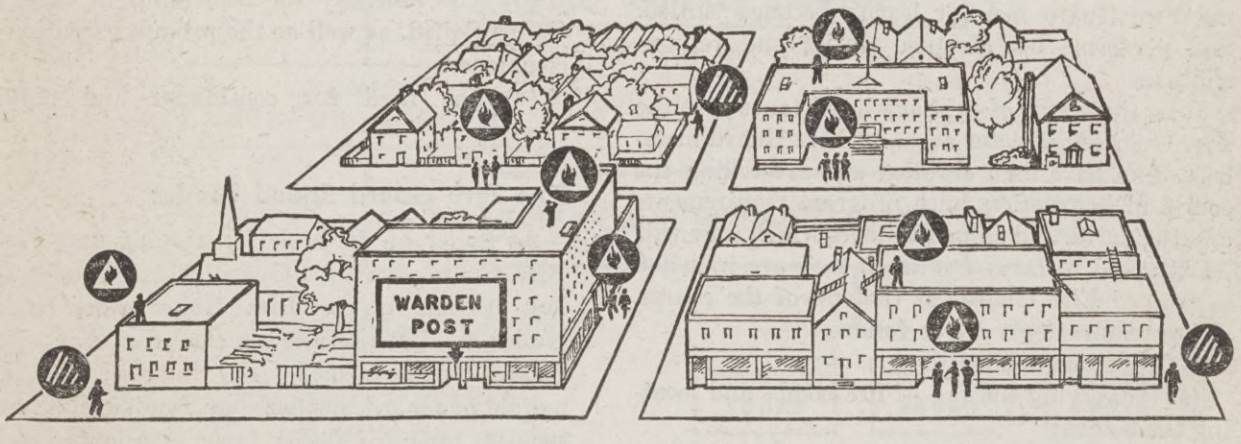

DIAGRAM 2

SECTION III

Suggestions for the Fire Guard Instructor

The success of any training program depends to a great extent upon the skill of the instructor. The training of Fire Guard is not different in this respect.

Many classes of Fire Guards will be taught by persons who have had no previous training for teaching. Others will be taught by professional teachers who have had little or no prior acquaintance with the subject matter. In both cases, intelligence and effort applied to the problem will result in satisfactory, even excellent, performance. There is no substitute for hard work on the part of the instructor.

Conditions for Learning

The environment in which the class is conducted should be conducive to effective instruction. The room to be used by the Fire Guard class should be conveniently located for the majority of the members. It should be well lighted, heated, and properly ventilated.

The minimum physical equipment of the classroom should consist of the following:

1. A seat for each member of the class, where he can see and hear the instructor.
2. A desk or table for the instructor on which notes and reference materials may be kept and upon which fire defense equipment can be demonstrated.
3. A blackboard, with chalk and an eraser.
4. A slide film projector, a suitable projection screen, and a stand or table for the projector. Projectors for slide films can be found in practically every community. Arrangements to obtain one for use in your classes should be made with the local Civilian Defense officials. If an assistant operates the projector, some means of signaling to change the picture will be needed. This can be done by tapping the floor with a pointer or ruler, or with an electric signal device.

The ordinary school classroom or church Sunday-school room is quite satisfactory. Adequate and properly equipped classrooms should be insisted upon by the Fire Guard Instructor.

The Instructor's Manner

The demeanor of the instructor when he is before his class is of utmost importance to his success. His attitude must reflect courtesy, patience, and seriousness. He should not apologize for his shortcomings but should strive to eliminate them. The quickest way to make a group feel that it is wasting its time is for the instructor to announce, "*After all, I'm really not a teacher, but . . .*" When he confronts his class the Fire Guard Instructor *is* a teacher and should make every effort to become a good one.

The attitude of the class will follow the lead given by that of the instructor. His manner should be such that the class will respond readily and seriously. The class should feel at ease, but attention to the work at hand must at all times be maintained. In general, a class will appraise the worth of the course according to the value implied in the actions and manner of the teacher.

The instructor must never show irritation because a member of the class is slow to comprehend or is awkward in the performance of a skill. Above all, he must never become sarcastic or hold up for ridicule any member of the class.

The instructor's voice is his most important teaching medium. It is important that every member of the class hear every word he says. This does not mean that the instructor should shout. It does mean that he should take pains to pronounce his words clearly and distinctly. He should strive to make his voice pleasant and convincing, using whatever dramatic qualities it possesses to secure emphasis and variety. Practice in doing this will give excellent results.

In giving instructions or directions to his class the instructor must make sure that they are complete and clear. The instructor should remember that the class cannot hear him when his back is

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turned. It is better for him not to attempt to address the class when writing or drawing on the blackboard.

Writing or diagrams placed on the blackboard must be legible to the person sitting in the last row. The blackboard itself should be in a position so that it can be seen easily by all the students. Demonstrations should be conducted in plain view of the entire class.

Class Routine

Certain tasks of a routine nature in connection with teaching should be attended to before the class assembles so that no interruption of class proceedings will be necessary. The blackboard should be clean, chalk and eraser at hand, and drawings or outlines put on the blackboard in advance. Equipment and materials for demonstration should be unpacked and ready for use. Projectors should be connected and tested. Heat, lights, and ventilation should be adjusted before the class begins.

A definite procedure of taking and recording attendance should be announced at the first meeting of the class and a secretary appointed to keep the necessary records.

Classes should be started and ended promptly according to schedule. A short recess, dividing the class period, is recommended.

The Teaching Process

The most essential step in the teaching process is prior planning and preparation on the part of the instructor.

To assist those who will serve as instructors of Fire Guards, lesson plans have been developed, covering the entire course. At the beginning of each lesson is a statement of the objectives of that lesson. These should be studied intensively by the instructor. They are the results that must be achieved. At the conclusion of the course the instructor should satisfy himself that every student in the class knows the facts that have been presented, reflects the attitudes that have been sought, and possesses the skills that have been demonstrated and practiced.

The resourceful teacher has at his command a variety of ways in which he can present the lesson and achieve his objectives. Underlying and guiding his actions at all times are certain principles of good teaching. The suggestions listed below should be studied by the instructor and every effort made to incorporate them in his teaching activities.

1. Go slowly enough to make certain that every member of the class comprehends the subject. Don't waste time belaboring an item that is already thoroughly understood.
2. Test comprehension occasionally by asking the class to cite illustrations drawn from their own experience.
3. Review related but previously covered material when the occasion justifies it.
4. Encourage members of the class to participate in discussions and demonstrations as much as possible, but do not allow one or two persons in the class to monopolize all of the time.
5. Stimulate the asking of questions by the class, but don't attempt to answer those that go beyond your knowledge. If uncertain, say, "*I don't know, but will find out.*" Secure the information and report it at the next meeting.
6. Make your teaching concrete and meaningful by explaining general statements and conclusions in terms of local conditions and situations wherever this is possible.
7. Build student confidence by complimenting them on their performance. Make corrections in an offhand manner, viz., "*That's good, but see if you don't like this way better.*"
8. Seek to impress the students with the serious responsibility of the work for which they are preparing.
9. Be careful to explain the meaning of all uncommon words or technical phrases that might be misunderstood.

Contents of the Manual

This Manual is organized into eight lessons. OCD Regulations No. 3, Revised August 1943, prescribes 12 hours of training as a minimum prerequisite for membership in the Fire Guard Unit of the Citizens Defense Corps. This requirement is subject to certain exceptions and provisions for exemption set forth in detail in the Regulations referred to. At the option of the appropriate commander (subject to such regulations as the appropriate state authority may make), Lesson 4 may be omitted.

The content of the lesson is presented in lecture form, accompanied by slide film "stills." The pictorial material gives concrete and practical aid to the instructor.

The series of eight lessons is followed by a

bibliography of standard reference materials in the fire field and an index of the contents of the manual.

Each Fire Guard instructor should use, in addition to the Instructor's Manual, a slide film strip, containing the complete sequence of "stills." The explanations of the slide film sequence, numbered to correspond with the "still" numbers, have been integrated with the lesson content in the order of the "stills" on the film. It is essential that the instructor show no slides in advance of their respective explanations.

The majority of the lectures may be given word for word from the lessons. However, unless the instructor is skilled in reading effectively to an audience, he will probably get the material over with greater success if he thoroughly familiarizes himself with the lecture content in advance and presents it to the class in his own words.

Fire Guard Handbook

Each member of the class should have a copy of the Fire Guard Handbook. It is the only text the Fire Guard really needs, and it is integrated with the Instructor's Manual.

LESSON ONE—OUTLINE

The Organization, Purpose, and Duties of the Fire Guard

INTRODUCTION

1. A statement to future Fire Guards
2. Purpose of the Fire Guard
3. Need for training

A. INCREASED FIRE HAZARDS

1. War production
   (a) How fire delays production
   (b) Fire costs
      (1) Fire defense
      (2) Property losses
      (3) Life loss
      (4) Indirect losses
2. Sabotage and arson
3. Air raid attack
   (a) Fire most serious consequence of air attack
   (b) Fire Guards are specialists in fighting fire bombs and small fires

B. DEFENSES AGAINST FIRE

1. Fire prevention
2. Fire protection
3. Fire laws

B. DEFENSES AGAINST FIRE—Continued

4. Municipal fire departments
5. Private fire companies
6. Auxiliary firemen
7. The Fire Guard

SLIDE FILM SEQUENCE

C. THE FIRE GUARD

1. Organization
2. Coordinated with the Warden Service
3. Sequence of command
4. Post headquarters
5. Communications
6. Warden responsibilities

D. DUTIES OF FIRE GUARDS

1. General duties
2. Duties during air raids
3. Post raid duties

E. SUMMARY OF BASIC KNOWLEDGE AND SKILLS—SLIDE FILM SEQUENCE

CONCLUSION

LESSON ONE

The Organization, Purpose, and Duties of the Fire Guard

Objectives

At the conclusion of this lesson the student should:

1. Understand the purpose and functions of the Fire Guard.
2. Understand how the war has increased the danger of fire.
3. Know the extent of our usual fire losses.
4. Know the danger of air raid fires.
5. Realize the importance of civilian participation in fire defense.
6. Know how the Fire Guard is organized and its place in civilian defense.
7. Understand the duties of the Fire Guard members.

Place of Meeting and Equipment

This lesson will be conducted in the regular classroom. Equipment: Slide film strip and projector.

INTRODUCTION

1. A Statement to Future Fire Guards

You are future members of the Fire Guard. Your organization is essential to the successful conduct of the war on the home front. None in the whole organization of civilian defense will have greater responsibilities than you and your comrades.

You are volunteers. There is no compulsion of law upon you to become a Fire Guard, as there is in other warring nations. You are in this classroom not because you *have* to be here, but because you *want* to be here. In order to fit yourself for duty, you will have to acquire new knowledge. You will have to develop new skills to use the weapons that will be at your disposal for fighting fire. This means work for you and for me. It is important that you think of all these things now, for this is a serious business.

2. Purpose of the Fire Guard

(Refer to recent local fires)

War has made the fire problem vastly more serious. Any fire from any cause that results in the destruction of property or loss of human life weakens the strength of the war effort. And you know, if you read the newspapers, that there are serious fires every day.

War has also introduced the possibility of fire on a wholesale scale as the result of air raids. Whether or not we believe this country will be attacked from the air, we must be prepared for it.

In this situation, our ordinary means of fire protection are not adequate. The public fire department was never planned, equipped, or organized for such emergencies. A large number of trained men and women, deployed throughout the community, is needed to carry out measures of fire prevention and to protect all civilian facilities from fires that do occur. The Fire Guard was organized to help provide this protection.

3. Need for Training

It is obvious that you cannot go about your duties until you have mastered the elements of fire defense. In this course of instruction you will learn how to prevent fires, how to put out small fires, how to

help your neighbors safeguard their homes against fire, and how to cope with fire bombs and the fires they may start.

The course consists of about 16 hours of instruction and additional drill periods. At the end of the course you will be required to pass an examination, showing that you have acquired the special knowledge and skills that you must possess in order to perform your work effectively.

A. INCREASED FIRE HAZARDS

The reasons for the increased fire hazards can be briefly enumerated:

1. War Production

1. The increase in the number of industrial plants, storage, and transportation facilities. Some of these new plants are located in buildings that never were intended for the use to which they are being put; many have inadequate fire protection and are of unsuitable types of construction.

2. The strain of "around-the-clock" operation, putting men and machines to a severe test of endurance. When motors are overtaxed, they may become defective and more likely to start fires. When human being are overtaxed, they may let accidents occur that result in fires.

3. The employment of thousands of "green" workers who are unfamiliar with their jobs and with the safe practices that prevent fire.

4. The tendency in the emergency to permit make-shift measures and equipment. The pressure on employees and executives, to get the work out at any cost, can result in dangerous expedients.

5. Shortages affecting fire protection which may cause delays in installing fire extinguishers, sprinkler systems, fire doors, and other devices. Even priorities are of no avail in some cases in purchasing such equipment. Then, too, substitutes have replaced standard equipment in some lines.

(*a*) *How Fire Delays Production*

It will be helpful at this point for us to consider how fire delays production. In war plants, fire can destroy irreplaceable tools and machinery, bringing production to a halt. It can burn down the plant itself, requiring expensive reconstruction and delays while hard-to-get building material is obtained.

In one industrial fire—the largest in the history of the country—one-tenth of the reserve stock of crude rubber was destroyed. This was a critical material that cannot be replaced until synthetic rubber production hits its stride or until new rubber plantations, not in the hands of the enemy, can be developed.

A few months before Pearl Harbor, the largest petroleum refinery in the world, producing 100-octane aviation gasoline, was severely damaged by fire. A magnesium plant having one-third of the national production capacity was destroyed at about the same time. Lumber yards, grain elevators, warehouses, piers, and ships—all important to the war effort in one way or another—are destroyed by fire with alarming frequency.

In New York State there was a plant making abrasive products needed by many other industrials working on war contracts. Fire

leveled it, with a loss of about a million dollars. Due to the difficulty of obtaining destroyed machinery, it was months before the plant could be placed in production again.

The destruction of transportation facilities, such as ships, docks, railroad and air terminals, may also seriously impede the war effort. This is called a war of transport, and all facilities bearing upon the movement of troops and supplies must be protected against fire.

Even the loss of dwellings in fire is more serious today. In some sections of the country there are housing shortages, and the loss of even a few dwellings would make the situation more acute. Many items for civilian use are not now being produced, and the existing goods may be all that are available until after the war. When fire-damaged living facilities must be replaced, the Nation's stock piles are reduced by just that much. Even the labor required for reconstruction is a consideration, because it must be diverted from the war effort.

(*b*) *Fire Costs*

When people talk about fire costs, they usually mean direct fire *loss*, without regard to indirect losses; moreover, *cost* of fire defense is seldom considered.

(*1*) *Fire Defense*

On the side of the ledger representing the cost of fire defense are some of the following items:

1. The money spent for fire insurance premiums on practically every structure.

2. The cost of maintaining the fire department—salaries of firemen, maintenance of apparatus and equipment, maintenance of fire houses, depreciation of apparatus, liability and casualty insurance.

3. The cost to owners of private property for maintaining their own fire protection. For a householder, this may mean no more than the cost of a faucet adapter for garden hose; for the industrialist, it may involve the expense of maintaining a private fire company and considerable fire protection equipment.

4. Part of the community water supply system was installed and is maintained to furnish water for fighting fire. This cost must be added to the total.

But these costs are negligible when compared with our fire losses. The cost of defenses against fire are like preparedness against enemy attack. Preparedness may seem expensive, but it is cheap if it prevents attack.

Let's examine our fire losses, starting with the direct fire losses. In the United States, this averages about $300,000,000 a year. That's a figure derived from actual fire insurance claims and estimates. Property was damaged or destroyed, and it had to be replaced. The fact that owners were reimbursed for part of their loss by their fire insurance company does not make it less a loss; the money was supplied to the fire insurance company in the first place when the property owners paid their fire insurance premiums.

(*2*) *Property Losses*

The fire losses for the year preceding the war, 1941, were representative of normal years. The total was $325,000,000, distributed among the various occupancies as follows:

Public buildings, including government buildings, hospitals, institutions, schools, churches, theaters, places of assembly and amusement	$20,750,000
Dwellings, including hotels, boarding houses, rooming houses, apartments, and private residences	$94,500,000
Mercantiles, including office buildings, restaurants and taverns, barber and beauty shops, miscellaneous stores, and warehouses	$63,750,000
Manufacturing, including plants, mills, laundries, bakeries, cleaners, and miscellaneous establishments	$73,500,000
Miscellaneous, including barns, out-buildings, lumber yards, storage plants, garages, etc	$72,500,000

(The instructor should obtain corresponding figures for local losses from the Fire Chief)

Think now in terms of your personal life and your community. Last year the local fire loss was $_____, and this was distributed among the various occupancies as follows: (enumerate them). That was a direct loss, one that appears on the books and is part of the public record. There were, however, many indirect losses, and that's where fire really begins to be expensive.

(3) *Life Loss*

Every year in the United States, about ten thousand men, women, and children are killed by fire. More than half of these deaths occur in dwellings, and nearly 75 percent of these victims are women and children. How can we estimate the actual or potential value of those lives? Not only do the deaths represent an economic loss to the families of the victims, but there may be an untold loss in the benefits any of the victims might have brought to their communities and to the Nation. These are indirect losses.

(4) *Indirect Losses*

Every time a factory, store, or office burns, there are indirect losses. Employers lose profits, trade, good will, and, perhaps, use of the properties involved. Employees lose wages. The money lost by employer and employee is lost by their landlords, butchers, grocers, doctors, others. You see, fire insurance may protect an individual or a company, but it does not protect the community. And something more to keep in mind is the statistical fact that 43 percent of the business establishments that are badly damaged by fire never open their doors again.

If people are injured by fire accidents, the medical and hospital expenses must be charged to the indirect fire loss. Even a small burn can lay a man up and keep him from his job.

If, in any community, all these costs of fire could be totaled, the amount would be staggering.

2. Sabotage and Arson

The number of fires that have occurred as the result of sabotage during the months since Pearl Harbor is unknown. We do know, however, that attempts have been made to introduce enemy agents into the country, and it is quite likely that there are some at large today. In any event, sabotage must be guarded against in industrial plants, public utilities, and public services.

Fire is a favorite weapon of the saboteur, because there are many ways in which it can be made to appear accidental or may be started by a variety of innocent-appearing devices. Even in normal times,

arson is responsible for a number of fires every year. In wartime, there is little difference between the saboteur and the arsonist.

3. Air Raid Attack

For the duration of the war, as long as an enemy bomber can take to the air, air attack will be a menace to the United States. Distance is no barrier against the enemy. Military experts point out that it is possible now to build bombing planes capable of flying across the ocean and back. Existing bombers can make one-way flights from European bases, drop their bombs, land their planes, and surrender. Carrier based planes can raid this country at any time. The Jap raiders at Pearl Harbor were brought within striking distance by airplane carriers. Even submarines can be used as carriers.

Knowing that the enemy can attack us from the air, when and if he chooses, we must prepare to defend ourselves.

In 1940, when civilian defense was first brought into existence in the United States, narrow strips of coastal land were designated target areas. Today we know that raiding planes can strike anywhere. Some of our largest industrial and supply establishments are located far inland, and these establishments are just as likely to be sought out by enemy bombers as the large business, industrial, and shipping centers on the coasts. So we must be prepared everywhere.

(*a*) *Fire Most Serious Consequence of Air Attack*

The experience of bombed countries shows that fire is the most serious consequence of air attack. In England, before its present system of fire defense was perfected, between 80 and 90 percent of all damage in raids was caused by fire.

So potent a weapon has fire become that all belligerents are using more incendiary bombs—as compared to the number of high-explosive bombs—than they did at the outset of the war. They are using larger and more destructive fire bombs of various types, all designed to start fires that the civilian defenders cannot control.

In the early months of the war, England depended upon the average citizen to defend its cities from fire bombs. When the new bombs were introduced, however, it was soon apparent that untrained people could not cope with them. Fighting incendiary bombs and the fires they start has become a job for specialists, and, in the United States, you will be those specialists.

(*b*) *Fire Guards Are Specialists in Fighting Fire Bombs and Small Fires*

You will learn the fundamentals of fire fighting. You will learn to recognize the various types of fire bombs and how to cope with them. All this must be accomplished before you are ready for duty, and that is the aim of this course of training. If raids come, you will be on the first line of defense, spotting fire bombs as they fall, and fighting them and the fires they start with the aim of putting out the fires before they spread to dangerous proportions.

B. DEFENSES AGAINST FIRE

Now, let us see what our defenses are against the scourge of fire. When speaking in terms of principles, we refer to fire prevention and fire protection. In a general way, fire prevention is concerned with all action that can be taken to prevent fire from starting. Fire protection refers to all that can be done to protect lives and property

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after fire has started. These are terms we will use often during the coming weeks, so it will be helpful if we understand exactly what is meant by them at the very beginning of this course.

1. Fire Prevention

Fire prevention can include a number of actions. It is education, aimed at showing people how to order their homes and places of employment so that fire will not start. It is the careful blowing out of a match, before it is tossed away. It is the proper installation of an oil burner, so that equipment will not be a fire hazard. Remember, every action that aims at preventing the start of fire is fire prevention.

2. Fire Protection

Fire protection also covers many factors. It is the fire hydrant on the street corner which taps the water mains so the fire department can obtain water to fight fire. It is the automatic sprinkler system, the fire extinguisher on the wall, the ladder truck of the fire department. To repeat, everything that can be done to protect lives and property after fire starts is covered by the term fire protection.

3. Fire Laws

Measures of fire prevention and fire protection are, in most States, the subject of fire laws. These regulate many phases of our daily lives and the conditions under which we live. In many communities there are ordinances regulating such matters as building construction, electrical installations, and other factors in which fire is a consideration. Our very fire departments exist by reason of such laws and ordinances.

4. Municipal Fire Departments

The public fire department is, of course, the mainstay of fire protection. With its trained men, powerful pumping apparatus, and its variety of special tools, it bears the brunt of fighting fire.

In recent years, fire departments have taken on additional responsibilities. They have carried on programs of public education, aimed at making the public more aware of the fire danger.

There has been a great tendency in this country to shift responsibility for fire safety upon the public fire departments. This a particularly dangerous attitude today, because fire departments have not been able to build up their resources—either in manpower or equipment—to cope with the increased hazards and greater needs of the time for fire defense.

In several ways, public fire departments have been weakened. They have lost men to the armed forces. They cannot obtain new fire apparatus. A survey by the National Fire Protection Association a year or so ago revealed that the average age of the fire apparatus in service is 15 years. Shortages of rubber and other critical materials have resulted in the use of substandard substitutes in the manufacture of hose, couplings, and other fire-fighting tools.

5. Private Fire Companies

It is fundamental in fire protection that the sooner a fire is attacked, the more easily it can be put out. Therefore, many industrial plants, institutions, and commercial properties have private fire companies. The members of these companies, being on the scene, can go into action with a minimum of delay. Where private fire companies have been adequately trained and equipped, they have made splendid records. Since the start of the war, more and more

dependence has been placed in the private fire company, and more attention has been given to its organization, training, and equipment.

6. Auxiliary Firemen

The United States Office of Civilian Defense has set up two organizations to supplement existing fire-fighting facilities. One of these is the auxiliary fire service. In practically all communities, auxiliary firemen have been enrolled and trained. Generally, they function under the direction of the public fire department.

The equipment of the auxiliary firemen consists chiefly of pumping units, hose, and the usual fire-fighting tools of the professional fireman. The OCD has furnished a number of pumping units and accessory equipment to the auxiliary fire service in the so-called target areas. Many communities have purchased additional equipment. Trucks have been converted into fire wagons, and auxiliary fire stations have been provided for this branch of the Citizens Defense Corps.

7. The Fire Guard

Originally, the OCD organized the Fire Watchers to serve as bomb spotters and fighters of incendiary bombs. But it soon became apparent that the Fire Watchers were inadequate in number and not sufficiently trained to meet the requirements of the emergency. Therefore, the Fire Guard was organized, and the Fire Watchers were absorbed by this new unit in the Warden Service.

Slide Film Sequence

Now we are going to see in pictures some of the conditions that make the Fire Guard so necessary to civilian security.

1. This was the most destructive industrial fire in American history. It occurred on October 11, 1941, in the property of the Firestone Rubber and Latex Co., at Fall River, Mass. The damage was estimated at eleven million dollars, and about 14,000 tons of rubber were destroyed. This is the sort of destruction that seriously hampers the war effort.

2. Here is another fire that will go down in history because of the number of lives lost in it. About five hundred men and women, many of them members of the armed forces, were killed in this Boston night club on the night of November 28, 1942. Criminal negligence was charged against the proprietor of the establishment, and a spectacular trial was held.

3. This is what can happen when fire gets a start. Formerly the French Line steamer, Normandie, this ship was being converted into a troop transport when it caught fire at dock in New York harbor. As a result, months of valuable service were lost. This giant ship might have carried thousands of soldiers to Africa, the South Pacific, and other battlefronts.

4. Any fire destroys facilities that are badly needed on the home front. This dwelling fire consumed materials that cannot be easily replaced. The prevention of such fires is one of the aims of the Fire Guard organization.

5. This was Pearl Harbor on the seventh day of December 1941. Jap

planes, carrier based, struck without warning at this naval base and destroyed or crippled badly needed war ships. The same thing can happen almost anywhere in the United States.

6. Modern war aims at knocking out civilian facilities as well as military installations. London was brutally bombed night after night, yet it survived, because its civilian population was prepared. We, too, must be ready if the invaders ever come.

7. Industrial plants where the machines of war are being produced will be bombed, if this country is attacked from the air. Elaborate preparations have been made to protect plants such as this.

8. You know from the newspapers, radio reports, and newsreels that we are bombing cities in Germany and Italy. The enemy can do the same to us.

9. This is one of the types of bombs used to rain fire from the skies. It has an explosive charge in the head to keep firefighters from approaching the bomb until it has started a fire.

10. This is one of the jobs you are preparing for. But equally important is the defense against other fires that may slow down or halt some part of the war effort.

DISCUSSION PERIOD
(Limit—15 minutes)

The following questions may be used to stimulate class discussion.

How has war made the fire problem more serious?

What are some of the reasons for the increase of fire hazards?

How does fire interfere with production?

What are the average annual fire losses?

What are some of the items that should be included in the total fire losses?

Why must we be prepared for air raid fires?

What are some of the reasons for increasing our defenses against fires from any cause?

Other questions will, of course, occur to the instructor, and it is desirable to encourage questions from the class.

INTERMISSION—5 minutes

C. THE FIRE GUARD

1. Organization

Fire Guards may function in residential neighborhoods. Or they may serve in factories, shops, office buildings, and other occupancies, either to supplement existing fire companies, or as the only fire defense body.

The basic unit of the Fire Guard is a squad of three to five persons, of whom one is the Squad Leader. Squads will be deployed according to the needs of a neighborhood. Each residential block or comparable area will be served by one or more squads. A large apartment house or an office building may require the services of several squads, perhaps one to a floor.

All the squads within an Air Raid Warden Sector will comprise a Fire Guard Sector Brigade, under the direction of a Sector Brigade Leader.

In addition to the squads under his command, the Brigade Leader

may have at his disposal one or more mobile squads, equipped with a cart or truck on which fire-fighting weapons are kept ready for action.

2. Coordinated with the Warden Service

At each level of the Air Raid Warden Service in the community, a Fire Guard officer will be appointed to work as a staff officer under the warden in charge. The titles of the Fire Guard officers will parallel those of the officers of the Warden Service. Example—Zone Fire Guard Officer.

3. Sequence of Command

Down to the sector, the chain of command in the Fire Guard unit will work through the Warden Service. Each Fire Guard officer will issue commands to the group of Fire Guard officers next below him through the Air Raid Warden to whose staff he is attached.

Within the sector, however, the Senior Warden will contact the Sector Brigade Leader directly, and the Brigade Leader in turn will go directly to the Squad Leaders.

4. Post Headquarters

In each sector of the Warden Service there is a Sector Post, the operational headquarters for most of the action groups in that area. When alerts sound, the Post becomes the assembly point for wardens, messengers, and the Brigade Leader. At the Post, records of the Fire Guard service will be filed, along with maps and other information.

5. Communications

The Post is the communications center for the Fire Guard Brigade. However, in calling for assistance from the Fire Department, Fire Guards will use the means of communication that have been decided to be most expedient locally. Reports of fire incidents, air raid damage, damaged equipment, etc., will be made to the Sector Warden through the Brigade Leader.

6. Warden Responsibilities

The Warden Service assumes the responsibility for furnishing all communication, administrative, clerical, and recruitment facilities for the Fire Guard. The Fire Guard assumes the responsibility for technical activities in connection with training, duty assignments, and "first aid" fire-fighting activities.

D. DUTIES OF FIRE GUARDS

1. General Duties

The duties of Fire Guards will depend, of course, upon their assignments. In general, these duties will include the following:

(1) The preparation for fire protection through—

(a) The mobilization and location of fire-fighting equipment, such as extinguishers, garden hose, and water supplies;

(b) The survey of buildings, in order to become acquainted with building layouts and with the locations of stairways, hallways, exit and access doors, etc., which will permit rapid squad movement and location of fires or fire bombs;

(c) The inspection of buildings, where occupants will permit, for the purpose of locating special fire hazards.

(2) The development of knowledge and skills of residents, as well as their cooperation in fire prevention and control, through—

(a) The identification of common fire hazards in dwellings and other buildings, with suggestions for their removal;

(b) Aid in the establishment of fire-safety procedures;

(c) Instructions to residents on how to protect themselves in the event of fire, how to operate first-aid fire-fighting equipment, and how to extinguish small fires effectively.

(3) The establishment of lookout posts for observing the fall of fire bombs and the routine inspection of these posts.

(4) The establishment of Fire Guard "equipment and assembly points," and the routine inspection and conditioning of equipment located at these points.

(5) Participation in regular squad drills for the purpose of developing fire-fighting skills and squad teamwork.

(6) The survey of outside areas of the sector for the purpose of locating and understanding the operation of all fire alarm boxes, and the location of special fire hazards in the community, such as gasoline stations, oil and gas storage tanks, etc.

2. Duties During Air Raids

When the alert sounds, the emergency duties and activities of the Fire Guards begin. They proceed to prearranged assembly points. Guards assigned to lookout duty go to their respective lookout posts. If the lookout posts are designed for observation only, one guard will cover the post. If the lookout posts are located on top of buildings with large roof areas, one or more guards are assigned for lookout duty. These guards will not only observe and report the fall of bombs in the neighborhood, but will also combat those bombs that fall within their reach. Other squads will work from the street, taking protected positions until they are needed for action. Mobile squads will stand ready with their equipment to rush to the scene of a fire incident where they may be needed. If fires progress beyond the control of Fire Guards, auxiliary firemen or the public fire department must be called to the sector. The Fire Guards must be ready to guide them to the scene of the emergency, to inform them as to the locations of stairways, exits, and of any special hazards involved, and also to offer aid in fighting the fire.

(The exact method, channels and time for summoning aid locally should be explained by the instructor at this point.)

3. Post Raid Duties

When the "all clear" sounds after a raid, the Fire Guards, through their Squad Leaders, must report to the Brigade Leader all fire incidents that have occurred in the sector. If fire-fighting equipment has been damaged so that it must be replaced, reports must be made to the Brigade Leader accordingly. All squad reports will be made by the Squad Leader, but he will need the advice of the other squad members to complete them.

As soon as possible after a raid, all equipment should be returned to the locations reserved for it. Each piece of equipment should be inspected to make certain it is in good working order. Any repairs to the equipment that are needed should be made without delay and, if possible, by the members of the squad. Water supplies must be replenished. Garden hose or other small hose used during the raid must be uncoupled, coiled, and restored to its proper place. In brief, the guard's equipment must be put back in readiness as quickly as possible after a raid, so that, if enemy planes come over again, the action warning will find Fire Guards again ready for action.

E. SUMMARY OF BASIC KNOWLEDGE AND SKILLS

We have covered very briefly, in this discussion, some of the things the Fire Guard must know for the services and duties he will be expected to perform. Let us review them in a little greater detail now, with the help of some pictures.

Slide Film Sequence

11. The Fire Guard will know how to help his neighbors prepare their homes for air raids, and in this way he will learn what facilities there are in each building for fighting fires.

12. He will help his neighbors eliminate many fire hazards, thereby reducing the chances for fire to spread during an air raid and, at the same time, making homes safer places in which to live in normal times.

13. He will show his neighbors how to use equipment and what to do in case of fire.

14. The Fire Guard must see to it that fire-fighting equipment is ready for action. He will inspect all fire extinguishers and other equipment to make certain that they are in good working condition.

15. Water is the best agent for fighting fire bombs; therefore, reserve supplies must be available in quantity and at many points during raids. Fire Guards prepare and place such supplies and make routine checks to see that adequate water is available for immediate use at specific points.

16. These are some of the tools that the Fire Guard will use. He makes certain that they are kept at assembly points and are always ready and available for immediate use.

17. In order to apply the knowledge he has gained and the skills he has acquired, the Fire Guard must know the layout of the properties in the area assigned to him. He must know the locations of equipment. He must become familiar with the locations of stairways, and means of exit and access to various portions of each building. He must know where fire alarm boxes are located. He should also be acquainted with the type and nature of special hazards in his assigned area.

18. Fire Guards will recognize the different classes of fire and know how to put them out.

19. There is more to fighting fire than throwing water on it. Fire Guards will know how to approach a fire area, where to look for concealed fire, and what to do in order to prevent an extinguished fire from re-igniting.

20. Since Fire Guards will be among the first on the scene of a bombing incident in which fire is involved, they must know how to rescue people from wrecked and burning buildings. Other methods of rescue will be presented and practiced in a subsequent lesson.

21. Some Fire Guards will man lookout posts to observe the fall of incendiary bombs or the outbreak of fire during raids. Each must know how to summon aid to fight the bombs or fire he cannot reach himself.

22. Fire Guards will be able to recognize the different types of incendiary bombs and know how to combat them effectively.

23. Because Fire Guards work in the open, they may be exposed to war gases. They must know how to protect themselves against war gases.

CONCLUSION

In this lesson, an effort has been made to give you, as prospective Fire Guards, considerable background information, so that you will appreciate the need for civilian defense and the importance of fire protection. The organization and functions of the Fire Guard have been described; the Fire Guard's regular duties have been presented; and you now understand, in a general way, the nature of the work that lies ahead.

The Fire Guard Handbook

You have been given a booklet, entitled "The Fire Guard Handbook." It contains the list of your specific duties and much of the information you will need for the protection of your community and the country against destructive fire. All of this information is presented in such manner that you can refer to specific points and materials rapidly and with ease.

The American people have always been noted for their "know how" ability. It is this "know how" that makes possible the transformation of civilians into soldiers, sailors, and marines in a matter of a few months. It is this "know how" in factories and mills that has been, and is, establishing new production records. When and if air attacks come, it will be the "know how" of Fire Guards that will protect our communities from destructive fires.

DISCUSSION PERIOD

(To end of class)

The following questions can be asked of members of the class for the purpose of stimulating additional questions and classroom discussion:

What is the relationship between the Fire Guard and the Warden Service?

Describe the sequence of command from the Chief Fire Guard Officer down to the Fire Guard Squad members.

How many persons comprise a Fire Guard Squad?

Who are the officers in a Fire Guard Brigade?

What are the mutual responsibilities of Wardens and Fire Guards?

Where is the sector headquarters for the Fire Guard Brigade?

What are the pre-raid duties of Fire Guards?

What are the principal duties of Fire Guards during raids?

What are the duties of Fire Guards after a raid?

Why must fire protection equipment be restored to service immediately after a raid?

LESSON TWO—OUTLINE

The Nature of Fire and Fire Prevention

A. Nature of Fire

1. Combustion
2. Factors in combustion
   (a) Combustible materials
      (1) Fire resistance
   (b) Oxygen
   (c) Sources of heat
3. Oxidation and heat
4. Demonstration of combustion
5. Spontaneous ignition
6. Results of combustion
   (a) Flame
   (b) Heat
   (c) Smoke
   (d) Gases
   (e) Oxygen reduction

B. How Fire Starts (sources of heat)

1. Open flames
2. Electric sparks
3. Other sources of heat

C. How Fire Spreads (heat transfer)

1. Conduction
2. Convection
3. Radiation

D. Causes of Fire

E. Fire Prevention Related to Most Common Causes

1. Careless smoking and use of matches
2. Electric wiring and equipment
   (a) Arcing
   (b) Sparking
   (c) Overheating
      (1) Overcurrent protection
   (d) Flexible cords
   (e) Other danger points
3. Sparks on roofs
4. Defective or overheated chimneys and flues
5. Defective or overheated heating equipment
6. Lightning
7. Flammable liquids
8. Rubbish
9. Open lights, flames, and sparks
10. Lamps and stoves

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LESSON TWO

The Nature of Fire and Fire Prevention

Objectives

At the conclusion of this lesson the student should—

1. Understand the principles underlying combustion.
2. Understand the underlying principles of the spread of fire.
3. Be familiar with the common causes of fire.
4. Understand the essentials of fire prevention.
5. Be able to identify common fire hazards and make suggestions for their removal.

Place of Meeting and Equipment

This lesson will be conducted in the regular classroom. Equipment: Slide film projector, slide film strip, and several stick matches.

A. THE NATURE OF FIRE

This lesson is concerned with the nature of fire and fire prevention. If you are to control fire, you must know what it is. You must know how fire starts, how it spreads, and how to put it out. You must be able to recognize the conditions in homes and places of employment that encourage the start of fire, in order that these conditions may be eliminated and fire prevented.

It was only a hundred and fifty years ago that scientists learned what fire is. In ancient times, fire was thought to be an element. We know now that fire is really a chemical process.

1. Combustion

Fire is the process by which the oxygen in the air combines with a combustible substance in the presence of heat. Therefore, three factors are necessary to produce fire:

1. A substance that will burn.
2. Sufficient oxygen.
3. A source of heat.

2. Factors in Combustion

(*a*) *Combustible Materials*

Practically all substances will burn under proper circumstances. We all know, or have observed, however, how some materials take fire more easily than others. Wood and paper can be set afire easily, but iron will not burn except under extraordinary conditions. Finely divided material burns more quickly than solid pieces of the same material. We all know that, when we start a fire, we use small pieces of kindling wood rather than large, solid pieces.

(*1*) *Fire Resistance*

Actually nothing is proof against destruction by fire. This is important to remember in connection with the term "fireproof." Under certain conditions, fire can destroy anything. A more accurate term is "fire-resistant," some materials having greater resistance to fire than others. Fire protection engineers deal in terms of relative fire-resistance, considering the greater or lesser time that materials will withstand the heat of fire before they fall away before it.

Modern fire-resistant buildings of concrete, masonry, and steel afford a high degree of protection against fire. These materials are noncombustible in the ordinary sense, but even so a severe fire can damage them.

Iron and steel, ordinarily regarded as non-combustible, can be burned by the welder's torch. The welder combines oxygen and acetylene to produce a flame that cuts through iron or steel like a hot knife slices through butter.

(*b*) *Oxygen*

Generally, if there is less than 16 percent of oxygen in the air, the chemical process will not take place regardless of the other two factors necessary to produce fire—a combustible material and a source of heat. There are exceptions to this rule, however.

Celluloid and thermit will burn even in a vacuum. They release oxygen in the process of combustion that is sufficient to feed the fire. The magnesium fire bomb, in which Fire Guards have a special interest, burns more intensely when water is applied to it. The water actually supplies the oxygen to feed the flames.

(*c*) *Sources of Heat*

The heat must be sufficient to raise the temperature of the combustible material to a point at which it will ignite, spoken of as its "kindling temperature." This temperature varies with different materials. Tests have shown that the kindling temperature of various kinds of wood ranges from 469° to 514° F., magnesium starts to burn at 954° F., and newsprint paper has a kindling point of 363° F.

There are many possible sources of heat—an open flame, friction, a spark of electricity, lightning, etc.

3. Oxidation and Heat

The start of the chemical process known as fire is termed "ignition," and its continuation is known as "combustion." Combustion is sometimes called "rapid oxidation." When materials combine with oxygen with insufficient heat to produce fire, the process is spoken of as "slow oxidation." Slow oxidation occurs continuously with many materials under ordinary conditions. Anything that decomposes suffers oxidation, although it may never become hot enough to ignite. A common example of slow oxidation is rusting iron.

The chemical process of combustion, or rapid oxidation, produces heat, and this heat in turn speeds up the process. Unless the heat is carried away faster than it is produced, the oxygen eliminated, or the combustible substance removed, consumed, or cooled below its kindling temperature, the temperature of the burning material will continue to rise and combustion will continue more and more rapidly.

4. Demonstration of Combustion

The ordinary wooden match provides a good illustration of the elementary principles of combustion. The head of the match contains certain chemicals which take fire easily when heated. It also contains particles of ground flint which create heat by friction when the match is struck and the process of combustion is started.

The head of the match is consumed in quick, violent reaction which produces sufficient heat to ignite the wood of the match stick. If the stick is held head upward, the combustion proceeds slowly because the heat rises, away from the wood. If the match stick is held head downward, the heat is transferred to the wood, increasing its temperature and speeding up the process of combustion.

When the match is blown out, the current of air carries the heat away so quickly that the wood is cooled below its kindling point and the fire goes out. If the match is dipped into water while burn-

ing, oxygen is immediately excluded from the fire, and that alone is enough to put it out. But water also lowers the temperature of the wood below its kindling point, and that, too, puts out the fire.

5. Spontaneous Ignition

When heating occurs as the result of a chemical reaction rather than from an outside source, such as a flame or spark, it is spoken of as being "spontaneous." If the heat raises the temperature of combustible material to its kindling point and ignition occurs, the process is termed "spontaneous ignition."

Some materials with an unusual affinity for oxygen combine quickly with the oxygen in the air. Among the most common of these materials are certain vegetable oils and animal oils. It is the process of oxidation that produces the spontaneous heating. However, spontaneous ignition can occur only under favorable conditions. There must be sufficient air present to supply the necessary oxygen, but ventilation must be so restricted that the heat is not carried away from the combustible material.

Oil mops, polishing cloths, paint-soaked rags, especially when piled in closets or perhaps covered with other materials, can be ignited spontaneously. If the material is finely divided, as cotton waste, the process may proceed more rapidly.

6. Results of Combustion

The process of combustion produces flame, heat, smoke, and gases. Also, because combustion uses up oxygen, it produces a condition of equal concern to the Fire Guard—the reduction of the oxygen content of the air.

(*a*) *Flame*

Combustible or flammable materials, when burning, do not combine directly with the oxygen of the air, but are first transformed by the heat of the process into a mixture of vapors and gases. Some of the vapors and gases are flammable, and they burn, producing flame. The color of the flame depends usually upon the nature of the gases and vapors from the burning material. Some of the gases and vapors are not flammable, and they pass into the air and become part of the atmosphere.

(*b*) *Heat*

Heat increases in intensity as fire continues to burn. In a few minutes any fire can generate super-heated air to temperatures of more than 1,000° F. This super-heated air will raise the temperature of combustible materials with which it comes in contact, and, when the kindling temperature is reached, the materials will break into flames. The super-heated air is extremely dangerous to breathe by those fighting fire. It is, therefore, of greatest importance to put out fires while they are still small and before such high temperatures are reached.

(*c*) *Smoke*

Smoke is the result of incomplete combustion. It is made up of the small particles of the burning material that are not consumed by the flames. These particles escape into the surrounding air and are visible as smoke. You have observed that, when heavy oil burns, it produces a very black and dense smoke. This is because a large quantity of carbon particles, or soot, is produced by the fires. The flames from a gas range burner give off small quantities of smoke

because the gas is almost entirely consumed. The same is true of a good wax candle and of properly trimmed and adjusted oil lamps or lanterns.

(d) Gases

The nature of the gases released during the burning process depends upon the material that is burning. The flammable gases, if combustion is fairly complete, will be consumed in the flames, or their chemical composition will be changed. If combustion is not complete, some of the flammable gases will escape into the air without being consumed or transformed.

Some of these gases are heavier than air and tend to settle to the floor. Others are lighter than air and rise to the ceiling.

Many of the gases from burning materials are toxic. Laboratory tests have shown that carbon monoxide, hydrogen sulphide, sulphur dioxide, nitrous fumes, and hydrocyanic acid may be produced by fire. The breathing of these gases results in what is commonly known as "smoke poisoning." However, if a fire is extinguished when it is small, there is not likely to be much danger from "smoke poisoning."

(e) Oxygen Reduction

Fire consumes oxygen, taking it from the air. The normal oxygen content of the air is 21 percent. If this percentage is reduced to 15 or 16 percent, the air will sustain life as long as the person exposed to it does not move about vigorously. But when the oxygen content of the air is reduced to 10 percent or lower, human life will cease in a matter of minutes. In an enclosed or insufficiently ventilated space, the oxygen content of the air may very quickly be reduced to a dangerous point. In fighting fires, the Fire Guard will encounter atmospheres containing smoke and fire gases, superheated air, and even a deficiency of oxygen. It will therefore be important for him to know how to fight fire with as little risk as possible, and we will cover this when we discuss fire fighting.

B. HOW FIRE STARTS (Sources of Heat)

As discussed earlier in this lesson, a necessary factor for the start of fire is a source of heat. If we understand what these sources are, we can plan to eliminate or control them in such a way as to prevent fires from starting.

1. Open Flames

The most common source of heat is the open flame. Matches, hot coals, candles, lamps, fireplaces, stoves, furnaces, gas jets—we are surrounded by open flames day and night.

Some idea of the frequency with which open flames occur can be gained from the use of matches. Each year more than three hundred billion matches are used in this country. This is at the average rate of about 600,000 every minute of the day and night throughout the year. It is small wonder that matches in their use for smoking, housekeeping, etc., and in the hands of children and careless persons account for about 150,000 fires each year, representing a property damage of more than $23,000,000.

2. Electric Sparks

Another common source of heat is the electric spark produced by arcing, of which a short circuit is a good example. When electricity

is improperly used, it becomes a serious cause of fire. The hot sparks ignite insulation of wires or nearby combustible material.

3. Other Sources of Heat

We have mentioned some of the other sources of heat—friction, spontaneous ignition, lightning, sunlight, etc. When you consider that each of them can provide a starting point for fire, the fire hazard will be more thoroughly understood.

C. HOW FIRE SPREADS (Heat Transfer)

Heat is transferred from one material to another in three ways, by (1) conduction, (2) convection, and (3) radiation. When transferred heat raises the temperature of a combustible material to its kindling point, it will produce fire. Thus, fire spreads from its point of origin, making big fires out of little ones.

1. Conduction

The dictionary says that conduction is the transmission of heat through or by means of a conductor. For our purposes, a conductor is any substance, connecting two other substances, through which heat can pass. It is obvious that some substances are better conductors than others.

A good example of how heat can be spread by conduction is a sheet metal smoke pipe that comes in contact with a joist or the woodwork of a partition. The sheet metal is a good conductor of heat, permitting the transfer of the heat in the smoke pipe to the wood with which the pipe is in contact. If the smoke pipe becomes hot enough to produce a kindling temperature that is transferred to the wood, fire will result. We can easily interrupt the flow of heat through the conducting smoke pipe to the wood by placing a sheet of asbestos between them, asbestos being a poor conductor.

Most metals are good conductors of heat. This is something to keep in mind when you are looking for fire hazards. Where you find stoves, furnaces, and pipes placed in contact with woodwork, without any insulating material to prevent the conduction of heat, there will be a point of danger.

2. Convection

Again consulting the dictionary, we find that convection is the transmission of heat by means of currents in liquids or gases resulting from changes of temperature and other causes. This is just another way of saying that drafts spread fire.

If you build a bonfire in an open field, where there is plenty of air, you will see that the smoke and flame rise upward. The fire generates its own drafts, drawing in cool air at its base, heating the air so that it becomes lighter than the surrounding atmosphere, and the heated air rises naturally above the cool air. This movement of air provides the current by which heat is transmitted from the fire to the air some distance above it.

When a fire is built in a fireplace, this same movement of air occurs, the heat and smoke being drawn up the chimney. We speak of this as the draft, which gives the fire fresh air and controls the escape of hot air and the other products of combustion. If the draft is strong, the fire burns vigorously; if the draft is weak, the fire burns slowly.

It is common for firemen to find, upon entering a burning building, that a fire on a lower floor has caused superheated air to rise through stairways, unprotected wall openings, etc., and form concentrations on upper floors or in attics. The concentrations of superheated air raise the temperatures of combustible materials to their kindling point and they burst into flame. The transfer of heat by convection accounts for the frequent occurrence of simultaneous fires in the basement or on a lower floor and in the attic of a house, with no apparent connection between them.

3. Radiation

When heat is diffused in the form of heat waves, the process of heat transfer is called radiation. This process is given practical use in many ways to heat buildings. The common electric heater is a good example. It consists of a heating element and a reflecting surface. When the heater is connected and the heating element becomes hot, the heat waves spread out and literally bounce off the sides of the reflector. The reflector sends this radiated heat in a beam very like the beam of a flashlight or searchlight.

If the beam of heat from an electric heater is directed toward some readily combustible material, the heat can easily raise the temperature of the material to its kindling temperature and start a fire. Many fires occur from this very cause.

However, the heat does not have to be radiated in a beam. It may be diffused, as by the radiator which heats a room.

The heat radiated from a burning building may be so great as to ignite other buildings as far as 500 feet away. In some of our large conflagrations of the past, the hot blast of heat traveling ahead of the fire has ignited combustible materials over 1,000 feet away.

DISCUSSION PERIOD
(Limit—15 minutes)

The following questions may be asked to stimulate class discussion:

What is fire?

What factors are necessary to produce fire?

What is rapid oxidation? Slow oxidation?

What is flame? Spontaneous ignition?

What are the products of combustion?

What is smoke? What produces heat?

Why are fire atmospheres dangerous to breathe?

Why is oxygen reduction dangerous?

What are the principal sources of heat that start fires?

Give examples of open flames that might start fires; of friction; of electricity; of chemical reactions.

How does fire spread by conduction? By convection? By radiation?

INTERMISSION—5 minutes

D. CAUSES OF FIRE

Specialists in fire safety speak of *common* fire hazards and *special* fire hazards, and, between them, these phrases cover all the causes of fire. To avoid confusion, we will use those terms here, giving them their special meanings.

Common hazards are those that may exist in any occupancy—careless smoking, defective electrical installations and equipment, defective heating plants, poor housekeeping, and so on down the list.

Special hazards are those existing by reason of the particular uses to which a building is put. Industrial plants have many special fire hazards as the result of the operations conducted in them.

In this course we cannot discuss special fire hazards in detail. There is not time enough. Nor is it necessary for all Fire Guards to know about all hazards. If you are assigned to areas where there are special hazards, you will, of course, have to learn about them. But it is most important to learn about the common fire hazards that cause the great majority of fires. You must be able to recognize them and to take the proper steps for their correction.

The 10 most common fire causes in 1941 are listed below:

Cause	*Number of fires*	*Losses*
1. Careless smoking and use of matches	147,000	$20,200,000
2. Electrical wiring and equipment	77,000	25,600,000
3. Sparks on roofs	60,000	9,500,000
4. Defective or overheated chimneys and flues	50,000	11,400,000
5. Defective or overheated heating equipment	46,000	14,250,000
6. Lightning	40,000	9,500,000
7. Flammable liquids	24,000	9,100,000
8. Rubbish	23,000	1,600,000
9. Open lights, flames, sparks	22,000	11,500,000
10. Lamps and stoves	20,000	6,000,000
	285,000	$118,650,000

The total number of fires from all causes in 1941 was 736,000, and the total financial loss was $325,000,000. You will understand the serious nature of the above fire causes when you understand that they accounted for 38 percent of all the fires and 36 percent of the financial loss.

From this list we can see that some of the fire causes exist by reason of faulty human behavior. Others exist as the result of defective equipment. Still others result from occurrences beyond control.

In the categories headed by human behavior and defective equipment, it is not always possible nor wise to charge up fire causes to one or the other. In a broad sense, all fire hazards are the result of faulty human behavior—carelessness. In an equally broad sense, there is only one means of correcting carelessness, and that is by processes of education. In approaching this conclusion, we come to the subject of fire prevention.

E. FIRE PREVENTION RELATED TO MOST COMMON CAUSES

As we said in the first lesson of this course, fire prevention consists of all the action taken to prevent fire from starting. In a general way these actions consist of (a) educating people to observe measures of fire prevention, (b) discovering and recognizing fire hazards, (c) eliminating or correcting the hazards so the element of danger no longer exists.

When you are invited to go into people's homes or other occupancies and inspect these places, point out hazards to the occupants, and suggest how they can be eliminated, you are carrying out the functions of education, inspection, and correction.

Your success will depend upon two chief factors, (1) your knowledge of fire prevention, and (2) your ability to impart this infor-

mation to others. So let us go back to our list of common fire causes, see what they consist of, and learn how they can be corrected.

1. Careless Smoking and Use of Matches

For years careless smoking and use of matches has topped the list. It covers the fire started by careless smokers, by those who carelessly toss a lighted match away, and by such careless acts as leaving matches where small children can get at them. No one has ever found a quick cure for carelessness. People must be constantly reminded to observe "No smoking" rules, to snub out lighted cigaret and cigar stubs, to make certain matches are not burning when they are thrown away.

Use large ash receivers and metal waste baskets. Use safety matches, rather than the wooden kitchen match. Where wooden matches are used, keep them out of reach of children and in metal containers.

One of the most frequent causes of fire deaths is smoking in bed. The smoker falls asleep, the lighted cigaret or cigar falls upon the combustible bed clothing, and the result is a fire and tragedy.

2. Electrical Wiring and Equipment

If Fire Guards were to be capable of entering a building and making an adequate inspection for electrical fire hazards, they would have to be electricians. That is out of the question, of course. It is difficult even to bring the most elementary points of safe electrical installations down to a basis that will be understood by everyone. But we can give you some general information that will be helpful in understanding how electricity can be a fire hazard.

Electrical current can cause fires by (a) arcing, (b) sparking, and (c) overheating.

(*a*) *Arcing*

When an electrical circuit is interrupted, as by a switch, or accidentally, as where a contact at a connection or terminal becomes loosened, an arc is produced. The temperature of the arc is high, and any combustible material it contacts may be ignited.

(*b*) *Sparking*

The arc also may fuse the metal of the conductor or ignite the insulating material so that hot sparks and globules of hot metal may be thrown about, and set fire to combustible material.

(*c*) *Overheating*

Electrical wiring is made to carry specific loads of current. Wire, of course, is the conductor through which the current passes. When a conductor carries current, heat is generated. When controlled, this heat serves a very useful purpose in heaters, irons, ranges, and other appliances. However, when the heat is beyond the limit that the conductor was intended to carry, or, to put it another way, when the circuit becomes over-loaded, the generation of heat becomes a hazard (a) through the deterioration of the insulating covering of the conductor, and (b) through transfer of the heat generated to a combustible material.

(*1*) *Overcurrent Protection*

The fuse and circuit breaker are protective devices against overheating conductors. The fuse, which is the most common overcurrent protection, consists of a fusible metal element which, when heated to a certain temperature, melts and opens the circuit. The

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circuit breaker consists of some mechanical means of opening or switching the circuit.

When, because of a short circuit or for some other reason, a circuit becomes overheated, introducing the danger of fire, these devices act like valves to cut off the flow of current until the difficulty is corrected. For this reason, fuses should never be bridged by using pennies in the fuse socket or by by-passing the fuse box.

(*d*) *Flexible Cords*

When the two copper conductors in a flexible cord come together, forming a short circuit, or when a live conductor comes in contact with a grounded object, arcs are produced. Short circuits usually are produced by (1) insulation failure, (2) mechanical interference, or (3) deterioration due to poor construction, age, and use.

For these reasons, flexible cords should be treated with respect. When worn or frayed, they should be replaced. They should not be hung over any metal object. And they should not be used as a substitute for a permanent extension of the wiring.

(*e*) *Other Danger Points*

In addition to watching for the above, when making inspections, Fire Guards should ascertain, if possible, if all electrical appliances are in good condition and if light switches are in proper working order. Running of extension cords under carpets or furniture should be discouraged. "Home-made" repairs and extensions of wiring should be discouraged.

On the average, about 40 fires occur each day in this country as the result of electric irons being left in the circuit. Greater emphasis must be placed upon the prevention of fires of this type, which are due entirely to thoughtlessness.

3. Sparks on Roofs

We may not be able to prevent sparks flying through the air and falling upon roofs, but we can use fire-resistant roofing materials that will not catch fire from the sparks, and, as Fire Guards, you can encourage your neighbors to do so.

4. Defective or Overheated Chimneys and Flues

The Fire Guard can no more be a heating engineer than he can be an electrician, but the common hazards connected with chimneys and flues should be clearly understood.

The greatest danger here is lack of maintenance. Chimneys and flues should be cleaned periodically to free them of soot accumulations. Chimneys should be examined to see that they are sound, that the mortar joints between bricks have not broken loose, that the flue lining has not cracked away. Some people speak of the smokepipe between furnace, or boiler, and the chimney as a flue. This pipe should be examined for signs of rust, and, if the rust and deterioration have progressed to a point where holes appear in the pipe, it should be replaced. Smokepipes should be securely braced, and, where they pass near joists or other woodwork, insulating material should be placed over the woodwork.

5. Defective or Overheated Heating Equipment

These hazards again are a problem of maintenance and of correct original installation. All heating plants and stoves should be thoroughly cleaned after each heating season. Grates and firepots should

be inspected and repaired or replaced, if necessary. Oil burners should be inspected by a competent man.

The most the Fire Guard can do in this respect is to urge upon his people the necessity for taking these precautions in season, using the arguments of safety and economy to justify them.

In making inspections, he should determine whether or not metal ash cans are used. If paper cartons or wooden containers are used, he should point out the danger of fires starting in them from hot coals or ashes.

Fireplaces should be protected by fire screens, and the Fire Guard can point out the desirability of such safeguards to the residents of his neighborhood.

6. Lightning

Lightning is certainly in the category of occurrences beyond control. We cannot prevent bolts of lightning from coming down out of the sky. But we can install lightning rods to protect our buildings.

7. Flammable Liquids

Many persons, vaguely aware that gasoline, benzine, naphtha, and similar fluids are dangerous, still endanger their lives and property by using them for cleaning purposes. These liquids vaporize easily, and, when mixed with air in proper proportion, the vapors are highly explosive. All it takes is a spark or flame to ignite them.

It is a safe rule never to use gasoline, benzine, or naphtha in the house for cleaning purposes. There are safe dry cleaning fluids on the market. In fact, such dangerous flammables should never be kept in the house at all. Some communities have ordinances which prohibit keeping all but a small amount in any dwelling, and then insist that safety cans be used. The gasoline hoarders who kept fuel for their cars in their homes might as well be sleeping under the same roof with a supply of dynamite.

If kerosene is used or stored on the premises, it should be kept in drums having drip-proof faucets, or in tightly closed metal containers from which it can be poured easily without spilling. Such containers should be kept in a cool place.

Some polishes contain flammable liquids, and it is a good idea for housewives to look at the labels to learn whether or not the liquids are dangerous.

Fire Guards can talk over these points with their neighbors, after good terms are established.

8. Rubbish

Accumulations of rubbish on any premises invite fire. Any chance spark or flame can ignite rubbish and start a serious blaze. Although this item appears on the list of fire causes under this name, the whole idea of a clean building might be better understood if we simply called this hazard "poor housekeeping."

Firemen say that a clean building seldom burns. And they don't mean that it should be carefully dusted and swept. They refer to all the combustible junk that can accumulate in storerooms, closets, attics, and cellars.

In fire defense it is particularly important that such areas be cleaned up. If a fire bomb should fall into a crowded attic or storeroom, it would be difficult for the fire fighters to get at the bomb before it started a fire.

Fire Guards should keep a sharp eye for accumulations of old newspapers and magazines, discarded furniture, clothing, and other trash that could be disposed of with no loss to the owner.

9. Open Lights, Flames, and Sparks

Bonfires, with their exposed flames, and the sparks of locomotives and smokestacks cause many fires which are grouped under this general heading.

All outdoor fires should be built in wire incinerators, or in places where there is no danger of fire spreading to nearby buildings, fences, or grass and brush plots. The practice of burning dead grass or brush in the Spring results in many serious fires, and it should be generally discouraged except where there are enough helpers around to keep the fire under control.

The installation of spark arresters on smokestacks is recommended and, in some communities, required by local ordinance. These arresters are made of fine metal mesh or of covering devices that stop the sparks from being released from the smokestack.

10. Lamps and Stoves

In rural areas where kerosene or gasoline lamps are used, many fires are charged to the careless use of these appliances. All lamps should be filled during the day, and the wicks properly trimmed and adjusted before it is necessary to use them. Careless use of candles is also hazardous. Wherever candles are used, the utmost care should be exercised to prevent their starting fires.

Small heating stoves and kitchen ranges should be properly installed so any nearby woodwork will be well insulated against their heat, and so they are fastened securely in place and cannot be knocked over.

Frilly curtains that are not fastened down so as to prevent a breeze from blowing them over the stove are an invitation to fire. This hazard should be pointed out to housewives. While the fabric cannot be made fireproof, it can be treated to make it fire retardant. In any event, curtains should be fastened so they cannot come too close to stoves and other heating appliances.

When oil stoves are being refilled, it is good practice to turn off the flame and to avoid smoking or affording some other source of heat that might ignite the oil or its vapors. Spills of oil should be cleaned up at once and the oily rags burned or disposed of where they cannot start a fire by spontaneous heating.

The use of kerosene or gasoline to start or hasten a wood fire—not an uncommon practice in the country—is dangerous and has resulted in many serious fires and deaths.

Slide Film Sequence

Now, let's go on an imaginary inspection tour of a somewhat typical dwelling and see what fire hazards can be discovered. All that we will see here can be rather easily eliminated, so the Fire Guard should be able to persuade his neighbors to take these simple steps for improving the safety of his own home and that of his community.

24. Such conditions as this are not unusual, whether they exist in the attic, the cellar, closets, or storeroom. Here is a fine place for fire to start, with plenty of fuel, and inaccessible places for the fire fighters to reach. It won't be easy to persuade the people in this house to clean up this mess, but maybe if you tell them about the dangers of a fire bomb landing in such a place they will do something about it.

25. This is a condition you may see often. If the insulation on that cord wears through and the copper wire comes in contact with the nail, there'll be trouble. The result will be a short circuit and possibly a fire. Instead of using extension cords in this manner, a permanent extension of wiring should be installed in this attic.

26. We can do things in pictures that you probably won't do in real life. You'd not get in this bedroom if Mr. Jones were in bed, but, if you could, this is what you might see. Mr. Jones likes a last cigaret before turning in for the night. He does it every night, as a matter of habit, and thinks nothing of the risk he runs. All he has to do is fall asleep once with that cigaret in his hand, and maybe he won't wake up again. You would be doing him a favor if you could convince him that it would be safer to have his last smoke before getting into bed.

27. Mrs. Jones was pressing a dress when her neighbor called up to give her a new recipe for upside down cake. She forgot about the electric iron. In some cases like this, the iron has burned right through the ironing board, setting fire to the ironing board cover and causing a serious blaze. Remember, there are about 40 fires every day from this cause, and, somehow, you Fire Guards have got to help prevent them.

28. Mrs. Jones is proud of her attractive curtains, but she won't be so proud if they start a fire. Perhaps you can tactfully suggest that they ought to be anchored down, out of danger.

29. Those matches are too easy for the Jones' children to get at. Better warn Mrs. Jones that they ought to be moved out of the children's reach.

30. Electric cords in this condition are dangerous. Unless they are repaired or replaced, they may cause short circuits and start fires.

31. Every year there are a number of fires caused by unprotected fireplaces. Hot coals pop out on the rug or onto some other combustible material while there is no one in the room. In this way the fire can get a good start before it is discovered. A metal fire screen will prevent this from happening. The Jones family ought to be glad to know about such things.

32. Running an electric cord under the rug this way is dangerous on two scores. Someone may trip and fall over it. And as the cord gets worn, it may set fire to the rug.

33. Most of the fires start in cellars, you know, and when you realize that these conditions can be duplicated many times over, it is not difficult to understand why this is so. You will be doing the Jones family a big favor if you can convince them that this mess should be cleaned up. If there is any usable paint in the cans, the cans should be covered. Oily dust cloths and mops should be kept in metal cans.

34. With more people replacing oil burners with coal grates, here is a condition that may become even more common—the use of wooden or other combustible containers for hot ashes. This barrel would catch

fire easily from hot coals, and the fire could quickly spread to the floor joists or other woodwork. Only metal containers should be used for ashes, and, preferably, they should be covered and placed so they will not come in contact with any combustible material. If ashes are wet down when they are taken from the furnace, there will be less dust in the cellar and far less danger of fire.

35. The Jones family uses kerosene in a small heating stove, like so many other families. But they make the mistake of keeping the kerosene near the furnace where the heat will cause it to vaporize more quickly and present a dangerous fire hazard. This kerosene drum should be kept where it is cool, and its faucet should be drip-proof.

36. Mr. Jones didn't mean to violate the law when he bought this gasoline and had it placed in tins. He thought it would be handy to have some for the car if he ran short, and Mrs. Jones might find it useful for dry cleaning. It is bad judgment on both counts, Mr. Jones. Gasoline should not be kept on the premises unless you have a vapor-proof safety can for it, and then it is much better to do without it. Mrs. Jones is endangering her life by using gasoline for dry cleaning. The vapors, mixed with air in proper proportion, are more easily exploded than dynamite, and have been known to travel a considerable distance to become ignited from an unsuspected source.

37. Here's a hazard easily overlooked. If this smokepipe fell while the furnace had a fire in it, sparks might be scattered, starting a fire. The pipe should be strongly braced with wire, and every season it should be inspected for signs of rust holes.

38. This is not a safe practice, as Mr. Jones will tell you someday if his house catches fire. Leaves and rubbish should be burned in a wire incinerator. The incinerator will prevent the fire from being blown out by the wind and spreading to grass, brush, or the house itself.

38 A.

1. Rubbish in attic or other storage places on the premises.
2. Improper use of electric extension cords.
3. Smoking in bed.
4. Electric iron left turned on and unattended.
5. Curtains left free to blow over stove.
6. Frayed electrical cords.
7. Matches in reach of children.
8. No fire screen at fireplace.
9. Electrical cord running under carpet.
10. Old paint cans, rags, and rubbish in cellar.
11. Combustible container for ashes.
12. Kerosene stored near furnace.
13. Gasoline stored on premises.
14. Unbraced smokepipe.
15. Bonfire near house.

DISCUSSION PERIOD

(To end of class)

The following questions may be used to stimulate class discussion:
What are common fire hazards? Special hazards?
Name the 10 most common causes of fire.
What among these fire causes may be charged to faulty behavior?
What to defective equipment? What to occurrences beyond control?
What is the most frequent cause of fire?
What is an arc? Overheating?
How do fuses and circuit breakers function?
How often should chimneys and flues be cleaned?
How much gasoline should be kept on the premises?
Why should rubbish be disposed of?

LESSON THREE—OUTLINE

Fire Extinguishment—Equipment and Methods

A. Fire Extinguishment

1. Classes of fire
   (a) Class A fires
   (b) Class B fires
   (c) Class C fires

B. Extinguishing Equipment

1. OCD pump tank
2. Privately owned equipment
3. Extinguishers which use water as the extinguishing agent
   (a) OCD pump tank
   (b) Standard pump tank
   (c) Stirrup pump
   (d) Garden hose
   (e) Soda-acid extinguisher
4. Extinguishers which use a smothering agent
   (a) Foam extinguisher
   (b) Vaporizing liquid extinguisher

B. Extinguishing Equipment—Con.

4. Extinguishers which use a smothering agent—Continued.
   (c) Carbon dioxide extinguisher
   (d) Sand

C. How Extinguishing Equipment Is Used and Maintained

1. OCD pump tank
2. Pump assembly of pump tank and stirrup pump
3. Stirrup pump
4. Soda-acid and foam extinguishers
5. Vaporizing liquid extinguishers
6. Carbon dioxide extinguishers

D. Fighting Fire

1. Class A fires
2. Class B fires
3. Class C fires
4. Precautions to be observed
5. Clean-up

Slide Film Sequence

LESSON THREE

Fire Extinguishment–Equipment and Methods

Objectives

At the conclusion of this lesson the student should:

1. Understand the principles of fire extinguishment.
2. Know the classes of fire.
3. Understand the assembly and operation of extinguishing equipment.
4. Know under what conditions various types of equipment should be used.

Place of Meeting

Regular classroom.

Equipment

Slide film projector and film slides.

Exhibit Materials

OCD pump tank, stirrup pump, standard pump tank, soda-acid, foam, vaporizing liquid, carbon dioxide extinguishers, garden hose and hose adapter.

A. FIRE EXTINGUISHMENT

You have learned that there are three factors needed to produce fire—a substance that will burn, a supply of oxygen, and a source of heat that will raise the temperature of the burnable substance to its kindling point. These factors give us clues to methods of extinguishing fire.

If a fire is deprived of oxygen, it cannot burn. If the temperature of burning material is reduced below its kindling point, the fire will go out. Therefore, we have two practical methods of controlling fire—by smothering it to exclude oxygen, and by cooling the burning material.

Theoretically, we could use a third method—by withdrawing the burning material. This is seldom practical, though some examples of this method should be mentioned:

A small bonfire can be kicked apart, scattering unburned material beyond the reach of the flames and preventing the transfer of heat. A lighted burner on a gas range is extinguished by turning off the gas, thereby removing or separating the gas from the flame. But, in general, there are only two practical methods of extinguishing fire—by smothering it or by cooling the burning material.

1. Classes of Fire

Some fires can be put out more easily by one method than by another. To distinguish between such fires, a standard classification of fires has been adopted.

(a) Class A Fires

The most common class of fire occurs in the substances that commonly surround us—wood, clothing, paper, and such materials. Fires in these materials are most easily put out by cooling the ma-

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terial itself to a temperature at which it will not burn. These are called Class A fires.

Water is the most effective means of extinguishing Class A fires, because it is a cooling agent. When water is applied to fire, it absorbs the heat of the burning material, thereby reducing its temperature.

Then, too, water is plentiful and inexpensive. It can be piped, held in reservoirs, pumped, and be made available for fire fighting in many other ways. It can be mixed with certain chemicals, as in fire extinguishers, and still retain its ability to cool burning material and put out fire.

(b) Class B Fires

Fires in flammable liquids are called Class B fires. These liquids include gasoline, oils, paints, greases, and others that are not so common.

A *stream* of water directed onto burning liquids may splash and spread the fire, and, in some cases, cause it to burn more intensely. Also, a flammable liquid fire is a very hot fire, and is not easily extinguished by cooling. This type of fire is much more effectively put out by smothering—that is, by using an agent that will cut off the oxygen supply. Therefore, special extinguishing agents have been developed for this purpose. You will learn more about them later in this lesson.

(c) Class C Fires

The common use of electricity for power, light, and heat introduces still another class of fire, known as Class C fires.

Water conducts electrical current and, if used on a fire in live electrical equipment, it will damage it by causing short circuits, and the water may conduct the current back to the person fighting the fire and injure him by shock. Therefore, extinguishing agents have been provided that are non-conductors of electricity and that can be used safely on electrical fires.

B. EXTINGUISHING EQUIPMENT

Since fire may occur anywhere in the area assigned to the Fire Guard, he must have portable equipment that can be carried to the scene as quickly as possible. The types of equipment available to him will determine the weapons that the Fire Guard will use.

1. OCD Pump Tank

The United States Office of Civilian Defense is making available to Fire Guards a pump tank extinguisher, specially designed and manufactured for the emergency. It is being distributed in strategic areas, designated by the Army and Navy, and will be standard equipment for Fire Guards in those areas, on a loan basis. Other communities will have to provide their own portable equipment, since there is a limit to the amount of equipment that the OCD is able to provide.

2. Privately Owned Equipment

In addition to the appliances distributed to Fire Guards by the OCD, many private properties are equipped with garden hose, stirrup pumps, and standard fire extinguishers. Such equipment will be found in industrial plants, office buildings, institutions, public buildings, and in dwellings. Fire Guards must know how to use all these appliances.

These different types of first aid fire appliances will be described

at this time, so you will understand what they look like, how they work, and how you can use them. After this equipment is described, you will have an opportunity to inspect those units we have been able to procure. At the next meeting of the class, which will be a practice session, each of you will have the chance to operate the various pieces of equipment.

Slide Film Sequence

3. Extinguishers Which Use Water as the Extinguishing Agent

Since Class A fires are the most common type of fire, and water is the most effective means of fighting them, we will give our first attention to the extinguishers which make use of water.

39. Water, supplied from pumps on fire apparatus through hose lines, is the chief weapon of the professional firemen. Tons of water can be applied to a fire in this way to cool the burning material. But this is the last resort. It is the job of the Fire Guard to put out fires when they are still small and before they need such extreme measures.

40. Here is water—the cooling agent—being directed on a big fire. By the use of a number of hose lines, as much as 50,000 gallons of water a minute may be directed onto a fire.

(a) OCD Pump Tank

41. Compare this picture with those you have seen. Here a fire is being put out while it is still small, with a pump tank extinguisher such as you may use as a Fire Guard. Four gallons of water or less do the job, minimizing the damage caused by fire and water. But to accomplish this, you have to be on the scene quickly with your equipment ready for use.

42. This is a cross section of the OCD pump tank extinguisher. It is a modification of the standard pump tank used in this country for many years. Little critical material is used in its manufacture. It has a capacity of 4 gallons, and it uses plain water. When the extinguisher is exposed to freezing temperatures, anti-freeze chemicals may be added to the water.

The pump is of the single-suction double-discharge type which develops a steady stream with a horizontal range of more than 30 feet. There is a large filler opening through which the tank can be refilled, and the opening has a cover to prevent the water from splashing out while the tank is carried.

43. The pump tank can be kept in continuous operation by two persons, one to pump and direct the stream, and the other to fill it with additional water, when needed. However, as in the case of the stirrup pump, the ideal team is three persons.

(b) Standard Pump Tank

44. It differs from the OCD version in appearance and water capacity. There are many of these in use, most of them being of 5-gallon capacity, although some are of only 2½-gallon capacity.

(c) Stirrup Pump

45. This is the stirrup pump designed for use on fire bombs. It is placed in a pail or other container of water and braced by the foot while being used. The mechanism of the pump is similar to that of the pump used in the OCD pump tank, and this device, too, is designed of non-critical materials.

46. Two persons are needed to use a stirrup pump effectively; one to

operate the pump, and the second to direct the stream from the nozzle; a third person can bring up additional water.

(d) Garden Hose

47. Garden hose is an effective weapon for fighting fire. However, it can be used only as long as the piped water supply is available. A high explosive bomb may break water mains, or firemen in the vicinity may deplete the normal supply, rendering the garden hose useless. Fire Guards should know where garden hose is kept on private property, and where water faucets, to which hose can be connected, are available.

Bathroom or kitchen faucets may not be threaded so the hose coupling can be screwed on it, and, in that event, special adapters should be provided so the hose can be used without delay. The hose should be kept on reels or coiled in a cool, dry place.

(e) Soda-acid Extinguisher

48. This is one of the most common types of standard extinguishers. It is operated by turning it upside down, permitting the chemicals it contains to mix and form a gas which expels the liquid contents through the hose. A water solution of bicarbonate of soda is placed in the tank of the extinguisher at (A). A bottle of sulphuric acid (B) is suspended in a cage in the neck of the extinguisher. The stopple (S) in the bottle falls partly out and thus meters the flow of acid when the extinguisher is inverted.

The stream has the same extinguishing value as water. It will travel a distance of 30 to 40 feet horizontally for about a minute. At temperatures below 40° F., the extinguisher must be protected against freezing. Anti-freeze crystals should not be added to the contents of the extinguisher.

All of the extinguishing devices thus far described are best for Class A fires, which you remember are fires in wood, paper, cloth, and other such ordinary materials. They may also be used on fire bombs, since water is the most effective means for coping with fire bombs.

4. Extinguishers Which Depend on a "Smothering" Agent

Flammable liquid fires, you remember, are best extinguished by cutting off the oxygen supply and smothering them. Here is an illustration of the "smothering" principle.

49. We have learned that fire feeds on oxygen. The candle flame in the open jar has plenty of air around it from which to obtain oxygen. When the jar is covered and air excluded from it, the oxygen in the jar is consumed, and the flame of the candle goes out.

50. There are a number of means of excluding oxygen from fire and thus smothering it. Here is a Fire Guard wrapping a coat around a person whose clothing is on fire and then rolling her slowly back and forth to smother the flames.

Fat and grease fires that occur during deep-fat cooking can be easily extinguished by simply placing a tight-fitting cover over the pan or cooking utensil. Small fires in greases and paints can be smothered by covering the burning surface with sand. Oxygen is excluded, and the flames die.

51. Here is a large flammable liquid fire—burning oil. A chemical

solution called "foam" is being applied to the fire. Foam consists of tiny bubbles, each filled with an inert gas. The foam "blankets" the burning oil, excluding the oxygen from it and thus smothering the fire.

(a) Foam Extinguishers

52. Externally, this extinguisher is identical to the soda-acid type, but, as you see, its internal design is different. A water solution of bicarbonate of soda plus a foam-stabilizing agent is placed in the outer reservoir. The inner chamber is filled with a solution of aluminum sulphate. When the chemicals are mixed by inverting the extinguisher, foam is formed and expelled through the nozzle in a stream.

Foam is very effective on most flammable liquid fires. However, since 95 percent of foam is water, this extinguisher is effective on Class A fires also. The 2½-gallon size is most commonly used and develops about 20 gallons of foam.

Like the soda-acid extinguisher, the foam extinguisher is inverted to operate it, and the stream will travel from 30 to 40 feet for about a minute. Foam extinguishers also need protection against freezing temperatures.

(b) Vaporizing Liquid Extinguishers

53. This extinguisher is known as the vaporizing liquid type, because the liquid turns into a vapor on contact with heat. The vapor, which is heavier than air, blankets and smothers the fire.

The liquid has a base of carbon tetrachloride, which has been treated to depress the freezing point and remove the impurities which might corrode the extinguisher. Because the liquid contains no water, it is a non-conductor of electricity, so this extinguisher is recommended for fires in live electrical equipment as well as for flammable liquid fires. It is not effective on deep-seated Class A fires, which require the quenching and cooling effect of water, but it may be of value for surface fires where the smothering effect of the vapor may be utilized. However, it should never be used on fire bombs; it is ineffective for this purpose and, under certain conditions, the gases generated may be dangerous.

The small sizes of this type of extinguisher operate like a "pump gun." Full strong strokes of the pump will expel a stream horizontally for 25 to 30 feet for about a minute. This type of extinguisher may be exposed to temperatures as low as 40 degrees below zero F.

Larger sizes are manufactured for industrial use, and these are operated by pump or stored pressure.

(c) Carbon Dioxide

54. Carbon dioxide, stored in cylinders and released by automatic or manual control, is another agent for putting out flammable liquid fires. The gas blankets and smothers the flames.

55. The carbon dioxide extinguisher consists of a heavy tank, a valve at the top, and a hose connected to a special discharge horn. The tank, or cylinder, is filled with liquid carbon dioxide. When the release valve is opened, the contents escape into the air, and the resulting gas is expelled through the horn. The gas is a non-conductor of electricity. This type of extinguisher is, therefore, recommended for both Class B and C fires. It is not effective on deep-seated Class A fires, which

require the quenching and cooling effect of water, but it may be of value for surface fires where the smothering effect of the gas may be utilized. Because the extinguisher contains no water, it has no effect on fire bombs. The carbon dioxide extinguisher requires no protection from freezing.

(d) Sand

56. When the enemy was using a simple type of incendiary bomb on which sand could be used with some limited effect, many communities urged their citizens to provide sand pails for air raid protection. The adoption of new types of incendiary bombs has made sand not only useless, but dangerous. It is good judgment to empty sand pails and fill them with water so reserve supplies will be available during a raid.

Sand has little practical value for fire extinguishment except in certain industrial occupancies. When used on fire, sand should be applied with a shovel or scoop. Sand is abrasive and should not be used on or near machinery.

In the same class with sand are the many "bomb extinguishing powders" that have appeared on the market. Sand and most powders are not effective on incendiary bombs and may endanger the lives of persons using them.

57. All first aid fire appliances should be placed where they are quickly available. No obstructions should be placed in front of them, and their locations should be plainly marked so as to be visible from a distance.

58. This chart appears on page 17 of the Fire Guard's Handbook (see also end of this lesson). It should be studied carefully, so each Fire Guard will become familiar with the characteristics of the various types of extinguishers. You will note that the first four types listed will be most readily available, and will constitute the equipment with which Fire Guards, for the most part, will work.

Incidentally, it should be understood that we have not discussed all the types of standard extinguishers. In addition to those discussed, there are the following: The gas cartridge extinguisher which is used for Class A fires; the loaded stream, which is used for Class A and B fires; and a dry compound extinguisher, used for Class B and C fires. However, these types of extinguishers are not widely used, and it is more important for you to know about the common types.

DISCUSSION PERIOD
(Limit—15 minutes)

The following are leading questions to stimulate class discussion:

What are Class A fires? Class B fires? Class C fires?

How are Class A fires best extinguished? Class B fires? Class C fires?

What are the two principal methods of extinguishment?

What is the limitation of the garden hose?

What is the fire extinguishing weapon provided for the Fire Guard?

What other extinguishing weapons will be useful to him?

What is a faucet adapter?

How should garden hose be kept?

How does foam extinguish fire?

Is sand an effective extinguishing agent?

INTERMISSION—5 minutes

C. HOW EXTINGUISHING EQUIPMENT IS USED AND MAINTAINED

The following types of extinguishers are needed for this section of the lesson:

OCD pump tank and/or standard pump tank. Stirrup pump.

Soda-acid, foam, vaporizing liquid, and carbon dioxide extinguishers.

(Note to instructor)

If any of this equipment is unobtainable, the instructor can use blackboard drawings, slide film section drawings, or refer to illustrations in the Fire Guard's Handbook to illustrate the points involved. The following procedure, in connection with each type of extinguisher, will constitute the order of this section of the lesson:

1. Description of how extinguisher is used.
2. Explanation of assembly, parts, and methods of inspection and maintenance.

1. OCD PUMP TANK

The pump tank is carried to the scene of a fire emergency by its handle. The weight of four gallons of water makes it an easy burden that even a woman can carry.

Operation of the pump tank is simple. The foot is placed upon the footbrace, and the operator raises and lowers the pump handle with one hand while directing the stream with the other. When it is necessary to fill the tank with additional water, the cover of the filler opening is slipped back and the water poured in. This can be done by a second person without interrupting the operation of the pump.

Parts of the OCD pump tank consist of the tank, a top cover, the pump, and the hose and nozzle. The tanks are shipped in nests of four, the tapering tank making it possible to nest one inside the other. In assembling the individual unit, the pump is inserted vertically through the appropriate opening in the tank and fastened in place with machine screws. The hose is clamped onto the discharge head of the pump. Periodically, the bolts and screws that keep the unit intact should be inspected to make certain that they are tight.

2. Pump Assembly of Pump Tank and Stirrup Pump

The mechanism of the OCD pump tank is practically the same as that used in the stirrup pump; so this description applies to both devices.

The base of the pump cylinder is fitted with a ball-type suction valve and a strainer. The other end of the pump cylinder screws fast to the fitting containing the discharge head, screw holes for securing the pump to the top cover, and packing recess with gland ring and packing nut. The discharge valve on the base of the plunger is also a ball-type valve. The plunger itself is attached to the plunger tube with enough clearance to keep friction at a minimum, but fitting snugly to prevent slippage of water between the plunger and cylinder tube. When the handle of the pump is pulled up, the suction raises the glass ball in the cylinder valve and draws water into the cylinder. At the same time the glass ball in the bottom of the plunger is seated and the water in the annular space between the pump cylinder and the pump plunger is discharged through the hose. A downward stroke of the pump closes the ball valve in the cylinder and forces the ball valve in the plunger tube open, so the water enters the plunger tube and is forced out of the discharge head and hose.

It may be necessary to disassemble the pump tank in order to clean

the strainer at the bottom of the pump cylinder. However, if care is exercised to use clean water in filling the tank, this should not be necessary often. A drop or two of thin lubricating oil should be placed on the piston packing of the pump at frequent intervals.

3. Stirrup Pump

To operate the stirrup pump, the end of the pump cylinder is placed in a pail of water. The operator places his foot upon the stirrup, or footbrace, while pumping. The hose can be used by the person operating the pump, or by another person to take advantage of its full length. A third person brings up additional water to refill the pail from which the water is pumped.

4. Soda-acid and Foam Extinguishers

There is a right and a wrong way of handling soda-acid and foam extinguishers. If handled properly, there will be no fumbling in bringing them to the scene of a fire and inverting them so the stream is under control the instant that it emerges from the nozzle. They are usually hung upon the wall at about eye level, and the following procedure is recommended in removing, carrying, and using them:

Grasp the nozzle between the thumb and forefinger of one hand, and with the other three fingers get a grip on the ring handle. Then grasp the bottom handle with the other hand, and lift the extinguisher up and off the hanger. Carry the extinguisher to the fire by the ring handle, retaining the grip on the nozzle. When putting the extinguisher into operation, grip the bottom handle again, and lift the bottom of the extinguisher up, at the same time letting go the grip on the ring handle but keeping the nozzle in your fingers. By keeping the grip on the nozzle throughout the operation, you will have instant control of the stream as soon as the extinguisher begins to operate.

(This part of the lesson to be used at the discretion of the instructor)

When recharging any type of extinguisher, only replacement parts and recharging materials furnished by the manufacturers should be used. This will insure maximum performance of the extinguishers.

Recharging Soda-acid and Foam Extinguishers

Both the soda-acid and foam extinguishers should be recharged annually. Inspect the extinguisher shell before unscrewing the head. If there is any serious distortion, the shell should be tested hydrostatically to determine whether or not it is sound. Arrangements for the test can be made with the representative of the manufacturer. No repairs on the seams should be attempted, and the extinguisher should be returned to the manufacturer for repairs, if such are needed.

The head of the extinguisher should unscrew by hand, but, if it is set up too tight, a stick can be thrust through the ring handle and used as a lever to unloosen it. It is important, when recharging several extinguishers, to keep the heads with their respective extinguisher tanks so that the proper head will be replaced on each extinguisher.

Remove the inner chamber from the foam unit or the cage containing the acid bottle from the soda acid unit, putting aside the lead or porcelain stopper for replacement after recharging.

Rinse out the extinguisher shell with warm water, draining it out through the hose. Examine the strainer inside the extinguisher at the hose connection and, if its holes are clogged, open them with a piece of stiff wire. Inspect the nozzle. If it is clogged, use the wire to clean out the chemical deposit that might have accumulated there.

Soda-acid Extinguisher

The dry chemical for the soda-acid extinguisher should be dissolved in lukewarm water in a clean pail or other container. Use a clean stick to stir the solution until all the chemical is dissolved. Then pour the solution into the

extinguisher and add enough water to fill to the filling mark on the inside of the shell.

Foam Extinguisher

There is an additional solution to deal with in the case of the foam extinguisher, one for the inner chamber and one for the extinguisher tank. Use clean, separate containers for each solution, following exactly the directions given by the manufacturer. The water used to dissolve the chemicals should be warm, never hot.

In the case of the foam units, replace the stopple on the foam solution container or, in the case of the soda-acid unit, remove the cork from the new acid bottle, and replace it with the stopple that was taken from the old bottle. Return the foam solution container to its extinguisher tank or, in the case of the soda-acid extinguisher, place the acid bottle in the cage, and lower it into position in the neck of the extinguisher.

Before replacing the head, examine the gasket. If it is at all worn, replace it with a new one. The use of worn gaskets often accounts for the leaking of extinguishers during operation.

Before screwing on the head, place a small quantity of vaseline in the threads to facilitate the work. It is not necessary to use more than hand strength to tighten the head. All that is necessary is to set the gasket snugly down against the neck of the extinguisher. Make certain that at least four threads are involved. If a new gasket is used, and the head is not screwed too tightly upon the neck of the extinguisher, it will be an easy matter to remove the head by hand when it is necessary to recharge the extinguisher again.

After the extinguisher is recharged, the date and initials of the person doing the work should be noted on the tag fastened to the ring handle. Some, but not all, approved recharge packages contain a new tag for this purpose.

In wartime, extinguishers should be inspected at least monthly, noting that the tag is in place and that the nozzle has not become clogged.

5. Vaporizing Liquid Extinguisher

Vaporizing liquid extinquishers are usually kept in a wall bracket. Some of them are removed by merely pulling loose from the spring clips that hold the handle; others are held in the bracket by a strap clamp. After taking the extinguisher from the bracket, unlock the handle by twisting it. When operating the extinguisher, aim the nozzle at the base of the flames and pump with long, firm strokes.

Inspecting the Vaporizing Liquid Extinguisher

(This part of the lesson to be used at the discretion of the instructor)

This type of extinguisher needs to be recharged after use only. Periodically, it should be inspected to make certain it is filled and that the pump is in working condition. This can be done by pumping some of the liquid into a clean dry container, and then returning the liquid, with enough additional liquid to fill the extinguisher, through the filler hole. Fill to about half an inch from the top, so as to allow for expansion of the liquid.

No other liquid should be used in these extinguishers except that provided by the manufacturer. The use of commercial carbon tetrachloride in the extinguisher may result in corrosion. Keep a quantity of the vaporizing liquid on hand so the extinguisher can be kept filled and ready for use.

6. Carbon Dioxide Extinguishers

Portable carbon dioxide extinguishers are usually kept in wall brackets from which they can be lifted and carried to the fire by the handle provided for that purpose.

There are various types of release valves. Some are operated by a wheel, others by patented "grips." Familiarize yourself with the various types of valves on the extinguishers of this type which you find in your area.

Inspecting Carbon Dioxide Extinguishers

(This part of the lesson to be used at the discretion of the instructor)

Extinguishers of this type should be recharged after use. Once each year they should be weighed, and loss of one-tenth of the weight stamped on the extinguisher is cause for having it recharged. The extinguisher can be sent back to the manufacturer for recharging, or to a carbon dioxide plant in the neighborhood. Manufacturers' representatives may be prepared to do recharging, and some owners of this equipment have their own recharging apparatus.

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D. FIGHTING FIRE

Now that we have some understanding of the weapons the Fire Guard will have for fighting fire, it is important that he learn how to use them most effectively in the emergency.

It must be kept in mind that the Fire Guard's equipment definitely limits his efforts to fighting small fires. He is in no sense a substitute for the public fire department or its auxiliaries. It is a good rule to call the fire department before attempting to put out small ordinary fires. During an air raid, of course, the Fire Guard will not summon help until it is actually needed.

1. Class A Fires

The majority of fires he will encounter are those in ordinary combustible materials—Class A fires. In fighting them with any extinguishing agent, the stream should be directed at the burning material, not at the flames or smoke. If the fire has spread from the floor up the wall, attack the fire on the floor first and then follow it up. If the stream is moved from side to side over the fire area, it will be found to be somewhat more effective.

If the fire is still small, the Fire Guard can approach quite closely to it in order to obtain the benefit of the greater force of a short stream. But if the heat of the fire is great, the full length of the stream can be used. The important thing to remember is to stay out of danger as much as possible.

Because of the length of hose on the OCD pump tank, if there is a man available to handle the nozzle, he can advance ahead of the man operating the pump and crouch or stand erect as necessary. The same is true of the stirrup pump.

When a standard fire extinguisher is used, one man can handle it, advancing or retreating as necessary, and the extinguisher can be held in front of the face as a shield against the heat of the fire.

As the duration of discharge in a standard extinguisher is only about one minute, the situation should be sized up before the extinguisher is operated.

2. Class B Fires

As previously explained, flammable liquid fires require special extinguishing materials. Foam, vaporizing liquid, and carbon dioxide are the most common extinguishers for these fires. When such fires occur in a container, the stream from a foam or vaporizing liquid extinguisher should be directed against the inside of the container just above the level of the burning liquid in order to prevent splashing. Carbon dioxide should be applied to such a fire by sweeping from side to side to cover the fire area as completely as possible. Even after the fire is out, continue to apply the gas to the liquid to prevent a possible "reflash" of the fire.

When flammable liquids are burning, approach from the windward side, attack the fire nearest you and then advance upon the remaining fire.

In places of special hazard in the Fire Guard's neighborhood where supplies of flammable liquids are kept, he should make certain in advance of an emergency that suitable extinguishing equipment is available at those points.

3. Class C Fires

When fires in electrical equipment carrying high voltages are concerned, as we have said, there is danger that water streams may act as conductors between the burning equipment and the operator of the

extinguisher. In ordinary domestic occupancies the voltage is not high enough to be a serious danger to Fire Guards. However, a non-conducting extinguishing medium should be used on electrical fires so as to prevent further short circuiting and injury to the device. In industrial plants, powerhouses, and other occupancies of like nature, however, it is important to use only extinguishing agents approved for Class C fires. Discharge the extinguisher directly at the burning part.

4. Precautions To Be Observed

In entering a room where there is a fire, the Fire Guards should note the most advantageous position from which the fire can be fought, and place the equipment accordingly. Stand between the fire and an exit, so that any sudden spread of fire will not cut off your escape from the room.

Stay on your feet so that you can move about freely and change your position, if necessary, to avoid inhaling smoke and fire gases. The smoke is usually thinnest at a level of about two to five feet above the floor. But because the smoke is thinnest at that level does not mean that the air is any safer to breathe. In fact, if there is any ventilation in the room, this, combined with the fire drafts and the movement of the Fire Guards in the room, will make conditions of atmosphere about the same at any level. So do not attempt to fight fire lying down. It not only does not prevent your inhaling fire gases, but it also interferes with your freedom of movement.

As you will remember from our discussion last time, burning materials produce dangerous gases as well as smoke. And the process of combustion consumes oxygen. Confined or poorly ventilated areas are therefore difficult and hazardous places in which to fight fire. Extinguishing the fire stops the generation of fire gases, of course. However, the gas released by carbon dioxide extinguishers will replace still more oxygen in the air. And the gases liberated from vaporizing liquid extinguishers may be dangerous, although the unpleasant odor usually makes the atmosphere too uncomfortable to permit dangerous exposure to the gases.

When fighting fires in confined spaces, such as a closet, hall, cellar, or other poorly ventilated area, to avoid smoke and gases stay outside the enclosure and direct the extinguishing agent in at the fire. Or perhaps a window or door can be opened so that drafts may carry the smoke and gases away. But if there is no way that you can get at the fire without exposing yourself to great quantities of smoke, the situation is probably not such that your equipment can handle anyway, and you had better leave the problem to the fire department which has all the proper kinds of equipment and protective devices.

Fortunately, you are not likely to be faced by situations of this sort very often.

5. Clean-up

After a fire is out, inspect the scene carefully to make certain there are no hot embers or hidden sparks that can cause the fire to start up again. It may be necessary to open up floor spaces and partitions to inspect them, but "don't tear the house down." As a safety precaution, such areas can be wet down to make certain no fire is lurking there.

It is particularly important to ventilate the area thoroughly, so as to clear out all smoke and gases.

Slide Film Sequence

Now we will see some pictures illustrating the points that have been made here on fire fighting.

59. The most common class of fire is that in ordinary combustibles—Class A fires—where wood, paper, and fabrics are burning. Aim the extinguishing stream at what is burning, not at the flames or smoke. Remember, the purpose of using water on such fires is to cool the temperature of the burning material below its kindling point, and to accomplish this the water must strike the burning material. If you move the stream from side to side across the fire area, more of the burning material will be wet down than if you direct the stream at just one point.

60. When the fire is small and you can approach it closely, your stream will have greater force and more of the water will reach the fire, helping you to get the fire under control quickly. But don't expose yourself to danger unnecessarily.

61. Play safe. If the fire has gained a good start, stay at a safe distance, and use the full length of the stream until you can approach the fire without danger to yourself. The pump tank will throw a stream for more than 30 feet, and there will be times when you will need this margin of safety.

62. When fire is spreading up a wall, put out the fire on the floor first and then follow it up. The point of the fire's origin is the place at which to begin fighting the fire, for there it will have generated more heat and have gained more headway.

63. The OCD pump tank has 10 feet of hose. Take advantage of it when there are two Fire Guards to operate the pump tank. The nozzle man can crouch or use the best available cover, while the pumper takes a position of safety outside the room or back of other cover.

64. Only one man is needed to use the standard soda-acid or foam extinguisher. The extinguisher can be held in front of the face and upper body as a shield against the heat of a fire. These extinguishers also have a range of more than 30 feet.

65. Flammable liquid fires in containers occur in garages, machine shops, and other places where gasoline and other volatile solvents are used. When fighting such fires, the extinguishing stream should be aimed against the inside of the container just above the surface of the burning liquid. This will avoid splashing the liquid and, in the case of the vaporizing liquid extinguisher, it will help break up the stream so it will vaporize more quickly.

66. When flammable liquids are burning on the ground, attack from the windward side, and then advance upon the remaining fire, taking care to put it all out as you move forward. Foam, vaporizing liquid, and carbon dioxide are the most common extinguishers used for such fires.

67. The carbon dioxide extinguisher is used with a sweeping motion, the escaping gas being applied to the entire fire area. After all flame has disappeared, apply a cooling agent such as water to prevent a reflash of the fire.

68. Remember, your own equipment, which probably will be the pump tank, is not designed for use on Class B fires. When you find Class B

hazards on your post, make certain that you know the location of suitable types of available extinguishers. These will be privately owned, but you may have to use them.

69. The same applies to any electrical hazards that exist on your post. Where there are power stations, or other occupancies in which high voltage current is used, suitable types of extinguishers should be available for dealing with electrical fires.

70. There are some precautions that must be observed in approaching a room in which there is a fire. If the door is closed, open it cautiously, for the fresh air entering the room may cause the fire to flash up dangerously.

71. Always keep yourself between the fire and an exit so you can escape, if necessary. Before you enter a room, if possible, acquaint yourself with the location of windows or other means of escape. Don't take unnecessary risks.

72. Avoid breathing smoke and fire gases as much as possible. Stay on your feet so you can move around the fire, as necessary, and so you can escape. If the conditions of fire become so severe as to endanger you, there probably won't be much you can do anyway, with your limited equipment, and you should call the fire department.

73. Remember that fire uses up oxygen and that in unventilated and small spaces there is danger of being overcome by fire gases. You will encounter such conditions infrequently, but you should be able to recognize the danger and take the proper steps to safeguard yourself.

74. After the fire is out, open windows and doors to clear the atmosphere so you can inspect the damage and complete necessary operations.

75. Make certain there is no fire or hot embers concealed in partitions or floor spaces. Use your ax to open up these spaces, if you have to, and douse the area with water to make certain the fire cannot start up again. When you leave, you want to be sure the fire is completely out.

DISCUSSION PERIOD

The following are leading questions to stimulate discussion:

What class of fire is most likely to be encountered by Fire Guards?

How should Class A fires be fought?

When can a fire be approached closely?

Why should the scene of a fire be carefully inspected after the fire appears to be out?

Why should windows or doors be opened? When?

What is the best posture for a Fire Guard while fighting fire?

Where is the visibility greatest in a smoke-filled room?

How are flammable liquid fires in containers fought? Ground fires?

What should Fire Guards remember about fires in live electrical equipment?

(Note to instructor)

(It is desirable that the next meeting of the class be a practice drill during which all members of the class will have an opportunity to examine all types of extinguishers. It is also desirable that,

when practical, the members of the class be permitted to extinguish actual fires. If fires are to be built, representatives of the public fire department should supervise the drill. One method of organizing the drill period is to divide the class into as many squads as there are pieces of equipment, and allow each squad to examine, handle, and operate each unit in turn.)

Extinguishing Equipment And Its Use

Type	*Class of Fire*	*For Fire Bombs*
OCD Pump Tank*	A	Yes
Stirrup pump*	A	Yes
Garden hose*	A	Yes
Standard pump tank*	A	Yes
Soda-acid*	A	Yes
Foam*	A and B	Yes
Vaporizing liquid†	B and C	No
Carbon dioxide†	B and C	No

*Extinguisher contents, reserve water supplies and exposed pipe lines need protection from freezing.

†May be used on small Class A fires in locations where drafts will not dissipate extinguishing vapors.

FIRE EXTINGUISHMENT

Demonstration and Drill—To Follow Lesson Three

Equipment and Materials

Kindling wood—boxes, crates, etc.
Gasoline.
Metal container.
Pump tank extinguisher.
Soda-acid extinguisher.
Garden hose and nozzle.
Vaporizing liquid extinguisher.
Foam extinguisher.
Carbon dioxide extinguisher.

The quantity of kindling and gasoline needed for the session will depend upon the number of persons in the class.

Fire Department Supervision

It is desirable to have the demonstration conducted by a representative of the local fire department. In any event, a member of the department should be present during the session and he should have additional equipment to handle any emergency fires that may occur. Regardless of the presence of a Fire Department representative, arrangement of the demonstration must have Fire Department permission, if fires are to be built.

Scene of Demonstration

The demonstration should be held in an open space such as a vacant lot, public park, or other location where there is no possibility

of the demonstration fires spreading to buildings or causing grass or brush fires. For convenience and safety, there should be a water tap from which water can be drawn.

Procedure for Demonstration

Build a small fire with the kindling wood. When it is burning freely, direct the contents of a pump tank on the fire to demonstrate the cooling effect of water. Explain what happens, according to the text of Lesson Three.

Class A Fire

Build another Class A fire at a distance of about 30 feet from a pre-determined point. When it is burning freely, use the pump tank to demonstrate the length of stream. Light the fire again, and use a soda-acid extinguisher to demonstrate the length of its stream.

Light the fire again, and show how the shorter stream has more force and better effect than the long stream. Show how a stream that is played back and forth across the fire has a cooling effect over a greater area than a stream that is held steadily at one point. Show also that stream must be aimed at the base of the fire, not at the flames.

Class B Fire

Spill some gasoline along the ground. Ignite it. Then demonstrate use of foam, vaporizing liquid, or carbon dioxide in putting out the fire. Show how the extinguisher should be directed at the fire nearest you at the start, and how the fire is swept out as you advance upon it.

Place some gasoline in the metal container and ignite it. Show how the foam or vaporizing liquid should be played against the inside of the container, just above the level of the liquid. Show what happens when the fire is handled the wrong way by directing the stream into the burning liquid. Show what happens when water from the pump tank is played on the burning gasoline. The same container can be used for each fire if a little more gasoline is added after the fire has been extinguished.

Garden Hose

Show how garden hose should be kept on a reel or coiled.

Show how one man can handle garden hose, making connection to faucet—with or without adapter—and then uncoiling hose to bring nozzle within reach of fire.

Show how nozzle adjustment causes spray or solid stream. Demonstrate how stream travels farther than spray.

Drill Procedure

If sufficient kindling wood and gasoline can be obtained, small practice fires may be built to give each member of the class a chance to use extinguishers on Class A and B fires. If drills are held on Class B fires, there must also be enough recharging material for foam or vaporizing liquid extinguishers.

If it is impractical to build practice fires for the drill period, a small box can be arranged as a target, and each member of the class can be given an opportunity to use the pump tank stream on it.

The class can be divided into teams of two persons, each team to take a turn using the pump tank. The members of each team can alternate pumping and using the nozzle.

Each member of the class should be given an opportunity to practice lifting each extinguisher down from a hanger, carrying it to the scene of a fire, and using it as directed in Lesson Three.

LESSON FOUR—OUTLINE

The Fire Guard's Accessory Fire-Fighting Tools

A. Fire Guard Equipment

1. For a Fire Guard
2. For a Fire Guard Squad
3. For a mobile Fire Guard Squad
4. Equipment stations
5. Responsibility for equipment

B. Ladders (slide film sequence)

1. The straight or wall ladder
2. The extension ladder
3. Precautions in the use of ladders
4. Ladder carries
   (a) One-man carry for a straight ladder
   (b) Two-man carry for a straight ladder
   (c) One-man carry for an extension ladder
   (d) Two-man carry for an extension ladder
5. Placing ladders
   (a) One-man raise for a straight ladder
   (b) Two-man raise for a straight ladder

B. Ladders—Continued.

5. Placing ladders—Continued.
   (1) Parallel raise
   (2) Right angle raise
   (c) One-man raise for an extension ladder
   (d) Two-man raise for an extension ladder
6. Climbing ladders
7. Working on ladders

C. Other Accessory Fire-Fighting Tools of the Fire Guard (slide film sequence)

1. Ax
   (a) Cutting with the ax
   (b) Opening doors
   (c) Opening windows
   (d) Breaking glass
   (e) Carrying the ax
2. Rope
   (a) How to coil
   (b) Knots and hitches
3. Faucet adapter

D. Clothing of Fire Guards

LESSON FOUR

The Fire Guard's Accessory Fire-Fighting Tools

Objectives

At the conclusion of this lesson and the following practice-drill session, the student should:

1. Understand and be skilled in the use of the accessory fire-fighting tools of the Fire Guard Squad.
2. Understand the care and arrangement of accessory equipment for emergency use.
3. Know the types of equipment located at "lookout posts," "assembly points," and that used by mobile Fire Guard Squads.
4. Understand his responsibility with respect to the care, conditioning, and use of the accessory fire-fighting tools.

Place of Meeting and Equipment

This lesson will be conducted in the regular classroom. Equipment: Slide film projector and film strip.

A. FIRE GUARD EQUIPMENT

In Lesson Three and the following practice-drill session, attention was given to the extinguishing equipment and materials that Fire Guards will use in extinguishing fires and dealing with fire bombs. Very little has been said, however, about the personal equipment that the Fire Guard will use in performing his assigned duties.

1. For a Fire Guard

Each Fire Guard will need a helmet, an armband insigne, and a flashlight which is to be carried while on duty. This equipment may be provided by the U. S. Office of Civilian Defense or the community. This is all the personal equipment that the guard will need, since most of his work will consist of squad operations and the use of squad equipment.

2. For a Fire Guard Squad

The full list of equipment needed by a Fire Guard Squad includes:

Pump tank extinguisher (1).
Ax (1).
Ladder (1).
Rope (⅝ in.).
Water pails or containers (2 to 4).
Garden hose and nozzle.
Faucet adapter for garden hose (1).
Electric or kerosene lantern (1).
Possibly—Gas mask (1).

As has been explained in an earlier lesson, the Office of Civilian Defense will supply a certain number of pump tank extinguishers to Fire Guard units. Because of material shortages, however, only 2,258,000 pump tanks have been ordered, and these will be distributed first in areas designated as "target areas" by the Army and Navy.

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Fire Guard units in communities located outside the designated "target areas" will be supplied with pump tanks in the event that they are available after a sufficient number have been distributed in designated areas. Otherwise, communities located outside of "target areas" will have to assume the responsibility of supplying local Fire Guard units with extinguishing equipment.

Most of the squad equipment, however, can be improvised or obtained from neighbors with only a minimum expenditure of money. It is of the greatest importance that Fire Guard units make the best and most efficient use of equipment and materials for combating fire now available in their respective communities.

3. For a Mobile Fire Guard Squad

In certain sectors it will be advisable for the Brigade Leader to organize a mobile Fire Guard Squad, trained to operate at any point of special danger or emergency within the sector. Obviously, special equipment cannot be placed at several points throughout the sector for use by a mobile squad. Mobile squad members will have to improvise mobile equipment.

Some type of mobile cart might be equipped with a water barrel or two, a pump tank, a fire extinguisher, and garden hose. The cart might also be equipped with rope, an ax, a pike pole or ceiling hook, as it is sometimes called, and a ladder. It is the responsibility of the Fire Guard Brigade Leader in a given sector to indicate where the mobile squad and equipment are needed. He is likewise responsible for the training of the squad and the construction of such fire-defense equipment.

4. Equipment Stations

The regular equipment of Fire Guard Squads will be kept at equipment stations in their respective areas, and these equipment stations will normally serve as assembly points for each squad when the action signal is sounded.

5. Responsibility for Equipment

Each Fire Guard will be responsible for his personal equipment, including helmet, armband, and flashlight, and he will be expected to produce it at times of inspection. Each Squad Leader will be responsible to his Brigade Leader for the equipment issued to his squad. It will be the responsibility of the Squad Leader to see that squad equipment at the equipment station is available and in good condition at all times. This includes not only extinguishing equipment that has been issued by the Office of Civilian Defense, but also any equipment that has been obtained from the community. When squad equipment is damaged or worn, the Squad Leader will report such damage or wear to his Brigade Leader, obtain the necessary replacements or repair parts, and put the equipment in good condition.

B. LADDERS

We will now discuss ladders. To professional firemen, ladders are basic emergency equipment. They are most useful under circumstances when every second counts. Fire Guards may be handicapped in their work with ladders, however, by not being able to secure the specially designed types with which the professional fireman works. In view of this fact, Fire Guards should exercise great care in selecting and using such ladders as can be secured in the neighborhood. Not only must this care be taken to increase the fire-fighting efficiency of

guards, but also to prevent needless accidents to the guards themselves.

The handling of a ladder of any kind can be compared with the handling of a human body. If you were unable to move about and had to be carried, you would prefer to be moved by a group of trained and careful men rather than by an untrained group, lacking rhythm, care, and team-work in the carrying and placing of your body. It is an accepted fact among professional firemen that the greatest wear on ladders is not in climbing them, but in handling them. Good ladder practices not only save equipment, but increase speed of action, increase operational efficiency, and afford a greater degree of safety to the persons using them.

It is unlikely that Fire Guards will have ladders that can be used above the second floors of buildings. This restricts the length of ladders that you will use to about 20 or 25 feet. All explanations to be presented in the following slide film frames are concerned with straight or extension ladders of approximately 20 or 25 feet in length.

Slide Film Sequence

1. **The Straight or Wall Ladder**

76. This is a straight or wall ladder, with its parts appropriately labeled. Straight ladders are preferred for their strength; ladders such as those used by fruit pickers and house painters can be used safely when available. Straight ladders may range in length from 10 to 40 feet. Few are more than 32 feet.

2. **The Extension Ladder**

77. This is the ordinary extension ladder. The shorter types (18 to 26 feet) are best suited for use by Fire Guards. The main or bed section of an extension ladder is the lower section of the ladder. The fly section, the upper section. The pulley is the small grooved wheel through which the halyard is drawn. The lock or pawl supports the fly ladder after it is raised into position.

The heel, foot, or butt, is the bottom or ground end of any ladder, while the top is known as the top or tip. Rungs are the cross members between the beams which support them.

3. **Precautions in the Use of Ladders**

78. These are conditions that make ladders dangerous. The beams or rungs may break and cause serious falls. Such ladders should be repaired or, if their defective condition is such that they cannot be made safe for use, they should be discarded.

Ladders that are unsafe are worse than no ladders at all. Preferably, only new ladders should be used, but this is altogether impractical under present conditions. Those ladders that are obtained by Fire Guards for use in fire-defense activities, therefore, should be carefully inspected and tested before they are put in use. A coat of paint on sound ladders prevents deterioration.

4. Ladder Carries

(*a*) ***One-man Carry for a Straight Ladder***

79. This is the easiest way for one man to carry a short, straight ladder. The weight is balanced, yet the forward end does not obstruct his vision. Notice how the shoulder carries the load while the grip on the beam enables the Fire Guard to hold the ladder steady.

80. The person about to make the carry stands a little ahead of the center rung, facing in the direction he wishes to go. The center rung may be painted a different color to facilitate quick identification.

81. To raise the ladder, the Fire Guard leans over, grasping the nearest beam, and turns the ladder on its side.

82. The ladder is raised to the shoulder by gripping the middle of the center rung and beam, at the same time slipping the arm of the hand grasping the center rung through the forward space, and grasping the lower beam.

83. The upper beam is brought to rest on the shoulder, and the weight should be distributed so that the end faced by the carrier is slightly heavier than the other.

(b) Two-man Carry for a Straight Ladder

84. When the load is light, two men can carry a straight ladder in this fashion, turning it on its side and gripping the rungs before lifting it. An ax or other tool can be carried in the free hands.

85. This 2-man carry is the one Fire Guards probably will use most of the time in their operations.

86. To make this carry, the men take up positions on the same side of the ladder at the ends.

87. To raise the ladder, it is first turned on its side and then lifted to shoulder height by the top beam. The free hand grasps a rung about an arm's length ahead, while the hand which has been supporting the beam is slid back to take hold of an adjacent rung.

88. Turning the body toward the ladder, each carrier is then supporting the ladder with both hands on a rung, from which position the ladder can be swung onto either shoulder, depending upon the direction of travel.

89. In lowering the ladder, the lifting movements are reversed. The free hand grasps a rung ahead, the arm through the ladder is withdrawn and a grip is taken on the top beam, and the ladder is lowered to the ground.

(c) One-man Carry for an Extension Ladder

90. If an extension ladder is not longer than 24 feet, it can be carried by one man.

91. If the ladder is on the ground, turn it so the fly is underneath. Stand facing the top of the ladder, at about the middle.

92. Turn the ladder on its side and raise it to above shoulder level. Slip shoulder forward or backward until ladder balances on shoulder.

(d) Two-man Carry for an Extension Ladder

93. This is the same method of carrying a ladder as previously shown. The weight can be carried on the shoulder, or the ladder can be braced against the upper arm and shoulder.

5. Placing Ladders

94. In placing a ladder, no experienced firemen would stop to figure out whether or not it is mathematically the correct distance from a wall. Experience teaches them to place a ladder so that it will be safe.

In placing a ladder, the heels should be set at such a distance from the building that the ladder will have an angle that permits easy climbing and sufficient strength to carry its load with safety. A general rule is to take one quarter the length of the ladder and set the

heels that distance from the building. However, only the length of the ladder that is to be used should be taken into consideration. If the tip extends beyond the rest upon which the ladder is placed, the length of that extension must be ignored. Thus, if a 28-foot ladder extends 6 feet above the rest, the length of the ladder used is 22 feet, and this is the length that should be used in the calculation.

95. Do not place ladders in the center of a window, but to one side of center, thus permitting easy entrance and exit. In this position the Fire Guard will not be exposed to flame or bomb fragments flying out of the window.

(a) One-man Raise for a Straight Ladder

96. After carrying the ladder to the place where it is needed, place the heel against the building or some secure object at the ground.

97. With both hands, raise the ladder to a vertical position by walking toward the foot of it, grasping every other rung.

98. When the ladder is vertical, get a hold with each hand on rungs about three rungs apart. Lift the ladder off the ground and carry it into position. To lower the ladder, the operations are reversed.

(b) Two-man Raise for a Straight Ladder

The two-man raise is accomplished in two ways, according to the working room available. In the first, the ladder is raised parallel to the building; in the second, it is raised at right angles to the building.

(1) Parallel Raise

99. After carrying the ladder to the place where it is to be used, place it on the ground with the heels directly below the position where the top is to rest, and be sure the heels are the proper distance from the building.

100. The man on the butt end of the ladder places his feet on the heels of the beams and reaches forward, grasping a convenient rung.

101. The man at the top of the ladder raises it over his head, using the rungs, and then, traveling toward the heel, he raises the ladder.

102. When the ladder is erect, the Fire Guards take up positions on opposite sides of it, facing each other. The ladder is then pivoted on one heel and lowered onto the building. The operations are reversed in lowering the ladder.

(2) Right Angle Raise

103. To use the right angle raise, the ladder is carried to the place where it is to be used and placed in position on the ground with the heels the proper distance from the building. The raising of the ladder is accomplished in the same way as for the parallel raise, but once the ladder is erect it is simply lowered into position.

104. In pivoting ladders when raised or before lowering, one man should always place his foot against the heel to brace it and prevent slipping.

(c) One-man Raise for an Extension Ladder

105. One man can easily raise an extension ladder of 24 feet or less. The ladder is placed in a vertical position as described for the one-man raise, the Fire Guard standing on the side of the ladder that the fly is on.

106. Brace the vertical ladder by placing one foot against the side of a

beam, and a knee against the front of a beam. Allow the top to lean slightly forward to counteract the strain created by pulling against the halyard rope. Pull the halyard, and raise the ladder to the desired height. Lock the ladder locks to prevent the fly from slipping. The rest of the procedure is the same as for raising the straight ladder.

107. To lower the extension, place one foot against the bottom rung as a brace, and pull the ladder to an erect position. Unlock the locks, and lower the fly ladder with the halyard.

(*c*) *Two-man Raise for an Extension Ladder*

108. When two men raise an extension ladder, they carry it to the place where it will be used, and, following the procedure for getting the ladder erect, they will be on opposite sides of the ladder facing each other.

109. The man on one side of the ladder raises the fly by pulling on the halyard, while his partner braces the ladder with hands and feet. When the ladder is at the desired height, the locks are locked, and the ladder is lowered into position against the building. The procedure is reversed for lowering the ladder.

6. Climbing Ladders

110. It is natural for some men to climb ladders correctly, but others cannot do so without practice. Rhythm is essential, and that is best accomplished by taking every rung with the feet and every other rung with the hands, though some expert ladder men prefer to climb every rung with the hands and feet.

Never climb with the hands on the beams unless you are carrying something. Keep in the center of the ladder so it will not wobble. Use the balls of the feet. A good ladder man never looks down while climbing, and stays an arm's length from the ladder. The climbing pace should be brisk, steady, and smooth.

7. Working on Ladders

111. No man should let go his hold with both hands while working on a ladder, unless he has properly secured himself to the ladder so he will not lose his balance and fall. Fire Guards will not have life belts for this purpose, so they must know how to make a leg lock on the ladder. This is done by placing one leg through the ladder over the next rung above the one upon which he is standing. This foot is then brought back and hooked around the beam. The leg lock is made on the side of the ladder opposite that on which the work is being done. As most work is done on the right side, the leg lock is usually made with the left leg. The arch of the foot on which the weight is carried should be on the rung near the beam in a position from which it will not slide should the ladder be wet or slippery.

112. The Fire Guard is limited in effectiveness when he works on ladders because of the types of tools that he uses. The hose of the pump tank is not long enough to reach the second floor levels from the ground, and the pumping certainly cannot be done by the Fire Guard from the ladder, so the garden hose will be his chief weapon in ladder work. In carrying hose up ladders, care must be taken to keep it clear of the rungs. This can be done easily by carrying it with one hand extended out beyond the beam.

113. Hose and tools may be hauled up a ladder by a rope after the Fire Guard has assumed the position from which he will work.

114. When ladders are placed at equipment stations or lookout posts, provision must be made for caring for them properly. They should not be left on the ground nor placed upright against a building. Fasten two stout pegs or metal hooks to the wall so the ladder can be hung by the beam. If possible, it should be protected against the weather.

DISCUSSION PERIOD

The following questions may be used to test the amount of information acquired by the students in the first part of this lesson:

What personal equipment does the Fire Guard use? Who will furnish it to him?

What equipment does the squad use? The mobile squad?

Why should the Fire Guards become proficient in ladder operations?

What is a straight ladder? An extension ladder?

What is the bed ladder of an extension ladder? The fly?

What is the heel of a ladder? A rung? A beam?

Why must ladders be handled carefully?

How do you climb a ladder correctly?

How should ladders on equipment stations be cared for?

INTERMISSION—5 minutes

C. OTHER ACCESSORY FIRE-FIGHTING TOOLS OF THE FIRE GUARD

The accessory fire-fighting tools of the Fire Guard which have not been explained and described in terms of actual operations are: Ax, rope, and faucet adapter. As in the case of ladders, these will now be described and explained so that you can acquire a basic understanding of these tools. The next class meeting will be a practice-drill session, and each of you will have the opportunity to develop skill in the use of the Fire Guard's accessory fire-fighting tools.

Slide Film Sequence

1. Ax

115. The ax is considered as one of the most necessary tools of the professional fireman. This is true because it is essential in the performance of so many necessary fire-fighting actions. The pick-headed ax is usually used by firemen, but Fire Guards will, in the great majority of cases, have to use the flat-headed ax—the usual type that is available in most homes. If the fire ax were used exclusively for cutting materials not harmful to the blade, the flat-headed ax would be ideal. However, the many requirements and severe service expected of a fire ax, such as prying, digging, hacking, and cutting, give the pick-headed ax quite an efficiency advantage over that of the regular ax.

(*a*) *Cutting With the Ax*

Short, quick strokes should be used when cutting. The ax should *not* be swung as a wood chopper uses it, because of the danger of hitting other persons or catching the ax in overhead obstructions or fixtures. When using short, quick strokes, the ax is under complete control at all times.

116. When cutting flooring or roofing, the cut should be made at an angle to the grain of the wood. An angle of approximately 60 degrees has been found most efficient. Wherever possible, the cutting should be

done close to a joist or stud to increase the firmness of the cutting position.

117. The cutter should always stand outside the space to be opened. In administering short, hard strokes, the hands are well apart on the handle, and the force-applying hand should be halfway up the handle. The feet should be fairly wide apart to insure good balance.

(b) Opening Doors

118. Doors opening outward may be opened by removing the seal or stop, inserting the blade of the axe into the crack between the door and the jamb, and prying the two apart until the bolt clears. However, an ax used for prying can break rather easily, and a pinch bar is a much better tool for the purpose. If you can get one, it would be advisable to add it to your equipment.

119. Double doors may be opened by prying between the doors until the bolt of the active door clears. If an astragal covers the opening, it must be cut away before inserting the ax blade.

(c) Opening Windows

120. The check rail window consists of two sashes and is the common type used in residences. If the sashes are hung with weights, they are usually locked at the center of the check rail, that is, the upper and lower sashes are locked together. If the window has no weights, the sash is usually locked with bolts in the window stiles. Check rail windows may be opened by prying upward on the lower sash rail. If it is locked on the check rail, the screws of the lock will give, and the sashes will separate. If it is locked with bolts, these must be broken or bent before the sash can be raised. In prying, the ax blade should be inserted under the center of the sash rail. However, if the check rail latch is located at the side, the prying should be done directly under it.

(d) Breaking Glass

121. Glass in either a door or a window may be broken easily by using the flat side of the ax. The Fire Guard breaking the glass should stand to one side and strike the upper part of the glass first. By striking the upper portion of the pane or plate, the glass cannot slide down the ax handle and cut the hands. After the pane or plate has been broken, all jagged pieces of glass should be removed from the sash. Removal of all jagged pieces prevents injury to fire-fighters and fire-fighting equipment.

(e) Carrying the Ax

122. Tools with sharp blades or hooks should never be carried on the shoulder, because of the possibility of injury to the carrier or other persons in the event of a stumble or fall. Axes can be carried in special belt and shield. When carrying an ax, hold it by the handle close to the head. In this position the ax can be discarded free from the body with little effort, and others are protected from its sharp edges.

Armed with this information, the Fire Guard is ready to become a first class house wrecker—and that is the danger. Remember that uninformed persons do not always understand why it is necessary to open a floor or wall when fighting fire. So the damage that is done to property should be minimized as much as is consistent with safety.

2. Rope

Rope is a desirable part of the equipment of a Fire Guard Squad. Lengths of about 30 to 50 feet are desirable, and rope of 5/8-inch diameter is sufficient for Fire Guard use. New rope is not essential, but any that is used should be sound. Rope for use by Fire Guards should be secured on a loan basis from community agencies, establishments, or residents. It should be properly coiled and kept at equipment stations.

(*a*) *How to Coil Rope*

Firemen use a mechanical winder for coiling rope, and particular care is taken so that it will pay out without tangling. It is recommended that Fire Guards coil rope by hand, using sufficient care to keep it reasonably free from tangles.

123. Hand lines should have an eye spliced in one end, and, when coiling the rope, the eye should be held in the hand of the arm over which the coils are made.

124. To start a coil, grasp one end of the rope in the left hand, and wind the rope around the forearm which is crooked at the elbow. Lay each loop parallel with the other.

125. Lay the second layer of coils on and between the coils of the first layer, keeping the coils as neat as possible.

126. Allow enough rope so that, after the coils are completed, there will be a tail to wrap the coils in a crosswise direction for a greater part of their length.

127. When the end of the rope is reached, fold it, and slip the loop through the end of the coil. Then slip the free end through the opposite end, and through the loop. Pull the loop tight, and the process is completed.

(*b*) *Knots and Hitches*

In using hand lines for hoisting equipment, Fire Guards should be familiar with several fundamental knots and hitches. They should be easily recognized by other Fire Guards even in the dark, and Fire Guards should be able to tie and untie them in the dark.

The following knots and hitches should be practiced by Fire Guards until they can be made easily:

Square knot.
Becket bend.
Bowline knot.
Bowline on a bight.
Half hitch.
Clove hitch.
Clove hitch with one or two half hitches.

128. This is the square knot used to tie together the ends of ropes of the same size. It is the knot used in making a tourniquet, is exceptionally strong, and becomes firmer the harder the pull.

129. The becket bend is used to fasten together the ends of ropes of different sizes, or of the same size.

130. The bowline is useful in hoisting hose or other fire-fighting equipment. When it is necessary to make a loop on the end of a line, the bowline is a good knot to use. It will not slip and is easily untied.

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131. The bowline on a bight is useful when a loop is desired in the middle of a rope.

132. A hitch is a single knot or a combination of knots used in securing tools to hand lines when they are to be hoisted. This is the simplest hitch and is the basis of most knots.

133. The clove hitch is used to secure small equipment to hand lines for hoisting. When used in combination with one or more half hitches, pump tank extinguishers may be hoisted safely.

134. Here a half hitch is combined with a clove hitch to hoist a pike pole.

135. Here, half hitches are used with the clove hitch to hoist a pump tank.

136. Here is how you tie a ladder so it can be hoisted with a hand line. A hitch is made about one-third the length of the ladder from the top. The end of the rope is passed around the beams of the ladder, a loop thrown into the line, and the free end passed through it, making a bowline. The knot is pulled tight and stretched over the cross rope, completing the job.

3. Faucet Adapter

The faucet adapter is a device for connecting garden hose to faucets that are not threaded so the hose coupling can be screwed to them.

137. When properly attached, the faucet adapter permits the regular flow of water into the hose without leakage or loss of pressure. This device may be available from hardware stores, and at least one should be available to each Fire Guard Squad.

D. CLOTHING OF FIRE GUARDS

Other than the helmets and armband insignia supplied by the Office of Civilian Defense, Fire Guards will wear any type of suitable clothing that they desire. The nature of the several types of activities which will be performed will determine the types of clothing to be worn. For inspection activities and visits to occupancies in the sector, the Fire Guard should probably wear his regular clothes plus his helmet and armband insignia. For participation in squad drills and actual fire fighting, Fire Guards should wear clothing that will permit rough work and that afford some protection against actual fire conditions. It is suggested, however, that, where possible, coveralls plus helmet and armband insignia be worn during squad drills and actual fire-fighting operations.

DISCUSSION PERIOD

The following leading questions can be used to stimulate class discussion:

In using the ax, why is a short stroke better than a long stroke?

How should the Fire Guard stand in relation to a window or door when using the ax to break glass?

How should the ax be carried?

Why should rope used by the Fire Guard be kept in a coil?

What knots and hitches are used in hoisting extinguishers or tools?

What is the purpose of the faucet adapter?

ACCESSORY TOOLS

Demonstration and Drill—To Follow Lesson Four

Equipment

Straight ladder.
Extension ladder.
Ax.
Rope, 5/8-inch.

Fire Department Supervision

It is recommended that this class session, concerned with the demonstration of, and drill in, the use of the Fire Guard's accessory fire-fighting tools, be conducted by and under the supervision of a member of the local fire department.

The handling of ladders, the use of the ax in cutting and gaining entry, and the use of rope in hoisting equipment are technical operations that should be conducted by professional personnel. These operations can likewise result in serious accidents and, therefore, every safety precaution should be observed while instruction is given to inexperienced groups.

Place of Meeting

Park, open field, or playground.

Ladder Operations

Demonstration Procedure

Following the procedure presented in Lesson Four demonstrate the following:

1. Ladder carries:
   (a) One-man carry for a straight ladder.
   (b) Two-man carry for a straight ladder.
   (c) One-man carry for an extension ladder.
   (d) Two-man carry for an extension ladder.

2. Placing ladders:
   (a) One-man raise for a straight ladder.
   (b) Two-man raise for a straight ladder, parallel and at right angles to building.
   (c) One-man raise for an extension ladder.
   (d) Two-man raise for an extension ladder.

3. Climbing ladders (straight and extension):
   (a) Positions of hands and feet.
   (b) Pace.

4. Working on ladders:
   (a) Leg lock.
   (b) Raising garden hose.

Drill Procedure

Divide entire class into squads of two persons each. Require each person or squad to practice ladder carries, placement, and climbing, as well as correct position and holds while working on a ladder.

Use of the Ax

Use log or timber for cutting. Indicate on doors and windows of nearby house how they are opened with the ax.

Demonstration Procedure

1. Correct method of cutting with an ax (stance, hold, and stroke).
2. Correct method of opening doors.
3. Correct method of opening windows with the ax.
4. Correct method of breaking glass with the ax.
5. Correct and safe method of carrying flat-headed ax and pick-headed ax.

Drill Procedure

Require each member of the class to practice each of the five uses of the ax as has been demonstrated.

Use of Rope

Demonstration Procedure

Demonstrate:

1. Correct procedure for coiling rope.
2. Correct method of tying the following knots:
   (a) The square knot.
   (b) The becket bend.
   (c) The bowline knot.
   (d) The bowline on a bight.
3. Correct method of throwing the following hitches:
   (a) Clove hitch.
   (b) Half hitch.
4. Use of knot and hitches on hand lines for hoisting the following fire-fighting equipment:
   (a) Ladder (bowline).
   (b) Ax (double loop with half hitch).
   (c) Extinguisher (clove and two half hitches).

Drill Procedure

Require each member of the class, working in squads of two, to coil and carry rope, successfully tie and identify all demonstrated knots and hitches, and use hand line in the hoisting of a ladder, ax, and extinguisher.

LESSON FIVE—OUTLINE

Rescue Work and Self-Protection

A. The Fire Guard Saves a Life

1. Artificial respiration
2. Removing persons from buildings

B. Artificial Respiration

1. Prone pressure method (slide film sequence)

C. Removing Persons From Building (slide film sequence)

1. Methods of carrying people
   (a) Improvised stretchers
   (b) Chair used as stretcher
   (c) Carrying person by extremities
   (d) Two-man cradle carry
   (e) Firemen's carry
   (f) Pack-strap carry
   (g) Firemen's drag
   (h) Carry-in-arms
2. Assisting persons to walk
3. Carrying persons on ladders

C. Removing Persons From Building—Continued.

4. General safety precautions
   (a) Helping people downstairs
   (b) Putting out fire in clothing
   (c) Escape from window

D. Gases

1. Household gases
   (a) Ammonia
   (b) Natural or illuminating gas
2. Fire gases
3. War gases
   (a) Reporting presence of gases
   (b) Precautions to be observed
   (c) Treatment for exposure to gases
   (d) Protective clothing

E. Electrical Hazards in Air Raids

1. Initial precautions
2. Moving a live wire
3. Rescue work

Slide Film Sequence

LESSON FIVE

Rescue Work and Self-Protection

Objectives

At the conclusion of this lesson the student should:

1. Understand when and how to use artificial respiration.
2. Know how to remove persons from buildings.
3. Know what action to take when war gases are encountered.
4. Know what to do if a fallen wire or cable must be moved to effect a rescue.

Place of Meeting and Equipment

This lesson will be conducted in the regular classroom. Equipment: Slide film projector and strip.

A. THE FIRE GUARD SAVES A LIFE

The Fire Guard's major duty is to fight fire. During air raids, every second counts, and time that is given to any other activity only lessens the Fire Guard's effectiveness. Although he may come upon situations where he could give a helping hand, only a matter of life and death should swerve him from his duty. Neglect of a small fire may enable it to get beyond control, causing far more damage than some small emergency. The Fire Guard must not forget that there are other branches of the Citizens Defense Corps trained and ready to act in emergencies other than fire.

The only justification for neglecting the fighting of fire is the saving of a life. The Fire Guard must use judgment in measuring the severity of any situation that will take him from the pursuit of his duty. Also there may be times when he will have to weigh the possibility of endangering many lives if he stops to rescue one life. But when a human life is endangered, he should know how to act effectively, whether the situation calls for light rescue work, or other activities apart from the fighting of fire.

When entering buildings where fire bombs have fallen, he may find persons with their clothing afire, unconscious persons, injured persons, and other situations where life is endangered, or he may discover war gases. It will take quick thinking and sound judgment for Fire Guards to decide what course of action to pursue.

Only a few situations in which persons are injured require immediate action.

1. Artificial Respiration

Asphyxia, or suffocation from the effects of smoke or fire gases, is one condition the Fire Guard must be prepared to meet. When he finds a person suffering from exposure to smoke or gases, he must be able to recognize the condition and administer artificial respiration.

2. Removing Persons From Building

If the Fire Guard comes upon a person trapped in the ruins of a bombed building before the Air Raid Warden reaches the scene, he must decide at once whether he can extricate the victim with his limited means. If not, the situation must be turned over to the Air Raid Warden, and the Fire Guard should go about his own duties. The Warden will summon a rescue squad or the fire department, perhaps

both. If the Fire Guard can remove the person to safety, he must know the various methods of carrying an injured or unconscious person and be able to apply these methods to the situation that confronts him.

It is possible that Fire Guards will find fire advanced so far in a building that occupants are trapped on upper floors. Without the aid of long ladders and other equipment, Fire Guards are not in a position to carry out rescue operations in such situations. However, if the fire reaches such a stage, it is likely that the fire department or its auxiliaries will be on the scene by that time to rescue the victims.

B. ARTIFICIAL RESPIRATION

Certain accidents may cause breathing to stop. The most common of these accidents which Fire Guards will encounter may be due to asphyxiation from smoke or illuminating gas, electric shock, or concussion from explosions or from a blow on the head or abdomen. A person who has stopped breathing from any of these causes must be made to breathe at once or he will die. Do not waste time on unnecessary things but get to work immediately, using the prone pressure method of artificial respiration. Get the victim into fresh air, and proceed as shown here.

Slide Film Sequence

1. Prone Pressure Method

138. The standard procedure is to lay the subject on his stomach, one arm extended directly overhead, the other arm bent at the elbow with the face turned outward and resting on the hand and forearm, so that the nose and mouth are free for breathing. If the ground on which the subject lies slopes, always place his head down hill.

139. The operator straddles the subject's thighs, with the knees placed at such a distance from the hip bones that his hands will reach the small of the subject's back when he goes to work.

140. In placing the hands on the subject's back, the palms are placed so the little finger just touches the lowest rib, and with the tips of the fingers extending around the subject's back so they are out of sight to the operator.

141. In beginning artificial respiration, the arms are kept straight at the elbow while the operator swings the weight of his body forward so it is gradually brought to bear upon the subject. The shoulder should be directly over the heel of the hand at the forward swing. This operation should take about two seconds.

142. Then swing backward so as to remove the pressure from the subject's body completely.

This forward and backward swing should be repeated unhurriedly from 12 to 15 times a minute, providing a complete respiration for the subject in 4 or 5 seconds.

143. As soon as artificial respiration has been started, someone other than the operator, if possible, should take any foreign substance from the subject's mouth, such as false teeth, chewing gum, or chewing tobacco. The clothing should be unloosened about the neck. Throughout the treatment the subject should be kept warm. No liquids should be given through the mouth until the subject is fully conscious. He should be kept lying down after being revived, and

watched closely, because sometimes breathing stops again. If this happens, artificial respiration should be resumed at once.

144. The Fire Guard should continue artificial respiration until someone else is able to take over. Operators can be changed without losing the rhythm of respirations. There is great danger of stopping resuscitation prematurely. Breathing has been re-established in some instances after 8 hours of artificial respiration.

C. REMOVING PERSONS FROM BUILDINGS

The handling of unconscious or injured persons is a serious matter. If a person is injured, his condition can be aggravated by careless handling. But when a building is burning, there may be no time for Fire Guards to look for a stretcher or take the care that might be otherwise exercised. The important thing is to remove the victim to safety where he can be given first aid or medical treatment as required.

1. Methods of Carrying People

145. A person with a fractured leg, spine, or a crushing injury to the chest, abdomen, or pelvis should be transported by some sort of improvised stretcher carried by at least two bearers. If fire conditions in the building warrant the immediate removal of the person, before the service unit trained to care for injured persons arrives, Fire Guards should be prepared to improvise stretchers from such common equipment and materials as window shutters, boards, ladders, benches, cots, doors, and the like. The victim should under no circumstances be lifted onto the stretcher, but rolled onto it and carried cautiously out of the building.

(*a*) *Improvised Stretchers*

(*b*) *Chair Used as Stretcher*

146. A convenient method of carrying a person without a stretcher, if the person does not appear to be seyerely injured, is to seat the person on a strong chair. Two Fire Guards are needed to lift the chair. One takes a grip on the lower part of the front legs, while the other holds the back of the chair. This method is valuable in carrying a person up or down stairs. The bearer carrying the legs of the chair will usually find it helpful to brace one shoulder against the wall as he goes up or down. This considerably lessens the danger of losing balance and falling.

(*c*) *Carrying Person by Extremities*

147. Two Fire Guards can carry a person by the "fore and aft" method. One bearer takes a position between the legs of the subject and gets a grip on the legs under the knees.

148. The other Fire Guard puts his arms under the subject's arms from the back while the subject is in a sitting position. Thus, the subject's back and head are supported against the man having the arm grip. This carry can be used safely and conveniently when the body has not received a serious injury. It is not to be used in fracture cases.

(*d*) *Two-man Cradle Carry*

149. In another two-man carry, which may be used when the victim is not seriously injured, the bearers kneel on each side of the injured person, near his hips, and raise him to a sitting position. Each then passes one arm around the subject's back just under the armpit, and the other arm under the subject's thighs.

150. The bearers slowly rise to their feet, and, if the subject is able to do so, he should put his arms around the necks of the bearers.

(*e*) *Firemen's Carry*

151. The firemen's carry is one which may be used when the victim is unconscious and is one the Fire Guard should thoroughly understand. The bearer faces the subject, who is presumably on the floor, and, with his hands under the subject's armpits, lifts the subject to his knees.

152. The bearer should hold the subject in this position while he shifts his hands lower down and clasps them behind the subject's back. With this position, the subject may be raised to a standing position.

153. The bearer supports the subject by placing his left leg between the subject's legs while grasping the left wrist in the right hand.

154. Holding the subject close, the bearer brings the subject's left arm around in back of his, the bearer's, neck. Then he passes his left hand between the subject's legs, and grasps the left thigh.

155. While having this hold, the bearer stoops quickly and pulls the subject's trunk across his shoulders with the right hand.

156. Now the bearer can straighten up, having the subject's weight evenly divided, the lower trunk and hips on the bearer's left shoulder, his upper trunk and head on the right shoulder. The subject should be carried buttocks first through narrow windows or doors.

157. To put his burden down, the bearer kneels on the right knee, reaches with his right hand to grasp the subject's right knee, and slides the subject around in front of him down the bearer's left thigh to a sitting position.

158. When the subject is in a sitting position, the bearer shifts his hands from subject's knees to his shoulders and eases him down upon his back. Care must be taken to prevent the subject's head from hitting the ground. This lift and carry require some practice. If the bearer wishes to use the right shoulder instead of the left, the hand and leg would be reversed accordingly.

(*f*) *Pack-strap Carry*

159. In the pack-strap carry, the subject's arms are brought across the bearer's shoulders, taking care that the subject's armpits are well up on the shoulders. The arms are crossed in front where they may be held in place by one of the bearer's hands.

160. In this carry, the bearer can carry a greater weight with safety to himself than in any other carry. However, the subject's injuries may prohibit its use. This carry is useful in lifting a person from a bed or chair.

161. (*Slide omitted.*)

(*g*) *Firemen's Drag*

162. Where the subject is unconscious and must be carried from under a low-lying ceiling or any space which does not permit the rescuer to stand up, the firemen's drag may be used. The subject's wrists are tied together. The rescuer then passes his head between the arms, raises the subject's head and shoulders just off the floor, and then, by crawling, drags the subject. The head can be prevented from dragging against the ground by pulling the coat collar up over it.

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(*b*) *Carry-in-arms*

163. It takes considerable strength to carry a person in your arms. To lift the subject, pass one arm beneath his knees and the other around his back. The arm must be placed well forward before commencing to lift. This is not an easy carry unless the bearer is strong and the subject light.

2. Assisting Persons to Walk

164. There may be occasions when the Fire Guard will wish to assist a person to walk. In doing so, you should take a position at the person's side and place his arm around your neck while you hold him with your arm around his back and under the arm.

3. Carrying Persons on Ladders

165. When an unconscious person is carried down a ladder, the firemen's carry is used.

166. When a person is frightened or physically weak, the method shown here should be used. The Fire Guard takes a position on the ladder facing the building so he can assist the person onto the ladder.

167. Place your feet on a rung below the person's feet and place your hands on a rung in line with your shoulders, keeping the subject between yourself and the ladder.

168. In descending, start with the same foot as the person and keep step with him, taking only one step at a time and allowing your knees to pass out over the beams. If you talk to the person while descending the ladder, you will be able to take his attention from the fear of falling.

169. While helping a person descend a ladder in this way, you can protect him if he faints or collapses. Simply use the weight and pressure of your body to pin him against the ladder. Call for help at once.

170. The man coming to your assistance should climb the ladder, free the person's feet from the rungs, and place them sideways on the beams. Meanwhile, you are holding the person's weight by your arms under his armpits.

171. When the subject's feet are in position, allow him to slide down, taking one rung at a time, holding his weight on your arms. If he is heavy, he can be pinned against the ladder with the pressure of your body while changing hands from rung to rung.

4. General Safety Precautions

(*a*) *Helping People Downstairs*

172. This is the easiest way to take an unconscious person downstairs. At the top of the stairs, lay the victim on his back, head toward the stairs. Support him by the armpits, moving slowly backward down the stairs.

(*b*) *Putting Out Fire in Clothing*

173. If your clothing catches fire, put your hands over your mouth and nose to avoid breathing flame, and throw yourself on the ground, rolling to smother the flame.

174. If another person's clothing catches fire, hold a blanket, overcoat, or rug before you, wrap it around the person, moving from head downward, and throw him to the ground, rolling him to smother the flames.

(c) Escape From Window

175. If it becomes necessary to escape from a window without the assistance of a ladder or rope, climb out onto the sill, sitting with your legs hanging free.

176. Then turn over on your stomach on the sill so as to face the wall.

177. When you drop, bend the knees so the force of the fall will be broken. Keep your body limp.

DISCUSSION PERIOD

The following leading questions are to stimulate class discussion:

Under what conditions should the Fire Guard render assistance to the injured or trapped?

What is the purpose of artificial respiration?

What should Fire Guards do when they find injured persons whose conditions are not serious?

What is one advantage of using a chair to move an injured person?

Should a person be carried by the extremities if he has sustained a fracture?

When the firemen's carry is used, how should the subject be moved through narrow doors and windows?

What carry is useful for lifting a person from a bed or chair?

What carry should be used to bring an unconscious person down a ladder?

INTERMISSION—5 minutes

D. GASES

There are a number of dangerous gases that may be encountered by Fire Guards. Some of them are used in our homes every day and you may be familiar with them. Others are products of combustion. Still others may be used as weapons of war.

1. Household Gases

There are at least two gases which are common and under certain circumstances necessary for the efficient operation of homes. These two gases are used as a refrigerant and for lighting and cooking.

Under normal circumstances these gases are seldom encountered since they are usually enclosed in pipes. Under conditions of air attack, however, the pipes may be broken and the gases escape, constituting a serious menace to the lives of occupants of buildings as well as to Fire Guards.

(a) Ammonia

Ammonia is commonly used as a refrigerant and if the atmosphere contains more than 3 percent of the gas, it is considerably irritating to the nasal passages, causing sneezing and watering of the eyes. The gas also irritates the skin. When there are large concentrations of the gas in an enclosed atmosphere, a special type of rescue mask should be used by persons entering the premises. Army and civilian gas masks provide no protection whatsoever against this gas. Ventilation is effective in reducing the gaseous concentration and, therefore, the harmful effects of the gas.

(b) Natural or Illuminating Gas

Natural or illuminating gas in confined areas is asphyxiating and in certain percentages highly explosive. Ventilation and stopping the escape of the gas are the most effective means of reducing the life and fire hazards of natural or illuminating gas.

2. Fire Gases

The term "smoke poisoning" is used by newspapers and laymen to describe the effect of exposure not only to smoke, but also to fire gases and superheated atmospheres. Fire Guards or others who become dazed or dizzy while working in a room containing smoke should be sent or carried into fresh air and made to remain in a relaxed position until recovery is complete.

If an unconscious person is found with burns about the nose and mouth, indicating that the victim has inhaled flame or superheated air, artificial respiration should not be attempted by the Fire Guard, for it might result in more harm than good. But for persons suffering from suffocation as the result of breathing smoke or fire gases, artificial respiration by the prone pressure method may restore them to consciousness.

3. War Gases

War gases, or chemical agents, used to produce casualties, may be dropped in bombs or simple containers. The liquid vesicants or "blister gases," such as mustard and lewisite, may also be sprayed by airplanes. They give off a dangerous vapor that acts as a war gas and, unless chemically neutralized, these liquids may persist for a week, contaminating the air for a considerable distance down wind.

As this is written, war gases have not been used against the British or others trained to protect themselves, but they have been used against the Ethiopians and the Chinese. We must face the possibility that gas may be used against us, and should prepare accordingly.

(a) Reporting Presence of Gases

If the Fire Guard detects the presence of poisonous gases, he should report it at once to the Air Raid Warden who will summon a Decontamination Squad, and if necessary evacuate the area.

(b) Precautions to be Observed

If caught outdoors in a gas attack, get out of the area at once. Do not look up to see the enemy planes. You may suffer a serious eye injury from droplets of liquid or spray. Do not worry about any brief vapor exposure to which you may be subjected. The danger from this source is not great.

Prompt action will avoid serious effects. If you know or suspect that you have gotten any of the gas on your person or clothing, do not go hunting for a casualty station or gas cleansing station and expect someone else to help you. Knock on the first door you come to and do whatever is necessary for yourself. Self-aid is the quickest and safest way.

(c) Treatment for Exposure to Gases

This is what you should do. This routine should be memorized so it will be done automatically in an emergency:

(a) Remove shoes and outer clothing and drop them outside the house, in a covered can, if available. Do not touch this clothing again except with sticks or gas-proof gloves. Do not cling to false modesty. To enter a house with contaminated clothing endangers everyone in it.

(b) Get to a bathroom, kitchen, or laundry room as fast as possible.

(c) If your eyes have been exposed to liquid gas or spray, flush them immediately with large amounts of fluid. To be of any use, this must be done within 5 minutes. Plain water out of a faucet, shower-head, canteen, or douche bag will do, but a lukewarm dilute solution of baking soda (heaping tablespoonful in a quart of water) is even better, if it is handy. Let anyone nearby help you.

(d) If drops of liquid blister gas have splashed the skin, you can prevent serious burns by promptly blotting up the liquid with pieces of cleansing tissue, cloth or a handkerchief which should be disposed of carefully so that it cannot contaminate anyone else. Then sponge the skin briskly with laundry bleach containing sodium hypochlorite, and rinse off under the shower or in a tub. This should be followed by vigorous lathering and a thorough bath. The skin should be patted, but not rubbed, dry. Dress in whatever clean clothing you can get to go home in. If blisters develop, you should seek medical advice.

(e) If your nose and throat feel irritated, snuff and gargle with a dilute baking soda solution. If your chest feels heavy and oppressed, if you have any trouble breathing or if smoking becomes distasteful, lie down immediately and stay perfectly still until you can be taken to a doctor. Do this even if you feel fine otherwise.

(d) Protective Clothing

The liquid vesicants are very penetrating, and ordinary shoes or clothing offer little protection. Full protection against these chemical agents is afforded persons whose duties take them into contaminated areas by gas-proof clothing, covering the wearer from head to toe, and tightened at neck, wrists, and ankles. The greatest care must be used in removing such clothing after exposure to lewisite or mustard. This may be done at cleansing stations designated for the use of personnel of the U. S. Citizens Defense Corps.

E. ELECTRICAL HAZARDS IN AIR RAIDS

When electric power lines have been damaged, electricity becomes a tremendously dangerous force. Because the performance of your duties as Fire Guards may bring you into situations where electric cables or wires have fallen, as the result of an air raid or other cause, it is imperative that you understand exactly what to do in such cases.

The voltage, and consequent danger, of a wire cannot be judged by its size or general appearance. Even if it could, it should be remembered that a comparatively low voltage, under certain conditions, is sufficient to cause death. Always assume that any wire or cable is a "live" and dangerous one until it has been proved safe.

1. Initial Precautions

As soon as possible, notify the Air Raid Warden of any such situation. Until an experienced utility repair crew arrives on the scene and makes necessary repairs, no one should be allowed to touch or handle a fallen wire. No amateur electricians should be allowed to "try a hand" at such a time.

2. Moving a "Live" Wire

If it should be necessary to move a wire to effect rescue work, use a long *dry* stick, a *dry* board, a *dry* rope, or other material which will not conduct electricity. Use no metal whatever. Be especially

careful in your selection of the object to be used; many materials commonly thought to be nonconductors will, under certain conditions, carry an electric current. For example, even apparently dry clothing may have a sufficient residue of salt from perspiration to conduct an electric current.

If necessary to move the wire, be very sure the ground you stand on is perfectly dry. If at all possible, secure a large *dry* board and stand on this while moving the wire with a non-conducting object.

Never attempt to climb poles, towers, or other structures to investigate an electrical hazard. And never permit yourself or others to work around fallen wires while wearing a metal helmet.

Should Fire Guards be fighting a fire where such wires are located, remember—*water is a conductor of electricity*. Live wires in water or upon wet surfaces may energize the surrounding ground or pavement; thus it is extremely dangerous to use water under such conditions. If essential to continue the use of water in extinguishing a fire in such an area, it is necessary to keep still farther away from the fallen wires than under ordinary conditions.

3. Rescue Work

Attempting to rescue a person from contact with a live wire is very dangerous. Do not touch any portion of the person's body until he has been freed from contact with the wire, and do not touch the wire with your hands or body. Do not attempt to cut the wire unless you have been trained and authorized to do such work, and have the proper equipment. Experience has shown that even the insulated coverings of wires afford little, if any, protection. Heavy rubber gloves may give some protection, but even these should not be depended upon.

In some cases, it may be possible to free a victim by pulling upon his clothing, but this is dangerous because of the possibility previously mentioned—that the clothing may conduct electricity because of a residue of salt from perspiration. The safest and most fool proof step is to have the current shut off, if at all possible, before attempting a rescue.

In any case of electrical shock, artificial respiration should be administered immediately after the victim has been removed from the live wire, using the prone pressure method. The victim should be given medical attention as soon as possible.

Slide Film Sequence

178. If you get gas on your person, do not take the time to get to a cleansing station. Stop where you are and enter the first building you come to. Before you go inside, remove your shoes and outer clothing, placing them in a covered metal can, if one is available.

179. Find your way to a bath, kitchen, or laundry room without delay. What you need is water, and plenty of it, and perhaps baking soda or laundry bleach which you will find in many dwellings.

180. If your eyes have been exposed to liquid gas or spray, flush them at once with large amounts of water. Plain water from the faucet, shower, or canteen bag will do. Even better is a lukewarm dilute solution of baking soda.

181. If the liquid gas has splashed or sprayed on your skin, promptly blot it up, using a cleansing tissue or handkerchief. Dispose of the material carefully so it cannot contaminate anyone else.

182. Then briskly sponge the affected parts with laundry bleach that contains sodium hypochlorite. After that, rinse off the bleach in a shower or tub, and follow with a vigorous lathering and a thorough bath. Don't rub the skin to dry it, but pat it. Dress in whatever clean clothing you can get, to go home in.

183. If your throat and nose are irritated, snuff and gargle a baking soda solution. Irrigate the throat and nose well, using the same lukewarm solution recommended for cleansing the eyes.

184. If blisters develop from contact with the gas, seek medical assistance. If your chest feels heavy and oppressed, and if you have trouble breathing or if smoking becomes distasteful, lie down immediately and stay still until you can be taken to a doctor. Even though you may feel well otherwise, when such symptoms are experienced you must lie down and not move about.

185. Remember, the liquid blister gases will penetrate ordinary clothing and shoes. Only men dressed in gas-proof clothing can move safely about a contaminated area. If you encounter gas, report it to the Air Raid Warden who will call the necessary help.

186. Another hazardous condition you may find is fallen wires or cables that prevent you from carrying out your duties. Always assume every fallen wire is "live" and dangerous until it has been proven safe. If the situation does not prevent you from carrying out your duties, notify the Air Raid Warden, and he will summon a utility repair crew.

187. If you must move the wires, do so with a dry board, stick, or rope. Make certain it is dry. Remember that any metal or anything wet can conduct electricity. Be sure that you stand on dry ground while moving the wire. If possible, obtain a dry board and stand on it.

188. In attempting to rescue a person in contact with a live wire, be certain that he is freed of contact with the wire before you touch any part of his body. Do not touch the wire under any circumstances. The safest step is to have the current shut off before attempting a rescue.

189. In any case of electrical shock, artificial respiration should be administered immediately after the victim has been removed from the wire, using the prone pressure method. The victim should be given medical attention as soon as possible.

DISCUSSION PERIOD

The following leading questions may be used to stimulate discussion:

What should the Fire Guard do upon detecting war gases?

What should you do if you know or suspect that you have gotten gas on your person?

How should you move a live wire?

Should any metal object or wet object be brought in contact with a fallen wire or cable?

RESCUE WORK AND SELF-PROTECTION

Demonstration and Drill—to Follow Lesson Five

Supervision

This demonstration and drill should be supervised by an official first aid instructor.

Place of Meeting

Regular classroom.

Drill Procedure for Artificial Respiration

Class can be divided into teams of three to practice artificial respiration. Each member of a team should act both as subject and operator. Have team members practice changing places as operators without losing rhythm of respiration.

Drill Procedure for Carries

Do not permit physically weak persons to lift and carry others; they may strain themselves seriously.

Select members of the class, with regard to weight, to act as bearers and patients.

Instructor should explain that ladder carries discussed in Lesson Five cannot be attempted until students have considerable experience in ladder work. Ladder carries require strength and skill that students cannot be expected to have at this point in their training.

Following the procedures outlined in Lesson Five, demonstrate the following:

Two-man carries:
- Chair used as stretcher.
- By the extremities.
- Cradle carry.

One-man carries:
- Firemen's carry.
- Pack-strap carry.
- Firemen's drag.
- Carry-in-arms.
- Assisting persons to walk.

LESSON SIX—OUTLINE

Fire Guard Survey

A. The Survey Plan

1. Introducing the Fire Guard
2. Explaining the plan
3. Use of Form A
4. Use of Form B

B. The Fire Guard's Relations with People

C. Preparing Maps

1. Building maps
2. Block or sector maps
3. Map symbols

D. Water Supplies

1. Reserve supplies in emergency container
2. Sprinkler systems
3. Standpipes

E. Establishing Lookout Posts

1. Roof lookout posts
2. Ground lookout posts
3. Lookout post equipment

Slide Film Sequence

Practice Period

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LESSON SIX

Fire Guard Survey

Objectives

At the conclusion of this lesson the student should:

1. Understand Fire Guard procedures in protecting an area against incendiary bombs.
2. Know how to survey a building for the purpose of becoming acquainted with its layout.
3. Know how to record necessary information about the layout of buildings and on the locations of fire-fighting equipment and materials.
4. Be prepared to invite public cooperation in the Nation's Fire Defense Program.

Place of Meeting and Equipment
(Note to instructor)

This lesson will be conducted in the regular classroom. Equipment: Slide film projector, slide film strip, blackboard, paper, and pencils.

(It is of the utmost importance that the text of this lesson be adapted to local conditions, with respect to types of occupancies discussed, types of maps to be made, location of blackout posts, etc.)

A. THE SURVEY PLAN

We speak of the neighborhood to which a Fire Guard is assigned as an "area" within the sector. The area may consist of a single floor in a large building, or an entire building, or several buildings. Whatever its nature, the Fire Guard must be thoroughly familiar with it, so that during an air raid or other fire emergency he can find his way about quickly and easily.

You will recall that one of the functions of the Fire Guard is the identification of fire hazards and obtaining the cooperation of building occupants in the removal of these hazards.

There is only one way the Fire Guard can gain possession of the necessary information about his assigned area and perform his remedial functions. He must go out into his assigned area, look at conditions, talk to people, and make a record of the things he finds. This record must be kept in such form that it can be referred to and quickly understood by the Brigade Leader or by other members of the squad or brigade.

To assist the Fire Guard, a Survey and Self Inspection Plan has been prepared, applying to each building.

This plan consists of:

1. Introduction of the Fire Guard to the occupant of the premises by an Air Raid Warden.
2. Recording of the needed information on a survey form (see pages 86 and 87).
3. Providing occupants with a Self Inspection Form which will help them recognize fire hazards (see pages 88 and 89).

The Air Raid Warden Service has been established in practically all communities or localities where there is a branch of the Citizens Defense Corps. In each sector of these communities, the occupants of buildings probably are now acquainted with their wardens. So it is

recommended that, when the Fire Guard goes out to meet people on his assigned area, he be accompanied by an Air Raid Warden. On subsequent visits, the Fire Guard should in every instance be accompanied by another Fire Guard or by a Warden, and the two should remain together all the time they are on the premises. Official Fire Guard insignia (armbands) should be worn without exception on all survey tours and visits. These stipulations prevent many embarrassing situations and misunderstandings.

1. Introducing the Fire Guard

In making introductions, the Air Raid Warden should explain that the Fire Guard has volunteered to help protect the neighborhood from incendiary bombs and the fires started by the bombs, and has become an accredited member of the local civilian protection organization.

The introduction should be made somewhat in the following manner:

"Mrs. Jones, this is Mr. _____, one of the Fire Guards in this sector. He has volunteered his services to aid in protecting this community, during the emergency, against fire. It will be his job during air raids to help protect our neighborhood from incendiary bombs. If a bomb strikes your home, he is the man who will be ready to help you dispose of it and to put out any small fires started by bombs. If a raid comes, Mrs. Jones, we will need your help and you will need our help. We are all fighting this war together."

2. Explaining the Plan

If Mrs. Jones is impressed by the necessity for cooperation, she probably will ask at this point what she can do. The Fire Guard should then explain further in the following manner:

"The Fire Guard organization, Mrs. Jones, is made up of people in the neighborhood who are trained to handle fires and fire bombs. We have attended a course of lectures and a number of practice drills in order to learn what to do if fire occurs. If a fire bomb drops into your house, we have to know how to dispose of it quickly and how to put out any fire that occurs, with as little damage as possible. It will help us a lot in our work if we learn in advance something about the physical layout of your house—where doors to the attic or roof are located, where you keep fire-fighting equipment, and other facts of that nature. There are some things you can do, also, in order to make your home safer from fire, and perhaps I can help you make those preparations. If fire losses are to be kept at a minimum we must all work together, the men and women in the Citizens Defense Corps and yourself. This is a cooperative job, and our neighbors must realize this."

3. Use of Form A

"Now, I have a few questions to ask, if I may." (Fire Guard asks questions to fill in check list, pages 86 and 87, Form A.)

4. Use of Form B

"I am going to leave a Fire Defense Self Inspection Form with you, Mrs. Jones. It tells you how you can make your home safer from fire and air raids. You will see that it contains a guide so you can inspect your home for common fire hazards and eliminate those that you discover. If you wish, I will be glad to help you fill out this form and explain other recommended procedures which you should follow in the event of air raids. (Form B, see pages 88 and 89.) It is only for your own information, and we are giving them to everyone."

B. THE FIRE GUARD'S RELATIONS WITH PEOPLE

There are certain things the Fire Guard must keep in mind in meeting and talking with the people in his area. He has no authority to force his way into a home for the purpose of inspecting the property. He enters the home as a guest, obtains the information he needs as a matter of courtesy, makes fire-defense suggestions when requested, and gives instruction on procedures and actions in fire defense when such are desired by the occupants. If he is denied access to a building, he can report the matter to his Brigade Leader, in whose hands all responsibility for further action must rest. If such matters are taken care of in an orderly manner, the Fire Guard will gain the respect of the householders for the branch of the Citizens Defense Corps he represents. There will be no difficulty obtaining the cooperation of neighbors in most cases, but the exceptional case must be taken into consideration. In such cases, the importance of having the Fire Guard make his calls in the company of an Air Raid Warden or with another Fire Guard is apparent.

C. PREPARING MAPS

1. Building Maps

From the check list (Form A) which the Fire Guard has made for each building that has been assigned to him, building maps may be made, if the Brigade Leader considers them desirable. It will also be within the Brigade Leader's discretion to decide just how much of the information obtained on the check list should be indicated on any building maps which he believes required. (Form C, page 90.)

2. Block or Sector Maps

After maps have been made of each building in the block, a map of the entire block can be compiled, showing the details that appear on the individual building maps, but including such things as driveways, walks, and fence lines. If building maps are not made, the information can be transferred from the check lists to the block or sector maps.

These block maps will probably be the basis for the Fire Guard Squad maneuvers in planning approaches to various parts of the area under actual air raid conditions. Fire Guards must carry out their duties during blackouts when they must be able to move from one part of the area to another in darkness, so it will be helpful if they are familiar with the information contained in these block or sector maps.

In addition to whatever information about individual buildings the Brigade Leader decides should appear on block or sector maps, the following information should appear:

Location of short cuts through driveways, yards, and between buildings.

Location of lookout posts.

Location of special fire hazards outside of buildings, such as gasoline, or oil storage tanks that are above ground.

Location of ladders outside of buildings.

Location of fire alarm boxes.

Location of the Warden's Sector Post.

Location of squad equipment stations.

All of the information to appear on the block or sector maps will necessarily be determined by local conditions, and it will be left to the Brigade Leader's judgment as to just what information shall be required.

3. Map Symbols

Suggested map symbols appear in Form C. Reference to the sample map will show how easy it is to lay out a simple floor plan and fill in the essential details. (Place Form C on blackboard, and the building in which the class is meeting may be surveyed to give practice to the students in filling out the form. This is in addition to the standard explanation which follows.)

Fill in the lines at the top to give the number of floors in the building and a description of the building. The symbols at the bottom of Form C are self-explanatory.

On the building map, the symbol for a faucet in the kitchen and bathroom shows where water connections are available for garden hose or where water can be obtained to fill pump tanks. The front part of the floor plan obviously contains living or sleeping rooms where no water connections are available.

The front or street entrance to the building is shown at the right hand corner of the plan and the initials (2W) and S on 1F show that there are two containers of water and a stirrup pump on the first floor at the foot of the stairs.

The basement stairs opening from the driveway are clearly indicated, and the symbol for garden hose shows where a hose will be found in the basement. The entrance to the attic, if there is one—which would be noted at the top of the form—can be assumed to be over the front stairway, since it appears nowhere else, and that is the reasonable place to expect such a stairway to be located.

D. WATER SUPPLIES

Water is the most readily available and most effective extinguishing agent for most of the fires that will be encountered by Fire Guards.

In air raids, however, normal water supplies cannot be depended upon. Water mains may be broken by high-explosive bombings. Or the public fire department may be pumping quantities of water so that mains are without adequate pressure.

The Fire Guard must have independent sources of supply that are adequate for the pump tanks he will use. The supply must be available on the various floors of buildings and in all buildings of an area.

People may be reluctant to make such supplies available, and yet it is part of the Fire Guard's job to convince them that it is necessary for the defense of homes and other structures.

1. Reserve Supplies in Emergency Container

This is a time of critical shortages of some materials. There are not enough 12- or 16-quart pails on the market to furnish every building with new water containers. But this is not necessary. Any container that will hold water without leaking can be used.

Wooden casks and barrels, oil and grease drums—almost anything will do. It is recommended that about 10 gallons of water be available on each floor of the average private residence, and comparable quantities should be placed in larger areas.

The time to prepare these supplies is before raids come. It will be too late if people wait for the alert signal before a raid to draw water into pails and barrels. Such a procedure, if carried out throughout a community at the same time, would seriously deplete the water supply.

In making their first survey of a building, Fire Guards can note available locations for storing containers of water. At the next or subsequent visit, reference can be made to the Fire Defense Survey, with the suggestion that something be done about supplying containers of water in order that the Fire Guard can fill out his report form and file it with the Sector Brigade Leader.

If people object to having containers of water on the premises because mosquitoes might breed in the water, Fire Guards should explain that a small amount of kerosene or light oil placed in the container will form a film on the surface of the water to prevent this from happening.

2. Sprinkler Systems

Although the Fire Guard must depend upon the water supplies we have just discussed, he may have the assistance of other supplies to help him. One is automatic sprinklers. These are generally fed water from gravity tanks atop buildings, or water is pumped into the sprinkler system by powerful water pumps. The automatic sprinkler, as its name implies, is a device for automatically distributing water upon a fire. The water is distributed through a system of piping, ordinarily attached to the ceiling, and the sprinkler heads are placed at intervals along this pipe. The heat of a fire causes the sprinkler heads to open, usually by melting a fusible link.

In buildings where there are sprinkler systems, the operation of the system will be controlled by those on the premises, and it is unlikely that Fire Guards need be concerned about them in any way. Unless members of the building staff happen to be Fire Guards and also have the responsibility of operating sprinkler control valves, *the Fire Guard should not under any circumstances attempt to open or close control valves.*

3. Standpipes

Many large buildings are equipped with a standpipe system, connecting to hose arranged on reels at locations on the different floors and in all wings of the structure. These may be supplied by water from a gravity tank or by a fire pump. Water is admitted to the hose by opening a valve in the standpipe. Fire Guards on duty in buildings where there is such equipment will probably receive special instruction in its operation. If the water supply is uninterrupted during a raid, standpipes will be a valuable weapon in the Fire Guard's arsenal.

E. ESTABLISHING LOOKOUT POSTS

Lookout posts for air raid action may be located on roof tops, in the entrances of buildings, or at other points of vantage. They may be located almost anywhere, since their purpose is to provide a series of points where Fire Guards may be stationed during an air raid in order to keep every part of a given area under observation. From these lookout posts, Fire Guards will summon and direct other guards to enter buildings and dispose of bombs.

The posts are selected by the Sector Brigade and Squad Leaders. As the post will usually be located on private property, suitable arrangements for establishing and maintaining it must be made with the owner. There can be no set rules for establishing and locating

lookout posts, as local conditions and guard activities will make a variety of methods necessary.

1. Roof Lookout Posts

Large buildings having considerable roof area of different levels may require one or more lookout posts, while one post may adequately cover a block of private homes. In congested city districts where adjoining roofs make it possible to pass from the roof of one house to that of another, a lookout post may command observation of a number of buildings. If possible, some protection should be provided for guards on duty at roof lookout posts. Sandbags may be used to build a high barricade around the place where the guards will be on duty.

2. Ground Lookout Posts

Posts at ground level may be located where the protection of buildings will give some security to the guards on duty. The entrance to a commercial building, an areaway below street level, the cover afforded by the entrance to a garage—any of these may be utilized as needed, and additional protection may be provided in the form of sandbags.

3. Lookout Post Equipment

Extinguishing equipment should be located at each lookout post. This should consist of a pump-tank, chemical extinguisher (utilizing water or foam), or a garden hose (with easily available faucet). An ample reserve of water should always be located at each lookout post, and, if required, a ladder may be kept on hand together with other available small fire-fighting tools.

(Discuss briefly local methods of establishing and locating lookout posts.)

Slide Film Sequence

We will assume that the Fire Guard is ready to go out into his assigned area and begin the task of familiarizing himself with the existing conditions. He has been assigned, we will suppose, to the houses on one side of the street within a certain block. His leader has conferred with the Senior Warden in the sector, and an Air Raid Warden, who knows the people on this block, has been designated to make the calls with the Fire Guard. Other guards in his brigade are working in other sections of the block so he does not need to concern himself with anything but the area assigned to him.

190. The Warden and the Fire Guard make their first call. Mrs. Jones knows the Warden so she is reassured that her callers are not people who will annoy her. She appraises the Fire Guard, taking note of his attitude. If he is courteous, friendly, and reassuring, she will welcome him.

191. The Warden has introduced the Fire Guard and the latter has explained the purpose of their visit. Mrs. Jones is glad to help. She has read and heard about the danger of incendiary bombs and she has thought some about what she and her family would do if an air raid occurred.

192. The Fire Guard explains the purpose of Form B (Fire-Defense Self Inspection Blank). Mrs. Jones thinks Mr. Jones will know more about the questions, and, when he comes home, she will show them to him.

193. The housewife is glad to give the Fire Guard the information he needs to complete his survey. He has been using his eyes while she has been talking, and it takes only a moment for him to note on Form A the information he wants.

194. Here is where diplomacy is needed. The Guard points to the pile of paper and tells the housewife that it might be difficult to fight an incendiary bomb that dropped in such a place. With all that paper around, the bomb could start a fire quickly before anyone could get at it. The questions on that form will help the housewife find such points of danger, and the Fire Guard suggests that she use the form in making an inspection of her home.

195. The Fire Guard explains that attics are danger spots in air raids because fire bombs may strike there. He tells the housewife that her entire home would be safer if the things she could throw away were taken from the attic. Then there would be room to fight a fire bomb and less combustible material for the bomb to ignite.

196. If the Fire Guard thinks that Mrs. Jones is friendly and cooperative, here is his last chance on this visit to offer to help Mr. Jones check over the common fire hazards in the house. "*We'll be glad to come back when Mr. Jones is home*," he tells the housewife. If she agrees this would be helpful, the Fire Guard will make a definite appointment, and, accompanied by the Warden or another Fire Guard, he will keep it on time.

197. When the Fire Guards have obtained the necessary information about a block or area, it is a simple matter to compile a map which will be kept in the sector post. A high-school student studying mechanical drawing or draftsmanship can help in making the map. Some community plan may be arranged for obtaining special help in completing plans, since they are to become more or less permanent records.

198. A block or area map will be helpful in establishing lookout posts in the block, for it will reveal roof levels and points of vantage that may not be apparent just by studying the skyline of the neighborhood. Every part of the block should be under observation during a raid, and lookout posts will be arranged accordingly.

199. The block or area map will be of great assistance in planning maneuvers for Fire Guard Squads. Where a high fence is located, it be necessary to place a ladder. A shed in a backyard may be a convenient place for locating several barrels of water.

200. Remember, Fire Guards are not policemen, nor are they firemen. They volunteer and are trained for the protection of their neighborhoods against fires and incendiary bombs. They must know their neighbors and the nature of the buildings in the area. If their neighbors have confidence in them, their work will be easier, and they will be more effective as Fire Guards during emergencies.

DISCUSSION PERIOD

The following questions are presented to stimulate class discussion:

What are the circumstances under which a Fire Guard should meet or visit occupants or residents?

What should the Fire Guard know about each building in his assigned area? His sector? His relations with occupants or residents that he visits?

INTERMISSION—5 minutes

PRACTICE PERIOD
(Note to instructor)

(Distribute paper to members of class. If copies of Forms A and C can be mimeographed, it will be helpful. Ask the members of the class to draw maps of their own homes or other buildings. A typical building map can be drawn on the blackboard, preliminary to this exercise, to show the procedure.)

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FORM A

Fire Defense Survey Check List

Address ---------- Number of floors in building ------

Describe premises, stating whether it is a private house, apartment house, combined store and dwelling, office building, loft building, etc.

Describe approach to stairs (as, "from rear hallway, first floor;" "from front entrance;" etc.):

Basement stairs ----------

Stairs between floors ----------

Attic stairs ----------

Fire escapes ----------

Stairs to roof ----------

Where are outside doors:	Has building—	Where are water faucets, outdoors:
Front (no.)? ----------	Basement? ----------	Front (no.)? ----------
Rear (no.)? ----------	Attic? ----------	Rear (no.)? ----------
Right side (no.)? ----------	Flat roof? ----------	Right side (no.)? ----------
Left side (no.)? ----------		Left side (no.)? ----------

Where are water faucets, indoors? (List number and locations, as, "1 in kitchen, first floor;" "1 in rear of store;" "1 in basement lavatory;" etc.)

FORM A—Continued

If garden hose has been provided on the premises, describe its length, location, and whether or not adapter has been provided for connecting it. (As, "50 ft. garden hose in basement near boiler;" "25 ft. garden hose in third floor hall closet for use with adapter on kitchen faucet.")

If there are reserve supplies of water on the premises, state how many and where containers are located, giving approximate gallons available. (As, "2 pails of water, second floor hallway, 6 gallons.")

If there are fire extinguishers on the premises, describe number and type of extinguisher at each location. (As, "1 soda-acid, rear of store;" "1 foam, foot basement stairs;" "1 pump tank, second floor hall closet;" "6 soda-acid, hallway on each floor.")

If there are any special hazards on the premises, describe them and their location:

Date ---------- Signed ----------

Fire Guard.

FORM B

Fire Defense Self Inspection Form

Place a check (✓) in the "Yes" or "No" column, according to conditions you find in your home. When the answer is "Yes" a hazardous condition exists, and it should be corrected as quickly as possible to make your home safe. Ignore any questions that do not apply to your building or home.

	Yes	No
Heating Plants, Cook Stoves, etc.		
1. Are chimneys in need of cleaning or repair?		
2. Do unprotected stovepipes pass through attic or closets?		
3. Do walls, ceilings and partitions need protection from overheating of stoves, furnaces, and pipes?		
4. Do floors under hot stoves need protection of metal, brickwork, or cement?		
5. Are curtains left free to blow over stoves?		
6. Are any unused stovepipe holes covered with paper or other combustible materials?		
7. Does the oil-burner need oiling and cleaning?		
8. Do you use wooden or cardboard containers for ashes?		
9. Are gas connections made with rubber tubing?		
10. Are spark screens needed at any fireplace?		
Housekeeping		
11. Are there accumulations of newspapers, magazines, furniture, or other rubbish in attic, basement, or closets?		
12. Are matches kept within reach of small children or near heat?		
13. Have you failed to place ash trays wherever there may be smokers?		
14. Is there any combustible material in the yard?		
15. Is your dustless mop left outside of its metal container in a closed closet or other place where it can ignite spontaneously?		

FORM B—Continued

	Yes	No
Electricity		
16. Are any electrical cords worn or frayed?		
17. Are you using pennies instead of new fuses?		
18. Are any electrical appliances in need of repair?		
19. Have extensions of wiring been made by any one except a competent electrician?		
20. Are cords on extension lights hung over nails or hooks when in use?		
21. Are any switches or light sockets in need of repair?		
22. Do you use an electric pressing iron without a metal stand?		
Flammable Liquids		
23. Is gasoline stored or used on the premises?		
24. Do you ever endanger your own life and possibly others by using gasoline, benzine or naphtha for dry cleaning?		
Fire Protection		
25. Have you failed to supply pails or other containers of water as a reserve supply for fighting fire bombs?		
26. Have you failed to provide a stirrup pump, fire extinguisher or garden hose for fighting fire bombs?		
27. Have you neglected to place fire fighting equipment where it is readily accessible and ready for use?		
28. Have you neglected to teach all members of your family how to use this equipment?		
Total number of "yes" and "no"		

WHAT TO DO IF AN INCENDIARY BOMB FALLS IN YOUR PREMISES

If you have the fire-extinguishing equipment, direct a solid stream of water upon the bomb without exposing yourself. It is important to keep behind cover because bombs may be of explosive types.

If the bomb explodes and the Fire Guards have not yet arrived, go immediately into the room or place where the bomb is burning and apply water from any source onto the bomb, its fragments and all burning materials.

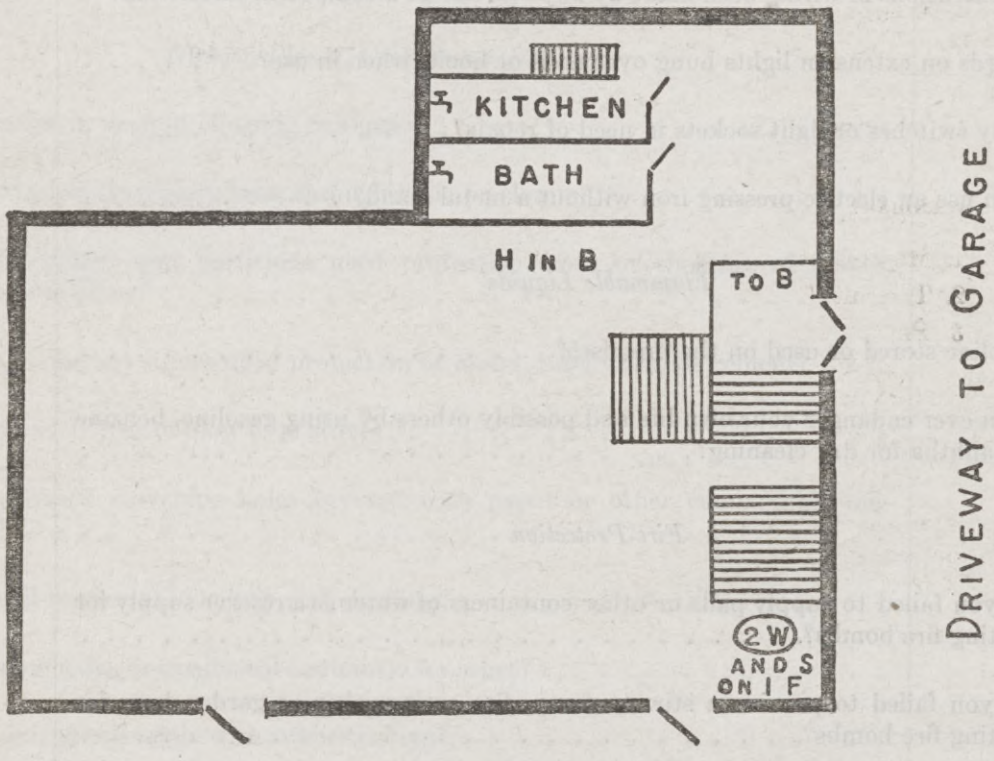
FORM C

How To Make a Simple Building Map

Street address _____

Number of floors _____ Basement? _____ Attic? _____

Description of premises (whether apartment house, single family dwelling, combined store and dwelling, etc.) _____



SYMBOLS TO BE USED ON MAPS

A=Attic.
B=Basement.
F=Floor (number in front of symbol indicates which floor).
=Stairs.
=Door.
=Faucet.
=Telephone.
=Sector Warden Post.
=Fire Guard Equipment Station.
=Fire Guard Lookout Post.
=Fire Station.
=Fire Alarm.
=Fire Hydrant.
=Stand Pipe (exterior building connection for fire hose).
=Cistern or Water Reserve.
=Sector Limits.

Equipment (number in front of symbol, encircled, indicates quantity, as (2W) means 2 containers of water; symbol alone means 1).

W=Water in pails or barrels.
P=Pump tank.
S=Stirrup pump.
FE=Fire extinguisher.
H=Garden hose.

LESSON SEVEN—OUTLINE

Incendiary Bombs and Their Control

A. Tactical Use of Incendiary Bombs

1. Historical background
2. Indiscriminate bombing
3. Target bombing
4. Fire bomb loads

B. Incendiary Materials

1. Magnesium
2. Thermit
3. Phosphorus
   (a) White phosphorus
   (b) Red phosphorus
4. Oil

C. Types of Incendiary Bombs—(slide film sequence)

D. Fighting Fire Bombs

1. Solid stream of water essential
2. Methods of dealing with different types of fire bombs
   (a) Magnesium

D. Fighting Fire Bombs—Continued.

2. Methods of dealing with different types of fire bombs—Continued.
   (b) Phosphorus
   (c) Oil
3. Conditions govern methods to be used

E. Air Attack

1. Manning lookout posts
   (a) Assignment of lookouts
   (b) What the lookout observes
   (c) The lookout's communication
   (d) The lookout post on large roof areas
2. The Fire Guard Squad goes into action
   (a) A fire bomb strikes
   (b) A Fire Guard Squad arrives
   (c) The squad attacks a fire bomb

Slide Film Sequence

LESSON SEVEN

Incendiary Bombs and Their Control

Objectives

At the conclusion of this lesson the student should:

1. Understand the tactical uses of incendiary bombs.
2. Know how to control the burning of different incendiary materials.
3. Be able to recognize the different types of incendiary bombs.
4. Know how to deal with the different types of incendiary bombs.

Place of Meeting and Equipment

This lesson will be conducted in the regular class room. Equipment: Slide film strip and projector, screen.

A. TACTICAL USE OF INCENDIARY BOMBS

1. Historical Background

There is nothing new about the use of fire as a weapon of war. The tactical use of fire to destroy the homes, military installations, and supplies of the enemy is as old as the human race. The Assyrians used liquid fire in military operations, and this probably was oil from what are now the Iraq oil fields. Flaming arrows and balls of burning pitch were thrown from catapults. Greek fire, which was used in defending Constantinople from the attacks of the Saracens, was said to have been a mixture of pitch, sulphur, quicklime, and naphtha. Balls of cordage soaked with such a mixture were said to have been used in naval battles.

The introduction of gunpowder in the fourteenth century made such elementary methods of spreading fire obsolete. Fire itself was used to razé captured cities and villages, but there was no need for special weapons to carry on such operations. In the eighteenth and nineteenth century, fire rockets and red-hot cannon balls were used with incendiary intent, but the development of long-range artillery so overshadowed such devices that little attention was paid to fire as a weapon until World War I.

It was the development of the airplane that brought incendaries to the fore again. The possibility of dropping incendiaries from planes upon military bases, factories, docks, and other military objectives was apparent from the beginning of the World War. But it was not until 1918 that incendiaries of the modern type were ready for use. The Germans manufactured them to bring about the destruction of London and Paris, but the war was going against Germany by that time, and the High Command could see no advantage to the army and only much harder peace conditions for Germany, so the use of the incendiary bombs was forbidden.

German and Italian fliers experimented with incendiary bombs during the Spanish revolution, and Japan used them in China. By the start of the present war, bombing on a large scale was well prepared for.

2. Indiscriminate Bombing

One way of using incendiary bombs in air attacks is to drop them indiscriminately over an area, rather than to aim them at any special target. In practice, a flight of bombers maneuver into position over

the area they have as their objective and let their bombs drop, cutting a swath of destruction across congested cities. For this type of bombing, the smaller incendiary bombs are more likely to be used.

3. Target Bombing

Another way of using incendiaries is to aim them at a specific target, such as a factory, railroad terminal, or other objective. For such attacks, larger types of bombs, capable of being aimed with greater precision, are used.

4. Fire Bomb Loads

Bombing planes may be loaded with both incendiary bombs and high-explosive bombs, or their loads may consist exclusively of one or the other. In mass raids, the first flight of bombers to reach the objective may be loaded with incendiary bombs and flares, the flares to illuminate the target from above, and the incendiary bombs to start fires. Such considerations depend upon the conditions and objectives of the attack.

B. INCENDIARY MATERIALS

There are only a few incendiary materials now being used in this war, but new ones may be introduced. Foremost among those being used is magnesium, a light metal. In fire bombs, it is seldom used alone, but is combined with other metals to form an alloy. This is done because the alloy can be machined more readily. The alloy used by the Germans in their small incendiary bomb varies in its metal composition, but is usually about 86 percent magnesium, 13 percent aluminum, and a small amount of copper.

1. Magnesium

Magnesium combines rapidly with oxygen. It will burn fiercely in air at a little above its melting point, which is 1,204° F. Its boiling point is 2,012° F., at which magnesium vapor is given off. This vapor, mixing with air, burns with a very hot flame, the temperature being estimated at about 3,300° F.

The great tendency of magnesium to unite with oxygen causes it to take oxygen out of many compounds, including water. Water gives up its oxygen readily and in the process releases free hydrogen gas which is also consumed in the flames.

Because of the affinity for water of burning magnesium, it might be assumed that water is unsuitable for use on incendiary bombs. Actually, this is not the case. The water causes the magnesium to burn violently, and, when it is applied in a solid stream, the reaction is so violent that the flame is literally knocked loose from the burning metal as the hot tip of a cigaret may be knocked away to put the cigaret out.

To start burning, magnesium must be heated to a kindling point of 945° F., so some other material must supply this high temperature. Usually it is thermit.

2. Thermit

Thermit is a mixture of finely divided aluminum and iron oxide, or iron rust. It is inert and can be handled without danger, since a part of the mixture must be heated to a high temperature before the reaction between the two metals can be started. Once started, however, the reaction proceeds rapidly through the whole mixture, and nothing can be done to stop it. No way has yet been found to put out burning thermit, since the iron oxide supplies all the oxygen needed to support

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the combustion of the aluminum. The reaction takes place in a matter of seconds, leaving a mass of molten iron. The greatest temperature of the reaction is estimated at about 4,500° F.

Since the thermit reaction cannot be started readily, a priming powder that is easily ignited and produces high temperatures must be employed. The priming mixture usually consists of finely powdered magnesium mixed with an oxidizing agent, such as barium peroxide. The priming mixture itself can be ignited with a match or fuse, or by a small amount of black gunpowder.

3. Phosphorus

Phosphorus is a non-metallic element, occurring naturally in the form of compounds. Bones are largely calcium phosphate, and other phosphorus compounds occur in animal and vegetable tissue. The element itself appears chiefly in two forms, white and red phosphorus.

(*a*) *White Phosphorus*

White phosphorus is known also as yellow phosphorus. It combines so readily with oxygen that it is a good incendiary material. No flame or priming mixture is needed to start it burning. As soon as white phosphorus is exposed to the air, it begins to combine with the oxygen of the air, generating its own heat until it bursts into flame. Its ignition temperature is 113° F., only a little above its melting point.

To prevent white phosphorus from igniting when it is stored, it is kept under water or in hermetically sealed cans or drums. Because of the rapidity with which this element combines with oxygen, it must be handled with tongs to avoid burning the fingers. Phosphorus burns are painful and heal slowly.

The temperature of phosphorus burning in air is relatively low, and therefore its incendiary value is limited to easily combustible materials such as hay, straw, paper, dry grass, etc. On boards or other woodwork, it is not only inefficient as an incendiary, but may actually act as a fire-retardant since it forms a glassy deposit of phosphoric acid, thus protecting combustible surfaces from ignition.

Water will put out burning phosphorus temporarily, but as soon as the water drains off or evaporates, the phosphorus will break into flame again.

(*b*) *Red Phosphorus*

Red phosphorus is a comparatively inert red powder which does not ignite spontaneously in the air the way white phosphorus does. However, it will burn when heated to 464° F., and it is one of the ingredients in a small Japanese anti-personnel incendiary bomb. Water will put out burning red phosphorous readily.

4. Oil

Petroleum and petroleum derivatives are also incendiary materials. However, they have certain disadvantages. Heavy oils have high flash points and therefore are not easily ignited. Thermit is generally used for the primary mixture, and rather large quantities of it are needed. Also, the oil must be solidified for, if it were placed in a bomb in its liquid state, it might drain harmlessly away after the bomb burst. Then, too, there is the necessity for holding the solidified oil together until it is ignited, so a heavy steel container must be

used that will prevent the solidified oil from being dispersed before it can be started burning.

To solidify the oil, it is generally mixed with soap or wax. When a bomb filled with such a mixture strikes, the contents are scattered and each blob of the "solid-oil" acts as an individual fire-starter.

C. TYPES OF INCENDIARY BOMBS

The various incendiary materials we have learned about have been combined in various types of incendiary bombs. None can tell what types of bombs may be dropped upon our cities, so you must become familiar with all types and learn to identify them quickly.

The weight of these bombs is given in kilograms, that being the measure of weight used by the Germans and Japanese.

Slide Film Sequence

201. This is a section drawing of the 1-kilo German magnesium incendiary. It is about 14 inches long and weighs about 2.2 pounds. The casing is of magnesium alloy, the core of thermit. The bomb ignites on impact when a detonating pin explodes a cap which ignites the priming charge. The priming charge ignites the thermit core of the bomb. The bomb has a burning time of from 10 to 15 minutes. Small burster charges are sometimes placed in capsules attached under the tail.

202. The more recent 1-kilo bombs have the vane designs shown in this picture.

Some variations of this type of bomb have been observed. Bombs confiscated by Germany from the French were cut down to fit German containers. Some 1-kilo bombs are fitted with steel fuses instead of alloy fuses, adding 12 ounces to their weight. The greater weight gives the bomb greater penetration.

203. This is a modification of the 1-kilo bomb to which a 3½-ounce explosive charge has been fitted in an extension to the nose. Its length is thus increased to about 21 inches; its total weight to 2 kilograms or about 5 pounds. As shown in the picture, a stiff wire 13 inches long, with a metal disk about 1½ inches in diameter at the upper end, is passed through a ring at the end of the tail vanes down the side of the bomb and through a hole in the safety pin projecting from the fuse body. On release from the plane, air pressure withdraws the wire, which falls separately and may be found on the ground some distance from the bomb. The safety pin is then ejected by an internal spring, leaving the striker free. On impact, the fuse functions.

204. The fuse ignites the incendiary body immediately and also lights a slow match fuse in the nose, delaying the detonation of the explosive charge up to a maximum of 7 minutes. The explosive extension of the bomb may break off on impact and detonate separately, some distance from the incendiary part of the bomb. The incendiary part of the bomb looks and has markings like the 1-kilo bomb. The rounded explosive container is covered by a thin cap.

205. Six types of bomb containers for the 1-kilo bomb are now in use by the Germans. This type is a bomb container attached to the outside of the plane. The doors open by electrical control and fall with the bombs. The container has a capacity of 700 bombs. A somewhat simi-

lar external bomb container, whose doors do not fall with the bombs, has a capacity of 360 bombs.

206. Still another type of carrier is this large bomb-like container which falls as a bomb and opens in air, releasing its bombs at a predetermined distance below the plane. It contains about 120 bombs.

There are also several small carriers holding 36 bombs. Some of them open in the air after being dropped from the plane; others release bombs from a chute arrangement.

207. Now we come to a bomb with some size to it—the 50-kilo German phosphorus bomb. It weighs 90 pounds and contains about 30 pounds of a black and very sticky liquid consisting of phosphorus, oil, benzene, and a rubber solution, in a casing similar to that of a 50-kilo high-explosive bomb. This bomb is split open on impact by a fuse and may scatter the contents some yards. The contents ignite spontaneously.

208. This is a 50-kilo incendiary and high explosive bomb used by the Germans. On impact, it first throws out, through the base plug, six pre-ignited firepots of the magnesium-thermit type, each shaped like a large tumbler, together with some 60 metal containers. The tumblers are 2¼ inches in diameter at the base, 3¾ inches at the top, and 5¾ inches long. The smaller metal containers are about 3 inches long and triangular in section, and they have a thermit-type filling. The detonation of the 12-pound charge of TNT in the nose of the main bomb follows almost immediately after the fire pots are scattered.

These bombs look like the 50-kilo high explosive bombs. They have a screwed filling plug in the nose and have "Sprengbrand C 50" stenciled in black lettering on both sides of the bomb. The word "spreng" means "explosive," and "brand" means "incendiary," thus its dual nature is indicated.

209. This is the 1-kilo Jap incendiary, 10½ inches long and 3 inches in diameter. It has a picric acid burster charge with a main filler of red phosphorus. When the bomb lands, the striker pierces the detonator which ignites the picric acid in the exploder tube. The exploder tube in turn fires the red phosphorus and at the same time explodes the bomb into small fragments. The lethal range of the bomb is about 50 feet.

The bomb has a black cast-iron body, attached to which is a conical tail assembly. The nose is streamlined by a rubber hemispherical covering which resembles half a tennis ball.

210. This is the Jap's idea of a thermit incendiary bomb. It is 40.1 inches long and 7.9 inches in diameter. It contains a black powder burster charge and a main filler consisting of three electron inserts containing thermit. When the bomb lands, the burster charge is ignited and ejects the inserts which are fired by the igniter fuse. The burning inserts are scattered, when ejected from the bomb case, and act as separate thermit incendiary bombs.

211. This is a large Japanese dual purpose bomb, 40½ inches long and 7½ inches in diameter weighing 60 kilograms. The bomb body and conical tail portion are filled with a large number of rubber bungs

or pellets (about 475) impregnated with phosphorus dissolved in carbon disulphide. In addition, there is a picric acid or TNT burster charge in the nose cap and in the exploder tube extending through the center of the body.

212. This is a diagram of the dual purpose bomb. On detonation, the rubber bungs or pellets are scattered for 50 yards, while the high explosive charge causes the fragmentation of the metal nose cap, scattering pieces for distances up to 80 yards.

213. The Japanese also use a 60-kilo solid oil incendiary. It is 42½ inches long and 9½ inches in diameter. The main filling is paraffin wax mixed with kerosene contained in six steel compartments. A tube, filled with thermit and another oxidizing agent, runs through the center of the bomb as a core. When the bomb lands, the propelling charge of black powder is ignited and ejects the inner case containing the oil. At the same time, the thermit in the center tube is fired and, in turn, melts and ignites the oil which is scattered.

DISCUSSION PERIOD

The following are leading questions to stimulate class discussion:

Why is magnesium a good incendiary material?

What is the effect of water applied to burning magnesium?

What is thermit? What purpose does the iron oxide serve in the thermit mixture?

How is white phosphorus stored? Why?

What is the structure of the German 1-kilo incendiary bomb? The 2-kilo bomb?

What is the purpose of the explosive charge in the 2-kilo bomb?

How are the small German incendiaries dropped from planes?

How does the German phosphorus bomb act when it strikes? What are its contents?

How does the German firepot bomb act when it strikes?

How large is the Japanese anti-personnel incendiary bomb?

Describe the 50-kilo Japanese thermit incendiary bomb.

Describe the 60-kilo Japanese incendiary and high explosive bomb.

What are the contents of the Japanese solid oil bomb?

INTERMISSION—5 minutes

D. FIGHTING FIRE BOMBS

No one can anticipate what type of fire bomb the enemy may drop on our cities. He may use intensive types, such as magnesium and thermit; scatter types, such as solidified oil or phosphorus; fire bombs with delayed explosive attachments; combinations of these; or perhaps altogether new types of fire bombs.

Until the summer of 1942, the fire bomb most commonly used was the small magnesium bomb, which sometimes contained a small explosive charge. More recently, the enemy used several new types of incendiary bombs, some of which contained delayed and heavier explosive charges.

No matter what type of incendiary bomb the enemy uses or may devise, his objective will be to cause the rapid spread of fire. That is the chief objective and chief danger of present day bombing attacks. Fire defense must therefore be concentrated on the danger of the spread of fire rather than the bomb itself.

These new bombs make it necessary for the fire fighter to use the best available cover. An overturned chair or davenport, or a door or thin plaster wall is no longer ample protection. Whenever possible, the attack should be from behind a solid wall, preferably brickwork or concrete blocks, and personal risk is greatly reduced when the fire fighter exposes himself as little as possible by crouching or lying down.

1. Solid Stream of Water Essential

A solid stream or jet of water should be used in fighting both the bombs and the fires started by the bombs. The use of sand or a spray of water must be ruled out as dangerous and ineffective.

Water, used with the pump tank or other water type fire extinguisher, must be available. The vital importance of a stored supply of water cannot be over-emphasized. Householders should have at least 10 gallons of water on hand at all times, placed where it can be reached easily and quickly. In other occupancies, similar reserve supplies should be available at convenient locations on all floors.

Special "bomb extinguishing" powders and special devices such as scoops, grabs, and snuffers are entirely without merit and may endanger the lives of those who depend on such devices for protection.

2. Methods of Dealing With Different Types of Fire Bombs

Bombs that depend upon magnesium for their incendiary action can be disposed of quickly with a solid stream of water. However, because of the explosive attachment, the application of water will depend upon the circumstances under which the bomb is found.

(a) Magnesium
(b) Phosphorus

You can't tell, when a bomb lands, whether it contains red or white phosphorus. Treat all phosphorus bombs alike. Put out the fire with water, and then dispose of the phosphorus by scooping or shoveling it into a pail of water so it can be removed to some open space where it can be left to burn itself out. It is important to be sure that none of the bomb remains where it can later start a fire.

Clothing or equipment splashed with free phosphorus should be kept thoroughly wetted until removed from the person. If phosphorus lodges on the skin, the affected part should be plunged into water or kept wet either by a water spray or a thick pad soaked in water. If available, a solution of baking soda (2 tablespoonfuls in a pint of water) followed by a copper sulphate solution (1 or 2 teaspoonfuls in a pint of water) should be applied liberally to the burned parts before attempting to remove the phosphorus. The phosphorus can best be removed with forceps, by careful scraping or picking off with a dull knife, sponging with a wet gauze pad, or by gently rubbing with a soft scrubbing brush, the affected part being well immersed in water during the whole of the cleaning operation. Never treat phosphorus burns with greasy dressings or ointments unless you are quite certain that no trace of phosphorus remains. Oil or grease dissolves phosphorus, aids its absorption, and may result in phosphorus poisoning.

(c) Oil

Oil bombs require careful attention, for there is a danger that the fire may be spread if water is used on the burning contents. Try not

to let the burning mass spread or flow in the direction of combustible material, and use water liberally to wet down any nearby combustible material.

3. Conditions Govern Methods to be Used

There are, roughly, three situations in which a Fire Guard must combat incendiary bombs—

1. In a relatively small room where he can obtain the protection of an interior wall or door, or, when approaching from the outside, the protection of a brick or concrete wall. The furnishings of such a room are ordinarily combustible, and the bomb can be expected to start a fire unless it is disposed of first.

2. In a large interior space, such as a store or factory area, where no cover is at hand, yet where the bomb can be expected to start a fire.

3. In the open where the bomb will not start a fire, but where the Fire Guard or other persons may be exposed to flying fragments of an explosive fire bomb.

Each of these somewhat typical situations requires different tactics. In the first instance, the Fire Guard can bring his equipment to the door or window of the room where the bomb has fallen, and, taking advantage of the best available cover, he can direct a solid stream upon the bomb in an effort to dispose of it or minimize its effect before any explosive charge goes off. After the explosive charge has detonated, the Fire Guard has a simple fire problem. He must dispose of any remaining fragments of the incendiary and put out the fire it has started.

In the second situation, his problem is to find a shield or cover which he can bring up to within range of the bomb so he can get water on it without exposing himself to danger. Failing to find cover, he has the choice of waiting at a safe distance until after the explosive charge detonates, or advancing in a crouching or prone position to a point from which he can apply water to the burning bomb.

In the third situation, the Fire Guard's duty is to keep people from approaching the bomb until after any explosive charge has gone off and to remain at a safe distance from the bomb himself. Once the explosion has occurred, the incendiary section of the bomb can be allowed to burn itself out, or it can be doused with a stream of water and disposed of quickly.

In industrial occupancies where flammable materials may be exposed to the action of a fire bomb, the Fire Guard will have to take his chances and attempt to dispose of the bomb before it explodes, or wait in safety and hope that he will be able to handle any fire that is started in the flammable material. At all action warnings, dip tank covers and other protective devices should be used to minimize the exposure of flammable materials as much as possible.

In any situation, the ability of the Fire Guard to size up the risks and carry out his duties accordingly is the controlling factor. If he is right in his judgment, the safety of the structure involved will not be impaired. If he is wrong, then the safety of the structure may be imperiled. The purpose of this whole course of instruction is to help the Fire Guard perfect his judgment in matters of fire control and to give him the skills he needs to execute his duties as he sees them.

E. AIR ATTACK

Now we will assume that we are experiencing an actual air raid. How will the Fire Guards function?

1. Manning Lookout Posts

The only exception to the general rule that Fire Guards will function in squads is when assignments are made to lookout duty. Lookout duty may be a regular assignment or be taken in turn, according to the local plan of organization of the Fire Guard.

(*a*) *Assignment of Lookouts*

The location of the post in relation to the area it covers will determine the number of guards to be assigned to it as lookouts. No guard should be required to man a post alone if he has to observe an area which extends in all directions from the post. This point may be explained by considering the lookout post as a center of a circle. During an air raid things happen with incredible rapidity. A flight of bombers passing over a lookout post may drop fire bombs on all sides of the lookout. The lookout is able to face in only one direction at a given time, observing effectively what happens in less than one-half the circle of observation. At his back fire bombs may fall and penetrate roofs even in daylight without being seen until they start a serious fire. For this reason, at least two guards and perhaps three should be assigned to such lookout posts, particularly in congested city districts or industrial establishments.

(*b*) *What the Lookout Observes*

While on duty at a lookout post, the Fire Guard will be on the alert for the following signs and indications of the fall of fire bombs:

1. The sound of impact of fire bombs on the roofs of surrounding buildings.
2. The flare of flame that marks where a fire bomb has ignited.
3. Holes in roofs made by fallen fire bombs.
4. Flames through windows and smoke issuing from exterior openings of buildings.
5. The call of occupants that a fire bomb has fallen into their premises.

When the lookout discovers a place where fire bombs have struck, his course of action becomes one of communicating the location of such bombs to Fire Guard squads that are waiting on the alert at established assembly points.

(*c*) *The Lookout's Communications*

If a post is far above the ground, there is little chance of the lookout making a whistle or shout heard above the crash and din of a raid. It is necessary, therefore, that he possess or arrange some dependable means of communicating with bomb-controlling squads below, either by telephone, messenger, or other means that may be set up by individual lookouts and squad members.

(*d*) *The Lookout Post on Large Roof Areas*

It is advisable to assign an entire and fully equipped squad to a post located on top of a building with a large roof area. Under such circumstances one guard can watch for the fall of fire bombs in the assigned area, while the remaining squad members can attack and control those bombs that fall within their reach.

Local conditions will, generally, determine the exact functions of the lookout and there should be no hesitation by local Fire Guard units

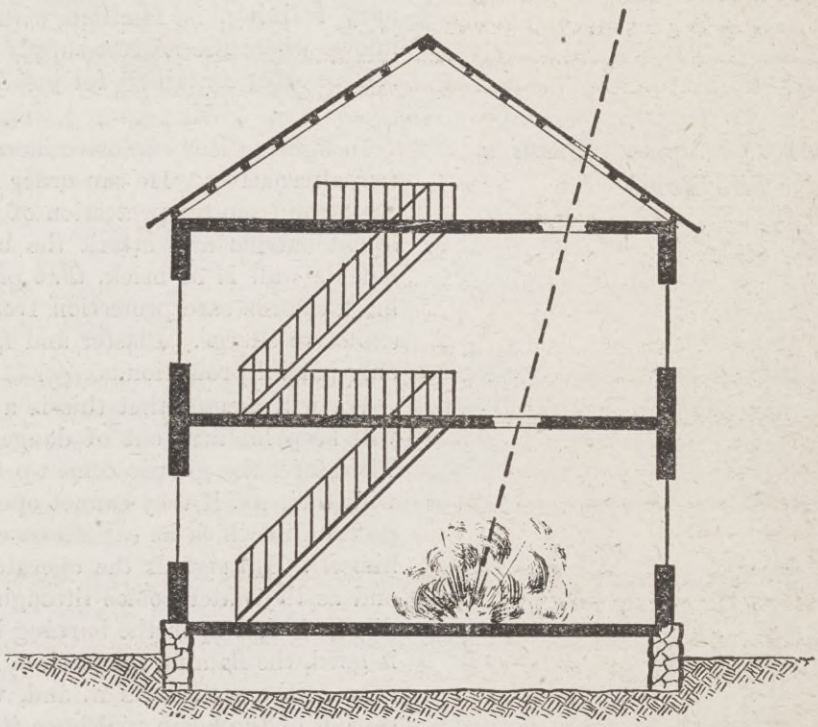
in deviating from the suggestions that have been given for establishing and operating lookout posts.

2. The Fire Guard Squad Goes into Action

A few moments after an alert sounds, Fire Guards should be completely deployed throughout the sector. The Sector Leader should be at the sector post with the Senior Air Raid Warden. Squads should be at their assembly points ready for a fire incident. Lookouts should be observing the skies for the first sign of enemy planes. Let us see what happens when this organization goes into action.

(a) A Fire Bomb Strikes

Note to instructor: (Draw a diagram, like this, of a typical building on the blackboard.)



On the blackboard has been drawn a simple diagram of a typical structure that will aid our present discussion of what may happen when a fire bomb strikes a building. It consists of two floors, a gable roof and attic, and a stairway extending from the first floor to the attic.

We will assume that an explosive incendiary bomb strikes the roof of this house. Its power to penetrate the roof and floors will depend upon the weight of the bomb, the height from which it is dropped, and the construction materials of the roof and floors. We will likewise assume that the bomb penetrates through to the first floor. The impact of the bomb striking the roof will set the incendiary train in motion—the percussion cap will be exploded by the firing pin, the cap will ignite the priming charge, the priming charge will ignite the thermit core of the bomb, and the thermit will ignite the magnesium body of the bomb, which will burn at a temperature of over 4,000° F. for approximately 10 minutes. Timed to go off at any

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moment is the explosive charge in the steel nose of the bomb, which is a threat to the lives of fire-fighting personnel within its range.

(b) A Fire Guard Squad Arrives

By one of several possible means, a Fire Guard Squad is summoned to this house. Perhaps a lookout saw the bomb strike. Perhaps an Air Raid Warden or a member of the Fire Guard Squad saw the flash of the burning magnesium through a window. Occupants of the building might have called the squad. In any event, within a short period of time, the Fire Guard Squad is on the scene and ready to combat and extinguish any small fires that it may start. Its members carry their own extinguishing equipment and light fire-fighting tools. Each member of the squad, by reason of his preliminary training, is familiar with the layout of the building. He knows where the nearest supply of water is available in pails, barrels, or other containers for just such an emergency.

(c) The Squad Attacks a Fire Bomb

In fighting this explosive incendiary bomb, the Squad Leader has two alternatives. He can order his men inside the house and attack the bomb from the protection of the interior wall, or he can keep the squad outside and attack the bomb through the window. If the outside wall is of brick, that probably will affect his decision, for brick affords safe protection from the flying steel fragments of the explosive charge. Plaster and lath walls inside the building afford only partial protection.

We will assume that this is a brick building and that the leader will keep his men out of danger as far as it is possible to do so. Therefore, the guards come up to the window, break out the glass with their ax, if they cannot open it, and the nozzle man takes up a position in which he can direct water on the bomb without exposing himself. He signals the operator of the pump to give him water, and as the water comes through the hose from the pump tank, he directs it full upon the burning bomb in a solid stream. If his aim is good, the flaming magnesium section of the bomb will flare up as soon as the water hits it, and, within a short time, the incendiary section of the bomb will burn itself out. There still remains, however, the explosive part of the bomb. So the guards must wait back of the brick wall until the charge is detonated. Then they can climb in through the window or enter the house by the door to make certain no fire is left in the room where the bomb landed. After inspecting the room, the guards will go through the rest of the house to see if other bombs have fallen into other rooms, and if all the occupants are safe.

This, of course, is about the simplest situation the Fire Guard Squad can encounter. They may have to combat the bomb without the protection of the exterior brick wall. They may have several bombs to fight on several floors of the house. They may find it necessary to help occupants to the street. The fire may spread beyond their control so that it becomes necessary to summon professional firemen.

Fire Guards must be prepared for all of these eventualities, and they must perform their duties under a variety of most difficult conditions. High explosive bombs may be falling in the neighborhood

and rocking the buildings with their terrific blasts. Panic-stricken householders may be demanding their help. Always there is the need for haste in getting on to the next bomb and the next small fire. Under such circumstances, Fire Guards will need all the skill at their command.

Slide Film Sequence

214. The sentinel of the Fire Guard is the lookout, alert for approaching planes and the fall of fire bombs.

215. Here a Fire Guard Squad, its equipment in hand and ready for use, answers the call to action. When the first fire bomb lands in their area they are ready to dispose of it almost as quickly as it strikes.

216. After the blue signal has sounded, Fire Guards stand ready for immediate action, the civilian population takes shelter, and there is a quietness such as that before a summer thunder storm. It takes courage on the part of Fire Guards to remain calm and alert through moments like these.

217. Your neighbors are waiting, too. Until such moments as these, they may not have taken you or your work seriously. But when the first bomb falls you will see how they turn to you for protection against enemy attack.

218. If you have done your work well before raids come, every building will have a pump tank or other water extinguisher and reserve supplies of water available for use in fighting fire. Normal water supplies cannot be depended upon entirely during air raids, and such reserves as these must be provided if fire bombs and the spread of fire are to be controlled.

219. When raids come, the planes will fly overhead in a pattern that will cover the area the enemy wants to destroy. Little is left to chance in modern warfare. If you are in this area, you will have fire bombs to fight.

220. A fire bomb has struck! In a moment it is afire, and unless Fire Guards arrive immediately and begin operations for its control, it will start a blaze that may sweep through the building, endangering the lives of the occupants and perhaps starting the conflagration that the enemy hoped for as the result of the raid.

221. Fire guards in the sector know this building well. They have visited the occupants; suggested where pails of water could be placed; learned where stairways, access and exit doors, extinguishing equipment, and water faucets are located; and have recorded this information on the sector map filed at the Sector Post. They know how to reach the room where the bomb is burning and where extinguishing equipment and materials are available for fighting it.

222. As soon as the Fire Guard Leader knows where the bomb has struck, he can visualize the circumstances under which his men must work. He knows what protection the walls afford, where to find water for his pump tank, and the number of occupants of the building.

223. Protection of life is the first responsibility of Fire Guards as is that of all defense services. As soon as Fire Guards enter the building, they

move all occupants out of range of the bomb before starting their bomb-control and fire-fighting operations.

224. After the occupants are out of range of the explosive bomb, the Fire Guard squad gets to work. Taking the best available cover, the nozzle man applies a solid stream of water to the bomb in an effort to dispose of the incendiary section before it can start a fire.

225. The best way to fight the explosive incendiary bomb is the safest way. If you stand erect or crouch within range of the steel fragments, more of your body is exposed than when you are prone on the floor.

226. The maximum effective range of the pump-tank stream is about 30 feet. The steel fragments of the explosive section of the bomb fly through the air for 50 feet or more. Obviously, the Fire Guard must come within this distance to get water onto the bomb. That is why he must take the best available cover to protect himself.

227. Remember that one fire bomb, striking in a vulnerable place, can start fires like this unless it is dealt with quickly. In protecting the community against such fires, the Fire Guard is just as important to the whole war effort as any soldier on any battlefront.

Discussion Period

The following are leading questions to stimulate class discussion:

Why must Fire Guards be familiar with all types of incendiary bombs?

What type of fire bomb was most commonly used by Germany during early months of the war?

What is the best protective cover from which to fight fire bombs?

Why is the solid stream recommended for fighting fire bombs?

How large a supply of water should be kept in dwellings?

Describe how the magnesium fire bomb should be approached.

How should phosphorus be handled?

What are the three most common situations in which bombs must be fought?

How many Fire Guards should be assigned to a lookout post?

What will the lookout listen and look for during a raid?

What is the first duty of a Squad Leader when approaching the house where a bomb has fallen?

What actions should be taken after a bomb has been disposed of?

LESSON EIGHT—OUTLINE

Summary and Examination

A. The Fire Guard is Pledged to Certain Specific Duties

1. To obey those in command
2. To cooperate with other action groups
3. To devote time to the work of fire defense
4. To develop his own efficiency
   (a) As a member of a squad
   (b) At squad action requiring teamwork
5. To keep abreast of developments
6. To be responsible for equipment
7. To be aware of his legal responsibilities

B. Examination

1. Directions for administering the examination
   (a) Time
   (b) Scoring
   (c) Failures
2. Answers to the examination
3. Final examination for Fire Guards

LESSON EIGHT

Summary and Examination

Objectives

At the conclusion of this lesson, the student should:

1. Understand his responsibilities toward his officers and fellow Fire Guards.
2. Understand his legal status as a Fire Guard and be aware of his responsibilities toward those he will protect.

Place of Meeting and Equipment

This lesson and examination will be conducted in the regular classroom. Equipment: Copies of examination papers for each student, pencils.

A. THE FIRE GUARD IS PLEDGED TO CERTAIN SPECIFIC DUTIES

Fire Guards must act quickly and decisively while on duty. When they function as members of a squad, some one person in the squad must make decisions and give orders accordingly so that this speed and certainty of action is possible. This is the Squad Leader's responsibility. His team mates must be prepared to obey his commands implicitly.

1. To Obey Those in Command

The same discipline will be expected of Fire Guards assigned to lookout duty. They must remain at their posts and carry out their duties. Their officers will depend upon them to safeguard a certain section of the neighborhood. Failure in this duty may result in a destructive fire.

Upon the Squad Leader's judgment may depend the lives of people in the area in which the squad is working. He must be able to size up situations and reach decisions promptly. While raids are in progress, individual squads may be working at some distance from the sector headquarters where the Brigade Leader will be on duty. There will be no time for the Squad Leader to turn to someone else for directions.

Just as the Squad Leader has the right to expect obedience from the Fire Guards in his squad, so the Brigade Leader has the right to expect compliance with his orders by the Squad Leader. In dispatching squads to different points in the sector, in assigning Fire Guards to lookout posts, and in all the other details of his command, the Brigade Leader is responsible for the conduct of all the Fire Guards and Squad Leaders in the sector. He is the operating chief of this vital action group.

The Brigade Leader reports to, and receives his orders from, his superior officers in the Fire Guard organization through the Senior Air Raid Warden in charge of the sector. This is necessary because the Senior Warden is essentially the coordinator for the sector and he must know what all the action groups are doing in the area under his command.

2. To Cooperate with Other Action Groups

Fire Guards make up only one of the action groups in the Citizens Defense Corps. Normally, any contact between Fire Guards or Squad Leaders and these other action groups is through the Air Raid

Warden working in the same area. Thus, if Fire Guards wish to summon a unit of the medical corps, a rescue squad, or auxiliary police, they do so through the Air Raid Warden who has the means of communicating with these action groups through the Senior Warden at the Sector Post.

But in an extreme emergency, the Fire Guards will be justified in making any short cuts they find expedient. They may be near enough to the sector headquarters to report directly to the officials there, instead of taking time to look for the Warden on the street. Between the Fire Guards and all other action groups there should be the utmost cooperation, but not at the expense or neglect of the duties of any one group or individual.

There is no direct relationship between the public fire department and the Fire Guard organization.

When the public fire department or its auxiliaries come into a sector to fight fire, the official in charge assumes control of that particular situation. Fire Guards, after giving what assistance they can to the firemen, withdraw from the scene of the fire.

3. To Devote Time to the Work of Fire Defense

The Fire Guards' responsibilities do not end with the completion of this course. Fire defense concerns every member of a community, and, in organizing and perfecting this defense, the Fire Guard organization assumes leadership. The task of becoming familiar with the layout of buildings, of encouraging the elimination of fire hazards, of helping occupants of buildings to prepare for raids is part of the Fire Guards' job.

Wherever the confidence of dwelling occupants is gained and their interest sufficiently aroused in cooperating in the fire defense program, it will be necessary to establish a routine of calls at intervals which will be determined by the number of the occupancies to be visited, their character, and other such factors. A single visit will not accomplish any miracles.

All this takes time, true enough. But if the Fire Guard is not willing to devote time to his work, he should not volunteer. In England, civilians are required by law to participate in civilian defense activities. This is a strong contrast to the voluntary system of the Citizens Defense Corps.

4. To Develop His Own Efficiency

This course of instruction is really only an introduction to the work of the Fire Guards.

(*a*) *As a Member of a Squad*

After qualifying as a Fire Guard at the conclusion of this course, you will be assigned to a squad of 3 to 5 men. Each member of the team must know as much and be able to do as much as any one of the other members. For instance, one guard will not be able to restrict himself to the work of operating the pump of a pump-tank extinguisher or of directing the stream upon the fire. Different emergencies will require different assignments of duties. During the course of a fire incident, assignments or functions of individual guards may have to be changed for the purpose of relief or because of injury. Each squad member, therefore, must be able to perform all jobs that fall within his line of duty, including that of taking over the duties of the Squad Leader.

Regular and serious practice is necessary in order to develop the Fire Guard Squad into an efficient operating unit. Practice is the only means through which confusion, delay, and awkwardness in operations can be eliminated, and speed, skill, and coordination in squad operations can be developed.

Each squad must function as a team, and this can only be brought about by squad drills. Then, too, the squad must learn to carry on its duties as one of the units in a sector, and this will be the product of drills.

(*b*) *At Squad Actions Requiring Teamwork*

In general, those squad actions that will require a great amount of teamwork are concerned with the following fire-defense operations:

1. The transmission of information about the location of fallen fire bombs.
2. The carrying of extinguishing equipment and materials to the scene of the fire incident.
3. The disposal of incendiary bombs and the extinguishment of small fires.
4. The use of ladders.
5. Light rescue work and care of casualties until the proper service unit arrives.

These are squad operations that must be practiced many times. They will constitute the principal maneuvers of regular squad drills. The rate of development and the status of squad efficiency will depend upon the regularity of squad drills.

The Squad Leader will be in charge of drills and will be in a position to determine the types and frequency of squad drills.

5. To Keep Abreast of Developments

Conditions of war change as new weapons and methods of using weapons are introduced. Therefore, it may become necessary in the future to keep the Fire Guards up-to-date in the latest developments of aerial attack. Fire Guards must be prepared to attend such courses, or any special meetings called by their officers.

6. To be Responsible for Equipment

In these times when shortages of critical materials make it necessary to conserve equipment of all kinds, it is a patriotic duty of the Fire Guards to take good care of the equipment entrusted to them.

Fire Guard equipment will come from several sources. Pump tanks are being distributed by the OCD in the target areas. Only a limited number of these tanks are available, and they must be cared for according to instructions. It may be difficult or impossible to replace them. Other equipment may be furnished by the local civilian defense council, including water containers, ladders, lanterns, axes, etc. This may be purchased with special funds or it may be donated by members of the community, but, whatever its source, the Fire Guard Squad is responsible for its care, and each item of equipment must be accounted for.

7. To be Aware of His Legal Responsibilities

The civilian defense services in certain States have been given some legal status by legislation. Thus, Fire Guards may have official status as members of the State civilian defense organization. However, this confers on them no special rights or privileges beyond those enjoyed in the legal pursuit of their duties under State or local laws. They

must respect the legal rights of householders and other occupants of the buildings in their assigned area. At no time should they enter upon private premises without the permission of the occupant, except during an emergency when it may be necessary to combat fire bombs or the fires they start and such consent cannot be readily obtained. No reasonable person would object at such a time to what otherwise might be trespass.

The Fire Guards also have a responsibility to preserve public and private property. They are required to exercise reasonable care even in the pursuit of their duty, and they may be legally liable for wilful destruction of property.

Unpleasant relationships that may develop between Fire Guards and the occupants of buildings are the concern of the Brigade Leader. It is his duty to help both the occupants and the Fire Guards to reach a mutual understanding. However, when Fire Guards are conscientious in their work and diplomatic in their relations with their neighbors, there should be little cause for misunderstanding.

B. EXAMINATION

1. Directions for Administering the Examination

The purpose of the final examination is to determine whether or not each student has acquired adequate fire-defense knowledge to qualify him for induction into the Fire Guard.

The administration of the examination should follow standard testing procedures, wherein the persons taking the examination are required to follow the specific directions given on the first page of the examination booklet.

(*a*) *Time*

It should be emphasized by the instructor that speed is *not* an important factor in the determination of the final score, but the number of items that are answered correctly. One hour is the official time for completing the examination, timing to be started with the instructor's signal *NOW BEGIN*. At the end of the one-hour period examination papers should be collected by the instructor, who will correct them and post examination results at a later time.

(*b*) *Scoring*

Probably the simplest way to score or correct the examination booklets is as follows:

1. Take a blank form of the examination booklet and enter the letters indicating the correct answers within the parentheses on the right-hand side of each column. The correct answer for all 100 items are given on page 110 of this Manual.
2. Now correct each examination, using the corrected form as the key. Mark each item that is correct with a check ($\surd$) and each item that is wrong with a cross ($\times$).
3. Count the number of checks ($\surd$) in the entire examination and the total will be the final score attained on the examination.
4. Enter this score in the box on the first page of the examination. Since there are a total of 100 items, each final score can be given in terms of percent.
5. Fifty correct items or 50 percent is the passing score or grade that will qualify a student for induction into the Fire Guard Organization.

(*c*) *Failures*

Those students failing to attain the passing grade of 50 percent on the final examination should be permitted to study their Handbooks

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for a period of one week, at the end of which time they will be given the same examination a second time.

After the examination has been completed by all of the students and their papers have been collected, the remaining time in this class can be devoted to a discussion of the examination. The instructor can ask individuals if there were any questions they found difficult. Or the instructor can read a certain number of questions, asking individuals in the class to supply the correct answers. It is important for the instructor to impress members of the class with the fact that it is the actual knowledge which is important, not the result of the test.

2. Answers to Examination

1	c	26	a	51	c	76	c
2	b	27	b	52	a	77	c
3	b	28	b	53	b	78	c
4	b	29	c	54	a	79	c
5	a	30	a	55	b	80	b
6	b	31	b	56	b	81	c
7	a	32	a	57	b	82	a
8	a	33	b	58	c	83	c
9	b	34	a	59	b	84	b
10	a	35	b	60	b	85	b
11	c	36	b	61	c	86	c
12	a	37	a	62	b	87	b
13	a	38	b	63	a	88	b
14	c	39	b	64	b	89	a
15	b	40	b	65	c	90	b
16	b	41	b	66	b	91	c
17	a	42	b	67	b	92	a
18	a	43	a	68	b	93	c
19	b	44	b	69	c	94	c
20	b	45	a	70	a	95	b
21	a	46	a	71	c	96	c
22	a	47	b	72	c	97	c
23	a	48	a	73	c	98	a
24	b	49	b	74	b	99	c
25	a	50	a	75	c	100	c

FINAL EXAMINATION FOR FIRE GUARDS

Do not open this folder or turn it over until you are told to do so. Fill in the following spaces now. Write plainly.

Name _____ Address _____

City _____ State _____ Date _____

Read carefully the directions given below for answering the questions of this examination. The score that you make will aid in determining how much you have learned about the Fire Guard, its organization and its operations.

Score

Directions: On the following pages you will find a number of statements of the type given below. One of each of the possible statements most correctly completes the sense of the statement. Indicate the statement that you believe is most correct by writing the letter representing your choice within the parentheses on the right-hand side of the page.

Sample:

The most important duty of a Fire Guard is to
(a)fight fire (b)save life (c)spot enemy planes (*a*)

Now wait for the signal to begin. Do not guess.

1. As a result of air attacks in England during the early months of the war, fire caused (a)less than 50 percent of the damage (b)almost as much damage as high explosives (c)between 80 and 90 percent of the destruction . . . . . ( )

2. The basic operating or fire-fighting unit of the Fire Guard is the (a)sector Fire Guard Brigade (b)the Fire Guard Squad (c)the lookout . . . . . ( )

3. Fire is known also as (a)slow oxidation (b)rapid oxidation or combustion (c)ignition . . . . . ( )

4. The class of occupancies in the United States most frequently involved in fire is (a)public buildings (b)dwellings (c)manufacturing plants . . . . . ( )

5. The Fire Guard organization is (a)a regular service unit of the Air Raid Warden service (b)an independent organization associated with the local fire department (c)a basic training unit of the Auxiliary Fireman's organization . . . . . ( )

6. Fires start in piles of oily rags without any ordinary source of heat being present by (a)lightning (b)spontaneous ignition (c) sparks . . . . . ( )

7. In the event of air attack the primary function of the Fire Guard is to (a)control incendiary bombs and the fires they start (b)aid fire department auxiliaries in controlling fire bombs (c)assist in fighting large fires . . . . . ( )

8. The most frequent cause of fire is (a)careless smoking (b)sooty chimneys (c) spontaneous ignition . . . . . ( )

9. The first thing that should be done if a person's clothing catches fire is (a)run to the nearest shower and get under it (b)smother the flames by wrapping the person in a rug (c)beat out the flames with your hands . . ( )

10. The purpose of screens before open fire places is to (a)prevent ignition of rugs and clothing (b)serve as decoration (c) screen out drafts of air . . . . . ( )

11. The chief difference in the three classes of fire is (a)the flames of each differ in color (b)they give off different amounts of smoke (c)they are best extinguished in different ways . . . . . ( )

12. The factors necessary for the occurrence of fire are (a)a kindling temperature, oxygen, and a burnable substance (b)a burnable substance, heat, and a kindling temperature (c)flame, heat, and something to burn . . . . . ( )

13. The three classes of fire are (a) wood or rubbish, oil, and electrical fires (b)electrical, wood, and coal fires (c)factory, home and school fires . . . . . ( )

14. The soda-acid type fire extinguisher is most effective for putting out small (a)electrical fires (b)oil fires (c)rubbish fires . . ( )

15. A Fire Guard Squad Leader is in charge of (a)a sector brigade (b)a Fire Guard Squad (c)sector post . . . . . ( )

16. Fire Guard Brigade Leaders have headquarters at (a)lookout post (b)sector post (c)assembly points . . . . . ( )

17. The Air Raid Warden service furnishes Fire Guards with (a)communications (b)pump tanks (c)technical advice . . . . ( )

18. In the buildings in his area the Fire Guard must learn (a)location of exits (b) type of building construction (c)whether blackout curtains are used . . . . . ( )

19. Fire Guards will help residents in their areas prepare for (a)blackouts (b)air raid fires (c)high-explosive bombing . . . ( )

20. When a person is killed by a fire, the casualty is considered (a)a direct fire loss (b)an indirect fire loss (c)a fire cost . . . ( )

21. Air raid signals notify Fire Guards to report to (a)assembly points (b)police headquarters (c)his commanding officer . ( )

22. Squad practice drills are useful for (a)perfecting skill in the use of fire-fighting equipment (b)keeping equipment in good condition (c)getting acquainted with other Fire Guards . . . . . ( )

23. The Firemen's carry is useful for (a)carrying an unconscious person down a ladder (b)lifting a person from a chair or bed (c)hoisting ladders to upper floors of buildings . . . . . ( )

24. The thermit reaction, once started (a)can be put out with a spray (b)cannot be stopped (c)can be smothered with sand . . . . . ( )

25. Burning magnesium bombs should be disposed of by (a)applying a solid stream of water (b)carrying them outdoors on a shovel (c)calling the fire department . . . ( )

26. The OCD pump tank extinguisher can be operated by (a)one man and an assistant (b)by turning it upside down (c)by stored pressure . . . . . ( )

27. The garden hose cannot be depended upon during air raids to fight fire because (a)Fire Guards may not be able to reach water faucets (b)normal water supplies may be depleted (c)owners of private property may not admit Fire Guards to the premises . . . . . ( )

28. In fighting Class A fires, the extinguishing stream should be aimed at (a)the flames (b)what is burning (c)where the fire will spread . . . . . ( )

29. The parts of a straight ladder include the (a)fly (b)ladder locks (c)beams . . . ( )

30. In placing a ladder against a building, the heels should be placed (a)one-quarter the length of the ladder from the building (b)where the Fire Guard can climb in a window (c)on a flat board . . . . . ( )

31. Burning white phosphorus from incendiary bombs should be handled (a)with heavy rubber gloves (b)by wetting it down and shoveling it into a container of water (c)by washing it into a manhole . . . . . ( )

32. If explosive incendiary bombs fall where they can start a fire, they should be attacked (a)from the best available cover (b)with a rake and shovel (c)with a long pole. . . . . (

33. Fire prevention consists of (a)doing everything to protect people from fire (b)doing everything to keep fire from starting (c)notifying the local fire chief when fire hazards are discovered . . . . . ( )

34. Among the things the Fire Guard should know about his area are (a)the boundary of the area (b)the location of all telephones (c)the identity of the policeman on the beat . . . . . ( )

35. Oil is solidified by adding wax or soap to it in fire bombs (a)to reduce its ignition temperature (b)to prevent the oil from draining away (c)to make it more difficult for Fire Guards to approach the bomb . . . ( )

36. The only exception to the general rule that a Fire Guard will function as a member of a squad is (a)when he is excused from duty for illness (b)when he is on lookout duty (c)when air raids are made in daylight . . . . . ( )

37. It is the duty of a lookout, during an air raid to (a)spot fallen bombs (b)whistle when he hears or sees an enemy plane approaching (c)call the Air Raid Warden if he needs to replace broken equipment . . . ( )

38. Water is the most commonly used extinguishing agent because (a)it costs the Fire Guard nothing (b)it is more readily available than any other extinguishing agent (c)there is no law against its use in apartment buildings . . . . . ( )

39. When fighting fire it is best to stay on your feet to enable you to (a)bring up more water for the pump tank (b)escape if necessary (c)rescue occupants of the building . . . . . ( )

40. Generally, how little oxygen must there be in the air to enable fire to continue burning (a)10 percent (b)not less than 16 percent (c)about 21 percent . . . . . ( )

41. The start of the chemical process known as fire is termed (a)oxidation (b)ignition (c)combustion. . . . . ( )

42. The nature of the gases released by combustion is regulated by (a)the drafts in the room (b)what is burning (c)the ignition temperature . . . . . ( )

43. Explosive mixtures of vapors and air are produced by volatile liquids when (a) the liquids evaporate (b)they are kept in air-tight drums (c)they are stored in the house . . . . . ( )

44. Wooden barrels should not be used for hot ashes from a stove or furnace because (a)it is against the fire laws (b)the wood might be ignited (c)the barrel might break while being carried . . ( )

45. Included in the cost of fire to a community is the (a)expense of the public water system (b)the salaries of traffic policemen (c)the cost of street and highway repairs . . . . . ( )

46. The chief factor in making air attacks possible is the (a)increased range and carrying capacities of planes (b)improvements in fire bombs (c)better trained pilots . . . . ( )

47. Fires in electrical equipment or near live wires should be extinguished by (a)stirrup pumps (b)vaporizing liquid extinguishers (c)soda-acid extinguishers . . . . . ( )

48. If you believe you have poison gas on your person or clothing, the first thing to do is (a)remove outer clothing and bathe as soon as possible (b)telephone a doctor (c)lie down. . . . . ( )

49. If you have to move a "live" electrical wire that has fallen as the result of an accident (a)use a crowbar (b)use a dry board (c)use your bare hands . . . . . ( )

50. The principal reason for directing a strong stream of water on a burning magnesium bomb is to (a)speed up the burning process (b)cool the burning metal to a point below its ignition temperature (c)reduce the sputtering usually present in burning magnesium . . . . . ( )

51. The products of combustion are (a) heat and smoke (b)heat, oxygen, and smoke (c)heat, smoke, and gases . . . . . ( )

52. The first objective of the civilian fire defense program is (a)the safeguarding of life and property in the community (b)to offer opportunities for civilians to aid in the war effort (c)to carry the war to the enemy. ( )

53. The first thing to be done after an electrical fuse has blown is to (a)replace it with a new one (b)correct the cause of the blown fuse (c)replace it with a stronger one . . . . . ( )

54. In order to become acquainted with the entrances and exits, and the location of fire fighting equipment in the buildings in their assigned areas, Fire Guards must (a) secure the active interest and cooperation of the occupants (b)secure such information from the fire or police departments (c) wait for a fire emergency and use that time to inspect the premises . . . . . ( )

55. Lookout posts should be set up (a) on the tops of buildings only (b)at points of greatest vantage (c)over structures that receive the greatest amount of protection from falling bombs . . . . . ( )

56. The blowing of an electrical fuse is (a) a normal and regular occurrence in present day houses (b)a signal that the circuit is in a hazardous condition (c)usually caused by variation in the supply of current . . . . . ( )

57. Spontaneous ignition is not likely to occur (a)through chemical action (b)in well-ventilated surroundings (c)in neat and well-kept surroundings . . . . . ( )

58. The principal extinguishing agent that Fire Guards will use in fighting fire bombs is (a)sand (b)special smothering materials (c)water. . . . . ( )

59. The water capacity of the OCD pump tank is (a)5 gallons (b)4 gallons (c)10 gallons . . . . . ( )

60. The reason that water will not extinguish burning magnesium, the principal destructive element in a frequently used type of fire bomb, is that (a)the water temperature is not sufficient to cool the burning substance (b)the burning magnesium extracts oxygen from the water which in turn accelerates the burning process (c)it is usually not obtainable in sufficient quantity . . . . . ( )

61. The personal equipment of a Fire Guard consists of (a)a pump tank and garden hose (b)flashlight, stirrup pump, and an armband (c)helmet, armband, and flashlight . . . . . ( )

62. The most important thing that residents can do in protecting their homes against fire is to (a)keep containers of sand ready for use (b)eliminate all fire hazards regularly (c)keep close contact with the Fire Guard organization . . . . . ( )

63. Spontaneous ignition occurs when flames actually develop as a result of (a)internal chemical action (b)friction (c)unknown causes . . . . . ( )

64. Attic fires that occur as a result of basement fires are usually caused by (a)the spreading of sparks (b)the accumulation of superheated air that has passed upward through floor and wall openings (c)actual contact of attic materials with the flames . . ( )

65. Carbon dioxide gas is effective in extinguishing gasoline or oil fires principally because of its (a)cooling effect (b)chemical action (c)smothering effect . . . . . ( )

66. The maximum effective range of the pump-tank stream is about (a)10 feet (b) 30 feet (c)15 feet . . . . . ( )

67. If a fire in a room has spread from the floor up a wall (a)attack the fire on the wall first and then follow it down to the floor (b)attack the fire on the floor first and then follow it up the wall (c)wet down nearby combustibles . . . . . ( )

68. If a fire is still small, the Fire Guard handling the nozzle of the extinguisher can advance close to the fire in order to (a)see it better (b)obtain the benefit of the greater force of a short stream (c)get in a position to apply a fine spray to cover all of the burning material . . . . . ( )

69. After a fire bomb has been disposed of, Fire Guards should (a)leave all inspection work to the fire department (b)remain on guard to see that it doesn't start burning again (c)carefully inspect the scene to make certain that all fire is entirely out . . ( )

70. If the floor or woodwork is burned after a fire bomb has been disposed of, it should be (a)opened with an ax for the purpose of making certain that all fire is out (b)covered with sand (c)reported to the fire department . . . . . ( )

71. Adequate protection from the explosive charge of an anti-personnel fire bomb is furnished by (a)plaster and lath walls (b)overstuffed furniture (c)the outside walls of brick buildings . . . . . ( )

72. The main source of water upon which Fire Guards must depend for fighting fire bombs (a)are streams or lakes (b)is that from regular faucets (c)is the reserve supply that has been placed in pails and barrels at strategic locations . . . . . ( )

73. A person who has received a crushing injury should be removed from a burning building (a)by the firemen's carry (b)in the arms of two Fire Guards (c)on a stretcher . ( )

74. Superheated air is (a)the same weight as normal air (b)lighter than normal air (c)heavier than normal air . . . . . ( )

75. A Fire Guard encourages the disposal of rubbish because it is (a)unsightly (b)a health hazard (c)a fire hazard . . . . . ( )

76. The danger of sparks from smokestacks can be limited by the installation of (a)rods (b)adapters (c)arresters . . . . ( )

77. Prone-pressure resuscitation should be used in all cases of (a)severe injury (b) severe bleeding (c)asphyxiation . . . . . ( )

78. Artificial respiration should be administered to a victim (a)for at least 2 hours (b)for 15 minutes and then discontinued (c)until he is revived or pronounced dead by a physician . . . . . ( )

79. A substance that is fire-resistant (a)is a type of fire extinguishant (b)will not burn at all (c)will not burn under ordinary conditions . . . . . ( )

80. Incendiary bombs that fall and explode in the street or in an open area should be (a)treated as though they had fallen on the roof of a building or into a house (b)watched and permitted to burn out if there is no danger that destructive fires will be started (c)covered with sand . . . . . ( )

81. The normal burning time of the German 1-kilo magnesium incendiary bomb is (a)2 to 3 minutes (b)1 hour (c)10 to 15 minutes . . . . . ( )

82. The effective range of fragments from anti-personnel fire bombs is (a)a radius of about 50 feet (b)about the length of the water stream from a pump-tank extinguisher (c)extremely small . . . . . ( )

83. Potentially, the weapon that destroys most property in modern aerial warfare is the (a)high explosive bomb (b)excitement and panic caused by air attack (c)incendiary bomb . . . . . ( )

84. The firemen's drag is used principally to (a)move valuable property from a burning building (b)rescue unconscious persons from places where the rescuer cannot stand (c)escape from a burning room . . . . . ( )

85. Some incendiary bombs are called "kilo bombs" because (a)they are both high explosive and incendiary (b)of their weight (c)of their deadly effects . . . . . ( )

86. In addition to magnesium, phosphorus, and thermit, another substance commonly used as an incendiary material in fire bombs is (a)sulphur (b)rubber (c)oil . . . . . ( )

87. The purpose of Fire Guard Squad maneuvers is to (a)give Fire Guards something to do until an air raid occurs (b)develop squad teamwork (c)permit Fire Guards to become familiar with the buildings in their assigned areas . . . . . ( )

88. If you are in range of an explosive incendiary bomb, the safest position to take, to avoid fragments while fighting it, is to (a)stand erect (b)crouch (c)lie prone on the floor or ground . . . . . ( )

89. The majority of fires that Fire Guard Squads will be concerned with during and after the disposal of fire bombs are (a)those in ordinary materials, such as textiles, paper, and wood (b)confined fires (c)large conflagrations . . . . . ( )

90. Carbon monoxide, a poisonous gas, usually present under fire conditions (a)has the odor of flowers (b)is odorless (c)very seldom causes death. . . . . ( )

91. If drafts are carrying the smoke from a fire in a certain direction, Fire Guards should approach the fire from (a)any direction (b)the same direction (c)the opposite direction . . . . . ( )

92. Class B fires are fires in (a)flammable liquids (b)live electrical installations (c) paper or cloth . . . . . ( )

93. An important pre-raid duty of Fire Guards is the (a)fighting of fire bombs (b) repair of fire-fighting equipment (c)survey of buildings for the purpose of locating special fire hazards. . . . . ( )

94. Celluloid and magnesium are examples of substances that (a)are used as incendiary materials in fire bombs (b)supply their own oxygen while burning (c)while burning cannot be extinguished with water. ( )

95. The responsibility for placing and maintaining adequate water supplies in buildings is that of (a)Fire Guards (b) occupants (c)Air Raid Wardens . . . . ( )

96. The thermit reaction of a bomb is started by (a)a solid stream of water (b) contact with a hard surface (c)an easily ignitable priming powder . . . . . ( )

97. In order for white phosphorus to burn there must be (a)a flame (b)a priming mixture (c)air . . . . . ( )

98. Smaller types of German incendiary bombs are used for (a)setting fires indiscriminately over a wide area (b)setting dwellings afire (c)hitting specific targets . ( )

99. Wider use of incendiary bombs has come about as the result of (a)the large number of flammable structures (b)the bad effect on civilian morale (c)the development of the airplane . . . . . ( )

100. The best way to find out whether a cleaning fluid is flammable is to (a)pour out a small sample and apply a lighted match to it (b)ask the salesclerk (c) read the label on the container . . . . . ( )

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