CIVIL DEFENCE

RESCUE MANUAL

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LONDON
HER MAJESTY'S STATIONERY OFFICE
1952
The pages of this manual are not numbered continuously as it may be necessary to introduce new pages at a later date.

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CHAPTER XI. USE OF HEAVY MECHANICAL PLANT IN RESCUE, DEMOLITION AND CLEARANCE OPERATIONS

In the last war it was found that at major incidents the use of heavy mechanical plant was frequently necessary in support of rescue operations. Such equipment was used to help in the quick removal of debris; to lift heavy blocks of brickwork or masonry; to take the weight of collapsed floors and girders so that voids could be explored and casualties extricated; to haul off twisted steelwork and other debris and to break up sections of reinforced concrete.

In future all these tasks may be required and heavy clearance may have to be effected to enable rescue and other Civil Defence vehicles

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**Fig. 20**

Using heavy mechanical plant at the Smithfield Market V.2 incident.  
[8 March 1945: market fell on to railway below: 110 killed]
to approach within measurable distance of their tasks. The problem of debris will in fact be a major factor in Civil Defence operations.

Heavy mechanical plant may be required for the following purposes:

(a) To assist in the removal of persons injured or trapped. At this stage mainly heavy plant is needed, particularly mobile cranes with sufficient length of boom or jib to reach for long distances over the wreckage of buildings.

(b) To force a passage for Civil Defence vehicles and fire appliances to enable them to reach areas where major rescue and other problems exist and require urgent operational action.

(c) To take certain safety measures—e.g., to pull down unsafe structures.

(d) To clear streets and pavements to help restore communications and to afford access for the repair of damaged mains and pipes beneath the streets.

(e) For the final clearance of debris and the tidying of sites. This is a long term and not an operational requirement.

Urgent Rescue Operations

During rescue operations in London in the last war the machines used with great success included heavy 3½-5 ton mobile cranes, mounted on road wheels, with a 30-40 ft. jib; medium heavy 2-3½ ton mobile cranes, mounted on road wheels, with a 26 ft. jib; heavy crawler tractor bulldozers; medium crawler tractor bulldozers; mechanical shovels and compressors, three stage, mounted on road wheels.

In the case of a large or multiple incident where access was obstructed by considerable quantities of scattered debris, a bulldozer or tractor was first employed in order to clear one or more approaches by which other equipment and personnel could reach the scene of operations.

Next, all debris of manhandling size was loaded into one-yard skips and discharged by the crane into lorries, giving increased manœuvring space to the Services operating on the site.

Heavy mobile cranes were then brought up to the incident where, used under the skilled direction of the rescue party Leader, they were invaluable for removing girders and large blocks of masonry which obstructed access to casualties or persons trapped. The necessary chains and wire ropes for these operations formed part of the standard equipment of the heavy and medium-heavy mobile cranes.

The work was, of course, carried out in close co-operation with the Rescue Parties who also used various forms of light mechanical equipment, such as jacks and ratchet lifting tackle for work in confined spaces.

Compressors sometimes proved valuable for breaking up large masonry such as fallen walls, into sections of a size and weight within the handling and lifting capacity of the cranes. This method was only used when it was known that there were no casualties under the masonry.

Mobile cranes and other heavy mechanical plant were withdrawn as soon as all casualties had been removed to be available for use at other incidents.

Safety Measures

Safety and clearance measures may follow the actual rescue operations if the situation permits.
APPENDIX C

TYPES OF BUILDINGS

Buildings can be grouped into categories by the methods and materials used in their construction.

The main groups are as follows:—

(a) Unframed Buildings.
(b) Partially Framed Buildings.
(c) Fully Framed Buildings.
(d) Monolithic Buildings.

(a) Unframed Buildings (Load Bearing Walls)

The majority of buildings are of this type, although the number of framed buildings is on the increase due to the greater use of steel and reinforced concrete.

The term “unframed” means there is no skeleton of steel or reinforced concrete taking the load. In unframed buildings the walls carry the weight of floors and roof as well as their own weight, and give protection from the elements.

The most familiar type of unframed building is the dwelling house which may have its floors made of timber or concrete. Both types will be described, in the order in which they would be built, since they have different characteristics.

(i) Dwelling House with timber floors

Foundations are the feet on which the building stands and are formed by digging shallow trenches along the lines of the walls, and partially filling them with concrete. This concrete must be thick and wide enough to spread the load over a sufficiently large area to ensure that the weight does not cause the foundation to sink any further into the ground. In some districts brick or stone is still used for the foundations, but normally concrete will be found.

Outer walls are usually built of either brick, stone or concrete, the bricks or blocks being laid overlapping one another, so that vertical joints do not run through successive courses in the wall. This lapping is called bonding and gives strength.

The bricks or blocks are bedded in position and joined together by a mixture of cement or lime and sand to which water is added to make it plastic for working. This mixture is called mortar, and when it hardens it becomes firm and solid.

The Walls begin at the top of the foundation and are built up to the start of the roof. They must be strong enough to carry the loads put on them by the floors and roof, and must be stout enough to keep the weather out. Thus in two-storey dwellings they are likely to be 9-inch solid or 11-inch cavity walling (two 4½-inch walls with 2-inch space between). The two sections are tied together with twisted metal strips or wire built into joints at intervals, the twist being necessary to prevent water running from the outside skin to the inner skin. Houses of three storeys will, of course, have thicker walls and may be 13½-inch solid or 15½-inch cavity, the inner load bearing wall being 9 inches.
Fig. 125
Constructional details of an ordinary dwelling house.

(1) Ridge Tile.
(2) Tiles.
(3) Tile Batten.
(3a) Close Boarding.
(4) Purlin.
(5) Ridge Board.
(5a) Flashing.
(6) Common Rafter.
(7) Ceiling Joists.
(8) Flue from Room.
(9) Flue from Adjoining House.
(10) Herring Bone Strutting.
(11) Concrete Hearth.
(12) Skirting.
(13) Damp-proof Course.
(14) Footing Course.
(15) 9" Solid Wall.
(16) Reinforced Concrete Lintel.
(17) Sill.
(18) Staircase.
(19) Handrail.
(20) String.
(21) Solid Floor.
(22) Vertical Damp Course.
(23) Floor Joists.
(24) Honeycomb Walling.
(25) Sleeper Wall.
(26) Wall Plates.
(27) Site Concrete.
(28) Air Brick.
Standard Rescue Training

APPRECIATION OF DAMAGE TO BUILDINGS—II, FORMS OF COLLAPSE

Notes for Instructor

1 Reference: Civil Defence Rescue Manual, Chapter V.
2 Instructor will find following are useful visual aids:
   (a) Home-made diagrams and/or models of types of buildings and of forms of floor collapse.
   (b) Selected frames from Film Strip CD 8 “Forms of Collapse”.

Object of Lecture and Inspections

3 To study common factors present in collapsed buildings and to appreciate their value in relation to problem of extricating casualties.

Nuclear Weapons

4 Although advent of nuclear weapons has enormously increased extent of damage that can be achieved in air attack on cities, the same effects are used to damage buildings as experienced with high explosive and incendiary bombs. These effects are, of course, on vastly larger scale with nuclear weapons so that largest buildings are affected as a whole by blast, whereas with high explosive bomb only parts of such buildings are affected. FROM RESCUE PARTY’S POINT OF VIEW, ANY PARTICULAR DAMAGED BUILDING IS MUCH THE SAME PROBLEM IRRESPECTIVE OF TYPE OF BOMB USED.

Common Factors

5 Buildings of same class and type of construction tend to collapse in much the same way, and certain common factors are present. FOR RESCUE PURPOSES, IT IS OF UTMOST IMPORTANCE THAT SUCH FACTORS ARE CAREFULLY STUDIED AND THEIR VALUE IN RELATION TO PROBLEM OF EXTRICATING CASUALTIES APPRECIATED.

Classification of Buildings

6 Class 1: Those built round steel or concrete frame in such manner that, even after all walls are demolished, floors and roof may still remain in position.
7 Class 2: Those in which weight of floors and roof are carried directly on walls below them, so that, if blast removes lower walls, everything above that level likely to collapse.
8 Collapse of Class 1 building generally more localised than with Class 2 building, and except that some heavy steelwork may be involved if main frame of Class 1 building damaged, collapse of such structure usually causes less debris than that of similar size building of Class 2. Damage to Class 1 building therefore not usually as complicated to deal with from rescue point of view.
9 Steel-framed buildings not encased in concrete are much more affected by fire than by blast as great heat softens steelwork and causes it to distort and collapse. REMEMBER THIS WHEN RESCUE WORK CONDUCTED IN OR NEAR STEEL-FRAMED BUILDING WHICH IS ON FIRE.

Forms of Collapse: Class 2 Buildings

10 Generally, on collapse of Class 2 building (except in case of direct hit) walls facing spot where bomb fell and part of side walls break into pieces and fall partly inside and partly outside building. Floors collapse either in one piece, breaking in centre and forming “V” shape, or remain fixed on one side and fall or sag down at other. First floor may sag in this way so that one end rests in its old position on side wall while other end rests on ground.
11 When Class 2 building affected, the explosion may destroy lower part of main wall leaving upper parts of building to come down under own weight or remain in position, but in extremely unstable and dangerous condition. This is particularly noticeable with multi-storied load-bearing buildings. EFFECT OF THIS ON RESCUE OPERATIONS MAY BE THAT BEFORE ANY ATTEMPT CAN BE MADE TO SEARCH FOR OR EXTRICATE CASUALTIES FROM DEBRIS BELOW, UPPER PORTIONS OF BUILDING MAY HAVE TO BE MADE SAFE OR PULLED DOWN. UNDER THESE CONDITIONS RESCUE OF CASUALTIES ON UPPER FLOORS GENERALLY BEST CARRIED OUT FROM SIDE OF BUILDING AWAY FROM EXPLOSION.

12 Wooden floors tend to hold together in one piece, even if distorted or broken in centre, which forms a strong and flexible “raft”. THIS “RAFT” MAY HAVE FALLEN IN SUCH WAY AS TO PROTECT CASUALTIES UNDERNEATH FROM FALLING BRICKWORK, OR TO FORM A VOID UNDERNEATH AS MEANS OF ACCESS TO INTERIOR OF DEBRIS.

Local Buildings: Knowledge of Layout

13 Rescue leaders are urged to examine and gain knowledge of form of construction and general layout of typical buildings in own area. Basements of buildings used as public or private air raid shelters should also be examined and small sketches made of general layout, emergency exits, etc.

Basements: Collapse and Formation of Lean-to’s

14 It is unusual for outside walls of basement to be damaged, except by earth shock. Basement ceiling is more likely to be damaged because it receives full load of debris from upper floors. The result is a partial or complete collapse of ceiling, unless it has been specially strengthened to withstand probable load.

15 When basement ceiling collapses, ceiling joists, while tending to break near middle, may remain fixed to walls at their extremities and so form lean-to’s against walls at either end. If main weight of debris comes at one end of ceiling joists, latter may be broken off near wall at this end and collapse to form only one lean-to against opposite wall of basement. Remember that floor or ceiling joists are practically always laid to span narrowest width of room, so that LEAN-TO’S MOST LIKELY TO BE AGAINST LONGEST SIDES OF ROOM.

16 FORMATION OF LEAN-TO’S IS OF PARTICULAR IMPORTANCE BECAUSE THEY MAY PROTECT PERSONS IN BASEMENT FROM MAIN LOAD OF DEBRIS AND SO ENABLE THEM TO BE RECOVERED ALIVE.

Unexploded H.E. Bombs

17 Detection of unexploded H.E. bombs is not part of rescue work, but members of rescue parties should be aware of one particular risk. When large unexploded bomb strikes building it may pass right through and bury itself in ground below. In passing through building at high speed a bomb often creates a degree of destruction not unlike explosion of smaller bomb, so that presence of large bomb, which may explode, is not noticed.

Concluding Summary

18 The object has been to study common factors present in collapsed buildings and to appreciate their value in relation to problem of extricating casualties. Collapse of Class 1 building generally more localised than with Class 2. Upper portions of building may have to be made safe before rescue of casualties. Knowledge of forms of floor collapse and resulting voids most important. Note unexploded H.E. bomb risk. Damaged buildings present much the same rescue problem, irrespective of type of bomb.
Light Rescue Training

APPRECIATION OF DAMAGE TO BUILDINGS

Notes for Instructor

1 Reference: Rescue Pamphlet, Chapters I and II and Instructional Diagrams.

2 The instructor requires a blackboard, and charts showing typical kinds of construction and forms of collapse. Selected frames from Film Strips CD15, "Elements of Building Construction", and CD8, "Forms of Collapse", and photographs or simple models may also serve as additional visual aids. An inspection of actual buildings under construction (and of damaged structures where possible) must follow the talk as an essential part of the instruction.

Object of Lecture

3 To impart a general knowledge of the more common types of building construction in order to appreciate the forms of raid damage which may be encountered and so assist in the location of casualties.

Types of Buildings

4 Unframed.—Floors and roof supported by load carrying walls, e.g., normal domestic buildings. Explain details of foundations, outer walls, party walls, partition walls, floors, roof trusses, staircases.

5 Framed.—Steel or reinforced concrete "skeleton" takes all main loads. Walls often added in "panel" form after erection of floors and roof, e.g., modern factories, blocks of flats, offices, cinemas.

Causes of Damage

6 Air raid damage can be caused in various ways by:
   (a) Blast, caused by an explosion.
   (b) Earth shock, caused by deep penetration of bombs.
   (c) Impact of bomb on building (may be UXB).
   (d) Fragmentation, i.e., bomb splinters at high velocity.

Effect on Unframed Buildings

7 Rescue Pamphlet, Chapter II.

8 Impact alone (even of UXB) apart from blast may break down bond between foundations, walls, floors and roof. Blast may either blow walls inwards or suck them outwards.

9 The debris from walls, if blown inwards, will load the floors, causing collapse, and if sucked outwards will fall in the main in the street or garden.

10 Floors of a normal dwelling house are not constructed to bear heavy loads of wreckage, and they may therefore bend or break across at the centre of the joist span, crashing down to form a V-shaped collapse, the bulk of the debris falling into the "V", and voids being formed beneath the broken floor.

11 Where walls are sucked out, floors may collapse in two ways. If one supporting wall is removed, a lean-to collapse of the floor is caused, with a void beneath it. Where both supporting walls are demolished a pan-cake collapse may take place, in which case strong furniture may form voids beneath the floor.
Effects on Framed Buildings

12 Rescue Pamphlet, Chapter II.
13 Generally less severe and more local than on unframed structures, owing to manner in which main loads are carried by the skeleton.
14 Although damaged by fragmentation or distortion from blast or fire, frame may retain sufficient strength to support floors and roof.
15 Panel or partition walls may be blown in or sucked out without causing general collapse. Debris from these walls is usually relatively light in weight, and fewer voids are likely to be formed.

Recognition of Dangerous Structures

16 When entering a badly damaged building, care must be taken to avoid becoming a casualty. Danger from partly collapsed walls, unsafe staircases, damaged beams, etc., may confront those who enter a building immediately after it has been damaged. Unavoidable risks should be reduced to minimum.

Concluding Summary

17 The object has been to impart a general knowledge of the more common types of building construction in order to appreciate the forms of raid damage which may be encountered, and so assist in the location of casualties.
18 An inspection of actual buildings under construction (and of damaged structures where possible) should follow this lecture.
Elementary Rescue Training
IMPROVISED ROPES AND STRETCHERS

Notes for Instructor

1 Reference: Rescue Pamphlet, Chapters VI and V and Instructional Diagrams.

2 The instructor requires a blackboard; fibre rope and specimens of material from which ropes can be improvised (e.g., clothes lines, sash cords, wire flex, and strips torn or cut from sheets, blankets, curtains); diagrams of knots used in Elementary Rescue training; standard stretcher and materials from which stretchers can be improvised (e.g., single mattress, light door, sheet of corrugated iron); three old blankets; short ladder, pieces of timber about 7-ft. long, or two broom handles or similar poles; and eight large safety pins. He will require a "casualty", but may use members of his class for stretcher carrying. Selected frames from Film Strips 23 and 24, and 6 and 7, are useful visual aids.

3 The instruction should be broken down into half-hour periods, each period being followed by adequate student practice.

Object of Lesson

4 To teach how to improvise ropes, how to tie simple knots, how to improvise stretchers, and to explain their use in rescue.

Ropes

5 Persons may have to be rescued from above or below ground level, and where staircases are damaged and ladders not available the need for lowering or hoisting will arise. Ropes are also often required for lashing casualties to stretchers.

6 Where proper ropes are not available, improvisation may be made from materials, such as clothes lines, sashcords, wire flex, or strips cut from bedsheets, blankets and curtains found in the vicinity of the damage. Improvised ropes, and the knots joining them, should be tested quickly before use, e.g., by the rescuer standing on one end and pulling on the rope.

Knots

7 A knowledge of elementary knots is required for joining material to form improvised ropes and for fastening ropes around persons being lowered or hoisted. There are four knots which everyone must know how to tie and apply under any conditions:

(a) Reef knot, for joining two ropes of equal thickness.
(b) Clove hitch, for securing a rope to a spar or support.
(c) Sheet bends (single and double).

Reef Knot

8 For joining two dry ropes of equal thickness. Rescue Pamphlet, fig. 35.

Clove Hitch

9 This forms basis of many securing knots where ropes have to be made fast to spars, poles or other supports, and can be used either at end of rope or in centre. Rescue Pamphlet, fig. 36.

Single Sheet Bend

10 Sheet Bends used for uniting two ropes of different thicknesses. They do not slip when rope is wet. Rescue Pamphlet, fig. 38a.
Double Sheet Bend

11 More secure than single sheet bend and used when there is major difference in size of ropes. Rescue Pamphlet, fig. 38b.

Stretchers

12 Blankets or rugs salvaged from the site can be used as improvised stretchers. They are particularly useful in confined spaces. (See blanket lift at fig. 28 of Rescue Pamphlet.)

13 If space permits, a more rigid form of stretcher can be improvised from a short ladder, light door, sheet of corrugated iron, or single mattress, but it may be necessary to lash the casualty to the improvised stretcher for negotiating corners and doorways or when carrying over debris and other obstacles. Whenever possible the stretcher should be blanketted to provide warmth and further security to the casualty.

14 Damaged limbs should, where possible, be immobilised by the use of improvised splints before placing the casualty on the stretcher.

15 Should no rigid platform be found, but blankets alone be available, a stretcher capable of being carried some distance can be improvised by correct folding and the use of strong safety pins and broom handles or similar poles for side supports. (See fig. 27 of Rescue Pamphlet.)

16 Care is necessary in crossing debris and obstacles, and additional carrying members may be required to steady the stretcher at the sides.

Concluding Summary

17 The object has been to teach how to improvise ropes, how to tie four simple knots, how to improvise stretchers, and to explain their use in rescue.
Sheet Bends

There are two types of Sheet Bend, the Single Sheet Bend and the Double Sheet Bend. Both are used for uniting two ropes of different thicknesses and have the advantage that they do not slip when the rope is wet.

The Single Sheet Bend is formed by making a loop in the thicker of the two ropes, and holding this in the left hand, the end of the thinner rope is passed upwards through the loop forming a half hitch round the two thicknesses of the thicker rope.

The Double Sheet Bend is a trifle more secure than the Single Sheet Bend and is used when there is great difference in the size of the ropes. It is formed in a manner similar to the Single Sheet Bend except that after having made the half hitch with the thinner rope, continue turning its short end to make another round turn around the two thicknesses of the thick rope and towards the bight.
Thumb Knot

This is a simple knot tied in the end of a rope to stop the rope passing through a pulley block or temporarily to prevent fraying of an end. The knot is formed by making a loop and passing one end through it.

Figure-of-eight knot

With the rope “away” from you, take the standing part in the left hand palm upwards and the running end in the right hand. Pass the running end over the top of the standing part making a loop, then carry on with the running end round behind the standing part, over the top, then down through the loop which you have formed.

Draw the running end tight and the knot should resemble the Figure-of-8. This knot is useful as a stop and is often used to prevent the end of a rope from running further through a block. It can also be used temporarily to prevent the end of a rope from fraying when the whipping has been lost. In general it is more useful than the Thumb Knot as it is easier to undo.

Reef Knot

For joining two ropes of equal thickness. This is best described as two thumb knots tied in reverse direction, left over right then right over left. It is quickly untied and is a useful knot for general purposes. It should be used for all bandaging and for tying two dry ropes of the same size when the pull is constant. A reef knot can be tied and will remain tied when there is an initial pull on the ropes.
Chair Knot

The chair knot is a good general purpose knot and one which is very important for emergency rescue work. One of its main purposes is to form an efficient and quickly made sling in which a person may readily be raised or lowered. The sling formed by this knot gives support to the chest and legs of the person being rescued.

![Chair Knot Diagram](image)

**Fig. 37**  
Method of making a chair knot.

It is formed by grasping the rope, near its centre, in the left hand, palm down. Approximately a yard from the left hand take the rope in the right hand, palm uppermost. Turn the left hand palm upwards forming a loop (anti-clockwise), turn the right hand palm down forming a loop. Pass the standing ropes through the loops of the opposite hand pulling them through, thus forming two loops with a knot in the centre. These loops can be adjusted to the required size. A half-hitch is then made on each loop to keep them at their required size.

One loop will be slightly larger than the other to keep the person being raised or lowered in a "chained" position.

To place the person properly in the knot the small loop must go under the armpits, and the longer loop at the back of the knees. When properly fixed in this knot and slung, the person cannot get out however much he may struggle. At the same time no undue pressure is caused upon his body.

Bowline

This forms a non-slip loop at the end of a rope and is a most useful anchoring knot. It may also be used for lowering or raising purposes and for attaching a rope to a person as a safety line.

![Bowline Diagram](image)

**Fig. 38.** Bowline.

To tie this knot take the running end of the rope in the right hand pull it across the upturned palm of the left hand, lasso the fingers of the
left hand, forming a loop, pull loop to required size, pass the running end (which is held in the right hand) up through the loop in the left hand, then underneath the standing rope and back down through the loop. Pull the standing rope and running end to tighten.

An insensible person can sometimes be dragged out of a building by means of a short length of rope with a bowline at both ends. The person is placed on his back with one bowline under his armpits and the knot of the bowline on his chest. The rescuer places the other bowline round his neck and over his chest, and crawls out on all fours with the rope passing under his body to the insensible person.

LASHINGS

Lashings are used mainly to secure two or more poles firmly together. The form of each type of lashing can best be understood by a careful study of the diagrams below and the appended explanation. The lashings may be made by using the 40 ft. 1½ in. lashing carried in the equipment.

Square Lashing

This is used to lash together two poles that touch and cross at right angles.

![Diagram of square lashing]

**Stage 1.** Start with a clove hitch (a) round the standard, below the ledger, “marrying” the ends as at (b). Take the “married” ends up and around both standard and ledger as depicted by arrows.
Elementary Rescue Training

EMERGENCY METHODS OF MOVING CASUALTIES

Notes for Instructor

1 Reference: Rescue Pamphlet, Chapter IV.

2 Instructor requires an assistant to act as casualty and an additional man to help demonstrate the methods mentioned in paragraph 7. Selected frames from Film Strips CD6 and 7 will be found useful.

Object of Lesson

3 To explain and teach various types of hand carriage for EMERGENCY use in moving casualties where need for speed precludes use of casualty handling equipment, as preliminary to actual practice.

Emergency

4 When casualty is in danger of receiving further injuries, by fire, coal gas, flooding or from dangerous structures, such as leaning walls, etc., it is necessary to remove cause of danger from casualty or casualty from the danger. If vital to remove casualty to safety, he must be removed regardless of his injuries. Only when casualty is in imminent danger of death by remaining where he is does removal take priority over stoppage of bleeding.

Choice of Method

5 Various types of hand carriage include five suitable for one rescuer and five for more than one rescuer. Choice of method depends upon:
   (a) Nature of casualty's injuries: Slight or serious, conscious or unconscious.
   (b) Position in which casualty is found: Ample space, narrow void, limited headroom.
   (c) Number of rescuers.

Methods Suitable for one Rescuer

6 Explain and teach following methods, vide Rescue Pamphlet:
   (a) Pick-a-back.
   (b) Human crutch.
   (c) Fireman's lift.
   (d) Rescue crawl. (Previously known as the Fireman's crawl.)
   (e) Removal downstairs.

Methods Suitable for more than one Rescuer

7 Explain and teach the following methods, vide Rescue Pamphlet:
   (a) Two man human crutch.
   (b) The fore and aft method.
   (c) Two handed seat.
   (d) Three handed seat.
   (e) Four handed seat.

Concluding Summary

8 The object has been to explain and teach various types of hand carriage for emergency use in moving casualties where need for speed precludes use of casualty handling equipment, as preliminary to actual practice. ONLY WHEN CASUALTY IN IMMINENT DANGER OF DEATH BY REMAINING WHERE HE IS DOES REMOVAL TAKE PRIORITY OVER STOPPAGE OF BLEEDING.
Rescue

This Handbook is a revised edition of,
and replaces, the
Civil Defence Rescue Manual

LONDON
HER MAJESTY'S STATIONERY OFFICE
1960
Preface

1 In this handbook, which is a revised edition of the Rescue Manual, no changes have been made in the principles of rescue techniques.

2 Since the Manual was issued, however, manpack equipment has been supplied to the Rescue Section of the Civil Defence Corps, and details of this and the method of its use are given in the handbook. Similarly, new items of hauling and lifting equipment and hydraulic power equipment have been introduced; their use and maintenance are explained in chapters under these headings.

3 Emphasis is placed on improvisation methods, and the need for using materials found on the site in conjunction with items of equipment carried in the manpack and by hand.

4 There is an additional chapter on the responsibilities of officers, and some of the principles of man management are enunciated in this, as well as their duties in rescue operations after a nuclear attack. The chapter on party leaders' duties and responsibilities has been brought up to date.

5 Since the Armed Forces will be aiding the civil power in any future war, tables showing the formation for civil defence duties of an Infantry Battalion and Regiments of the Royal Artillery are included in the appendices.

Note for members of the Armed Forces

In the text of this handbook all references to ranks and units relate to the Rescue Section of the Civil Defence Corps, and these should be amended where necessary to correspond with particular formations of the Armed Forces e.g. read Rescue Sections for rescue parties and Rescue Section Commander for rescue party leader. (See also Appendix D and Civil Defence Pocket Book No. 2 “Military Support in Civil Defence”).
CHAPTER 3

Duties and Responsibilities of Party Leaders

3.1 The leader of a rescue party occupies a position of responsibility both in the depot and in operations. In many ways he is a key man, being the direct link between the men themselves and their officers. In addition he is the one man who welds a collection of individual recruits into an effective party or team, capable of exerting a combined effort as and where required. The magnitude of the rescue task in any future war has increased the importance of the party leader and made him more than ever one of the most vital links in the rescue chain. Although he will have a strong and recognised command above him and one to which he can always turn for advice or assistance, it will be on the excellence of his reconnaissance and the soundness of his initial plan of action that the overall success of the platoon or company will be built up. Rescue party leaders did a magnificent job in World War II; in any future operations they will have to think and work even more quickly, and no time must be lost by mistakes or haphazard approach to a task.

3.2 It is the leader’s duty to ensure that the instructions of his superior officer are faithfully carried out by himself and his men; to make decisions in the absence of his superior; to organise his work and to train and direct his men so that their duties are carried out smoothly and effectively; to be continually on the watch for means of adding to the efficiency and preparedness of his team; to foster the loyalty of his men, both to himself and to those in authority; to earn their confidence in him and his leadership; and generally to control them efficiently and effectively.

3.3 The leader can best do this by encouragement and by example, by teaching his men to co-operate as a team and carry out their duties in a spirit of keenness and willingness. To win the confidence of his team, the leader must be quite clear in his mind what he wants done, how he wants it done, and the reason why it is to be done at all. He should take an impartial interest in each of his men, try to realise their individual capabilities and be watchful for their general welfare in the widest sense. His constant aim should be to build up a tradition and pride of service. While the chief officers and their staff are continually working to further the interest and improve the well-being of the personnel, the men owe it to themselves to assist in every way and it is the leader’s duty to teach and encourage them to co-operate with those in authority and to give of their best.

Personal qualities and practical ability

3.4 Among the important personal qualities required in a leader are ability to appreciate a situation quickly and accurately, technical reliability, perseverance, careful attention to detail and ability to co-ordinate the work of his men.
3.5 Ability to appreciate a situation quickly and accurately. After being given his initial briefing and priorities by the Senior Warden, the first thing a leader must do is to make a rapid summing up of the situation. He must be able quickly to assess the nature of the problem and to decide the way in which he will tackle it. Priorities must be assessed, additional information obtained, and any other appropriate action taken to enable the job to be tackled not only expeditiously, but on the right lines. To do this the leader must be able to bring to bear all his knowledge and experience, and remain unflustered by the situation. Once his men have been deployed he must make a quick reconnaissance.

3.6 Whenever a party leader is in doubt about the way a particular rescue task should be carried out, he must not hesitate to seek advice from his senior officer. Incorrect approach to a task can mean many hours of fruitless work.

3.7 Technical reliability means sound knowledge of rescue work in its widest sense; methodical and thoughtful preparation for the task in hand; orderly carrying out of the successive stages of rescue; and careful recording of what has been done. The leader's knowledge of his work can be gained only by a proper study of the subject and by the continual exchange of ideas with other leaders. He should lose no opportunity of discussing with other leaders how particular rescue jobs were tackled, what difficulties had to be faced, and how they were overcome. It may be claimed that no two rescue jobs are the same, and that it is of little value to study what has been done at other tasks. Experience shows this to be wrong. Though no two jobs are exactly the same, the general procedure and methods of "attack" have many features in common. Men who have the important responsibility of saving life can usefully spend time in examining and discussing tasks and in exchanging experiences. Just as good leadership is the key to successful rescue operations, so sound knowledge—the basis of self-confidence—is the key to good leadership. It broadens the leader's outlook and teaches him not to be resentful of constructive criticism, but to welcome it as a corrective and as a stepping-stone to perfection.

3.8 Perseverance enables the leader to complete his tasks in spite of setbacks and difficulties. It also teaches him self-discipline.

3.9 Attention to detail is important as the basis of sound and effective rescue work. Neglect of detail creates slovenliness of mind and habit, breeds accidents and lowers the performance, morale, and prestige of the section. Quality of work is much more difficult to achieve than quantity or speed. It requires a much greater personal effort; but it is far more effective and productive of useful results. Reasonable speed is a necessary consideration in every operation, but speed without quality is of little value, and may be dangerous, though spectacular to thelay onlooker. Leaders must teach their men that the efficiency of their work is a primary consideration, that speed must be regulated according to the purpose in hand and with due regard to the safety not only of persons trapped but also of the personnel.
Co-ordination. Effective co-ordination ensures that the leader and all his men work unitedly as a team towards the common end. Every man must work harmoniously with his fellows so as to achieve the desired result in the quickest, safest and least tiring manner. The leader’s most important duty is to achieve this co-ordination; and in most circumstances, he will be far more effectively employed in co-ordinating the work of his men than in attempting to do the work himself.

As the leader is a practical man, he may find it difficult to resist the temptation to take a hand in the work, especially when life is at stake. Experience shows, however, that when the leader himself takes too great a part in the manual work, the general efficiency of the operation suffers and the men tend to work as individuals and not as a team. Except in rare instances, the effect is not to accelerate but to delay the ultimate release of trapped casualties. Thus, cases have occurred where in the absence of proper reconnaissance and supervision by the leader, men have worked for hours extricating a casualty whilst several others less badly trapped were neglected during this period. In other cases, through faulty directions, men have spent precious time laboriously piling debris higher still over the place wherein casualties were trapped. The leader’s task is to retain a grasp of the situation and to maintain effective control until rescue work is completed. He must keep all his men fully employed and ensure that, while lives are at stake, no worker stands idly about waiting to be told what to do next.

Party discipline

Every leader is responsible for the good conduct and behaviour of his men, and must have the courage to see that his instructions are obeyed. The leader’s understanding of his men must be increased by frequent exercises. Such exercises give the leader an opportunity to develop the art of giving commands in a clear and unmistakable manner, and what is even more important, of so asserting himself that his instructions are promptly and properly carried out. No opportunity should be lost by leaders at exercises of “trying themselves out” in this way. Experience shows that rescue party men generally prefer working under a leader who asserts himself; they are the first to realise that efficient control makes their work easier and relieves them from the strain of not knowing what to do.

A good leader should be able to maintain a good standard of discipline and secure compliance with all reasonable instructions. Only in the last resort should he report cases of insubordination and other faults to his superior officer who, if unable to deal with the situation, must at once refer the matter to a higher authority. Leaders should not allow smoking during training sessions and exercises.

Distribution of party: use of deputy leader: use of public

The division of a rescue party into smaller working units will depend largely on the priority of commitments, and the supplementing of his party members by the help of persons trained in light rescue or elemen-
The early release of uninjured persons may be a prime consideration in providing a leader with supplementary labour.

3.15 The deputy leader will, therefore, frequently be given tasks using "rescue" trained and other personnel. To enable the deputy leader to undertake such work efficiently, it is essential that his training and qualities ensure a thorough knowledge of a leader’s responsibilities.

Co-operation with other services

3.16 Party leaders must co-operate fully with other services working at the scene of operations, especially the Fire Service. If fire is present the whole of rescue operations will be guided in accordance with the fire fighting plan. Any requests for assistance from the Fire Service, such as turntable ladders or pumps, must be sent through officer-in-charge of civil defence operations—e.g. Post Warden or Senior Warden. If several parties are working together the request will go first to the senior Rescue Section officer. If the Fire Service ask for assistance, the party leader will work his party in accordance with the Fire Service request and directions.

First aid and stretcher bearing

3.17 The arrangements for casualty collection have not taken away the responsibility of the Rescue Section for administering first aid during rescue, and for stretcher bearing. Rescue parties are not intended to be stretcher bearing parties, though they may help in this work once rescue is completed. Short carries to casualty collecting points, or to cover in the event of fall-out, are of course part of the rescue operation. The party leader will ask for assistance from the Ambulance and Casualty Collecting Section (in Scotland, the Warden Section) to enable the Rescue Section to concentrate on rescue, but if this is not available, the work must be undertaken by the Rescue Section.

Handing over and reliefs

3.18 When a party which has been working for some time is relieved by a fresh party, it is essential that contact should be established between the incoming and outgoing leaders. The latter verbally informs the former of the plan of action and what work is in hand. It is preferable that the outgoing leader accompanies the incoming leader on the latter’s initial reconnaissance. Equipment in position should not normally be removed by the outgoing party, but should form a basis of exchange or be left for recovery later.

Welfare of party

3.19 The leader must watch for signs of fatigue in his men. For their own sakes, and in the interest of the rescue effort, men must not be allowed to work until they are exhausted completely, but should be given periods of rest, or changed over from a heavy to a lighter task.

Inventory of party equipment

3.20 The party leader is responsible for all equipment issued to his party. At every change of shift the party leader must check this. This also applies
CHAPTER 6

Types of Damage from Modern Air Attack

General Characteristics

6.1 When a nuclear weapon explodes an immense amount of energy is released almost instantaneously and the contents are transformed into a rapidly expanding white hot ball of gas at a temperature as high as that on the sun. From this "fireball" a pulse of intense light and heat is radiated in all directions. The materials in the fireball are also a source of radioactivity in various forms. As the fireball expands and cools, a powerful blast wave develops. As it cools still further, it shoots upwards to a height of many thousands of feet, billowing out at the top to give the appearance of a huge mushroom or cauliflower on its stalk.

6.2 The three forms of energy released in the explosion, namely, light and heat, radioactivity, and blast, all produce effects in different ways and in different proportions according to the position of the explosion in relation to the surface underneath. This chapter, however, deals primarily with the damage caused to buildings by the blast effect.

6.3 With nuclear weapons (as opposed to high explosive weapons), blast pressure rather than "impulse" tends to be the criterion of damage. If the effective blast pressure exceeds the static strength of the structure, failure must be expected. If it is less, no failure can occur however long the duration of the blast. In fact, nuclear bomb blast is more like a strong wind than the sudden blow of high explosive blast, and many of the failures observed at Hiroshima and Nagasaki and in subsequent tests resemble closely the kind of damage that might be done to buildings by a hurricane.

6.4 The scarcity of suction damage from the nominal bombs in Japan was due to the high blast pressures produced and to the fact that these were three or four times as great as the blast suction. With all such large explosions, if a building does not fail from blast pressure it is unlikely to fail under the lower stresses in the suction phase.

Effect of blast on structures

6.5 The type of damage which long duration blast (from nuclear weapons) causes to structures can possibly best be appreciated by considering the forces to which a simple building is subjected during the passage of a horizontal blast wave. When the blast "front" strikes the front wall it is reflected back, and the pressure in the wave front builds up to more than double the original pressure. However, this build-up only lasts for a very short time and is mainly important for large flat surfaces such as walls of big buildings. As the blast wave passes over the building, the sides, roof, and finally the rear wall are subjected to what is known as the
“side-on” pressure in the wave, but since they are side-on and not face-on there is no extra pressure due to reflection. At this stage the front, roof, sides and back of the building are all subjected to more or less the full blast pressure, and the principal tendency then is for the building as a whole to be crushed.

6.6 But the pressure at and behind the blast front is accompanied by the blast wind which, while it exerts additional pressure on the front wall, exerts a suction* on the back (since it is sucking air away from the back wall and to some extent also from the sides and roof) which tends to cancel out the pressure in the blast wave itself. The net effect is a much enhanced pressure on the front of the building, and most of the direct blast damage is produced there with comparatively little elsewhere. The building as a whole tends to be pushed over away from the explosion.

6.7 The above relates only to a building with blank walls. If the blast gets inside through openings in the front wall, the pressure inside, acting upwards on the roof, is the full side-on blast pressure, whereas the pressure outside is the blast pressure less the wind suction. The net result is therefore that the roof tends to be forced violently upwards, a feature which was noted in Japan and has been observed in published photographs of American nuclear weapon trials, where houses have appeared to “explode” when struck by the blast wave.

6.8 The ability of a building to withstand the shock of the blast wave depends upon its strength, its shape, and the number of openings into the building which serve to relieve the pressure on the outside walls. The strongest structures are heavily framed steel and reinforced concrete buildings, while among the weakest are shed type industrial structures having light frames and long roof spans.

6.9 The resistance to blast of brick structures is poor, partly because of their low resilience and partly due to their weakness against pressure from inside, since a comparatively small outward movement of the walls causes the floors to collapse.

6.10 The floors of a dwelling house are not constructed to carry tons of wreckage and so, in due course, they may bend, or break across at the centre of the joists, crashing down to form the roof of two voids, or they may remain fixed on one side and fall or sag down at the other, the bulk of the debris falling to the lowest point. The over-loading of the ground floor may well lead to similar collapse into the basement.

6.11 When external walls are sucked outwards, the bulk of the debris falls into the garden or street. The floors and roof, with some of the internal walls, are deprived of support and collapse in a heap, separated only by the furniture and such portions of the walls as remain. There may be voids formed by the furniture supporting the collapsed floors. It is possible to crawl through them in comparative safety provided that such supports are not disturbed.

*The occurrence of “wind” suction in the positive phase of the blast wave when it strikes any form of structure must not be confused with the suction in the negative phase of the blast wave, which is independent of the presence of any structure.
Effect on framed buildings

6.12 Framed buildings stand up well to blast and unless there is complete collapse, the debris from walls is prevented by floors from collecting in one large heap in the basement. (The panel walls are, in fact, no "lighter" than domestic house walls, e.g. 9-in., or 11-in. brick.) In framed buildings, whether of reinforced concrete or steel frame construction, there are usually reinforced concrete slabs (e.g. in floor, roof and sometimes in walls) and these, in the form of debris, present special problems that can be dealt with only by the experience and equipment of the fully trained rescue parties. Blocks of flats, modern cinemas and theatres, hotels, and city offices embody the framed types of construction.
PART II. RESCUE TECHNIQUES

CHAPTER 8

The Elements of Building Construction

8.1 Buildings can be grouped into categories by the methods and materials used in their construction. The main groups are as follows:

(a) unframed buildings;
(b) partially framed buildings;
(c) fully framed buildings;
(d) monolithic buildings.

Unframed buildings (load bearing walls)

8.2 The majority of buildings are of this type, although the number of framed buildings is on the increase due to the greater use of steel and reinforced concrete. The term "unframed" means there is no skeleton of steel or reinforced concrete taking the load. In unframed buildings the walls carry the weight of floors and roof as well as their own weight, and give protection from the elements. The most familiar type of unframed building is the dwelling house, which may have its floors made of timber or concrete. Both types will be described in the order in which they would be built, since they have different characteristics.

(i) Dwelling house with timber floors

8.3 Foundations are the feet on which the building stands and are formed by digging shallow trenches along the lines of the walls, and partially filling them with concrete. This concrete must be thick and wide enough to spread the load over a sufficiently large area to ensure that the weight does not cause the foundation to sink any further into the ground. In some districts brick or stone is still used for the foundations, but normally concrete will be found.

8.4 Outer walls are usually built of either brick, stone or concrete, the bricks or blocks being laid overlapping one another, so that vertical joints do not run through successive courses in the wall. This lapping is called bonding and gives strength. The bricks or blocks are bedded in position and joined together by a mixture of cement or lime and sand to which water is added to make it plastic for working. This mixture is called mortar, and when it hardens it becomes firm and solid.

8.5 The walls begin at the top of the foundations and are built up to the start of the roof. They must be strong enough to carry the loads put on them by the floors and roof, and must be stout enough to keep the weather out. Thus in two-storey dwellings they are likely to be 9-inch solid or 11-inch cavity walling (two 4\(\frac{1}{2}\)-inch walls with 2-inch space
Fig. 11. Constructional details of an ordinary dwelling house

1. Rain water gutter
2. Tile battens
3. Fascia
4. Close boarding or felt
5. Roof tiles
6. Hip
7. Purlin
8. Ridge tile
9. Rafters
10. Ridge board
11. Stack
12. Flashing
13. Wall plate
14. Cement finish
15. Cill
16. Cavity brickwork
17. Wall string
18. Newel
19. Wall ties
20. Carriage
21. Tread
22. Riser
23. Hand rail
24. Damp course
25. Site concrete
26. Skirting
27. Plaster board ceiling
28. First floor joists
29. Floor boarding
30. Chimney breast
31. Foundation concrete
32. Air brick
33. Plaster
34. Gulley
35. Rain water pipe
between). The two sections are tied together with twisted metal strips or wire built into joints at intervals, the twist being necessary to prevent water running from the outside skin to the inner skin. Houses of three storeys will, of course, have thicker walls and may be 13\(\frac{1}{2}\)-inch solid brickwork.

8.6 Partitions or division walls are the walls built inside the building to divide up into rooms the area confined by the outer walls. These partitions may also carry loads and may be constructed of 4\(\frac{1}{2}\)-inch brickwork, stone or timber framing with lath and plaster, or of breeze or other types of light-weight blocks. When they are load bearing they will usually rise from their own foundation and be continued vertically to the height required. Unloaded partitions on upper floors will not necessarily be placed directly above those on the floor below.

![Fig. 12. Hollow wall construction](image)

8.7 Openings in walls are formed as the wall proceeds, having arches or concrete and steel rod lintels built over the top to form a bridge or beam to carry the wall above. On external walls a sill or threshold, shaped and grooved to throw off water, is built in at the bottom of the opening. The frames of the windows and doors are usually built in as the wall is
erected and have metal straps or lugs attached to them for fixing, or they may have projecting ends for building into the wall to hold them in position.

8.8 *Damp proof courses.* Damp can penetrate a building from the ground on which it stands by rising up the walls, or rain may percolate through the walls or roof. This is most undesirable both from the point of view of health and also from the stability standpoint since dampness can set up rot in timber, rust steel, and decay brickwork, and so destroy the strength and stability of the building.

8.9 In view of these possible troubles, precautions are taken by covering the ground under the ground floors with a layer of surface concrete and leaving an air space between this and the wood floor through which air from gratings built into the walls at suitable levels can circulate. In walls

![Image](image_url)

*Fig. 13. Hollow walls built to damp proof course level*

and partitions, at a height of approximately 6 inches above the natural ground level and below the level of any timber work, a layer of impervious material such as slate, bituminous felt or copper, lead or aluminium alloy foil is placed so that the rising damp cannot pass. The driving rain is kept out by the thickness of solid walls and by the cavity in the hollow walls.

8.10 Party walls are usually 9 inches thick solid brickwork, stone masonry, or concrete, for although they appear to be only partitions they separate two adjoining properties and therefore have to be thick to prevent the spread of fire and noise from one house to the next. These party walls are often carried up through the roof to make separation complete, and this can best be seen in a row of terrace houses where they will indicate the extent of each house or group of houses.
8.11 The fireplace and chimney stacks are often built as part of the party walls, so that the flues can be formed in one stack for two houses. The chimney stacks are built from their foundations, at the same time as the walls, to well above the roof line and make this wall stronger than the others. Party walls, and end walls which are carried up to the roof top (gable walls), usually carry the strong members of the roof, called “purlins”.

8.12 Floors in the main are constructed of timber, the strength being given to them by the joists, which are usually about 4 by 2 inches for the ground floor, where they rest on timber wall-plates provided on the outer walls and intermediate dwarf walls. They are of small dimensions as they have only to bridge short distances. The joists for upper floors may be 7 by 2 inches or 9 by 2 inches, according to the distance they have to bridge or span. The ends usually rest on strip iron or timber wall plates to provide a level bearing, or in pockets in the walls.

8.13 All joists rest on their narrow edge, as they are stronger in the upright position, and they are usually placed across the narrow way of a room. Over the joists and laid at right-angles to them is nailed the floor boarding, so that the run of joists can be known by remembering that they run the opposite way to the boards of the floor. Where deep joists are used over wide spans, block or “herring bone” strutting is nailed between them across the middle of the span to strengthen the floor by preventing the joists from warping or twisting.

8.14 The underside of the joists will carry the ceiling of the room below. This is done by nailing narrow pieces of timber (called “laths”) to the joists and at right angles to them. A narrow space is left between the
laths so that when the plasterer presses the soft plaster to them it is squeezed through, making a little bulge in the back which, when it sets hard, secures the plaster to the lathing. This holding arrangement is called the “key” of the plaster. In some buildings expanded metal lathing is used instead of wood laths. The ceiling can also be formed by using specially made sheets of various materials which are nailed to the joists. These sheets may be finished with a thin coat of plaster.

8.15 It will be seen that all the members of a timber floor are tied together forming a sort of slab which depends for support purely on the walls.

Fig. 15. Details at eaves of roof

8.16 In some cases parts of the ground floor (such as in sculleries, kitchens etc.) are made solid—that is made in concrete with no space left under them. This floor can be finished with tiles, linoleum or a composition floor surfacing.

8.17 Roofs in dwelling houses are usually sloping (pitched roofs), although some may be flat and constructed like floors, but having a waterproof external covering. When the walls have been built to the required height, a timber wall-plate is fixed at the top to which will be attached the sloping members of the roof (the rafters). These extend to the apex,
where they are fixed to the ridge board, but if the span of the roof is such that they are not strong enough to do this unaided, they are supported on strong horizontal timber members called the purlins. Purlins usually take their bearings on the party and gable walls where the roof is sloping two ways only, but where there are more than two slopes (in hipped roofs) the purlins are fixed to sloping members (hips) running from the corners of the wallhead to the ridge, and may have struts supporting them from the internal cross walls. A shorter piece of timber called the “collar” is often fixed at about a third of the distance from the top of the roof to a rafter and its opposite number on the other side of the roof to tie them together and counteract outward thrust. Larger roof spans will require trusses, either of timber or steel, to support the purlins.

8.18 Resting on the wall-plates and fixed to the feet of the rafters are the ceiling joists, spanning the width of the building in the same direction as the rafters, and taking support from the partitions they pass over. To these ceiling joists is fixed a ceiling as already described. Over the rafters may be fixed boarding, felt and battens for fixing tiles or slates to form weather protection and to keep the house warm.

8.19 The bottom edge of the roof (the eaves) usually projects beyond the wallhead to give the wall protection from the weather. From these timbers brackets are framed to which boarding is fixed to enclose the roof space and exclude cold draughts. A channel, known as an “eaves-gutter”, is fitted to the bottom of each sloping side to catch the water and conduct it to rainwater pipes which discharge into drains underground.

8.20 Another type of roof, called a “mansard”, is often used when it is desired to make rooms in the roof space. Each of its sides is formed in two different slopes, and the lower slope, which extends from the eaves gutter to about half way up the roof, is at a steeper slope than the remaining half.

8.21 The staircase, usually made of timber and framed up complete in the workshops, is delivered to the site when required in the same way as an item of furniture, and, although not requiring support from the walls, is fixed to them and the floors. The stair does not support the floor, as the joists are usually trimmed to provide a well-hole ready to take the staircase. The vertical part of the step, known as the “riser”, is fitted to the level part of the “tread”, the ends of both resting on or sunk into the sloping members called “strings”, one against the wall, called the wall string, and the other, the outer string, which also carries the balusters supporting the hand rail and finishing at top and bottom on to larger posts known as newels. Underneath the wider type of stair is occasionally to be found a rough sloping member, called a “carriage”, its purpose being to provide extra strength.

8.22 The water service pipe is often provided with a stopcock in the pavement or path in front of the house so that supplies may be cut off when necessary. There is often a stopcock fitted also just above floor level at
the point of entry of the service into the house. Gas and electricity supplies may be cut off at the meters which are generally to be found under the stairs or in cupboards in the scullery, kitchen or basement.

8.23 Basements are provided to some houses, and it is desirable, before entering an old derelict or damaged house, to look for indications of the existence of a basement, evidence of which is usually revealed by the presence of a sunken area to enable admission of light to a window, access stairs, coal-plates, flaps or gratings or perhaps a doorway at a lower level than ground floor.

(ii) Dwelling House with concrete floors

8.24 Houses of this type are built on the same lines as those previously described, but as little site excavation as possible or necessary will be done in order that the solid concrete ground floors when laid will be at the appropriate level above the ground. To prevent damp rising through the concrete, a layer of asphalt may be placed in the concrete floor making a sort of sandwich. The floor can then be finished to receive linoleum or other floor covering. Alternatively the sandwich layer may be omitted and an impervious floor finish such as asphalt provided.

8.25 Upper floors may be formed of timber as previously described or be of precast concrete units or concrete laid in position, reinforced with steel bars for strengthening. The precast type of floor would not be likely to hold together as one slab as well as the “cast in position” type should the walls collapse. Clearing or cutting away a building of this type would be more difficult.

8.26 The roof may be of timber as previously described or of concrete, when it would usually be flat and constructed similarly to the floors.

(iii) Larger houses, blocks of flats and offices

8.27 The construction of larger unframed buildings will be similar to those previously described although, for stability, the walls of a building having several storeys will be thicker at the bottom than at the top. The load bearing walls within the building will also be constructed to a correspondingly substantial thickness.

8.28 If the floors are of timber construction, it is likely the staircases will consist of similar material and, conversely, if the floors are of concrete, the stairs will usually be of concrete.

8.29 The roof may be timber or concrete, pitched or flat. Concrete roofs will usually be flat.

(iv) Unframed buildings of stone masonry construction

8.30 In districts where stone is readily available, foundations and walls will often consist of stone masonry rather than of brickwork. Owing to the irregular shapes and sizes of this stone, walls of this material will generally be found to be thicker than those built with bricks, and walls to two storey houses may be 14 to 18 inches thick. Stones in the footings or foundations will be laid as headers or bonders, i.e., long stones laid
across the thickness of the wall to spread the load as evenly as possible. If the stones are worked on all faces, then the wall need not be any thicker than a brick wall.

8.31 More often, however, the wall will be faced with squared rubble or ashlar and backed with random rubble (stone as quarried) or even brickwork. Alternatively the outside and inside faces of the wall may be built as two separate walls held together with "through stones" or "bonders", and the space between filled in with dry rubble, or rubble in mortar. Sometimes the walls are built without any through bonding; such walls are not so strong as walls of similar thickness built in brickwork, and are therefore built in greater thickness than brickwork.

8.32 The wall head will be levelled off and timber plates fixed for the roof as previously described. The inside face of the wall may be plastered straight on to the stonework, but very often wooden plugs are driven into the stonework to which battens are fixed to take lath and plaster. This reduces the possibility of damp penetration. Damp-proof courses can be of dense stone, slate, metal or bituminous felt, etc.

8.33 Openings in walls for doors and windows are formed as the work proceeds, and usually have dressed stone sills, reveals and lintels. As stone in long lengths breaks easily when loaded, great care has to be taken to ensure that rough arches or, in some cases, wooden inner lintels are formed behind the stone lintels to carry most of the weight.

8.34 Staircases may be constructed of wood, but can also consist of hard dressed stone, sometimes having one or both ends built into the walls. The former is known as a cantilever stair, because it receives its support from only one wall and the step immediately below. Balusters, usually iron, are held in position by housing the bottom end of them into holes made in the steps.

8.35 Floors will be similar to those already described, but the ground of basement floors may consist of large flat stones known as "flagstones".

8.36 Roofs in some cases will be covered with thin stone slabs, necessitating stronger roof timbers to carry the load, but slates or similar finishes as already described will more often be used.

8.37 Larger type buildings will be generally similar in construction but will have thicker walls built with very large stones. Floor and roof timbers will also be large.

(v) Converted buildings

8.38 It should be remembered that there are many cases of domestic buildings, with walls of the load bearing type, which have been converted into industrial or shop premises. This has usually been done by forming wide openings at ground floor level and supporting the upper walls on beams or rolled steel joists carried by steel stanchions or brick piers.

(b) Partially framed buildings

8.39 Partially framed buildings characterise those that are halfway between unframed and fully framed, i.e., buildings containing a share of each.
The external walls form the unframed section as they are load-bearing, and the framed section comprises the posts and beams erected to replace the thick load-bearing internal partitions. This treatment, it will be observed, permits larger open floor spaces.

8.40 Partially framed buildings of an old-fashioned type usually incorporate timber posts and beams, providing support for timber floors, or cast-iron columns, moulded for strength and appearance, and beams of iron and timber or inverted tee section cast-iron. In the more recent buildings of this type, however, the columns and beams are constructed of steel and are similar to those used in modern fully-framed buildings.

8.41 The walls in both cases will be constructed in the same manner as in an unframed building but, where the beams enter the wall, the wall will probably be thickened, to form a “pier”. The beams will rest on a block of hard stone or concrete, known as a “template” or “padstone”, or a steel plate may be used. These blocks or plates spread the load transmitted by the beam and thus avoid crushing of the brickwork; where very heavy loads are imposed, blocks and plates are used together. Whilst the walls will have their continuous concrete foundation, the columns or piers as they are often called will have individual foundations of solid concrete placed deeper into the ground since they have to carry more load.

8.42 Floors may be of timber or, alternatively, have low brick arches spanning between the “tee” section beams over which concrete is laid to form a level floor. They may also consist of small steel beams with concrete in between, precast concrete slabs, or hollow blocks set in reinforced concrete.

8.43 Roofs may be flat or pitched. A flat roof can be of similar construction to the floors, but if pitched it will probably be of timber and comprise a series of small roofs joined together. Eaves-gutters, or box gutters, formed behind parapet walls, will be fixed to take the water from the outside slopes. Channels are formed in the roof valleys with falls to the outlets at the external wall, so that the water will enter a rainwater head, and descend by the rainwater pipe to the drains.

(c) Fully framed buildings

8.44 Fully framed buildings are so described because they have a skeleton frame which carries all the loads including the weight of the walls. The frame may consist of steel or reinforced concrete.

8.45 Foundations are usually formed individually for each stanchion, and may consist of comparatively small blocks of solid concrete, large reinforced concrete joists or steel joists encased in concrete. Where steel is employed, steel joists may be laid side by side, each layer running at right-angles to the one beneath and bolted together. This type of foundation is known as a “grillage” to which the base-plate of the stanchion is bolted. When the stanchions have been fixed the whole floor area is excavated and covered with solid concrete with or without steel reinforcement.
8.46 The frame is formed by fixing the stanchions to the concrete bases or grillages, and fixing between them at suitable levels steel beams which will support the floors and transmit the loads to the stanchions. These stanchions and beams may be encased in concrete or brickwork to protect the steel in case of fire. When the frame is of reinforced concrete, steel rods will be incorporated in the concrete in place of steel stanchions and beams.

8.47 Floors are laid on the beams and may be constructed of concrete having steel joists incorporated, called a “filler joist” floor. The joists span from beam to beam of the frame and are placed close enough together so that when solid concrete is placed between them it will support the loads without any further reinforcement. Precast concrete beam floors are constructed of precast reinforced concrete members which span between the beams; they are laid side by side and are jointed and screeded in cement to take the floor finish.

8.48 Hollow block floors have rectangular hollow clay or concrete blocks in short lengths laid end to end in rows. Steel rods are placed in the spaces between the rows and concrete grouted around the rods and over the top of the blocks, forming a level surface. The reinforced concrete ribs thus formed between the blocks give the strength to the floor.

8.49 Solid reinforced concrete floors have a mattress of steel rods formed between and linking over the beams. The bars are hooked at the ends and wired together where they cross each other. Concrete is poured over and around the rods completely to encase the mattress and form a reinforced concrete slab. In place of a mattress of steel rods, some reinforced concrete floors are constructed with a specially designed mesh of expanded metal, or wire rods, or pierced thin steel sheeting.

8.50 Roofs may be flat or partly pitched and partly flat. If flat, they can be formed like the floors and finished on top with asphalt or bituminous felt as desired. If partly pitched and partly flat, the frame is carried up to give the required slope. It can then be concreted and finished in the same way as a flat roof, or covered with metal, or timber may be fixed to the concrete to receive slates or tiles.

8.51 The walls can be erected after the floors and roof are in position since these elements do not rely on the walls for their support as they do in unframed buildings. The external walls are merely weather protecting panels placed between the various members of the frame. They may be of any material which will give the necessary weather protection, appearance and stability, the latter quality only in so far as it must stand up securely without deteriorating or becoming a danger to the public or occupants.

8.52 Internal partitions, if required to be of heavy construction, for, say, dividing up space for fire protection or for any purpose connected with the user of the premises, will be built over members of the frame, but if they are light partitions forming rooms and corridors they can usually be placed on the floor.
8.53 Staircases will usually be of concrete, reinforced and cast in position, or formed of precast reinforced concrete steps. They may take support from walls, or from steel supports fixed to the frame, or be cantilevered from one wall.

8.54 Shed type framed buildings are single storey framed buildings with pitched roofs and are used mostly for manufacturing or storage purposes. The frame is usually of steel, but sometimes precast concrete units are employed. The ground is excavated, and concrete bases laid at regular intervals for stanchions as previously described. Stanchions and beams are erected and a roof is formed by bolting steel trusses or precast concrete ribs to the heads of the stanchions or beams. Roof trusses are framed of light steel members and arrive on the site in one or two sections, ready for fixing in position. Steel beams and angles are fixed between the stanchions giving them support and also to take the wall and roof covering, which is usually of corrugated asbestos or steel sheeting. This sheeting or cladding is fixed with hooked bolts to the steel frame. The walls and roof may be lined to keep the building warm in the winter and cool in the summer. The walls can also be built of brickwork or concrete blocks.

8.55 The steel frame in such buildings is not normally encased in concrete and is not therefore protected against fire. In a severe fire, the steel work may quickly distort and bring about the collapse of the building at an early stage of the fire.

(d) Monolithic buildings

8.56 Monolithic buildings, as the name implies, are built in one piece, which means that the foundations, the frame, walls, floors, staircases and roof
are formed of reinforced concrete on the site as they occur in the building as it rises. The mass of reinforcing rods is carefully set out with each bar hooked and wired in position, to form the raft or base of the building and partly up the walls and piers or columns. The timber or metal form-work for the walls is then fixed in position, the steel reinforcement placed and the concrete poured over and worked around the bars. When the concrete is set, the form-work is removed and the next stage proceeds, and so on upwards to the top of the roof, the floors being placed as the walls rise. The roof is constructed in the same manner as the rest of the building, and when the building is completed all the various elements are intimately linked together.

![Fig. 17. Typical reinforced concrete building](image)

8.57 Reinforced buildings of this type may have non-load bearing panel walls similar to steel-framed buildings, or the walls may be designed to share the loads. In either case the building will be very strong and be capable of withstanding considerable blast or damage without danger of the whole building collapsing. Such buildings are also very resistant to fire.
CHAPTER 12

Casualty Handling in Rescue Operations—Improvised and Emergency Methods

Improvised stretchers

12.1 When there is a shortage of stretchers it is better to improvise rather than manhandle the casualty unnecessarily. An old door, a sheet of galvanised iron, a blanket, or a short ladder are all examples of improvisation.

12.2 The method of blanketing a door is the same as for blanketing a stretcher (see paras 11.21-24). One method of securing the casualty to the door, with the exception of the start and finish, is the same as the stretcher lashing. With this particular lashing, start at the head end with a complete turn around the door, making fast with a clove hitch on the standing part of the rope, and then continue down the side of the door as for the normal stretcher lashing, up the opposite side to the first turn around the door, there make a turn on the rope on the top side, over the door and complete with a clove hitch on the rope on the opposite side of the door, or come back to the round turn around the door and finish with a clove hitch, as clearly shown in Figs. 39 a-b. Another method is to leave about 1 ft. of rope beyond the centre of the door at the head end. The rope should be pinned between the brick supporting the corner of the door and the door itself before proceeding to the actual lashing of the casualty to the door. To finally secure this lashing the running end of the rope should be passed over the door and tied off with a reef knot on the top edge of the door (see Figs. 39 c and d).

12.3 One method of using a blanket as a stretcher is described in para. 11.16. Another way of using a blanket is to first lay the blanket on the ground or the floor and then place two short broom handles, poles or pieces of timber about 6 ft. in length, or whatever are used for the supports, across the narrow width of the blanket, approximately 2 ft. apart, then take one edge of the blanket and fold over the pole furthest away and tuck underneath as shown in Fig. 40(a). Then take the second edge of the blanket, fold over to the opposite fold and tuck underneath (Fig. 40(b)). Then fix the three thicknesses of the blanket together on the outside of the pole with safety pins or nails as shown in Figs. 40(c) and (d).

12.4 The ways in which webbing bands can be used to improvise a stretcher are described in paras 11.6-15.

Emergency Methods

12.5 When casualties are in danger from fire, coal gas, flooding or dangerous structures such as leaning walls, it is necessary to remove the cause of danger from the casualty, or the casualty from the danger. If it is vital
Fig. 39 (a). Using a door as a stretcher

Fig. 39 (b). Using a door as a stretcher
CHAPTER 15

Principles of Levering and Jacking

15.1 The principles of levering and jacking are, in a variety of differing ways, brought into most aspects of rescue work. The purpose of lifting appliances is to gain power so as to lift a large load with a small force suitably applied.

Levers

15.2 The simplest appliance for gaining power is the lever, of which an improvised version made of laminated timber or an ordinary crowbar are most frequently used by rescue workers. There are two principal ways in which a lever can be used, as illustrated in the diagrams. In each case the advantage gained depends on the distance of (A), the centre of the load, and (C) the points where the push or force is applied from (B), the heel or fulcrum.

![Diagram of lever (downward force)](image1)

![Diagram of lever (upward force)](image2)

Fig. 68. Lever (downward force)  
Lever (upward force)

15.3 The relation between the load and the amount of force required to lift it is in the same ratio as the length BC is to AB, where AB and BC are the distances of the weight and the force respectively from the fulcrum. A man using a 10-foot lever and bearing down at C with half his weight, say, 6 stone or 84 lb., against a fulcrum 1 foot from the other end of the lever, can lift a weight of $84 \times 9 = 756$ lb. because the length from fulcrum to hand is nine times the length from pivot to weight. If B is only 6 inches away from the weight the ratio is increased to 19 times its own weight.

Fulcrum blocks

15.4 A fulcrum block should be of wood (hardwood if possible), never of brick or other crushable material. It must be resting on a firm base, which should be as large as possible so as to distribute the weight to be lifted. The fulcrum must be placed as near to the weight as is possible under the circumstances, and it should never be placed at any point where there is a possibility of a casualty being buried immediately below.

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CHAPTER 30

Flame Cutting

General

30.1 When iron or steel obstructions are encountered in the course of rescue work, the most rapid means of cutting a way through is with the oxy-acetylene blowpipe. It should, however, be borne in mind that only readily oxidisable steels can be cut by this process, consequently stainless steel not being oxidisable cannot be cut with ordinary cutting equipment. Cast iron can only be cut by a special technique of weaving the blowpipe very slowly with a semi-circular motion. Brass, bronze and copper, which do not oxidise rapidly, cannot be cut. Bars and thin sections of these metals can, however, be melted away by the high temperature of the flame, and this may on occasion prove useful.

30.2 Briefly, the equipment for this method of cutting consists of a cutting blowpipe, a cylinder of oxygen, a cylinder of acetylene, and oxygen and fuel gas regulators, devices which are screwed into the cylinder valves for reducing the pressures of the gases to those required at the blowpipe. To these regulators are connected lengths of hose for conveying the gases to the cutting blowpipe, to which their other ends are connected. The cutting blowpipe is the tool with which the severing of the steel is done.

Principle of the flame cutting process

30.3 The cutting blowpipe is so constructed that part of the oxygen entering it is mixed with acetylene within the blowpipe; the mixed gases issue from a ring of slots in the nozzle and when lit produce the very high temperature flame for heating the steel to be cut. The remainder of the oxygen, separately controlled by a lever-operated valve, issues as a jet of oxygen only, from a hole in the centre of the ring of heating flame jets.

30.4 The action of flame cutting, or more accurately, oxygen cutting, relies on the fact that steel, when heated to incandescence (bright red heat) will oxidise or burn rapidly in an atmosphere of pure oxygen. The cutting blowpipe makes use of this phenomenon by employing the very hot oxy-acetylene flame to heat a spot on the steel to incandescence and then making it possible to direct a jet of pure oxygen on to the heated spot and burn the steel away in a shower of sparks. The extreme tips of the pre-heat flames are the hottest part. So rapid is this burning action that it is possible to pierce a small hole through a piece of steel several inches thick in two or three seconds from the time that the oxygen jet first impinges on an incandescent spot on the surface of the steel. In practice it is always advisable to start on the edge of the piece to be cut. It takes only a matter of a few seconds preliminary heating with the flame to bring a spot on the edge of the piece of steel to incandescence; the jet of "cutting" oxygen will then burn the steel, which produces additional
heat. The heat of the flame plus the heat of the burning metal makes it possible to advance the blowpipe at speeds of from 6 in. to 2 ft. per minute, always maintaining a hot spot in advance of the cutting oxygen jet so that a continuous narrow cut is made. This cut is only slightly wider than the diameter of the hole in the nozzle from which the cutting oxygen issues.

30.5 The purpose of having a ring of jets for the heating flame is twofold; it allows the cut to proceed in any desired direction, as by this arrangement there is always a part of the heating flame in front of the cutting jet, while a considerable part of the remainder of the flame passes down the cut as it proceeds and maintains the necessary heat throughout the full depth of the cut.

Fig. 135. Cutting equipment
PART III. OPERATIONS

CHAPTER 31

Briefing

Definitions

31.1 *Briefing* is the term used to signify the giving of orders or instructions by which the course of action decided by controllers is communicated to services placed under their control or in their support.

Importance of good briefing

31.2 Success in any operation involving action by others depends very largely on the clearness and conciseness of the orders by the person ordering that action and the manner in which the orders are given. Good orders, well delivered, have a high morale value for those affected: the converse is equally true and nothing contributes so speedily to inefficiency and lack of confidence as bad orders hesitatingly given. Briefing is a responsibility not only of controllers, or of members of their staffs acting in their name, but also of commanders of services giving executive orders to their own personnel. It is, therefore, of the highest importance that the points dealt with in the succeeding paragraphs be borne in mind by all leaders wherever they may be in the chain of control and command.

The object of briefing

31.3 The object of civil defence briefing is to ensure accuracy, speed and economy in the deployment of services to life-saving tasks.

Build-up of an order

31.4 An order develops logically from the following sequence of thought:

(a) Appreciation of the situation based on the information available and the deductions made therefrom.

(b) The plan decided on from the various courses of action suggested by those deductions.

(c) Translation of the plan into the approved form and sequence of an order.

Methods of issuing orders

31.5 An order may be issued:

(a) by a formal written order;

(b) in message form;

(c) by an authorised representative of a controller, e.g., a staff officer;

(d) verbally by a controller at his own or at a subordinate headquarters or rendezvous, or by telephone or R/T.
Of these methods the most probable in civil defence operations is the verbal order given personally by the controller. It is not only the most probable, but by far the most desirable, for a controller or a commander can impress his will on, and inspire confidence in his subordinates more easily and effectively by verbal orders than by written orders or messages prepared by his staff. The morale effect of good orders delivered determinedly can be very considerable. Whichever method is adopted the principles are identical; the type of order dealt with below is the verbal order.

Essentials of an order

31.6 The essential ingredients of a good order for operations are:

(a) It should contain only such information relevant to the situation as the recipient needs to carry out his task.

(b) It must be unmistakably and unequivocally clear regarding the tasks to be done.

(c) It must be expressed in the minimum of simple words.

(d) It must be arranged in the approved sequence.

(e) It must be thought out on the above lines before delivery.

Arrangement of an order: the importance of sequence

31.7 At Appendix E is the approved list of main headings and sub-headings to be used in arranging an order. This list follows an accepted order of sequence which must be observed. Briefing is a two-way process of giving and receiving, both of which are made easier if both parties are trained to anticipate the contents of the order in an accepted sequence. Correct sequence, too, is a valuable aid to ensuring that the order develops logically, omits nothing essential and includes nothing superfluous.

Main headings of an order

31.8 Essential information will be grouped under five main headings, nomenclature and sequence being common to all members of N.A.T.O. These headings are:

- Situation
- Mission
- Factors affecting the mission
- Administration/logistics
- Command and signal

(i) Situation. The commander reporting for orders is unlikely to have much knowledge about what has happened and may often be a complete stranger to the locality in which he is to act. The aim of the Situation paragraphs is, therefore, to give him a description, in very general terms, of the situation in the locality as a background to the tasks required of him. The situation paragraphs are not the place for details.
(ii) **Mission.** The essential in an order is that it must be crystal clear regarding the tasks to be undertaken. These tasks must be listed in order of priority and be stated in clear, concise terms.

(iii) **Factors affecting the mission.** It is not the business of the giver of an order to tell the recipient how that order is to be executed. But, so that the recipient can frame his own orders for the execution of the tasks to be done, he must be given full information on all factors affecting these tasks, including information of the situation on route to the area into which he is to move. The distribution between the general information under **Situation** and the detailed information under **Factors** will be readily apparent from a study of Appendix E.

(iv) **Administration/logistics.** Policy regarding the administration and maintenance of civil defence forces in action or elsewhere is not yet available, but it may be expected that this heading will include such matters as feeding, reliefs, quartering, equipment replenishments, transport.

(v) **Command and Signal.** Details of the location of control headquarters with whom the recipient is likely to be working, any special communications arrangements affecting incoming services, liaison, reports, etc.

**Use of sub-headings in an order**

**31.9** The list of sub-headings is both comprehensive and exhaustive, and it should be obvious that there will be no need to use, for every order, all the items listed. Use only those items that are necessary for providing information essential for the efficient execution of the tasks to be carried out. Below sector level, it should rarely be necessary to use more than a few of the items; an example is given in Appendix F which should be studied in conjunction with paragraph 31.11.

**Importance of pre-thought before briefings**

**31.10** A frequent cause of bad briefing is that the giver tends to rush matters without being clear in his own mind about what he intends to say and the sequence in which he intends to say it. It cannot be emphasised too strongly that the complete order must be thought out before any attempt is made to start briefing. If this is not done the sequence will be illogical, irrelevancies will creep in, delivery will be hesitant, time will be wasted and the recipient will be left with a hazy idea of what is required of him when the briefing is over. It is not always realised that this process of quiet thought while preparing an order has an additional value in that it tends to bring under control any excitement, anxiety or nervousness the giver may feel. It is of great importance in promoting confidence in the command that the giver of an order, whatever he may be feeling inwardly, should outwardly appear completely calm, collected and confident—quite unperturbed by what may be going on around him.

**Briefing below sector level with particular reference to rescue units**

**31.11** The preceding paragraphs have dealt with the salient points regarding briefing in their application to all levels of control and to all services.
In particular, it has been stressed that only that information should be included in orders which is essential to the efficient execution of the tasks given. If life-saving units, e.g., rescue and casualty collecting personnel, are being sent on by a control to work under another control at a lower level then the initial briefing should be limited to directions for reaching the lower control. It follows that the nearer the tasks the greater the detail. Life-saving services may therefore expect to receive fuller details regarding their tasks as they advance through the chain Sector Warden—Post Warden—Senior Warden, complete details being obtained finally at the lowest level of control i.e. Senior Warden. An example of the briefing of rescue personnel advancing through this chain is given at Appendix F. It should be noted that this example, while adhering to the form laid down in Appendix E, selects from the sub headings only those which are considered necessary for the briefing of rescue personnel at Post Warden and Senior Warden level in the particular circumstances depicted. The example given may usefully be staged as a demonstration during training.

**Hints for the giving of good verbal orders**

31.12 The delivery of good verbal orders is a technique which can only be acquired by practice. While all givers of orders are required to follow the chain of thought, sequence and headings already described, it is in the actual delivery of the order that the technique of the individual giver is developed. On no occasion will he have such an opportunity of impressing his personality on subordinates as when he is giving verbal orders. Some *Do's* and *Don'ts* when giving orders are listed below.

**Do's**

31.13 (a) Address yourself to one commander or leader only. There is no objection to his subordinates listening in for this may well save time when the commander comes to give his own orders, but it should be made quite clear that these subordinates are listeners only.

(b) Treat the recipient as an intelligent man, whatever his grade or type. The fact that he is a commander, however lowly his grade, proves that he has shown qualities meriting promotion to a position of leadership. On the other hand, do not be overawed by the high rank of a commander.

(c) Put the recipient at his ease; it is not necessary to keep the recipient at "Attention" when giving an order. He may well be tired and will appreciate the consideration shown to him.

(d) Be businesslike, firm and courteous, no matter how high or low ranking the recipient may be.

(e) Pay attention to speed of speech. Speak at a steady rate and do not gabble. The recipient may well want to make brief notes.

(f) It is advisable to allow no interruption during the course of a briefing. Interruptions tend to break the trend of thought and may well lead to discussions which not only waste time, but confuse the whole purpose and sequence of the briefing. The
recipient will be given an opportunity to clarify any points not clear to him when the giver invites questions at the end of the briefing.

(g) When briefing, look the recipient in the face. There is nothing to be ashamed of or to apologise for in giving an order. Study of the recipients face will help the giver to assess whether the briefing is being understood or otherwise.

(h) Remember that an order is an order and not a subject for discussion. The giver of an order is entitled to give it, he has thought it out, he has delivered it and, by so doing, has accepted responsibility for it. Nothing contributes so quickly to lack of confidence in and respect for a commander as his readiness to chop and change his orders in consequence of discussions or opinions interjected by recipients of those orders. There is one exception to this rule, and that is the scope of the mission. In fixing on a mission the tendency is often to ask for more to be done than the services available can deal with adequately for technical reasons. Many Controllers and Staff Officers will not have the technical experience necessary to assess what task is fair and reasonable. In these circumstances it may be necessary to agree with the commander concerned on what his forces can undertake, and to modify or increase the tasks accordingly. But the time for this discussion is after questions have been invited and not in the course of the briefing.

(i) Whenever possible, orders should be given where the ground can be seen. Words and time are saved and accuracy ensured by being able to point to rather than describe and, since briefings should be given in the minimum possible time, accuracy and time saved means lives saved. Maps and plans should only be used when the ground and the task areas on it are not visible.

**Don’ts**

31.14 Don’t be pompous, don’t hector, don’t bully, don’t be apologetic, don’t cringe and don’t doubt your ability to give an order.

**Training in briefing**

31.15 It must not be forgotten that all leaders from Regional Commissioners (or Zone Controllers in Scotland) to deputy party leaders will have to give orders at some stage or other in civil defence operations. Briefing is not the prerogative of the control only, but of leaders in all grades in all sections. Training in briefing is, therefore, just as important as training in other civil defence subjects. Some suggestions for this training are given in Appendix H.
CHAPTER 32

The Rescue Plan—Stages of Rescue

32.1 The size of the area in which a Civil Defence Corps rescue column will
be deployed depends on the circumstances at the time, but generally
speaking a column would be wasted if it were to be allocated lower than
a sector, and is unlikely to be usefully employed as a column higher than
a Sub-area. It is considered that in most circumstances the column
might be more usefully employed allotted to a Sub-area with each of its
companies being allotted to a sector, although there will be occasions
when it will be necessary to use one complete column in one sector area.
Similarly it is reasonable to suppose that in a large town or city to which
only one column is allotted, one or more of its companies will have to
be more widely separated.

32.2 It is a complicated problem and the area involved will depend on
(a) The number of types of buildings in the area and the density
of population at the time of attack.
(b) The extent of the damage.
(c) The extent and dose rate of the residual radioactivity.
(d) Whether or not the area or areas are threatened by fires and
therefore whether or not as much of the whole area as possible
must be covered quickly.

32.3 The allocation of tasks and their priorities is the responsibility of the
various levels of control and must be accepted without question. The
technical direction is the responsibility of the various levels of command
in the rescue column. It is with this picture in mind that the organisation
of the Rescue Section is planned.

32.4 Successful rescue work depends principally on two things: firstly, a
quick but thorough appraisal of the situation by the person in charge
(whether it be Column Rescue Officer, Company Rescue Officer,
Platoon Rescue Officer or party leader) plus a systematic working plan
which gives a flexible but reliable guide for successful operation. The
appraisal is termed “Reconnaissance” and the guide “The Rescue
Plan”.

32.5 The type and scope of the reconnaissance will vary according to the
level of briefing and the scope and size of the task involved. Just as the
more detailed the briefing the lower the chain of control, so the more
detailed the rescue reconnaissance the lower the level of rescue com-
mand. This chapter deals with rescue reconnaissance from the point of
view of the rescue party leader. It is detailed in full as it is the basis of all
good rescue, for once a man has learned and mastered the techniques of
handling and using equipment it is of paramount importance that he
knows how to properly put these techniques into operation. First class 
rescue reconnaissance brings successful results and that point cannot be 
over emphasised throughout all stages of training.

32.6 At the same time it must be stressed that the magnitude of the task and 
the limiting time factor in which maximum results can be obtained calls 
for a rapid assessment throughout. Rescue reconnaissance is allied to 
all stages of the rescue plan, but there is no suggestion that all the 
stages referred to more fully in succeeding paragraphs must be followed 
rigidly; the "five stages of rescue" are a guide, but it is more than likely 
that where a megaton weapon has exploded the Rescue Section will be 
primarily concerned with the second, third and fourth stages. It is 
indeed doubtful if stage five (general debris clearance) will be called for 
until such time as the whole area is cleared.

32.7 As explained in paragraph 2.10 the rescue plan would always need to be 
flexible in order to ensure that rescue personnel did not exceed the 
permissible war-time emergency dose of radiation unless, exceptionally, 
a higher dose were authorised to enable them to complete an important 
task already in hand. The arrangements for the control of civil defence 
operations under fall-out conditions are described in Civil Defence 
Training Memorandum No. 3 (in Scotland, Civil Defence General 
Training Bulletin No. 5).

Initial reconnaissance

32.8 It will be appreciated that, in every plan of action, reconnaissance (i.e. 
information and observation) is an essential preliminary. The party 
leader's reconnaissance is in effect an attempt to arrive at an accurate 
assessment of the numbers and whereabouts of casualties. It is essential 
that every member of a rescue party should be thoroughly grounded in 
rescue reconnaissance as in many instances, especially where large areas 
of damage are being dealt with, the leader of a party may be responsible 
for a considerable number of buildings and men deployed by him must 
be able to do their own reconnaissance of the task on which they have 
been set to work.

Information

32.9 Normally the initial information to the leader will be given by a Senior 
Warden and possibly more detailed information by a warden on the 
spot. Apart from this, or in addition to these sources, the leader and 
members of the party may obtain valuable information from reliable 
witnesses, e.g. police officers, relatives, neighbours and indeed from 
casualties, and all such information will prove valuable to the leader.

32.10 In certain cases, especially in large scale damage by modern weapons, 
the leader may be directed to definite tasks, e.g. a position where large 
numbers of people are known to seek shelter or congregate together, or 
where people are endangered by the spread of fire, or any other 
hazards.

Observation

32.11 Having deployed members of his party to such "priority" tasks as may 
have been assigned to him, the leader will make a quick but thorough
32.12 During this reconnaissance he will be checking or picking up information on any complicating factors such as danger from coal gas, flooding of basements, over-hanging walls, etc. which may endanger either casualties or his party. This would undoubtedly influence him in assessing priorities from a technical point of view. It would also ensure that casualties in need of urgent medical attention are removed from the site before those whose need is not so great.

32.13 Men deployed on a particular building must make careful observation of how that building has collapsed. This should be done in the light of any information available concerning probable casualties. First some attempt should be made to locate and identify the parts of the building and especially those parts in which casualties are reported to be. This will enable a rough idea to be obtained as to where casualties might be found in relation to the various parts of the damaged structure. This process of translating information with reference to the undamaged building into terms of the damaged building is the most difficult and certainly one of the most important parts of technical rescue reconnaissance for it is only from this that any effective plan of action can be built up.

32.14 The art of rescue lies in being able to identify and exploit to the maximum all debris formations such as voids, etc. which can be used to facilitate access to the casualty once his whereabouts has been fixed by information and inference. To be able to do this successfully will depend to a great extent upon careful observation on the part of the leader, and each member of his party.

32.15 The secret of efficient working is that every man should do the job for which he is best suited and that he should work to his full capacity. This is possible only if all leaders fully appreciate the capabilities of their men and co-operate fully to use each man to the best possible advantage.

32.16 Most rescue work has to be conducted under conditions of great difficulty and confusion often made worse by darkness. As a result, it is usually difficult to form a true picture of the position and it is, therefore, highly important that rescue operations should be carried out systematically in stages and to a definite plan.

32.17 On first approach, even the best leaders tend to over-estimate the difficulties owing to the appalling confusion, and the apparent magnitude of the job. This mental reaction is quite natural. And it is at such times that a leader requires to exercise all his qualities of coolness, perseverance and courage, and to make full use of the knowledge gained in his previous experience and training. At the same time, the party, to avoid harassing the leader, must display confidence in him and must help him, especially by remembering:

(i) Not to ask unnecessary questions.
(ii) Generally to give the leader advice only when he asks for it.
(iii) To listen attentively, so that instructions need be given once only.

(iv) To keep together on the job, and not to be missing when required.

(v) To concentrate on the job in hand.

Rescue by stages

32.18 No standard set of rules can be devised to give leaders sure guidance on how to tackle every job, but by proceeding in stages according to a regular plan they are less liable to overlook important points, and are more likely to be able to appreciate and organise appropriate action. The principal of applying the art of reconnaissance to each successive stage will operate throughout. It is suggested, therefore, that rescue operations should proceed as nearly as possible by the following successive stages. They are framed so as to be generally applicable to any set of circumstances and to any rescue task from start to finish. They are easily memorised by reference to the key headings.

Stage 1—Dealing with surface casualties

32.19 Attending either to those who were outside buildings when injured or (what is much more likely) to the many slightly injured persons who will come out, should they be at all able, after the occurrence.

Note. The Rescue Section Party Leader will require:

(a) to know from the Senior Warden that this has been done; or

(b) to organise a general survey of the site to ensure that all surface casualties are dealt with.

(Generally speaking it is assumed that surface casualties will have been dealt with by wardens, casualty collecting personnel or others who have been trained in light or emergency rescue and first aid. If they have not been dealt with, the party must do this, giving priority to those in immediate danger).

Stage 2—Immediate rescue and searching lightly damaged buildings

32.20 This involves: (a) the recovery of those who are lightly trapped, and (b) the searching of slightly damaged buildings to ensure that no casualties within them are unattended. Once casualties have been seen or heard, or their whereabouts definitely ascertained, every endeavour should be made to maintain contact until they are released. In carrying out this stage, a speedy but careful examination of the damaged structures is needed in order to determine the best and safest approach. There is always the danger of fire owing to hot coals, etc. from open fires having been scattered by the blast. In houses where gas is used there is danger of gas poisoning and explosion owing to: (i) lights, stoves, etc. having been blown out by blast, (ii) house mains having been fractured by earth shock. It is for this reason that rescuers must not smoke or use naked lights when searching a building. Normally, the search should commence at the lowest portions of the building and be continued upwards until every room, and every possible position in which casualties may be has been explored.
Fig. 140. Surface casualties caused by the effects of an explosion

Fig. 141. Interior of slightly damaged building showing lightly trapped casualty
32.21 Slightly damaged houses should be marked when they have been searched and any casualties attended to (and removed if necessary).

*Marking buildings after search*

32.22 The objects of markings are to:

(i) Save time and labour by indicating that the buildings have been searched for casualties and cleared.

(ii) Indicate the service responsible for the search, e.g. wardens.

(iii) Show if the building contains some particular danger.

Only slightly damaged buildings which have been thoroughly searched can safely be so marked and the following standard marking must be used. A capital letter ‘S’ chalked near the entrance will denote that the building has been searched and cleared of casualties. This will be underlined and underneath will be chalked the initial letter of the service responsible for the search, thus:

\[
\begin{align*}
S \\
W
\end{align*}
\]

searched by Warden Section

\[
\begin{align*}
S \\
F
\end{align*}
\]

searched by Fire Service

\[
\begin{align*}
S \\
P
\end{align*}
\]

searched by Police

\[
\begin{align*}
S \\
LR
\end{align*}
\]

searched by those trained in Light Rescue

\[
\begin{align*}
S \\
R
\end{align*}
\]

searched by Rescue Section

Where searchers find dangerous conditions, e.g. leaning walls, damaged staircases, holes in floors, escaping coal gas etc. they should chalk the letter ‘D’ after the standard marking. Thus the symbol—

\[
\begin{align*}
S \\
W \quad D
\end{align*}
\]

means that the building has been searched by wardens and that dangers have been found, but could not be rectified at that time. This will warn others who may be sent at a later date (e.g. members of the Rescue Section, public utility company employees etc.) to rectify such dangers.

32.23 Buildings in which dangers exist should be marked in a prominent position on all sides where entry is likely to be made. In addition to the mark, a piece of board or some improvised barricade with the word “DANGER” chalked or written on it, or even string tied across an opening, will assist in warning anyone who has occasion to enter the building.

32.24 If debris is present in sufficient quantity to hide casualties, only mark those parts of the building which have been thoroughly searched.
Stage 3—Exploration of likely survival points

32.25 All likely survival points where persons may have taken refuge and in which they may be trapped, either injured or uninjured, must be searched. Too much stress cannot be laid on the need for searching all likely places for casualties who may still be alive, and of effecting their release before any attempt is made to rescue victims who have little chance of survival. This does not mean that every nook and cranny must be searched for possible casualties, but likely places must be fully explored.

![Image of destroyed building]

Fig. 142. All likely places must be searched for casualties

Typical places include:

(i) air raid shelter, inside and outside the building
(ii) points near fireplaces and chimney breasts
(iii) spaces and cupboards under staircases
(iv) basements
(v) voids under floors that have partially collapsed
(vi) rooms not entirely demolished but from which exit is barred by debris

32.26 It should be remembered that casualties may be found who have received severe crush injuries from fallen masonry, brickwork, beams, party walls, heavy furniture, etc. These persons will be suffering from shock and their breathing passages may be clogged by the dust contained in the debris, in which case these passages must be cleared. Persons suffering from crush injuries need special treatment before release if practicable.
Calling and listening technique

32.27 When it is known that persons are still missing, and the rescuers are confronted with a major collapse of premises, the casualties may be trapped within the voids formed by the collapsing building. A “calling and listening” period should be introduced; this has in the past saved many lives and is carried out in the following manner:

The leader places such men as may be available at suitable vantage points around the area in which the persons may be trapped. He then demands complete silence and each man as directed by the leader calls “RESCUE PARTY HERE . . . CAN YOU HEAR ME?” All others listen intently for any reply. If none is heard it is a good plan to tap on a wall, or on any gas or water pipe, beam etc., running into the debris, all of which are good conductors of sound, and again listen for an answer. On hearing a reply, each listener points to the place from which he thinks the sound came, thus “pinpointing” the position. Once contact has been established with a trapped person it should be maintained, because:

(a) It keeps up his morale and helps him to withstand whatever pain and discomfort he may be suffering, and may even help to keep him alive.

(b) It helps the rescuers to decide on the best place at which to start and to work in the right direction, often a difficult matter, particularly in the dark.

(c) The casualty, if conscious, may be able to give warning of any movement in the debris likely to cause him further injury.

32.28 No attempt should be made to move debris until a “calling and listening” period has been introduced with a view to pin-pointing the position of the casualties. Since the detection and location of sounds is a most vital clue to rescue section personnel, every sound, even if obviously made by animals, should receive investigation.

32.29 Conversation with a trapped person should always be of a reassuring nature, making light of the extrication work and encouraging him to talk about his own work, his friends or anything that will relieve his mind, rather than about his position or injuries.

Stages 1-3

32.30 The work involved in the foregoing stages may frequently be done by those trained in light rescue or elementary rescue, working in teams, although in some cases they may require the assistance of fully trained rescue men to advise or even to complete a particular task, e.g. rescue from upper floors of badly damaged buildings, or of any seriously injured casualties etc.

32.31 One or all of the stages may be operated simultaneously according to personnel available and other circumstances.

Use of dogs

32.32 Specially trained dogs were used with conspicuous success on a number of occasions during the later stages of the last war, and proved their
value as an adjunct to rescue reconnaissance, especially in the “third stage of rescue”. A searching dog, trained to locate human scent, can lead to a very considerable saving of time and labour in the definite location and extrication of casualties. The dogs when brought to the scene of rescue operations can often quickly provide an indication of the position of a trapped or buried person which otherwise might take some time to determine by normal rescue reconnaissance methods. Highly trained dogs and handlers may well play an important part in rescue operations in any future war and their possible use has not been overlooked.

Fig. 143. A specially trained dog at work during rescue operations

Stage 4—Further exploration and selected debris removal

32.33 If casualties are located, their recovery will entail removing debris from selected places, according to:

(i) The location of the casualty.

(ii) Information regarding the lay-out of the building.

(iii) A careful study of the way in which the building has collapsed. See Chapter 19 “Rescue by Debris Clearance” for detail of methods adopted.

Stage 5—General Debris Clearance

32.34 Where it is still impossible to account for all missing persons it may be necessary to strip the site methodically. See Chapter 19 “Rescue by Debris Clearance” for details.