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# MAGAZINE REGULATIONS

(Land Service)

## PART II

1934

INSTRUCTIONS FOR THE STORAGE  
AND CARE OF AMMUNITION AND  
EXPLOSIVES IN THE FIELD, IN-  
CLUDING LABORATORY OPERA-

NOT TO BE PUBLISHED.

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Regulations  
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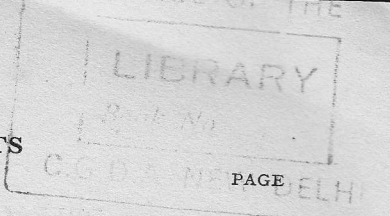
NEW DELHI

*By Command of the Army Council,*

*H. Greedy*

THE WAR OFFICE,  
31st March, 1935.

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## PREFACE TO PART II.

These instructions are intended as a guide to the general principles which should govern the storage, care and preservation of ammunition and explosives in the field, including the conduct of laboratory operations.

In an emergency, relaxation of these instructions may be necessary, but under normal conditions any instruction containing the term "will" or "must" will only be relaxed under special authority from G.H.Q.

These instructions, together with Part I, supersede Magazine Regulations, 1922, and all published amendments thereto.

## SECTION I.

## CLASSIFICATION FOR STORAGE.

1. For the purposes of storage in the field, and to facilitate receipt and issue in depots, ammunition and explosives are divided into five categories, which correspond as closely as possible to the classification laid down in Part I of these regulations. The categories are:—

- A. **Boxed Ammunition** (Q.F.) for guns, howitzers and \* small arms (except incendiary, smoke and gas).
- B. **Component Ammunition** (B.L.) plugged shell (except incendiary, smoke and gas), cartridges, fuzes and tubes for medium, heavy and super heavy Artillery.
- C. **Bombs and Grenades**, including aircraft bombs and mortar bombs and all their components (except incendiary, smoke and gas).
- D. **Miscellaneous Ammunition.** This category includes incendiary, smoke and gas ammunition and pyrotechnic stores.  
Each nature will be segregated as far as possible, phosphorus or phosphide filled ammunition being stored as far away from other natures as is practicable and loaded in separate trucks or vehicles for transport.
- E. **Demolition Explosives.** This category includes guncotton, ammonal, blasting explosives generally, detonators, safety fuze, instantaneous fuze and fuze, instantaneous, detonating.

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\* Small arm ammunition classified in Group VI may be stored in any category, but the normal practice is to put small arm ammunition in category A and the standard ammunition depot provides for this. Small arm ammunition classified in Group XII should be stored in category D.

## SECTION II.

## SITING AND ARRANGEMENT OF AMMUNITION DEPOTS AND DUMPS.

**2. Siting.** The choice of a site for an ammunition depot or dump in the field is normally very limited, but the site must be selected in conjunction with all branches of the staff concerned.

**3.** Where choice is possible, the following principles should be borne in mind :—

- (a) **Protection.** The site should afford the maximum possible degree of protection against all forms of attack. Protection against attack by armoured fighting forces is facilitated by concentration, protection against attack by aircraft may involve dispersion. The relative importance of these two considerations will vary with the position and purpose of the depot, but the instructions regarding safety distances (paras. **13**, **14** and **84**) must always be borne in mind.
- (b) **Accessibility.** The site must be in the vicinity of communications which will give a “through” traffic, but not on main lines of communication which might be cut as a result of an explosion. An ammunition depot should never be sited astride the main line of communications.
- (c) **Isolation.** The site should not be in the vicinity of buildings, factories, hospitals, other depots, camps, dock areas or railway centres.
- (d) **Drainage.** The ground should be well drained.
- (e) **Space for expansion.** If possible, the site should be chosen to give ample space for possible future expansion.

**4.** If underground storage is available, it should be utilized, provided that it can be made dry and suitable for rapid receipt and issue.

The construction of artificial underground storage will rarely be justified.

**5. Floor Space.** The following basis of area-tonnage may be taken as a guide for the provision of storage (including

working space, gangways, internal traverses, etc., in the case of covered storage) :—

Categories A and B ... 1 ton per square yard.  
 Categories C, D and E ... 0.6 ton per square yard.

### 6. Arrangement of ammunition depots and dumps.

The general arrangement of an ammunition depot in the field is shown in diagrammatic form in Plates I-IV, but it must always be borne in mind that a regular or symmetrical lay out, such as parallel lines of categories and internal communications, facilitates observation and attack from the air, and will rarely be possible on account of other considerations.

7. The arrangement of the depot in the selected area will be based on the following considerations :—

- (a) Protection against all forms of attack.
- (b) The features of the ground, which should be used to minimize risks by isolating different categories, and to provide as much protection as possible against observation from the air.
- (c) The utilization of existing buildings, sheds, etc.
- (d) The utilization of existing communications and the additional constructional work required.
- (e) Rapidity of receipt and issue.
- (f) The length of time it is anticipated the depot will be required.

8. All ammunition depots must be enclosed and provided with adequate traffic facilities. Dumps and stacks of a semi-permanent nature should also be enclosed by a suitable fence.

9. The number of entrances to the depot should be a minimum, compatible with ease of working. The perimeter should be capable of being patrolled and should be clear of obstruction on the outside for a distance of 50 yards.

10. Railway lines or roads should be arranged to give a through "gathering" line or road for each category with "loading" spurs to each shed or group of sheds. The "loading" spurs should be of sufficient length to enable trucks or lorries to be moved to and fro in order to reduce to a minimum the amount of man-handling required in loading and unloading. Through "loading" lines and "back siding" lines with numerous turn-outs will, of course, facilitate receipt and issue, but, owing to operating difficulties and lack of resources, they will not be available in the initial stages and, accordingly, they are shown dotted in the standard lay out of an ammunition depot.



11. In army areas, direct lorry access to all ammunition sheds and dumps is desirable and, where this cannot be provided, there should be means whereby all ammunition can be moved without delay, and without excessive labour, to some place where it can be conveniently loaded into lorries.

12. Administrative buildings, offices (other than group offices), and living accommodation for personnel and guards, must be situated outside the perimeter.

### 13. Safety distances.

- (a) The distance between ammunition depots or dumps and groups of buildings, hospitals, other depots and camps must be as great as possible.
- (b) The distance between different categories should be at least 400 yards.
- (c) The minimum distance which should be maintained between sheds or groups of sheds in the same category is shown in Plates I-V. If sheds are not traversed, all distances should be doubled.
- (d) If space admits, lines of sheds in the same category should be at least 400 yards apart. Where space is limited, a minimum distance of 200 yards in depots on lines of communication and 100 yards in army areas should be maintained, if possible, except in the case of categories C and E, where the minimum distance between lines of sheds may be reduced in all cases to 100 yards if all sheds have splinter-proof roofs and are traversed all round.
- (e) All sheds should be traversed all round and should have splinter-proof roofs, except as provided in (f) below.
- (f) A suitable arrangement of sheds for category B which proved to be satisfactory in France (1914-1918) is shown in Plate V, Fig. 1. Splinter-proof roofs are not necessary for shell sheds, but should be provided for other components in this category.

An arrangement of sheds for categories C and E, which was satisfactorily employed in some ammunition depots in France (1914-1918) is shown in Plate V, Fig. 2, but, in the initial stages of a war, the simpler alternative arrangement indicated in Plate V, Fig. 3 will normally be more suitable. In this case the contents of each shed must not exceed 200 tons and sheds to hold 100 tons are preferable where there is room for them.

- (g) If any stack of ammunition is in the open, it should be regarded as being in an untraversed shed for the purpose of determining safety distances.

14. Advantage should be taken of any features of the ground in siting sheds, such as hillocks, banks, trees, etc., which may minimize the risk of explosion in one shed being communicated to adjacent sheds.

15. No shed or group of adjacent sheds should exceed the dimensions shown in Plates I-V. In army areas smaller sheds are usually more suitable, and, where it is not possible to observe the prescribed safety distances, a compromise should be aimed at between :—

- (a) An arrangement of ammunition in small stacks so as to minimize loss in case of fire or explosion, the stacks being kept far enough apart to prevent fire spreading from one to another, and
- (b) An arrangement of the ammunition so that it can be received, stored and rapidly loaded into both lorries and railway trucks, without excessive labour.

16. No point of arrival or departure sidings, marshalling yards or regulating stations should be within 400 yards of any shed containing ammunition or explosives.

17. Special arrangements will be made for repair work, experimental work and laboratory operations, which must not be carried out in ammunition depots (*see* paras. 49 and 84).

## SECTION III.

**CONSTRUCTION OF SHEDS AND TRAVERSES.**

**18. Materials.** The use of inflammable materials in the construction of sheds, etc., will be avoided as far as possible. Wooden sheds may be constructed if other less inflammable material is not available, but the roofs should be non-inflammable and may be of corrugated iron.

**19. Construction.** Suitable types of shed with rough area dimensions are shown in the Plates. These should have numerous openings and, where possible, the floor should be brought level with the loading platform in order to facilitate rapid receipt and issue and to economize labour.

**20.** The standard sheds used in ammunition depots in France (1914-1918) were 9 feet high at the eaves and 11 feet high at the centre. Stacks of boxes were built to a height of approximately 7 feet. "Nissen" huts of standard pattern, *see* Plate V, were also used.

In the early stages of a war it is unlikely that standard hutting will be available for ammunition depots, and local resources and improvisation will have to be resorted to.

In arranging for covered accommodation, it should be borne in mind that lofty sheds are not required for category **B** (Shell) and category **D** ammunition owing to the restrictions on the heights of piles and stacks, *see* paras. 72 and 82.

**21.** It will not normally be practicable to provide roofs which are proof against aircraft bombs and artillery bombardment, but all sheds, with the exception of those used for storing plugged shell in category **B** and small arm ammunition in category **A**, should be provided with *splinter-proof cover*. For this purpose, protection equivalent to that given by three layers of sand bags is regarded as sufficient to keep out missiles, fragments, etc., projected by an explosion in a neighbouring shed. Weather-proof sheds give sufficient cover for plugged shell and category **A** small arm ammunition.

**22.** If it is not possible to provide weather-proof sheds for plugged shell in category **B**, they should be protected, if possible, from the direct rays of the sun while being exposed to the free circulation of air. A suitable protection is afforded

by tarpaulins stretched over a light wood framework placed over the shell. Where floor space admits, shell 6-in. and above should be stored on their bases.

23. Floors should be of hard rammed road metal, levelled off and raised slightly above the surrounding ground.

24. Improvised drainage should be provided round the outside of sheds to carry off water and guard against floors becoming flooded.

25. Where weights of 200 lb. or over are to be handled, some convenient form of lifting and carrying device, which may have to be improvised, is desirable.

26. **Traverses.** External traverses up to the eaves should be provided at the back and ends and between the "loading" line and "gathering" line of all sheds in base ammunition depots and depots of a semi-permanent nature, except that sheds for the storage of plugged shell in category **B** need not be traversed externally.

27. Suitable hills, ridges or belts of trees between sheds can be taken into account in considering traverses.

28. Sheds should be traversed internally at least every 75 feet of their length. Boxes containing small arm ammunition may be used for this purpose.

29. A suitable arrangement of traverses is shown in Plate V. For the type of sheds indicated in Fig. 2, if earth is not available to fill the space between the sheds, as shown, the sheds themselves should be well covered and the earth should be banked against the sides to the greatest thickness practicable.

30. The most satisfactory form of traverse in the field is one consisting of two mutually inclined corrugated iron sides, the sheets riveted together at the edges, supported on a wooden framework and tied together with iron rods or wires, the space between the sides being filled with earth or sand in sand bags. If the woodwork is burnt away or rots, the iron ties prevent the sides of the traverse from collapsing.

31. When the extent of ground space occupied by a traverse is of no account, a good form is an earth bank with a slope of 1/1, which requires no revetting.

32. Sand bag traverses or sand bag walls with unprotected surfaces are apt to be damaged in handling ammunition and are unsatisfactory on account of the large amount of work necessary to keep them in repair. If, however, sand bag

traverses have to be used, they should be properly bonded and the slope of the sides should not be steeper than 4/1.

**33.** No traverse should be less than 2 feet thick at its narrowest part.

**34. Lighting.** Whenever possible, electric light should be installed in an ammunition depot, all necessary precautions being taken to shield lights from view and guard against fire. Bulbs should be completely enclosed, preferably in an outer globe or dome of thick glass, or, if this is impossible, in a protecting cage.

**35.** The installation should provide separate circuits for the depot and the railway yards, each controlled by a master switch, so that each can be operated irrespective of the others.

**36.** Direct telephonic communication should be provided between the power house, air defence headquarters, depot office and main guard room to enable the current to be switched off at a moment's notice in emergency.

**37.** No naked lights will be used in an ammunition depot or in the vicinity of any ammunition dump.

## SECTION IV.

## PROTECTION.

**38. Protection against attack, sabotage and unauthorized entry.** General officers commanding formations and areas are responsible that adequate measures are taken to defend ammunition depots and dumps in their areas against all forms of attack. The lay out of ammunition depots and R.A.O.C. dumps must always be arranged in conjunction with the General Staff.

**39.** All entrances to a depot or an enclosed area in which ammunition is stored must be guarded by day and night. Perimeters must be frequently patrolled by day and night, and no unauthorized person will be allowed to enter the enclosed area. General officers commanding formations and areas are responsible for seeing that the necessary guards are provided for this purpose.

**40.** No public thoroughfare should traverse an ammunition depot or enclosed area.

**41. Protection against fire.** Troops must not be billeted nor camps pitched near any ammunition depot or dump.

**42.** Smoking, fires, cooking and naked lights are forbidden within 100 yards of any enclosure where ammunition is kept.

**43.** The enclosed area should be kept free from long grass, undergrowth, broken glass and litter of all descriptions.

**44.** Where possible, there should be a fire-break (*i.e.* an area from which all long grass, undergrowth, etc., has been cleared, but in which trees are left standing as a protection against observation by aircraft), of 30 yards round the outside of the perimeter and 10 yards round each shed or stack.

**45.** Locomotives used inside ammunition depots, and especially those used on loading or back siding lines, should be oil-fired or of the Diesel type, but, if coal-fired locomotives have to be used, they should be fitted with an extra ash pan to prevent the dropping of hot cinders on the track and adequate internal and external spark arresters.

**46.** Empty wood packages should, if possible, be stored outside the perimeter of the enclosed area. If this is not

possible, stacks of empty packages should be placed as far as possible from sheds containing ammunition especially categories C, D and E.

47. The use of canvas or other inflammable material as curtains in sheds containing ammunition is prohibited.

48. Oiled cotton, rags and waste, and any article liable to spontaneous ignition will not be allowed to remain near stacks of ammunition.

49. No laboratory or repair operations will be carried out in the enclosed area.

50. In siting stacks of ammunition, tarpaulin shelters, etc., attention should be paid to the danger of fire that may be caused by sparks from coal-fired locomotives.

51. A plentiful supply of water should be available and hydrants should be situated in positions convenient to each group of sheds. Where hydrants or other sources of water supply are not available, tanks should be let into the ground at convenient places and kept filled with water.

52. Water mains and connections for fire service must be buried underground or otherwise protected. All possible steps should be taken to prevent freezing.

53. Fire fighting appliances on an adequate scale should be provided. A plentiful supply of fire buckets should be situated in places convenient to each shed or stack and kept filled. Buckets may be improvised from four-gallon petrol cans or biscuit tins. Extinguishers should be provided on a scale of one to every five buckets.

54. Keys to fire fighting appliances, or the sheds in which they are housed, should be kept in protected recesses in the *immediate* vicinity.

55. The permanent staff of each ammunition depot or dump will be detailed to and trained in, specific duties in the event of fire.

56. Fire orders will be drawn up for each particular case and made known to all concerned; copies of these orders will be posted in conspicuous places.

## SECTION V.

## SAFETY REGULATIONS.

**57. Safe Custody.** To ensure that these instructions are being complied with and that every precaution is being taken to safeguard stocks of ammunition and the personnel concerned therewith, frequent inspections should be carried out by qualified ordnance officers. Such inspections must be carried out in a thorough and detailed manner.

**58.** It should be impressed on all concerned that carelessness or failure to comply with these instructions may lead to the loss of large stocks of ammunition and, in consequence, impair the safety of the forces in the field.

**59.** Any building intended to be used for the storage of ammunition should be inspected by a qualified ordnance officer and certified as suitable by him.

**60.** A qualified officer should be placed in charge of each ammunition depot and dump. He will be made responsible for all arrangements in connection with the safe custody and storage of the ammunition and that all reasonable precautions are taken to guard against accident, fire and deterioration. He will also be held responsible that all personnel under his control are fully acquainted with orders regarding safety, fire and storage.

**61. Safety instructions.** Each person, before entering the enclosed area, will search his pockets to see that he has no smoking materials, matches or lighters in his possession. Disciplinary action will be taken against any person importing such prohibited articles into an ammunition depot or enclosed area where ammunition is stored.

The officer in charge may, at his discretion, prohibit the introduction into an enclosed area of other articles if he considers this desirable from the safety point of view.

**62.** Demonstrations or experiments with explosives or any type of ammunition will not be carried out in the vicinity of an ammunition depot or dump, *see* para. 17.

**63.** Where any explosive is stored in bulk, packages will not be opened in the main store. If small issues have to be made, they should be made from an expense store.



64. Inspections which involve the removal of components from ammunition should not be carried out in main stores. The ammunition should first be removed to another building or a position remote from any shed or stack.

65. The opening of packages or breaking of bulk in storage sheds or near dumps must be carefully regulated.

66. All forms of salvaged ammunition and explosives, including pyrotechnic stores, smoke appliances, etc., whether of our own or of enemy make, will be placed as far as practicable from any stock of ammunition until they have been overhauled to make sure that they are in a safe condition for storage. They will not be stored in the same depot as service stocks until they have been examined by an inspecting ordnance officer.

67. Detonators will not be inserted into bombs or grenades until the last possible moment before use; except when it is necessary to hold stocks of grenades or bombs ready for instant use.

Selected men should be chosen for fitting detonators to bombs and grenades. The work should not be carried out in main stores or close to dumps.

68. Care will be taken that bombs and grenades returned to rail head are *not* fitted with detonators and are otherwise in a safe condition for transit.

## SECTION VI.

## STORAGE AND CARE.

**69. Storage.** Ammunition and explosives will be stored strictly by categories. Each calibre, nature and type of ammunition should be stacked separately and, where space admits, ammunition should be stacked by ballistic group, batch number, fuze lot, etc., in order to facilitate issue in accordance with the latest instructions. Each stack should be plainly labelled to show the essential particulars of the ammunition or explosive concerned.

**70.** Boxes should be raised from the floor on dunnage. Outside cuts from trees are the most economical form of dunnage, but for first shipments dunnage 4 inches by 4 inches, will be provided. Stacks of boxes should never exceed 11 feet in height in the open and 7 feet in height in sheds, and wood battens should be used, as necessary, between layers to protect handles, etc., and to preserve stability.

**71.** Cartridge cylinders contained in skeleton cases may be piled on their sides to a height not exceeding 11 feet. Cartridge cylinders not protected by skeleton cases should be stored vertically where space admits; if this is not possible, they should be piled on their sides to a height not exceeding 6 feet.

**72.** Shell 6-in. and above should be stored on their bases \* if space is available; otherwise they should be piled with alternate layers "heads and tails," care being taken that driving bands and points are not damaged during the processes of piling and unpling. Bottom tiers should be raised from the floor on dunnage and securely wedged. Piles should not exceed 5 feet in height.

**73.** In category **D**, phosphorus or phosphide filled ammunition should be segregated and stored as far away from other natures as possible.

**74.** Detonators will always be stored apart from other ammunition or explosives, except when packed in boxes with their associated bombs or grenades.

**75.** Bombs and grenades which have been fitted with detonators (but *see* para. 67) should not be stored near other

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\* Except that shrapnel and star shell will on no account be stored on their bases in the open, as it is impossible to dry these shell properly when water has once entered them.

ammunition or explosives. Their transport in trucks, lorries and wagons should be avoided as far as possible.

**76. Care.** Every effort will be made to protect ammunition and explosives from the weather and direct sunlight and to keep them in a serviceable condition.

**77.** Boxes containing ammunition or explosives must always be carefully handled. They should never be rolled or dragged about, but lifted from place to place.

Any package that has been submitted to *abnormal* rough usage should be put aside as unfit for issue. Such packages should be marked "*Abnormal Rough Usage*" and should not be issued until their contents have been examined and sentenced by an inspecting ordnance officer.

**78. Ammunition filled white phosphorus.** White phosphorus, if dry, ignites spontaneously when exposed to air. It is easily extinguished by water, and is quite safe when wet; consequently a good supply of water should be kept at hand.

**79.** The liability to spontaneous ignition is accentuated by heat, and stocks should be stored under as cool conditions as possible. They should not be exposed to the sun.

**80.** If *any* phosphorus filled ammunition shows signs of not being air-tight, it should be isolated and kept under water. But it must be borne in mind that, if the released phosphorus is allowed to dry again afterwards, it is as liable to spontaneous ignition as before, and such ammunition should therefore be destroyed.

Leakage is indicated by the characteristic smell of phosphorus and the presence of white fumes.

**81. Ammunition filled phosphide.** Leakage in the case of ammunition containing phosphide will be readily detected by a strong odour of phosphorus and it should be noted that the gas is somewhat poisonous. In the event of a leak being detected, the ammunition should be immediately removed to an isolated position, where its inflammation will not result in serious consequences, and placed under cover to protect it from moisture. Leaky ammunition should be dumped in deep water or destroyed as soon as possible.

**82.** When possible, boxes containing phosphorus or phosphide filled ammunition should be stacked not higher than 5 feet, with a passage between each two rows, so that any box showing signs of taking fire can be promptly removed.

**83. Protection of ammunition against gas.** Precautions to be taken and methods for cleaning contaminated ammunition are laid down in other publications.

## SECTION VII.

LABORATORY OPERATIONS AND  
EXPERIMENTAL WORK.

**84. Site and arrangement of a laboratory area.** The site of a laboratory should be at a distance from public roads, buildings, factories, hospitals, depots and camps. If possible, it should be at least 400 yards from the perimeter of any area in which ammunition or explosives are stored. Should it be impossible to obtain this distance, the site must be suitably traversed to confine the effects of an explosion, but the distance must on no account be less than 50 yards.

In choosing a site, due regard must be paid to external sources of danger, such as sparks from coal-fired locomotives.

**85.** The laboratory area must be enclosed by a suitable fence, the entrances being controlled by sentries. The general instructions for protection and safety of ammunition depots, laid down in this book, apply similarly to laboratory areas.

**86.** A suitable arrangement is to carry out the work in a number of small huts or tents, spaced from each other and traversed.

**87. Experimental work.** Experimental work will always be carried out in a properly organized field laboratory, which must be in charge of a fully qualified officer.

**88.** Preventable accidents have occurred in the past as a result of alterations to ammunition being carried out without proper authority and by persons with insufficient knowledge and experience. On no account will ammunition be altered or tampered with in any way, whether for demonstration or other purpose, without the definite instructions or sanction of the D.M.G.O.

If it is desired to carry out any experimental work, details of the proposed experiments should be submitted to G.H.Q., and the sanction of the D.M.G.O. obtained *before* the work is begun. Such sanction will not absolve the officer in charge of the work from the responsibility for taking all necessary precautions to guard against the results of premature explosions or other accidents.

**89. Safety instructions.** In the field it is not possible to adhere altogether to "magazine conditions," but the instructions given below should be complied with at all times. The general instructions regarding the storage and care of ammunition and explosives contained in this book will be strictly adhered to, and peace conditions should be adopted as far as possible. (Copies of A.F. G 940, G 947 and G 953 containing peace time instructions for storage and laboratory operations can be obtained on demand.)

**90.** No fires, naked lights, lighters, matches or smoking materials will be allowed in the laboratory area.

**91.** Laboratory and experimental work will only be carried out by trained personnel. If none is available, suitable persons will be trained by the expert staff, who should exercise the strictest supervision. Changes of personnel should be avoided.

**92.** Before any work is undertaken, the number of men and the amount of explosive to be allowed in each hut or tent will be decided by the officer in charge, and a notice stating these limits will be posted in a conspicuous place.

**93.** The smallest number possible, and in no case more than eight men, will be allowed at one time in any hut, tent or room of a building in which laboratory operations are in progress.

**94.** The amount of ammunition, explosive or other dangerous (*e.g.* inflammable) material in any laboratory, hut or tent will be strictly limited to immediate requirements.

**95.** The operations should be organized to take place methodically and in a regular manner.

**96.** Operations should only take place by artificial light when absolutely necessary. If artificial light cannot be dispensed with, every precaution will be taken to guard against risk of fire. Where possible, lights should be placed outside huts in such a position that sufficient light is admitted through the windows.

**97.** A magazine must be provided at a distance from the laboratories in which to store the bulk ammunition and explosives to be used in the operations.

**98.** Not more than one *dangerous* operation should be carried out in any hut or tent at any one time.

**99.** Fuzes, detonators and similar stores will be assembled in a separate hut or tent.

100. In order to avoid detonators being taken into a hut or tent where laboratory operations are in progress, the unpacking and packing of boxes containing detonators should be carried out in a separate hut or tent.

101. The fuzing and unfuzing of shell, except at battery positions, must be carried out at a safe distance, which must not be less than 50 yards from any stock of ammunition, and behind a traverse.

102. Receptacles containing explosives will not be left open. If necessary, suitable flap lids should be improvised from leather or thick cardboard. Any loose explosive spilled will be swept up immediately and deposited in a bucket of water, which should be kept handy for the purpose.

103. Work should cease and laboratories be vacated and closed during thunderstorms.

104. On the conclusion of the day's work, benches and floors in huts and tents will be carefully cleaned. Ammunition and explosives will be covered up and all waste material, explosives, rags, dust, etc., will be collected and taken outside the laboratory area for destruction.

105. A copy of these instructions should be in the possession of every officer in charge of laboratory operations, who will be responsible for seeing that all personnel employed are fully acquainted with them.

## APPENDIX I.

SAFETY PRECAUTIONS IN DEALING WITH  
ENEMY AMMUNITION.

1. Captured ammunition and blind projectiles must be handled with extreme care, the latter should be destroyed *in situ* whenever possible. Blind projectiles should not be moved for at least thirty minutes after they have fallen.
2. Abandoned dumps of enemy ammunition should always be regarded with suspicion. The vicinity of each dump should be carefully searched for "booby traps."
3. A guard will be placed over captured dumps and the ammunition must not be tampered with in any way until it has been examined by an inspecting ordnance officer. The capture of dumps will be reported immediately to the Ordnance Service through the usual channels. This procedure is necessary in order to gain information as well as to ensure safety. The discovery of blind projectiles or fuzes of unusual design or appearance must also be reported immediately.
4. If it is necessary to move blind projectiles, etc., they should be lifted *very carefully* and retained in a horizontal position. They should not be transported in vehicles, but carried on a stretcher to a convenient place for destruction.
5. Plugged shell and B.L. cartridges may be handled in the same manner as similar stores in our own service.
6. Any shell from which liquid is exuding, or which have a distinctive smell, should only be handled by men wearing respirators and protective clothing.

## APPENDIX II.

**QUANTITIES OF AMMUNITION AND EXPLOSIVES  
WHICH CAN BE STORED IN A GIVEN SPACE.**

The quantities given in the tables below are intended to form an easy basis for calculating the *covered* storage required. They are approximate only; they take no account of working space, gangways, internal traverses, etc., and they deal only with *typical* calibres and natures of ammunition and explosives in each category.

In applying these figures, allowance must therefore be made for the additional space required for working conditions. The loading on the ground per square yard must always be considered in conjunction with the nature of the surface.

The space taken as a basis is an area approximately 10 feet by 10 feet (as nearly as the size of packages permits), the height of stacks or piles being 7 feet, except where limited, *see* paras. 71, 72 and 82.



| NATURE OF AMMUNITION.          | HOW PACKED.     | PACKAGE.  |                              |                 | NUMBER OF STORES IN STACK. | TOTAL WEIGHT Tons. Cwt. | WEIGHT PER SQ. YARD OF AREA. Tons. |
|--------------------------------|-----------------|---|------------------------------|-----------------|----------------------------|-------------------------|------------------------------------|
|                                |                 | DIMENSIONS (APPROX.) Inches.                              | WEIGHT FILLED. (APPROX.) lb. | NUMBER STACKED. |                            |                         |                                    |
| <b>CATEGORY A.</b>             |                 |   |                              |                 |                            |                         |                                    |
| Cartridges, Q.F.—              |                 |   |                              |                 |                            |                         |                                    |
| 3-pr. 2-cwt. ...               | 12 in steel box | $21\frac{1}{2} \times 14\frac{1}{2} \times 11$            | 104                          | 6 × 8 × 7       | 4,032                      | 15                      | 1.35                               |
| 13-pr. ...                     | 4 in wood box   | $27\frac{1}{2} \times 10\frac{1}{2} \times 10\frac{1}{2}$ | 84                           | 4 × 12 × 8      | 1,536                      | 14                      | 1.3                                |
| 18-pr. ...                     | 4 in wood box   | $29\frac{1}{2} \times 11 \times 11$                       | 116                          | 4 × 11 × 8      | 1,408                      | 18                      | 4                                  |
| 18-pr. ...                     | 4 in steel box  | $28\frac{1}{2} \times 9\frac{1}{2} \times 9\frac{1}{2}$   | 116                          | 4 × 13 × 9      | 1,872                      | 24                      | 5                                  |
| 3-in. 20-cwt. ...              | 4 in wood box   | $33\frac{1}{2} \times 12 \times 12$                       | 126                          | 3 × 10 × 7      | 1,164                      | 16                      | 8                                  |
|                                |                 |   |                              | + 1 × 3 × 7     |                            |                         |                                    |
| 3-in. 20-cwt. ...              | 4 in steel box  | $32\frac{1}{2} \times 10\frac{1}{2} \times 10\frac{1}{2}$ | 132                          | 3 × 12 × 8      | 1,344                      | 19                      | 16                                 |
|                                |                 |   |                              | + 3 × 2 × 8     |                            |                         |                                    |
| 3-7-in. howr.—                 |                 |   |                              |                 |                            |                         |                                    |
| Complete rounds                | 4 in wood box   | $23\frac{3}{4} \times 11\frac{3}{4} \times 12\frac{3}{4}$ | 123                          | 5 × 10 × 6      | 1,200                      | 16                      | 9                                  |
| Shell ...                      | 2 in wood box   | $16\frac{3}{4} \times 11\frac{1}{4} \times 7$             | 52                           | 7 × 10 × 12     | 1,680                      | 19                      | 10                                 |
| Cartridges ...                 | 10 in wood box  | $26 \times 12 \times 7$                                   | 49                           | 4 × 10 × 12     | 5,280                      | 11                      | 4                                  |
|                                |                 |   |                              | + 1 × 4 × 12    |                            |                         |                                    |
| 4-5-in. howr.—                 |                 |   |                              |                 |                            |                         |                                    |
| Complete rounds                | 2 in wood box   | $26\frac{1}{2} \times 12\frac{1}{2} \times 7\frac{1}{2}$  | 100                          | 4 × 10 × 11     | 968                        | 21                      | 12                                 |
|                                |                 |   |                              | + 1 × 4 × 11    |                            |                         |                                    |
| Shell ...                      | 2 in wood box   | $19\frac{3}{4} \times 12\frac{3}{4} \times 7\frac{3}{4}$  | 84                           | 6 × 9 × 11      | 1,188                      | 22                      | 5                                  |
| Cartridges ...                 | 10 in wood box  | $23\frac{1}{2} \times 13\frac{1}{2} \times 7\frac{1}{2}$  | 58                           | 5 × 9 × 10      | 4,500                      | 11                      | 13                                 |
| Cartridges, S.A., .303-in. ... | 1,000 round box | $18 \times 10\frac{1}{2} \times 9$                        | 75                           | 7 × 11 × 9      | 693,000                    | 23                      | 4                                  |

## CATEGORY B.

|                                       |   |                  |     |  |        |    |    |       |
|---------------------------------------|---|------------------|-----|--|--------|----|----|-------|
| Cartridges, B.L.—<br>60 pr. ...       | 10 in Case, powder,<br>M.L.                   | 17½ × 17-0 × 21½ | 180 | 7 × 5 × 5                                | 1,780  | 11 | 14 | 1-09  |
| 6-in. howr. ...                       | 20 in Case, powder,<br>M.L.                   | 17½ × 17-0 × 21½ | 183 | 7 × 5 × 5                                | 3,500  | 11 | 19 | 1-12  |
| 6-in. gun ...                         | 1 in Cylinder, cartge.<br>(Standing)          | 27 × 7½ dia.     | 33  | 15 × 15 × 3                              | 675    | 9  | 19 | ·91   |
| 6-in. gun ...                         | 1 in Cylinder, cartge.,<br>with skeleton case | 31 × 9½ × 9½     | 39  | 4 × 12 × 9                               | 432    | 7  | 10 | ·69   |
| 8-in. howr. ...                       | 2 in Cylinder, cartge.<br>(Standing)          | 32½ × 9½ dia.    | 48  | 12 × 13 × 2                              | 624    | 6  | 14 | ·66   |
| 8-in. howr. ...                       | 2 in Cylinder, cartge.,<br>with skeleton case | 36 × 11½ × 11½   | 55  | 3 × 10 × 7<br>+ 1 × 3 × 7<br>12 × 13 × 2 | 462    | 5  | 14 | ·6*   |
| 9-2-in. howr. ...                     | 1 in Cylinder, cartge.<br>(Standing)          | 32½ × 9½ dia.    | 37  |  | 312    | 5  | 3  | ·5    |
| 9-2-in. howr. ...                     | 1 in Cylinder, cartge.,<br>with skeleton case | 36 × 11½ × 11½   | 44  | 3 × 10 × 7<br>+ 1 × 3 × 7<br>9 × 9 × 4   | 231    | 4  | 11 | ·43   |
| 12-in. howr. ...                      | 1 in Cylinder, cartge.<br>(Standing)          | 19½ × 13 dia.    | 62  |  | 324    | 9  | 0  | ·8    |
| 12-in. howr. ...                      | 1 in Cylinder, cartge.,<br>with skeleton case | 23 × 15½ × 15½   | 70  | 5 × 8 × 6                                | 240    | 7  | 10 | ·7    |
| Fuzes, perc.—<br>No. 106 type ...     | 20 in wood box                                | 18½ × 13½ × 11   | 70  | 6 × 9 × 7                                | 7,560  | 11 | 16 | 1-09  |
| No. 101 type ...                      | 20 in wood box                                | 18½ × 13½ × 11   | 80  | 6 × 9 × 7                                | 7,560  | 12 | 10 | 1-24  |
| Fuzes, T. & P.—<br>No. 80 or 88 types | 25 in wood box                                | 20 × 18½ × 5½    | 62  | 6 × 6 × 15                               | 13,500 | 14 | 19 | 1-35  |
| Shell, B.L.—<br>60-pr. ...            | Piled   | 6 diam. × 19     | 60  | 6 stacks × 155                           | 930    | 24 | 18 | 2-27* |
| 6-in. gun or<br>howr. ...             | On bases                                      | 7½ " × 22        | 100 | 15 × 15                                  | 225    | 10 | 1  | ·91   |
| 6-in. gun or<br>howr. ...             | Piled   | 7½ " × 22        | 100 | 5 stacks × 92                            | 460    | 20 | 11 | 2-06  |
| 6-in. howr. ...                       | On bases                                      | 7½ " × 22        | 86  | 15 × 15                                  | 225    | 8  | 3  | ·75   |
| 6-in. howr. ...                       | Piled   | 7½ " × 22        | 86  | 5 stacks × 92                            | 460    | 17 | 13 | 1-76  |

| NATURE OF AMMUNITION.                     | HOW PACKED.          | PACKAGE.                      |                             |                             | NUMBER OF STORES IN STACK. | TOTAL WEIGHT. Tons. Cwt. | WEIGHT PER SQ. YARD OF AREA. Tons. |
|---|----------------------|-------------------------------|-----------------------------|-----------------------------|----------------------------|--------------------------|------------------------------------|
|   |                      | DIMENSIONS (APPROX.). Inches. | WEIGHT FILLED (APPROX.) lb. | NUMBER STACKED.             |                            |                          |                                    |
| <b>CATEGORY B—contd.</b>                  |                      |                               |                             |                             |                            |                          |                                    |
| Shell, B.L.— <i>contd.</i>                |                      |                               |                             |                             |                            |                          |                                    |
| 8-in. howr. ...                           | On bases             | 10 diam. × 29½                | 200                         | 12 × 12                     | 12                         | 18                       | 1-16                               |
| 8-in. howr. ...                           | Piled                | 10 " × 29½                    | 200                         | 4 stacks × 57               | 20                         | 8                        | 1-84                               |
| 9-2-in. howr. ...                         | On bases             | 12 " × 30                     | 290                         | 10 × 10                     | 13                         | 0                        | 1-17                               |
| 9-2-in. howr. ...                         | Piled                | 12 " × 30                     | 290                         | 4 stacks × 40               | 20                         | 14                       | 1-86                               |
| 9-2-in. gun ...                           | On bases             | 12 " × 33¾                    | 380                         | 10 × 10                     | 17                         | 0                        | 1-53                               |
| 9-2-in. gun ...                           | Piled                | 12 " × 33¾                    | 380                         | 4 stacks × 35               | 23                         | 15                       | 2-12                               |
| 12-in. howr. ...                          | On bases             | 14½ diam. × 40½               | 750                         | 8 × 8                       | 21                         | 8                        | 1-95                               |
| 12-in. howr. ...                          | Piled                | 14½ " × 40½                   | 750                         | 3 stacks × 26               | 26                         | 2                        | 2-41                               |
| Tubes, perc., S.A. cartridge ...          | 200 in wood box      | 15½ × 7½ × 4½                 | 13                          | 8 × 16 × 20                 | 14                         | 17                       | 1-33                               |
| <b>CATEGORY C.</b>                        |                      |                               |                             |                             |                            |                          |                                    |
| Grenades, No. 36M.                        | 12 in wood box       | 22½ × 7¼ × 6¾                 | 28                          | 5 × 16 × 12<br>+ 1 × 5 × 12 | 12                         | 15                       | 1-15                               |
| M.L. 3-in. mortar Bombs, H.E., air-craft— | 6 rounds in wood box | 20½ × 14 × 10¾                | 100                         | 6 × 8 × 8                   | 17                         | 3                        | 1-63                               |
| 20-lb. ...                                | 1 in wood box        | 28½ × 6½ × 6½                 | 34                          | 4 × 19 × 12                 | 13                         | 17                       | 1-27                               |
| R.L., 112-lb. ...                         | 1 in wood box        | 35¼ × 17½ × 17¾               | 182                         | 3 × 7 × 5<br>+ 1 × 3 × 5    | 9                          | 15                       | ·88                                |
| G.P., 120-lb.                             | 1 in wood box        | 39½ × 14½ × 14½               | 182                         | 3 × 8 × 6                   | 11                         | 14                       | 1-07                               |
| G.P., 250-lb.                             | 1 in wood box        | 48½ × 16 × 16½                | 343                         | 2 × 7 × 5<br>+ 1 × 2 × 5    | 12                         | 5                        | 1-15                               |

## CATEGORY D.

|                                      |                |     |               |         |    |    |      |
|--------------------------------------|----------------|-----|---------------|---------|----|----|------|
| Cartridges, signal or illuminating:— |                |     |               |         |    |    |      |
| 1-in. ...                            | 17½ × 8½ × 11  | 36  | 7 × 14 × 7    | 102,900 | 11 | 0  | 1-0  |
| 1½-in. ...                           | 17½ × 8½ × 11  | 41  | 7 × 14 × 7    | 49,392  | 12 | 11 | 1-15 |
| Cartridges, 18-pr., smoke ...        | 29½ × 11 × 11  | 116 | 4 × 11 × 5    | 880     | 11 | 8  | 1-03 |
| Generators, smoke, No. 5 ...         | 23½ × 10½ × 9½ | 58  | 5 × 11 × 9    | 4,950   | 12 | 16 | 1-17 |
| Grenades, signal...                  | 17 × 17 × 7½   | 27½ | 7 × 7 × 10    | 11,760  | 6  | 0  | -55  |
| Shell, smoke—                        |                |     |               |         |    |    |      |
| 3-7-in. howr. ...                    | 16½ × 11½ × 7  | 52  | 7 × 10 × 8    | 1,120   | 13 | 0  | 1-27 |
| 4-5-in. howr. ...                    | 19½ × 12½ × 7½ | 84  | 6 × 9 × 8     | 864     | 16 | 8  | 1-5  |
| 6-in. howr. ...                      | 7½ diam. × 22  | 100 | 15 × 15       | 225     | 10 | 1  | -91  |
| 6-in. howr. ...                      | 7½ " × 22      | 100 | 5 stacks × 92 | 460     | 20 | 11 | 2-06 |

## CATEGORY E.

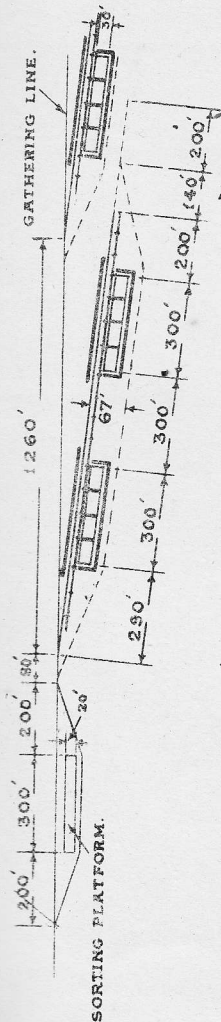
|                                 |                |     |  |         |    |    |      |
|---------------------------------|----------------|-----|--|---------|----|----|------|
| Detonators—                     |                |     |  |         |    |    |      |
| No. 8 ...                       | 18 × 5 × 5     | 7   | Storage of these will only be in small quantities. |         |    |    |      |
| No. 9 ...                       | 22½ × 6½ × 10½ | 18½ |  |         |    |    |      |
| Fuze, instantaneous, detonating | 13½ diam. × 4  | 47  |  |         |    |    |      |
| Fuze safety ...                 | 19 × 17½ × 21  | 114 |  |         |    |    |      |
| Guncotton, dry—                 |                |     |  |         |    |    |      |
| Primers ...                     | 16½ × 6½ × 7½  | 13  | 8 × 20 × 11  | 105,600 | 10 | 4  | .93  |
| Guncotton, wet—                 |                |     |  |         |    |    |      |
| Charges, field ...              | 18 × 9½ × 7½   | 36  | 6 × 12 × 10<br>+ 1 × 6 × 10<br>9 × 14 × 9          | 12,480  | 12 | 11 | 1-15 |
| Slabs, field ...                | 13½ × 8½ × 8½  | 26  |  |         |    |    |      |

PLATE I

SHEDS & SAFETY DISTANCES.

DIAGRAMMATIC ONLY-SEE PARA 6.

CATEGORY "A."



AT LEAST 300' TO BE LEFT CLEAR BETWEEN SHEDS ON ONE GATHERING LINE.  
1200' CLEAR TO BE LEFT BETWEEN SHEDS OF THE SAME CATEGORY ON  
DIFFERENT GATHERING LINES.

AT LEAST 1200' CLEAR TO BE LEFT BETWEEN ANY SHED OF CATEGORY A  
AND A SHED OF ANY OTHER CATEGORY.

Lines shown dotted are to be completed when possible, provided  
the ground will allow this to be done.

ammunition for different equipments should preferably be stored in separate sheds.  
boxed small arm ammunition may be used for internal traverses.

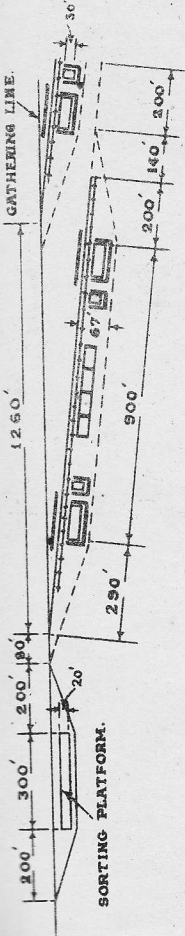
thick lines represent traverses. Tramway shown thus ————

## PLATE II

### SHEDS & SAFETY DISTANCES.

DIAGRAMMATIC ONLY-SEE PARA 6.

#### "B." CATEGORY B.



AT LEAST 300' TO BE LEFT CLEAR BETWEEN GROUPS OF SHEDS ON ONE GATHERING LINE.

1200' CLEAR TO BE LEFT BETWEEN SHEDS OF THE SAME CATEGORY ON DIFFERENT GATHERING LINES.

AT LEAST 1200' CLEAR TO BE LEFT BETWEEN ANY SHED OF CATEGORY B AND A SHED OF ANY OTHER CATEGORY.

LINES SHOWN DOTTED ARE TO BE COMPLETED WHEN POSSIBLE, PROVIDED THE GROUND WILL ALLOW THIS TO BE DONE.

AMMUNITION FOR DIFFERENT EQUIPMENTS SHOULD PREFERABLY BE STORED IN SEPARATE SHEDS. BOXED SMALL ARM AMMUNITION MAY BE USED FOR INTERNAL TRAVERSES.

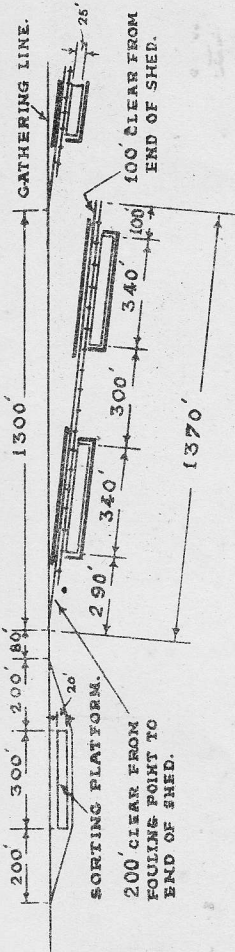
THICK LINES REPRESENT TRAVERSES. TRAMWAY SHOWN THUS

# PLATE III

## SHEDS & SAFETY DISTANCES.

DIAGRAMMATIC ONLY - SEE PARA 6.

### "C" CATEGORY C.



AT LEAST 300' TO BE LEFT CLEAR BETWEEN SHEDS ON ONE GATHERING LINE.  
1200' CLEAR TO BE LEFT BETWEEN SHEDS OF THE SAME CATEGORY ON DIFFERENT GATHERING LINES.

AT LEAST 1200' CLEAR TO BE LEFT BETWEEN ANY SHED OF CATEGORY C AND A SHED OF ANY OTHER CATEGORY.

GROUP OF 10 HUTS IN EACH 340', SEE PLATE V, FIG. 2.

AMMUNITION FOR DIFFERENT EQUIPMENTS SHOULD PREFERABLY BE STORED IN SEPARATE SHEDS.

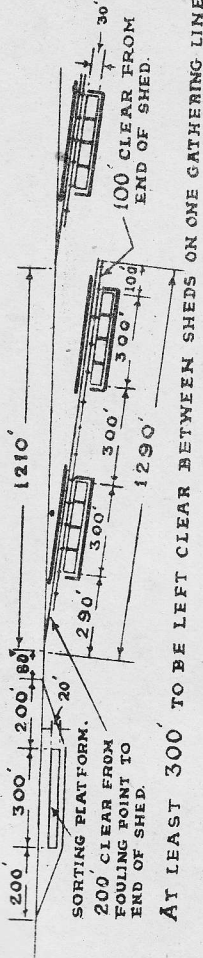
THICK LINES REPRESENT TRAVERSES. TRAMWAY SHOWN THUS 

# PLATE IV

## SHEDS & SAFETY DISTANCES.

DIAGRAMMATIC ONLY - SEE PARA 6.

### CATEGORY D.



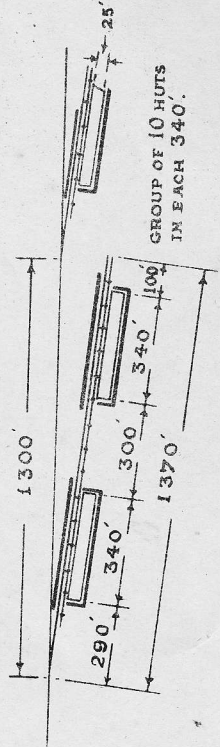
AT LEAST 300' TO BE LEFT CLEAR BETWEEN SHEDS ON ONE GATHERING LINE.

1200' CLEAR TO BE LEFT BETWEEN SHEDS OF THE SAME CATEGORY ON DIFFERENT GATHERING LINES. THICK LINES REPRESENT TRAVERSES.

AT LEAST 1200' CLEAR TO BE LEFT BETWEEN ANY SHED OF CATEGORY D OR E AND A SHED OF ANY OTHER CATEGORY.

TRAMWAY SHOWN THUS

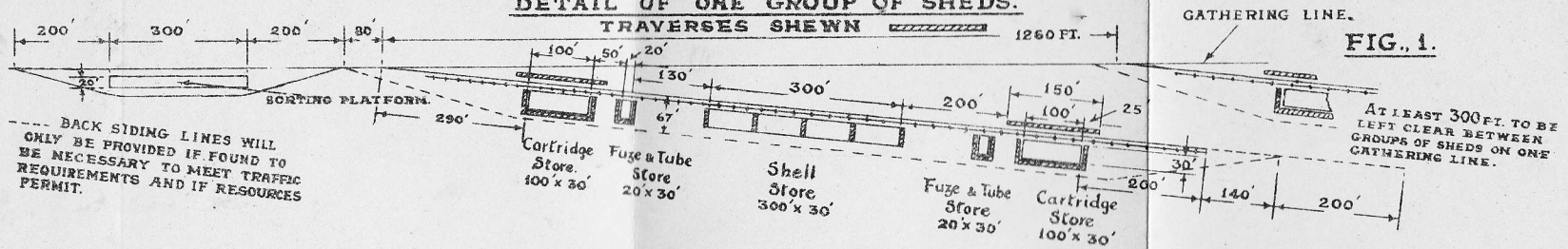
### CATEGORY E.



GROUP OF 10 HUTS  
IN EACH 340'.



**CATEGORY "B".**  
**DETAIL OF ONE GROUP OF SHEDS.**  
**TRAVERSES SHOWN**

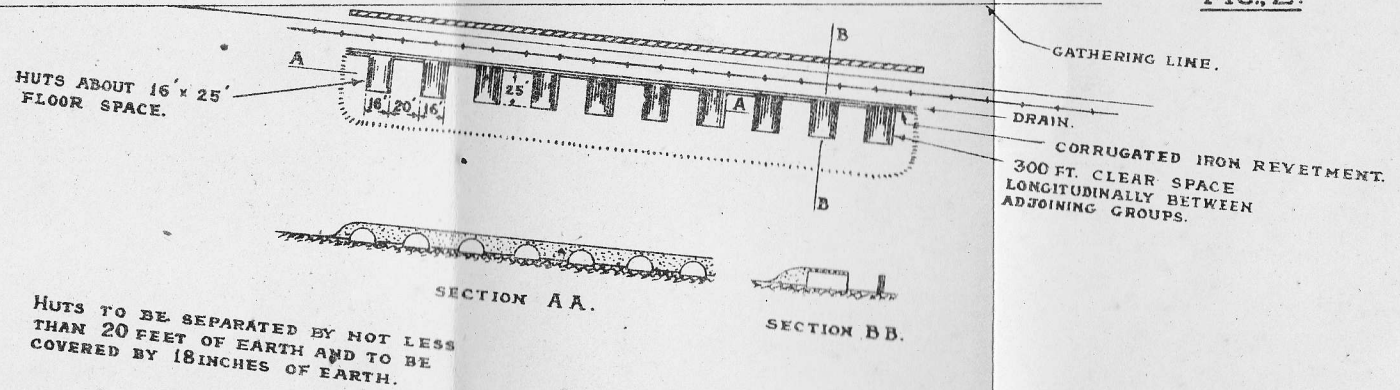


BACK SIDING LINES WILL ONLY BE PROVIDED IF FOUND TO BE NECESSARY TO MEET TRAFFIC REQUIREMENTS AND IF RESOURCES PERMIT.

**FIG. 1.**

**CATEGORIES "C" & "E".**  
**DETAIL OF ONE GROUP OF HUTS.**

**FIG. 2.**



HUTS ABOUT 16' x 25' FLOOR SPACE.

GATHERING LINE.

DRAIN.

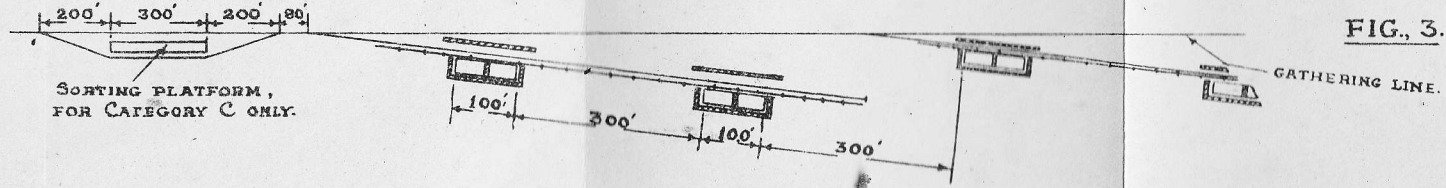
CORRUGATED IRON REVETMENT.  
 300 FT. CLEAR SPACE  
 LONGITUDINALLY BETWEEN  
 ADJOINING GROUPS.

SECTION AA.

SECTION BB.

**CATEGORIES "C" & "E".**  
**ALTERNATIVE TO FIG. 2.**

**FIG. 3.**



SORTING PLATFORM,  
 FOR CATEGORY C ONLY.

GATHERING LINE.

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