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# MAGAZINE REGULATIONS

(Land Service)

Part I, 1941

INDIAN SUPPLEMENT, 1955

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This edition supersedes all previous editions

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## INDIAN SUPPLEMENT TO MAGAZINE REGULATIONS

(LAND SERVICE)

Part I, 1941.

## PREFACE

## GENERAL.

1 This Indian Supplement details the deviations from and the amendments necessary to make Magazine Regulations (L.S.) applicable to India. The following general amendments will therefore, be made where necessary, throughout the regulations :—

<i>For</i>	<i>Read</i>
"War Office" .. ..	"Master General of the Ordnance" or "G. O. C-in. C" as applicable (see para 6 below).
"B. A. O. C." .. ..	"A. O. C."
"Royal Engineers" ..	"Military Engineer Services" or "Commander Engineers".
"Chief Inspector of Armaments, Woolwich"	"Director of Technical Development"
"C. O. O." "Chief Ordnance Officers"	"Commandants, Chief Ordnance Officers, Ordnance Officers"

2 Officers commanding units and formations, etc., should address all questions relating to Magazine Regulations to the Brig Ord/Ord Rep at Command/Formation H.Q.

As it is difficult to legislate for all circumstances, these regulations are to be interpreted intelligently as regards their application to local conditions.

3 Mandatory clauses in this Supplement are those in which the terms "will" and "must" are used. Advisory clauses are those in which the terms "should" and "may" are used. All mandatory clauses will be complied with unless special authority to the contrary is obtained from the Master General of the Ordnance, or the General Officer Commanding-in-Chief, as applicable.

All deviations sanctioned by General Officers Commanding-in-Chief will be reported in detail to Army Headquarters for record.

4 Ammunition and explosives held by the I.A.F. or the I.N. and ammunition and explosives peculiar to, or held for the I.A.F. or I.N. in Ordnance Establishments, will be stored and maintained in accordance with the regulations of the Services concerned. Necessary technical assistance will however be obtained from the Services concerned.

#### RESPONSIBILITY OF OFFICERS-IN-CHARGE OF MAGAZINES ETC.

5 The Officer-in-Charge of Magazine, laboratory, explosives storehouse, or small arms ammunition store is responsible for the correct observance of Magazine Regulations. He is also responsible, in cases where compliance with the regulations is impracticable for obtaining authority for any existing or proposed deviations from them and for the production of such authority when called for by an inspecting officer. If necessary, opportunity should be taken during the I.O.O's inspection to consult him in regard to any proposed deviations.

#### SANCTIONING AUTHORITY FOR DEVIATIONS FROM MAGAZINE REGULATIONS

6 When the storage of ammunition in strict compliance with Magazine Regulations, as modified for India elsewhere in the text of this Supplement is impracticable, or when it is found to deviate from the regulations in the construction of new magazines or explosives storehouses sanction for the deviation and acceptance of the risk involved must be obtained from :—

- (a) The Master General of the Ordnance for ammunition on Ordnance charge.
- (b) The Army Commander or the General Officer Commanding-in-Chief concerned for ammunition on unit charge.

#### AMMUNITION ON ORDNANCE CHARGE

7 In the case of existing storage all deviations from Magazine Regulations for which no sanction exists, will be referred by the Commandant/COO/OO, through the Brig Ordnance, to the Director of Ordnance Services in the form given at appendix 'K' to this Supplement. Before submitting the deviation statement to the DOS, the Brig Ordnance will scrutinize and make sure that the deviations are inevitable and that the deviation

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statement received from the Commandant/COO/OO is correct in all respects. The DOS will either :—

- (a) accept the recommendations of the Brig Ordnance and obtain the sanction of the MGO

or

- (b) instruct the Brig Ordnance to arrange for a departmental Board of Officers to be convened to consider and recommend what deviations are necessary

or

- (c) in case of major deviations involving consideration of technical aspects, may refer the matter to Storage and Transport of Explosives Committee for their recommendations.

8 In the case of new construction whether or not any deviations from Magazine Regulations are involved, the proposals before being worked out in detail will be forwarded to the Army HQ by the Brig Ordnance after consultation with Staff at Command Headquarters for acceptance by the MGO. The detailed scheme when completed will be forwarded to the DOS for the information of the MGO and for sanction if any deviations are involved.

9 The departmental Board of Officers referred to in para 7(b) above, to investigate the deviations in the storage of ammunition will be convened by the Brig Ordnance with the prior approval of the DOS. This Board will consist of—

(a) Chairman

(b) Members—

(i) the Dy Comdt/DCCO/Ordnance Officer Incharge of the Central Ammunition Depot/Ammunition Depot/Ammunition Sub Depot concerned.

(ii) an IOO from any other establishment.

(iii) DOS representative.

Note 1.—The Chairman may avail of the services of any other officer of the depot concerned as member.

Note 2.—In case of major deviations mentioned in para 7(c) above, the DOS may acquire the services

of a representative of the Storage and Transport of Explosives Committee to act as an adviser to the Board.

#### AMMUNITION ON UNIT CHARGE

10 Applications for deviations from Magazine Regulations will be made on the form at Appendix 'K', and should be accompanied with the recommendations of a Station Board to be convened under the authority of the Area/Formation Commander. He may, however, waive the necessity for Station Board when he considers that the deviations involved are quite clear and investigation by Board is not essential. This application should clearly state the sanction required and the necessity for it and it will be forwarded to the GOC-in-C through Staff channels. The Area<sup>2</sup>/<sub>4</sub>Formation Cammander will scrutinize and record their recommendations in consultation with Ordnance representative<sup>3</sup>/<sub>4</sub>IOO concerned before submitting the applications to the GOC-in-C.

The above procedure will apply both where the state of existing buildings and/or safety distances are such as to give rise to danger and where in the proposed construction of new buildings, compliance with Magazine Regulations is found to be impracticable and sanction for the deviation is necessary.

11 One member of the Station Board will be the Inspecting Ordnance Officer and, if possible, the Board should be convened to coincide with this officer's annual visit to the station. Where the construction of new buildings or the structural alteration to existing buildings is involved one member of the Board will be a representative of the Commander Engineers.

12 The Inspecting Ordnance Officer will bring to notice in his Narrative Report (I.A.F.O. 2638) all cases where Magazine Regulations, as modified by the Indian Supplement, have not been complied with. He will also give particulars in his report of ammunition stored in accordance will paras. 3, 4 and 5 of Appendix G to the Supplement.

## MAGAZINE REGULATIONS.

(LAND SERVICE)

Part I, 1941.

### SECTION I.

#### DEFINITIONS.

*Miscellaneous Explosives.*—This term, where it occurs throughout the Indian Supplement, refers to the very small quantities of different explosives, of different Groups, held by certain units, e.g., H. E. and smoke grenades, demolition explosives, SAA cartridges, held by infantry battalions. The total amount of explosives of the different items will not however exceed 200 lbs. net explosive content.

Para 5.—In India the following definition will apply :—

'*Enclosed Explosives Area* is the area within the protective fence. Where there is no protective fence it will be taken as being the area within a radius of 50 yards from a building or stack containing explosives.

Para 24 (a) to (f) will not apply in India. Instead, the following instructions will be observed :—

'For the purpose of determining safety distances, the total net weight of explosives, incendiary, chemical and smoke substances will be taken into account'.

Para. 29—See para Section II.

#### *Additional Definitions :—*

*Bin type building.*—Bin type building is one with separate rooms under the same roof but without connecting doors and in which the dividing walls are constructed of brick or concrete not less than 9" thick and carried upto roof.

*Canals* refers to those used by sea going vessels or Passenger carrying craft.

*Charge/Weight ratio* is the percentage of explosives incendiary and smoke substances in a package or weapon in relation to its gross weight.



*C.W. Weapons (Chemical Warfare Weapons)* means Ammunition or weapons charged with gases or other chemical preparations and designed to produce toxic, blister or choking effect when the chargings are ejected.

These also include Chemical Warfare Preparations/Stores which are suitable for charging or are intended for charging in Chemical Warfare Weapons.

*Debris* are portions of the building or weapons projected by an explosion.

*Explosion* as used in reference to Safety Distances, implies a pressure rise as a result of combustion with Cat X or Y explosives and a pressure rise as a result of detonation with Category Z or ZZ explosives.

*Lobbed weapon* is an unexploded weapon projected from an exploding stack and which may explode on reaching the ground.

*Rivers* refers to those having tidal water and others used by Passenger carrying craft plying for hire.

*Railways* refers to all railways outside the Enclosed Explosives Area used for public passenger traffic.

*Service Headquarter* means the Army HQrs in the case of Army, the Naval HQrs in the case of Navy and Air HQrs in the case of Air Force and the Directorate General, Ordnance Factories in the case of Ordnance Factories.

## SECTION II.

## SITING OF AMMUNITION DEPOTS.

A. *General Considerations.*

A miscellaneous explosives storehouse should, if possible be sited on the cool side of the S.A.A. storehouse and may be built against or in close proximity to that storehouse.

*Para 32(d).*—The site should be sufficiently remote from airfields also. The distances from airfields will be as given in sub section 'D' below :—

*Para 33.*—Not applicable in India.

D. *Safety Distances.*

Safety Distances need not be observed in the case of buildings containing upto 100 lbs. of explosives on unit charge. Buildings must however be sited as far from other buildings as circumstances will allow and situated so that in the event of an accident the least damage from fire/explosion may occur. Special provisions for storage of explosives on unit charge are given in Appendix G to this Supplement.

*Paras 42 to 47, 48(a), 50 and 50A.*—In India, the following 'Regulations regarding Safety Distances' will apply.

(i) *Responsibility of Service Headquarters.*—A building or stack containing explosives presents risk of explosion or fire which may cause explosions or fires in adjacent buildings or stacks containing explosives, damage to property or injury to individuals. Service Headquarters are responsible that the building or stack is sited sufficiently clear of other buildings, stacks, roads, railways, airfields or places frequented by persons (both within and without the Enclosed Explosives Area) as will ensure the minimum practicable risk to life and property should an explosion occur. This clearance is designated Safety Distance.

(ii) *Kinds of Safety Distances.*—There are two kinds of Safety Distances to be considered. One of these termed Inside Safety Distance, has reference to the clearance to be observed between a building or stack containing explosives and other buildings or stacks containing explosives or any other buildings inside an Enclosed Explosives Area,

whilst the other, termed Outside Safety Distance has reference to the clearance to be observed between a building or stack containing explosives and buildings works and other places used by the general public outside an Enclosed Explosives Area.

(iii) *Factors governing Safety Distances.*—The Safety Distances necessary for a building or stack containing explosives to achieve the required degree of safety depend upon the following factors :—

- (a) The nett explosives quantity in the building or stack.
- (b) The Safety Distance category of the explosives.
- (c) The charge/weight ratio of the explosives.
- (d) Whether the building or stack is effectively traversed.

(iv) *Nett explosive quantity.*—In regard to (iii) (a), the explosive quantity is the *total nett weight* of explosive, incendiary, and smoke substances in the building or stack.

(v) *Safety Distance Categories.*—In regard to (iii) (b), Service explosives are divided into categories according to the risks which they present when initiated in storage, as follows :—

*Category X.*—Those explosives which have a fire or a slight explosion risk or both but the effect of which will be local.

*Category Y.*—Those explosives which have a mass fire risk, or a moderate explosion risk, but not the risk of mass explosion.

*Category Z.*—Those explosives which have a mass explosion risk with serious missile effect.

*Category ZZ.*—Those explosives which have a mass explosion risk and minor missile effect.

*Category V.*—Those weapons containing toxic materials, with or without explosives, which have a toxic risk, with or without a very slight explosion risk.

The Category to which each Service explosive belongs is indicated by the appropriate letter in Appendix II of this Supplement.

(vi) *Charge/weight ratio*.—In regard to (iii) (c), the risk of propagating explosion from a building or stack containing explosives to an adjacent building or stack containing explosives depends upon the charge/weight ratio of the weapons or packages, in both buildings or stacks and the kind of explosive they contain. For example, if a stack of H. E. aircraft bombs having a charge/weight ratio of 20 per cent is adjacent to a stack of H.E. aircraft bombs having a charge/weight ratio of 80 per cent, the risk of propagation from the 20 per cent stack is greater than that from the 80 per cent stack, because the latter is more vulnerable to attack than the former.

(vii) *Effective Traverse*.—In regard to (iii) (d), an effective traverse is one sited close to the building or stack, made of earth, having the crest *at least 3 feet wide* and built to the eaves or to a height *2 feet above the upper level of any explosive* within the building or stack whichever is higher. Alternatively, the inner face of the traverse may be vertical in which case the crest must be 5 feet wide. A bunker type building having this degree of earth protection may also be considered as effectively traversed.

Depending on the quantity of explosives, such a traverse may 'contain' to some extent, the effects of the explosion in the building which it protects and will protect the building from the effects of an explosion in another building. Its primary function is to protect the contained explosives from the missiles which are produced when Category Z ammunition explodes. This latter function may also be provided by erecting a brick wall 18 inches thick in place of the earth traverses around the building which should have a well not less than 9 inches thick.

A traverse will afford some protection to the contained explosives against blast or flame.

When the ceiling of a building is below the *natural* ground level it will be considered effectively traversed when the ground level is at least 2 feet above the top of the stacks within the building.

Any building or stack with less protection than the above will be considered as untraversed, but see paras (ix) and (xiii) below.

Types of effective traverses are illustrated in Appendix 'H'.

(viii) *Mixed Traversed and Untraversed Buildings or Stacks.*—When there are both traversed and untraversed buildings, or stacks, within an Enclosed Explosives Area, an untraversed building or stack containing Category Z or ZZ explosives may be assessed for Inside Safety Distance as effectively traversed, provided that every portion of it is completely screened from all other untraversed buildings or untraversed stacks containing explosives, by an intervening traversed building or traversed stack, sufficiently high and wide to preclude missiles from it reaching any other untraversed building or stack.

(ix) *Partly Traversed Buildings or Stacks.*—When an effective traverse is provided around a portion only of the building or stack, the Safety Distances specified for traversed buildings or stacks, are applicable only to the effectively traversed sector or sectors, less a safety overlap of 3 feet at each end of each traversed sector, the remaining portion being dealt with as untraversed.

(x) *Direct Propagation of Explosion.*—Explosion may be propagated direct from a building or stack to an adjacent building or stack by flame, missile or blast.

Category X or V explosives will not cause direct propagation, though a burning building or stack may start a fire in adjacent buildings or stacks.

Category Y explosives may cause direct propagation by flame only.

Category Z explosives may cause direct propagation by missile or blast or to a much lesser extent, by flame.

Category ZZ explosives may cause direct propagation by flame or blast or to a much lesser extent by missile.

(xi) *Damage outside the Area.*—Damage to buildings, vehicles or individuals outside the Enclosed Explosives Area may be caused by blast, missile, flame, or toxic vapours.

Category X explosives should not cause any damage.

Category Y explosives may cause damage by flame.

Category Z explosives may cause damage by blast, missile or flame.

Category ZZ explosives may cause damage by blast or flame.

Category V explosives may cause casualties by toxic vapour.

(xii) *Indirect propagation.*—An explosion in a building or stack containing explosives may lead *indirectly* to explosions in other buildings or stacks within the Enclosed Explosives Area or cause damage to life or property outside the area by lobbed weapons, debris or the partial collapse or movement of an adjacent building, but it is not practicable to consider such risks in laying down for safety distances.

(xiii) *Effect of hillocks.*—Where a fold of the ground between two untraversed buildings containing explosives completely screens the stacks in one building from the stacks in the other buildings, the two buildings may be considered as effectively traversed from each other for Inside Safety Distances.

This principle is not applicable to untraversed stacks unless the crest of the hillock is at least 5 feet above every line joining the top surfaces of the two stacks.

(xiv) *Inside Safety Distances :*

- (a) The Inside Safety Distance between a building or stack, containing explosives belonging to Categories Y, Z or ZZ and other buildings or stacks containing explosives within the Enclosed Explosives area is defined as the distance which will prevent the *direct* propagation of explosion from the building or stack to the explosives in the other buildings or stacks by missile, flame or blast.
- (b) The Inside Safety Distance between a building or stack containing Category Y, Z or ZZ explosives and buildings used as main offices or main engineering workshops within an Enclosed Explosives Area will be greater than those under (a) as the personnel employed therein must be protected from the risk of serious injury by the partial collapse of the building, broken glass, etc.

- (c) The Inside Safety Distance between a building or stack containing Category X explosives and other buildings or stacks within an Enclosed Explosives Area will be that considered sufficient to preclude the ignition of adjacent buildings or stacks in the event of the explosives contents of the Category X building developing a mass fire.
- (d) The Inside Safety Distance between a building or stack containing Category V explosives and other buildings or stacks containing explosives within an Enclosed Explosives Area will be at least 50 yds., irrespective of the quantity of Category V in the building or stack but the Inside Safety Distance to be observed between such a building or stack and main offices or main engineering workshops inside an Enclosed Explosives Area will be not less than 440 yards in the case of light case weapons, and 220 yards in the case of heavy case weapons.
- (e) The Inside Safety Distance between a storage building or stack containing bulk explosives or filled ammunition and buildings used for manufacturing or filling processes or between one process building and other process buildings within an Explosives or Filling Factory Enclosed Explosives Area, must be sufficient to provide a reasonable degree of immunity for operators within the process buildings.
- (xv) *Outside Safety Distances :*
- (a) The outside Safety Distance between a building or stack containing explosives belonging to Categories Y, Z or ZZ, and structures outside the Enclosed Explosives Area is defined as the distance where the ignition or explosion of the *complete contents* of the building or stack will not cause severe structural damage by flame or blast to the standard type of civilian dwelling house. The distance *does not exclude* the risk of broken glass, displaced slates or falling ceilings to such a building. This distance is also applicable to Churches and other buildings or places, where people may assemble.

- (b) The Outside Safety Distance between a building or stack containing explosives belonging to Categories Y, Z or ZZ, and railways, main roads, canals or rivers, outside the Enclosed Explosives Area, will be one half of the distance specified in sub para (xv) (a) above on the principle that traffic passing on these routes is not continuously exposed.
- (c) The Outside Safety Distance between a building or stack containing Category X explosives and structures, railways, main roads, canals or rivers, outside the Enclosed Explosives Area will be that deemed sufficient to preclude a fire involving the complete contents of the building or stack, causing a fire in the structures or vehicles.
- (d) The Outside Safety Distance between a building or stack containing Category V explosives and structures, places where people congregate, railways, main roads, canals or rivers outside the Enclosed Explosives Area will depend upon the type of weapon and its toxic filling and will be sufficient to ensure that no serious toxic effects are experienced by persons in such places.
- (e) The Outside Safety Distances between a building or stack containing explosives belonging to Categories X, V, Y, Z or ZZ and airfields will be that deemed sufficient to offer protection to aircraft and their personnel when the aircraft are grounded or in landing or taking off stages, against flame, missiles or blast effects. The Safety Distances required are greater than those required at (a) above and the special aspects of the question are dealt with in detail in para (xxii) below.

(xvi) *Safety Distance Tables.*—Tables of Safety Distances to achieve the standards of safety set out in the preceding paragraphs, based on an extensive series of trials and a careful analysis of all available data on explosives and storage conditions in this and other countries have been prepared and are shown in Appendices III to VI and IX of this Supplement. See also para (xxvi) The distances for Category V are taken from the 'Regulations for the Storage and Transport of Chemical Weapons'.



No increase in the explosives limits permissible by these Tables for a building or stack containing explosives is permitted without the approval of Service Headquarters.

(xvii) *Applicability of Tables.*—The Safety Distance Tables at Appendices III to VI and IX of this Supplement are applicable only to stacks above ground and to buildings which have the ceiling either above the natural ground level or not more than 2 feet below ground level.

The Tables do not apply to buildings which have ceilings more than 2 feet below the natural ground-level or to underground storage sites, see para (xviii) below.

(xviii) *Underground Sites.*—Safety distance table cannot be provided for underground explosives storage sites or for buildings which have the ceiling more than 2 feet below the natural ground-level as the conditions in this respect differ so greatly.

In such instances, reference must be made to Service Headquarters for a ruling on the Safety Distances to be observed.

(xix) *Use of Tables.*—In applying the Tables to a specific building or stack, the following procedure will be adopted :—

Ascertain the exact distance, see para (xx) below, from the building or stack to the nearest building or stack containing explosives and also to the nearest main office, main engineering workshop or process building, within the Enclosed Explosives Area, also the distance to the following, outside the Enclosed Explosive Area,

- (a) private dwelling or house of assembly,
- (b) main road, railway, canal or river,
- (c) air field.

From the Tables at Appendices III, IV, V, VI and IX to this Supplement obtain the nett explosives quantities of the particular Category to be permitted for storage at those separate distances. See also para (xxiv) and (xxviii) below.

The approved nett explosives limit for the building or stack will be *the least* of these quantities.

(xx) *Measuring Distances.*—Safety Distances will be measured from the nearest point of the building or stack containing explosives to the nearest point of the other building, stack, any other public utility such as road, railway, canal, river or perimeter of an airfield, traverses etc., being ignored.

(xxi) *Factory Safety Distances.*—Safety Distances for process buildings in an Explosive or Filling Factory may be based on unit quantities and not on the gross quantity allotted to a line of units provided the units are so spaced, loaded and protected as will ensure that there is no risk of propagation from one unit to another. Where the risk of propagation does exist, the total explosive quantity involved in this risk must be taken in assessing Safety Distances.

(xxii) *Safety Distances to Airfields :*

(a) *Explosive Storages.*—These will normally be sited at as great a distance as possible from airfields so as to preclude the possibility of damage to aircraft which may be grounded or in the process of taking off or landing, from an accidental explosion in the explosive storage or the risk to the explosive storage arising from the crash of an aircraft on or near an explosive storage.

(b) *Service Airfields.*—An explosive storage may either be associated with a Service Airfield to meet its operational requirements or it may not be connected with such airfield as in case of an ammunition depot or dump for general storage of explosives/ammunition. From practical points of view, the provisions of Safety Distances to Service Airfields from the two types of explosive storages referred to above are considered separately :—

(i) *Explosive Storage Sites associated with Service Airfields.*—In the case of these explosives storages it may not be possible from practical points of view and tactical requirements to site them at a distance sufficiently remote to afford protection to aircraft from the effect of an explosion involving such an explosive storage. The risk has, therefore, to be accepted. The other risk, that is, an aircraft crashing on the explosive storage, is minimised by keeping the explosives stored outside the approach lanes and borders

to landing strips of airfields in accordance with Explosives Regulations for the Air Force, AP 2608A. Appx IV(B) Section 31 reproduced below :—

“The approach lanes to landing strips must be kept clear. This is defined as a funnel-shaped area, projected at 15 deg, horizontally outside from the 200 yards strips and vertically at an angle of 1 : 50 from the ends of the runway. In addition to the above, the triangular areas obtained by projecting the 400 yards strip to meet the 15 deg. funnel, must also be kept clear. Both sides of runways are to be kept clear of all obstructions for a width of 200 yards.”

In order however to offer the maximum safety under the circumstances the explosive storages will be adequately spaced and traversed to prevent a mass explosion by propagation from stack to stack.

- (ii) *Explosive Storage sites not associated with Service Airfields*—Explosive storage sites not connected with Service airfields will observe the same distance from these airfields as they would for Civil airfields—see sub-para (c) below.

(c) *Civil Airfields*.—The radius of circling of an aircraft over an airfield may be of the order of 8 miles and the height above ground may be as low as 3,000 feet. In order to afford safety to aircraft flying at the above height from blast pressure, it is necessary that not more than 30,000 lbs. Cat Z & ZZ explosives should be stored at any one place. Explosives of X & Y categories could, however, be stored in quantities normally authorised for a single unit holding that is up to 300,000 lbs.

Such limitation on the quantity of Cat. Z & ZZ explosives for a single unit holding may, however be rather impracticable and also uneconomical. It is, therefore, necessary that as far as possible no explosive storage should be sited within an 8 mile radius of important airfields, Services or Civil, and where the observance of such clearance is not possible, the explosive limit for a unit holding should be restricted to 30,000 lbs. only of Cat. Z or ZZ explosives and the special safety distances stipulated in Appendix IX

should be followed. In case, however, of other airfields where the air traffic is not expected to be very heavy, the single unit category Z or ZZ holding may be upto the normal accepted limit of 300,000 lbs., but the Safety Distances must be in accordance with the Table given in Appendix IX.

(d) In all cases the explosive storages will be sited outside the funnel zone of the airfield as prescribed under (b) (i) above.

(xxiii) *Mixed Categories.*—When a building or stack contains explosives from more than one Safety Distance Category the following rules will be observed in calculating safety distances—

- (a) Where there are Category X explosives in addition to those of other categories the Category X quantity will be ignored, subject to the adoption of an overriding minimum safety distance based on the Category X quantity alone.
- (b) Where there are Categories Y and Z together, safety distances will be computed as follows :—

*Inside Safety Distances.*—Ascertain the Inside Safety Distances required for the Category Y nett explosives quantity and the Category Z nett explosives quantity, separately. The greater of these two is the Inside Safety Distance to be observed.

*Outside Safety Distances.*—Proceed in the same manner as specified for Inside Safety Distances.

- (c) Where there are Categories Y and ZZ together, safety distances will be computed as follows :—

*Inside Safety Distances.*—Ascertain the Inside Safety Distances required for the Category Y nett explosives quantity and the Category ZZ nett explosives quantity, separately. The greater of these two is the Inside Safety Distance to be observed.

*Outside Safety Distances.*—Proceed in the same manner as specified for Inside Safety Distances.

(d) Where there are Categories Z and ZZ together Safety Distances will be computed as follows :—

*Inside Safety Distances.*—Ascertain the Inside Safety Distances required for the *total nett* explosives quantity in the building or stack taken as Category Z and then as Category ZZ. The greater of these two is the Inside Safety Distance to be observed.

*Outside Safety Distances.*—Ascertain the Outside Safety Distances for the *total nett* explosives quantity in the building or stack taken as either Category Z or Category ZZ.

(xxiv) *High Capacity Category Z.*—When a *traversed* building or stack containing Category Z explosives having a charge/weight ratio of 60 per cent. or over is sited next to a building or stack containing Category Y or ZZ explosives from Groups 1, 2, 3 or 4, it will be considered as a Category ZZ building or stack for assessment of Inside Safety Distances. In such instances, the distance shown in Column 6 Appendix V will be observed. An untraversed building or stack containing such explosives will continue to be assessed as Category Z and para. (xxvi) will apply.

(xxv) *Bin Type Buildings.*—When a bin-type building contains ammunition of Category X the explosive quantity to be considered for safety distance purposes is the largest net explosives quantity contained in one bin, except that where propagation of explosion from bin to bin is possible, safety distances for the building must be calculated on the total net explosives quantity in the building.

When a bin type building contains explosives of Categories Y, Z or ZZ the *total nett* explosives content of the building will be taken in calculating Safety Distances.

(xxvi) *Untraversed Category Z.*—When Category Z explosives are stacked in untraversed stacks above ground it is not possible to prescribe a table of Inside Safety Distances to give freedom from propagation. Missiles from an explosion retain their velocity for a considerable distance. The same position applies to untraversed buildings with windows. Buildings without windows offer more resistance to propagation but their value cannot be precisely expressed. If the building is, however, constructed of brick walls 27 inches thick with no openings on the side which may be attacked by missiles arising from a

neighbouring building Category Z ammunition, it is probable that the explosives contained therein will be immune from attack but see sub para (vii) at page 5 for the preferable method of construction.

When explosives from Category Z of Group 5 or of Group 6 only are held under the above conditions the Table of Inside Safety Distances at Appendix VI may be used.

(xxvii) *Untraversed Category ZZ.*—Buildings or stacks containing Category ZZ explosives should be effectively traversed. When, in exceptional circumstances, an effectively traversed building or dump is not available for explosives of this Category the Inside Safety Distances shown in Column 7, Appendix V, may be accepted giving a reasonable degree of protection to adjacent units.

(xxviii) *Buildings adjoining Category Y or ZZ.*—As propagation from a building or stack containing category Y or ZZ explosives is principally by flame, the type of building containing explosives in the neighbourhood of a Category Y or ZZ building or stack has an important effect on the risk of propagation. Where adjacent buildings are of the earth covered bunker type, the actual distance between the two buildings may be *doubled* when determining the nett explosives quantity to be placed in the *Category Y or ZZ building*.

(xxix) *Explosives Limit Boards.*—Each building scheduled for the storage or handling of explosives will be furnished with an Explosives Limit Board in a conspicuous position near the entrance on which will be shown the nett explosives quantity, in lbs., under each Category, permitted within the building.

## SECTION III.

## CONSTRUCTION OF MAGAZINES, LABORATORIES AND EXPLOSIVES STOREHOUSES.

*Para. 51 (c).*—In order to avoid flooding, the floor of these buildings should be suitably above ground level.

*Para. 51 (d).*—The buildings should also be designed to be as cool as possible, provided the temperature does not fall below 45°F. To effect this, buildings should be provided with overhanging eaves and verandahs on three sides to prevent the direct rays of the sun beating on the walls.

*Para. 52.*—The Board before forwarding the plans of new buildings should ensure that no deviation requiring the sanction of the M.G.O. GOC-in-C is entailed and that all details, e.g., nature and quantities of ammunition to be stored in the building, site plan showing distances from and contents of neighbouring buildings, are complete.

*Para. 53 (a).*—It may be necessary to increase the height of the buildings in order to reduce the internal temperatures attained.

*Para. 53 (d).*—Above-ground buildings containing explosives must be provided with splinter proof roofs and the roof design should be such as to be capable of withstanding the entry of a 4 lb. incendiary bomb and should be capable of venting in case of an explosion inside the magazine.

*Para. 53 (f).*—It is important that direct sunlight, should not be allowed to enter these buildings. Laboratory windows must be provided with blinds.

*Para. 53 (g).*—Drains, windows and ventilators should be proof against entry of birds and animals.

*Para. 56.*—As glazed bricks are expensive in India, the interior surfaces should be cement plastered and painted with three coats of good white zinc paint applied after the plaster has matured.

*Para. 57.*—Floors of buildings for all groups should be of well rendered cement concrete and treated with sodium silicate. A weathering period of one month should elapse and then the floors should be washed down before

the buildings are taken into use. The floors may be covered with well fitting linoleum or other approved materials, care being taken to prevent explosive dust accumulating under such coverings. In particular, for Groups 1 and 2, it is essential that on any day when work involving the handling of bulk explosives has been carried out, such coverings should be taken up and the floors washed.

Where cement concrete is not available, fully dressed stone may be used for floor construction, care being taken that joints are well grouted with cement and smoothly finished.

Para. 60.—Paint PFU (Ammunition) may be used for magazines and explosives storehouses. Fitments fabricated of commercial materials not containing lead as an ingredient may be used in magazines/explosive storehouses.

Para. 61.—In most parts of India condensation is little to be feared and iron may be protected by three coats of good white zinc paint.

Para. 62 (a).—Galvanised iron padlocks may be used for all outside doors.

Para. 62 (b).—Only hard wood will be used for the fittings of buildings and the necessity for protecting this in the manner described will be waived.

Paras. 63 to 82 and 86 to 88.—In India, the following "REGULATIONS FOR THE LIGHTING, HEATING AND POWER SUPPLY IN BUILDINGS CONTAINING EXPLOSIVES", will apply—

(i) Scope.—These Regulations relate to electrical installations in buildings containing explosives and are applicable to the following:—

- (a) All storage buildings whether or not within an enclosed explosives area, containing explosives or intended for the storage of explosives.
- (b) Service Laboratories and attached repair shops under the control of Inspecting Officers.
- (c) Explosives and Filling Factories of the Ministry of Defence, so far as buildings containing explosives are concerned.
- (d) Underground explosives storage sites.



They do not apply to Administrative buildings, residence, or other personnel accommodation, or to workshops, etc., within an enclosed explosives area not containing explosives. The electrical installations in such buildings must, however, comply with Departmental Specifications.

(ii) These Regulations are in supersession of all existing Regulations on the subject but are intended only to refer to new installations and to repair and replacements when necessary and must not be construed as authority to bring existing installations upto the scale laid down, unless conditions give rise to serious apprehension of danger, when the matter should be reported to Service Headquarters.

(iii) *General.*—Permanent electrical installations are an approved and integral feature in the construction of buildings designed for the manufacture, assembly or storage of explosives and ammunition, and are used to provide lighting, heating and power. Such installations, if defective in design, erection, or operation, are liable to introduce serious risks, and therefore special consideration must be given to their design, construction, erection and maintenance. The installation must provide, for example, that when a fault occurs, any sparking or overheating which may develop will be confined within the conduit or other approved metallic wiring system, until the fault is automatically disconnected.

(iv) There may be restrictions on the use of certain materials in the construction and equipment of buildings designed for the storage, manufacture or processing of particular substances. In general the restrictions apply to the use of lead or copper and may not be stipulated in the specification for the particular substance. Enquiries should be made of Service Headquarters before proceeding with the installation or alteration of electrical equipment in such buildings.

(v) *Compliance with Regulations.*—These Regulations are intended to bring out the special points requiring attention in electrical installations provided for buildings containing explosives. They are to be read in conjunction with the relevant Departmental Specifications and the current editions of the following publications dealing with electrical installations generally—

- (a) "Regulations for the Electrical Equipment of Buildings" issued by the Institution of Electrical Engineers.

(b) "Indian Factories Act".

(c) "Indian Electricity Act and Rules".

(vi) *Types of Installations.*—Buildings containing explosives are divided into two types in regard to electrical installations, viz :—

(a) Those requiring a flame-proof installation.

(b) Those requiring a dust-tight installation.

Type (a) installations must be fitted in all buildings containing explosives in Group 15, and Type (b) installations in all buildings containing explosives in Groups 1 to 13. (Group 14 is not a Land Storage Group).

(vii) *Specifications.*—Flame-proof equipment must conform to Group II flame-proof standards as shown in B.S. Specification 229.

Dust-tight equipment must conform to the Specification given in Appendix F to this Supplement.

*Note.*—Flame-proof installations must also conform to the relevant B.S. Code of Practice.

(viii) *Siting of Electrical Installations.*—This comprises the several links in the electrical installation from the generating station serving the area, through sub-station, switch houses, feeder pillars, etc., and the principle to be observed is that such buildings and equipment should be sited and designed so as not to offer any risk of damage to any buildings containing explosives.

(ix) The generating stations and sub-stations themselves should be located at a minimum distance of 50 yds. If it is considered necessary to protect these stations from an explosion occurring within a building containing explosives, they must be located beyond Inside Safety Distances for process buildings in accordance with the Regulations of the Service concerned.

(x) Low and Medium voltage switch houses and feeder pillars must be placed at a minimum distance of 30 feet from a building containing explosives.

(xi) *Overhead lines serving telephones, fire alarm points, or call boxes,* must not be carried nearer than 50 feet to a building containing explosives, the remaining distance being completed by underground cable.

(xii) Fire alarm points and emergency call boxes should not be sited where they are likely to be put out of action by an explosion.

(xiii) Street lighting standard, high voltage overhead lines and poles carrying power, lighting, public address or telephone lines must not be sited where they, or the wires they support, can fall on a building containing explosives, in the event of their collapse.

(xiv) *Electricity Supply*.—The electricity supplied for light, heating or power, in buildings containing explosives may be either direct or alternating, but the voltage to earth must not exceed 250 volts. On this basis a 500 volts, 3-wire D.C. system, or a 440 volts 3-phase 50 cycle, 4-wire alternating system, may be employed, provided the mid wire or neutral conductor is connected to earth in accordance with the "Indian Electricity Act and Rules".

(xv) *Distribution*.—Supply systems may be carried through the enclosed explosives area by overhead wires or by underground wires or by underground cable. The underground system is the safer and should be adopted wherever possible. Underground cables, should not, for maintenance reasons, be led below the buildings, but no other restriction is imposed on their location; they are to be terminated outside the buildings. The underground cable shall be paper insulated lead sheathed double armoured. (The installation of cables must comply with Departmental Specifications and I.E.E. Rules)

(xvi) When the supply system is above ground, the fixing of poles or other form of support to a building containing explosives is prohibited, owing to the lightning hazard thus introduced. For the same reason all overhead supply systems must run throughout their length and be terminated at not less than 50 feet from the building containing explosives, which they serve, and the remaining distance completed by underground cable—See para. (xi) above.

Suitable non-electrolyte lightning arresters are to be provided at points where overhead lines are connected to underground Service Cables.

(xvii) *Control of Current*.—The supply of electricity to a building containing explosives must be controlled by a master switch *outside* the building. The switch must be capable of isolating every conductor entering the building and should be housed in a keyed box with glass front.

In above-ground explosives storage sites, all main switches, distribution boards and sub-switches, must be located outside the building, but need not be dust-tight, but if exposed to weather, should be of weather-proof type.

In underground storage sites, where this arrangement is found to be impracticable, the control gear, sub-switches and fuze protection may be located in a substantial fire-proof structure, where they are not likely to be damaged by an explosion, or otherwise.

(xviii) In underground storage sites, lighting points may be controlled by local sub-switches in the storage area, provided they are of the double pole type, and of dust-tight or flame-proof construction, as applicable. (See paragraph (vi)).

Duplicate indicator lamps, red, must be fitted near the master switch for the purpose of indicating when this switch is "ON".

(xix) Where a number of circuits are provided in any building each circuit must be controlled by switch designed to ensure the complete disconnection of each conductor from the supply.

All circuits must be protected against over-load and faults in accordance with the Regulations referred to in paragraph (v).

(xx) Before opening up any lighting fittings or any part of the conduit system, the main controlling switch must be opened and effective steps taken to prevent the circuit being made live before the work is completed and the installation sealed up again.

(xxi) *Fire Precautions.*—When an electrical station or sub-station within an enclosed explosives area has oil for fuel or for electric devices in sufficient quantity to constitute a serious fire risk, oil drains must be provided to lead oil leakage into a shingle filled sump of adequate size to contain *all* leakage. In addition, a fire break of at least 6 feet must be maintained around the sump.

(xxii) When the oil in the equipment of medium voltage switch house or a feeder pillar is in sufficient quantity to constitute a serious fire risk, drains and sump of the type specified in paragraph (xxi) must be provided and fire break maintained.

(xxiii) *Wiring System*.—The electrical installation within a building containing explosives must be enclosed entirely in heavy gauge solid drawn steel screwed conduit to B.S. Specification 31. All conduits must be screwed tightly into all fittings.

The use of inspection fittings, solid tees, bends or elbows, in lieu of conduit boxes, is prohibited. Conduit fittings must be fixed securely whilst the conduits must be run on the surface and be visible and high enough to eliminate the risk of accidental damage.

V.I.R. taped and braided or T.R.S. cable, 660 volt grade, must be used with conduit systems.

As an alternative to the Conduit System lead covered steel wire armoured cables or mineral insulated metal sheathed cables of a type approved by Service Headquarters may be used, provided that additional mechanical protection is afforded where necessary.

(xxiv) The lamps may be of the filament or fluorescent types subject to the condition that lamps of the filament type or protected by fittings to the requirements of the dust-tight (flame proof for Group 15 explosives) specification and those of fluorescent type by approved flame-proof fittings. All fittings must be of sufficient size so that, when the lamp is burning continuously the temperature of any external part does not exceed 140°F. If the outer globe or dome is liable to mechanical damage, it must be suitably protected. Only lamps of the approved wattage as shown on the Design Drawings of the installation, are to be used. The use of lamps of higher wattage is prohibited. To prevent the use of unauthorised lamps and unauthorised interference with conduit fittings, the keys of the fittings should be kept in the office of the engineer responsible for maintenance and issued only to persons authorised by him to work on the installation.

(xxv) In places where heavy condensation occurs or the fixing of conduits is impracticable, lead covered twin cored steel wire armoured cables or mineral insulated metal sheathed cables must be used for the wiring system in lieu of conduits, subject to compliance with the conditions of paragraph (iv) above.

(xxvi) Portable mains-operated equipment with flexible leads is not permitted in buildings containing explosives, and plug sockets must not be provided for such fittings.

(xxvii) In underground storage sites it is desirable to provide an alternative system of electric lighting for use if the main system is damaged by roof walls or other like occurrences.

(xxviii) *Portable Lighting*.—Portable floodlights of an approved battery operated type may be employed in buildings containing explosives belonging to Groups 3 to 13 inclusive, but not in buildings containing explosives belonging to Groups 1 or 2.

(xxix) Till facilities are available in the country for testing of flame-proof equipment, electric hand lamps certified by (a) Ministry of Fuel & Power London for those of U.K. manufacture and (b) U.S. Bureau of Mines for those of American manufacture for Groups I & II gases or vapours in B.S. Specification 229, may be used for lighting in buildings containing explosives of Groups 1 to 13 inclusive. Only lamps so certified for Group II gases or vapours, B.S. Specification 229, may be used in buildings containing Group 15 explosives.

(xxx) Electric torches, fitted with dry batteries only, may be used for inspection purposes in magazines, laboratories and explosives storehouses, containing explosives from Groups 1 to 13 inclusive, but in magazines and laboratories, only torches having non-ferrous cases are to be used. Dry battery operated torches for use in buildings containing Group 15 explosives should be certified for Group II gases (B.S.S. 229), as intrinsically safe for petrol vapour.

(xxxi) *Telephones, Bells and Loudspeakers*.—Telephones, or bells, must not be installed in buildings containing explosives, except with the specific approval of Service Headquarters. When approved, they will normally be sited in the lobby, with as short a run of conduit as possible within the building.

(xxxii) When telephones, or bells, are approved for installation in an underground explosives storage site, or within an above-ground building containing explosives, they must be of a flame-proof type where Group 15 explosives are present or of a dust-tight type, when the explosives belong to Groups 1 to 13 inclusive.

(xxxiii) Where Service Headquarters approves the installation of a loudspeaker within an above-ground building containing explosives belonging to Groups 1 to

13 inclusive, the speech transformer and its connection (if any) must be enclosed in a dust-tight enclosure provided with conduit outlet; where no speech transformer is incorporated, the speech coil circuit and all wiring within the building must be of low impedance and dust-tight. *Loudspeakers must not be installed in buildings containing Group 15 explosives.*

(xxxiv) All wiring for telephones, bells or loudspeakers within buildings containing explosives or in underground explosives storage sites, must be totally enclosed in conduit as for the power and lighting circuits. Fuzes etc., provided for the protection of telephones or bells must be weather-proof and fixed outside the building. For loudspeaker circuits provision must be made outside the building for isolating all wiring passing into the building.

(xxxv) *Heating.*—Electric heating of buildings containing explosives may be approved by Service Headquarters. In such instances low temperature flame-proof heaters must be used in buildings containing Group 15 explosives. In buildings containing explosives belonging to Groups 1 to 13 inclusive, dust-tight low temperature heaters must be used, the heaters being protected by a suitable guard which, however, must not interfere with the natural ventilation of the heater.

(xxxvi) Low temperature electric heaters must not have a surface temperature in excess of 140°F. Where thermostat control is employed an approved type of thermostat in which the electrical contacts are located on the outside of the building, must be used.

(xxxvii) In buildings containing explosives where the use of low temperature electric heaters is considered uneconomic or impracticable, the details must be submitted to Service Headquarters for a ruling on the type of heaters to be installed.

(xxxviii) *Earthing and Lighting Protection.*—All metallic enclosures for electric cables of any description must be efficiently bonded throughout and earthed at the point of entry into the building, the actual earth connection being made outside the building. Such metallic enclosures must also be bonded to the system of lighting protection provided on the building and to the lead sheath of the supply cable.

Earthing of direct current system shall conform to the following requirements :—

- (a) Three-wire systems in which the voltage exceeds 250 volts shall have a point of the system connected with earth.
- (b) The connection shall be made at the generating station or sub-station, and the insulation of the system shall be maintained at all other parts.
- (c) The connection shall be maintained except when it is interrupted by means of a switch or link for the purpose of testing or locating a fault.
- (d) A fuse or circuit-breaker may be inserted in the earth connection in parallel with a resistance of suitable value to reduce to safe limits any current flowing to earth.
- (e) An ammeter shall be permanently inserted in the earth connection, and the current to earth shall be recorded daily.

Earthing of alternating current systems shall conform to the following requirements :—

- (a) Any medium or low-voltage alternating current system in which the voltage exceeds 125 volts shall have a point of the system connected with earth. This means each distinct system from which a supply is given.
- (b) The connection shall be made at a generating station, sub-station, or a transformer, and the insulation of the system shall be maintained at all other parts.
- (c) The connection shall be maintained except when it is interrupted by means of a switch or link for the purpose of testing or locating a fault.
- (d) No resistance, impedance, fuse or circuit-breaker shall be inserted in the earth connection.
- (e) The current passing to earth shall be ascertained and recorded quarterly.

The mid-point of one phase of a delta connected system may be connected to earth when the working conditions are suitable. Delta or star connected systems in which the voltage does not exceed 125 volts need not be earthed.



(xxxix) Lightning protection of buildings containing explosives and all other buildings, poles, etc., within the enclosed explosives area must be based on the current British Standards Institution Code of Practice 326-101 (1948) together with any other requirements of Departmental Regulations.

(xl) *Power appliances.*—When electrically operated hoists, pumps, fans, doors, small portable tools and other equipment of a like nature are installed in buildings containing explosives, the power unit and the attendant switch gear should normally be located in a separate room of non-inflammable construction, entirely partitioned off, externally ventilated, and having no direct access to the compartment containing explosives, the power being transmitted into the building through line shafting or an extended motor shaft *via* a dust-tight gland. The power unit and the attendant switch gear must be of the totally enclosed type for the purpose of preventing the entrance of dust into the electrical system. A dust-tight (flame-proof for buildings containing Group 15 explosives) push-button stop switch should be provided within the building to permit of the stoppage of the motor in an emergency. If more convenient, the stop switch may be installed outside the building, provided it is equipped with a mechanical linking to enable it to be operated from inside the building. In exceptional cases *but only with the approval of Service Headquarters* the power unit and switch gear may be installed within a building containing explosives. These must be of the dust-tight type where explosives of Groups 1 to 13 are concerned or flame-proof for explosives from Group 15.

(xli) *Inspection.*—All electrical installations in buildings containing explosives and in all other buildings or erections within the enclosed explosives area, must be inspected and tested for insulation resistance electrical continuity and good earth connection of metallic enclosure not less frequently than once every 6 months, the results of such tests being recorded so that comparisons from test to test may be made. When testing sets of the "Megger" Type are used for this purpose, the test cables must be firmly secured to the instrument *and* to the circuit undergoing test *before* the circuit is energized by turning the handle of the instrument. Furthermore, the instrument must be left connected to the circuit under

test for at least 30 seconds after the test is completed before proceeding to disconnect it from the circuit.

Note.—The test for earthing will be carried out in accordance with the current edition of I. E. E. Regulations.

(xlii) *Static Electricity*.—Adequate precautions must be taken to prevent the accumulation of static electrical charges, including the thorough bonding and earthing of all conducting materials. Shafting, compressed air plants, runways etc. used in the building in addition to those forming the enclosures of the electrical system, (see paragraph xxiii above) and the lightning protection system of the building or other structure, (see paragraph xxxix above). Where belts are installed they are to be of a material of sufficient conductivity to drain away static charges.

All metallic machinery is to be bonded and connected to earth to provide sufficient conductivity to drain away static charges.

(xliii) *Records*.—Plans must be kept, showing the positions of all underground cables and the location of all joints in cables, cable pits, etc. The underground cables should have flag marking on the ground showing depth of the cable.

(xliv) *Ammunition testing appliances*.—No electrically operated tool or appliance designed for testing electrically operated types of filled ammunition will be adopted or brought into use until approved by the Engineer-in-Chief.

Paras 84 and 85.—In India, the following provisions will apply.

All magazines, laboratories and explosives storehouses having an explosive quantity of 200 Lbs. or over will be provided with lightning protection which should be in accordance with para (xxxix) of 'REGULATIONS FOR THE LIGHTING, HEATING AND POWER SUPPLY IN BUILDINGS CONTAINING EXPLOSIVES.' These will be tested at least twice a year with an interval of 6 months.

## SECTION IV.

CARE AND MAINTENANCE OF MAGAZINES, LABORATORIES AND  
EXPLOSIVES STOREHOUSES.

*Para 90.*—Inspection of buildings and plant is dealt with in M. E. S. Regulations (1936), para 358 (viii) and in M. E. S. Standing Orders, para 371.

## SECTION V.

## PROTECTION OF AMMUNITION DEPOTS, MAGAZINE AREAS AND ISOLATED MAGAZINES OR EXPLOSIVES STOREHOUSES.

Para 98.—In India, flying of aircraft over Explosives and Filling Factories is prohibited. Flying of aircraft over other Explosives Areas such as Ammunition Depots etc. will also be avoided as far as possible but in any case low flying (within 1200 ft. of the ground) will be prohibited. Necessary arrangements to give effect to these instructions should be made with the Air Authorities concerned through the usual channels.

Paras 99 to 110.—Regulations for Army Fire Service do not apply in India. Local Fire Orders will, therefore, be drawn up under the provisions of Regulations for the Army in India (Instructions) so far as applicable, and in accordance with paras 99 and 110 of Magazine Regulations, Part I, 1941 and any other instructions issued by Army HQ. from time to time. A copy of these Fire-Orders will be hung up at the entrance to each Magazine, Laboratory, Explosives Storehouse and S. A. A. Storehouse. I. O. Os will inspect the local fire orders at their annual inspection and advise Officers Commanding regarding their adequacy.

Instructions on Fighting Ammunition Fires issued by Army HQ are contained in Appendix 'J' of this Supplement.

Para 100(d).—In India Ammunition/Explosives which are in a dangerous condition presenting a risk of spontaneous ignition/explosion/detonation and those which are otherwise dangerous for retention will be removed to an isolated place where their spontaneous ignition/explosion/detonation would be harmless. They will be rectified or disposed of at the first available opportunity. Unserviceable ammunition/explosives, other than those mentioned above may be stored with serviceable ammunition if separate storage accommodation is not available but will be kept separated from the serviceable ammunition.

Para 100(e).—In India, the requirement of an extra ash pan may be waived provided the existing ash pan is correctly fitted to prevent the dropping of hot cinders on the track. See also Appendix 'L'.

## SECTION VI.

## LIGHTING AND VENTILATION.

*Para 114.*—In India all types of lights, lamps, torches, batteries etc. will be approved by the E-in-C.

*Paras 123-128, 133, 134 and 136-138.*—The procedure of ventilation will be in accordance with the following details :—

Storehouses or magazines are classified into four categories as below :—

- (a) Depot storehouses containing cordite or other smokeless powders, other than in S.A.A., dynamite, gelignite or other plastic explosives.
- (b) Depot storehouses not containing cordite or other smokeless powders, other than in S.A.A.
- (c) Unit storehouses containing cordite or other smokeless powders, other than in S.A.A. dynamite, gelignite or other plastic explosives.
- (d) Unit storehouses not containing cordite or other smokeless powders, other than in S.A.A.

2 Thermometers will be supplied as follows:—

(i) One maximum and minimum thermometer per category (a) storehouse.

(ii) One common thermometer per category (b) storehouse.

(iii) One maximum and minimum thermometer per category (c) storehouse.

3 In addition, Depots will be supplied with one or if necessary, more wet and dry bulb thermometers; units, fort armaments, posts, etc., having storehouses in category (c) will be supplied with one extra common thermometer for estimation of the outside shade temperature prevailing.

*General Procedure in Depots.*

4 The wet and dry bulb thermometer will be exposed in a Stevenson Screen to specification I.T. No. 78 (a). The screen will be erected in an open space well away from

neighbouring buildings in order to ensure a free air circulation. The door of the screen should be on the north side in order to prevent direct sunlight falling on the instrument when a reading is being taken. The common or maximum and minimum thermometer will be hung inside the storehouse at a convenient height on the north wall.

(ii) When the outside dry bulb temperature is between 45° and 80°F. ventilation may be carried out whenever the inside temperature is higher than the outside wet bulb temperature.

When the outside dry bulb temperature is above 80°F ventilation may be carried out in the early morning preferably, whenever the inside temperature is higher than the outside dry bulb temperature.

(iii) Maximum and minimum temperature records of all storehouses in category (a) will be completed daily on I.A.F.O.1433 and the completed form showing average temperature records will be sent each month to the Superintendent of Development (Military Explosives) Kirkee, for record.

(iv) Where the taking of temperature reading on Sundays and during holidays cannot be arranged conveniently reference will be made to Army Headquarters through the Brig Ordnance for further instructions.

#### *General procedure in units.*

5 (i) The maximum and minimum thermometer will be hung inside the storehouse at a convenient height on the north wall. The common thermometer, for estimation of outside shade temperature, should be hung under the shade of a verandah wall clear of any walls. There should be a free air circulation and no possibility of direct sunlight falling on it.

(ii) Ventilation of storehouses in category (c) will be carried out daily, preferably in the early morning, when the inside temperature is higher than the outside shade temperature.

(iii) Ventilation of storehouses in category (d) will be carried out daily in the morning between the hours of 6 A.M. to 8 A.M. Except during this period all ventilators, and doors as far as possible, will be kept closed.

6 Ventilation must not be carried out, even under favourable temperature conditions, when it is raining or high wind is blowing which is likely to lead to the entry and deposition of dust and as far as possible storehouses should not be opened for any purpose at this time.

7 The duration of the period for ventilation should not normally be less than half an hour.

SECTION VII.

ADMINISTRATIVE INSTRUCTIONS.

Para 143 (c).—In India the following will apply:—  
“Is at least of 18 years age”.



## SECTION VIII.

## SAFETY REGULATIONS.

*Para 154. A.F.G. 940-B* 'Instructions for carrying out laboratory operations in Ordnance charge' will be maintained also in all laboratories or buildings used as such.

*Para 163.*—The Officer-in-Charge of a magazine, explosives storehouse or laboratory, will be responsible that adequate arrangements are made for searching individuals entering such buildings.

*Para 164.*—The use in India of Magazine Clothing is confined to Ordnance Establishments and it will not be used by units except when its use is ordered by the Inspecting Ordnance Officer for the carrying out of special laboratory operations.

The following additional instructions are applicable to soldiers and workmen (accustomed to working barefooted) employed in magazines or laboratories:—

Before entering the magazine or laboratories:—

- (i) Remove outer clothing and headgear outside the barrier and hang up. The minimum of clothing only should be retained if magazine clothing is to be worn.
- (ii) Remove shoes and wash feet in the tub of water provided for the purpose. Dry and place each foot over the barrier without touching the ground outside the barrier.
- (iii) Put on magazine clothing if necessary (see para 164).

When due to climatic conditions or reasons of religion, adherence to the above instructions would entail undue hardship they may be modified at the discretion of the Officer-in-Charge of the magazine or laboratory.

The above instructions will be embodied in A.F.G. 949 (modified for India).

*Para 164 (c).*—JCOs and other Ranks of the A.O.C. (Ammunition Examiners and Storemen) may also retain their footwear and step over the barrier into special overboots or goloshes.

Para 165.—Other Ranks and workmen may work barefooted (see para 164 above).

Para 166.—Shallow tubs of water should be provided and kept outside but close to the barrier, for Other Ranks and workmen to wash their feet.

Para 167.—See para 164 above.

Inspecting Ordnance Officers/Ammunition Examiners when supervising or instructing in laboratory operations may wear the special dust coat provided for this purpose instead of the usual magazine-clothing.

Magazine clothing and the special dust coat, which are of white cotton drill, must be fireproofed before being taken into use and subsequently after each washing fireproofing must be carried out again.

Instructions to guide the fireproofing in Ordnance Establishments of magazine clothing are laid down in Appendix C.

## SECTION IX.

## CLASSIFICATION OF EXPLOSIVES.

*Para 179.*—For transport of explosives, see Appendix A

The mode of attachment of labels and the sealing of ammunition packages in India is generally similar to that outlined in this para. Armaments Inspecting Department (C.I.A.) W.D. CHEM, and I.S.A.A. will not be found on labels of packages of ammunition manufactured or re-packed in India. The equivalent markings in use in India are as shown in Regulations for the Equipment of the Army, India, Part I. The lids of small arms ammunition boxes are generally sealed by means of a brass split pin connected to a brass T-piece which are joined to the lid by a short length of cord. The lid slides into position and is secured by the split pin passing through the lid into a hole provided in the side of the box, free length of cord, T-piece and head of split pin fitting into recesses cut in the lid. The cord is sealed at its junction with the lid by a label with directions for opening, (I.A. 109), while the head of the split pin is covered with sealing wax and impressed with the Inspectorate of Ammunition monogram I  $\blacktriangle$  A.

In addition, to prevent access to the box other than by opening the lid, a number of screws (number and position vary according to type of box) on the top and bottom of the box are sealed by the heads being recessed into the wood, and the recess filled with solder which is impressed with the monogram of the Ammunition Factory e.g. "KF".

For list of labels, etc., in use in India see the 'List of labels contents sheets etc., used on packages in India' issued with R.A.O.S. Part 8 Pamphlet No. 8, (India) 1940.

*Para 180.*—In India Experimental explosives must not be stored with other explosives, nor such experimental explosives of different groups be stored together.

*Para 182.*—In India the composition of the various groups and conditions of storage as shown in Appendix II of this Supplement will be followed".

## SECTION X.

## STORAGE.

*Para 184.*—In India the following procedure will be observed :—

- (a) Cordite blank charges (Group 3) held in unit charge may be stored, under magazine conditions, in the same compartment with gun powder blank charges.

*Para 185.*—In India the following instructions will apply :—

Ammunition and Explosives in groups 5 to 13 and 15 need not be stored in magazines. They should normally be stored in explosive storehouses to which modified conditions apply (See para 174—177 of Magazine Regulations). If such buildings are not available they may be stored in magazines in which case magazine conditions (See para 15 of Magazine Regulations) will not apply.

*Para 188.*—In India the following groups must always be kept separate (except as provided in paras 192 and 193 and Appendix 'G' of this supplement) :—Groups 7A, 12, 13 and 15.

*Para 189.*—In India, when it is not possible to store separately each group, the following groups may be stored together in one building—

- (a) Groups 1, 2 and 4.  
 (b) Groups 3 and 5.  
 (c) Groups 5, 6, 8 and 10.  
 (d) Groups 9 and 11.

Combinations (b) and (c) will be regarded as alternative. Group 5 may be stored with group 3 or with groups 6, 8 and 10, but the two combinations will not be stored in the same building.

*Paras 192 and 193.*—In India, instructions contained in Appendix G of this Supplement may be followed.

*Para 194.*—In India, cordite blank charges (Group 3) held by units may be stored in the building with explosives of Groups 1 and 2.

*Para 200.*—In India, this receptacle is governed by design No. G.C.F.:2461 and demands should be submitted in accordance with the scale laid down in Equipment Regulations (India), Part 1.

*Para 215.*—Delete “especially” from line 2.

*Para 225.*—In India an inventory board will not be hung up; however instruction contained in sub para (xxix) Section IID (page 15) of this supplement will apply.

*Para 230.*—Barrels containing gunpowder will be stacked on their bilges in racks; the bottom rack being raised a few inches from the ground. The height of the racks, however, should be limited as much as possible.

*Paras 232-237.*—The following instructions will be observed in substitution of these paragraphs:—

1. (a) Rectangular metal or wooden packages will be stacked on their bases to a height not exceeding 6 feet, with the following exceptions:—
  - (i) When the width (or narrower dimension) of the lid is less than half the height of the sides, the packages may be stacked on their sides, (i.e. the long side: not the end) to a height not exceeding 12 feet.
  - (ii) Packages containing wet guncotton will be stacked on their sides with venting plugs outwards, to a height not exceeding 6 feet. Stacks will be two boxes wide with sufficient space between stacks to allow of easy access to venting plugs.
  - (iii) Packages containing ammunition in Group 12 will be stacked to a height not exceeding 5 feet.
  - (iv) Packages containing ammunition in Group 9 will be stacked to a height not exceeding—
    - 5 ft—for paper-cased stores.
    - 12 ft—for metal or plastic cased stores.
- (b) Crated cylinders should be stacked horizontally in tiers to a height not exceeding 12 ft., unless racking or stanchions are provided, when the height may be 16 feet.
- (c) Uncrated cylinders should be stacked vertically when possible, to a height not exceeding 12 feet unless racking is provided. Alternatively they

may be stacked horizontally in tiers. In this event, the numbers of tiers will not exceed—

- (i) Cylinders under 60 lb in weight—7 tiers.
- (ii) Cylinder 60 to 100 lbs in weight—5 tiers.
- (iii) Cylinders 100 lbs or over in weight—4 tiers.

Care will be taken that the reinforcing bands of cylinders are coincidental throughout the stack.

- (d) Cylinder (crated or uncrated) containing B. L. charges of cordite S.C. will, wherever possible, be stored horizontally in order to prevent distortion of charges. If, however, this is not possible, vertical stacking may be resorted to providing that maximum periods of 6 months in temperate climates and 3 months in tropical climates alternate with equal period of storage horizontally.
- (e) For all stacks, battens shall be provided, both as stabilizers and to facilitate ventilation, as
  - (i) For all stacks : beneath the bottom tier to raise stacks from floors,
  - (ii) For steel boxes : on 3rd, 6th and 9th tiers.
  - (iii) For wooden boxes : between 8th and 9th tiers.
  - (iv) Thin battens shall be used on each tier of cylinders stacked vertically.
- (f) All unboxed filled projectiles will be stored on their bases on wood battens, except when racks and/or conveyors are installed or where local conditions render it necessary to pile them. If piled, they will be arranged as follows :—
  - (i) The bottom tier will be placed on wood battens of sufficient thickness to prevent driving bands from coming in contact with the floor.
  - (ii) Tiers will be arranged "heads and tails" to obviate damage to driving bands, but if this is not possible thin battens will be placed between tiers.

- (iii) End projectiles in the bottom tier will be secured by wooden scotches fixed to the battens, and if necessary, wooden wedges should be placed against the shoulders of all other projectiles in the bottom tier to prevent movement.
- (iv) Projectiles 7.2-in and above will be piled on battens between each tier in order to protect driving bands and to facilitate handling.
- (v) Unless the piles are supported at each side by strong traverses at least every 10 feet, the numbers of tiers will not exceed—
- (a) 12-in calibre and over—5 tiers
  - (b) Below 12-in to 7.2-in—8 tiers
  - (c) Below 7.2-in to 5.5-in—11 tiers
  - (d) Below 5.5-in—15 tiers.

NOTWITHSTANDING ANYTHING SAID TO THE CONTRARY IN para 1 (a) to (f) above the height of stack of ammunition must be less than the height of the eaves/traverses by at least 2 ft.

Para 248.—I.A.F.O.-1443-A will also be maintained by units and defences holding gun ammunition.

Para 249.—I.A.F's O-2713 and 2714 will be used in lieu of A.F.G. 854.

## SECTION XI.

## CARE AND HANDLING OF AMMUNITION AND EXPLOSIVES IN STORE.

Para 261.—A scale of paint for this purpose is laid down in Regulations for the Equipment of the Army (India), Part 1.

Paras. 264 and 265.—Storage in accordance with these paras will not always be possible in most parts of India. This should, however, be aimed at and, as far as possible, the temperature kept within these limits.

The I.O.O. should pay particular attention to any magazine or explosives storehouse the mean annual temperature of which exceeds 85°F or the maximum temperature of which exceeds 110°F with a view to taking action to lower the storage temperature if possible.



## SECTION XII.

## INSPECTION OF MAGAZINES AND EXPLOSIVES STOREHOUSES

## APPENDIX I.

## LIST OF ARMY FORMS USED IN CONNECTION WITH THESE REGULATIONS.

For "A.F.G.-944	... Thermometers and Hygrometers for Magazines and Explosives Storehouses Daily record of readings".
Read "I.A.F.O.-1433	Daily record of reading of Thermometer and Hygrometer for magazines in India."
For "A.F.G.-854	... Cartridge, Fuze, Tube, Primer or shell Record".
Read "I.A.F.O.-2713	Register of Lotted ammunition."
I.A.F.O.-2714	... Register of Batched ammunition.

Insert the following posters :—

- |                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| (i) A.F.G.-940-B.  | ... Instructions for the carrying out of laboratory operations in Ordnance Charge. |
| (ii) I.A.F.O.-1416 | ... Rules for the storage of ammunition in Regimental custody.                     |

The following forms are not used in India :—

- |            |                                           |
|------------|-------------------------------------------|
| A.F.G.-934 | ... Guncotton, storehouse label.          |
| A.F.G.-956 | ... Hygrometric Table, Class V Buildings. |

A Roman-Hindi and vernacular translation will be made of all instructions contained in posters. This translation should be attached to, or hung in close proximity to, the form concerned.

## APPENDIX II.

CLASSIFIED LIST OF GOVERNMENT EXPLOSIVES (ARMY, NAVY AND AIR FORCE) IN LAND STORAGE GROUPS SHOWING THE STORAGE CONDITIONS REQUISITE FOR EACH ITEM.

## GROUP 1.

CHARACTERISTICS :—Explosives bearing a fire and explosion risk and relatively sensitive to spark or friction or those requiring Lead-Free conditions; The Explosives being in bulk or contained in paper or fabric wrapping (i.e. other than those contained in a sealed metal component) and not containing a means of ignition.

Storage Conditions :—Magazine.

Designations 1	Charge/wt. ratio. (Average net explosive Percentage) 2	Safety Dis- stance Category 3	Fire fighting class (storage) 4	Service users 5
Ammonium picrate .. ..	60	ZZ	3	..
Bursters, gunpowder .. ..	70	ZZ	1	LNA
Bursters, H. E. .. ..	70	ZZ	3	LA
Charges, gunpowder .. ..	50	ZZ	1	LN
Charges, propelling .. ..	40	ZZ	1	LNA
Composition, exploding .. ..	75	ZZ	1	LNA
Composition, illuminating .. ..	75	ZZ	1	..
Composition, match .. ..	75	ZZ	1	N
Composition, priming .. ..	75	ZZ	1	N
Composition, rocket .. ..	75	ZZ	1	..
Composition, rocket, life-saving	75	ZZ	1	..
*Compositions, (Type A) S. R. ..	75	ZZ	1	N

## GROUP 1—contd.

1	2	3	4	5
*Compositions, (Type B) S. R. ..	75	ZZ	1	N
*Composition s, (Type A) P. N. ..	75	ZZ	1	N
*Compositions, (Type B) P. N. ..	75	ZZ	1	N
Cordtex .. ..	5	ZZ	3	LNA
Di-nitro-phenol .. ..	75	ZZ	3	N
Di-nitro-resorcinol .. ..	60	ZZ	3	..
Exploders, C. E. .. ..	65	ZZ	1	LNA
Exploders, picric .. ..	75	ZZ	1	LN
Fuze powders .. ..	70	ZZ	1	..
Gunpowder .. ..	70	ZZ	1	LNA
Igniters, gunpowder .. ..	70	ZZ	1	LN
P. E. T. N. .. ..	50	ZZ	1	..
Picric acid .. ..	75	ZZ	1	N
Picric powder .. ..	75	ZZ	1	..
Potassium di-nitro-phenate ..	75	ZZ	1	..
Primers, C. E. .. ..	30	ZZ	1	LNA
Puffs, gunpowder .. ..	75	ZZ	1	LNA
Quickmatch .. ..	20	Y	2	LN
R. D. X .. ..	60	ZZ	1	N
Styphnic acid .. ..	50	ZZ	3	..

\*NOTE.—Compositions S. R. and P. N. in this Group generally contain a metallic powder and are more sensitive to shock and friction than those in Group II. The "A" types contain a chlorate and in some cases a peroxide. Such compositions are regarded as being more sensitive than the "B" types of composition.

## GROUP 2.

CHARACTERISTICS :—Explosives Liable to Decomposition, bearing an Explosion risk and liable to function by spark or friction. Not containing their own means of ignition.

STORAGE CONDITIONS :—Magazine.

1	2	3	4	5
Ballisite .. ..	75	ZZ	1	..
Blasting explosives .. ..	70	ZZ	1	LNA
Cordite small arms, granular ..	75	ZZ	1	..
Guncotton, dry .. ..	70	ZZ	1	LNA
Nitro-cellulose, small arms, granular	75	ZZ	1	..
Nobel's, 808 .. ..	75	ZZ	1	LNA
Nobel's 809 .. ..	75	ZZ	1	L
Puff's cordite .. ..	70	ZZ	1	L

## GROUP 3.

CHARACTERISTICS :—Explosives liable to decomposition, bearing a fire risk. Not containing their own means of ignition.

STORAGE CONDITIONS :—Magazine, but may be placed in Explosives Storehouse.

Cartridges, B. L. .. ..	60	Y	2	LN
Cartridges, M. L. Mortar, augmenting.	75	Y	2	LA
Charges, propellant, incremental	65	Y	2	L
Cordite .. ..	65	Y	2	N
Nitro-cellulose cannon powder ..	70	Y	2	..
Nitrated paper .. ..	10	Y	2	L

## GROUP 4.

CHARACTERISTICS:—Stable explosives, bearing a fire or explosion risk. Not containing their own means of ignition.

STORAGE CONDITIONS:—Magazine, but may be placed in an Explosives Storehouse.

1	2	3	4	5
Amatex .. .. .	75	ZZ	3	..
Amatol .. .. .	75	ZZ	3	A
Ammonal .. .. .	75	ZZ	3	LNA
Baratol .. .. .	75	ZZ	3	..
Battle noises .. .. .	40	ZZ	3	N
Demolition explosives .. .. .	70	ZZ	3	LNA
*D. N. T. .. .. .	75	ZZ	3	..
Exploders, R. D. X./Wax .. .. .	60	ZZ	3	L
Exploders, T. N. T. .. .. .	70	ZZ	3	LNA
Fuze, detonating .. .. .	5	ZZ	3	LNA
Guncotton, sets, demolition .. .. .	50	ZZ	3	L
Guncotton wet .. .. .	30	ZZ	3	LA
Guncotton, wet, loose .. .. .	30	ZZ	3	..
Minol .. .. .	75	ZZ	3	N
Nobel's 896 .. .. .	75	ZZ	3	..
Pentolite .. .. .	75	ZZ	3	..
P. E. T. N./Wax .. .. .	75	ZZ	3	..
*Picrite .. .. .	75	ZZ	6	..
Plastic explosive .. .. .	75	ZZ	3	LNA

## GROUP 4—contd.

1				2	3	4	5
R. D. X./T. N. T.	..	..	..	75	ZZ	3	..
R. D. X./Wax	..	..	..	75	ZZ	3	..
T. N. T.	..	..	..	75	ZZ	3	..
Torpex	..	..	..	75	ZZ	3	N
Tritonal	..	..	..	75	ZZ	3	..

\*Note :—For assessing storage safety distances, 2 tons of the explosive are to be taken as equal to 1 ton in the same category.

## GROUP 5.

CHARACTERISTICS :—Unboxed shell, filled H. E., Gunpowder or star composition, plugged or fuzed.

STORAGE CONDITIONS :—Explosives Storehouse. See para 185.

*Unboxed*

Shell, H. E., armour piercing	..	..	..	3	X	3	LN
Shell, flare	..	..	..	18	X	6	L
Shell, H. E.	..	..	..	13	Z	3	LN
Shell, H. E. piercing	..	..	..	13	Z	3	N
Shell, practice	..	..	..	9	X	6	LN
Shell, radar echo	..	..	..	2	X	6	LN
Shell, H. E., semi armour piercing	..	..	..	8	Z	3	LN
Shell, shrapnel	..	..	..	2	X	6	LN
Shell, star	..	..	..	20	X	6	LN

Note :—When boxed, the items in this Group become Group 6.

## GROUP 6.

CHARACTERISTICS :—Boxed Ammunition containing high explosives, gunpowder and propellants only. With or without their own means of ignition.

STORAGE CONDITIONS :—Explosives Storehouse See para 185.

1	2	3	4	5
Adapters, booster .. ..	30	Z	3	NA
Adapters, exploder .. ..	20	Z	3	A
Adapters, " K " .. ..	10	X	6	N
Boxes, junction .. ..	2	X	6	A
Bursters, Bomb .. ..	10	X	6	LNA
Bursters, mine .. ..	10	X	6	LN
Caps, percussion .. ..	25	X	6	LN
Capsules, delay .. ..	2	X	6	NA
Cartridges, aiming rifle .. ..	5	X	6	LN
Cartridges, bolt .. ..	3	X	6	LN
*Cartridges, cable cutting .. ..	2	X	6	A
Cartridges, ejection .. ..	20	X	6	NA
Cartridges, electric .. ..	5	X	6	NA
Cartridges, engine starter .. ..	30	Y	2	NA
Cartridges, impulse, torpedo, cordite.	25	Y	2	N
Cartridges, impulse, torpedo gunpowder.	25	Z	2	N
*Cartridge, link .. ..	3	X	6	A
Cartridges, lowering undercarriage	25	X	6	A
Cartridges, M. L., depth charge thrower.	25	X	2	N



## GROUP 6—contd.

1	2	3	4	5
*Cartridges, M. L. Mortar ..	20	X	6	LNA
Cartridges, percussion .. ..	10	X	6	A
Cartridges, pistol $\frac{1}{2}$ .. ..	10	X	6	N
*Cartridges, punch * .. ..	3	X	6	LN
Cartridges, Q. F., H. E. ..	20	X	3	LNA
Cartridges, Q. F. practice ..	20	X	6	LN
Cartridges, Q. F., radar echo ..	15	X	6	LN
Cartridges, Q. F., shrapnel ..	16	X	6	LN
Cartridges, Q. F., shot ..	15	X	6	LA
Cartridges, Q. F., star .. ..	20	X	6	N
Cartridges, Q. F., separate ..	25	Y	2	LNA
Cartridges, Q. F., separate gunpow- der.	25	Z	3	L
Cartridges radar echo .. ..	1	X	6	A
*Cartridges, rim fire .. ..	20	X	6	LNA
*Cartridges, rocket .. ..	10	X	6	LNA
*Cartridges, S. A. ball .. ..	11	X	6	LNA
Cartridges, S. A. H. E. ..	12	Z	3	LN
Cartridges, S. A., H. E./I. ..	12	Z	3	LNA
Cartridges, S. A., incendiary ..	11	X	6	LNA
*Cartridges, S. A., piercing ..	11	X	6	LNA
*Cartridges, S. A., separate ..	20	X	6	LNA
*Cartridges, S. A., tracer ..	12	X	6	LNA
*Cartridges, shot gun ..	10	X	6	LNA

## GROUP 6—contd.

1	2	3	4	5
*Cases, cartridges capped ..	1	X	6	..
Charges cased .. ..	50	Z	3	A
Ejectors, contents .. ..	20	X	6	N
Ejectors, electric .. ..	20	X	6	NA
Ejectors, flare .. ..	20	X	6	NA
Floats, signal .. ..	20	X	6	N
Fuze, instantaneous .. ..	1	X	6	LA
*Fuze, safety .. ..	2	X	6	LNA
Fuzes .. ..	3	X	6	LNA
Gaines .. ..	10	X	6	LN
Heads, rocket, radar echo ..	2	X	6	N
Heads, T-cutters .. ..	15	X	6	N
Igniters, electric .. ..	10	X	6	LNA
Igniters, fuze .. ..	12	X	6	LNA
Igniters safety .. ..	1	X	6	N
Igniters, shell .. ..	30	X	6	LN
Initiators, thermal .. ..	2	X	6	NA
Motors, rocket .. ..	30	Y	2	LNA
Primer detonators .. ..	10	X	6	A
Primers electric .. ..	5	X	6	LN
Primers, electric and percussion ..	5	X	6	N
Primers, percussion .. ..	7	X	6	LNA
Projectiles, hedgehog, weighted ..	1	X	6	N

## GROUP 6—concl'd.

1	2	3	4	5
Projectiles, practice, hedgerow ..	2	X	6	N
Puff powder with igniter ..	5	ZZ	6	A
Relays, electric .. ..	10	X	6	L
Sets, fuzing .. ..	10	X	6	A
Shell, flare (boxed) .. ..	18	X	6	L
Shell, H. E. (boxed) .. ..	7	X	6	LN
Shell, practice (boxed) .. ..	7	X	6	N
Shell, radar echo (boxed) .. ..	2	X	6	LN
Shell, shrapnel (boxed) .. ..	1	X	6	LN
Shell, star (boxed) .. ..	15	X	6	LN
Shot, with tracer .. ..	1	X	6	LN
*Signals, fog .. ..	2	X	6	L
Switches .. ..	2	X	6	LNA
Tubes, electric .. ..	4	X	6	LN
Tubes, friction .. ..	12	X	6	LNA
Tubes, percussion .. ..	4	X	6	LN

\*NOTE 1.—Explosives marked \* in Column 1 are included in the Safety Class and packages bear a Group 6 Government Explosives label including the words "Safety Cartridges".

NOTE 2.—Fixed Q.F. cartridges are distinguished in nomenclature from separate loading Q.F. cartridges by having the word "Shot" or "Shell" included in the designation. Also, the word "filled" is used in the designation of separate loading Q.F. cartridges.

NOTE 3.—When unboxed, shells and projectiles in this Group become Group 5.

## GROUP 7.

CHARACTERISTICS :—*Mines, Metal Primers, Bombs and Underwater Ammunition, filled High Explosives, Plugged, with or without components in their packages.*

STORAGE CONDITIONS :—*Explosives storehouse. See para 185.*

1	2	3	4	5
Bangalore torpedoes ..	50	Z	3	LNA
Bombs, aircraft, A. P. ..	10	Z	3	NA
Bombs, aircraft, H. E., high charge	75	Z	3	A
Bombs, aircraft, H. E., low charge	20	Z	3	NA
Bombs, aircraft, H.E., medium charge.	55	Z	3	NA
Bombs, demolition .. ..	25	Z	3	L
Bursters, limpet .. ..	40	Z	3	LN
Charges, countermine ..	50	Z	3	L
Charges, demolition .. ..	75	Z	3	LNA
Charges, line .. ..	60	Z	3	LN
Depth charges .. ..	75	Z	3	NA
Explosive Sweeps .. ..	15	Z	3	N
Flashes, photographic, large ..	50	Z	3	NA
*Flashes, photographic, medium	30	Z	3	NA
Mines, cases, charge .. ..	60	Z	3	N
Mines, contact .. ..	60	Z	3	LN
Mines, underwater .. ..	63	Z	3	NA
Primers, metal, H. E. .. ..	30	Z	3	LNA
Projectiles, H. E., hedgehog, plugged.	15	Z	3	N

## GROUP 7—contd.

1	2	3	4	5
Projectiles, H. E., hedgerow, plugged.	15	Z	3	N
Rope, cutters .. ..	30	Z	3	N
Squids, plugged .. ..	45	Z	3	N
Warheads .. ..	75	Z	3	NA

NOTE 1.—This is a high capacity group and comprises plugged ammunition only.

\*NOTE 2.—Flashes photographic—Sizes smaller than 8-inch are medium.

## GROUP 7A.

CHARACTERISTICS :—*Mines, Bombs and Underwater Ammunition, filled H. E., containing their own means of ignition.*

STORAGE CONDITIONS :—*Explosives storehouse. See para 185.*

Bombs, A. A. D. .. ..	10	Z	3	A
Clusters, H. E. .. ..	20	Z	3	A
Destructors, contact .. ..	30	Z	3	L
Fuzes, with burster .. ..	10	Z	3	LN
Projectiles, H. E., hedgehog, fuzed	15	Z	3	N
Shell, H. E./S. H. fuzed .. ..	31	Z	3	L
Squids, fuzed .. ..	40	Z	3	N

## GROUP 8.

CHARACTERISTICS :—Mortar and Projector Ammunition (filled H.E. or gun powder), Grenades and Rockets filled H.E., with or without Propellants and Components in their packages.

STORAGE CONDITIONS :—Explosives storehouse. See para 185.

	1	2	3	4	5
Grenades, H. E. .. ..	13	X	6	LNA	
Grenades, H. E./H. C. ..	60	Z	3	LA	
Kits, waterproofing .. ..	5	Z	3	L	
Mines, anti-personnel .. ..	30	Z	3	L	
*Mortar ammunition, H. E. (light)	8	X	6	LA	
Mortar ammunition, H. E. (medium)	12	Z	3	LN	
Mortar ammunition, practice ..	4	X	6	LA	
Mortar ammunition, radar echo ..	4	X	6	L	
Packs, explosive, bomb disposal ..	50	Z	3	A	
Petards .. ..	10	Z	3	L	
Projector, ammunition, H. E. ..	15	Z	3	LA	
Projector, ammunition, practice ..	4	X	6	LA	
Rockets, H. E. .. ..	20	Z	3	LA	
Rockets Training .. ..	5	X	6	A	
Sets, initiating charges .. ..	60	Z	3	L	
Shell, H. E. rocket .. ..	20	Z	3	L	
Shell, H. E. A/C rocket .. ..	24	Z	3	NA	
Switches H. E. .. ..	15	Z	3	L	

\*Mortars of not more than 3-inch calibre.

## GROUP 9.

CHARACTERISTICS :—*Pyrotechnics.*STORAGE CONDITIONS :—*Explosives storehouse.* See para 185.

1	2	3	4	5
Bombs, A. R. P. .. ..	10	X	2	LN
Bombs, practice, flash .. ..	13	X	2	NA
Bombs, T. I. .. ..	25	X	2	A
Candles, rocket, flare .. ..	30	X	2	N
Cartridges, flash .. ..	10	X	2	A
Cartridges, illuminating .. ..	40	X	2	LNA
Cartridges, signal .. ..	40	X	2	LNA
Clusters, flare .. ..	25	X	2	A
Crackers, blank .. ..	3	X	2	LN
Flares, ground .. ..	50	X	2	LNA
Flares indentification .. ..	50	X	2	NA
Flares, illuminator .. ..	50	X	2	A
Flares, reconnaissance .. ..	12	X	2	NA
Flares, signal .. ..	50	X	2	N
Floats, flare .. ..	50	X	2	N
Floats, smoke and flame .. ..	50	X	2	NA
Grenades, signal .. ..	12	X	2	N
Heads, rocket, flare .. ..	18	X	2	N
Heads, rocket, target .. ..	16	X	2	LN
Igniters, flame thrower .. ..	10	X	2	L

## GROUP 9—contd.

1	2	3	4	5
Igniters Rocket .. ..	10	X	2	NA
Igniters, smoke .. ..	30	X	2	LN
Indicators A/S training ..	10	Y	2	A
Indicators, mine, firing ..	15	X	2	N
Lights, service .. ..	60	X	2	N
Mines, alarm .. ..	1	X	2	L
Mortar ammunition, signal ..	33	X	2	LNA
Portfires .. ..	25	X	2	LNA
Rockets, illuminating .. ..	25	X	2	NA
Rockets, line .. ..	25	X	2	NA
Rockets, practice .. ..	19	X	2	N
Rockets, signal .. ..	25	X	2	LNA
Signals .. ..	25	X	2	LNA
Simulators, gunflash .. ..	20	Y	6	LN
Thunderflashes .. ..	18	Y	6	LNA
Tracers .. ..	15	X	6	LNA

## GROUP 10.

CHARACTERISTICS :—*Detonators and Initiatory Compositions.*

STORAGE CONDITIONS :—*Explosives storehouse.* See para 185.

Barium styphnate, dry 1 OZ. ..	..	X	3	..
Barium styphnate, wet ..	50	ZZ	3	..
Composition, initiating R. D. dry 1 oz. sample.	..	X	3	..



## GROUP 10—contd.

1	2	3	4	5
Detonators .. ..	10	Z	3	LNA
Detonator bursters .. ..	15	Z	3	NA
Fulminate of Mercury, wet ..	50	ZZ	3	..
Fulminate of Mercury, dry 1 oz. sample.	..	X	3	..
Fuzes, mine, A. TK. No. 3 ..	10	Z	3	L
Lead styphnate, dry 1 oz. sample	..	X	3	..
Lead styphnate wet .. ..	50	ZZ	3	..
Lead azide, wet or dry 1 oz. sample	..	X	3	..
Simulators, R. F. or M. G. ..	10	Z	3	L
Sleeves fuze .. ..	35	Z	3	N

NOTE 1.—Fulminate of mercury, barium styphnate, Composition initiating R.D., lead azide and lead styphnate samples will be packed, "Loose" in cylindrical capsules closed by cotton wool, the capsules to be placed in cylindrical holes in a wooden block lined with sorbo rubber and covered by a sorbo rubber pad in wood wool in a metallic container. No container to contain more than 1 oz. divided equally in 4 capsules. The capsules to be of brass or copper for fulminate of mercury and for compositions containing fulminate of mercury, but of aluminium for other explosives.

NOTE 2.—The following compositions may be stored in the dry state in Government factories. They are in Category ZZ for Safety Distances and Class 1 for fire fighting.

- Compositions, cap.
- Compositions, initiatory.
- Fulminate of mercury.
- Lead azide.
- Lead styphnate.
- Lead di-nitro-resorcinol.

## GROUP 11.

CHARACTERISTICS :—*Incendiary and Smoke Ammunition not containing Phosphides, White Phosphorus, Inflammable Liquids or Gel. with or without components in their packages.*

STORAGE CONDITIONS :—*Explosives storehouse. See para 185.*

	1	2	3	4	5
Bombs, incendiary .. ..	16	Y	6	LNA	
Bombs, smoke .. ..	4	X	4	A	
Candles, smoke .. ..	6	X	4	LN	
Cartridge, Q. F., smoke .. ..	10	X	6	L	
Cartridges, Q. F., smoke F. M. or C. S. A. M.	1	X	6	..	
Clusters, incendiary .. ..	11	Y	6	A	
*Composition (Type C) S. R. .. ..	60	X	4	..	
*Composition (Type C) P. N. .. ..	60	X	4	..	
*Composition (Type D) S. R. .. ..	60	X	4	..	
*Composition (Type D) P. N. .. ..	60	X	4	..	
Destructors, incendiary .. ..	16	Y	4	LA	
Flares, incendiary .. ..	4	Y	4	N	
Floats, smoke .. ..	1	X	4	LNA	
Generators, smoke .. ..	60	X	4	LNA	
Grenades, incendiary .. ..	2	Y	4	A	
Grenades, smoke .. ..	20	X	4	LN	
Igniters, torpedo .. ..	12	Y	6	N	
Markers, smoke, white .. ..	10	X	4	N	

## GROUP 11—contd.

	2	3	4	5
Mortar ammunition, smoke ..	7	X	4	L
Mortar ammunition, smoke F. M. or C. S. A. M. .. ..	1	X	4	L
Puffs, smoke .. ..	1	X	4	L
Shell, smoke .. ..	7	X	4	L
Shell, smoke, F. M. or C. S. A. M.	1	X	4	L
Signals, drift, night .. ..	3	Y	4	A

\*NOTE 1.—Compositions S. R. and P. N. in this group are smoke compositions and are not sensitive to shock or friction. Type C compositions contain a chlorate and although not sensitive to shock they have a relatively low ignition temperature as compared with type D compositions.

## GROUP 12.

CHARACTERISTICS :—*Ammunition containing Phosphide or White Phosphorus with or without components in their packages.*

STORAGE CONDITIONS :—*Explosives storehouse. See para 185.*

Bombs, incendiary, W. P. ..	10	Y	4	A
Cartridge, Q. F., smoke, W. P. ..	10	X	6	L
Cartridges, S. A. observing ..	10	X	4	LN
Clusters, incendiary, W. P. ..	10	Y	4	A
Grenades, smoke, W. P. ..	25	X	4	LNA
Mortar ammunition, Smoke W. P.	10	X	4	LA
Shell, smoke, W. P. .. ..	7	X	4	LN

## GROUP 13.

CHARACTERISTICS :—*Chemical Ammunition with or without components in their packages.*

STORAGE CONDITIONS :—*Explosives storehouse. See para 185.*

	2	3	4	5
Ampoules, chemical .. .. .	..	V	5	LA
Bombs, chemical .. .. .	2	V	5	A
Bottles, chemical .. .. .	..	V	5	LA
*Composition (Type E) P. N. .. .. .	3	V	5	..
Containers, chemical .. .. .	..	V	5	L
Floats, lachrymatory .. .. .	1	V	5	N
Generators, chemical .. .. .	1	V	5	LA
Generators, lachrymatory .. .. .	1	V	5	LNA
Grenades, lachrymatory .. .. .	1	V	5	L
Mines, chemical .. .. .	..	V	5	L
Mortar ammunition, chemical .. .. .	10	V	5	L
Shell, chemical .. .. .	1	V	5	LN

\*NOTE.—These compositions have also a lachrymatory effect.

## GROUP 14.

*This is Naval Stowage Group, in H. M. ships only.*

## GROUP 15.

CHARACTERISTICS :—*Incendiary Ammunition containing Inflammable Liquids or Gel, but not containing Phosphides or White Phosphorus; with or without components in their packages.*

STORAGE CONDITIONS :—*Explosives storehouse.*

Bombs, incendiary, liquid .. .. .	38	Y	SPECIAL A
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## ANNEXURE 'A' TO APPENDIX II

## AMMUNITION OF THE NON-EXPLOSIVE CATEGORIES OF DANGEROUS GOODS.

There are some types of ammunition used in the Services which are categorised in the non-explosive categories of 'Dangerous Goods'. The designations of these types together with the nature of the danger to which they give rise, are indicated below.

Designation of Ammunition	Dangerous Substance
Ampoules for mine, practice, contact, A. Tk. ..	Chlorosulphonic acid
Bomb, aircraft, practice, flame, break-up 8½ lb. ..	Phosphide.
Bomb, aircraft, practice, smoke, break-up 8½ lb. ..	Titanium tetrachloride.
Bomb, aircraft, practice, smoke, filled F. M. or C. S. A. M.	Titanium tetrachloride and chlorosulphonic acid mixture.
Bomb, incendiary, AN-M, . . . lb., filled T.P. 1 (see Group 15 for these bombs fitted with exploders)	
Candles, smoke, white .. .. .	.. Phosphide.
Container, smoke .. .. .	.. Titanium tetrachloride.
Destructor, incendiary No. 2 (see Group 11 for other numbers)	Petrol.
Drums, F. M. .. .. .	.. Titanium tetrachloride.
Flame floats, aircraft, navigation .. .. .	.. Phosphide.
Installation, S. C., type G, . . . lb. filled F. M.	.. Titanium tetrachloride.
Marker, marine, aircraft .. .. .	.. Phosphide.
*Marker, sea, aluminium .. .. .	.. Aluminium powder.
Matches, flamer .. .. .	.. Match composition.
Matches, fuze, safety .. .. .	.. do
Matches, waterproof safety .. .. .	.. do
Mine charge cases, filled sodium phosphide ..	.. Phosphide.
Slow match .. .. .	.. Potassium nitrate.
*Submarine bubble decoy .. .. .	.. Magnesium and iron powder.

Note:—If stored within an explosives area, the Inside Safety Distance to be observed with regard to the building in which they are stored will be that for a corresponding quantity of explosives belonging to Category Y and the fire class will be class MP, excepting those starred in column 1. The class for these will be class MP. Powdered metals in bulk will also be included in Class MP, when stored in an explosives area.

NORMAL OUTSIDE SAFETY DISTANCES FOR ABOVE GROUND BUILDINGS

In India, safety distances given in the table below will apply. See also 'Regulations regarding Safety Distances', contained in Section II-D of this Supplement, regarding applicability of this Table.

All distances are in feet

Net Explosives Quantity Lbs	To Dwelling Houses, Church, Main Offices, Workshops etc.							To Railways, Canals, Rivers or Main Roads					
	Cat. X	Cat. Y	Cat. Z	Cat. ZZ	Cat. V	Traversed or Untraversed							
1	2	3	4	5	6	7	8	9	10	11	12	13	
100	50	74	63	63	L.C.	H.C.	25	37	32		L.C.	H.C.	
200	60	94	100	100	2,640	1,320	30	47	60	32	2,640	1,320	
400	70	118	159	159	2,640	1,320	35	59	80	50	2,640	1,320	
600	80	134	208	208	2,640	1,320	40	67	104	80	2,640	1,320	
800	90	148	252	252	2,640	1,320	45	74	126	104	2,640	1,320	
1,000	100	160	292	292	2,640	1,320	50	80	146	126	2,640	1,320	

## APPENDIX III—contd.

1	2	3	4	5	6	7	8	9	10	11	12	13
2,000	115	202	459	459	2,640	1,320	58	101	230	230	2,640	1,320
3,000	124	230	592	592	2,640	1,320	62	115	296	296	2,640	1,320
4,000	130	254	704	704	2,640	1,320	65	127	352	352	2,640	1,320
5,000	135	274	800	800	2,640	1,320	68	137	400	400	2,640	1,320
6,000	139	290	882	882	2,640	1,320	70	145	441	441	2,640	1,320
8,000	146	320	1,018	1,018	2,640	1,320	73	160	509	509	2,640	1,320
10,000	150	342	1,129	1,129	2,640	1,320	75	172	565	565	2,640	1,320
15,000	159	394	1,335	1,335	2,640	1,320	80	197	668	668	2,640	1,320
20,000	165	434	1,490	1,490	2,640	1,320	83	217	745	745	2,640	1,320
30,000	174	498	1,725	1,725	2,640	1,320	87	249	863	863	2,640	1,320
40,000	180	548	1,906	1,906	2,640	1,320	90	274	953	953	2,640	1,320
50,000	185	590	2,060	2,060	2,640	1,320	93	295	1,030	1,030	2,640	1,320
60,000	189	626	2,190	2,190	2,640	1,320	95	313	1,095	1,095	2,640	1,320
80,000	195	690	2,410	2,410	2,640	1,320	98	345	1,205	1,205	2,640	1,320
100,000	200	742	2,600	2,600	2,640	1,320	100	371	1,300	1,300	2,640	1,320
150,000	209	850	2,975	2,975	2,640	1,320	105	425	1,488	1,488	2,640	1,320

1	2	3	4	5	6	7	8	9	10	11	12	13
200,000	215	936	3,275	3,275	2,640	1,320	108	468	1,638	1,638	2,640	1,320
250,000	220	1,008	3,530	3,530	2,640	1,320	110	504	1,765	1,765	2,640	1,320
300,000	224	1,072	3,750	3,750	2,640	1,320	112	536	1,875	1,875	2,640	1,320
350,000	227	1,128	3,950	3,950	2,640	1,320	114	564	1,975	1,975	2,640	1,320
400,000	230	1,178	4,130	4,130	2,640	1,320	115	589	2,065	2,065	2,640	1,320
450,000	233	1,226	4,290	4,290	2,640	1,320	117	613	2,145	2,145	2,640	1,320
500,000	235	1,270	4,445	4,445	2,640	1,320	118	635	2,220	2,220	2,640	1,320
550,000	237	1,310	4,590	4,590	2,640	1,320	119	655	2,295	2,295	2,640	1,320
600,000	239	1,350	4,720	4,720	2,640	1,320	120	675	2,360	2,360	2,640	1,320
800,000	245	1,486	5,200	5,200	2,640	1,320	123	743	2,600	2,600	2,640	1,320
10,00,000	250	1,600	5,600	5,600	2,640	1,320	125	800	2,800	2,800	2,640	1,320

NOTE :—The Distances given in Columns 4, 5, 10 and 11 for quantities not greater than 8,000 lbs. may be reduced by 20 per cent if the explosive is surrounded by an *effective traverse*.



## APPENDIX IV

## NORMAL OUTSIDE SAFETY DISTANCES SEMI-UNDERGROUND BUILDINGS

In India, safety distances given in the table at Appendix III of this Supplement will apply

Explosive	Quantity	Distance	Notes
1	1000	100	
2	2000	150	
3	3000	200	
4	4000	250	
5	5000	300	
6	6000	350	
7	7000	400	
8	8000	450	
9	9000	500	
10	10000	550	
11	11000	600	
12	12000	650	
13	13000	700	
14	14000	750	
15	15000	800	
16	16000	850	
17	17000	900	
18	18000	950	
19	19000	1000	
20	20000	1050	
21	21000	1100	
22	22000	1150	
23	23000	1200	
24	24000	1250	
25	25000	1300	
26	26000	1350	
27	27000	1400	
28	28000	1450	
29	29000	1500	
30	30000	1550	
31	31000	1600	
32	32000	1650	
33	33000	1700	
34	34000	1750	
35	35000	1800	
36	36000	1850	
37	37000	1900	
38	38000	1950	
39	39000	2000	
40	40000	2050	
41	41000	2100	
42	42000	2150	
43	43000	2200	
44	44000	2250	
45	45000	2300	
46	46000	2350	
47	47000	2400	
48	48000	2450	
49	49000	2500	
50	50000	2550	

INSIDE SAFETY DISTANCES : ABOVE GROUND AND SEMI-UNDERGROUND BUILDINGS  
 In India the safety distances given in the following table will apply, see also "Regulations regarding Safety Distances" contained in Section II-D of this Supplement regarding applicability of this Table.

*All distances are in feet*

Nett Explosives Quantity Lbs.	To Building or Stacks containing Explosives					To Main Offices or Engineering Workshops			To & between process Buildings in Factories																
	CAT. X OR UNTRAV	CAT. Y. UNTRAV	CAT. Z	CAT. ZZ	CAT. V. L.C. H.C. TRAV OR UNTRAV	CAT. X. TRAV OR UNTRAV	CAT. Y. TRAV OR UNTRAV	CAT. Z OR UNTRAV	CAT. V	CAT. X OR UNTRAV	CAT. Y. TRAV OR UNTRAV	CAT. Z OR UNTRAV	CAT. V. L.C. H.C. TRAV OR UNTRAV												
														1	2	3	4	5	6	7	8	9	10	11	12
100	30	30	30	30	150	50	74	63	1320	660	30	37	57	1320	660	30	37	57	1320	660	30	37	57	1320	660
200	30	30	30	30	150	60	94	100	1320	660	60	94	100	1320	660	30	47	69	1320	660	30	47	69	1320	660
400	30	30	30	30	150	70	118	159	1320	660	70	118	159	1320	660	30	59	85	1320	660	30	59	85	1320	660
600	30	30	30	30	150	80	134	208	1320	660	80	134	208	1320	660	30	67	97	1320	660	30	67	97	1320	660
800	30	35	31	56	150	90	148	252	1320	660	90	148	252	1320	660	30	74	105	1320	660	30	74	105	1320	660
1,000	30	40	60	90	150	100	160	292	1320	660	100	160	292	1320	660	30	80	112	1320	660	30	80	112	1320	660

(SEE PARAGRAPH (XXVI) OF SECTION II-D)

## APPENDIX V—contd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2,000	30	46	33		76	113	150	150	115	202	459	1320	660	30	101	172	1320	660
3,000	35	50	34		87	130	150	150	124	230	592	1320	660	48	115	222	1320	660
4,000	38	54	36		95	143	150	150	130	254	704	1320	660	60	127	264	1320	660
5,000	42	57	37		103	154	150	150	135	274	800	1320	660	67	137	300	1320	660
6,000	45	60	39		109	164	150	150	139	290	882	1320	660	72	145	331	1320	660
8,000	50	64	41		120	180	150	150	146	320	1018	1320	660	78	160	382	1320	660
10,000	54	69	44		129	194	150	150	150	352	1129	1320	660	82	172	423	1320	660
15,000	63	79	49		148	222	150	150	159	394	1335	1320	660	86	197	501	1320	660
20,000	69	88	54		163	244	150	150	165	434	1490	1320	660	88	217	559	1320	660
30,000	77	103	62		186	280	150	150	174	498	1725	1320	660	90	249	647	1320	660
40,000	81	118	69		205	308	150	150	180	548	1906	1320	660	90	274	715	1320	660
50,000	85	129	76		221	332	150	150	185	590	2060	1320	660	90	295	771	1320	660
60,000	88	139	82		235	352	150	150	189	626	2190	1320	660	90	313	820	1320	660
80,000	90	159	94		259	388	150	150	195	690	2410	1320	660	90	345	904	1320	660
1,00,000	90	174	103		279	418	150	150	200	742	2600	1320	660	90	371	974	1320	660
1,50,000	90	208	123		319	478	150	150	209	850	2975	1320	660	90	425	1116	1320	660

SEE PARAGRAPH (XXVI) OF SECTION II-D

## APPENDIX V—concl'd

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2,00,000	90	236	139		351	526	150	150	215	936	3275	1320	660	90	468	1228	1320	660
2,50,000	90	260	154		378	567	150	150	220	1008	3530	1320	660	90	504	1323	1320	660
3,00,000	90	283	167		402	602	150	150	224	1072	3750	1320	660	90	536	1406	1320	660
3,50,000	90	304	180		423	634	150	150	227	1128	3950	1320	660	90	564	1480	1320	660
4,00,000	90	322	190		442	663	150	150	230	1178	4130	1320	660	90	589	1547	1320	660
4,50,000	90	339	200		460	690	150	150	233	1226	4290	1320	660	90	613	1609	1320	660
5,00,000	90	354	209		476	714	150	150	235	1270	4445	1320	660	90	635	1667	1320	660
5,50,000	90	366	218		492	737	150	150	237	1310	4590	1320	660	90	655	1721	1320	660
6,00,000	90	382	226		506	759	150	150	239	1350	4720	1320	660	90	675	1771	1320	660
8,00,000	90	435	257		557	835	150	150	245	1486	5200	1320	660	90	743	1949	1320	660
10,00,000	90	480	284		600	900	150	150	250	1600	5600	1320	660	90	800	2100	1320	660

## NOTES

1. L. C. in Columns 8, 13 and 18 indicates Light Case Weapons.
2. H. C. in columns 9, 14 and 19 indicates Heavy Case Weapons.
3. The Distances in column 4 do not apply to explosives having a charge/weight ratio of 60% or over where adjacent buildings or stacks contain category Y or ZZ explosives from groups 1, 2, 3, or 4, in such instances the distances in column 6 must be observed. See para (XXIV) of 'Regulations regarding Safety Distances' vide Section II-D of this Supplement.
4. The inside safety distances for explosive quantities less than 100 lbs will be specified by Service Headquarters.
5. Reduced distances are permissible between certain types of surface bunker magazines (See Para 29). These will be specified by the Headquarters of the Service or Department concerned.
6. The distances given in Column 12 for quantities not greater than 8000 lbs. may be reduced by 20 per cent if the explosive is surrounded by an effective traverse).

## APPENDIX VI

INSIDE SAFETY DISTANCES : ABOVE GROUND AND SEMI-UNDER  
GROUND BUILDINGS, CATEGORY Z EXPLOSIVES  
OF GROUPS 5 AND 6

Net Explosives Quantity					Untraversed
	Lbs.				Feet
Up to	2,000	..	..	..	210
	4,000	..	..	..	240
	10,000	..	..	..	300
	20,000	..	..	..	360
	30,000	..	..	..	420
	40,000	..	..	..	464
	50,000	..	..	..	498
	60,000	..	..	..	540
	70,000	..	..	..	570
	80,000	..	..	..	600
	90,000	..	..	..	630
	100,000	..	..	..	660
	120,000	..	..	..	720
	140,000	..	..	..	780
	160,000	..	..	..	840
	180,000	..	..	..	900
	200,000	..	..	..	960
	250,000	..	..	..	1,050
	300,000	..	..	..	1,140
	350,000	..	..	..	1,230
	400,000	..	..	..	1,320

## APPENDIX VII

## INITIALS AND MONOGRAMS OF STATIONS

In India, reference should be made to the DTD Publication Ammunition Pamphlet (India). (Markings and Identification) Pamphlet No MI/1 issued by the Chief Superintendent of Development TDE (Ammunition) Kirkee. The information contained in this pamphlet is not of much use to units other than ordnance establishments.

## APPENDIX VIII

## PARTICULARS OF PACKAGES AND EXPLOSIVES CONTENT OF TYPICAL TYPES AND NATURES OF AMMUNITION

In India, reference should be made to the DTD publications, Ammunition Pamphlets (India) (Useful Information) Pamphlet Nos UI/1 and UI/2 issued by the Chief Superintendent of Development, TDE, (Ammunition) Kirkee.

## APPENDIX IX TO INDIAN SUPPLEMENT

## SAFETY DISTANCES BETWEEN EXPLOSIVES STORAGES AND OTHER THAN IMPORTANT AIRFIELDS

(a) Safety Distances given in the following Table will be observed for Cat. Z & ZZ stores. These distances are compiled on the following basis :—

- (i) Z explosives will present both a blast pressure and fragment risk.  
 (ii) ZZ explosives will present a blast pressure (and minor fragmentation risk only).

*Safety distances separating aircraft runways and explosive stores (Z & ZZ)*

(Measured from the perimeter of the airfield)

Explosives (In lbs.)	Cat. Z. distance (ft.)	Cat. ZZ distance (ft.)
100 .. .. .	1,700	460
200 .. .. .	1,700	580
400 .. .. .	1,700	730
600 .. .. .	1,700	840
800 .. .. .	1,700	920
1,000 .. .. .	1,700	1,000
2,000 .. .. .	1,700	1,250
3,000 .. .. .	1,700	1,440
4,000 .. .. .	1,700	1,570
5,000 .. .. .	1,700	1,700
6,000 .. .. .	1,820	1,820
8,000 .. .. .	2,000	2,000
10,000 .. .. .	2,160	2,160
15,000 .. .. .	2,470	2,470
20,000 .. .. .	2,710	2,710
30,000 .. .. .	3,110	3,100
40,000 .. .. .	3,420	3,420



Explosives (In lbs.)	Cat. Z. distance (ft.)	Cat. ZZ distance (ft.)
50,000 .. .. .	3,700	3,700
60,000 .. .. .	3,920	3,920
80,000 .. .. .	4,310	4,310
100,000 .. .. .	4,640	4,640
150,000 .. .. .	5,310	5,310
200,000 .. .. .	5,850	5,850
250,000 .. .. .	6,300	6,300
300,000 .. .. .	6,690	6,690
350,000 .. .. .	7,050	7,050
400,000 .. .. .	7,370	7,370
450,000 .. .. .	7,660	7,660
500,000 .. .. .	7,940	7,940
550,000 .. .. .	8,190	8,190
600,000 .. .. .	8,480	8,430
800,000 .. .. .	9,280	9,280
1,000,000 .. .. .	10,000	10,000

(b) With Cat. Y explosives there is a slight risk to the aircraft from fragments and a possibly greater risk from flame. The ordinary outside Safety Distances for Cat. Y as given in Appendix V would amply cover the flame radius risk and these distances will be observed.

(c) For Category X explosives, the Safety Distances for Cat. Y which are not very large and give a much larger degree of protection will be observed.

(d) For category V, outside safety distances prescribed for category V will be observed.

## APPENDIX A TO INDIAN SUPPLEMENT

## TRANSPORT OF EXPLOSIVES

(Referred to Section IX of the Indian Supplement)

1 Regulations for the transport by rail of explosives are contained in the Red Tariff—"Rules and Rates for the conveyance by Rail of Explosives and other Dangerous goods".

Regulations for the transport of explosives by road are given in Appendix D to this Supplement.

2 Transport by sea of explosives will be governed by the provisions of chapter V of Regulations for the Sea Transport Service amplified as follows :—

- (i) When a vessel commences to receive explosives (except safety small arms cartridges), a red flag will be hoisted at the mast head, and kept moving (except at sea) until the cargo is discharged.
- (ii) No vessel will remain without proper protection for which the Master, under the Transport Officer at the station, will be responsible.
- (iii) The Master will be held responsible for the proper stowage of the explosives, and an officer of the ship is to be constantly in charge of the shipment, storage or discharge of explosives.
- (iv) When receiving gunpowder, the Master will see that all iron and steel works are covered with tanned hides, covers—water proof or blankets and that the barrels are carefully stowed.
- (v) When handling barrels containing gunpowder they are to be carried and on no account rolled.
- (vi) No leaky or badly coopered barrel, or defective case containing explosives, will be received on board, and should such be offered, the Master will refuse to receive them, and will immediately report the circumstances to the Ordnance Officer.

- (vii) On delivery of the explosives, the same caution will be used as in loading. Should any of the barrels or cases be found broken a report of the circumstances is to be made by the Master to the Ordnance Officer, before delivery to the magazine.
- (viii) The Port Regulations for the shipment of explosives will be adhered to.
- (ix) The general provisions of Magazine Regulations Part I, 1941, will be observed, so far as practicable particularly the instructions contained in Section VII.

## APPENDIX B TO INDIAN SUPPLEMENT

INSTRUCTIONS COVERING THE USE OF MAXIMUM AND MINIMUM  
AND WET AND DRY BULB THERMOMETERS

Maximum and Minimum thermometer is the instrument generally used in Indian Magazines. It gives a double reading and therefore to a certain extent corrects itself. It consists of a U-shaped tube with a bulb at each end. The left bulb is filled entirely with liquid alcohol, the right partly with alcohol and extends down the connecting U-tube until it meets the thread of mercury which occupies the middle portion. In the thread of alcohol on either side is an index made of iron. When the temperature rises the alcohol in the left bulb expands and pushes the mercury column down in the left branch of U-tube and up in the right branch carrying the Index in the latter with it. Part of the alcohol vapour in the right bulb is condensed. When the temperature falls the mercury in the right portion of U-tubes falls leaving the index behind; in the left branch it rises carrying the corresponding index with it. It is evident therefore that the lower end of the left index gives the minimum temperature since the thermometer was last set, and the lower end of the right one gives the maximum. The thermometer is set after reading by drawing the indices down with a small horse-shoe magnet.

2 *Wet and dry bulb thermometers.*—The humidity of the atmosphere is usually determined from readings of dry and wet bulb thermometers placed in Stevenson Screen. A wet bulb thermometer is made by coating the bulb of an ordinary thermometer with muslin kept moist with water. Its action depends on the fact that evaporation takes place from every wet surface as long as the air in contact with it is not saturated with aqueous vapour. The heat required to bring about this evaporation is in the case of the wet bulb taken in part from the thermometer itself and hence a wet bulb generally reads lower than a dry bulb placed in the same screen. In a saturated atmosphere both instruments should read the same. In unsaturated air the amount of lowering depends on the rate of evaporation and this in turn on the temperature and dryness of the air.

3 The bulb and a short portion of the stem above it should be covered with a single thickness of thin clean muslin, which is kept moist by attaching to it some threads of darning cotton (about No. 8) dipping into a small reservoir of water placed near it. The muslin and thread must be free from grease, otherwise they will not be kept moist. To remove grease they may be washed in water containing ammonia. Care must be taken that the muslin is stretched smoothly on the bulb; creases must be avoided as far as possible. To a thermometer with a spherical bulb it is best applied by placing the finger in the centre of a circular piece of muslin and forming a small bag by gentle traction of the ends of the threads on the margin; this bag is then slipped over the bulb and tied above securely with thread. In the case of a thermometer with a cylindrical bulb a small "finger" of muslin should be sewn to fit the bulb exactly. After fixing the muslin it should be trimmed carefully with a pair of scissors removing all superfluous material and loose ends.

4 The wick of cotton threads should be long enough to pass from the bottom of the water reservoir round the thermometer stem just above the bulb and back again to the bottom of the reservoir. The middle portion is tied round the stem over the muslin just above the bulb either in a single knot or a clove hitch. The muslin and wick should be moistened with distilled or rain water and the ends of the wick placed in the reservoir which is filled with the same water. No reading of the wet bulb thermometer should be taken for at least an hour after these operations are completed.

5 If the column of mercury or spirit becomes broken it can usually be restored by tapping gently or swinging the thermometer round vigorously.

6 *Packing of thermometer for transmission by parcel post.*—When it is necessary to send a thermometer by rail or post it should be packed in the following manner:—

First wrap the instrument well with sheet cotton and place it in the light wooden box, in which the instrument was originally received or in a similar box. There must be sufficient cotton placed in the box to prevent the thermometer shaking about during transit by post or rail.

Place this box in a larger box so that there is a free space of from one to two inches between the two. This space should be carefully packed with saw-dust; cotton wool or soft paper, so that the whole of the inner box (the top, bottom and sides) is enclosed in a layer of about 2 inches of soft materials in such a manner that it will not move about inside the outer box. The lid of the outer box should then be screwed down, as the jarring made by driving nails into it might break the instrument.

## APPENDIX C TO INDIAN SUPPLEMENT

INSTRUCTIONS TO GUIDE FIREPROOFING OF MAGAZINE CLOTHING  
IN ORDNANCE ESTABLISHMENTS

The clothes will be washed and dried before fireproofing is carried out.

The ingredients and the proportions to be used for the fireproofing solution are :—

Borax-refined	...	...	Lbs 6-6-6
Acid Boric	...	..	Lbs 3-14-6
Tri-sodium phosphate	...	...	Lbs 1-12-13
Water	...	...	Lbs 88

Mix the above, stirring and warming the contents. Immerse the clothes for 20 minutes, the solution being maintained at 60°C and stir the garments with a stick.

After immersion remove the garments and allow them to air-dry. The clothes **MUST NOT** be 'wrung out'.

Clothing in everyday use should be washed and re-fireproofed at least once every fortnight.

## APPENDIX D TO INDIAN SUPPLEMENT

## REGULATIONS FOR THE CONVEYANCE OF GOVERNMENT EXPLOSIVES AND/OR AMMUNITION BY ROAD IN MECHANICALLY PROPELLED VEHICLES

## 1. General

(a) These Regulations have been framed to govern the conveyance of Govt. explosives and/or ammunition by road and are applicable to all the three Services.

(b) The term 'Explosives' mentioned hereinafter will cover bulk explosives and/or filled ammunition or both.

(c) When deviations from these Regulations become inescapable in any particular consignment/consignments, a full report will be submitted to service HQ for sanction.

## 2. Vehicles

(a) No road Vehicle driven by steam or producer gas and no trailer other than an articulated one will be used for transport of explosives.

(b) Vehicles will not be refuelled within an enclosed explosives area.

(c) Mechanically driven vehicles except those specifically approved for the purpose will not be allowed within magazines.

(d) Covered Vehicles will normally be used. If these are not available, open vehicles may be used and explosives adequately covered with tarpaulins to protect them from rain and direct exposure to sun.

(e) The vehicles used for conveyance of explosives of Groups 1 to 4 must comply with the following :—

(i) The vehicle will be of covered type.

(ii) It should be fitted with a quick action cut off to the fuel feed pipe as near the driver's seat as possible, but not so close as to be involved in a fire therein.

(iii) The Fuel tank of the vehicle will be carried under the driver's seat only.



- (iv) Floor board and other wooden structure of the body should be rendered fireproof. If such vehicles are not available, only vehicles with metal bodies and floor boards should be used for the conveyance of explosives by road.
- (v) The cab should be separated from the body of the vehicle by a fire resisting screen carried down to within 12 in. of the ground, a clear space of about six inches being provided between the screen and the body. The whole of the exhaust pipe will be carried in front of the screen.
- (vi) There is to be no opening in the body of the vehicle except the door at the back which is to fit closely.
- (vii) If covered type vehicles are not available, a portable magazine may be used. The vehicles are to comply with (ii), (iv) and (v) above.
- (viii) Trailers will comply with relevant requirements referred to in this paragraph.
- (ix) If the vehicle is of the oil driven type, the fuel used in the engine must not give off an inflammable vapour at a temperature of less than one hundred and fifty degrees Fahrenheit, (i.e. the flash point of the fuel used should not be less than 150°F.).

Note 1.—Notwithstanding anything contained in para 2(e) above, small quantities of explosives not exceeding 500 lbs. gross in suitable packages and further packed in an approved metallic container may be transported by any type of road vehicle and this arrangement may also be applied to Groups 1, 2, 3 and 4. For specification of the metallic container to be used, see Schedule 'D'.

Note 2.—Where Service vehicles do not comply with the requirements of para 2(a) to 2(e)(i)—(viii) above, the Service H.Qrs. may grant necessary relaxations.

(f) The officer supervising the vehicle or responsible for obtaining it from the authorised contractor will ensure that:—

- (i) The vehicle supplied is in good mechanical condition and has its electric wiring, lights, fuel

A copy of these instructions will always be handed over to the driver for strict compliance.

- (c) The driver and the escort shall be at least eighteen years of age.
- (d) As far as possible for any continuous trip exceeding 6 driving hours a spare driver will be provided by O.C. Unit supplying the transport.
- (e) The driver and the escort will each be provided with one copy of the relevant extracts from Schedule 'C' for guidance and immediate action in case of a fire involving the vehicle or the load. These instructions will be fully explained to them before the commencement of the journey.
- (f) The driver and the escort will also be provided with the following certificate duly sealed and signed by the consignor.

"This is to certify that the bearer of this certificate is escorting Govt. explosives/ammunition and is to be given all possible help, in the event of a breakdown or accident, specially in phoning the authorities concerned.

Signed.....

Rank.....

Date.....

*Note.*—Translations of the instructions and the certificate referred to at sub-paras (e) and (f) respectively above will be made in Hindi or local language and a copy handed over to the person/s concerned.

## 6 *Safety Precautions*

- (a) Instructions for loading and unloading of vehicles used for conveyance of explosives, incorporated in Schedule 'A' to these Regulations will be strictly complied with.
- (b) No explosives will be carried in the cab.
- (c) As far as possible all journeys will be completed during the hours of day light.

- (d) The journey will be routed to avoid as far as possible passing through thickly populated areas.
- (e) The speed of the vehicle will not exceed 20 m.p.h. In the case of vehicles upto 3 tons capacity, the speed of the vehicle outside the depots may however be increased to 25 m.p.h. on metalled or tarred roads subject to the permissible speed limits, as laid down in Formation Orders.
- (f) A vehicle loaded with explosives will under no circumstances be left unattended.
- (g) When explosives are carried in a convoy the distance between any two vehicles will not be less than 75 yards, but in case of fire on any vehicle the distance will not be less than 300 yards.
- (h) During loading, unloading or transport of explosives all personnel will observe necessary precautions for the prevention of accidents by fire or explosions.
- (j) When transporting unboxed ammunition, all projectiles will be laid on their sides and not on their bases, and with the sides of the projectiles parallel to the side of the truck, so that the projectiles will not roll back and damage the tail board of the truck and fall out.
- (k) No unauthorised person will be permitted access to the explosives being carried or to act in a manner which is likely to cause fire or explosion.
- (l) When W.P. ammunition is transported, adequate quantities of sand and water will also be carried in suitable containers.

#### 7 *Special instructions for Transport of IAF Ammunition.*

- (a) IAF, HE A/C Bombs may be loaded to the normal loading capacity of the vehicle. Bombs upto 1,000 lbs. weight will be loaded crosswise and will be securely chocked and roped. Bombs exceeding 1,000 lbs. in weight will be loaded lengthwise and chocked and roped.
- (b) During handling and stacking stores like Shell H.E. 60 lbs. SAP, which are fitted with thermal

initiators, special precautions are necessary. For this purpose they should be loaded transversely to the line of movement of the vehicle. They should be placed base to base or nose to nose each row being securely scotched to prevent movement during transport.

8 *Special Instructions for Transport of C.W. Weapons*

- (a) Chemical Warfare agents whether in chemical warfare weapons or in storage drums will be classified as Group 13 for storage and transport. The appropriate labels will be applied. They will not be transported in the same vehicle with any other materials. On no account will C.W. Weapons be loaded with bleaching powder.
- (b) Chemical Warfare Weapons shall be conveyed in open vehicles, well sheeted and covered with tarpaulins. Trucks with metal bodies and floors should be normally used for the conveyance of C.W.W.
- (c) The transport of chemical warfare weapons should preferably be confined to Government vehicles in good mechanical condition and provided with a cut-off valve in the fuel supply system.
- (d) When light cased weapons "charged 'Y'" are carried unboxed, the floor of the vehicle will be covered by tarpaulins or a layer of sand/saw dust. The consignee will remove these at the completion of the journey, and carry out necessary decontamination.
- (e) Transport of light cased weapons through thickly populated areas must be avoided as far as possible. The route should be carefully planned in advance to avoid such areas even to the extent of making a considerable detour.
- (f) Vehicles loaded with light cased weapons will not be parked by road side, particularly at night. If parking becomes necessary, it should be done in a field.
- (g) Chemical warfare weapons will always be accompanied by a conductor or a conducting party. The composition of the conducting party escort

will be in accordance with the instructions in force.

- (h) Personnel forming a conducting party will be trained in the handling of C.W. Weapons, detection and disposal of leakage, first aid in case of Gas casualties, etc., and given instructions in writing as to their duties. They will be provided with decontamination equipment and protective clothing to the appropriate scale (ER Pt. I, 1942, Appx. 65, table 4). In addition they will have the following items :—
- (i) Bags for contaminated clothing.
  - (ii) Spare clothing as necessary.
  - (iii) Alarm signals.
  - (iv) Ammonia spray for detection of leakage of G1.
- (j) The decontamination equipment will be carried in a separate vehicle and care must be taken to ensure that this vehicle keeps in close touch with the loaded vehicles during the whole of the journey.
- (k) Consignments should be arranged in the largest possible groups of vehicles so as to prevent uneconomical use of conducting personnel.
- (l) Decontamination of vehicles will be carried out as laid down in R.A.O.S. Volume 3, Pamphlet No. 7.
- (m) In the case of light cased weapons, only one type of Charging will be loaded in one vehicle.
- (n) Vehicles will be inspected and conducting party will ensure that vehicles are free from contamination, before the vehicles are returned to garages, vehicle parks, etc.
- (o) Vehicles which have been contaminated will be decontaminated thoroughly and it will be ensured by suitable marking that such vehicles are not used for the carriage of food stuffs for three months.

## SCHEDULE 'A' TO APPENDIX 'D'

## INSTRUCTIONS REGARDING LOADING/UNLOADING OF VEHICLES

- 1 Loading/unloading will be carried out under the direct supervision of a responsible person.
- 2 Before loading is commenced, the interior of vehicles will be thoroughly cleaned from grit, oily rags, waste and other combustible material. On no account will explosives be loaded into a vehicle which is contaminated with tar, oil paint or other substance which might stick to the explosive packages or unboxed ammunition or might confuse the markings on them.
- 3 The person-in-charge will ensure that the provisions of paras 2(f) and 3 of the Regulations are complied with.
- 4 No smoking will be permitted within 30 yds. of the vehicle and no fire or naked light will be allowed within 100 yds. of the vehicle.
- 5 Explosives will not be unloaded or piled immediately behind the exhaust of a vehicle.
- 6 After loading/unloading has commenced, the work will be completed without interruption as far as possible. If the work is interrupted, the vehicle will not be left unattended.
- 7 Explosives will be protected from rain or prolonged direct exposure to sun during loading/unloading.
- 8 Whilst loading/unloading is being carried out, engine will be switched off and no refilling of the fuel tanks will be allowed.
- 9 All packages in the vehicle will be well secured and effectively protected against the risk of pilfering and sabotage. All unboxed projectiles will be properly loaded and securely scotched to protect them from damage and to avoid accident by rolling or movement.
- 10 The tail board at the rear of the vehicle will be well secured before starting.
- 11 At the time of unloading, the packages will be examined for any evidence of pilferage/sabotage. Broken,

damaged or doubtful packages found will be set aside for examination. The attention of the driver and/or escort will be drawn to these and any statement made by them/him will be recorded.

12 After unloading, the inside of the vehicle will be thoroughly cleaned and decontaminated if necessary in case of vehicles carrying chemical warfare weapons.

Note.—After loading, a board (wooden or cardboard) indicating the Explosive Group number in 2-in. letters loaded in the vehicle will be hung on both sides of the vehicle. This will enable the identification of the contents for combating fire as per instructions contained in Schedule 'C'.

SCHEDULE 'B' TO APPENDIX 'D'  
INSTRUCTIONS TO DRIVERS OF ROAD VEHICLES TRANSPORTING  
GOVERNMENT EXPLOSIVES

The driver of a vehicle carrying Government Explosives will ensure that :—

- (i) the vehicle and load are examined before the journey begins to see that the vehicle is in a serviceable condition and the load is properly secured and evenly distributed
- (ii) his lighter, matches and smoking materials, if any, and those of the escort are placed in the metal box supplied which is to be carried unopened in a safe position within the cab of the vehicle
- (iii) chemical fire extinguisher of suitable size is carried in the vehicle fitted in a handy position
- (iv) adequate quantities of sand and water are carried in suitable containers when W.P. Ammunition is transported. When incendiary ammunition from group 11 is transported sufficient quantities of sand will be carried
- (v) red flags are displayed on both sides of the cab and at the rear of the vehicle
- (vi) no explosives are carried in the driver's cab
- (vii) when the vehicle is loaded or unloaded or during refuelling, the electric ignition system should be switched off and if the engine is provided with magneto ignition, it should be grounded
- (viii) no fuel is carried in or on the vehicle except in the fuel tank
- (ix) the tail board of the vehicle at the rear is well secured before starting off
- (x) the speed limit of 20 miles per hour is strictly observed. It may, however, be increased to 25 miles per hour for vehicles upto 3 tons capacity in case of metalled or tarred roads, subject to permissible speed limit as laid down in Formation Orders



- (vi) the vehicle is stopped before passing any unguarded level crossings and started only after ascertaining that it is safe to proceed further,
- (vii) the vehicle is stopped as soon as possible in open country after covering approximately 5 miles and is also stopped thereafter in open country at intervals of one hour of driving and inspected to see that :—
  - (a) the vehicle is generally in a serviceable condition,
  - (b) the load remains adequately secure and intact,
  - (c) no undue heat is being generated through movement of the load, rubbing of the tyres on the chassis, deflation of the tyres, faulty brake adjustment or other cause,
- (viii) any defect found on inspection is remedied before he proceeds further on the journey,
- (ix) if an accident or breakdown occurs enroute he informs the consignee or consignor as quickly as possible. Police and the nearest military commander should also be notified. In the event of mechanical breakdown, he will notify the local military commander and will take orders from him regarding action to be taken.
- (x) in case of an accident and where the ammunition involved can reasonably be suspected to have been rendered dangerous, no action will be taken to gather and/or set aside any packages or its contents which might have been thrown about as a result of the accident. Such ammunition will be left in situ till the arrival of competent persons who will decide as to what further action is to be taken. The affected area will be prominently marked and action taken to warn incoming traffic of the danger. In the event of a vehicle being entangled with another or with any object or structure, no attempt will be made to disentangle the same, until the load is removed to a place 100 yards away from the vehicle or any habitation. Inhabitants and other vehicles will be warned of the danger,

Note.—The foregoing does not however prohibit action at the discretion of the escort commander or other responsible person on the spot which he may consider essential to avert immediate danger to life or property.

- (xvi) Neither he nor the escort nor any other person smokes on or within 30 yards of the vehicle.
- (xvii) the vehicle is not at any time left unattended (i.e. either the driver or the escort is on the vehicle or close to it) and that no person other than the driver or the escort is allowed on the vehicle except for the purpose of loading or unloading.
- (xviii) the journey is completed without unnecessary halts and the vehicle is not put up in any building or stopped in any populated area except when absolutely necessary,
- (xix) no garage or major repair is carried out while explosives are on the vehicle,
- (xx) the vehicle is not brought within 75 yards of another vehicle of the same convoy unless this prevents the vehicle from remaining in the convoy.
- (xxi) the escort will normally travel in the cab of the vehicle in addition to the driver. When however explosives are transported in vehicle outside ordnance depots, one person only may ride in the back of the vehicle to prevent pilferage, etc.

Note.—This, however, will not apply to personnel riding on the body of the vehicle carrying small quantities of explosives in the ordinary course of duty.

- (xxii) in the event of a fire on the vehicle he will take action in accordance with the Instructions contained in Schedule 'C' (copy of relevant extracts of which have been given to him and the escort) with particular attention to the risk involved as referred to in the extracts and explained to him before commencement of the journey.

## SCHEDULE 'C' TO APPENDIX 'D'

## INSTRUCTIONS TO DRIVERS/ESCORT COMMANDERS OF ROAD VEHICLES CARRYING GOVERNMENT EXPLOSIVES—FIRE ACTION.

1 You have a load of explosives. If a fire breaks out in the vehicle **YOU MUST ACT QUICKLY.**

2 **PREVENTION IS BETTER THAN CURE.** Before starting off, check your fire extinguisher. See that it is filled, ready to your hand and in good working order. See your vehicle is clear of combustible materials.

3 Keep clear of any other vehicle on fire by 75 yards. If the vehicle on fire contains explosives do not get your vehicle nearer than 300 yards.

4 If your engine, petrol or oil system catches fire, get busy with your fire extinguisher, first closing the cut-off, if fitted. If your vehicle catches fire, get busy with your fire extinguisher and any water you can get.

5 If fire is detected early the prompt application of the fire extinguisher may prevent the development of a serious fire and consequent explosion/detonation.

6 Should you succeed in extinguishing the fire, examine the vehicle and load carefully, to see that there is no smouldering before proceeding on your journey.

7 If you cannot put out the fire, **YOU HAVE TO THINK AND ACT QUICKLY.** Send the escort to alarm the area and to get the news to the Police and any Fire Service as quickly as possible. With the help of passers by, stop traffic and keep the road and vicinity clear of unnecessary personnel for 300 yards from the vehicle. If you are in a town or village and can drive the vehicle into open country safely do so.

8 So long as the fire is not actually affecting the packages or loose weapons there is no immediate danger.

9 When the Police or fire brigade arrive, give them the copy of extracts from Schedule "C" which detail the group number of explosives carried and fire action to be taken.

10 Action to be taken in case of fire on different groups of explosives is detailed below :—

(i) *Groups 1, 2 and 10.*—If fire reaches explosives of these groups, an explosion or a detonation is inevitable and may be expected in a few minutes. In this case the fire should not be fought, the vehicle will be abandoned, all personnel evacuated from the vicinity and action will be confined to preventing the fire involving surrounding places and protecting them from the effect of an explosion/fire.

The roofs and walls of buildings sufficiently near the burning vehicle likely to be affected by the burning debris or sparks should be thoroughly sprayed with water from the outset.

(ii) *Groups 4, 5, 6, 7, 7A and 8.*—If fire reaches the packages or weapons containing these explosives groups, the whole lot may explode, though there is likely to be some time interval, depending on the fierceness of the fire. The fire can therefore be fought in the early stages. If unsuccessful, attention should be directed to protect surrounding places from the effects of an explosion/fire. All non-essential personnel will be evacuated from the vicinity. Fire-fighting services on arrival can attack the fire even after the explosives have become involved in the fire with a reasonable hope of success but the operation should be carried out from a protected position to guard against the risk of explosion/detonation.

NOTE.—In the case of Group 6 there are certain items of explosives which carry only a fire risk as described in (iii) below. In case of such types of explosives of Group 6 being transported, the loading authority will give clear instructions to the driver/escort that the load carries only a fire risk and action be taken in accordance with para (iii) below. Otherwise all explosives of Group 6 will be considered to bear an explosion risk as detailed above.

(iii) *Groups 3, 9, 11 (other than incendiary ammunition containing metallic powders) and Group 15.*—There is no likelihood of mass explosion. Only a fierce fire, with, in some instances toxic effects, may be expected when fire reaches the explosives. The

application of the fire extinguisher will be useful only upto the stage of fire reaching the explosives in the packages after which the Fire Fighting First Aid Measures are unlikely to be effective.

Firefighting services, on arrival will fight the fire from a distance with a view to subduing the fire.

- (iv) *Group 12.*—There is no risk of mass explosion, but a fierce fire with dense smoke may be expected. To avoid effects of smoke the fire should be fought from the windward side

The Fire should be fought with water and sand carried specially for the purpose.

Special precautions are necessary in disposing of the residues as loose phosphorus will ignite spontaneously when it dries out. The residues should be carefully collected and destroyed by allowing to burn at a safe place.

Phosphorus causes severe flesh burns which require medical treatment. Special care should therefore be exercised to avoid contact between phosphorus and fire-fighting equipment or clothing or person.

- (v) *Group 13.*—There will not be an explosion but serious gas effects may be expected. The bursting charges of weapons of this group are liable to explode in a fire and scatter the toxic fillings. The Police will be warned. Antigas equipment will be necessary. The fire must be fought from the windward side.

- (vi) *Group 11—Incendiary ammunition containing metallic powders.*—The explosives are likely to be ignited readily and may burn with great violence. Dry sand must be used to fight the fire. Water, foam or chemical extinguisher must not be used. The powders contained in the ammunition should not be agitated.

## SCHEDULE 'D' TO APPENDIX 'D'

GENERAL—SPECIFICATION OF METAL CYLINDERS AND METAL CASES FOR CONVEYANCE OF EXPLOSIVES—VIDE NOTE UNDER PARA 2(e) OF THE REGULATIONS.

1 *Body*—Of wrought iron, mild steel, hard rolled brass, muntz metal, or zinc, rivetted or lap-welded filled at both ends with a substantial flange of same materials or of gunmetal for the attachment of lid and bottom; if of iron or steel to be thoroughly galvanised after making up or to be effectively painted.

Thickness not less than 18 B.G.=0.0495 inches, or if of zinc not less than  $\frac{3}{8}$  inch.

*Bottom*—Of same materials or gunmetal; if of iron or steel to be thoroughly galvanised; securely rivetted to flange of body or forming part of such flange.

Thickness not less than  $\frac{1}{8}$  inch, or if of zinc, not less than  $\frac{3}{8}$  inch.

*Lid*—Of same materials or gunmetal; if of iron or steel to be thoroughly galvanised.

Thickness not less than 1/16th inch at centre, and not less than  $\frac{1}{8}$  inch at rim or if of zinc, not less than  $\frac{3}{8}$  inch throughout.

*Fastening*—The lid to be secured by not less than four good screws, bolts, with or without a substantial hinge, which may take the place of one of the four screws, bolts or swing bolts.

*Washer*—A washer of leather, India rubber, or other suitable material, to be between the lid and the flange; unless the lid is fitted with a projecting ring fitting into a depression in the flange.

All rivet heads to be well finished, and the inside of the package to be free from rough edges or burns.

The whole to be of good material and workmanship, and to be maintained in an efficient condition.

2 The following Service packages may also be used for conveyance of explosives in lieu of metallic containers to specifications detailed above:

Cases, transport, detonators.

Cases, transport, explosive.

## APPENDIX E TO INDIAN SUPPLEMENT

THEORETICAL CRATER DIAMETERS FOR GIVEN QUANTITIES OF  
EXPLOSIVES (APPROXIMATE).

Lbs.						Diameter (feet)
1,000	..	..	..	..	..	25
2,000	..	..	..	..	..	32
4,000	..	..	..	..	..	40
10,000	..	..	..	..	..	54
20,000	..	..	..	..	..	68
40,000	..	..	..	..	..	85
70,000	..	..	..	..	..	104
100,000	..	..	..	..	..	116
150,000	..	..	..	..	..	133
200,000	..	..	..	..	..	147
250,000	..	..	..	..	..	158
300,000	..	..	..	..	..	168

NOTE.—Crater Diameters for intermediate quantities may be interpolated.

APPENDIX F TO INDIAN SUPPLEMENT  
 (REPRODUCED AS IN E IN C TECHNICAL PAPER No 15)  
 REQUIREMENTS FOR DUST TIGHT ENCLOSURE IN ELECTRICAL  
 INSTALLATIONS

Note :—Pending the issue of a B.S. Specification for “dust tight” enclosure, with appropriate tests, the following general principles of design and construction of enclosures of electrical fittings apparatus and machinery are to be complied with in electrical installations for buildings containing explosives Groups 1—13.

These requirements are to be read in conjunction with any detailed Specification for dust-tight apparatus issued by Service Headquarters.

Departures from these requirements will not be permitted unless specially approved by Service Headquarters. 2 Cases, Lids, Covers, Inspection Plates.—Material shall be to Departmental Specification and of best quality.

To be of cast or pressed metal, of rigid design and ample thickness for their purpose, castings shall have a minimum finished thickness of  $\frac{1}{8}$  in. and pressed metal a minimum thickness of  $\frac{1}{16}$  in.

2.1 Fabricated construction with continuous welding will only be considered for large items where pressings or castings would be unacceptable on account of cost or weight, etc.

2.2 Exteriors shall be designed with a view to ease of cleaning and avoidance of crevices which would accumulate dust. Similar requirements shall apply to clips saddles and all securing fixtures for apparatus. Exteriors and interiors of ferrous metal enclosures are to be rust proofed by an approved process and all exteriors shall have a smooth hard and anticorrosive finish.

2.3 Cases shall be designed for conduit entry of cables, armoured lead covered cables, or mineral insulated metallic sheathed cables, as may be specified.

2.4 Conduit glands and cable glands shall preferably be made integral with the case. If attachable glands are necessary, they shall be brazed or welded to the case and



3.5 Before the joint is closed it shall be smeared with a high melting point grease to prevent rust and ensure dust tightness. Suitable grease shall be selected from those specified in the "Handbook of Service Lubricants".

3.6 "Use of Gaskets.—When specially authorised, gaskets may be used in lieu of machine faced joints to ensure dust tightness, provided that :—

- (a) The gasket is of non-perishable material.
- (b) The joint so made is not required to be broken for normal maintenance and repair.
- (c) The flanges and housings of the joints are of adequate dimensions to ensure dust tightness".

#### 4 Conduit and conduit fittings.

4.1 Conduit and fittings shall be to B.S.S. 31, Class B, except as modified herein. The conduit shall be solid-drawn, screwed and galvanized. Conduit boxes and covers shall be of malleable cast iron and galvanized. Joints in conduit system must be kept to a minimum and except for conduit couplings, only conduit boxes shall be used. Inspection fittings and solid tees will not be permitted. Solid elbows will only be permitted for the direct connection between conduit and apparatus. The joint between cover and box shall be machined flat and smooth and shall be not less than 3/16 inch in width. Fixing screws shall be exterior to the joint surface.

4.2 Drainage holes in conduit shall be closed by iron plugs, which shall be galvanised and made captive by a chain secured to the conduit. The joint between plug and conduit is to be flat and smooth and smeared with grease as specified above in Clause 3.5.

4.3 Conduit shall be screwed into conduit boxes and in the gland boxes of all other enclosures against a shoulder provided for the purpose and the conduit end is to be faced to ensure a tight metal to metal joint.

A machined faced locking nut is to be provided on couplers and running joints to ensure "dust tightness".

#### 5. Lighting Fittings

All joints in these fittings shall be made "dust tight" in accordance with the above requirements. Glasses shall

be cemented between metal rings having the appropriate width of flange for joint purposes as specified above.

## 6 Motors

6.1 Frames and brackets of electrical machines shall be designed with as few openings as practicable and joints and covers shall be made "dust tight" in accordance with the above mentioned requirements. Labyrinth type glands or an approved dust excluding seal, grease filled, shall be fitted where the shaft emerges from the end bracket. Means shall be provided for keeping the gland and seal enclosures filled with grease.

## 7 Spindles for switches and controllers, etc.

7.1 Spindles upto  $\frac{1}{2}$  in. in diameter shall be made "dust tight" by means of a close fitting bush giving an "easy slide or close running" fit in accordance with B.S.S. 164. The length of the bush shall not be less than one inch. Alternatively the spindle may be fitted with a tight fitting cup cover which shall shroud the enclosure and provide a minimum air path of one inch between the interior and exterior of the enclosure. The cup cover shall be slide-fit on the enclosure.

Larger spindles for switch and controller handles and push button switches shall pass through labyrinth glands or an approved dust excluding seal.

## 8 Miscellaneous Apparatus.

8.1 Cones and diaphragms of "dust tight" loud-speakers and telephones shall be of fireproof material and formed without ridges or corrugations. The mounting of the cone or diaphragm to the flanged enclosure shall be made "dust tight" by a suitable adhesive and secured by a metal ring having an adequate number of securing screws. The width of the flange shall be not less than that specified above for covers and lids, etc. The cone or diaphragm shall be protected by a stout wire guard of  $\frac{1}{4}$  mesh.

8.2 "Dust tight" heaters shall be completely enclosed in accordance with the above-mentioned requirements.

## 9 Design and Manufacture

9.1. All apparatus intended to be "dust tight" shall have ample interior air space with a view to prevention of

excess rise of pressure when arcs or sparks occur in normal use, *e.g.* on operation of switches, circuit breakers and controller, blowing of fuzes, etc.

9.2 Special attention shall be given to the manufacture and inspection of "dust tight" enclosures to ensure that they are mechanically sound and without flaws and finished in accordance with specified requirements.

9.3 "Dust tight apparatus" which is required to be weather-proof also shall preferably be installed under a weather proof housing.

## APPENDIX G TO INDIAN SUPPLEMENT.

SPECIAL PROVISIONS FOR THE STORAGE OF AMMUNITION AND  
EXPLOSIVES ON UNIT CHARGE1 *General*

Comprehensive instructions regarding the storage and maintenance of ammunition are contained in Magazine Regulations (Land Service). In consideration of the limitations of units' resources and the non-static conditions prevailing in units, the following relaxations from Magazine Regulations (Land Service) as contained in this Appendix may be taken advantage of, for the storage of ammunition by units. Instructions laid down elsewhere in Magazine Regulations and Indian Supplement thereto, which are not covered in this Appendix, will however be strictly followed in so far as they affect storage and maintenance of ammunition on unit charge.

2 *Storage*

Normally covered accommodation of a permanent nature should be provided for storage of ammunition. As far as possible each group should be stored in separate buildings or in separate bins in the case of bin type buildings. If however sufficient accommodation for storage of each group separately in a building/bin is not available or the quantities held on charge are so small as to make provision of separate buildings/bins uneconomical, the ammunition from the following groups may be stored in the same building/bin or compartment provided the different groups are separated from each other by a partition wall at least 9" thick or one thickness of sand bag or same thickness of ammunition boxes filled with earth. Different groups will not however be mixed in the same stack.

(a) Groups 1, 2 and 4—These need not necessarily be stored under magazine conditions unless bulk gunpowder or blasting powder in Group 1 is stored under this grouping in which case magazine conditions are obligatory.

(b) Groups 3, 5 and 6

(c) Groups 5, 6, 8 and 10.

(d) Groups 7 with safety cartridges from Group 6.

(e) Groups 9 and 11.

Groups 7A, 12, 13 and 15 must always be stored separately.

Where a component is not packed with the remainder of the complete round whether boxed or unboxed with which it is associated, it may be stored in the same building as the main round although the remainder of the complete round may be in a different group from that of the separate component.

When storage in the open is unavoidable each group must be stored in a separate stack effectively covered with tarpaulin and away from each other at specified safety distances.

### 3 Storage of Small quantity

In case of explosive storehouses containing *\*small quantities* of ammunition and explosives other than from Groups 7A, 12, 13 and 15, the G.O.C.-in-C may authorise the whole of such ammunition to be kept in one compartment except that ammunition under group 10 must be separated from other Groups by a traverse or wall of sand bags or of empty ammunition packages filled with sand/earth. He may further authorise the whole of such ammunition or explosive to be kept in the same magazine or explosive storehouse with any small quantities of ammunition or explosive such as grenades containing High Explosive, Pyrotechnics, Lachrymatory capsules or Generators, Candles or Generators Smoke or other smoke ammunition which does not contain White Phosphorus, —detonators or igniter sets that are required for local defence. These stores should be kept separate from other explosives by a traverse of sand bags or of empty packages filled with sand.

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*\*Small quantity* of ammunition for purposes of the above storage means the ammunition equivalent of an explosive content of 200 lbs. or any quantity of Small Arms Ammunition of the Safety Cartridges type from Group 6.

- (a) In the case of units which do not hold miscellaneous explosives other than SAA and signal and illuminating cartridges, the G.O.C.-in-C may authorise as a permanent measure the storage in the S.A.A. storehouse of signal and illuminating cartridges provided that they are stored in a case powder M.L. which is kept properly closed.
- (b) Where no specially provided accommodation is available, Small Arms Ammunition of the Safety

Notwithstanding the provisions of para 3 above, separate components of the main charge or round may be stored within the same compartment whatever the difference in explosive group. Such components must however be kept separate properly packed in a cub-board or in shelf and must not be stacked on top of the main round or packages. Further the number of components stored must not exceed their normal operational ratio for the number of main rounds present.

Arms will at no time be stored in the same compartment as ammunition.

When it is operationally necessary to store a small quantity of ammunition (i.e. not more than 400 lbs of gross weight of Groups 1, 2, 3, 4 and 7 taken together or 300 lbs of other Groups also taken together) in a place where no ammunition storehouse is available, temporary storage may be used and all Groups may be stored within the same storehouse except Groups 7A, 12 (white phosphorus), 13 (C.W.W.) and 15 for each of which Groups, if held, separate storage must be provided. Temporary storage as detailed here will be resorted to only in an emergency and never for periods longer than 2 weeks.

Cartridge type from Group 6 in service packages may be stored, in small quantities, in any substantially constructed building or in any room, cupboard, or other compartment in such building provided that the following conditions are fulfilled:—

- (i) The lock-up must be free from easily inflammable material (e.g. it must not be constructed of match board or other such material) and must be subject to no undue risk of fire. Provided that these conditions are fulfilled, it is not necessary that the lock-up should be detached from other buildings.
- (ii) The lock-up must be in charge of a responsible person, must be kept scrupulously clean and devoted exclusively to such storage.
- (iii) The safe custody of the ammunition must be provided for at all times and Officers Commanding will be responsible that the places selected are suitable in all the above respects.

## 6 Bin Type Storage

When provision of separate buildings for the storage of various groups of ammunition that may be held by a unit is considered uneconomical, a building divided into separate compartments/bins by intervening walls may be taken into use. The intervening walls between two bins will be carried from the floor to the roof without gap and will have a minimum thickness of 18 inches.

Improvised bin wall may be constructed in case of an emergency by using sand bags or ammunition boxes filled with sand/earth in which case the thickness will be—

(a) for category X and Y explosives—

(i) sand bags—the length of one sand bag

(ii) boxes—the width of one box to be not less than  $13\frac{1}{2}$  inches.

(b) for categories Z and ZZ explosives—

(i) sand bags—one length and one, width i.e. one sand bag length-ways and one side-ways.

(ii) Boxes—the length of one box to be not less than 18 inches.

7 Bins will be constructed with the main object of preventing propagation of explosion from one bin to another by means of flying fragments or blast impulse. Bins will not be inter-connected. Each bin will have one door only and will open outwards into open air. The size and number of the bins and the buildings may vary according to the nature and quantity of the ammunition required to be stored.

8 The mixing of groups in the same bin will be as given in para 2 above. Storage of ammunition will be so adjusted that two adjacent bins do not both contain category Z or ZZ explosives.

## 9 Traverses

Buildings used for the storage of ammunition and explosives by Units will be adequately traversed in accordance with the "Safety Distance Regulations" as laid down in section II-D of this Supplement.

For improvised storage an outside traverse will consist of either—

(i) A sand bag wall minimum thickness of which at the bottom will be the length of 2 sand bags.

or

(ii) A wall built of empty ammunition boxes preferably of steel filled with sand or earth and minimum width of which at the bottom will be 2 feet.

### 10 Safety Distances

Safety distances need not be observed for buildings containing upto 100 lbs. of explosives on unit charge. Buildings must, however be sited as far from other buildings as circumstances will allow and situated so that in the event of an accident as little damage as possible either from explosion or subsequent fire may occur.

For buildings containing quantities of ammunition and explosives in excess of 100 lbs. (nett explosive content), the safety distances required, *vide* Appendices III to VI of this supplement will be observed. In case of bin type buildings safety distances will be calculated in accordance with para (xxv) of section II-D of this Supplement.

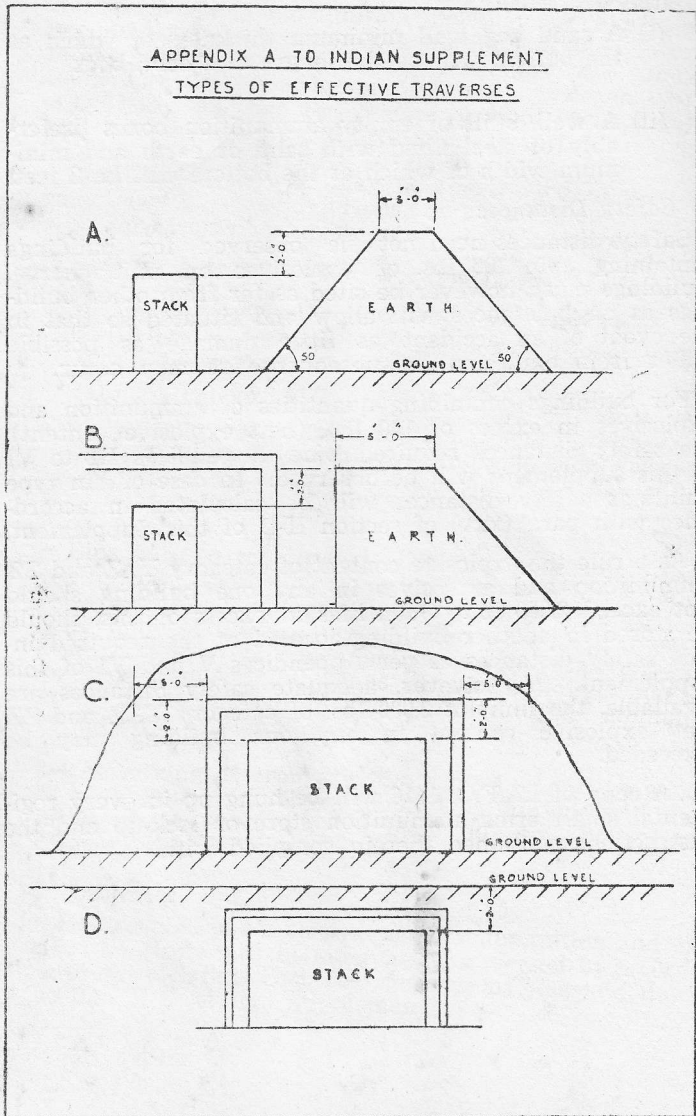
As a rule the explosive content of category Y, Z and ZZ ammunition and explosives in any one building should not exceed 2,000 lbs. Quantities in excess of this, should be stored in another building located at the required inside safety distances as per Appendices V and VI of this supplement. If, however, adequate safety distances are available, the limit of 2,000 lbs. of category Y, Z and ZZ net explosive content in any one building may be exceeded.

11 A copy of I.A.F.O. 1416 will be hung up in every regimental small arms ammunition store or lock-up and the instructions contained therein complied with.



APPENDIX H TO INDIAN SUPPLEMENT  
 TYPES OF EFFECTIVE TRAVERSES

APPENDIX A TO INDIAN SUPPLEMENT  
TYPES OF EFFECTIVE TRAVERSES



APPENDIX J TO INDIAN SUPPLEMENT  
INSTRUCTIONS ON FIGHTING AMMUNITION FIRES

I.—PROCEDURE IN DEPOTS

A GENERAL.

An outbreak of fire amongst or in the vicinity of explosives is a potential source of very great and immediate danger to life and property. The Comds/COOs/OOs of the Ammunition Depots must, therefore, regard as of the greatest importance this responsibility for ensuring that the preventive measures, specified in the relevant Fire Regulations and those issued from time to time from service HQ, are taken and that the organization in the depots is such that when a fire does break out it is tackled immediately and energetically with all available resources.

2 To avoid confusion, the responsibilities of the persons present at such a fire are defined as follows :—

*Comd/COO/OO* is responsible for the general administrative arrangements, e.g. communications, medical, etc. and for the safety aspect of fire fighting, i.e. he will decide in any particular instance whether the Fire Fighting Services are to tackle the building or stack on fire or to prevent the fire affecting adjacent buildings or stacks. He will advise the Depot Fire Master on the risks involved in any given line of action.

*Depot Fire Master* is responsible for the control and direction of all fire fighting personnel and equipment on the object or objectives selected by the *Comd/COO/OO*.

3 The *Comd/COO/OO* will arrange to evacuate all personnel not required for fire fighting, rescue or first aid duties to a place of safety. He will warn the civil Police, particularly when Class 5 explosives are likely to be involved.

4 Fire Fighting measures within an Ammunition Depot call for close attention to detail and the co-ordination of all available means to ensure that an outbreak is tackled immediately and energetically and brought under control as quickly as possible. These measures may conveniently be sub-divided as follows :—

(a) Fire Fighting first aid measures.

(b) Establishment measures.

(c) Mutual Aid Scheme.

(d) Civil Authorities measures.

5 *Fire Fighting first aid measures* are the provision within a building containing explosives or in the vicinity of an explosive stack in the open or underground, of fire fighting appliances and local alarms for operation by those on the spot. The prompt use of these appliances may be the means of preventing a serious fire and all concerned must be trained to be alert and fire conscious and able to operate the equipment.

6 *Establishment measures* include as far as practicable, the provision of an adequate supply of water and foam, where the latter is necessary, hydrants, hose and fire engines, self-contained breathing apparatus, an efficient alarm system and trained fire fighting personnel. All these appliances are to be maintained in an efficient condition. Test calls should be made at frequent and irregular intervals. Special attention should be given to deal with out-breaks during silent hours.

7 *Mutual Aid Scheme.*—The Station Commander who is responsible for security against fire of all Mil Units in the Station, will formulate this scheme and the Comds/COOs/OOs will fully co-operate and assist him in the working of this scheme. Under the scheme all fire Brigades maintained by various Military Units in a Station are made to fight together a fire, on an alarm being given if it breaks out in any Mil Installation in the Station.

8 *Civil Authority measures* are those taken by the Local Fire Authority and include the provision of all the normal equipment used by them, together with trained fire fighting personnel.

9 The close and efficient co-operation of the first three elements is absolutely essential. With regard to the Civil Authorities Measures, it is left to the discretion of the Station Commanders and Commandants/COOs/OOs who may seek the co-operation and assistance of the Local Civil Authorities if considered necessary and feasible. In the event of such a co-operation the following instructions will be observed by the Comd/COO/OO :—

(a) The Comd/COO/OO of the Ammunition Depot will inform the nearest Local Fire Service Officer

of the presence of Explosives. He will be given full details of the layout of the depot, the disposition of explosives, their nature (in terms of fire-fighting only) and all other information necessary for fire fighting personnel, including full details of the fire fighting, first aid, and Depot Fire Fighting Measures. The Local Fire Officer will be kept fully informed up-to-date, as changes take place in the Depot affecting the fire fighting arrangements. He and authorised members of his staff may visit the depot as necessary, by prior arrangement with the Comd/COO/OO to ensure familiarity with the arrangements, ensuring due observance of the Official Secrets Act and current security regulations.

The Comd/COO/OO and the Local Fire Officer, in consultation, will prepare an agreed scheme of fire fighting to cover all contingencies. The Comd/COO/OO will prepare a map of the area, showing the location of the explosives in each Fire Class and will arrange one or more rendezvous points where a copy of this map will be available. Agreement should be reached between the two officers on their respective contributions in equipment and personnel towards the overall fire fighting scheme and combined exercise arranged where possible.

(b) Agreement will be reached on the conditions under which Civil Authority measures will be called upon.

(c) To minimise delay there should be permanent telephone communication between the Comd/COO/OO and the Local Fire Officer, by direct line where possible, particularly at large establishments.

(d) The control of the fire fighting operations within an enclosed explosives area when both the depot and civilian fire services are operating will necessarily be exercised by the Depot Fire Master.

10 To ensure public safety, the Comd/COO/OO should arrange with the local Police on the action to be taken by the latter when an outbreak occurs.

11 To facilitate the task of fire fighting services, explosives and ammunition have been divided, according to their behaviour when involved in a fire, into Fire Classes given in B below. The action to be taken in dealing with such fires has been defined in C below.

12 All fires in which explosives are involved or are likely to be involved, will be tackled by water and/or sand only, except those containing petrol, when foam will be used. Water plentifully applied at the earlier moment, will extinguish most fires involving Explosives.

13 Although phosphide filled weapons are brought to ignition by the action of water it is nevertheless correct to apply water copiously when they are on fire. The flame from the burning phosphide is small and relatively cool, although practically non-extinguishable in air. Flooding with water may increase the number of phosphide ignitions but the total effect should not be serious. It would, however, prevent the spread of the fire to the immediate surrounding, where phosphorus filled weapons may be stacked. The latter, if ignited, can be extinguished by water and would not re-ignite until almost dry. If such weapons are not ignited the application of water should cool them and thus prevent ignition.

14 To facilitate the work of the Fire Fighting Services, each building containing explosives or mettalic powder will be provided with board or plate carrying a symbol to denote the fire class to which these belong. Stacks in open storage will be marked in a similar manner. The details of these symbols are shown in Annexure 'A'.

The boards/plates are to be positioned on all the direct approach routes to the building or stack, though sufficiently clear of them to avoid being damaged or displaced. The symbols should be double sided and positioned in such a place as to be visible from a distance of 200 yards in day light and in the headlights of road vehicles during the night. They can conveniently be fixed on traverses about 5 ft. from ground level.

The symbols will carry no explanatory legend.

15 Where the building or stack contains explosives from two or more fire classes the symbol marking will be for the more dangerous Fire Class.

16 In explanation of the symbol provided on each explosives building and to serve as a further guide to the fire fighting personnel regarding action to be taken in case of fire in a building, posters denoting the appropriate "Action" to be taken by fire fighting personnel will be erected on all normal approaches to an explosives building. These posters shall be fixed at a safe distance in conspicuous position on all normal approaches to the building so that these are clearly visible and shall be at such height from the ground as can be read easily in the head lights of road vehicles. The details of the posters showing symbols for the different Fire Classes along with the respective legends indicating action to be taken in case of fire are shown in Col. 3 "Posters" of Annexure 'A' to Appendix 'J'.

17 Printed posters depicting the symbols and Fire Actions for all the different Fire Classes should be displayed at Fire Stations, guard rooms, entrances to storage areas and other prominent places of the establishment including mustering in and out sites. In case of posters displayed in Fire Stations and entrances to Storage areas, they should also indicate the building Nos pertaining to each Fire Class.

18 A complete set of instruction (both in English and Vernacular languages) together with symbols should be displayed in the Central Fire Station and fire fighting personnel made fully acquainted with fire risk of each building/plinth. Similar information with due regard to the security requirements should be given to Local Fire Fighting Authorities if their assistance has been arranged, *vide* para 9 above.

19 In case of fire in a depot, tarpaulins will immediately be removed from all the stacks placed within the danger zone.

## B. FIRE FIGHTING CLASSIFICATION

1 For Fire fighting purposes explosives and ammunition are divided into fire classes in accordance with their behaviour when involved in a fire. The explosives enumerated under the several classes in the following paragraphs are to be taken as a guide only, as so much depends on the conditions under which the explosives are stored.

- 2 Where the quantity of explosives in a building/ laboratory does not exceed 10 lbs. net, the class marking of the building is not necessary. The Local Fire Officers must be notified *vide* sub para 9, A above.
- 3 Class 1 explosives are those which must be expected to explode en-masse *immediately* fire reaches them.
- 4 Class 2 explosives are those which are readily ignited and burn with great violence without necessarily exploding.
- 5 Class 3 explosives are those which may explode en-masse but compared with Fire Class 1 explosives, may be exposed to a fire for some time before exploding. There will be a blast and fragment hazard.
- 6 Class 4 explosives are those which burn fiercely and give off dense smoke, with, in some instances, toxic effects. There is *no risk of mass explosion*.
- 7 Class 5 explosives are those used in association with toxic substances as chemical weapons.
- 8 Class 6 explosives are those which may be exposed to a fire for some time before exploding. The risk of mass explosion is not involved, but small sporadic explosions will occur with increasing frequency as the fire takes hold. There will be a fragment hazard but not a serious blast risk.
- 9 Class MP comprises substances of the non-explosive dangerous goods class containing metallic powders such as magnesium, aluminium or zinc powders either in ammunition or in bulk when these are held in explosives establishments and provision for fire fighting has, therefore, to be included. These burn fiercely with intense heat.
- 10 The Fire Class for each generic type of explosives is shown in Column 4 of the List of Explosives as shown in Appendix II, and is for explosives and ammunition contained in the approved service packages, and will apply to all forms of storage where the explosives and ammunition are so contained.
- 11 Annexure 'A' to this Appendix shows the fire risk classes, fire risk signs and warning notes.

### C. FIGHTING EXPLOSIVE FIRES ABOVE GROUND SITES

1 The essence of success with explosive fires is speed in getting into action before the fire can develop. The means employed are water, more water and a speedy application. Where petrol is present, foam, not water, is used.

2 When a fire occurs at an open storage site, tarpaulins, other than those of fire-proof material, will be removed from all other open stacks in the vicinity which are considered to be within range or spark or projected burning debris of fragments.

3 *Class 1 explosive fires.*—If detected early, the prompt application of fire fighting first aid measures may prevent the development of a serious fire. The fire alarm must be operated immediately and all non-essential personnel evacuated to a safe position.

On arrival of the fire fighting service, action should be directed towards preventing the explosives from becoming involved, fire fighting operations being carried out from behind cover. The Comd/COO/OO is responsible for advising on the safety aspect of this operation and the Depot Fire Master must refer to his advice.

If the fire reaches the explosives, an explosion is to be expected, the external effects of which will depend upon the quantity and type of explosive, the design of the building and its protecting traverses. Thereafter, in such cases, action will be confined to preventing the fire involving adjacent building or stacks. The roofs and walls of buildings sufficiently near the burning building to feel the effects of the heat be within range burning debris or sparks should be thoroughly sprayed with water from the outset. The Comd/COO/OO will decide whether the explosives contained in these buildings or stacks are also to be sprayed. If the number or size of fragments falling on such buildings is likely to be large, no time should be lost in doing this. If hand operated drenchers or sprinklers are fitted in buildings they should be operated directly the risk is apparent.

At open storage sites the adjacent stacks will be dealt with in a similar manner.



4 *Class 2 explosive fires.*—If detected early the prompt application of fire fighting first aid measures may prevent the development of a fierce fire. The fire alarm must be operated immediately and all non-essential personnel evacuated from the vicinity.

The fire fighting service can fight the fire before and after the explosives become involved as there is no great risk of explosion. The fire is however likely to be fierce. The spread of the fire to neighbouring buildings will be dealt with as for Class 1 explosive fires.

5 *Class 3 explosive fires.*—If detected early, the prompt application of fire fighting first aid measures may prevent the development of a serious fire. The fire alarm will be operated immediately and all non-essential personnel evacuated from the vicinity.

Once the explosives have become involved, the fire fighting services should only continue to operate when substantial cover such as that afforded by intervening mounded buildings or high ground is available.

The spread of the fire to neighbouring buildings will be dealt with as for Class 1 explosive, fires.

6 *Class 4 explosive fires.*—If detected early, prompt application of fire fighting first aid measures may prevent the development of the fire. The fire alarm should be operated immediately.

The fire fighting services may fight the fire, whether the substances are involved or not, as there is no risk of explosion. When the substances are involved dense smoke will be given off and as there may be some risk of toxic effects the use of self contained breathing apparatus is essential. When incendiary fillings are involved a fierce fire, with intense heat, must be expected.

Action to prevent the fire spreading to other buildings or stacks will follow the lines prescribed for Class I explosives fires.

If phosphorus fillings have been involved in the fire, special precautions are necessary in disposing of residue, as loose phosphorus will ignite spontaneously when it dries out. The affected packages and loose residue should therefore be removed to a safe spot, split up into small

isolated groups, and allowed to dry. If spontaneous ignition again occurs, split the groups still further and allow contaminated material to burn out.

When the fire has been subdued the building should be strewn with wet sand and thoroughly cleaned, all residue being removed to a safe place and allowed to burn out. The building should be dried out and carefully inspected in the dark for signs of phosphorus before being used again.

Phosphorus causes severe flesh burns which require medical treatment.

Special care should be exercised by fire fighting personnel to avoid contact between phosphorus and fire fighting equipment or clothing or their person.

7 *Class 5 explosives fires.*—If detected early, prompt application of first aid measures may prevent the development of the fire. The fire alarm should be operated immediately.

The fire fighting services may fight the fire, whether the chargings are involved or not, as there is *no risk of mass explosion*. The toxic effects may, however, be very serious.

The bursting charges of the weapons are liable to explode in a fire and scatter the toxic fillings, consequently, fire fighting personnel must be equipped to deal with liquid contamination and toxic effects in the form of a cloud of lethal gas. They must have protective clothing and Service Respirators or self contained breathing apparatus. The fire should be fought from the windward side. A general alarm must be sounded to put the police and civilian population on the alert and enable them to proceed in accordance with the pre-arranged scheme. All personnel within the enclosed area should don gas masks.

The fire fighting personnel should be relieved at short intervals as prolonged stay in contaminated areas even with protective clothing is likely to affect them.

8 *Class 6 explosives fires.*—If detected before the explosives are involved, prompt application of fire fighting first aid measures will prevent the development of the fire. The alarm should be operated immediately.

Once the explosives have become involved, all non-essential personnel will be evacuated from the vicinity, but the fire fighting services should continue to operate from behind light cover such as brick buildings.

The spread of the fire to neighbouring buildings will be dealt with as for Class 1 explosive fires.

**9 Class MP fires.**—If detected early, prompt application of fire fighting first aid measures may prevent the development of the fire. The firealarm should be operated immediately.

To deal with the burning powders dry sand should be used as extinguisher; powdered talc, powdered asbestos, asbestos graphite can also be used. Care should be taken to avoid agitating the powder.

Water foam or chemical extinguishers (carbon dioxide, methyl bromide and carbon tetrachloride) should not be used except in the case of ammunition in this class which, if caught in the early stages, may be fought with water.

A notice to the above effect should be displayed at each building where these powders are used or stored.

**D. UNDERGROUND SITES** (They are not in use in India at present).

1 The term "underground sites" in the fire fighting sense covers explosives storage sites where the whole of the storage space is below ground level.

2 The general conditions of previous sections apply, together with the following special conditions.

3 In view of the great quantity of explosives often held at such sites and the confined space, special attention must be given to fire prevention measures, alarm circuits and the provision and efficient maintenance of adequate equipment.

4 The water supply should include reserve tanks on the surface, sited well clear of the crater area and, if water is carried to hydrants underground, consideration should be given to the provision of an alternative supply.

5 The alarm system should be arranged to sound throughout the whole area both *above* and *below* ground.

6 In air conditioned sites or in sites provided with forced ventilation the decision whether these are to be shut down on an outbreak of fire must be left to the Fire Fighting Officer on the spot.

7 Fire fighting personnel of the establishment fire service should be drawn principally from those working above ground, who should, however, be familiar with the underground arrangements.

8 Conveyor belts must be stopped on the sounding of the alarm. They may be linked up to the Alarm System to ensure automatic stoppage.

9 Passage ways must be adequate and kept clear to enable working personnel to get away and to allow fire fighting personnel to approach the fire.

10 The fire fighting equipment retained underground should be sited where it is most likely to be readily accessible when an outbreak is detected.

11 Self contained breathing apparatus is essential for underground fire fighting.

12 The fire fighting action follows the general lines set out for above ground sites with the following exceptions:—

*Class 2*—If these explosives become involved the flames are likely to sweep through the workings, the available oxygen will be quickly exhausted and the chances of escape or of fire fighting are very small.

*Class 4*—The smoke, or flames given off by these substances when they become seriously involved will make fire fighting very difficult.

*Class 5*—These weapons will only be held at underground sites in very exceptional circumstances. Should they be involved in a fire at an underground site the fire can be fought so long as it is clear that only the packages are involved. When there is a risk of the weapons bursting through heat or explosion, fire fighting should be suspended.

Full protective equipment should be worn in all operations of this nature.

The site can be entered at a reasonable interval, 2 or 3 days, after the fire ceases and inspected, by fully protected personnel.

13 No person, unless equipped with self-contained breathing apparatus, will enter an underground explosives storage site after an outbreak of fire, until the area has been certified free from noxious gas.

**E. NON-EXPLOSIVE WEAPONS, MAGNESIUM ITEMS OF INCENDIARY AMMUNITION FROM GROUP 11 AND BULK METALLIC POWDERS.**

1 These may be divided into two classes—

*Class (a)*—Magnesium items of incendiary ammunition from group 11, bulk metallic powders and non-explosive weapons containing metallic powders such as Markers Sea Aluminium (Magnesium items of incendiary ammunition consisting of a magnesium body with an explosive filling such as an incendiary bomb and not the explosive composition on the ground that they include magnesium among the other ingredients).

*Class (b)*—All other non-explosive weapons.

2 *Class (a)*—Buildings containing such weapons or metallic powders such as those of magnesium or Zinc will be marked by a crescent symbol detailed in Appendix 'A'.

Where a fire involving the above, occurs the directions for fire fighting are :—

(i) To deal with the burning powders, dry sand or extinguishers such as powdered talc, powdered asbestos, asbestos graphite should be used, care being taken to avoid agitating the powder.

(ii) Water, foam or chemical extinguishers (carbon dioxide, methylabromide and carbon tetrachloride) should not be used, except where necessary for the protection of other dangerous stores in the vicinity not involving metallic powders or weapons containing metallic powders.

A notice to the above effect shall be displayed at each building where these weapons and/or powders are stored.

3 *Class (b)*—Buildings containing the following non-explosive weapons will be treated in the manner described for Class 4 explosive fires and the buildings are to be marked with the Class 4 symbol shown in Annexure 'A'

A.C. Delay Mk II.

Bombs, T.I. 250 lb. No. 29.

Bombs, T.I. 1,000 lb. No. B 29.

Mine water proof, safety No—  
 Bombs, Skymarker, puff.  
 Bombs, Practice aircraft, 8½ lb. break up.  
 Containers, smoke No. 1 Mk I.  
 Containers, smoke No. 2 Mk I.  
 Indicator flame, aircraft, Sea/Rescue, No. 1 Mark 1.  
 Matches, flamer.  
 Matches fuze, safety.  
 Mine charge cases, filled calcium or sodium phosphide.  
 Bombs aircraft smoke, filled F.M. or C.S.A.M.  
 Markers marine.  
 Markers night, depth charge.  
 Candles, smoke, white.  
 Bombs, practice, flame, break up.  
 Bombs, smoke, 10 lbs. flame, filled sodium phosphide.  
 Floats, flame, navigation.  
 Drums, F.M.  
 Slow match.  
 Mines Practice Contact /Tk Mk 1.

## II.—PROCEDURE IN UNITS

Fire risk symbols mentioned in I above will be provided for all stacks/shelters in the DIV/BDE ammunition dumps and Ammunition Points and where practicable for ammunition storages in units. Posters indicating the location of various stacks/shelters, their fire risk symbols and the action to be taken in each case will be displayed in the Unit Fire Picquet and the Guard Room for the information of all concerned.

Units holding small quantities of ammunition stored in bin type buildings will comply with the general instructions contained in I above and will display these symbols. Unit personnel will be made fully conversant with the behaviour of the various ammunition/explosives held by them when involved in a fire and also the action to be taken in dealing with the various types of ammunition fires.

Unit Commanders will ensure that fire fighting appliances are always complete to scale and in serviceable condition. Suitable extracts from the instructions at Appendix J, Part I will be included in the Unit Fire Orders.

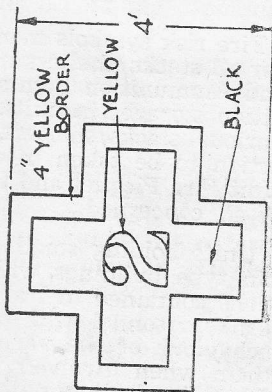
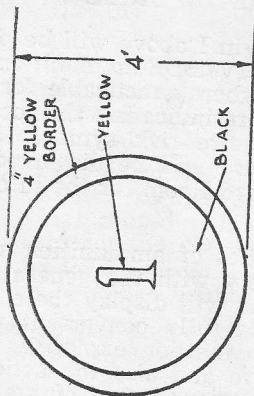
ANNEXURE 'A' TO APPENDIX 'J',

Symbol

Explosive Groups

Class I

Posters  
Class I.



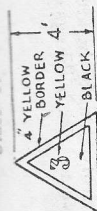
The Building contains explosives which must be expected to explode en masse very soon after fire reaches them. As a result of explosion there will be a serious blast risk.

*Fire Action.*—Fight in the initial stages. If the explosives are actually involved in the fire, abandon the building and concentrate on preventing the fire spreading to the adjacent buildings, taking by spraying water on them.

The building contains explosives which are readily ignited and burn with great violence without necessarily exploding. There is no risk of mass explosion.

*Fire Action.*—Continue to fight the fire preferably from a protected position even when the explosives become involved. If the entire contents of the building are involved in the fire, concentrate more on preventing the fire spreading to the adjacent buildings by spraying them with water.

Class 3.

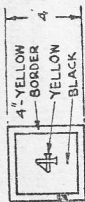


The building contains explosives which may explode en masse but, compared with Fire Class 1 explosives, may be exposed to a fire for some time before exploding. There will be a blast and fragment hazard.

*Fire Action.*—Fight the fire. If the explosives have become involved, fire fighting should be continued *only* from behind substantial cover such as traverses or high ground.

Simultaneous action should be taken to protect surrounding buildings as in case of Class 1 explosives fire.

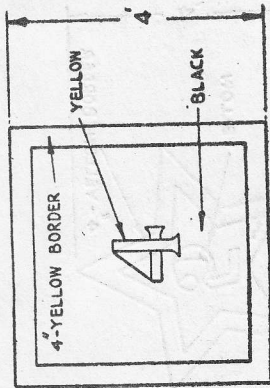
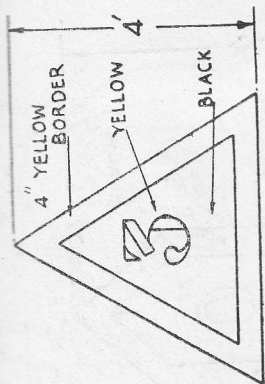
Class 4.



The building contains substances which burn fiercely and give off dense smoke with, in some instances, toxic effects.

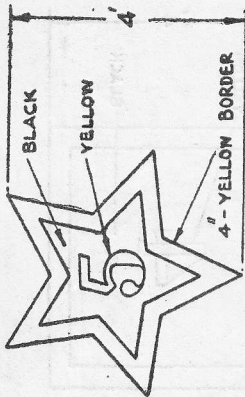
There is no risk of explosion. If incendiary filings/compositions are involved, a fierce fire with intense heat must be expected.

*Fire action.*—Fight the fire from the windward side. Fire fighting should be continued even if the explosives are involved, but self-breathing apparatus should be used. If phosphorus is involved in the fire, exercise special care to avoid contact with it.





Class  
5



Posters:  
Class 5.



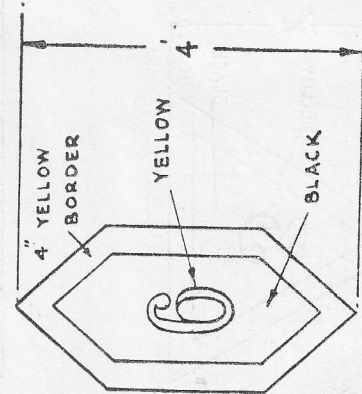
The building contains C.W. Ammunition or C.D. Preparations. There is no risk of mass explosion, but the toxic effects may be serious.

*Fire action.*—Fight the fire from windward side. Fire fighting should be continued even if the explosives are involved in fire.

Use respirators or self contained breathing apparatus. Wear protective clothing.

Avoid contamination from toxic chemicals.

Class 6.



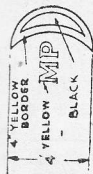
The building contains explosives which are ignited slowly or with difficulty but may give rise to small sporadic explosions as the fire takes hold.

There is no risk of mass explosion. There will be a fragment hazard but not serious blast risk.

*Fire Action.*—Fight the fire. If the explosives have become involved, fight the fire from behind light cover such as brick buildings or blast walls or traverses.

6

MP Class.

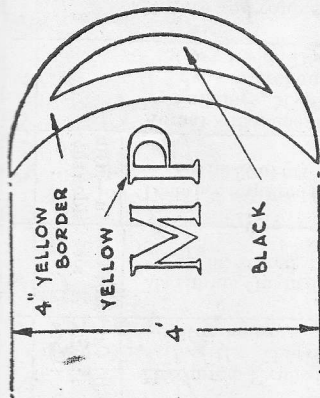


The building contains substances of the non-explosives dangerous goods class containing metallic powders such as magnesium, aluminium or zinc powders either filled in ammunition or in bulk.

These are likely to be ignited readily or with some delay and burn with great violence.

*Fire Action.*—Use dry sand. Do NOT use water except in the case of ammunition, in the early stages of fire.

DO NOT use foam or chemical extinguishers.  
DO NOT agitate the powder.



MP

APPENDIX 'K' TO THE INDIAN SUPPLEMENT

A Sketch will accompany this form invariably

Deviation Statement

Statement of Deviations from the provisions of Magazine Regulations (L. S.) Part I, 1941 as amended to date in respect of Magazines or Explosives Storehouses at \_\_\_\_\_ Depot/Unit.

2	3	4	5	6	7	8	9	10	11	12	13
Is the Magazine or Explosives Storehouse:— (a) Traversed (b) Untraversed (c) Semi-underground (d) Underground	Maximum Explosives limit permitted for the Magazine or Explosives Storehouse Lb : Cat : or : Cats	Maximum Quantity stored or required to be stored therein, with details Lb : Cat : or : Cats	Distance required for the quantity shown against Col (4) In—: Out side : side : :	Actual distance in Yds from other buildings, Magazine and/or Explosives storehouses falling within the Inside Distance shown in (5)	Nature and contents of the Magazines and/or Storehouses shown in (6)	Particulars of all Public Roads, Railways and Buildings falling within the inside/outside safety distances shown in (5) with actual distance from (1) in each case.	Are the Buildings in (8) Government or private.	Particulars of existing deviations from clauses of Mag. Regs. relating to construction and electrical installations.	Periods for which sanction is required	Existing authority for deviation (if any)	Remarks (Here state also the nature of deviation required.)

Magazine or Explosives Store house No.,  
 Description and Dimensions.

## APPENDIX L TO INDIAN SUPPLEMENT

INTERNAL COMBUSTION ENGINES—CONDITIONS FOR USE IN  
EXPLOSIVE AREAS AND UNDER-GROUND AMMUNITION  
STORAGE SITES.*Vehicles, Appliances and Conditions.*

(a) From the safety aspect electrically operated vehicles and lifting or stacking appliances are preferable to those operated by internal combustion engines for use in explosive areas and underground storage sites for explosives. The former should conform to the conditions prescribed in Sec. 3 of this supplement for electrical installations in buildings containing explosives. Of those operated by internal combustion engines, diesel types are preferable to petrol types but in view of the present need to use both types, conditions are given for both. Diesel engines which have petrol starting devices should be regarded as petrol engines in the interpretation of these safety conditions. Trackless diesel vehicles should be interpreted to include towing vehicles used within establishments as well as road vehicles.

Vehicles and mobile lifting or stacking appliances operated by diesel or petrol engine will be permitted in explosive areas on underground storage sites for explosives only under the conditions in the following paragraphs. A summary of some of these conditions is given in Annexure 'A' to this Appendix but this does not include those relating to fuel, garaging, maintenance, speed and explosive limits of fire fighting as given in the various paragraphs. *The danger to personnel and possibly to some bulk explosives arising from exhaust fumes in an enclosed space has also to be considered.*

(b) Details of the required construction of petrol or diesel operated vehicles used for the conveyance of Government explosives by road, with due regard to quantity and to the characteristics of the classification Groups, are given in Regulations for the Conveyance of Government Explosives by Road.

2 *Fuel and Filling Arrangements*(a) *Diesel Engines*

- (i) The oil used as fuel for diesel engines should have a flash point of not less than 150°F as

determined in the manner given in the current British Standard Specification (No. 209).

- (ii) Fuel tanks should be filled only at filling stations approved for the purpose.
- (iii) In underground storage sites where filling stations for diesel engines are approved within the site, the fuel will be taken underground to the filling station in sufficient quantities for one day's work in strong closed receptacles. The filling station must have a floor of concrete with a sill of sufficient height to contain the fuel stored.
- (iv) No spare fuel oil will be carried on diesel operated vehicles or mobile lifting or stacking appliances in an explosives area or underground storage site.

(b) *Petrol Engines.*

- (i) Fuel tanks should be filled only at filling stations approved for the purpose.
- (ii) No spare fuel will be carried on petrol operated vehicles or appliances in an explosives area.

3 *Garaging.*

(a) *Diesel Engines.*

- (i) Vehicles and appliances operated by diesel engines used in an explosives area should not be garaged within the Inside Safety Distance as for explosive buildings of any building or stack containing explosives.
- (ii) Vehicles and appliances operated by diesel engines used in an underground storage site for explosives should preferably be garaged outside the explosives area. If this is not practicable, special authority may be given for them to be garaged at a selected site in the underground site as far as possible from the explosives.

(b) *Petrol Engines.*

Vehicles and appliances operated by petrol engines used in explosives areas will not be garaged within the Inside Safety Distance of any building containing explosives.

#### 4 *Maintenance and Repairs.*

All vehicles and mobile lifting or stacking appliances operated by diesel or petrol engines (including their braking arrangements) used in explosives areas or underground storage sites for explosives will be properly maintained and periodically tested in accordance with the appropriate regulations concerned and will not be used if they have any defect liable to affect their safe running.

#### 5 *Speed and Explosives Limits.*

The maximum load and speed limits for vehicles and mobile lifting or stacking appliances operated by diesel or petrol operated engines in explosives areas or underground sites for the storage of explosives will be decided by the Commandant/COO/OO/OC unit and displayed by notice.

#### 6 *Fire Fighting Appliances and Precautions.*

Vehicles and mobile lifting or stacking appliances operated by diesel or petrol engines used in explosives areas or in underground storage sites for explosives should carry sufficient fire extinguishers of a type suitable for use against petrol and oil fires. Adequate means for fighting such fires should be provided at:—

(a) buildings containing explosives and underground storage sites for explosives where these vehicles and appliances may enter;

(b) garages and fuel filling stations.

#### 7 *Engines Permitted Alongside Explosives Stacked in the Open or Buildings Containing Explosives.*

##### (a) *Diesel Engines.*

A tracked or trackless vehicle and mobile stacking or lifting appliance operated by a diesel engine and fitted with a spark arrester may be used with the engine running alongside a stack in the open or alongside a building containing explosives belonging to any Group.

##### (b) *Petrol Engines.*

Vehicles and mobile stacking or lifting appliances operated by petrol engines may be used alongside a stack in the open or alongside a building containing explosives belonging to any Group provided the exhaust is directed away from the explosives.

*Note.*—The word “alongside” in Sub Paragraphs (a) and (b) as applied to a building includes an external loading bay forming part of such a building.

## 8 *Engines Permitted Inside Buildings Containing Explosives.*

### (a) *Diesel Engines.*

- (i) Any type of tracked or trackless vehicle other than in sub para (ii) below operated by a diesel engine and fitted with a spark arrester may enter a building containing explosives belonging to Groups 5 to 13 (inclusive) provided the engine is stopped or it is uncoupled and removed from the building before loading or unloading is commenced.
- (ii) Tracked or trackless vehicles and mobile stacking or lifting appliances, operated by diesel engines may be used with the engine running in a building containing explosives belonging to Groups 5 to 13 (inclusive) in the course of loading or unloading provided a spark arrester is fitted and that any portion of the exhaust system or any exposed portion of the engine which may develop a surface temperature exceeding 212°F is suitably screened to ensure that all exposed surfaces are below this temperature.
- (iii) Tracked or trackless vehicles and mobile stacking or lifting appliances, operated by diesel engines may enter a building containing explosives belonging to Group 15, and may be used with the engine running in the course of loading or unloading provided they are of a type approved for use in coal mines by the Government of India.

### (b) *Petrol Engines.*

- (i) Road vehicles operated by petrol engines may enter an explosives storehouse containing explosives belonging to Groups 5 to 13 (inclusive) provided the engine is stopped during loading and unloading.
- (ii) Mobile lifting and stacking appliances operated by petrol engines may be used in explosives storehouses containing explosives belonging to Groups 5 to 13 (inclusive) only when specially authorised by the Army HQ.

9 *Use of Engines in Underground Storage Sites Containing Explosives.*

(a) *Diesel Engines.*

Tracked or trackless vehicles operated by diesel engines fitted with spark arresters may enter underground storage sites containing explosives belonging to Groups 5, 6, 7, 8, 9, 10 or incendiary explosives belonging to Group 11 provided the engine is stopped before loading or unloading is commenced.

(b) *Petrol Engines.*

Petrol driven vehicles, lifting or stacking appliances should not be permitted in underground storage sites containing explosives.



*Summary of Safety Conditions for Use of Internal Combustion Engines in Explosive Areas, referred to in para 2 (a) of Appendix 'L'*

(See also footnote at end of this Summary)

Vehicles and lifting or stacking appliances	Permitted alongside open stacks or buildings containing explosives of :—	Permitted in underground storage sites containing explosives of :—
Diesel tracked or trackless vehicles fitted with spark arresters.	All Groups. Engine running (Para 7 (a)).	Groups 5, 6, 7, 8, 9, 10 or incendiary explosives in Group 11. Engine stopped before loading or unloading is commenced. (Para 9(a)).
Diesel tracked or trackless vehicles with screened exhaust system etc. and spark arrester.	All Groups. Engine running (covered also by Para 8(t)).	Groups 5, 6, 7, 8, 9, 10 or incendiary explosives in Group 11. Engine stopped before loading or unloading is commenced. (Para 9(a)).
Diesel tracked or trackless vehicles approved for use in coal mines.	All Groups. Engine running. (covered also by Para 8 (a)).	Groups 5, 6, 7, 8, 9, 10 or incendiary explosives in Group 11. Engine stopped before loading or unloading is commenced. (Para 9 (a).)

Permitted in underground storage sites containing explosives of:—

Permitted inside buildings containing explosives of:—

Permitted alongside open stacks or buildings containing explosives of:—

Vehicles and lifting or stacking appliances.

Not permitted!

Groups 5 to 13 when fitted with screening devices for exhaust. (Para 8 (a)(i)).

All Groups. Engine running. (Para 7(a)).

Diesel driven mobile stacking or lifting appliances fitted with spark arrestors.

Not permitted.

Groups 5 to 13 (inclusive) under explosives storehouse conditions when specially authorised. Engine stopped during loading and unloading. (Para 8 (b)(i)).

All Groups. Engine running but exhaust directed away from explosives. (Para 7 (b)).

Petrol road vehicles

Not permitted.

Groups 5 to 13 (inclusive) under explosives storehouse conditions when specially authorised. (Para 8 (b)(ii)).

All Groups. Engine running but exhaust directed away from the explosives. (Para 7 (b)).

Petrol driven mobile stacking or lifting appliances.

*Note.*—This summary makes no reference to the conditions relating to fuel, garaging, maintenance, speed and explosives limits or fire precautions given in the preceding paragraphs and is, therefore, only an indication of the limitations on engines.