

CHAPTER 15**FIRE SAFETY****CONTENTS**

Para

1 INTRODUCTION

1.1 General Responsibilities

Annex

A Fire Risk Management – Prevention & Protection

B Emergency Response

1 INTRODUCTION**1.1 General Responsibilities**

1.1.1 An outbreak of fire in the vicinity of explosives, or amongst the explosives themselves, must be recognised as a potential source of a great and immediate danger to life and property. HoEs, in conjunction with unit explosives and fire staff, must consider the importance of the Fire Safety¹ measures described in this chapter and ensure that any fire occurrence is tackled effectively and immediately with all available resources. The on-site and/or Local Authority Fire & Rescue Service and other emergency services must also be called or alerted without delay.

1.1.2 Considerable detail is given in this chapter to enable unit explosives staff to liaise effectively with other staff having a responsibility for preventing and fighting fires. Detailed definitive policy not covered by this chapter on such matters as firefighting systems, numbers and location of first aid firefighting equipment, etc, is primarily a matter for Defence Fire Risk Management Organisation (DFRMO) staff². For MOD Fire Safety Policy see JSP 426.

1.1.3 The close involvement and advice of unit specialist explosives staff will be essential in achieving the most effective arrangements for all fire safety matters. That said, HoEs are ultimately responsible for legal requirements falling out of Health and Safety and Fire Safety legislation. Risk assessments form part of these legal requirements and the Management of Health and Safety Regulations, together with Approved Codes of Practice (ACOPs) and JSP 375 (MOD Health and Safety Handbook), should be used as source documents in achieving levels of safety that meet 'as low as reasonably practicable' (ALARP) standards.

1.1.4 Statutory regulation regarding the safety for all employees from fire falls out of the Regulatory Reform (Fire Safety) Order across England and Wales with similar risk based fire safety legislation as it applies to the Crown (MOD) in Scotland and Northern Ireland³. This is supplemented by Regulation 4 of Manufacture and Storage of Explosives Regulations for explosives facilities. These statutory requirements are fundamental to the protection of all personnel on MOD premises. Risk assessments (RA) for this purpose include ongoing RA by a nominated person

¹ Fire Safety is a generic term relating to fire prevention, protection, firefighting and other fire related matters.

² Throughout this document the term DFRMO is used and is deemed to encompass all fire and rescue service personnel working on the MOD estate; be they service (RN or RAF), civilian (DFRS), contractor or agency personnel.

³ Legislation identifies the Defence Fire and Rescue Service as the Fire Safety Enforcing Authority on the MOD Estate.

responsible for a premises or each building on a site, and DFRMO staff who issue Fire Safety Management Plans (FSMP). In essence, the Fire Safety Order⁴ (FSO) defines specific fire safety duties including the requirement that all personnel must be trained in fire safety matters. This is essential when personnel are involved with explosives. The initial reaction of these personnel could be crucial if the consequences of an outbreak of fire are to be minimised. All personnel are to be instructed in the use of firefighting equipment on an annual basis. Fire prevention is dependent on local conditions; consequently, management and supervisors are actively to support and promote fire safety awareness for all personnel, including contractors and visitors to the unit.

1.1.5 The Senior Fire Officer (Local Authority Fire & Rescue Service or DFRMO) has legal responsibility for conducting fire fighting operations and for undertaking Dynamic Operational Risk Assessments (DORA) to determine the appropriate fire fighting actions to be taken. However the specialist nature of explosives means that any DORA is only as good as the information provided on the hazards by site personnel. The MOD Incident Officer must therefore be in a position to provide specialist advice to the Senior Fire Officer on the nature of the explosives, their reaction to stimulus (impact or heat) and the physical storage methodology employed at the establishment. Information on secondary hazards should also be provided; e.g. the thallium risk from Stingray torpedoes. It is stressed that this information is to assist the Senior Fire Officer in reaching realistic conclusions on the necessary actions. The MOD Incident Officer is NOT advising the Senior Fire Officer on how to fight fires. Whilst some of this information may have already been supplied in generic terms the MOD Incident Officer must be capable of utilising on site resources to provide further more detailed information as an incident develops. Arrangements should also be in place to gain access to corporate information (e.g. PT emergency response cell) via the respective chain of command as required. It should be noted that MOD has a Duty of Care to any emergency services personnel who attend an incident at one of their establishments. Any arrangements to meet this duty of care are to be dovetailed into the broader emergency arrangements to meet the duty of care for MOD personnel, contractors and the public.

⁴ The Regulatory Reform (Fire Safety) Order is commonly referred to as the "Fire Safety Order" (FSO).

ANNEX A**FIRE RISK MANAGEMENT – PREVENTION & PROTECTION****CONTENTS**

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1 APPLICABILITY

1.1 Annex A is intended for use by Line Managers, both Service and civilian, who are responsible for the continual management of fire safety. The instructions in this Annex are additional to those in JSP 426 (MOD Fire Safety Policy).

2 INTEGRATED SITE FIRE SAFETY MANAGEMENT PLANS

2.1 MOD Fire Safety Policy

2.1.1 In accordance with legislation, and to comply with the Secretary of State's policy statement, all MOD premises used as places of work shall have a suitable and sufficient fire risk assessment in place.

2.2 Management Obligations

2.2.1 The Fire Safety Order (FSO) introduced a significant change in the responsibilities for Fire Safety in Buildings. Previous legislation made use of a Fire Certificate⁵ which was provided by the Fire Authority; however, the FSO introduced a 'responsible person' (for MOD; person having control of premises – normally the Head of Establishment) who has specific Fire Safety responsibilities:

- (1) Carry out a suitable and sufficient Fire Risk Assessment.
- (2) Provide and maintain general fire precautions to the extent that is appropriate.
- (3) Monitor and review the Risk Assessment and revise as appropriate.
- (4) Inform staff and/or their representative of the identified risks.
- (5) Plan for an emergency.
- (6) Provide staff information, instruction and training.
- (7) Appoint persons to assist.
- (8) Co-operate and co-ordinate with other "responsible persons" on the site where necessary.

2.2.2 The responsible person is typically the Head of Establishment (HoE). It should also be noted that other agencies who have control and/or fund maintenance works may also share these responsibilities, particularly where installed measures fail to offer the protection to persons that could reasonably be expected from these systems; such as fire detection and warning and emergency lighting systems. Measures installed for the protection of firefighters must also be maintained in a serviceable condition with supporting documented records.

2.3 Tactical Information Plans

2.3.1 Risk inspections/visits for Local Fire and & Rescue Authorities, are carried out under Section 7(2)(d) of the Fire and Rescue Services Act 2004 (formally known as Section 1(1)(d) of the Fire Services Act 1947. This section falls under Part 2

'Functions of Fire and Rescue Authorities', Section 7 which requires a fire and rescue authority to make arrangements for obtaining tactical pre-incident information.

2.3.2 As a consequence of the above legislation, mirroring Local Authority Fire and Rescue Service procedures and introducing a generic standard throughout DFRMO's Area of Operations, DFRMO Tactical Information Plans (TIPs) are developed using the format shown in Chief Fire Officers Instruction CFOI-041/2010-Ops.

2.3.3 With specific regard to incidents involving explosives, consideration should be given to the buildings that would require evacuation. The contact details of buildings falling within the respective explosive cordons should be recorded on relevant TIP, so that rapid evacuation can be achieved in an emergency situation.

2.4 Fire Risk Assessments - Life Safety

2.4.1 Within the Defence Community assistance with the Fire Risk Assessment is typically⁶ provided by a DFRMO Officer. The Fire Risk Assessment is reviewed at 1, 3 and 5 year intervals, depending on the Building classification of High, Medium or Low risk rating. However the responsible person should request a review of the Fire Risk Assessment when there is a significant change in the work activity or the use of the building, in materials used or stored, or when building works are proposed and after their implementation.

2.4.2 The outcomes of the Fire Risk Assessment, within the Defence Community are incorporated into the Fire Safety Management Plan (FSMP). Significant findings of the respective Fire Risk Assessment are to be made available to all relevant persons within every building. The person having control of the building will be responsible for ensuring the requirements of the Fire Risk Assessment are adhered to on a 'day to day' basis.

2.5 Fire Risk Assessments - Business (Operational) Resilience

2.5.1 FSMP was adopted within the MOD and assesses the danger to life in each building where personnel are employed. Additionally, following Treasury pressure to protect vital military assets, the Fire Resilience Risk Assessment (FRRA) is the management tool employed to measure fire risks to business (operational) resilience and Defence assets and provide risk proportionate non-statutory guidance on the appropriate level of protection for buildings and assets.

2.5.2 Whilst a Fire Resilience Risk Assessment (FRRA) may be beneficial on an explosive site, the results of such a FRRA should not be considered in isolation due to the largely cost-benefit nature of the process. The introduction of the Control of Major Accident Hazard (COMAH) Regulations 1999 as adopted by MOD in JSP 498 (MACR) will also take fire protection measures into account.

3 DETERMINATION OF PREVENTION AND PROTECTION MEASURES

3.1 Fire Prevention and Protection Surveys

3.1.1 All MOD sites are surveyed by DFRMO staff and reports drawn up for senior management and their TLBs, who then decide the way forward regarding implementation of the most suitable risk based option. However, due to the sensitive nature of explosives in the eyes of the media and general public, cost benefit analysis alone must not generally be used to determine levels of fire protection.

⁶ Exceptions being Exercise and Operational deployments where separate advice should be sought in accordance with JSP 426, Chapter 4.

3.2 The Determination Process

3.2.1 The determination process is explained fully in Appendix A, and is intended to enable management to make decisions on clearly based and visible information relating to the special problems associated with explosives facilities. It is therefore obligatory for management to consult with and seek advice from the Defence OME Safety Regulator (DOSR) regarding any proposed reduction or removal of existing on-site fire services.

3.2.2 The risks identified during formal assessments must meet ALARP standards, and fire plans are to reflect all actions and contingency arrangements that are necessary, including arrangements for suitable response during silent hours.

3.3 Maintenance of Safety Measures and Control of Contractors

3.3.1 In dedicated facilities for work involving heat or flame, appropriate fire safety measures must be incorporated. However, the conduct of such processes in more ad hoc circumstances has all too often led to serious fires. Examples include welding, flame cutting, grinding, paint stripping and roofing work involving the use of tar boilers. Therefore, while constant attention must be paid to fire safety precautions in dedicated facilities for work processes involving heat or flame, extra care must be given to all instances when such processes are to be employed elsewhere. In particular, the procedures required under the hot work permit system must be followed (see Standard Fire Precautions for Contractors Engaged on Crown Works – Available from the Stationary Office).

3.3.2 Unless proper procedures are followed, maintenance and other work by contractors can seriously reduce fire safety standards and even negate them. The temporary interference with fire detection, suppression and alarm systems, with fire compartments and fire doors and the failure to control flammable materials and ignition sources can all lead to serious fires. It is therefore crucial that management ensures all work by contractors at MOD establishments is conducted in accordance with the Standard Fire Precautions for Contractors Engaged on Crown Works. Any contractors working within IBD of a PES are also required to have a Permit to Work Explosives – PTW(E), see Chapter 18 for details.

4 PLANNING

4.1 Introduction

4.1.1 Where not already included on the MACR plan (see JSP 498), every HoE is to prepare a plan for fire safety to include efficient arrangements relating to:

- (1) Raising of the alarm.
- (2) Calling the emergency services.
- (3) Safe evacuation of personnel (including evacuation distances/points and arrangements for roll call).
- (4) Appropriate Tactical Information Plans for all buildings on site.
- (5) Adequate identification of all PES and other buildings and their contents, and all site roads.
- (6) Routine liaison with the DFRMO and/or Local Authority Fire & Rescue Service (LAFRS) and other emergency services.
- (7) Personnel training.

4.1.2 In the interest of security and public safety, the need for action by the local civil police must also be considered should an outbreak occur, and predetermined

arrangements made as necessary. In many circumstances, it will be necessary to hand over the actual firefighting arrangements to the Senior Officer of the LAFRS, but the MOD Incident Officer is to prioritise the areas or stocks to be saved and give any technical information required for firefighting purposes.

4.1.3 Information which may be necessary or desirable to have immediately available in the event of a fire emergency must be prepared and regularly reviewed. In particular, the following facets are to be included in the Tactical Information Plan.

(1) A site plan of the unit showing the location and identity of all roads, each building or stack of explosives in each fire division (including staging/holding areas) and the layout of the principal service mains, including water, gas, electricity and telephone services. Full details of all water supplies capable of being used for firefighting are to be included. Alternatively, a water map may be produced which shows the layout of all water mains, hydrants, stop cocks, static water tank and natural supplies. Copies of this plan are to be kept at a strategic point, or points, on the unit, e.g. fire section, guardroom, emergency control centre, etc. For security reasons, the plan should contain only the minimum information necessary for effective firefighting (but see sub-paras (4) and (5) below).

(2) Line drawings/plans of all explosives buildings and those presenting special risks or problems including supplementary hazards (e.g. Otto fuel, radioactive stores, etc), are to be made available for the use of the incoming LAFRS. These Line drawings/plans should include such information as the location of exits; main control switches and/or valves for ventilation plant, gases, water and electricity; stairways; fire stop doors; specialised fixed firefighting equipment; emergency lighting and any other information which might be reasonably required in an emergency.

(3) Pertinent Health and Safety information, including radio frequency hazards (RADHAZ). Certain explosive stores are sensitive to RADHAZ, and general advice can be found in Chapter 24. Specific advice concerning radios, including Emergency Services radios, likely to be used in the vicinity of a PES may be obtained from DOSG (see Chapter 24) via the appropriate Inspector of Explosives (IE). Communications equipment likely to be used by the LAFRS should be submitted for approval as part of the Tactical Information Plan plan.

(4) Guidance pertaining to the release of information to the local authority, if necessary, in the interests of public safety.

(5) Information on any adverse environmental effects (e.g. pollution of groundwater or atmosphere). This information should be contained within the establishments Environmental Risk Assessment, if a MACR qualified site, or within the relevant Environmental Impact Statement for other explosives facilities.

4.2 Emergency Control Centres

4.2.1 When preparing an emergency response plan (which may be fire specific but could be part of other emergency plans) consideration should be given to the provision of an emergency control centre to act as a focal point for managing an incident. The detailed requirements should be identified as part of establishments risk assessment process. The requirements should be proportional to the identified risks i.e. an air cadet unit will not require the same level of facilities as a major depot. JSP 498 provides significant detail on the requirements for emergency control centres for MACR qualified sites. This guidance may be applicable to other explosives facilities depending on the complexity of the site.

4.3 Mustering of Personnel and Reporting

4.3.1 Site evacuation plans shall ensure that all site personnel, including any contract maintenance or visiting personnel are accounted for and reported to the Crew Manager of the first responding fire and rescue service appliance.

4.4 Hazard Zones for Above Ground Facilities

4.4.1 Above ground explosives facilities are those where the explosives are above ground level, but include those where part of the explosives may be below ground. Hazard zones for above ground storage, to be included in the Tactical Information Plan/Site Emergency Plan's, are as follows:

- (1) HD1.1: IBD taking account of the applicable minimum distance i/a/w Chapter 10.
- (2) HD1.2: IBD taking account of the applicable minimum distance i/a/w Chapter 10.
- (3) HD1.3: IBD taking account of the applicable minimum distance i/a/w Chapter 10.
- (4) HD1.4: Fire fighters to fight fire, but others to a minimum of 100 m.

NOTE: The calculations should utilise the license authorised limits to evaluate the worst case evacuation distance for each hazard division at a particular facility. Further advice is available from the Technical Explosives Authorities.

For above ground facilities the hazard zones for each hazard division are to be recorded along with details of the appropriate IBD equations obtained from Chapter 10. The distances detailed above are dependant on the availability of adequate cover at IBD. Where there is insufficient cover available at IBD, the hazard zone is to be a minimum of 2 x IBD or at the closest point past IBD where you encounter adequate cover. Where there are significant directional effects such as for an igloo design the resultant hazard footprint is best plotted on a map.

4.5 Hazard Zones for Underground Facilities

4.5.1 Hazard zones for underground storage, to be included in the Tactical Information Plan/Site Emergency Plan's, are as follows:

- (1) HD1.1: IBD taking account of the applicable minimum distance i/a/w Chapter 10.
- (2) HD1.2: IBD taking account of the applicable minimum distance i/a/w Chapter 10.
- (3) HD1.3: IBD taking account of the applicable minimum distance i/a/w Chapter 10.
- (4) HD1.4: Firefighters to fight fire, but others to a minimum of 100 m.

NOTE: The calculations should utilise the license authorised limits to evaluate the worst case evacuation distance for each hazard division at a particular facility.

For underground facilities the greatest hazard is likely to be in line with the entrance. The evacuation distance is therefore significantly affected by direction. This information is best recorded on a map to reflect the highly directional effects to be expected and will normally be represented by the contours of the IBD driven by the HD 1.1 limits. Further advice is available from Technical Explosives Authorities.

4.5.2 Once the hazard zone has been identified consideration should be given to each facility within the hazard zone to evaluate its structure to see if it can be used as a place of refuge. There are obvious advantages in personnel having a lesser distance to travel in terms of the physical capability of the staff and the decreased time to reach a place of refuge. Examples of a place of refuge within the hazard zone

would be the hardened office facilities in a HAS site or the control room in an IWC. Any facility which is designated as a place of refuge within the hazard zone should be recorded in the FSMP/Tactical Information Plan/Emergency Plan. Advice on the suitability of any facility to be designated as a place of refuge can be obtained from the relevant IE.

4.5.3 The hazard zone information should be held with the individual FSMP for each facility (normally as part of the Tactical Information Plan) and be available in the Emergency Control Centre. During an incident, if time allows, the distance should be recalculated by Emergency Control Centre staff using the actual holdings to give a more accurate hazard zone to the Establishments Incident Officer and the First Responders from the civil emergency services. A more accurate hazard zone will only be of value should there be a requirement to operate closer to the incident. If the Fire & Rescue Services need to undertake search operations for people known to be missing in the vicinity of the incident, more accurate information will enable them to better evaluate the risk to their personnel and decide whether to commit them to a rescue attempt.

Note: Further advice is available from the Technical Explosives Authorities.

4.5.4 Evacuation distances may be informed and modified by the availability of adequate cover.

4.6 Exercising Emergency Evacuation Plans

4.6.1 Personnel must be practised at least annually in building evacuation procedures. Other emergency incident plans may require to be rehearsed and validated on a more frequently basis; particularly in there is a relatively high turnover of personnel.

4.7 Exercising Emergency Plans

4.7.1 In most cases, such practises and training will be relatively simple and straightforward. However, where the nature of the risks in the working environment are assessed to warrant it, management should ensure that the depth of practises and training are more frequent and tailored to the degree of risk. As appropriate, personnel should also be given instruction in site-wide fire safety precautions and any specific fire safety functions, which their post may have. Each exercise should have an appropriate post exercise report to capture any issues and the records should be kept for a minimum of 3 years. The records may be kept with the PES Log book or cross referred from the PES Logbook. If they are kept in a PES Log Book, the minimum retention period for records is 11 years. Any gaps in training identified for key post holders should be recorded. A gap analysis of training requirements should be undertaken and remedial actions implemented.

4.8 Communications

4.8.1 An efficient communications system is vital if prompt and effective action is to be taken during an incident. The system should comprise primary and back-up arrangements based on landlines or radios, the latter being preferred because of their mobility (but see sub-para 4.1.3(3) above).

5 FIRE ALARM AND DETECTION SYSTEMS

5.1 Introduction

5.1.1 During RA, FRRRA and FSMP Risk Assessors will examine existing fire alarm systems throughout the Explosives Area. Fire alarm call points and emergency telephones are to be plainly visible in the dark, readily accessible at all times, and positioned so as to minimize any delay in raising the alarm. Fire alarm systems in Explosives Areas/Sites may be mechanical or electrical, but the electrical 'break glass' type are preferred, and are mandatory for large sites.

5.1.2 For PES located externally to an Explosives Area or Site, the provision of fire alarms or emergency telephones is always to be considered and the advice of DFRMO staff is to be obtained.

5.2 Testing of Fire Alarms

5.2.1 Fire alarm systems are to be tested in accordance with BS5839-1 Code of Practice for fire detection and fire alarm system design, installation, commissioning and maintenance under unit arrangements as follows:

- (1) Electrical: Weekly.
- (2) Mechanical: 6 monthly.

5.2.2 The unit is to maintain a record of all tests of fire alarm systems. This may be achieved by using electronic means if required.

6 OTHER CONSIDERATIONS

6.1 Fire Breaks and Vegetation

6.1.1 These requirements are shown in JPS 482 Chapter 12.

6.2 Dangerous Goods

6.2.1 The storage of Dangerous Goods (DG) other than Class 1 (except those items excluded from Class 1 and classified by ESTC as DG (see Chapter 4) and listed in ESTC Leaflet No 3 and No 4) in explosives facilities is to be avoided (see Chapter 10, Section 7). Specific approval for such storage is to be given by HoEs in consultation with the appropriate IE, but the items are normally never to be stored in the same building as explosives. The presence of such items must be clearly indicated in firefighting plans and the LAFRS made aware.

6.3 Firefighting Measures

6.3.1 Guidance of firefighting measures is contained in Annex B.

6.4 Water Supplies for Firefighting

6.4.1 Water supply requirements are contained in Annex A Appendix D.

6.5 Scales and Maintenance of Firefighting Equipment

6.5.1 Requirements are shown in Annex A Appendix A.

7 UNDERGROUND SITES

7.1 In view of the confined nature of underground sites, the increased problems associated with access and the large quantities of explosives that could be held, special attention must be given to fire safety measures, pre-planning and the adequate provision and maintenance of firefighting equipment. HoE must also consider that LAFRS may not be willing to commit personnel to firefighting in such locations. This will include circumstances regarding any suspected fire the details of which are unknown. Consideration must therefore be given to providing automatic monitoring systems such as UV/IR sensors and CCTV, etc.

7.2 It is essential to make adequate provision for:

(1) Means of Escape and Fire Access. The maintenance of clear exit doors and unobstructed means of escape for occupants is mandatory. Clear passageways and gangways through stocks of explosives are to be carefully planned and encroachments prevented by use of painted lines on the floor.

(2) Fire Alarm Call Points Sounders and Firefighting Equipment. Fire alarm call points and sounders must be provided throughout the area and so arranged that the actuation of any call point causes an alarm to be audible throughout the area, both above and below ground. The system must be connected to a central control point, manned at all times, from where additional resources can be speedily summoned and the Tactical Information Plan set in motion. Adequate fire notices and first aid firefighting equipment are to be provided.

(3) Emergency Lighting. An emergency lighting system is to be provided which operates independently of, and automatically on failure of, the normal lighting system.

(4) Luminous Guide-lines. To assist in rapid evacuation, continuous luminous guide-lines must be applied to walls or floors as necessary.

8 SAFETY SIGNS - HAZARD DIVISIONS AND SUPPLEMENTARY SIGNAGE

8.1 Hazard Divisions – Explanation

8.1.1 The Hazard Divisions (HDs) into which explosives are placed are described in detail in Chapter 4, and a précis of firefighting actions to be taken for each division is contained in Annex B.

8.2 Hazard Division Signs

8.2.1 To facilitate firefighting, explosives have been divided into HDs according to their behaviour when involved in a fire. The HD for each type of explosive is shown as the second digit of the UN Hazard Classification Code (see Chapter 4). Any PES, including staging facilities (see Chapter 10), containing any quantity of explosives, is to be provided with a plate bearing a sign to denote the HD to which they belong. The signs⁷ are normally to be of reflective orange background with black numerals denoting the HD⁸ (see Appendix B to Annex A). In the event of mixed stocks, the greatest risk sign is normally to be displayed, with HD 1.1 being the greatest risk and HD 1.4 being the lowest risk. However, if considered necessary or desirable by the unit Explosives Safety Representative and DFRMO, more than one sign, mounted one below the other in decreasing order of risk, may be displayed. These signs must be removed from display when the facility no longer contains explosives.

⁷ For the purposes of this chapter, the signs are also known as 'Fire Division' signs.

⁸ USVF may, with the agreement of the LAFRS, use the Fire Signs detailed in AATP-2 if required.

8.3 Supplementary Signs

8.3.1 Supplementary fire signs, illustrated at Annex D, are also to be displayed. The signs are as follows:

- (1) Respirator Facemask (White on Blue Circular Background). This sign advises that respiratory protection using self-contained breathing apparatus is required, together with impervious gloves, because of the possible presence of a noxious atmosphere.
- (2) Figure Wearing Protective Suit (White on Blue Circular Background). This sign advises the need for the wearing of personal protective clothing, e.g. in situations where there is a danger of intense radiated heat, corrosive fumes or acid splashes.
- (3) Trefoil Sign (Black on Yellow Triangular Background). This sign advises of a radiological hazard, with a danger of the release of contaminated products of combustion in any fire. Self-contained breathing apparatus with full face mask and gloves is to be worn. The wearing of protective clothing, if required, will be indicated by the display of the appropriate supplementary sign. The trefoil sign may also be used to indicate a source of gamma radiation.
- (4) Water Prohibited Sign. Illustrates water from a bucket being emptied on to a fire (white background), negated by a red diagonal band within an encircling red band on the back-plate. Indicates that water is not to be used.

8.4 Position of Hazard Division and Supplementary Signs

8.4.1 Signs must be positioned on each approach road to the building or stack, though sufficiently clear of it to avoid damage or displacement and at a height that allows for clear illumination by vehicle headlights. The positioning must be such that the building or stack to which the sign refers is immediately apparent. The method used to display signs should provide for their easy removal or replacement as the need arises.

8.5 Internal Depot Transport

8.5.1 For Internal Depot Transport, the appropriate hazard division signs for transport shown in Annex A Appendix B are to be displayed. Supplementary signs are not required.

ANNEX A**APPENDIX A****FIREFIGHTING EQUIPMENT AND TRAINING****CONTENTS****Para****1 FIREFIGHTING EQUIPMENT FOR USE IN EXPLOSIVES FACILITIES**

- 1.1 General
- 1.2 Storage Buildings
- 1.3 Process Buildings
- 1.4 Transit Facilities
- 1.5 Maintenance, Testing and Training Records

2 FIRE SAFETY TRAINING**1 FIREFIGHTING EQUIPMENT FOR USE IN EXPLOSIVES FACILITIES****1.1 General**

1.1.1 Assessment of the requirement for firefighting equipment is considered under each of the three types of PES normally associated with explosives:

- (1) Storage buildings.
- (2) Process buildings.
- (3) Transit facilities.

1.2 Storage Buildings

1.2.1 PES used for explosives storage are normally visited for the purposes of receiving, issuing and checking stocks. However, there will be occasions when minor building repairs or periodic checks have to be carried out with the explosive stock in situ.

1.2.2 Firefighting equipment need not be permanently sited in storage PES, but may be taken to them by personnel detailed to work therein and returned to the point of issue at cessation of work. When considering the location and scale of issue of firefighting equipment for each working party visit to such PES, the following points must be examined:

- (1) The quantity and type of extinguishers required, and their location as detailed by the DFRMO fire adviser.
- (2) If required, the person in charge of the working party is to ensure that the firefighting equipment taken into the building is positioned immediately adjacent to the working area and between the working party and the nearest exit. They may require repositioning as work progresses.
- (3) Whenever powered mechanical handling equipment is being used in the PES, the person in charge of the working party is to ensure that fire extinguishers, suitable for the risk are available for immediate use by the operator or member of the working party. See also Chapter 16.

1.3 Process Buildings

1.3.1 The risks likely to be met within Process Buildings are many and varied and do not lend themselves to a simple scaling procedure. Generally, suitable firefighting systems should be agreed with DFRMO staff for fixed firefighting installations such as hose reels to be provided for the protection of explosives process work. However, these should be augmented by portable hand-held firefighting equipment of a size and type suitable for the operations being carried out. The 'Determination' process (see Chapter 15, Annex A Appendix C) will form the basis for this provision. In any case of doubt, advice may be obtained from the DFRMO.

1.3.2 In the event of a fire in a process building, speed and weight of attack are of primary importance, but personnel must only attempt to extinguish a fire if explosives are not involved and personnel are content that taking firefighting actions will not be a risk to themselves or others. For example, where rapid cooling is required and the use of water is permitted, buckets or similar water-filled receptacles capable of containing the item, rather than extinguishers, may be used. Where portable hand-held firefighting equipment is provided, they are to be positioned as close to the work as is safe and practicable.

1.4 Transit Facilities

1.4.1 The main risk at Transit Facilities may not be the immediate involvement of explosives, but their exposure to heat from a fire starting in the vehicles using the facility.

1.4.2 Transit buildings are to be provided with sufficient hose reels to enable all parts of the building to be reached. Platforms used for the handling of explosives stores must be provided with adequate length of hose, on reels. Additional portable hand-held firefighting equipment should also be provided on the advice of the DFRMO.

1.4.3 Any jetties associated with MOD explosives facilities should be covered by the FSMP process and their firefighting requirements evaluated. Jetties are regarded as an integral part of the main establishment and should be considered as a PES for fire prevention purposes in accordance with Annex A Appendix D. Sufficient fire hydrants are required to ensure adequate coverage of the area of the jetty where explosives are worked, including any berthed lighters. For example, if lighters are moored 3 abreast and 3 deep, there must be sufficient coverage of water spray to clear all 9 lighters if they are loaded with explosives. In addition, sufficient fixed monitors are to be positioned to ensure complete coverage of the explosives area as shown on the relevant explosives licence. The monitors are to enable unmanned firefighting to continue whilst personnel are evacuated. They may be remotely controlled, in which case the controls are to be situated at a location remote from the explosives operations and preferably out with the jetty area. Ships exceeding 500 gross tonnes are required to have at least one international shore connection which can be connected from either side of the ship to provide water for the firefighting equipment. This is a requirement of SOLAS Chapter II-2 Regulation 19, and the specification for the connection is contained therein. Where the explosives jetty can berth such vessels the firefighting water supply will have provision for the shore connection to be coupled into the system.

1.5 Maintenance, Testing and Training Records

1.5.1 All firefighting equipment is to be maintained and tested in accordance with current BS/EN requirements. In matters of life safety, FSMP requires records to be kept for the fire training of all personnel and maintenance of fire safety equipment. (see JSP 426 for further details).

2 **FIRE SAFETY TRAINING**

2.1 It is a mandatory requirement for HoEs to arrange for induction training covering the use of all first aid fire appliances available, together with safety aspects of the working process. Refer to JSP 426 Fire Safety Training.

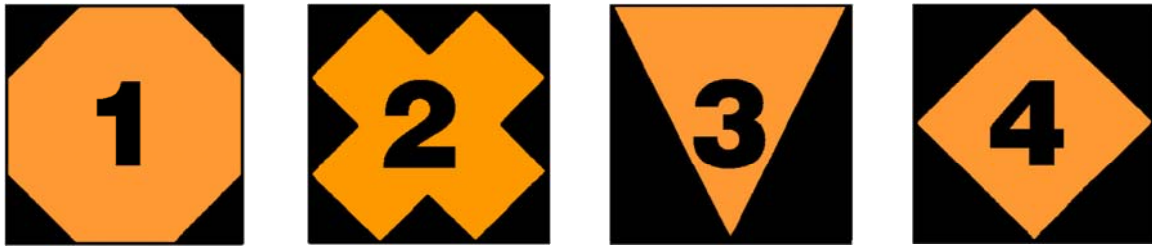
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ANNEX A

APPENDIX B

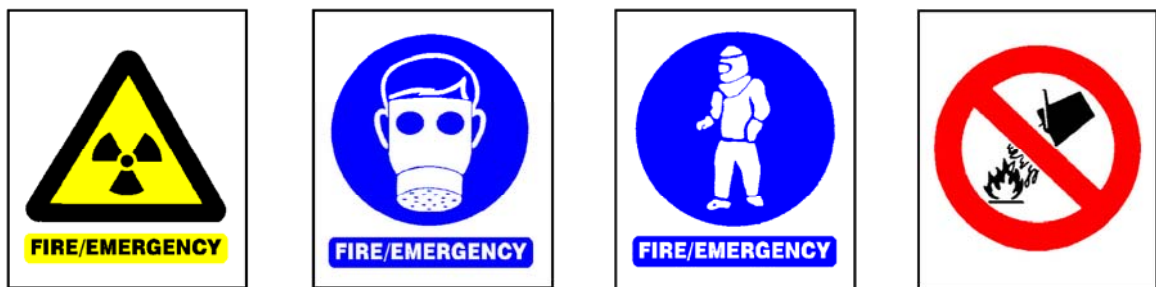
HAZARD DIVISION SIGNS FOR USE ON BUILDINGS AND STACKS AND ON ROAD AND RAIL TRANSPORT

TYPICAL FIRE DIVISION SIGNS – BUILDINGS & STACKS



These Fire Division Signs are 300 mm square, the numbers are 125 mm in height.

SUPPLEMENTARY FIRE SIGNS



These Supplementary Fire Signs are 300 mm square.

TYPICAL FIRE DIVISION LABELS - TRANSPORTATION



F/MOV/605A



F/MOV/605B



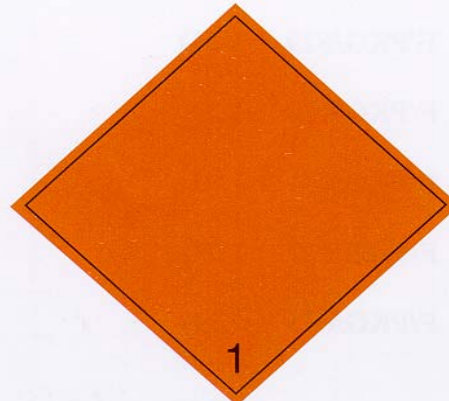
F/MOV/605C



F/MOV/605D



F/MOV/606A



F/MOV/606C

Fire Division Labels - Transportation are 250 mm square.

ANNEX A**APPENDIX C****THE DETERMINATION PROCESS****CONTENTS**

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 - 1.2 Factors
 - 1.3 Fire Safety Management Plan
 - 1.4 Fire Resilience Risk Assessment (FRRA)
 - 1.5 Explosives Activities Not Associated with Buildings
 - 1.6 Non Explosive Hazardous Activities Not Associated with Buildings
 - 1.7 Political and Public Perception Considerations
- 2 THE DETERMINATION PROCESS
 - 2.1 Introduction
 - 2.2 Outputs
 - 2.3 Management of the Determination Process
 - 2.4 Site Emergency Plan

1 INTRODUCTION**1.1 Determination of Fire Measures**

1.1.1 All MOD sites are regularly inspected by professional fire staff and reports dealing with fire safety matters drawn up. While certain elements of the report must be followed to the letter, in order to meet Statutory Requirements, others may be presented in the form of recommendations. Management and their TLB then decide on the way forward regarding implementation of the most suitable risk based option. On a note of caution, it should be understood that any cost benefit analysis alone must not be used to determine levels of protection.

1.2 Factors

1.2.1 Some of the factors that govern the determination of appropriate fire safety measures can be stated numerically, others have to be judged subjectively and pragmatically. The main elements are set out below.

1.3 Fire Safety Management Plan

1.3.1 Fire Safety Management Plans (FSMP) came into force on 1 Apr 97 to address the threat to life from fires in buildings. Buildings and the management thereof must comply with the Regulatory Reform (Fire Safety) Order (and similar legislation for Scotland and Northern Ireland). Where they are used for any explosives purposes (storage and processing are the primary ones), they must also meet requirements set by ESTC and be licensed accordingly by respective Inspectors of Explosives (IEs). However, many licensed buildings do not meet the structural fire standards contained in present day Building Regulations or Crown Fire Standards, which are not retrospective, and only apply when an existing building is subject to change of use or major refurbishment. Hence some licensed buildings, like many other buildings in the UK, may not fully meet current standards for structural fire safety measures. Hitherto, the means of assessing deficiencies in this

area has depended upon the judgement of individual fire specialists when carrying out building inspections.

1.3.2 In order to comply with fire safety legislation, a “suitable and sufficient” life safety fire risk assessment must be undertaken in each building where persons are employed. The outcome of the assessment will assist management in deciding whether additional fire safety measures are needed to meet the legal obligation. The policy for FSMP procedures is contained in JSP 426 MOD Fire Safety Policy, which should be referred to as a source document.

1.4 Fire Resilience Risk Assessment (FRRA)

1.4.1 The Fire Resilience Risk Assessment (FRRA) is the management tool employed to measure fire risks to business (operational) resilience and Defence assets and provide risk proportionate non-statutory guidance on the appropriate level of protection for buildings and assets. At the request of the risk owner/custodian, DFRMO may conduct a FRRA to buildings, compartments and their contents, both singly and as a group at a site. The assessment is not primarily concerned with risk to life; and, whilst a FRRA may be beneficial on an explosive site, the results of such a FRRA should not be considered in isolation due to the largely cost-benefit nature of the process. It will be essential for site management to maintain close co-operation with the FRRA fire safety officer throughout the assessment. This will be of key importance when considering the flexibility of an on-site fire service and risk proportional options for fire protection systems.

1.5 Explosives Activities not Associated with Buildings

1.5.1 Explosives activities include handling, transportation, stabling, open storage, test firings, demolitions and disposals, training and demonstrations, etc. Activities extend to the preparation and de-preparation of munitions for use in fighting vehicles, aircraft and ships. FSMPs will take account of activities as they affect any risk to persons in or in the vicinity of premises (this may include a site).

1.6 Non-Explosive Hazardous Activities not Associated with Buildings

1.6.1 These hazards include operations concerning aircraft, land vehicles, ships or submarines which (as above) FSMP is unable to address but which do not involve explosives. In most cases these also can only be judged pragmatically.

1.7 Political and Public Perception Considerations

1.7.1 Certain military sites, such as research and development establishments, open weapon test areas or ranges, major storage depots, or establishments where radioactive material is present, may be particularly sensitive to the political or media consequences of even a small incident. The requirement for fire measures, especially an on-site fire service for example, may be governed more by such considerations than by any assessment of risk, whether scientific or pragmatic.

2 THE DETERMINATION PROCESS

2.1 Introduction

2.1.1 The recommended process for considering the above factors is as follows:

(1) Stage 1. Using FSMP risk assessment procedures, consider the protection of life in buildings (including explosives ones). The output will be a list of measures required to meet statutory requirements.

(2) Stage 2. Using FRRA procedures, consider protection of assets, being buildings (including those storing or processing explosives) and the stocks within them. The output will consist of risk proportionate non-statutory guidance.

(3) Stage 3. Consider non-explosive hazardous activities not associated with buildings. Where these are significant (such as at an airfield), they may call for extra fire safety measures.

(4) Stage 4. Examine pragmatically the political or public perception of risks arising from explosives on the site. If significant, they may call for extra fire safety measures.

(5) Stage 5. As the last stage, examine pragmatically, and in turn, all the types of explosives activity not associated with buildings. In each case, the following question should be asked:

“Given the measures already identified under Stages 1 to 4 above, and taking into account other prescribed measures, such as fire extinguishers on vehicles and specialist equipment on jetties, are there any extra measures which would reduce the risk to life should a fire break out during the explosives operation?”

If the answer is ‘Yes’, they can be added.

2.2 **Outputs**

2.2.1 The output from Stage 1 will normally be in the form of a statutory requirement. The output from Stage 2 will take the form of non-statutory risk based options for consideration by TLB and site management. Following Stages 3, 4, and 5, the total output from Stage 1 to Stage 5 will be in the form of a recommendation which draws together all the other risks from the site as a whole.

2.3 **Management of the Determination Process**

2.3.1 Stage 1 and Stage 2 of the process should be controlled by management in conjunction with HQ DFRMO (Fire Safety Business Unit) staff who are responsible for FSMP and FRRRA risk assessment policy. Close liaison between HoEs and DFRMO staff is strongly recommended and any ‘Determination’ team should include unit specialist explosives personnel. On a note of warning, FSMP falls out of the Regulatory Reform (Fire Safety) Order. This legislation is binding on the Crown and requires management to undertake regular life safety fire risk assessments. FSMP is designed to assist management with this requirement but does not shelter management from undertaking regular life safety risk assessments prior to and following its issue. Where any doubts arise regarding FSMP and associated life safety fire risk assessments, HoEs should request advice from their regional DFRMO offices.

2.4 **Site Emergency Plan**

2.4.1 Management will already be undertaking regular risk assessments, falling out of H&S legislation, and should have in place an emergency plan for the establishment. They should also have in place a Tactical Information Plan. These documents must be reviewed at regular intervals.

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ANNEX A**APPENDIX D****WATER SUPPLIES FOR FIGHTING FIRES IN EXPLOSIVES FACILITIES****CONTENTS**

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- 1.1 Introduction
- 1.2 Quantities of Water Required
- 1.3 Location of Hydrants and Emergency Water Supply
- 1.4 Fire Hydrants
- 1.5 Emergency Water Supplies
- 1.6 Types of Emergency Water Supply
- 1.7 Marking of Hydrants and Emergency Water Supplies
- 1.8 Inspection and Maintenance
- 1.9 Training
- 1.10 Water Maps
- 1.11 Water Supplies for Underground Sites

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| 2 | Emergency Water Supply Sign | 4 |
| 3 | Supplementary Emergency Water Supply Sign | 5 |
- 1 **WATER SUPPLIES FOR FIGHTING FIRES IN EXPLOSIVES FACILITIES**
 - 1.1 **Introduction**

1.1.1 Existing Water Supplies for firefighting in Explosive Storage Areas/facilities may be assumed to have complied with regulations and standards relevant and extant at the time the site was created. These standards will have been based on earlier versions of Crown and MOD Fire Standards; which have evolved over previous decades. When considering the performance “gap” between water supplies that were provided by these earlier standards and any additional requirements relating to current standards, a number of factors need to be considered:

- (1) Crown Fire Standards; specifically Fire Standard D3 (Water Supplies for Firefighting) is not applied retrospectively and predominantly applies to new builds and major refurbishments.
- (2) Firefighting technology; specifically ground monitors and other fixed jets are now more efficient; being capable of projecting water further in relation to a given pressure and flow.
- (3) Firefighting tactical plans regarding offensive and defensive operations (the latter most applicable to explosives) have evolved since the original performance requirements were identified.

1.1.2 The above factors must be analysed as part of a risk assessment, conducted by DFRMO. The risk assessment is to be completed in consultation with the HoE Explosive Safety Representative and will also require the involvement of a representative of the Local Fire Authority. Using tactical planning information and either desktop or real time exercise data, the assessment will be required to quantify

the performance of the water supplies as they relate to the success of the tactical firefighting plan offered by the Fire Authority. Should a capability “gap” be identified, this methodology will offer the evidence required to justify any case for additional water supplies or an upgrade to meet the requirements for a site emergency. Irrespective of storage capacity in use, the risk assessment to be based on maximum licensed storage levels and is to be reviewed when any planned changes are known. This guidance is provided to assist risk assessors and to give direction to occupiers in existing establishments when changes are proposed and to provide guidance to designers of new facilities and/or establishments. The results of such an assessment shall be staffed to Senior Fire Safety Manager (SFSM) at Defence Infrastructure Organisation (DIO) and the relevant Inspector of Explosives.

1.1.3 Suitable plans (periodically reviewed and tested, must exist for alerting and calling in personnel for the efficient operation of all water supply equipment during normal and silent hours. Tactical Information Plans are to record all arrangements for this purpose. Where applicable, the Local Fire Authority must be afforded the opportunity to conduct Operational Response Assessment visits.

1.2 Quantities of Water Required

1.2.1 Based on a capability of 90 minutes initial firefighting, anywhere on a site, the risk assessment must quantify in terms of capacity, flow and pressure and sustainability the required water for firefighting purposes for each licensed facility or area. This supply may consist of Hydrants or Emergency Water Supplies; preferably a combination of both. Under the terms of the Water Industry Act 1991, water taken for fighting fires or for testing and training is not chargeable. In line with the risk based and proportionate nature of this standard, when changes are proposed at existing explosive sites or new facility design proposals known, the amount of water may be varied by the DFRMO Fire Safety Officer (also referred to under Regional Prime Contracting (RPC) as Project Fire Officer) according to a detailed fire risk assessment taking para 1.1.2 above and the following factors into account and in consultation with explosives licensing authority (and Project Sponsor if applicable):

- (1) The maximum licensed quantity of explosives held.
- (2) The presence and proximity of any on-site fire and rescue services and the planned response from any local fire authority.
- (3) The nature and physical characteristics of the explosive group; i.e. any incendiary type or ordnance.
- (4) The flammability of the local terrain; i.e. wildfires.
- (5) The proximity of adjacent military assets and their strategic criticality.
- (6) The proximity of public assets or other life risks.
- (7) The proximity of environmentally protected sites, such as SSSI or RAMSAR sites

1.3 Location of Hydrants and Emergency Water Supply

1.3.1 Hydrants should be sited not more than 70m from the entry to a PES. EWS tanks should be sited not more than 70m from the PES. Access points must be selected and in order to meet the requirements of the tactical firefighting plan, it may be necessary to facilitate the access of several pumping appliances to Hydrants and EWS tanks. Consideration must be given to the security of verges and banks from collapse; where deep water is concerned, the safety of personnel must be assessed. EWS tanks should be provided with vehicular access and hard standings capable of withstanding 15 tonne gross vehicle weight (30 tonnes for airfield major foam vehicles).

1.4 Fire Hydrants

1.4.1 Fire Hydrants shall provide a minimum static pressure of 4Bar. If this is unsustainable, pump augmentation must be implemented to sustain a flow rate of 75 Litres per Second (LPS) from one or more fire hydrants for a minimum of 90 minutes achieved. The flow rate from up to 3 adjacent hydrants is the normal method to calculate overall acceptable flow rate. In order to achieve adequate pressure from hydrant supplies, it may be necessary to provide automatic pumps. It is emphasised that flow rates are of greater importance than the pressure.

1.4.2 Fire Hydrants may be supplied from clean water or dirty/salt water mains. Only pipes of sufficient size to meet the flow rate required are to be considered, together with a viable system for keeping them charged at an adequate pressure. Hydrants should be of the double outlet type and fitted in accordance with Crown Fire Standard D3 or the host nation requirements overseas if such requirements are to a higher standard. Mains configuration should ideally be a loop system with adequate valves to enable isolation of part the mains in the event of a fracture.

1.4.3 If supplies are metered, such a meter should not compromise the performance of the mains in achieving the pressure and flow requirements. If a meter does create an unavoidable restriction, an automatic by-pass valve or one simple manually operated valve should be fitted. Additionally where a manually operated water main by-pass valve is fitted, full operating instructions and the exact location of the valve system must be included in the Tactical Information Plan.

1.5 Emergency Water Supplies

1.5.1 Emergency Water Supplies (EWS) may consist of high, low or buried tanks, natural or tidal supplies. Tanks are to be sited at a maximum of 70m from the entrance to a PES and if a sole supply is provided, consideration should be given to buried tanks to prevent damage from pressure waves or ground shock. Steps are to be taken to prevent feeder pipes from such sources becoming blocked by debris, or ice.

1.6 Types of Emergency Water Supply

1.6.1 The following may be considered a suitable form of Emergency Water Supplies; however, it is imperative that access and potential damage due to pressure waves and ground shock should be considered:

- (1) Natural Supplies. These comprise of rivers, streams, lakes or ponds and tidal waters from which water can be drawn. The main criteria for their inclusion in the water scheme are that they are usable at all times and that quick and easy access is possible. Particular consideration must be given to tidal levels and drought conditions.
- (2) Emergency Supplies. Man made ponds and reservoirs, canals or tanks fall into this category. The main criteria for their inclusion in the water scheme are that they are usable at all times and that quick and easy access is possible. Particular consideration must be given to drought conditions.
- (3) Static Tanks. Open-topped tanks without suction outlets should be partially buried to facilitate the introduction of the suction hose. This will also afford some protection from fragmentation damage. Each EWS tank should be of a minimum of 114 000 litres capacity and be provided with 'top-up' facilities where suitable mains water is available.
- (4) High Level Sources. Care must be taken to ensure that the high level source can keep the system supplied even in times of drought and its size should reflect this.
- (5) Vehicle Borne Supplies. To enable an initial attack to be made upon the fire, whilst sustainable supplies are being tapped, a limited amount of water may be carried upon vehicles, preferably fire appliances.

1.7 Marking of Hydrants and Emergency Water Supplies

1.7.1 Hydrants and Emergency Water Supply must be marked in accordance with BS3251 1976. A yellow line 2.4 m long and 100 mm wide with an arrow head pointing towards the hydrant cover with two 100 mm bars across the arrow near the centre may be painted on the road or footpath as an additional means of identifying the location of a hydrant. The location of all hydrant outlets must be annotated on the Tactical Information Plan.

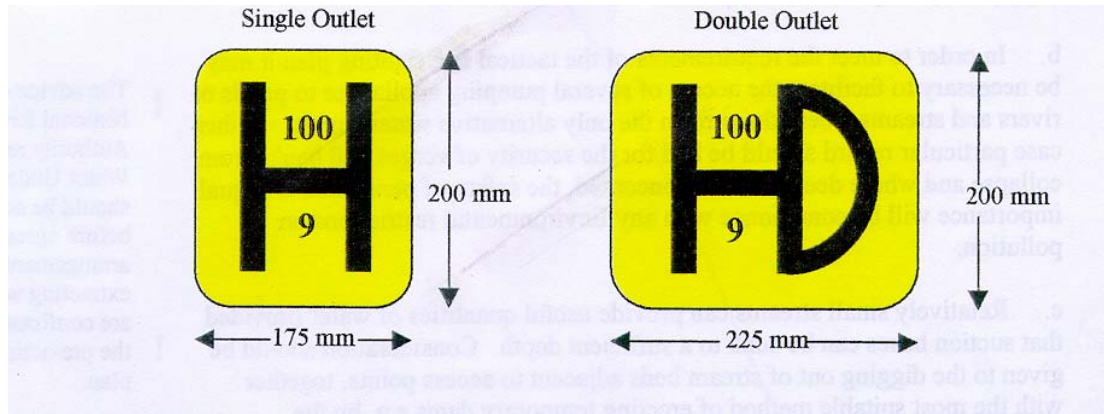


Fig 1 Hydrant Plates

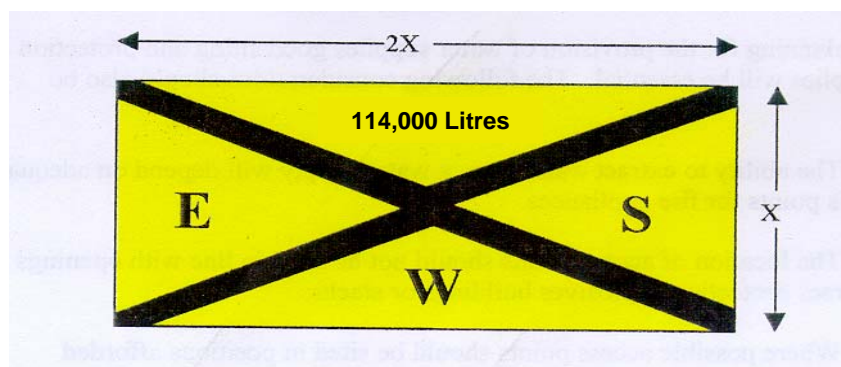


Fig 2 Emergency Water Supply Sign

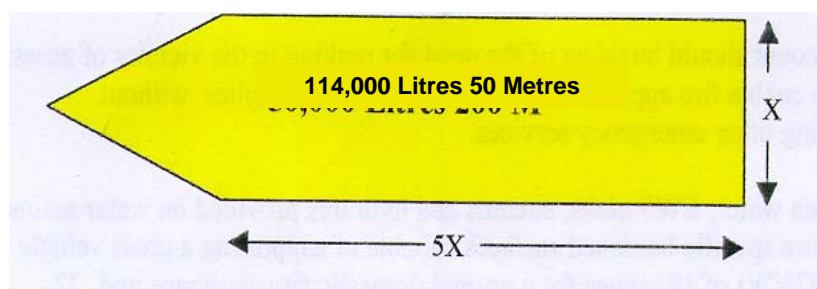


Fig 3 Supplementary Emergency Water Supply Sign

1.8 Inspection and Maintenance

1.8.1 In the event that local water supplies are not maintained by a service provider such as under Project Aquatrine⁹, a competent 'Water Officer' must be appointed to ensure that water supplies are maintained in full operational order and all access points are readily available and suitably indicated. It is imperative that water supplies be inspected, maintained and tested on a regular routine basis by competent person/¹⁰s. Units are to ensure that recorded maintenance procedures are put in place for this purpose.

1.8.2 Defence Infrastructure Organisation (DIO) policy is that an annual inspection shall be carried out on all hydrants. Bi annual flow and pressure tests shall also be undertaken except where permanent monitoring equipment has been installed and agreed by Project Aquatrine and Senior Fire Safety Manager at DIO. Fire Hydrants must be inspected in accordance with BS 5306 Part 1. All inspection and tests are to be recorded together with the results of water flow rates and the running and static pressure obtained.

1.8.3 Emergency Water Supplies must be checked visually at monthly periods or more frequently during drought conditions by competent persons, to include:

- (1) Water levels, which are to be checked and, where necessary, topped up. Persistent loss indicates a leak that must be investigated and rectified.
- (2) The operation of tank filling devices, suction outlets and valves, which are to be physically checked for satisfactory operation.
- (3) The adequacy of all frost precautionary measures.
- (4) Netting, sheeting and plastic floats, together with fencing and gates are in place and serviceable.
- (5) The structural condition of tanks. Where necessary, metal tanks should be drained, cleaned, painted internally and externally and then refilled.
- (6) The adequacy, security and legibility of EWS signs.

1.8.4 If installed, meter by-pass valves should be checked twice a year after liaison with the appropriate water undertaker. The adequacy, security, legibility and the clarity of the instruction given on the signs indicating position and direction of operation for by-pass valves must be checked and made good as necessary.

1.8.5 All records of periodic inspection, testing and maintenance are to be kept on site.

1.9 Training

1.9.1 It is important to have trained and competent personnel available to operate all water supply equipment likely to be required in the event of an emergency. Arrangements for alerting and calling in personnel for the efficient operation of all water equipment during normal and silent hours must be periodically tested by exercise. Suitable and sufficient refresher training and exercises are to be carried out to ensure the competence of the personnel nominated for these duties.

1.10 Water Maps

1.10.1 Accurate and comprehensive plans and information concerning the physical layout of water supplies must be made available as part of the Tactical Information Plan / TIPs package. The map should include:

⁹ Most likely to be found at overseas locations.

¹⁰ A person is to be regarded as competent where he has sufficient training and experience or knowledge and other qualities to enable him properly to assist in undertaking the preventive and protective measures.

- (1) The layout of the establishment's roads, railway and buildings etc, together with the location within the establishment, or immediately adjacent to it, of all sources of water that could be used for firefighting.
- (2) The quantities of water available at each static supply and the maximum and minimum flows for natural water.
- (3) The location of all water mains and their sizes, together with all hydrants and valves, each of which should be identified.
- (4) The flow rates and pressure valves achieved at the last hydrant test, as well as any hydrants which are unserviceable, valves or lengths of main which have been shut off, open water access points temporarily out of use, etc.

1.11 Water Supplies for Underground Sites

1.11.1 Consideration must be given to the provision of adequate supplies of water for firefighting purposes. Where a permanently wet system is selected for installation, there should be a means of isolating the supply above ground. A water map must be provided for responding fire services, and a person with a sound knowledge of the water system should be available on site. These assets should be available and located in accordance with the Tactical Information Plan.

- (1) Reserve water tanks must be above ground, but well clear of any possible crater area and, if water is to be carried to hydrants underground, an alternative supply, i.e. hydrants supplied from the mains, should be available.
- (2) Adequate and well-positioned stop valves must be positioned in case isolation is required.

ANNEX B

EMERGENCY RESPONSE

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 - 2.1 MOD Incident Officer
 - 2.2 Senior Fire Officers
- 3 EMERGENCY ACTIONS
 - 3.1 Raising the Alarm
 - 3.2 Evacuation
 - 3.3 Firefighting Action by Site Personnel (Non-Specialist Intervention)
- 4 PORTS AND HARBOURS
 - 4.1 Firefighting Principals

Appendices

- A Principles of Firefighting
- B Advice Provided to Emergency Services

1 APPLICABILITY

1.1 Annex B is intended for use by both Service and civilian personnel who are responsible for emergency response actions.

2 RESPONSIBILITIES - MOD INCIDENT OFFICERS & SENIOR FIRE OFFICERS

2.1 MOD Incident Officer

2.1.1 The HoE or, in their absence, any other person so nominated in the Tactical Information Plan, is to be responsible for the co-ordination of all the various emergency services arrangements and requirements and will be known as the MOD Incident Officer/Establishment Incident Controller (see JSP 498). It is imperative that the MOD Incident Officer/Establishment Incident Controller, if they are not the Unit Explosives Safety Representative, has rapid access to personnel with explosives expertise. Before any delegation of responsibility by HoE takes place, consideration is to be given to providing clear TORs regarding the anticipated duties of all personnel mentioned by name or post in the Emergency Plan(s). Additional specific provisions may have to be made for MOD Incident Officer functions during silent hour periods. The responsibilities of the MOD Incident Officer at a fire are as follows:

- (1) Liaison with the Senior Fire Officer (SFO) present.
- (2) Giving advice to the SFO present relating to the explosives safety aspects of firefighting, including, where applicable, information relating to other non-explosive hazardous materials, e.g. Otto fuel, DU, etc.
- (3) Advising the SFO concerning the risks involved in any given line of action.

2.2 Senior Fire Officer

2.2.1 The Senior Fire Officer present is responsible for all fire and rescue operations, including the direction of firefighting personnel and equipment.

3 EMERGENCY ACTIONS

3.1 Raising the Alarm

3.1.1 In the initial stages of an outbreak of fire, personnel will have the greatest opportunity to evacuate to a place of refuge. Due to the distances involved that extend beyond those normally applicable to more conventional workplaces, it is essential that at the first sign of fire, the alarm is raised. In areas of risk but with non continuous occupation, an outbreak of fire may be detected by automatic means. On occasions, automatic fire detection (AFD) systems may cause spurious alarms; however site personnel are to consider all AFD activations as a requirement for immediate evacuation to a place of refuge and the commencement of any relevant site emergency plans until clear evidence suggests otherwise.

3.2 Evacuation

3.2.1 Evacuation for any personnel not at the scene of an incident will be a considered decision, normally made by the Emergency Control Centre. Due account must be taken of the prevailing circumstances. Personnel may already be at a place of refuge (defined by distance and physical structure) and moving them should not lead to an increase of risk. Evacuation routes should also take account of available cover.

3.2.2 A place of refuge is defined as a physical location which by virtue of its distance from a PES or the strength of its structure (or a combination of both distance and structural strength) provides an acceptable degree of protection from any event at the PES. Information on places of refuge should be included as part of the FSMP/Tactical Information Plan/Emergency Plan. Each PES should be subject to a risk assessment which will identify places of refuge relevant to that PES. The start point should always be to determine the hazard zone from the PES.

3.3 Firefighting Action by Site Personnel (Non-Specialist Intervention)

3.3.1 The safest time to tackle any fire in the very early stages of an outbreak. To tackle such an early outbreak safely requires confidence and risk awareness that can be reinforced by regular training and exercises. Consequently, those Site personnel who are not fully trained fire fighters are advised only to tackle an early outbreak of fire where such a fire does not directly involve the explosives and they feel confident to do so without a disproportionate risk to their safety. In carrying out this action non-specialist site personnel may prevent a wider and greater risk to others. However, if they doubt their own safety at any time during this action, they must immediately withdraw to a place of refuge.

4 PORTS AND HARBOURS

4.1 Firefighting Principles

4.1.1 The Dangerous Substances in Harbour Areas Regulations require Serious and Imminent Danger Plans to be produced. Tactical Information Plans should be prepared and form part of the appropriate emergency plan. Firefighting actions should be approached in accordance with Chapter 15 Annex B.

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ANNEX B**APPENDIX A****PRINCIPLES OF FIREFIGHTING****CONTENTS**

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 - 2.3 Actions for Fire Division 1
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- 5 FIGHTING FIRES IN AUTHORISED QUANTITY STORES

1 BASIC PRINCIPLES

1.1 Unit Personnel Responsibilities

1.1.1 It is essential that personnel are aware of their responsibilities when reacting to a fire alarm or other indication of an outbreak of fire. It also assists attending emergency fire and rescue services by ensuring that personnel are accounted for before Firefighters are committed to search and rescue tasks. It is the responsibility of the unit HoE Explosives Safety Representative to ensure that management of these arrangements are included in the Tactical Information Plan and well practised, and that accurate information is passed to the Emergency Services without delay.

1.2 Briefing for Arriving Local Authority Fire & Rescue Service /On-Site Fire & Rescue Services

1.2.1 It will be essential for attending Emergency Services to be briefed as fully as possible on the type and nature of hazards they may face. Pre-planning and exercises will already have played their part in preparing and familiarising crews with the hazards and risks pertinent to the site. For this reason, the MOD Incident Officer must know the results of evacuation roll calls and be able to identify to the Senior Fire Officer (SFO) the last known whereabouts of any personnel unaccounted for.

1.2.2 The SFO will require information and intelligence regarding the nature of the incident. Correct initial deployment of fire appliances/pumps and manpower will depend on the ease of access to the MOD Incident Officer and the accuracy of the information provided. The SFO and MOD Incident Officer in tandem will dictate the method used to interdict any potentially disastrous situation.

1.2.3 Firefighting philosophy now dictates the following:

- (1) Firefighters will risk their lives in a highly calculated manner to save lives where there is a realistic opportunity that people are still alive and will remain so if quick intervention by firefighters can move them to a place of safety and treatment.
- (2) Firefighters will only act to save property which can realistically be protected / saved if it is feasible to do so without taking undue risk. The balance of risk is heavily weighted in favour of the safety of the firefighters. This position is fully supported by MOD and the HOE's advice should take account of the Duty of Care held towards Firefighters.
- (3) Firefighters will not risk their lives to save life or property that is already lost.
- (4) Therefore, the Emergency Services will require a significant amount of information on arrival to form a Dynamic Operational Risk Assessment (DORA) and subsequent action plan. The SFO will need to know:
- (5) The last known whereabouts and numbers of any personnel unaccounted for.
- (6) The HD, type and NEQ of explosives in the PES involved, and the presence of anything presenting a special risk (e.g. Otto fuel, DU, Thallium, etc).
- (7) The advisory safety evacuation distances or access to site plans with overlays of the distances and adjacent cover within the evacuation zone, so that fire crews can seek immediate cover should the need arise.
- (8) Any information available from the evacuated occupants of the facility involved, or from the immediate area of the fire, regarding the type and nature of the fire. Where built-in telemetry is installed in the PES or in an adjacent PES, information on any rise in temperature and humidity conditions within the area will allow more accurate planning regarding any potential explosion risk.
- (9) The state and condition of water supplies.

(10) Consideration should be given to the possible environmental hazards from contaminated firefighting water, particularly where there are sensitive environmental receptors. Where feasible these effects should be mitigated, for instance by lagooning or with the use of drain covers. Further guidance on these aspects should be covered within the site Environmental Risk Assessment.

2 FIGHTING FIRES IN ABOVE-GROUND SITES

2.1 Introduction

2.1.1 For the purposes of fire prevention and firefighting, above-ground sites are those where the explosives are above ground level, but include those where part of the explosives may be below ground.

2.2 Actions for All Fire Divisions

2.2.1 Actions for all Fire Divisions are as follows:

(1) Raise the alarm and call the Fire and Rescue Services. All non-essential personnel are to be evacuated from the scene of the fire (or moved to sheltered protection) in accordance with the Tactical Information Plan to a sufficiently safe distance.

(2) If detected before the explosives are involved, and it is safe to do so, prompt action with first aid firefighting equipment should be taken to prevent the development of a serious fire or possible mass explosion. If a fire cannot be extinguished before the first explosions are to be expected, the scene of fire is abandoned and firefighters should retreat to a place of refuge (see Annex B para 3.2.2). If drenchers are provided, they are to be operated immediately. If possible, their use should be confined to the buildings involved and those immediately adjacent. It must be borne in mind that the indiscriminate use of drenchers could affect firefighting potential by reducing the pressure and flow of water at the site fire hydrants.

(3) Re-entering the hazard zone following an explosive event should only be undertaken if there is adequate evidence that it is safe to do so. If there is no life risk (i.e. there is no-one missing) the area should be left to cool down for at least 24 hours. It is feasible to utilise EOD personnel with remote controlled cameras to evaluate the situation and authorise an earlier re-entry, probably undertaken jointly with the Fire & Rescue Service. If personnel are missing and it is feasible they are within the hazard zone any re-entry attempt should be the subject of discussion between the Silver Command Team including EOD Officer (if already available on site this advice can be obtained from a serving Ammunition Technical Officer or Ammunition Technician). If no EOD Officer is at the site advice can be obtained from JEODOC – Telephone: Didcot Military: (94 234) Ext: 3360, 3361 or 3362. Didcot Civil: (01235) Ext: 513360, 513361 or 513362. EOD assistance should always be requested if there has been an explosives event (detonation or deflagration) which has resulted in disrupted munitions. The EOD Officer can assist with; analysis of scene to recommend future actions, make safe procedures, capability for remote evaluation and action, forensic analysis.

(4) If there is a life risk, the decision to deploy resources to save lives will normally be taken by the Senior Fire Officer. In reaching a decision to commit Firefighting personnel the following factors will need to be taken into account. In essence these factors will inform the DORA;

- (a) Possibility that personnel are still alive,
- (b) What risk will the emergency services be at in taking rescue action?

2.3 Actions for Fire Division 1

2.3.1 Explosives in this division may explode en-masse with very little or no warning. The principles involved for fire and rescue services are as follows:

(1) The action of the fire and rescue services is to be directed towards preventing the explosives from becoming involved. This must only be attempted if advice as to the progress of the fire is available, via the MOD Incident Officer, from responsible persons in the vicinity of the fire. Once the fire reaches the explosives, a mass explosion can be expected very quickly. The primary concern must therefore be for the safety of personnel from blast, heavy debris and high speed fragments, as sufficient warning of an impending explosion is unlikely to be available to crews involved in close proximity firefighting. Of secondary importance, where practicable, is the avoidance of loss, or damage to, other explosives stocks or firefighting equipment. If it is known or suspected that the explosives are involved, emergency services are to withdraw to a place of refuge (see Annex B para 3.2.2).

(2) If information on the progress of the fire is not available, accurate, or the advice is such that firefighting action is not considered to be practical, crews should withdraw to a place of refuge (see Annex B para 3.2.2). They should avoid large glazed areas and make use of any substantial cover, such as traverses or substantial hardened buildings, from where a close watch must be kept for secondary fires caused by projections from any explosion.

(3) After an explosion the firefighting forces may approach the scene of fire only if the ammunition or explosives have been completely destroyed by the explosion (mass explosion) so that only debris is left burning. Whilst a HD 1.1 event may have occurred this does not mean that all explosives will have been initiated. Indeed this is unlikely to be the case unless the building contained only HD 1.1 items and these items were densely packed. The assumption therefore should always be made that further HD 1.1 events are feasible unless advised to the contrary by the MOD Incident Officer or an EOD Officer / ATO / AT.

(4) Following a mass explosion, action is to be confined to preventing the involvement of adjacent buildings or stacks by the application of cooling water sprays but only where this can be done at a safe distance, according to the advice given by the MOD Incident Officer. Personnel must not enter the area until sufficient evidence indicates a satisfactory level of risk reduction.

2.4 Actions for Fire Division 2

2.4.1 Explosives in this division will have a projection hazard but do not explode en masse. Fire Division 2 ammunition does not explode immediately after fire reaches it. Usually explosions from these fires can be expected only after the ammunition has been heated for an extended period of time. The firefighting principles for fire services are as follows:

(1) The action of the firefighting services is to be directed towards preventing the explosives from becoming involved, however, this must only be attempted if advice as to the progress of the fire is available, via the MOD Incident Officer, from responsible persons in the vicinity of the fire. A HD 1.2 event will result in hot fragments, firebrands, lobbed items and possible flight of self-propelled stores. Some lobbed or self-propelled items may explode on impact, others may automatically arm, therefore none should be disturbed¹¹ Personnel should be detailed to watch for such occurrences and report them immediately so that the appropriate action may be taken by EOD staff. A HD 1.2 event can be expected to continue for a considerable period (a number of hours) therefore re-entry to the area should only be undertaken once it is confirmed safe to do so by EOD staff.

¹¹ In this respect, care is needed to avoid disturbance by misdirected water jets.

(2) If drenchers are provided in adjacent buildings, they are to be operated immediately any risk to the buildings is apparent, but see sub-para 2.2.1(1), above.

2.5 Actions for Fire Division 3

2.5.1 Explosives in this division will have a mass fire hazard, with a minor blast, or minor fragment, hazard. They will not explode en masse. The firefighting principles for fire services are as follows:

(1) The action of the firefighting services is to be directed towards preventing the explosives from becoming involved, but if this proves unsuccessful, a marked increase in radiant heat is to be expected, perhaps with jetting of flame perpendicularly from openings in buildings. Such areas must be avoided and firefighting efforts should be concentrated on subduing the fire and preventing its spread to adjacent buildings or stacks by intense radiation or flying brands.

(2) Firefighting personnel must take full advantage of any protection that is available to themselves and their equipment from the effects of radiated heat, which may become intense. Water should be applied freely in a form that will provide for effective firefighting consistent with the need for protection of fire fighters.

2.6 Actions for Fire Division 4

2.6.1 Explosives in this division present no significant hazard, being mainly confined within their packaging:

(1) The ammunition may explode sporadically over an extended period of time. The action of the firefighting services is to be directed towards preventing the explosives from becoming involved, but if this proves unsuccessful, firefighting personnel should take full advantage of any available shielding, e.g. buildings, adjacent stacks, brick walls, etc, and continue to attack the fire. For protection against fragments and missiles the firefighting forces should not approach the scene of fire any closer than 25 m. Whilst the hazards from explosives in HD1.4S are expected to remain within the packaging other items within the HD1.4 category may produce a small amount of fragments and burning debris within a short distance.

(2) Water should be applied freely in a form that will provide for effective firefighting, consistent with the need for protection of firefighters. It may even be possible to approach the fire at a range that will allow the use of water spray.

2.7 Metallic Powders

2.7.1 Metallic powders (MP) are occasionally used as an ingredient of explosives and stocks may therefore be located in explosives facilities. MP's constitute a special risk because they are capable of burning fiercely with the evolution of intense heat and light. A smothering agent should be employed when fighting fires involving MP as the application of water can cause a violent increase in the rate of burning with the risk of subsequent explosion. Water and other liquid extinguishers must therefore not be used, and this will be indicated by the use of the "NO WATER" supplementary fire sign.

2.7.2 Should the fire be so intense as to preclude the approach of fire crews to deploy extinguishing media, water sprays may be used to protect and cool adjacent material not already involved.

2.8 Additional Considerations for Senior Fire Officer

2.8.1 The following additional equipment and precautions must also be given consideration:

- (1) Portable ground monitors (PGM¹²) capable of being operated from a safe position should be provided and used for firefighting, fire protection and cooling purposes.
- (2) Decisions relating to the opening or closing of ventilation systems must be left to the SFO present.
- (3) As soon as explosives are hazarded by fire, advise retirement to the pre-planned place of refuge (see Annex B para 3.2.2) immediately.
- (4) Solid water jets can displace items or boxes and will spread loose propellants, etc. Only use jets where maximum range is required or a liquid fuel fire has to be driven, otherwise use spray.
- (5) Some items may react violently with water. Watch for USE NO WATER signs shown on the buildings. Always consult with the MOD Incident Officer or specialist advisers before commencing firefighting operations.
- (6) Dynamic Operational Risk Assessment (DORA) must be kept under review at all times.
- (7) Consideration should be given to managing fire water run-off due to the environmental damage this can cause.

3 FIRES IN UNDERGROUND SITES

3.1 Introduction

3.1.1 For the purposes of fire safety measures, underground sites are those where the whole of the storage space is below natural ground level.

3.2 Firefighting Personnel

3.2.1 A very rapid response is required to fires in underground sites. If practicable and safe to do so, any firefighting should be restricted to tackling the fire before any explosives become involved and to that necessary to allow personnel to evacuate the site. All personnel employed in underground sites must be adequately trained and regularly practiced in the use of firefighting equipment in accordance with FSMP requirements.

3.2.2 Firefighting equipment retained underground should be positioned where it is most likely to be accessible when an outbreak of fire is detected.

3.3 Self Contained Breathing Apparatus

3.3.1 Self Contained Breathing Apparatus (SCBA) is essential for the protection of fire fighters underground. Unless equipped with approved SCBA, no personnel are to enter an underground site in which fire has broken out until the area has been certified gas free.

3.4 Ventilation Systems

3.4.1 Decisions regarding the opening or closure of any ventilation systems must be left to the SFO, who will be advised by the MOD Incident Officer. It is essential that the ventilation system and its method of operation are included in the Tactical Information Plan plan. In air-conditioned sites or in sites provided with forced air ventilation, the need to shut those down on the outbreak of a fire must be considered.

3.5 Conveyer Systems

3.5.1 Conveyer systems are to be stopped on the sounding of the alarm unless:

¹² PGM are normally carried by Emergency Fire and Rescue Services. During pre-planning, it may be found that Emergency Fire and Rescue Services do not carry PGM. In these instances, it may be necessary to provide the equipment and maintain it on site ready for immediate use.

- (1) It is considered by the operator that to do so would create an additional hazard,
- or,
- (2) A manual over-ride is fitted where a conveyer is designed to stop automatically on operation of the alarm.

3.6 Fire Divisions 1, 2 and 3 – Actions

3.6.1 Firefighting actions follow the general lines for fires in above ground sites (see paras 2.2 to 2.7 above). However, the following paragraph prescribes special conditions applicable to all Fire Divisions underground.

3.6.2 The first priority must be the initiation of the Tactical Information Plan. Calling for assistance from the Emergency Fire and Rescue Services must automatically follow together with the evacuation of all non-essential personnel and roll call completion. If immediate first aid firefighting measure prove ineffective, all personnel must be speedily evacuated and no further attempt made to fight the fire other than by remotely controlled fixed firefighting installations. Due to the additional confinement of an underground storehouse munitions in HD 1.3 will react in a similar manner to HD 1.1. Re-entering the hazard zone following an explosive event should only be undertaken if there is adequate evidence that it is safe to do so. If there is no life risk (ie there is no-one missing) the area should be left to cool down for at least 24 hours. It is feasible to utilise EOD personnel with remote controlled cameras to evaluate the situation and authorise an earlier re-entry, probably undertaken jointly with the Fire & Rescue Service. If personnel are missing and it is feasible they are within the hazard zone any re-entry attempt should be the subject of discussion between the Silver Command Team including EOD Officer. If no EOD Officer is at the site advice can be obtained from JSEODOC – Telephone: Didcot Military: (94 234) Ext: 3360, 3361 or 3362
Didcot Civil: (01235) Ext: 513360, 513361 or 513362.

3.7 Incendiary and Smoke Compositions

3.7.1 Articles containing incendiary and smoke compositions may be stored in single chamber sites not containing other types of explosive. Fires occurring in such sites would present unacceptable hazards and should not be fought. All personnel must be speedily evacuated.

3.8 Toxic Substances

3.8.1 Weapons containing toxic substances should only be held in underground sites in exceptional circumstances. An interval of 2 to 3 days after the fire has apparently ceased must elapse before any attempt at re-entry by fully protected personnel for inspection purposes.

4 FIRES INVOLVING EXPLOSIVES WITH A RADIOLOGICAL HAZARD

4.1 Fighting Radiological Fires Above Ground

4.1.1 The firefighting procedures applicable to explosives involving either minor or major radiological risks are basically the same. There will, however, be marked differences in detail in the radiological, protection aspects of the Tactical Information Plan.

4.1.2 If the fire is detected early, prompt action with firefighting equipment should be taken. This should prevent the development of a serious fire. The fire alarm must be operated immediately, the Tactical Information Plan set in motion, and non-essential personnel evacuated to a safe distance upwind from the incident (see Chapter 15, paras 10).

4.1.3 The Tactical Information Plan must cover the requirements for PPE to be used by firefighting personnel. SCBA must be worn. Where the presence of radioactive material could entail a major radiological hazard, protective clothing must also be worn. Decontamination procedures and the containment and disposal of contaminated run off water, used for firefighting and decontamination purposes, must also be provided for.

4.1.4 Personnel known to have cuts and wounds or other skin conditions, which might lead to radiological contamination, must not be permitted to remain in the vicinity. Those who suffer from cuts or wounds in the course of their duties must be withdrawn for first aid treatment to prevent contamination entering the body. Smoking, eating and drinking must be prohibited in areas where contamination exists or is likely to occur.

4.1.5 Success in fighting the fire is largely dependent on action being taken with suitable equipment before the fire can develop and involve the explosives and subsequently on the availability of copious water supplies. Efforts must be made to avoid dispersing the radioactive materials any more than is necessary, and surface water drains carrying the run-off from firefighting operations will require special consideration. Of equal importance will be compliance with any environmental restrictions on pollution.

4.1.6 All personnel are to be monitored before leaving the exclusion area and must undergo personal decontamination as necessary. Appropriate attention must be given to any cuts, wounds or other skin conditions liable to radioactive contamination. Furthermore, equipment and appliances used within the exclusion area must be retained in the area until checked for contamination, and cleared by qualified personnel before removal. Equipment and appliances found to be contaminated must be clearly marked and segregated pending decontamination or disposal.

4.1.7 Salvage operations and re-instatement works must not be undertaken in the vicinity of the fire until guidance has been given by the appropriate authority to do so.

4.2 **Fighting Radiological Fires in Underground Sites**

4.2.1 The conditions given at paras 4.1, above, are also applicable to firefighting in underground sites. Monitoring for radioactivity and decontamination arrangements is essential. Additionally, personnel must not be permitted to re-enter the underground site after a fire until it has been certified by qualified specialists that it is safe to do so. In the Tactical Information Plan, account must be taken of the likelihood of fumes from burnt or exploded stores with a radiological hazard being released into the open.

5 **FIGHTING FIRES IN AUTHORISED QUANTITY STORES**

5.1 The licence conditions for authorised quantity stores should ensure that there is no risk of a mass explosion. Majority of the explosives effects should be contained within the PES structure. In line with all incidents potentially involving explosives initial efforts should be made to avoid explosives becoming involved with any fire. Once explosives are involved in the fire firefighters should not enter the PES but can continue to fight the fire from a distance of 10m. This distance is to take account of any minor fire brands and thermal effects.

ANNEX B**APPENDIX B****PRINCIPLES OF FIREFIGHTING
ADVICE PROVIDED TO EMERGENCY SERVICES****CONTENTS**

Para

- 1 BASIC PRINCIPLES
- 1.1 MOD Incident Officer Responsibilities
- 1.2 No Identified Life Risk
- 1.3 Identified Life Risk

1 BASIC PRINCIPLES**1.1 MOD Incident Officer Responsibilities**

1.1.1 The MOD Incident Officer(s) is responsible for providing the Senior Emergency Services Officer (SESO) with credible information to assist the SESO in undertaking their Dynamic Operational Risk Assessment (DORA). The DORA is the prime methodology the SESO utilises to evaluate what are the risks to his personnel and to determine what degree of risk he is willing to accept in undertaking the emergency response actions deemed necessary.

1.2 No Identified Life Risk

1.2.1 In the circumstances where people are not at risk from death or injury the DORA process will balance the risk in saving property with the risk to the fire fighters. If explosives are not involved then standard firefighting techniques will be appropriate and the advice from the MOD Incident Officer will be restricted to;

- (1) Confirmation that all personnel are accounted for and in a place of refuge;
- (2) Information on any hazardous materials in the vicinity,
- (3) Advice on the priorities for saving building threatened by fire,
- (4) Advice on the nearest place of refuge in the event explosives do become involved.

1.3 Identified Life Risk

1.3.1 Where it is clear that not all personnel cannot be accounted for and it is therefore reasonable to assume they have been affected by the incident the advice provided will need to be more extensive. As a minimum the following factors need to be considered and appropriate information passed to the SESO.

- (1) (a) Is it reasonable to expect that personnel are still alive?
- (b) Is there visible evidence that people are alive by seeing movement?
- (c) What were their last known whereabouts?
- (d) Is there evidence from witnesses, where people were last seen?
- (2) (a) If the probable location of missing personnel can be established can they be evacuated to a place of refuge in a safe manner?

- (b) Is the location safe to approach or is it at risk from an initial explosion or secondary explosions. This will depend in part on what PES is at risk and how long will it be until any explosives involved in a fire are likely to react.
 - (c) Can the contents of the PES be established? Both by NEQ and HD or type of munition. If characteristics of the munitions are known can an evaluation be made on expected reaction. Can the amount of time explosives have been involved in the fire be established?
- (3)
- (a) What risk will the emergency services be at in taking rescue action?
 - (b) How close is location of personnel to PES, is it in excess of PBD?
 - (c) If explosive event has already taken place what is the likelihood of secondary explosions? HD 1.1 munitions may produce a mass detonation event but may leave disrupted and damaged munitions thrown around which remain dangerous to any rescuers. HD 1.2 explosives are very likely to continue to produce explosive events for a number of hours. HD 1.3 is likely to produce directional jetting.
 - (d) Using information above is there a window of opportunity to send in a rescue team to evacuate personnel?
 - (e) Can a safe route be identified? For instance can approach be made using substantial cover (traverses), can approach be made from corners of the PES (corners will normally produce significantly less fragments/debris in the event of an explosion). If location of personnel is in excess of PBD from PES blast over-pressures are likely to be acceptable.

1.3.2 Due to the considerable number of factors which could apply to one incident it is not feasible to provide definitive guidance which can be applied in all circumstances. Reliance is therefore made on competent individuals fulfilling the MOD Incident Officer roles. The above principles can only act as a guide and need to be interpreted competently. The precautionary principle should always be considered and advice that it is likely to be safe to enter (or re-enter) the hazard zone should only be provided if there is clear evidence that indicates that is the case. If in doubt, the MOD Duty of Care to the emergency services requires us to err on the side of caution.