



Defence  
Safety Authority

# DSA 03.OME Part 2 (JSP 482) - Defence Code of Practice (DCOP) and Guidance Notes for In-Service and Operational Safety Management of OME

Defence OME Safety Regulator

*DOSR*



## **DSA VISION**

***Protecting Defence personnel and operational capability through effective and independent HS&EP regulation, assurance, enforcement and investigation.***

## PREFACE

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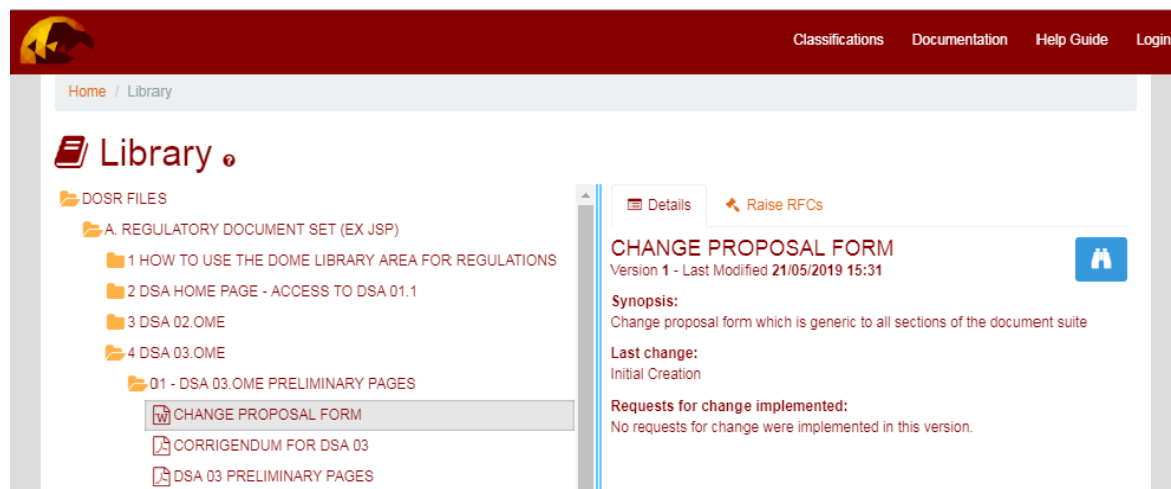


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<b>Job Title</b>	DOSR-Policy, Regulations and Guidance
<b>E-mail</b>	<a href="mailto:DSA-DOSR-PRG@mod.gov.uk">DSA-DOSR-PRG@mod.gov.uk</a>
<b>Address</b>	Juniper #5004, Level 0, Wing 1, Abbey Wood North, Bristol, BS34 8QW



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## 1 EXPLOSIVES LICENSING ARRANGEMENTS

### 1.1 Introduction

1.1.1 The Secretary of State for Defence is authorised to operate his own scheme for Separation Distances (Quantity Distances) and Explosives Licensing<sup>1</sup>. That scheme is to provide an equivalent level of safety to that afforded by Explosives Regulations (2014) through separation distance or separation distance and other safety measures. Explosive Regulations 2014 and other civil legislation place duties on an explosives licence holder. These are principally in relation to assessing the risk from the explosives activities, preventing fire and explosion, limiting the spread of fire and explosion, protecting people from the effects of fire and explosion and preventing unauthorised access to explosives. MoD incorporates the legislative requirements through various documents including DSA 03.OME (JSP 482). Where MOD is the explosives licensing authority it corporately

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<sup>1</sup> Explosives Regulations 2014 Regulation 3(9)



underwrites these risks on the proviso that the standards contained within DSA03.OME (JSP 482), and other guidance materials have been met.

1.1.2 All sites required to store, handle or process explosives must be licensed as suitable for the intended purpose. The HSE, Police and Local Authorities perform this role in the civil sector and CIE (MOD) puts in place arrangements for the licensing of explosives facilities or areas under the control of the Secretary of State for Defence. There may be occasions where, for one reason or another, MOD estate is not licensed by the MOD but by HSE, the Police or Local Authority, and vice-versa. Guidance on determining whether the MOD is the licensing authority is at Annex A. The underpinning intent is to issue the explosives licence to the person<sup>2</sup> carrying out the activity; therefore, that person will be accountable for controlling the activity, on a day to day basis; consequently, if a person does not have the requisite authority to control the people and activities then they should not be the explosives licensee.

1.1.3 It should not be assumed that there is an automatic right to an Explosives Licence. Where the TLB/TFA has a requirement for explosives or ammunition to be stored, processed, handled or disposed of, then it is up to that TLB/TFA to ensure they meet the standards required and resource the Duty Holder adequately. There may be circumstances where the standards are not met, but MOD will continue to underwrite the risks providing any variations have been assessed and accepted by the relevant technical/competent authorities and there is evidence that the residual risks will be managed.

1.1.4 Explosives licences will allow for the presence of explosives for either Storage (includes Stabling); Handling (Rail Road Transfer Points and Ports); Processing; or Logistical Disposal Areas. In general, the licensing process should consider the intended activity (storage, handling, processing or disposal), for the facility or area to which the licence refers, dictating a maximum quantity of explosives allowable based on external constraints.

1.1.5 It is the responsibility of the HoE to ensure that no facilities within his site are used for the storage, handling, processing or logistical disposal of explosives unless there is a valid licence in place. Where the MOD is to be the explosives licensing authority the relevant MoD Duty Holder should request a licence from the appropriate TLB/TFA IE.

1.1.6 In determining who should hold the explosives licence the IE must consider who has effective control of the people and activities and the extent to which they have control over the duties. This may result in an explosives licence being issued to a lodger unit rather than the HoE. Where more than one site<sup>3</sup> on an establishment is under the control of a single MoD Duty Holder then there shall, so far as is practicable, be only one IE responsible for explosives licensing of that establishment.

## 2 GENERAL PRINCIPLES

### 2.1 Introduction

2.1.1 The principles below apply to all situations where an IE is licensing in accordance with DSA02.OME.

- (1) Explosives buildings, facilities and associated traverse if required, must be constructed to an approved design.
- (2) Where Electrical installations will form part of the building infrastructure then they must conform to the required standard

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<sup>2</sup> Person in this context is the relevant commander who controls the people carrying out the activity.

<sup>3</sup> Site: an area under the direct control of the same Duty Holder.

- (3) With certain exceptions detailed in Chapter 8, a Lightning Protection System must be installed. Legacy systems are acceptable providing they continue to meet the design and performance criteria applicable at the time of installation, unless legislation or a safety concern requires retrospective action.
- (4) All new explosives buildings are to be commissioned in accordance with ESTC Standard 6.
- (5) All explosives facilities must be subject to acceptance by the relevant TLB/TFA security service. Any security requirements must be complied with, or where observations allow a HoE to accept a security risk, there must be evidence of such acceptance.
- (6) All explosives facilities must be subject to acceptance by DFR, where DFR is the Fire Enforcing Authority. Any requirements of DFR must be complied with, or where observations allow a HoE to accept a fire risk, there must be evidence of such acceptance.
- (7) Where DFR is not the Fire Enforcing Authority (such as with CCF located in schools) then the TLB/TFA IE is to inform the relevant fire enforcing authority, in writing, to comply with the Regulatory Reform (Fire Safety) Order 2005 Section 42(1)(a). Any requirements made by the relevant fire enforcing authority must be complied with.
- (8) An effective Safety Management System (SMS), appropriate to the explosives activities for which the explosives licences are required, is to be in place.
- (9) There is to be a suitable organisation with the appropriate competences, under the command of the explosives licensee, to operate the SMS and manage the duties required by MoD regulations.
- (10) The appropriate Quantity Distances (QDs) should be met. Licences are to be issued based on appropriate protection to people; the underlying principle is that people are to be afforded protection from a fire or explosion and this may be by distance or distance and other safety measures.

2.1.2 Validity of the explosives licence, once issued, is dependant upon continued maintenance of explosives facilities in accordance with ESTC Standard 6; there being no comments restricting or prohibiting the presence of explosives by the security or fire services; no infringements of the QDs; and the continued effective management of the explosives facilities and activities

2.1.3 Consequences from an unplanned fire or explosion in a PES, to people within an ES external to the PES, can normally be assumed to be at least tolerable if all the Explosives Licences for all the PES on site meet all the normal requirements of the Quantity Distances.

2.1.4 Where there is full compliance with DSA 03.OME (JSP 482) then a Standard Explosives Licence may be issued by the TLB/TFA IE.

2.1.5 Where the requirements of Structural Standards, Electrical Infrastructure, LPS, Fire, Security or Quantity Distances cannot be met, this may not in itself necessarily preclude the issue of an Explosives Licence. Situations may also occur which the prescribed standards do not address. In these cases, then a Technical Assessment (TA) or Consequence Analysis (CA) should be made to determine whether the intent of the legislation or regulations is being met and form part of the evidence within a Safety Case (SC).

### 3 TECHNICAL ASSESSMENT AND CONSEQUENCE ANALYSIS

#### 3.1 Introduction

3.1.1 If an explosives licence is required, despite the prescribed standards not being met, then the TLB/TFA IE should arrange for the site to be surveyed and a TA or CA as appropriate to be conducted by a competent person.

3.1.2 Technical Assessment will be required where Infrastructure, Fire & Security do not meet the required standards. A TA should assess whether the standards in place provide equivalent safety to that afforded by full compliance with the regulations and any standards based upon legal requirements and associated ACOP.

3.1.3 A Consequence Analysis will be required where the QDs or building standards cannot be met and people, or assets that are vital, are at risk. A CA should assess the protection to people & assets

3.1.4 Guidance on TA and CA is at Annex C.

3.1.5 If, because of a TA or CA the IE has sufficient evidence that the intent of the regulations has been met, and any loss to infrastructure or assets has been accepted appropriately, then a Standard Explosives Licence may be issued. DSA DOSR CIE (MOD) must be informed of the outcome of the TA or CA.

3.1.6 Where a licence is issued under the authority of a TA or CA, reference is to be made, on the licence, to the TA or CA and any conditions required by the assessment should form licence conditions to be met. Failure to do so may invalidate the TA or CA assumptions and outcome. The establishment must:

- (1) either sign up to an action plan to remove the requirement for the TA or CA;
- or,
- (2) where no remedial action can reasonably be taken, provide a statement defining why remedial action is not practicable.

3.1.7 DSA DOSR CIE (MOD) is to be provided with a copy of Explosives Licence/Letter of Authority, granted under the terms of a TA or CA. CIE (MOD) is also to be advised whenever a CA supported Explosives Licence/Letter of Authority is cancelled.

3.1.8 If the TA or CA shows that the intent of the regulations cannot be met, or the loss of infrastructure or assets is unacceptable then the IE should not issue the licence.

3.1.9 There may still be reasons for an explosives licence despite the failure to meet the required standards. In these instances, there must be a clear Defence Imperative and where a licence may be issued it will be a Non-Standard Licence.

## 4 NON-STANDARD LICENCES

### 4.1 Introduction

4.1.1 In principle there should be no Non-Standard explosives licences. However, it may be that the TLB/TFA still requires an explosives licence to support their activity. Depending on the level of residual risk it will be for DSA DOSR CIE (MOD) or PUS to determine whether defence will underwrite the risk and therefore allow the issue of an explosives licence.

4.1.2 Where the TLB/TFA believes that to meet the Defence Imperative the activity is required, irrespective of the residual risk, then they must make an application to DSA DOSR CIE(MOD), as detailed below. The application must be submitted with sufficient time for adequate scrutiny and possible referral to PUS.

4.1.3 The CA detailed above may require the need to undertake a Quantitative Risk Assessment (QRA) as part of the SC.

4.1.4 The SC may provide a variety of potential scenarios and consequences. The CA will provide an output expressed in terms of Conditional Probability of Fatality based upon the explosion happening; Annual Risk of Fatality for an individual at exposed sites (Individual Risk); and of the surrounding population (Societal Risk).

4.1.5 A SC must be supported with clear evidence as to the Defence Imperative; what options have been considered; reasons for rejecting options and selection of the preferred option; and the consequences of not being granted an explosives licence.

4.1.6 Where an option exists that meets the standard licence conditions then there will need to be a very compelling argument to support why it has not been taken.

4.1.7 Where:

- (1) The general public<sup>4</sup> are at no greater risk of harm than if they were at the full QD appropriate for the circumstances (PTRD, IBD OR VBD); and
- (2) Potential consequences only affect explosives workers and explosives area support workers; and
- (3) Where the risks, Individual and Societal lie between the Broadly Acceptable and the Intolerable, the Safety Case submitted to DSA DOSR CIE(MOD) must be endorsed by an appropriate 1\* from the TLB/TFA requiring the activity. The 1\* is to have the authority to accept the risks on behalf of the TLB and confirm that all options have been considered; with reasons as to the appropriateness of the selected option.

Then the TLB/TFA IE may authorise the licence if it has DSA DOSR CIE(MoD) endorsement.

4.1.8 Where:

- (1) The general public are at greater risk of harm than if they were at the full QD appropriate for the circumstances; or
- (2) Where the risks, Individual or Societal, are above the intolerable limit the Safety Case submitted to DSA DOSR CIE (MOD) must be endorsed by an appropriate 2\* from the TLB/TFA requiring the activity. The 2\* is to confirm that all

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<sup>4</sup> The term general public applies to all people, MoD employees, contractors and members of the public who are not involved in the explosives activities for which the licence is required.

options have been considered; with reasons as to the appropriateness of the selected option.

4.1.9 Then such applications for a licence are to be submitted to DSA DOSR CIE(MoD) for comment and then submitted through the TLB/TFA chain of command to PUS for approval.

4.1.20 It is to be noted that any single major industrial incident that may result in 50 or more fatalities overall or 6 members of the general public should be viewed with grave concern. Society is unlikely to tolerate such consequences<sup>5</sup>.

## **5 REASONS NOT TO ISSUE A LICENCE**

### **5.1 Introduction**

5.1.1 In exceptional circumstances it may be that a site is unsuitable to be licensed despite meeting the external Quantity Distance criteria. Examples whereby a site maybe unsuitable could include:

- (1) The management organisation lacks the competence to manage or undertake the activities for which an explosives licence is required.
- (2) The presence at, or in the immediate area of the site, of methane (for example from a landfill site) so that there is a significant risk that fire or explosion involving methane could spread to the explosives site; or
- (3) The presence at or in the immediate area of the site of gas pipelines or high voltage electricity supply so that there is a significant risk that an explosion involving the explosives would result in a significant knock on consequences; or
- (4) The presence of hazardous substances at or in the immediate area of the site so there is a significant risk that an explosion at the site would cause the release of hazardous substances into the wider area; or
- (5) Bulk storage of flammable substances at or in the immediate area of a site so that there would be a substantial risk that an explosion at the site would cause a fire in the flammable, or a fire involving the flammables could spread to an explosives building.

5.1.2 It should be noted that this is to address the hazards posed by the exposed site and the consequences of an incident at the ES which may result in a large gathering of people.

## **6 POSITIONING OF UK MOD EXPLOSIVES IN NON-MOD LOCATIONS**

### **6.1 Introduction**

6.1.1 When it is necessary to position explosives at non-MOD locations, including airfields and docks, in the UK, or overseas, the regulations or legislation of the landlord (in UK) or Host Nation (HN) are to be compared with standard applicable in the UK and the more stringent of the two are normally to be observed. Prior to any deployment, a safety review of the facilities available at the host location is to be carried out to ensure that standards applicable in the UK will not be subsequently infringed. The safety review is to be carried out by a competent person on behalf of DSA DOSR CIE(MOD) or the appropriate IE

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<sup>5</sup> HSE Documents Reducing Risk Protecting People (R2P2) and Controlling Risks Around Explosives Stores 2002.

6.1.2 The assessment is to compare the host's standards with DSA03.OME (JSP 482) and determine whether any explosives limits are achievable. If they are then the activity may take place within the limits achievable.

6.1.3 Where it is possible to demonstrate that the SofS has, in practice, control of the people and the activities then a Licence(s) should be produced and issued to the relevant MoD Duty Holder.

6.1.4 If no limits are achievable or there is a requirement to exceed the achievable limits then either the activity does not take place, or the Non-Standard licensing procedure is to be followed.

## **7 CIE(MOD) INSTRUCTIONS**

### **7.1 Introduction**

7.1.1 There may be occasions, that sit outside of the normal sphere of DSA03.OME (JSP 482), where DSA DOSR CIE(MOD) will wish to set down the conditions under which UK Military Explosives activities take place. Such conditions will be issued as DSA DOSR CIE(MOD) Instructions to relevant MoD Duty Holders who can affect any mitigation measures identified.

## **8 CONTINGENCY LICENCES**

### **8.1 Introduction**

8.1.1 There may be circumstances where a requirement to have an explosives licence is not immediate, but under certain conditions, there is a foreseeable need; such circumstances may be dependant upon putting in place contingency plans.

8.1.2 In such circumstances the normal licensing procedure is to apply. Where the assessment indicates that a licence cannot be issued without evacuation of, or placing restrictions on, members of the public; the licence must be treated as if it is a Non-Standard Licence and referred to DSA DOSR CIE(MOD) with a clear Defence Imperative, options considered, and safety case for the proposed licence.

## **9 OPERATIONAL THEATRE EXPLOSIVES LICENSING**

### **9.1 Introduction**

9.1.1 Where practicable the arrangements in DSA03.OME (JSP 482) should be applied to explosives licensing in the operational theatres. However, there may be operational limitations that preclude compliance with DSA03.OME (JSP 482) in some areas.

## **10 MOD EXPLOSIVES LICENCES**

### **10.1 Formats**

10.1.1 MoD Explosives Licences come in three formats:

(1) MOD Explosives Licence (MOD Form 1658)

(a) This is the front sheet of the licence to be used when licensing a PES. An electronic template of this form is provided for users. It is a Quantity Distance based licence. The MOD Explosives Licence authorises the maximum NEQ, by Hazard Division, that may be kept in the subject PES. The front sheet of the licence must be supplemented by further sheets listing PES details (e.g. building dimensions and construction types).

(b) In order to ensure that all ES have been captured a site building schedule listing all ES site potentials achieved within the safeguarding distance is to be produced by the establishment. The building schedule is to identify all buildings, occupancy levels and times of occupancy. These supplementary sheets, also known as licence back pages, are to be in a format agreed with DSA DOSR CIE (MOD).

(2) MOD Authorised Quantity Explosives Licence (MOD Form 1659)

(a) This licence is for use when PES is to be licensed under the DOSR regulations. The basic principle of a PES licensed with MoD Form 1659 is that if the contents are involved in a fire or are initiated there are no external effects to the PES when it is closed, except for smoke or fumes. This will normally restrict the presence of explosives to those of SsD 1.2.2 Compatibility Group G and 1.3.4 and HD 1.4.

(b) The MOD Authorised Quantity Licence authorises the maximum NEQ, by Hazard Division, that may be kept in the subject PES. Normally it shall specify the natures, by Hazard Division, Compatibility Group and quantity that may be present. Where this is not practicable, due to the number of natures or the changing requirements of the facility, it is permissible to state the maximum authorised NEQ by hazard division and include a statement as to the Compatibility Groups allowed in the licence conditions. Before issuing a MOD Form 1659 in such a way the IE is to be satisfied that the establishment has an effective method of controlling the explosive quantity present, to not exceed the authorised quantity.

(c) If articles other than those of SsD 1.2.2 and 1.3.4 Compatibility Group G and HD 1.4 are required to be present in a PES licensed on MoD Form 1659 then there must be evidence that the articles are compatible and will not give rise to a hazard external to the store other than stated above.

(3) Ammunition and Explosive Disposal, Proof and Demonstration Site Licence (MOD Form 1672)

(a) This licence shall be used where sites are for the logistical disposal, demonstration and proof of explosives under the regulation of Chapter 10. When licensing using this MOD Form the environmental issues addressed in JSP 418, the Management of Environmental Protection in Defence shall be taken account of.

## 10.2 Registered Locations

10.2.1 There are some circumstances where a licence is not required but MoD still requires putting in place controls. These circumstances are:

- (1) Guardrooms and Police or Security posts where explosives are limited to SAA and pyrotechnics only. The quantity of SAA and Pyrotechnics is such that it is sufficient to arm the immediate duty guard force only;
- (2) Amnesty Boxes;
- (3) Cadet Forces with only Rds .22in ammunition.
- (4) Limited Quantity Top Up areas with less than 10 Kg HD1.1

10.2.2 All such locations are to be a Registered Location and included in the Licence Register held by the IE. They are to be included in the periodic inspections.

## 11 EXPLOSIVES LICENCE LIMITS

### 11.1 Introduction

11.1.1 Potential and Authorised Limits are as follows:

- (1) Site Potential Limit. This is the potential NEQ, by HD, which is achievable at a PES after calculating QDs to the various ES.
- (2) Authorised Limit. This is the actual limit, authorised by the IE, and reflects the maximum quantity of explosives, by HD, which is permitted at that PES. Normally the Authorised Limit will not exceed the Site Potential Limit.

11.1.2 With an Authorised Limit sufficient to meet predicted operational needs over the life of the licence with due regard to maintaining flexibility of storage, handling and processing assets. Whenever reasonably practicable, the Authorised Limit should be less than the site potential.

## 12 EXPLOSIVES PROCESSING FACILITIES

### 12.1 Introduction

12.1.1 In addition to ensuring that people external to the licensed facility are afforded adequate protection, either through distance or structural engineering of the PES or ES, there is also a requirement to protect people in adjacent areas of the process from the risk of death or serious injury. Although a licence may be granted for a processing facility no processing may take place until the relevant process instructions have been approved.

## 13 LICENSING OF UNITED STATES VISITING FORCES (USVF) SITES

### 13.1 Introduction

13.1.1 Under the terms of the Memorandum of Arrangement between the Government of the United States of America (as represented by Commander Third Air Force) and the Government of the United Kingdom of Great Britain and Northern Ireland (as represented by the Air Secretariat (Air staff), UK Ministry of Defence dated October 1997 (The Munitions MOA) all applications for explosives licensing of USVF facilities in UK shall be dealt with by the Royal Air Force Liaison Officer Armaments office (RAFLOArm). Explosives licences for USVF in the UK are to be raised in accordance with the criteria stated in this JSP. Where USVF cannot comply with MOD Regulations but meet US national regulations regarding QDs from their own PES to entirely US facilities, personnel and material, then IE (RAF) may issue a Standard licence. Facilities where UK nationals are present shall always to be given the full protection afforded by MOD Regulations. Where neither US national regulations nor DSA02.OME can be met, then full CA procedures are to be followed. Any subsequent licence application is to include the following:

- (1) A written Risk Assessment carried out iaw AFMAN 91-201.
- (2) A justification for the requirement, including a note of any special controls, conditions or limitations considered appropriate.
- (3) If appropriate, a written statement from the appropriate US commander accepting the risks to United States personnel and assets.



## 14 CLASSES OF WORKERS

### 14.1 Introduction

14.1.1 There are numerous people who may be required to be exposed to the explosives hazard. However, the law requires that any person manufacturing or storing explosives takes appropriate measures to protect people from the effects of fire and explosion. The fundamental principle is that only the minimum number of people should be exposed to the minimum level of explosives for the minimum time. To assist with determining who is exposed to the explosives hazard MoD identifies three classes of worker.

14.1.2 Explosives Worker (EW): A person who is working on explosives and as such is required to be exposed to the explosives hazard. They are an Explosives Worker only in relation to the process they are working on and should be afforded the appropriate protection from other areas or tasks where explosives are present. Where the explosives to be worked on present a high risk of initiation then remote working should be considered.

14.1.3 Explosives Area Support Worker (EASW): A person who is not required to work on explosives but is required to work inside the relevant QD in support of the explosives work or facilities. Examples may include maintenance engineers and grounds maintenance staff. Generally, no QD is specified for their varied work locations; however, they must be afforded protection from the effects of fire or explosion where appropriate. As far as reasonably practicable their work must be de-conflicted from areas where explosives activities, such as storage, movements or processing, are being undertaken, and their time at risk must be kept to the minimum practicable. The retaining at risk of any EASW must be justified by the relevant MoD Duty Holder. An EASW must not be retained at risk for convenience.

14.1.4 General Public: This includes MoD employees, contractors and visiting workers who do not need to be exposed to the explosives hazard. Such people are to be afforded the appropriate level of protection that the relevant QD provides.

## 15 ELECTRONIC LICENSING TOOLS

### 15.1 Introduction

15.1.1 Only electronic explosives licensing tools approved by DOSR may be used for the generation of MoD explosives licences. This does not include electronic registers used solely for the recording of explosives licence data.

## 16 NOTIFICATION TO FIRE ENFORCING AUTHORITY

### 16.1 Introduction

16.1.1 DFR is not the Fire Enforcing Authority for non MOD land. Such examples may include, but not limited to, CCF located in schools and colleges; University Officer Training Corps that may be located on University premises; there may be others. To ensure MOD is complying with the Regulatory Reform (Fire Safety) Order 2005 IEs are to make arrangements to inform Fire Enforcing Authorities prior to the issue of an explosives licence, or Registered Locations, on non-MOD property in England and Wales. Details of the relevant Fire Enforcing Authority should be obtained from the establishment to whom the licence/registration is being issued. A specimen set of words for compliance with the Regulatory Reform (Fire Safety) Order 2005 is at Annex B.

## 17 MANAGEMENT OF LICENCES

### 17.1 Introduction

17.1.1 After authorisation, one copy of the licence is to be retained by the appropriate IE, and a minimum of two by the establishment/unit. The Licensee has ownership of the risks posed by the operation of his explosives facilities. Once an Explosives Licence has been issued, he must where reasonably practicable:

- (1) Display one copy of the licence at the PES and hold controlled copies in the appropriate site office for reference and audit purposes.
- (2) Notify the IE immediately of any material change in circumstances that would require the licence to be reviewed.

### 17.2 Standard Licence Re-validation and Renewal

17.2.1 Once authorised, Standard Explosives Licences (including those authorised by TA/CA) have a maximum life of 5 years. Licences do not require renewal or amendment within the 5-year life unless:

- (1) Alterations are made to the PES.
- (2) A review is required by significant changes to MOD Explosives Regulations or as directed by DSA DOSR CIE (MOD).
- (3) Change of circumstances.
- (4) Encroachments occur which affect the licensed NEQ and/or the principles under which the licence was originally issued.
- (5) A change of use or business need arises.

17.2.2 During the year before the expiry date, the licence and its original supporting documentation are to be reviewed by the appropriate IE and re-validated against the regulations in force at the time of the review. If the justification for the licence is still valid and the conditions of issue remain compliant with the extant regulations, a new licence may be issued.

17.2.3 Where a licence is granted based on TA/CA, the licence and TA/CA must be subject to a regular review to determine that the licence is still required and that the assumptions of the Assessment are still being met or identify if changes have occurred. Where the licence is not required, or the Assessment assumptions are not being met, then the licence should be withdrawn.

### 17.3 Non-Standard Licence Re-validation and Renewal

17.3.1 Once authorised, a Non-Standard Explosives Licence has a maximum life of 3 years, but, may be less at the discretion of the IE or DSA DOSR CIE (MOD). Where a Non-Standard licence has been issued in accordance with the procedures in this chapter the aim normally will be to remove the need for such licences. Therefore, such licences are to be reviewed annually by DSA DOSR CIE(MOD) and the IE to ensure the continuing validity of the original assessment. The following factors are to be considered:

- (1) Is there a continuing need for the licence?
- (2) Is there now a possibility of removing the non-standard conditions or reducing the sensitivity?
- (3) Does MoD continue to meet its statutory duty?

## 17.4 Extension to Life of Licence

17.4.1 In exceptional circumstances, the life of a Standard Explosives Licence may be extended for a period of up to 12 months by TLB/TFA IE.

## 17.5 Licence Amendment

17.5.1 There may be occasions when a minor amendment to a licence is required but a new licence is not justified. Such amendments to the licence may be made in writing on the licence. In these cases, a copy of the letter, e-mail or signal from DSA DOSR CIE(MOD) or the TLB/TFA IE authorising the amendment should be attached to all copies of the licence pending issue of a new licence. Such amendments should be limited to a maximum of three.

## 17.6 Letter of Authority

17.6.1 Where a licence cannot be issued or re-issued in time to meet operational deadlines or maintain continuity of licensing cover then an appropriate "Letter of Authority" may be issued by DSA DOSR CIE(MOD) or the relevant TLB/TFA IE to cover the circumstances. Similarly, where a temporary change of circumstances such as the presence of contractors need to be authorised, and the effort involved in the issue of short term Non-Standard Licences would be substantial, then a Letter of Authority, specifying appropriate measures, may be issued. Copies of the Letter of Authority are to be held with all subject licences for its duration. DSA DOSR CIE (MOD) is to be sent a copy of all Letters of authority.

## 17.7 Suspension of Explosives Licences

17.7.1 If for any reason an explosives licence is suspended, the activity authorised by that licence must cease immediately and must not be resumed until the licence has been reinstated. Any explosives must be removed from the licensed facility/area.

## 17.8 Withdrawal of Explosives Licences

17.8.1 If an explosives licence is withdrawn from a PES the activity authorised by that licence must cease immediately and must not be resumed until a new licence is issued. Any explosives must be removed from the licensed facility/area. For a new licence to be issued the full licensing process must be followed.

# 18 LICENCE REGISTERS

## 18.1 Introduction

18.1.1 IEs shall maintain a register of all Explosives Licences and Registered Locations they authorise. The register is to contain the following detail:

- (1) Post title of the Licensee/Registrant;
- (2) Name of the establishment/unit/organisation;
- (3) Permanent address of the establishment;
- (4) Address/location of the licensed facility if different from 3 above;
- (5) Hazard divisions and NEQ authorised;
- (6) A plan in a suitable scale sufficient to show the separation distances required or a condition of the licence to be maintained around the store or the building where explosives are processed (Reference may be made to where such a plan is available);

- (7) A map in a suitable scale sufficient to show the location of any stores (Reference may be made to where such a map is available); and
- (8) The type of store concerned, including the material out of which it is constructed.

18.1.2 The plan and map referred to above may be the same plan or map, if to a suitable scale, that is able to show on-site and off-site separation distances, if such distances are required. The register may be kept in any form, including electronically.

## 18.2 Access to the Register

18.2.1 Information is to be made available to the Health and Safety Executive (HSE) within 28 days of a request from the HSE. Such requests will come from the HSE via DSA DOSR CIE(MOD). Therefore, IEs must ensure that they are able to provide such information to DSA DOSR CIE(MOD) within 14 days of a request.

## 18.3 Public Access to the Register

18.3.1 Where the licence or registration relates to explosives which require an explosives certificate under the Explosives Regulations 2014, the IE shall:

- (1) Ensure that the information referred to in that licence or registration is available for inspection at an office of the IE, at all reasonable times and free of charge, only by a person who resides or, in the case of an undertaking, is situated within a public consultation zone<sup>6</sup> concerned in relation to the licence or registration;
- (2) Provide a copy of the entry in the register for the licence or registration only to such a person who requests a copy and pays a charge which shall not exceed the reasonable cost of providing the copy.

18.3.2 Where the licence or registration relates to explosives which do not require an explosives certificate under the Explosives Regulations 2014, the IE shall:

- (1) Ensure that the information in respect of that licence or registration is available for inspection at an office of the IE, at all reasonable times and free of charge, by members of the public;
- (2) Provide a copy of the entry in the register relating to the information in respect of that licence or registration to a member of the public who requests a copy and pays a charge which shall not exceed the reasonable cost of providing the copy.

## 18.4 Exceptions

18.4.1 The requirements shall not apply where the information referred to is in respect of any site to which a licence or registration relates which is used only for the storage of:

- (1) Less than 500 kilograms of HD1.1 or HD1.2 explosives;
- (2) Less than 2 tonnes of HD1.3 or HD1.4 explosives; or
- (3) Any explosives for a period of less than four weeks.

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<sup>6</sup> Public Consultation Zone is the Safeguarded Zone to VBD.

## 19 **QUANTITATIVE RISK ASSESSMENT (QRA)**

### 19.1 **Introduction**

19.1.1 All MACR sites that exceed the threshold limits for explosives are to have QRA carried out. QRA should not be older than five years. This is to ensure the risks arising from MOD sites are being managed, are tolerable and ALARP.

19.1.2 QRA is to be used to assist with ensuring that risks associated with the implementation of QDs is at least tolerable and within ESTC guidelines. The QRA is for use by the relevant HoE and IE to determine levels of risk from the operations of the site and help to identify areas of high risk, or potential consequence and where risk can be reduced or better managed.

19.1.3 QRA may be required at intervals less than five years, such as where the site has substantial change to how it operates or the nature of the hazards changes. QRA is normally provided by DES Wpns DOSG ST2. Guidance on QRA is at Annex D.

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**CHAPTER 9****ANNEX A****MOD OR MSER EXPLOSIVES LICENSING ARRANGEMENTS****CONTENTS**

## Paragraph

**1 GUIDANCE AS TO WHETHER CONTRACTORS MAY OPERATE MOD EXPLOSIVES FACILITIES WITHOUT AN EXPLOSIVES LICENCE ISSUED IAW MSER**

## 1.1 Introduction

**2 CONTRACTOR OPERATED MOD EXPLOSIVES FACILITIES**

## 2.1 Introduction

## 2.2 Overseas Sites

## 2.3 Further Advice

**1 GUIDANCE AS TO WHETHER CONTRACTORS MAY OPERATE MOD EXPLOSIVES FACILITIES WITHOUT AN EXPLOSIVES LICENCE ISSUED IAW MSER****1.1 Introduction**

1.1.1 This annex is aimed at giving guidance to MoD explosives licensing staff when determining whether MoD explosives facilities can be operated by contractors' staff without an explosives licence being issued iaw the Manufacture and Storage of Explosives Regulations (MSER) 2005 to the contractor.

1.1.2 The Explosives Regulations 2014, require any person that manufactures or stores explosives to have a licence for that manufacture or storage. It is essential to note that CIE(MOD) is not a licensing authority for the purposes of MSER, therefore a contractor cannot treat a DSA03.OME (JSP 482) Explosives Licence as an Explosives Licence for the purposes of compliance with MSER.

1.1.3 Regulation 3(5) to MSER disapplies Regulation 5<sup>7</sup> and Regulations 9-21<sup>8</sup> to MSER for sites<sup>9</sup> "Under the Control of the Secretary of State for Defence". The Approved Code of Practice (ACOP) to MSER states "The licensing scheme established by the Secretary of State is a mechanism for the MOD to ensure that it is compliant with the relevant requirements of the Regulations. The operation of the licensing system by the MOD will be subject to scrutiny by HSE." This would suggest that MoD is expected to have a licensing scheme even though disapplied the requirements of Regulations 9-21. The SofS licensing scheme is included in JSP 482 MoD Explosives Regulations.

1.1.4 It is the intent of MSER to licence the person<sup>10</sup> doing the activity (manufacture and/or storage); in order that a contractor is able to carry out the explosives activities for which an explosives licence would be required, without being in breach of MSER, the SofS, and there by default the relevant MoD Duty Holder must be in a position whereby it is their organisation that has effective control over the site, the people carrying out the activities and the activities thereon so as to meet their statutory duties under MSER and other applicable legislation. It should be noted here, that it would be in very exceptional circumstances, with a very specific contract, that a MoD Prime Contractor could employ a sub contractor to operate MoD explosives facilities without an MSER Explosives Licence.

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<sup>7</sup> Separation Distance Scheme

<sup>8</sup> Licences and Registrations

<sup>9</sup> MSER Regulation 2 "Site" means the whole area under the control of the same person.

<sup>10</sup> Person may be a legal entity or an individual

The normal circumstances would be that control by the relevant MoD Duty Holder is too far removed to allow the facilities to operate under a JSP 482 Licence.

1.1.5 The SofS scheme is applied to sites operated by the MoD, normally employing crown servants to manage, supervise and operate the explosives facilities being licensed, where the Duty Holder is a MoD employee and MoD exercises direct control over its employees. Contractors are not the employees of the MoD Duty Holder and therefore the extent to which the MoD Duty Holder can directly influence or control those employees will vary. It is the principle that the duty holder can, legally and practically, control these duties, on a day to day basis, for which they will be accountable in the event of a breach, or potential breach, which must be ensured by the MoD when issuing explosives licences.

## **2 CONTRACTOR OPERATED MOD EXPLOSIVES FACILITIES**

### **2.1 Introduction**

2.1.1 Where it is the intent of the contract to outsource the activity, through a contract for availability or output/outsource, and the contract staff operating the explosives storage facilities are directly managed and supervised by their own company line management chain, then the contractor shall be required to comply with the Explosives Regulations 2014, and DSA02.OME should not be used for licensing purposes.

2.1.2 Where it is intended that DSA03.OME (JSP 482) is to be retained as the explosives licensing arrangements for contractor operated MoD explosives facilities, then the contract MUST specifically place the contractors' employees under the supervision and direction of the MoD Duty Holder management chain. There must also be a MoD employee in the MoD Duty Holder management chain who is responsible for supervising the safe and secure operation of the explosives facilities. The contract must make adequate provisions for the MoD Duty Holder to discharge all their duties required by DSA02.OME and any other statutory or mandatory requirement.

2.1.3 Before issuing an explosives licence under the authority of DSA02.OME, where contractors will be operating the explosives facilities, CIE(MOD) is to be consulted and confirm that the contractual and management arrangements are adequate for the SofS to claim control.

### **2.2 Overseas Sites**

2.2.1 The UK MoD authority to issue explosives licences overseas, where contractors may be required to carry out the operation of the explosives facilities or some of the explosives activities, must be considered against any host nation legislation governing explosives licensing, access to, and possession of, explosives by civilians and the arrangements for holding duty holders to account. All projects considering the use of civilian contractors to operate UK MoD explosives facilities, or to carry out explosives activities for which an explosives licence would be required in the UK must be notified to DSA DOSR CIE(MOD) before going to tender.

### **2.3 Further Advice**

2.3.1 Prior to engaging in a contract with a civilian contractor to manage or operate MoD licensed explosives facilities, contracting authorities are to inform DSA DOSR CIE(MOD) in order that an assessment can be made as to who will be the explosives licensing authority.



**CHAPTER 9****ANNEX B****SPECIMEN SET OF WORDS FOR COMPLIANCE WITH REGULATORY REFORM  
(FIRE SAFETY) ORDER 2005**

To the Chief Fire Officer  
Fire & Rescue Service

**NOTIFICATION IN ACCORDANCE WITH THE REGULATORY REFORM (FIRE  
SAFETY) ORDER 2005**

1 The Secretary of State for Defence is empowered under the Explosives Regulations 2014, to operate his own explosives licensing scheme for sites under the control of the Secretary of State for Defence. This scheme is contained in DSA02.OME MOD Explosives Regulations.

2 For the purposes of the storage of Ammunition and Pyrotechnics the following site is due to be granted /renew/vary/transfer a licence / registration to store under the above regulations. The site is not subject to regulation and enforcement by the Defence Fire and Rescue Management Organisation.

3 The details of the site are given below and in accordance with Article 42(1)(a) of the Regulatory Reform (Fire Safety) Order, 2005 the licensing authority would be obliged to know if you have any representations to make regarding this licence.

4 It is the intention of the licensing authority to issue the licence by .

5 It is requested that if you have any representations, these be submitted not less than 7 days beforehand.

Name of Licensee	
Address	
Address of storage (if different to the above)	
Store type	Small Arms Ammunition (SAA) only / Pyrotechnic Articles / SAA and Pyrotechnic Articles (Delete detail not relevant)

6 The licence is being dealt with by the Inspector Explosives [relevant IE details], from who further details of the licence can be obtained. Any representations should be sent to this address, for the attention of .

7 Please note that the information provided in relation to this licence is to allow consideration under the 2005 Order and may not be relied upon for any operational purposes.

Signature

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**CHAPTER 9****ANNEX C****TECHNICAL ASSESSMENTS AND CONSEQUENCE ANALYSIS****CONTENTS**

Paragraph

**1 TECHNICAL ASSESSMENTS AND CONSEQUENCE ANALYSIS**

- 1.1 Introduction
- 1.2 Principles
- 1.3 TA Infrastructure
- 1.4 CA Explosion Affects

**1 TECHNICAL ASSESSMENTS AND CONSEQUENCE ANALYSIS****1.1 Introduction**

1.1.1 There may be various reasons why the standard conditions in JSP 482 cannot be met. These may include construction to previous standards; alternative arrangements are already in place; or explosives to be held are less than the minimum assumed by QD tables' minimum separation distances.

1.1.2 The TLB/TFA have the option to arrange for a Technical Assessment or a Consequence Analysis (TA or CA) to be conducted by a competent person; this may be someone from within their own chain of command or an external person if the TLB/TFA does not have the competence.

**1.2 Principles**

1.2.1 The basic principle of the TA or CA is to compare the standards that would have been achieved if full compliance with the regulations was met with that that is being achieved in practice. If the TA or CA can demonstrate that the intention of the regulations has been met, then this will allow for the authorisation of the explosives licence by the TLB/TFA IE.

1.2.2 If the TA or CA demonstrates that the intent of the regulations has not been met then the licence should not to be issued. If the TLB/TFA still requires a licence, then it must comply with the Non-Standard Licence procedures.

1.2.3 All explosives licences issued based on a TA or CA should refer to the TA or CA and any conditions imposed by the TA or CA should be licence conditions; otherwise the TA or CA assumptions may be invalidated.

1.2.4 One copy of the TA or CA is to be retained by the site and one copy by the TLB/TFA IE; a copy is also to be given to CIE(MOD). TA and CA are divided as follows:

- (1) Technical Assessment: Infrastructure related to Electrical Infrastructure; Fire; and Security
- (2) Consequence Assessment: Explosion Effects related to QD's and Structure Types.

### 1.3 TA Infrastructure

1.3.1 Infrastructure related TA will normally relate to either statutory standards or MoD mandated standards. In either case, where the current standard is not being met in practice then the appropriate Technical Advisor should be requested to assess the actual arrangements against the statutory or mandatory requirements. Attention must be paid to any appropriate Approved Codes of Practice (ACoP) or industry best practice.

1.3.2 Where the assessment demonstrates that the intent of the statutory or mandatory requirement is being met, and MoD can defend itself, then the explosives licence can be issued by the TLB/TFA IE.

1.3.3 Infrastructure that has been installed under previous standards, and where there is no breach of safety standards, may continue to be used providing that the performance continues to meet the standards at the time of installation. The exception to this is where legislation, or other safety concerns, may require retrospective action.

### 1.4 CA Explosion Effects

1.4.1 Explosion Effects CA must consider the hazards produced in the event of a fire or explosion. These may include:

- (1) Blast;
- (2) Primary fragmentation such as from the munitions casing;
- (3) Secondary fragmentation such as from the munitions packaging or other munitions;
- (4) Debris from the structure or other non-explosives articles present;
- (5) Thermal effects from blast or fire;
- (6) Toxic effects of gases produced during fire.

1.4.2 The CA must identify:

- (1) The hazards and level of hazard generated in the event of a fire or explosion;  
And
- (2) Any secondary hazards that may be present such as fuel installations etc.
- (3) All people exposed to the hazard and the degree of protection afforded to them.
- (4) Whilst the priority is the protection of people, consideration must be given to assets where such assets are critical; their loss may have a strategic impact and be unacceptable.
- (5) The potential consequences to the people and assets exposed to the explosives hazard;  
And
- (6) Any other mitigation measures in place.

1.4.3 The CA must provide a comparison between the potential effects to people and assets exposed to the hazard vs the potential consequences if the full requirements of the QDs had been met. To achieve this, it is probable that the effects will need to be modelled. A DOSR approved modelling tool must be used where this is necessary.

1.4.4 Where the CA demonstrates that people exposed to the hazard will not suffer greater harm than that would be expected if full compliance with the QD's/Structural requirements had been met then a Standard Licence can be authorised by the TLB/TFA IE.

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**CHAPTER 9****ANNEX D****QUANTITATIVE RISK ASSESSMENT PROCEDURES****CONTENTS**

Paragraph

**1 QUANTITATIVE RISK ASSESSMENTS**

- 1.1 Introduction
- 1.2 Aim

**2 CONTENT AND FORM OF QRA REPORT**

- 2.1 Site Description
- 2.2 Management Standards
- 2.3 Description of Method
- 2.4 Exposed Sites
- 2.5 Potential Explosion Sites
- 2.6 Site Co-ordinates
- 2.7 Basic Initiation Frequency
- 2.8 External Hazards - Contributions to Initiation Frequency
- 2.9 Additional Contributions to Initiation Frequency
- 2.10 Consequence Models
- 2.11 Results
- 2.12 Individual Risk
- 2.13 Societal Risk
- 2.14 Assumptions
- 2.15 Conclusions
- 2.16 Recommendations

**1 QUANTITATIVE RISK ASSESSMENTS****1.1 Introduction**

1.1.1 Quantitative Risk Assessment (QRA) was introduced into the work of the Explosives Storage and Transport Committee (ESTC) – now DOSR - in the early 1990s. A Risk Assessment Study Team (RAST) was later established in the ESTC Support Group to develop the technique and produced a range of reports in so doing. Using the resulting modelling programmes, several studies have now been conducted on a range of MOD explosives areas, and the process has been largely validated. As a result, the RAST has been renamed Risk Assessment Team (RAT) and has representatives from each of the Services.

1.1.2 Explosives safety regulations employ Quantity/Distance (QD) rules, based on the likely effect of an accidental explosion. A QRA procedure is used to assist management decisions where there is concern that the QD rules cannot be fully met. QRA estimates the probability of initiations at potential explosion sites in addition to the probability of fatality given that initiation has occurred, and thereby assesses the overall risk to exposed persons. Individual risk is defined as the probability that a single person who is continuously exposed to the stated hazard will suffer a fatal accident for one year. An indication of risks to groups of people whose members may be continually changing (known as societal risk) is produced in the form of a graph of the frequency of accidents that generate N or more fatalities.

1.1.3 Assessments are done by DOSGTS2 staff - the computer programmes are not available elsewhere.

## 1.2 Aim

1.2.1 The aim of this annex is to inform appropriate explosives management staff in the purpose and use of QRA.

## 2 CONTENT AND FORM OF QRA REPORT

### 2.1 Site Description

2.1.1 The purpose and outline arrangement of the site is described.

### 2.2 Management Standards

2.2.2 Management and technical standards are subject to regular technical inspections, often involving also an Explosives Auditor from Directorate of Safety, Environment and Fire Policy (DSEF Pol), to which ESTC reports. Any audit made by the Health and Safety Executive (HSE) is also noted.

### 2.3 Description of Method

2.3.1 Assessments may be made at a basic level (Level 1) or a higher level. Level 1 follows a standard mechanism; higher levels introduce more specialised methods where unusual problems must be examined. The Level 1 assessment method is based on an estimate for the frequency of initiation per Potential Explosion Site (PES) per year, taking a standard storage category for each store. In the case of a Process Building (PB), an additional frequency contribution is added. Further contributions to this basic frequency are made to include the probability of external hazards (aircraft crash, flood, lightning, and nearby hazardous installations). Finally, the probability of ignition by communication from neighbouring buildings is included. The total frequency of initiation is then combined with fatality predictions from a suite of consequence models (for blast, weapon fragments, building debris and thermal radiation) to produce probabilities of fatality. These are expressed in terms of individual and societal risk. The computations are performed using a programme (RISKWING) developed by AEA Technology. QRAs estimate the maximum risk generated by explosives areas, based on a range of assumptions. They also address the maximum quantities of explosives permitted by the Explosives Licence for each PES. A second assessment may be made based on the actual holdings on a given day.

### 2.4 Exposed Sites

2.4.1 With the agreement of the local site management, several exposed sites (ES) are chosen for the assessment to represent the locations at highest risk, usually those recorded in the explosive limit licences. ES are usually both on the site and external to it. Details are entered in annexes. Also shown, for each ES, are the number of workers, residents and those exposed to transient risks, and the fraction of time they are likely to spend exposed, indoors and outdoors.

### 2.5 Potential Explosion Sites

2.5.1 Examples of PES are explosive store houses (ESH), process buildings (PB), hardened aircraft shelter (HAS), forward weapon store (FWS), road and rail transfer points, road staging and rail marshalling areas, etc. Annexes show each PES by its number, type and length of building, NEQ and HD of the explosive for which it is licensed, the date of the licence, and the map co-ordinates. Confirmation is sought that storage rules are closely set out in the licences and operating procedures of the site under survey.



## 2.6 Site Co-ordinates

2.6.1 The site co-ordinates used in a RISKWING study are normally taken from Ordnance Survey maps, though they may be superimposed. They are taken into the ES and PES tables in the various annexes. The areas containing certain ES are divided into fine grids to give more accurate inter-building distances and facilitate the modelling.

## 2.7 Basic Initiation Frequency

2.7.1 Basic initiation frequencies are derived from the Level 1 method and entered for each PES in the PES annex. No account is taken of PES licensed only for HD 1.4, because of the very limited effects outside the building which are likely to follow from any accident. In buildings containing more than one HD, the highest is used for the assessment, the initiation frequencies being based on the greatest possible figure for munitions that might be held. Thus, the worst credible event is assessed, even though in practice the management of storage always tends to reduce the frequency noticeably. The PBs, HAS, FWS, road and rail transfer points, road staging and rail marshalling areas, etc are shown in the same way.

## 2.8 External Hazards - Contributions to Initiation Frequency

2.8.1 The following contributions are considered for addition to the basic initiation frequency, in line with an External Hazards Guidebook. The frequency contribution for each PES is entered in the PES annexes:

- (1) Lightning. All PES where a lightning protection system (LPS) installed to BS 6651 is not fitted.
- (2) Flooding. Any history of significant flooding at the site, or of stores being affected by it though water, sensitive stores will normally be fully protected by their packaging.
- (3) Aircraft Crash. The probability of crash, by civil airline aircraft, light aircraft and small transports, military fixed wing aircraft (especially where the site is in a designated High Crash Concentration Zones (HCCZ)) and helicopters. Special factors, such as hot refuelling of helicopters on the site, are considered. Aircraft crash is normally the only external hazard to have a significant effect.
- (4) Nearby Hazardous Installations. On a site, there may be storage tanks for heating oil and fuel for vehicles and machinery, and liquid petroleum gas tanks. There may also be demolition and burning areas. Such installations are not normally regarded as constituting a significant hazard.

## 2.9 Additional Contributions to Initiation Frequency

2.9.1 The following are considered:

- (1) Site Transport and Transfer Operations. The modelling programme makes standard allowances for frequency contributions arising from site transport and transfer operations. These apply at road and rail loading and transfer points and need to be modified only if there are extraordinary conditions on the site.
- (2) Malicious Destruction. The modelling programme also makes a standard allowance for frequency contributions arising from malicious destruction. This is also entered in the tables.
- (3) Communication. A calculation is made of the probability of the communication of an initiation event between PES, each one in turn being

regarded as donor and receptor. The input for the programme is based on the QD rules.

## 2.10 Consequence Models

2.10.1 Once the total initiation frequency is known for each PES, based on all the above influences, the next step in the QRA process is to determine the fatality probability at each ES, given an event from each PES. This is done using the RISKWING programme. The RISKWING software has separate consequence models for assessing lethality from blast, weapon fragments, building debris and thermal radiation. Lethality can be determined for people in the open or inside domestic housing. For HD 1.1 and HD 1.2 stores, all consequences less thermal radiation is combined. For HD 1.3, thermal radiation is the only consequence model considered. The models are as follows:

(1) Blast. The relationship between quantity of explosives, separation distances and lethality are taken from two RAST reports. The lethality from blast applies only to HD 1.1 and HD 1.2 events. The lethality probability falls below  $10^{-9}$  (effectively zero) at a scaled distance (SD) of 6.8 for people outdoors and 55 for people indoors.

(2) Building Debris. The model for building debris has been derived for traversed PES of brick walled construction with a reinforced concrete roof. The method provides only a coarse estimate of fatality probabilities, but it can be taken as a maximum value. Special account must be taken of debris from igloos, especially the front wall.

(3) Weapon Fragments. Fragment lethality is estimated for each PES licensed for HD 1.1 and HD 1.2. A selection of weapon type is made from the following, reflecting the worst long-range consequence predicted for the contents of the PES:

- (a) 155 mm L15 HE Shell
- (b) 1000 lb Bomb
- (c) 81 mm Mortar HE Bomb
- (d) 30 mm ADEN HE Round
- (e) Sea Dart SAM
- (f) Mk 24 Torpedo

For HD 1.2, the blast and debris effects are assessed on a notional NEQ of 50 kg rather than the licensed NEQ. This follows the assumption that HD 1.2 would detonate at intervals, in a series of initiations, rather than in mass. The 50 kg figure used allows for 10 consecutive explosions of 5 kg each, which it is assumed would give time for anyone in the immediate area to move to safety.

(4) Thermal Radiation. Where PES is licensed primarily for HD 1.3, an estimate has been made of the effects of thermal radiation, for which a procedure has been devised. These effects are clearly in a much lower order than blast and projection effects.

## 2.11 Results

2.11.1 Assessment address the risks arising from the storage, handling and processing of explosives, particularly:

(1) The risks to workers operating at various points around the site, though not within the explosives areas, and considering the working hours during which they are exposed to risk.

- (2) The risks to those workers regarded as 'residents' because of their permanent occupation of exposed sites, and to the general public residing in houses around the sites.
- (3) The risks to the transient general public on nearby railways, major roads and, in some cases, public rights of way.

## 2.12 Individual Risk

2.12.1 Responsibility for ensuring the Health and Safety of Service personnel, MOD civilian staff and members of the general public lies firmly with the line management who generate the hazard and the risks there from. The generator of the risk must show that the risk not only is tolerable, but also has been reduced to a level which is ALARP. Under a procedure devised by ESTC, now DOSR the respective IEs are given guidance on how they may manage explosive storage and handling situations, including those which do not appear to meet ESTC recommendations for QDs as reflected in this publication. ESTC suggests that an IE could determine the range of risks of fatality which are generated by the high proportion of his explosives facilities which meet existing QD rules. Then, by assessing risks associated with a non-compliant situation, the IE could decide whether the problem generated a risk significantly greater than the normal range. If not, he may decide to issue a licence for the operation to proceed. He will remind the risk generator of his responsibility to ensure that the risks as ALARP. The IE may of course make his approval conditional on management constraints; regular review, time limits and so forth. Even if risks are significantly higher than normal, he may conclude that they are ALARP and can be defended as tolerable within the guidelines laid down by the HSE. DSA03.OME (JSP 482) states that he may proceed with issuing licences if DSA DOSR CIE (MOD) is informed through DOSR, and that the situation is subject to regular review. Further guidance is offered for dealing with higher risks and those which affect the general public.

2.12.2 MOD does not have formally accepted criteria for tolerable risk, and each estimated risk must be discussed in terms of criteria used by other bodies in similar situations. For example, HSE has published guidance on how to assess acceptable risk associated with the operation of nuclear power stations and the transport of dangerous substances. The approach followed in QRAs is recommended by HSE and involves the use of two threshold criteria. Above the upper threshold risk is considered intolerable and immediate steps must be taken to reduce or eliminate it. Below the lower threshold risks are accepted as tolerable and no further effort need be made to reduce them. In the intermediate region, the risk must be demonstrated as ALARP. The IE is at liberty to identify conditions which enable him to defend the choice of different threshold values if he considers this both necessary and practicable.

2.12.3 QRA site assessments performed for each of the Services and results from across the MOD have shown that the risks generated by explosives storage facilities which meet ESTC, now DOSR QD recommendations can be defended as 'tolerable' using guidance issued by the Health and Safety Executive. Values used by HSE in their recommendations on the transport of dangerous goods are:

- (1) 1 in 1000 per year - maximum tolerable risk of fatality for any identifiable group of workers.
- (2) 1 in 10 000 per year - maximum tolerable risk of fatality for the general public.
- (3) 1 in 1 000 000 per year - individual risk negligible for both workers and the general public.

2.12.4 The estimated maximum values of individual fatality risks per year are shown, from all PES, for people at each exposed site. Comparison with the above figures will indicate whether the risks can be defended as tolerable. It should be noted that

management action will normally reduce these risks further by, for example, restricting the routine movement of explosives to the smallest number of storehouses, or by restricting the storage of white phosphorous natures to specific ESH.

## 2.13 Societal Risk

2.13.1 Societal risk addresses the number of fatalities to be expected from an accident. This is done because of the perception that society in general tends to have a greater aversion to a single accident causing multiple casualties than to several separate accidents causing an equivalent number of deaths. Criteria for this have not been developed to the same extent as individual risk. HSE has estimated that the annual chance of an aircraft crash somewhere in the UK killing more than 500 people is 1 in 1000 per year, and they have stated that a major societal risk in UK with a similar large number of casualties should be tolerable at a probability of 1 in 5000 per year. The calculation takes each PES in turn and determines the probability of an accident there having a lethal result at each ES. This probability is then summed for all the ES and multiplied by the population.

2.13.2 The QRA programme produces a graph indicating the estimated accident frequencies where between 0.1 and 1000 fatalities may be expected. The diagonal lines on the graphs indicate the seriousness of the risk and threshold values adopted by the HSE. Above the upper line, the risk must be regarded as intolerable, and below the bottom line broadly acceptable. Between the two lines, the risk can be regarded as tolerable but must be kept ALARP.

## 2.14 Assumptions

2.14.1 The risk estimates generated in a QRA are normally based on several assumptions:

- (1) For the permitted licence, all storehouses are full to the maximum NEQ allowed, with the worst-case natures (highest frequency and most severe hazard division).
- (2) There are no materials stored in contravention of compatibility mixing rules.
- (3) Any processing operations are performed only in the permitted buildings.
- (4) Workers in buildings are protected only to a level expected in normal domestic housing.
- (5) Workers are generally at risk for a maximum of eight hours per working day (0.24 fractional exposure). The number of days in the year on which each specific exposed site is occupied varies considerably, however, and is taken into account.
- (6) The communication frequencies for the most vulnerable igloo and ESH may be applied to another similar PES.
- (7) The consequence models, though simplistic in several areas, represent maximum values and a worst-case prediction. It follows that estimates of risk can be upper limits for a site operated as described and which meets MOD safety standards.

## 2.15 Conclusions

2.15.1 A QRA report can often conclude that the maximum risk of fatality to workers and residents from the storehouses, PBs and transport facilities, etc, on the site, can be defended as tolerable under the current Explosive Licences. This is normally so where

the site is licensed under full QD rules, but tolerability of risk may also be established in circumstances where strict compliance with QD causes difficulties. Where the risk cannot be defended as tolerable, the deficiency will be identified. Care should be taken, in any event, to ensure that risks can be shown to be as low as is reasonably practicable.

## 2.16 **Recommendations**

2.16.1 Recommendations are made where required, especially when remedial action can be taken to address means of reducing risk to tolerable and ALARP

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