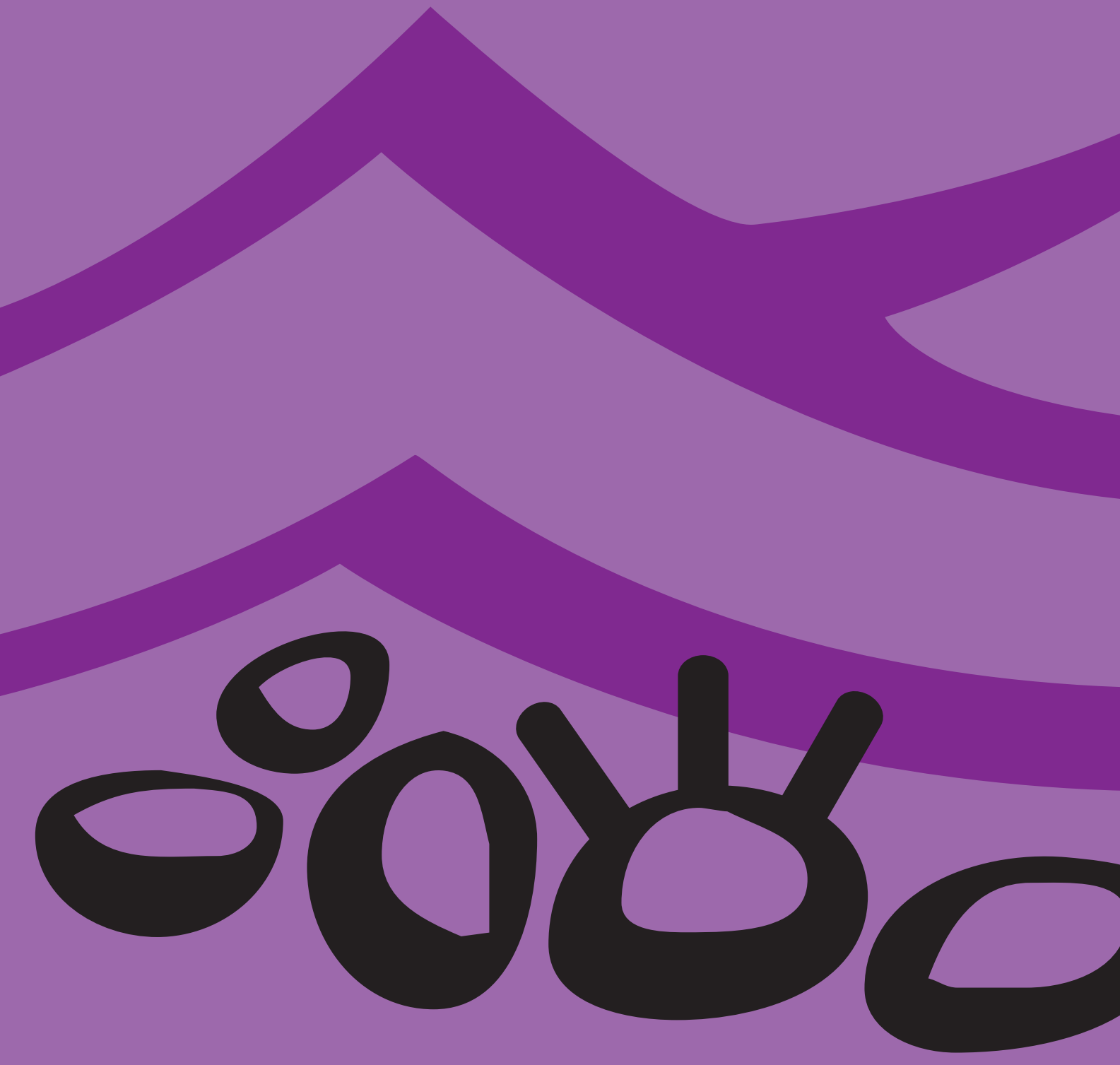
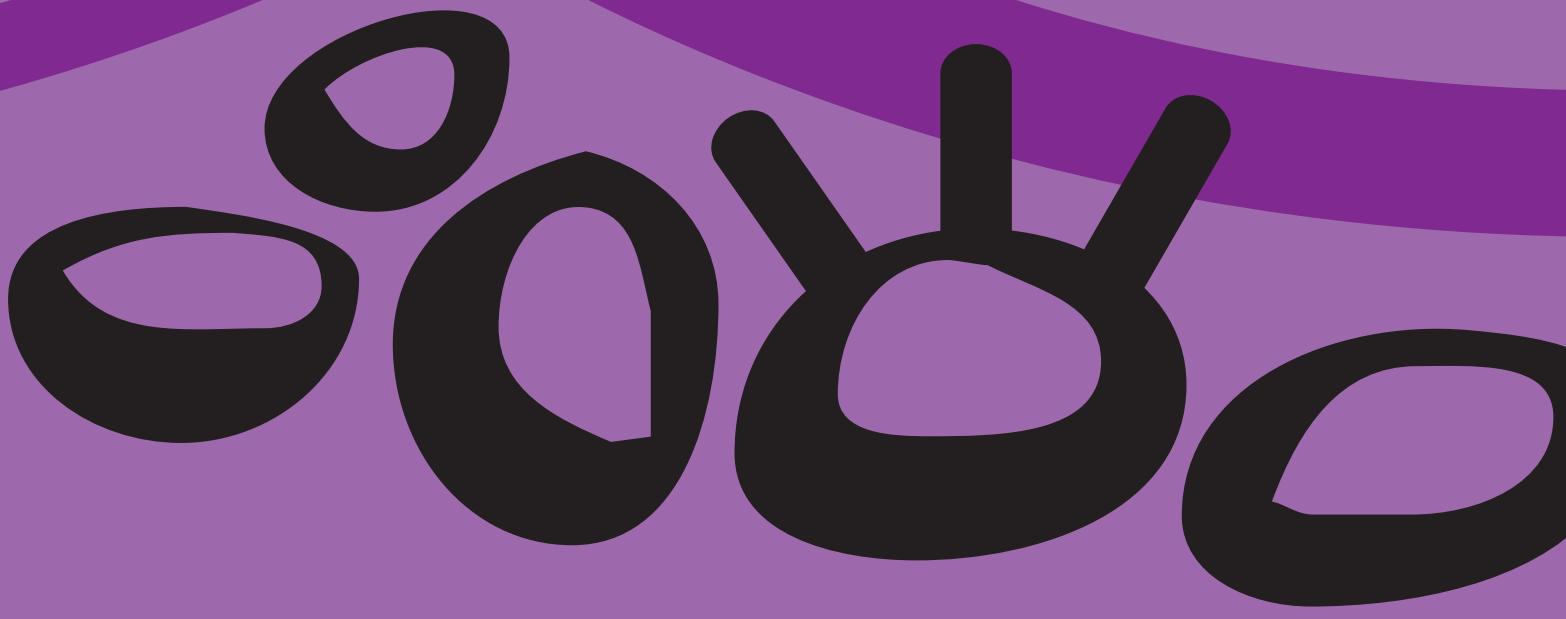


Guidance Note June 2006

Dealing with munitions in marine aggregates

Contents



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1 Preface

1.1 This Guidance Note is produced by the Quarry Products Association (QPA) and British Marine Aggregate Producers Association (BMAPA) in consultation with the Association of Chief Police Officers, Joint Services Explosive Ordnance Disposal Operations Centre, the Health and Safety Executive, Maritime and Coastguard Agency and The Crown Estate to complement and direct the individual company procedures to comply with safety legislation and best practice.

1.2 It provides guidance on best working practices for dealing with potentially unexploded munitions recovered from the seabed while dredging for marine aggregates.

1.3 The Guidance Note is not a substitute for officially recognised training and qualifications but is intended to assist all involved in fulfilling their responsibilities for –

- the safety of employees (wharf and sea staff), contractors and service personnel
- the safety of people living or working in the vicinity of the wharf
- the safety of people working with the end use of the aggregate.

2 Introduction

2.1 The distribution and density of exploded and unexploded munitions ('explosive ordnance') on the sea bed varies depending on the history of the area – for example whether it has been used for warfare, naval training, disposal or weapons testing. Changes to existing marine aggregate dredging zones and new licensed areas can result in munitions being raised by a dredger and discharged amongst the marine sand and gravel at a wharf. In the interests of safety and the protection of the environment, **dumping of munitions overboard is not advised, while discarding of munitions from a wharf is a criminal offence.**

2.2 QPA & BMAPA, in consultation with the supporting authorities, have prepared this Guidance Note:

- to outline the potential risks and safety measures that need to be considered;
- to provide practical advice to marine aggregate operators on the measures to be taken to reduce the risk of dredging munitions, and;
- the procedures to be followed when suspected munitions are encountered – either on the dredger itself or at the wharf while receiving or processing marine dredged aggregate.

2.3 The Guidance covers two distinct operations:

- offshore dredging;
- onshore activities (wharf) taking place in a harbour*

***Note** Harbour defined under Regulation 2, MSER 2005 as '…a harbour which is within the jurisdiction of a harbour authority and includes- a) the areas of water within the jurisdiction of that harbour authority; and b) land within the jurisdiction of, or occupied by, the harbour authority and used in connection with the loading and unloading of ships;'

3 Scope of the Guidance Note

3.1 This Guidance Note covers all types of munitions likely to be encountered at sea and transferred to wharves which remain potentially dangerous even when they have been submerged for many years.

3.2 Munitions can potentially be encountered during various stages of marine aggregate production and processing:

- at the mouth of the dredger drag head through the pumps and pipework
- in the dredger's hold and during discharge
- in the stockpiles at the wharf
- during the processing of material at the wharf
- on the wharf conveyor screen or magnet.

3.3 Marine aggregate operators need to consider the potential risks and safety measures of encounters at all of these locations and take action to ensure that the risks to their employees and others are reduced to the lowest level that is reasonably practicable. Against this background, the advice in this document provides practical guidance to operators of the options available to minimise the occurrence of munitions in marine dredged aggregate, and the steps needed to manage any encounters that may take place.

4 Roles and responsibilities

4.1 The dredging and aggregate companies have a responsibility, under Sections 2 and 3 of the Health and Safety at Work etc. Act 1974 to reduce the risks, to their employees and persons not in their employment who could be affected by their activities, to as low a level as is reasonably practicable. In fulfilling those responsibilities the operator will need to consider in particular:

- adopting safe systems of work
- providing appropriate training.

4.2 The Health and Safety Executive has responsibility for enforcing health and safety legislation in respect of harbours, and the construction and extractive industries as well as for the storage of explosives in harbour areas.

In all other cases the Police service has responsibility for licensing the storage of explosives.

4.3 The Joint Service Explosive Ordnance Disposal Operations Centre (JSEODOC) are responsible for tasking appropriate Ministry of Defence (MOD) assets to provide Explosive Ordnance Disposal (military EOD) support to the civil authorities in order to assist in the maintenance of law, order and public safety.

4.4 The Police will be responsible for coordinating the emergency services in the event of an incident. This will include: establishing a cordon and evacuating people from the area. The police will normally be the enforcing authority for the storage of explosives.

4.5 The Maritime and Coastguard Agency, under the Merchant Shipping Act 1995, has a duty to enforce merchant shipping legislation.

4.6 Explosive ordnance contractors trained to Level 2 (as defined in Annex A) may provide advice and guidance to operators on the identification of munitions and the subsequent actions that may be necessary.

5 Definitions

5.1 Munitions can range from a .22 inch calibre rifle bullet to large calibre shells. There is also the potential to encounter incendiary items – such as military and civil marine pyrotechnics.

Throughout this report, munitions are considered under three distinct categories:

- **inert** – contain no explosives whatsoever
- **live** – contain explosives and have not been fired
- **blind** – have fired but failed to function as intended.

6 Dredging operations management actions and best practice

6.1 Prevention

6.1.1 It is obviously preferable to avoid recovering unexploded ordnance while dredging. Measures taken to prevent recovery of such items will also help avoid picking up other debris (metal, wood, etc), which may damage the dredge gear or potentially contaminate the cargo.

6.1.2 It is recommended that aggregate dredging vessels have a 150mm – 200mm metal grid over the mouth of the drag head, to prevent large items from entering the dredge pipe, and ultimately the pump and vessel itself. The drag head and metal grid must be inspected at the completion of each dredging operation for integrity and trapped munitions.

6.1.3 Identifying potential concentrations of debris on the seabed is more difficult. While magnetometers can indicate whether iron or steel is present on the seabed, they provide no guide as to the identity or nature of contacts (one large item, or a number of closely spaced smaller items) and whether they are on the surface of the seabed or buried. In the case of munitions, the size of individual items coupled with the scale of the areas being dredged mean that it is impractical to identify the presence of munitions against a background of general metallic seabed debris. Side scan sonar, although commonly used to identify wreckage on the seabed, is not capable of resolving small items of ordnance which may only be a few cm in size on a gravelly seabed.

6.2 Management of dredging operations

6.2.1 While it is not possible to entirely avoid recovering munitions; there are a number of steps that can be taken to manage the risks to health and safety – as well as business disruption. Management of dredging operations can also assist in reducing the burden on military EOD units.

6.2.2 Munitions will generally be immobile on the surface of the seabed. On licence areas where there is known to be a high risk of encountering munitions, restricting trailer dredging operations to narrow lanes ensures that the surface sediments and any accompanying items will be recovered at the start of production. Therefore while there may be a higher than normal recovery rate of items to begin with, experience has shown that there is normally a marked drop in the frequency of incidents once the surface sediments have been removed.

6.2.3 In areas where there is a high potential for recovering munitions, and where the geological deposits, licence conditions and dredging capability of the individual vessels permit, operators may choose to restrict dredging to static operations. This further minimises the spatial extent of the dredged area, which in turn enables the surface sediments to be removed more quickly.

6.3 Monitoring

6.3.1 The rate at which surface sediments will be removed, and thus the potential for recovery of munitions, will vary on a case-by-case basis – depending upon the number and distribution of ordnance, size of the zoned area and the rate of production.

6.3.2 Records of munitions encounters from individual cargoes can be used to monitor the frequency of incidents over time. Dredging zones can be categorised into low/medium/high risk areas by marine and wharf staff to assist in the risk assessment process. The frequency of incidents has a bearing on the response and burden placed upon the local Police service and the attending military EOD teams. By managing dredging operations and accurately recording the frequency of incidents, it should be possible for operators to provide advance notice of any change in the expected frequency of encounters, for example when starting to work a new dredge zone, or when the records indicate the surface sediments have been removed.

6.4 Emergency procedures

6.4.1 Under the requirements of the International Safety Management code, all aggregate dredging vessels must have procedures which define the appropriate responses and actions required by Master and crew for any potential operational risk – such as a munition being encountered onboard.

The procedures will be informed by a risk assessment, which should consider the implications on crew and vessels should a munition explode when moving through the cargo system.

The procedures themselves will be defined within the individual vessel's Emergency Procedures Manual.

6.5 Emergency actions

6.5.1 Munitions encountered while at sea should never be tampered with or cleaned because there is always a possibility of detonation and personal injury.

6.5.2 In the interests of safety and the protection of the environment, dumping of munitions overboard is not advised. However, where circumstances dictate that this is the most appropriate action to maintain safety of crew and vessel, the requirements defined in MGN 323 (Explosives Picked Up At Sea) apply.

6.5.3 If an item is discovered while the vessel is at sea – either while dredging or in transit, the incident must be reported to the Coastguard who will be responsible for arranging military EOD support.

6.5.4 If an item is discovered while the vessel is alongside a wharf and discharging, the incident must be reported to the local Police service (via a 999 call) who will be responsible for arranging military EOD support.

6.5.5 A flow diagram defining generic actions is presented in Annex B. However, individual vessels should refer to their own Emergency Procedures Manual.

7 Wharf operations management actions and best practice

7.1 Screening for munitions

7.1.1 Effective measures for screening the aggregate for presence of munitions are essential in order to maintain the safety of all site workers and to ensure that that munitions are not passed on to end-users in the saleable aggregate product. Effective screening will ensure that any munitions present can be dealt with in a controlled and safe way with the minimum of business disruption.

7.1.2 To allow effective screening for the presence of munitions within marine aggregate, the minimum standard equipment suggested on a site that receives and processes marine dredged aggregate with a history of munitions contamination should be as follows:

- primary magnet (on ship to shore/plant feed conveyor) with safe access
- metal detector with safe access interlocked to stop the feed conveyor
- secure inert munitions container
- adequate communication system for raising the alarm.

This should be augmented by a programme of scheduled visual checks by trained site staff.

7.1.3 To further enhance the minimum standard and to operate with best practice the following additional equipment can be used:

- CCTV coverage linked to a monitoring location
- emergency site siren to communicate a muster
- a secondary magnet on other feed conveyors to assess the effectiveness of your systems (usually fitted to the crusher feed)
- photographic evidence of the munitions.

7.2 Management of materials not screened for munitions

7.2.1 The management of any product not screened for munitions requires a risk assessment prior to sale. By reviewing records of previous munitions finds, it should be possible to determine whether munitions have been historically encountered in processed material from the originating licence area. A decision can then be made whether screening is required prior to sale.

7.3 Monitoring equipment guidelines

7.3.1 PRIMARY MAGNET (SHIP-TO-SHORE)

If the primary magnet is located on the ship-to-shore conveyor then all of the product in the yard will be screened for munitions. The disadvantage of this location is the operational problems incurred when the munition is found when the cargo is partially discharged. The vessel will usually have to leave the berth due to draught restrictions and if the cargo has more munitions onboard then, a similar situation would occur for each item.

To counter this it is recommended a larger magnet be fitted to accommodate multiple munitions in order to allow the discharge to be completed. The appropriate notice to military EOD via the Police should be undertaken on encountering the first item, but the ongoing status and timing of the discharge operations should also be stated.

Note Example of primary magnet installation

Note Example of metal detector

7.3.2 Provision needs to be made to allow safe access to the magnet to permit retrieval of the items in consultation with military EOD (see 7.4.1).

7.3.3 PRIMARY MAGNET (PLANT FEED)

Wharves that locate the magnet on the plant feed conveyor will usually not have a ship to shore conveyor, and the dredged aggregate will initially be discharged on to the ground. The ballast as dredged (BAD) will therefore not have received screening, and could potentially be contaminated with munitions.

7.3.4 METAL DETECTOR

A metal detector can be used as a backstop for any metallic object that passes beyond the magnet. Locating the metallic object will normally require the removal of aggregate from the belt cross-section.

Daily tests of the effectiveness of the detection system should be carried out. The correct calibration piece must be used to test the operation of the detection equipment. Failure to do this can restrict the effectiveness of the screening, and could allow munitions to enter the product sales chain. If munitions are being discovered on the secondary magnet this will indicate poor calibration on the metal detector or a design issue.

7.3.5 ACCESS

For all detection equipment (magnet/metal detector), a safe spacious landing with handrails is required to access the munitions. The area should be illuminated at night to at least 100lux.

7.3.6 WHARVES WITH NO RECORD OF MUNITIONS

On wharves with no record of historical record of receiving munitions, appropriate procedures should still be defined, as the lack of regular exposure will create a higher risk should an item be encountered on site.

7.3.7 CHANGE OF DREDGE ZONES/AREAS

At all sites, personnel need to be aware that changes in the source of marine aggregate supply (dredge zone or licence area) or to the product being supplied from an existing licence area (particularly from sand to gravel) can immediately alter the potential for encountering munitions.

7.4 Emergency procedures, records and audit trails

7.4.1 Consultation with military EOD should be undertaken to determine and define safe systems of work in advance of any EOD incident. This will feed into each site's defined Emergency Procedure.

7.4.2 Each site should have a defined procedure to follow in the event that a munition is discovered during the normal operations of the site. This will include defining the roles and responsibilities of all site operatives. Generic instructions are defined in Annex C but the application of the various elements required will differ by site/company. For example, some sites will require an aerial plan with the location of key personnel posted to assist the Police in cordoning off the area.

7.4.3 A standard form to allow all wharves and sites to record munitions incidents is recommended, as outlined in Annex D. Records of munitions incidents will provide statistics for production downtime, response time by the Police/military EOD, measure the effectiveness of site detection equipment and assist in the risk assessment of licensed areas and dredge zones.

7.5 Training and appointment of competent personnel

7.5.1 When munitions are found, a competent person will need to make a decision on what action to take. This will depend on whether the munitions are assessed as obviously inert or other (live or blind). This initial assessment may be carried out by an employee or contractor who holds a current, approved EOD qualification defined as Level 1 trained (see Annex A).

7.5.2 Where a competent person has not been appointed then all munitions must be assumed to be blind and the appropriate action taken as described below.

7.5.3 In the event that items are assessed not to be obviously inert and are therefore blind or live they will need to be rendered safe either by military EOD or an appropriate third-party disposal contractor with equivalent competence defined as Level 2 trained (see Annex A).

7.6 Emergency actions

7.6.1 Discarding of munitions from a wharf is a criminal offence under Regulation 6(1) of the Manufacture and Storage of Explosives Regulations 2005.

7.6.2 Retaining live/blind munitions at a site beyond 24 hours of discovery is a criminal offence under the Manufacture and Storage of Explosives Regulations 2005 unless held in a licensed store (see 9.1).

7.6.3 Munitions encountered at a wharf should never be tampered with or cleaned because there is always a possibility of detonation and personal injury.

7.6.4 The flow diagram presented under Annex E defines the sequence of decisions and actions to be taken should a potential munition be discovered during the operation of a site.

General actions will depend on whether the munitions are assessed as inert, live or blind:

- **inert** – when identified by a Level 1 trained person (or higher) as obviously inert the item may be moved to an inert munition container and a record of this activity made
- **live** – when identified by a Level 2 trained contractor may be moved to an appropriate location for storage pending appropriate action by military EOD or a suitably qualified and permitted contractor
- **blind** – Only military EOD or a Level 2 trained contractor with approved on- site storage and disposal facilities may handle and render safe/dispose of these items.

7.6.5 On discovery of a suspected item, site management should be immediately notified. The device must be monitored at a safe distance until competent personnel arrive to prevent any unauthorised handling (see 7.5.1 and 7.5.2).

The plant can only remain running if the munition can be monitored remotely and all personnel who may be affected are made aware of its presence and kept clear, in line with the appropriate Emergency Procedures defined for each site (see 7.4.2).

7.6.6 In the absence of any suitably competent staff, all suspected items must be treated as blind, and therefore high risk. Once a potential item has been verified by the site manager/foreman, the site should be evacuated to the site perimeter.

Where the company retains a Level 2 trained contractor, they will attend the site and take control of the situation.

Where there is no Level 2 trained contractor support, the Police should be informed of the EOD incident via a 999 call. The Police will attend, satisfy themselves that the site is secure and arrange for military EOD assistance.

Once military EOD have attended and completed the necessary actions to make the munition(s) safe, the Police will be able to collapse the site cordon and normal site operations will be able to recommence.

7.6.7 The presence of Level 1 trained staff on site can allow an initial screening of a suspected item, to determine whether it is obviously inert. Where this is the case, it can be removed to an inert munitions storage container and the normal operations of the wharf can continue.

The identification and retention of inert items will be audited by military EOD and in the event of live/blind munitions being found in storage, a three near hit system will withdraw the ability for the site to operate with Level 1 personnel.

To allow military EOD staff to be tasked to inspect inert items, site staff should notify the Police via the non-emergency telephone line when either a maximum of 10 inert items has been retained on site or any single item has been in storage for a period of 28 days.

7.6.8 If Level 2 trained contractors are able to identify the item as live and consider it safe to move, then subject to an appropriate risk assessment the item may be transferred to an appropriate on-site licensed store – where such a facility exists. Taking into account the conditions of the licence in relation to storage and separation distances, if disposal is required by military EOD this should be arranged by the Level 2 contractor through a non-emergency telephone request to the Police.

7.6.9 Under certain circumstances, where operators are regularly encountering live and blind munitions, it may be necessary to put in place alternative procedures in order to ensure safety while reducing demands on military EOD teams and reducing business disruption. These alternative arrangements, may involve:

- the appointment of suitable specialist explosives ordnance disposal contractors (Level 2 trained)
- the construction of a blast-proof containment pit or structure
- the provision of suitable remotely-operated equipment for moving articles to the containment area
- appropriate training and awareness of site staff, coupled with Safe Systems of Work and Permit to Work systems.

The specifications for these arrangements must be agreed with the HSE, Police, and military EOD on a case-by case basis.

8 Storage of inert munitions/items

8.1 Inert munitions/items should be stored in a container manufactured from 25mm plywood and designed to allow the explosive ordnance disposal personnel good access. The container must not be constructed from metal or filled with water. The container should be partitioned and must be secured against a structure and locked to maintain security prior to audit by military EOD (see 7.6.7).

9 Licensing requirements

9.1 If live munitions are encountered and are to be retained on site beyond 24 hours, there is a legal requirement for a licensed store. The wharf operator and their Level 2 contractor are responsible for applying for such a facility. The Police will normally be the licensing authority unless in a harbour in which case this responsibility rests with the Health and Safety Executive.

References

The Health and Safety at Work Act 1974
MGN 323 (M+F) – Explosives Picked Up At Sea
The Control of Explosives Regulations 1991
The Manufacture and Storage of Explosives Regulations 2005

Further information/advice

Institute of Explosive Engineers
Cranfield University
RMCS Shrivenham
Swindon
Wiltshire
SN6 8LA

Telephone 01793 785322
Facsimile 01793 785972

Annex A

Competence/training

Level 1 qualification

Level 1 qualification will allow identification of inert munitions/items.

- training to Level 1 must be accredited by an independent external organisation (BS EN ISO9001:2000 / Institute of Explosive Engineers).

Level 2 qualification

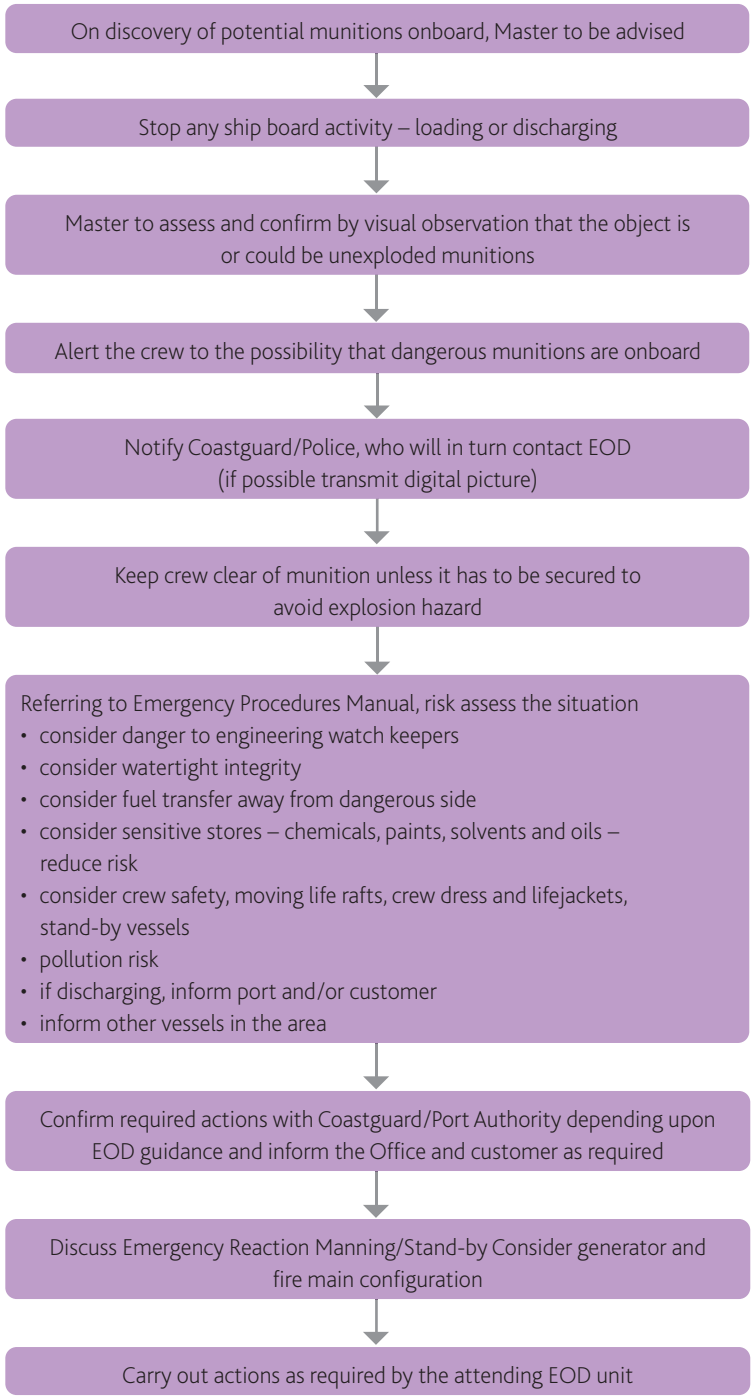
The required standard for the individual responsible for managing the incident must have the combination of training and experience listed below:

- successfully completed the Advanced EOD Course 801 at the Defence Explosive Ordnance Disposal School, or Ammunition Technical Officer/ Ammunition Technician Course at the Army School of Ammunition
- conducted at least one mainland UK tour as a Commissioned or Senior Non-Commissioned Officer within an operational EOD / IEDD unit, or alternatively conducted an instructional post at the Army School of Ammunition or Defence EOD School
- in many cases this will mean that the operator has also completed the Joint Service IED Operators Course
- full personal member of the Institute of Explosive Engineers
- where the operator will also be required to participate in maritime operations they must have successfully completed the Advanced Underwater EOD Course (808) at the Defence Explosive Ordnance Disposal School.

Annex B

Munitions onboard vessels

Individual vessels should refer to the appropriate sections of their Emergency Procedures Manual.



Annex C

Instructions for dealing with munitions at wharves

Handling/storage of munitions

In the event that you identify any potential munitions you should immediately contact your Line Manager (Wharf / Assistant Manager / Foreman / Charge Hand) or contact the Company Operations Manager in their absence.

On no account should any potential munition be handled or moved mechanically until deemed safe.

The following procedures are to take place in the event of munitions being found on the wharf.

1 The munition is not to be moved and site management are to be immediately notified. The munition must be monitored until competent personnel arrive to prevent any unauthorised handling. A competent person will carry out a visual check to determine what has been found. The plant can remain running if the munition can be monitored remotely and all personnel who may be affected are made aware of its presence. When appropriate the plant must be shut down in a manner least likely to cause disturbance to the device.
2 Where a competent person is completely satisfied that there is no danger (the item is inert) the object will be placed in a container for identification to be confirmed by military EOD.
3 If there is **any doubt** regarding the stability of the munition(s) found then the sites local emergency plans should be put into place with the area cordoned off and the Police advised immediately by management staff (insert local Police number). The Police will respond appropriately and arrange the attendance of a military EOD unit.
4 Traffic movements through the yard and joint access routes should be assessed and appropriate restrictions placed as per sites local emergency plans.
5 The military EOD personnel will assess the device(s) and take appropriate actions. This may take the form of removing the device or destroying it on site should it prove unstable. Local management and staff must co-operate fully with all requests from the Police and all other Emergency Agencies called to site.
6 In the event that the device has to be destroyed on site, by means of a controlled explosion, the area will be isolated and all staff evacuated to a safe distance as designated by military EOD personnel. Unless told otherwise, all persons will report to their assembly points.
7 The site management will arrange for all persons on the contact list to be informed.
8 The identification of any munitions and subsequent action taken is to be recorded in the Daily Inspection Book and copied into the Ordnance Action Record Sheet.
9 In all cases, personnel should only return to the site once military EOD personnel determine it to be safe.

Persons to be contacted if a munition has to be detonated on site

Name	Company	Position	Office telephone	Mobile

Roll call to ensure all persons on site are accounted for

Members of staff					
Name	Company	Present at assembly point **A** (*yes* or *no*)	Present at assembly point **B** (*yes* or *no*)	Holiday, sickness training or temporarily off site	Comments

Contractors and visitors					
Name	Company	Present at assembly point **A** (*yes* or *no*)	Present at assembly point **B** (*yes* or *no*)	Holiday, sickness training or temporarily off site	Comments

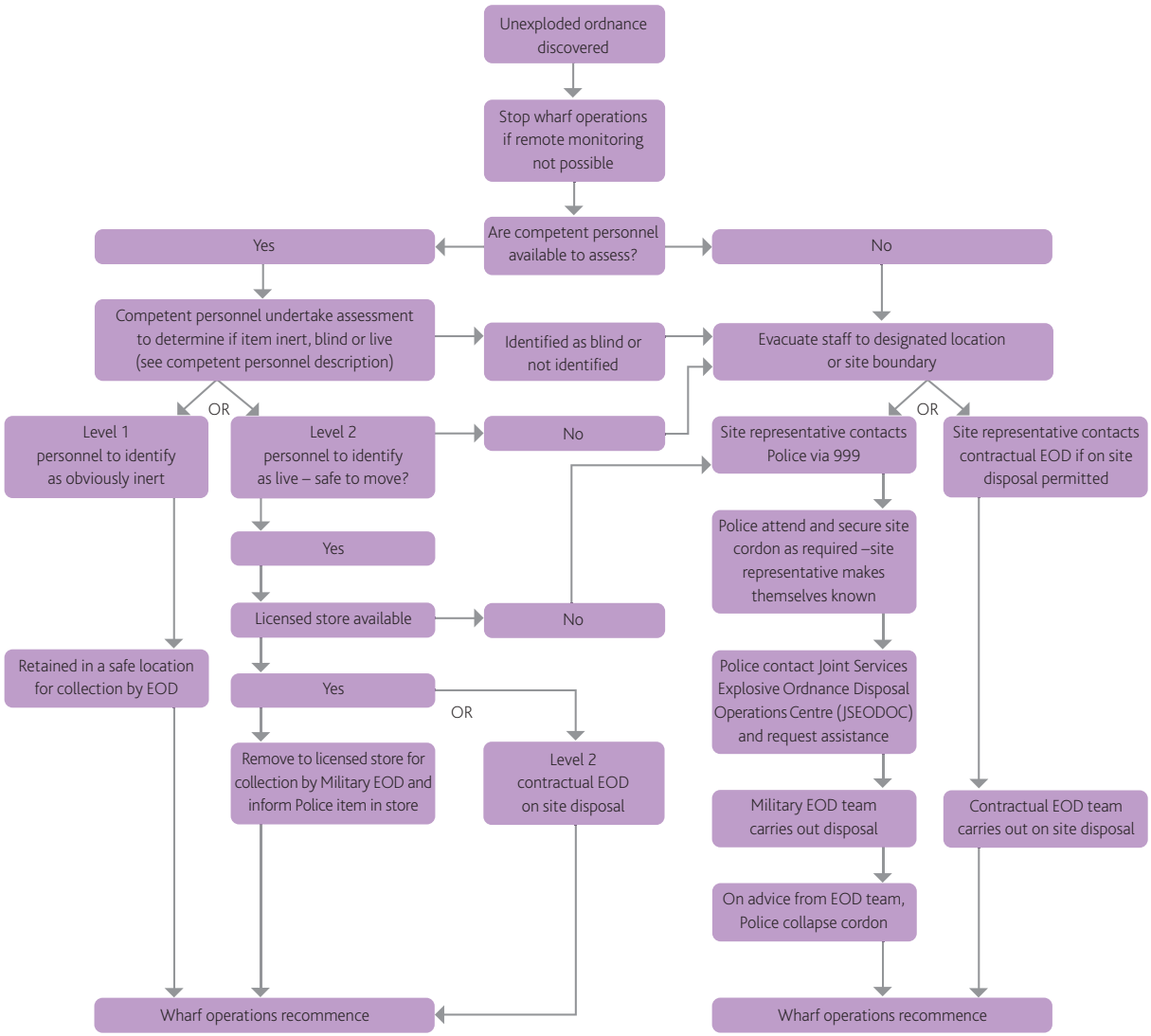
Annex D Records and audit trails

Found	Depot	
	Person	
	Date	
	Time	
	Type	
	Location	
Reported to	Competent person	
	Date	
	Time	
	How was it detected (Metal detector/magnet/ visual/complaint)	
	Did it pass detection device (*yes/no*)	
	Action taken	
EOD	Called date time	
	Visit date time	
	Dangerous (*yes/no*)	
	Exploded on site (*yes/no*)	
Source details	Licence area	
	Ship	
	Date	
	Time	
	Ticket	

Continuation sheet

Found	Depot	
	Person	
	Date	
	Time	
	Type	
	Location	
Reported to	Competent person	
	Date	
	Time	
	How was it detected (Metal detector/magnet/ visual/complaint)	
	Did it pass detection device (*yes/no*)	
	Action taken	
EOD	Called date time	
	Visit date time	
	Dangerous (*yes/no*)	
	Exploded on site (*yes/no*)	
Source details	Licence area	
	Ship	
	Date	
	Time	
	Ticket	

Annex E Munitions at wharf



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