

First Street

House of Social 1 Ltd

Operational Unexploded Ordnance (UXO) Emergency Response Plan

Meeting the requirements of the UK's Construction Industry and Information Association's UXO Risk Management Framework:
"Unexploded Ordnance (UXO) – A Guide for the Construction Industry" (C681)
and in compliance with the Construction (Design and Management) Regulations 2015

6 Alpha Associates Ltd

Project No.: 10464

8th June 2023

Disclaimer

This guide and the procedures it contains are designed for specific works at First Street where the risk of a UXO encounter has been reduced to As Low As Reasonably Practicable (ALARP).

These recommendations are project and operation specific; they are not transferable.

Document Control

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1 Introduction

1.1 General

The aim of this document is to provide guidance to *House of Social 1 Ltd* on Unexploded Ordnance (UXO) risk management for the site described as *Plot 10b, First Street, Manchester.*

Over the last 20 years, there have been a limited number of recorded incidents in the UK where UXO (mainly incendiary devices) have detonated during engineering works, although a significant number of UXO items have been discovered.

As outlined above, UXO discoveries do not always result in detonation, they do however, typically cause disruption to the project deadline and impact on the local community/infrastructure. Therefore, *6 Alpha Associates Limited* (6 Alpha) believes that our clients need to have a coherent understanding of how to manage the situation should a suspect item of UXO be discovered.

This document should be held on site within the health and safety documentation, accessible to all workers, but particularly to site management, for reference in case of an UXO related incident.

Additionally, it is ***strongly recommended*** that, in addition to this document, all workers on-site, particularly those involved in ground works, receive an **Unexploded Ordnance Safety & Awareness Briefing**, which *6 Alpha* can provide on request.

1.2 Aims and Objectives

Historical research indicates that there is a risk of encountering UXO during planned intrusive activities on this site. The aim of this document is to provide information on both strategic planning to site management but also operational guidance to site operatives. Accordingly, this document will include the following objectives:

- Providing data on the UXO threat to form part of the standard site induction;
- Outline what is involved with planning for the discovery of UXO;
- Providing guidance on what actions should be taken if a suspected item of UXO is discovered;
- Outlining the appropriate risk mitigation measures in advance of any intrusive groundworks.

1.3 Background UXO Threat

During WWII, the Study Site was situated within the *Manchester County Borough,* which recorded 26 HE bomb strikes per 1,000 acres, a relatively low level of bombing. However, given that the Site was situated partially within a primary bombing target and industrial area during WWII, the localised bombing density may in fact have been much greater.

Luftwaffe aerial reconnaissance photography associated with the Site identified a gas works located partially on Site and immediately to the north as a primary bombing target. In addition, numerous manufacturing industries and railway stations in the vicinity may have been considered secondary bombing targets.

ARP records associated with the Site did not note any HE bomb strikes within it however seven were recorded within 190m of the Site. Furthermore, whilst IBs may have fallen within the Study Site, they fell in such large numbers they were considered ubiquitous and accurate record keeping was either non-existent or perfunctory. Despite this, ARP records associated with the Site registered one IB within the Site's north-eastern section. In addition, eight were recorded within 272m of the Site.

Official bomb damage maps associated with the Site could not be located. Nonetheless, an analysis of pre and post war mapping has identified several 'missing houses', which could be attributed to bomb damage. However, the validity of these 'missing houses' being definitively associated with bomb damage is compromised as further research suggests that the area underwent mass slum clearance during the late 1930s into the 1950s. As such, the areas of 'missing houses' may in fact represent an amalgamation of both bomb damage and slum clearance.

Pre-WWII mapping (1938) associated with the Study Site shows that it was located to the south of *Gaythorn Gas Works* within a dense residential and industrial area. It also shows mass clearance in the Site and to the west, which was identified to be slum clearance. Located in the northeast of the Site and surrounding vicinity is the *Dunlop Rubber Works,* which made barrage balloons during WWII. As a result, it is plausible that *Dunlop Rubber Works* was inspected for UXB entry holes following any raids. However, due to the recent slum clearance in the remaining areas of the Site, a UXB entry hole would likely not have been noticed.

The Site has undergone extensive redevelopment since WWII though the majority of this involved the demolition of structures with little replacing them. Consequently, it is considered unlikely that any UXO within the Site would have been discovered and removed; suggesting that the risk of UXO is equal across the Site. The exception of this is the post-WWII construction seen at *Medlock House* and *Church Works*. Nonetheless, the potential for buried UXO may still be present within these areas of recent development.

2 Regulations

There is no formal control or legislative guidance relating to either UXO or commercial explosive ordnance disposal activities. Therefore, this document has been produced taking into consideration the overarching legislation regarding the proposed ground works planned at the site and the potential risk of uncovering buried UXO:

- Personal Protective Equipment (PPE) at Work Regulations;
- Management of Health and Safety at Work (MHSW) Regulations;
- Control of Substance Hazardous to Health (COSHH) Regulations;
- Explosives Act;
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR);
- Construction and Design Management (CDM) Regulations.

Although the Health & Safety at Work Act and the Construction (Design & Management) Regulations do not specifically require a search for UXO, there is an obligation on those responsible for intrusive works to ensure that comprehensive risk assessment and mitigation measures are taken with regard to all underground hazards on-site.

The Health & Safety at Work Act 1974 - Section 3, states:

- *It shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment who may be affected thereby are not thereby exposed to risks to their health or safety.*
- *It shall be the duty of every self-employed person to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that he and other persons (not being his employees) who may be affected thereby are not thereby exposed to risks to their health or safety.*
- *In such cases as may be prescribed, it shall be the duty of every employer and every self-employed person, in the prescribed circumstances and in the prescribed manner, to give to persons (not being his employees) who may be affected by the way in which he conducts his undertaking the prescribed information about such aspects of the way in which he conducts his undertaking as might affect their health or safety.*

Construction (Design & Management) Regulations 2015 - Regulation 9 '*Duties of Designers*' states:

- *A designer must not commence work in relation to a project unless satisfied that the client is aware of the duties owed by the client under these Regulations.*
- *When preparing or modifying a design the designer must take into account the general principles of prevention and any pre-construction information to eliminate, so far as is reasonably practicable, foreseeable risks to the health or safety of any person –*
  - *Carrying out or liable to be affected by construction work;*
  - *Maintaining or cleaning a structure; or*
  - *Using a structure designed as a workplace.*
- *If it is not possible to eliminate these risks, the designer must, so far as is reasonably practicable –*
  - *Take steps to reduce or, if that is not possible, control the risks through the subsequent design process;*
  - *Provide information about those risks to the principal designer; and*
  - *Ensure appropriate information is included in the health and safety file.*
- *A designer must take all reasonable steps to provide, with the design, sufficient information about the design, construction or maintenance of the structure, to adequately assist the client, other designers and contractors to comply with their duties under these Regulations.*

3 Planning

3.1 Nomination of UXO Site Co-Ordinator

In the absence of an Explosives Ordnance Disposal Engineer, a suitable person who is routinely present on site during works e.g. site supervisor, project manager, health & safety manager, should be nominated as the UXO site co-ordinator. They would assume responsibility for:

- Briefing the site personnel with the actions to be taken if a suspicious item is discovered;
- Assist with the co-ordination of the evacuation, if an item of UXO is confirmed;
- Liaise with *6 Alpha*, the Client and the Police.

They should familiarise themselves with the contents of this document and ensure they retain the following contact details:

- *Greater Manchester Police, Greenheys Police Station, M15 6NP* – 101 / 0161 872 5050;
- *Manchester Royal Infirmary, M13 9WL* – 0161 276 1234;
- *6 Alpha Associates Limited* – 020 3371 3900.

3.2 Evacuation Planning

If UXO or an item potentially thought to be UXO is found, all non-essential personnel should be evacuated to at least 100m. If this falls outside the site do not attempt to enforce it until the Police are involved. It may be necessary to evacuate all non-essential personnel to 1,000m if a large *German* Unexploded Bomb was discovered. Therefore, the site's neighbours would need to be consulted.

In the event that the item is confirmed as UXO and that it constitutes a major risk, the following evacuation plan should be implemented:

- Activate the signal/message for evacuating the site;
- The UXO Site Co-ordinator will take charge of the evacuation (6 Alpha will assist if on-site), until the Police/Military are on the scene and in a position to take control;
- Leave the site by the pre-planned evacuation route to the muster point;
- Where applicable, nominated site personnel will assist the UXO Site Co-ordinator by directing site personnel to the muster point;
- Under no circumstances should site personnel re-enter the site until it has been declared safe by the Police/Military;

- Site personnel are reminded that, under no circumstances, must suspect items be handled or moved. The Military will deal with all suspect items;
- All personnel at the muster point should be checked off against the site attendance register to ensure no personnel remain on site.

4 Unexploded Ordnance

4.1 Definitions

The generally accepted and used definition of **explosive ordnance** is:

> *"…all munitions containing explosives, nuclear fission or fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature."*

The NATO Standardization Agreement (STANAG) refers to **UXO** and defines it as:

> "*…explosive ordnance which has been primed, fused or otherwise prepared for action, and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material and remains unexploded either by malfunction or design or for any other cause.".*

4.2 UXO Hazards and Risks

UXO presents negligible levels of risk if left **undisturbed.** However, in the event of disturbance during construction activities e.g. drilling, piling, mechanical excavations etc; and transference of any form of shock, friction, heat or other energy via these activities onto the item of UXO, then a possible partial or full detonation of the item could be the result.

The major hazards that are likely to result from a partial or full detonation of a single item or multiple items of explosive ordnance are shockwave, blast wave, heat and shrapnel. By way of example, the shock/blast waves caused by the detonation of a 50kg buried bomb containing approximately 25kg of high-explosive material, would potentially cause significant damage to brick or concrete structures up to 16m away and would likely cause harm of varying degrees of severity via the same shock and blast waves, but also from shrapnel and heat, to unprotected personnel on the surface up to 45m away. Larger ordnance is more destructive, with an accepted safety distance from the hazards mentioned for a 500kg HE device being 1,000m.

Explosives rarely become inert or lose effectiveness with age but over time, mechanisms involved in the functioning of explosive ordnance, such as fuzes and gaines, can become more sensitive and therefore more prone to detonation. This applies equally to items that have been submersed in water or embedded in sand, gravel or similar materials.

Once initiated, the effects of the detonation of explosive ordnance are usually extremely fast, often catastrophic and invariably traumatic to the personnel involved. The degradation of an item of UXO may also offer a source of explosive contamination into the underlying soils. Although this contamination may still present an explosion hazard, it is not generally recognised that explosives offer a significant toxicological risk at concentrations well below that at which a detonation risk exists.

4.3 Types of Ordnance Potentially Found On-Site

The probability of UXO encounter is considered to be remote, however, if it was encountered during intrusive works then it is likely to fall within the following groups of ordnance:

- *German* High-Explosive Bombs;
- Incendiary Bombs;
- Land Service Ammunition (LSA);
- *British* Anti-Aircraft Artillery (AAA) Projectiles;
- Small Arms Ammunition (SAA).

5 Identification of Ordnance

In this section *6 Alpha* have outlined the basic details about UXO items that have been identified as potentially presenting a risk on site to proposed intrusive activities. The actual range and variety of munitions that may be encountered could be extensive and cannot be covered in this document in detail. However, at Appendix 2, examples of a range of munitions are provided as some indication of the variety of ordnance that may be found.

As ***strongly recommended*** elsewhere in this document, to ensure awareness of the UXO hazard(s) and risks and an understanding of immediate and emergency response procedures to be adopted in case of a UXO encounter (in addition to this document, which should be held on site within the health and safety documentation for reference in case of an UXO related incident), all workers on-site, particularly those involved in ground works, should receive an **UXO Safety & Awareness Briefing**, which *6 Alpha* can provide this on request.

5.1 *Luftwaffe (German)* High Explosive Bombs

Luftwaffe general-purpose bombs of WWII vintage, come in many shapes and sizes, depending on the intention of the bombing mission. Generally, these bombs are of similar construction and consist of a metal container (iron construction), a fuse (mainly transverse), and a stabilising device. The metal container (called the bomb body) holds the high explosive content, which may be in one or in multiple pieces. High explosive-filled bombs range in size from the relatively small 50kg bomb through to the 250kg, 500kg, 1,000kg and 1,800kg bombs to the largest at 2,500kg.

The main components of a bomb are:

- *Bomb Body* – This is the main item referred to as an Unexploded Bomb (UXB). General Purpose bombs will have a typical bomb shape with parallel sides. Given the age and environmental conditions, most bombs are found corroded. It is possible to mistake them for old gas cylinders or boiler tanks.
- *Tail Unit* – As the UXB enters the ground this section is removed (see Appendix 2). Although very rarely found, the presence of a tail unit may indicate that an unexploded bomb is buried at depth in proximity.
- *Fuze* – With a *German* UXB, it is most likely that the bomb would have a mechanical or electrical transverse fuze (inserted on the parallel side of the body rather than at the *nose* &/or *tail* ends). In some cases a bomb may contain two fuzes. The fuzes were of an alloy construction and therefore a visual contrast from the bomb body.

5.2 *German* Incendiary Bombs

In the early stages of WWII, the Incendiary Bombs (IBs) dropped over the *United Kingdom* were of the "oil bomb" variety, where a flammable liquid was used along with an explosive charge. The idea was to cause some blast damage with the explosive, but mainly to spray the burning liquid over a wide area and cause widespread fires. This bomb weighs approximately 50kg, the body diameter is 8", and the overall length is 43.2". The filling is 15 litres of a mixture of 86% benzene, 10% rubber, and 4% phosphorus. It has a bursting charge of picric acid.

By 1942, oil bombs had been superseded by smaller and more intensely burning IB made of magnesium. These weighed only 1kg or 2kg and were deployed in containers carrying hundreds of individual bombs. Some were coupled with a small high explosive charge that went off when the magnesium was alight to spread the fire over a wider area and also to deter manhandling clearance efforts. Generally encountered at quite shallow depths, a corroded 1kg IB can closely resemble a short section of scaffold tube.

- 1kg IB- The diameter is 2" and over-all length 13.6". The filling is 0.44lbs of *Thermite*.
- 2kg IB - The filling includes *Trinitrotoluene* (TNT) or *Amatol* as well as *Thermite*. The diameter is 2", and the overall length is 20.7".

5.3 Land Service Ammunition

Land Service Ammunition (LSA) covers "*…all items of ordnance which are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics*."

LSA is generally (although not exclusively) employed by land-based military forces. Such items are generally designed to be carried by personnel and consequently, their quantity of high explosive is likely to be limited in comparison with other types of ordnance, e.g. air-delivered bombs.

Despite this, LSA can be exceptionally dangerous because their detonation effects include localised shock, blast and fragmentation and high velocity metal 'slugs' travelling at distances that are often in significant excess of those normally associated with more conventional high explosive events.

Additionally, it is assessed that between 4% and 10% of LSA fails to function during peacetime usage, with the figure rising to as much as 30% during times of conflict

Land service ammunition can be broken down into 5 main groups:

- Projectiles (Shells) - an object capable of being propelled by a force, normally a gun, and continuing in motion by virtue of its kinetic energy. It contains a fuzing mechanism and a filling.
- Mortars - a fin stabilised munition normally nose fuzed and fitted with its own propelling charge (primary cartridge).

- Rockets - a self-propelled weapon whose trajectory, while in flight, cannot be controlled. The main components of a rocket are the warhead, fuzing, propellant section, fins and venturi
- Grenades - a short range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher.
- Landmines – an explosive or other material, normally encased, designed to destroy or damage ground vehicles, boats or aircraft, or designed to wound, kill or otherwise incapacitate personnel. It may be detonated by the action of its victim, by the passage of time, or by controlled means. Landmines are categorised as either anti-vehicle (AV) or anti-personnel (AP), depending on the intended target.

Illustrations of typical items of LSA that are potentially present at this site are presented in Appendix 2 (not including landmines which are not considered to be relevant), however, the vast range of different sizes, shapes, markings, colouring etc contained within each category makes it impracticable to expand or cover this entirely within the document. Neither is it necessary that non-UXO specialist need this level of knowledge. However, it does add emphasis and reinforces the importance that all workers on-site, particularly those involved in ground works, receive an **UXO Safety & Awareness Briefing**, which *6 Alpha* can provide this on request.

5.4 Anti-Aircraft Artillery

Although strictly speaking these items fall under the category of projectiles, for purposes of this document, Anti-Aircraft Artillery (AAA) refers to all munitions used against *German* bombers with a calibre of over 20mm. They can be filled with explosives or illuminating chemicals. Projectile bodies can be one piece of metal or multiple sections fastened together.

In the case of the AAA gun batteries on or in proximity of the site, the most common calibre used were 3.7” and 4.5” shells. These were fitted with a barometric fuze, which was designed to detonate at the bomber formation altitude.

Tracer rounds contain a composition in the base that burns during the flight and helps identify the fall of shot. Normal, non-tracer rounds are referred to as ‘ball rounds’. Also, dummy cartridges have neither a primer nor propellant.

5.5 Small Arms Ammunition

Small Arms Ammunition (SAA) refers to bullets or projectiles, cartridge cases, primers/caps and propellants that are used in small arms weapons e.g. machine guns, rifles, pistols etc; and are of 14.5mm calibre or less.

SAA in its most basic form comprises two sparts, those being a ‘bullet’ and a ‘cartridge case’. The main function of the cartridge case is to expand and seal the chamber against rearward escape of gases when the cartridge is fired. The shape of cases can be straight (pistols), bottlenecked (rifles), or tapered and is generally brass.

Bullets can be either of lead, or metal jacketed. Bullet jackets are generally made from gilded metal or copper-coated steel. Military ammunition, whether rifle or pistol, is full metal-jacketed.

High-velocity rifle ammunition used for hunting, and high-velocity revolver and pistol ammunition cartridges, are partial metal-jacketed: the metal jacket is open at the tip of the bullet to expose the lead core (soft point or hollow point), causing the bullet to mushroom upon impact. Blank cartridges are sealed with paper disks instead of bullets, or else have a crimped neck.

Tracer rounds contain a composition in the base that burns during the flight and helps identify the fall of shot. Normal, non-tracer rounds are referred to as ‘ball rounds’. Also, dummy cartridges have neither a primer nor propellant.

6 Actions on Discovery of Suspect Items

6 Alpha have included a flow diagram at Appendix 3, which indicates the process that should be followed when dealing with a *suspect* item i.e. an item that cannot be clearly confirmed as NOT being an item of UXO. In general terms, the following steps are to be followed:

- The item is found by a site worker or workers who, in the absence of attendance by *6 Alpha* Explosive Ordnance Disposal Engineer(s), reports the encounter to the nominated UXO site co-ordinator who will, if required, call *6 Alpha* and request an Explosive Ordnance Disposal Engineer attends site.

  NOTE: If a *6 Alpha* Explosive Ordnance Disposal Engineer is present on site, he should also be contacted and will assist with coordination, management and/or provide advice as the situation demands.

- Works and other activities within an exclusion zone of ~20m in all directions, or as far as practicably possible up to that distance, should cease and workers cleared from within that zone and evacuate to a safe location. The 20m exclusion zone should be cordoned off (barrier tape, markers etc). Encroachment of and access into the cordoned off area should be controlled to only those who need to enter.

- The UXO site co-ordinator (or if on site, the *6 Alpha* Explosive Ordnance Disposal Engineer) should endeavour to take clear photographs (or video) of 360-degress around the item i.e. of both visible ends and sides if possible; without it being further touched, moved or otherwise interfered with. To aid identification and better understanding of dimensions, a scale rule or other commonly recognisable object e.g. a pen, pencil, A5 or A4 book etc; should be placed beside the item for each photograph. The photographs should be sent to *6 Alpha* via email, MMS or any other suitable technology available to both parties, as soon as possible.

- The UXO site co-ordinator and *6 Alpha* will view the item together, either on-site if relevant, or via telephone, *Microsoft Teams*, *WhatsApp* or other workable communication method; to either confirm or disregard it as explosive ordnance.

- If the item is disregarded the exclusion zone can be lifted, workers allowed to re-enter and work resume.

- If the suspect item is *suspected* of being or confirmed as being an item of explosive ordnance, then the incident is to be reported as soon as practicably possible to the local police. As much detail as possible should be provided to enable the authorities to mobilise the appropriate

military explosive ordnance disposal service. In these circumstances, the exclusion zone should remain in place and under control until the police have arrived on site to take control of the situation.

NOTE: If the item of ordnance is considered to constitute a major risk to people or infrastructure, then the police may implement an extended excavation procedure. This may involve extending the exclusion zone.

- If the police become involved then any further decisions will be their responsibility in coordination with the military, if and when they are mobilised and attend. Once the items has been dealt with and the 'all clear' given by the police, the exclusion zones can be collapsed and workers allowed to recommence works.
- Following an incident involving confirmed UXO, *6 Alpha* should be requested to reassess the risk on site, in accordance with general risk assessment protocols and requirements. Additional mitigation measures may be required.

Appendices

Appendix 1

Detailed UXO Risk Assessment: Stage Four – Risk Assessment

STAGE FOUR – RISK ASSESSMENT

Threat Items

The most probable UXO threat items are *German* HE bombs and IBs, whilst *British* AAA projectiles pose a residual threat. The consequences of initiating *German* HE bombs are more severe than initiating IBs or AAA projectiles, and thus they pose the greatest prospective risk to intrusive works.

Maximum Bomb Penetration Depth

Considering the ground conditions (highlighted in Stage 1), the average BPD for a 250kg *German* HE bomb in sands, gravels, clays and sandstone is assessed to be approximately 5m bgl, with the maximum BPD considered to be approximately 14m bgl. Although it is possible that the *Luftwaffe* deployed larger bombs in the area, their deployment was infrequent, and to use such larger (or the largest) bombs for BPD calculations are not justifiable on either technical or risk management grounds.

WWII *German* bombs have a greater penetration depth when compared to IBs and AAA projectiles, which are unlikely to be encountered at depths greater than 1m bgl.

Risk Pathway

Given the types of UXO that might be present on Site, all types of aggressive intrusive engineering activities (i.e. groundworks) may generate a significant risk pathway. Whilst not all UXO encountered aggressively will initiate upon contact, such a discovery could lead to serious impact on the project especially in terms of critical injury and project delay.

Prospective Consequences

Consequences of UXO initiation include:

1. Fatally injure personnel;
2. Severe damage to plant and equipment;
3. Deliver blast and fragmentation damage to nearby buildings;
4. Rupture and damage underground utilities/services.

Consequences of UXO discovery include:

1. Delay to the project and blight;
2. Disruption to local community/infrastructure;
3. The expenditure of additional risk mitigation resources and EOD clearance;
4. Incurring additional time and cost.

UXO RISK CALCULATION

Site Activities

Although there is some variation in the probability of encountering and initiating items of UXO when conducting different types of intrusive activities, construction methodologies have been described for analysis at this Site. The consequences of initiating UXO vary greatly, depending upon, *inter alia* the mass of HE in the UXO and how aggressively it might be encountered. For this reason, 6 Alpha has conducted separate risk rating calculations for each construction methodology that might be employed.

Risk Rating Calculation

6 Alpha's Semi-Quantitative Risk Assessment assesses and rates the risks posed by the most probable threat items when conducting a number of different activities on the Site. Risk Rating is determined by calculating the probability of encountering UXO and the consequences of initiating it.

STAGE FOUR - RISK ASSESSMENT (…continued)

UXO RISK CALCULATION TABLE – ALL AREAS

Activity	Threat Item	Probability (SHxEM=P)	Consequence (DxPSR=C)	Risk Rating (PxC=RR)
Excavations (<3m)	HE Bombs	1x2=2	2x3=6	2x6=12
	IBs	2x2=4	3x2=6	4x6=24
	AAA Projectiles	1x2=2	3x1=3	2x3=6
Piling (>15m)	HE Bombs	1x3=3	3x2=6	3x6=18
	IBs	2x3=6	3x1=3	6x3=18
	AAA Projectiles	1x3=3	3x1=3	3x3=9

Abbreviations – Site History (SH), Engineering Methodology (EM), Probability (P), Depth (D), Consequence (C), Proximity to Sensitive Receptors (PSR) and Risk Rating (RR).

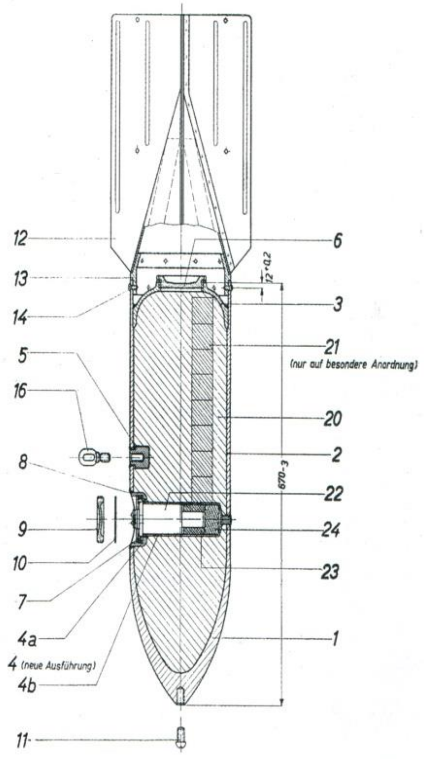
Appendix 2

Examples of UXO

WWII GERMAN HIGH EXPLOSIVE BOMBS

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special risks consultancy

GERMAN HIGH EXPLOSIVE BOMBS – SC-50



The German "Minenbombe" SC-50 was used for smaller targets such as ammunition depots, light bridges and buildings up to three stories.

Type: General purpose

Bomb weight: 40-54kg

Explosive weight: ~25kg

Explosive filling: TNT or Amatol

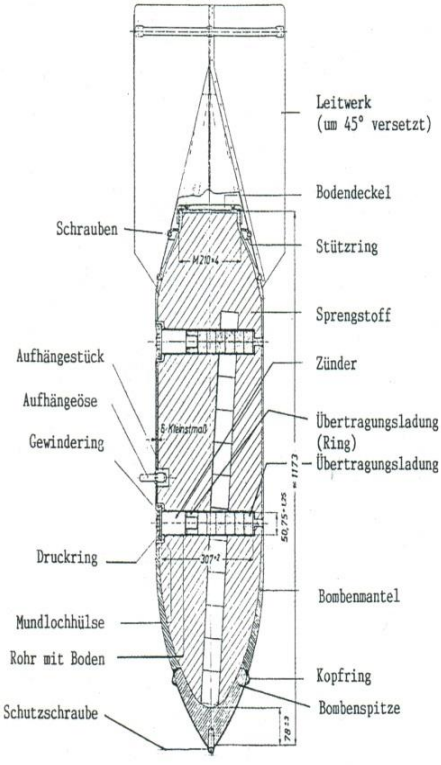
Bomb dimensions: 1,090 x 280mm

Bomb diameter: 200mm

Bomb colour: Dark grey or green



GERMAN HIGH EXPLOSIVE BOMBS – SC-250



The German "Minenbombe" SC-250 was used for larger targets such as railway infrastructure, large buildings and below ground installations.

Type: General purpose

Bomb weight: 245-256kg

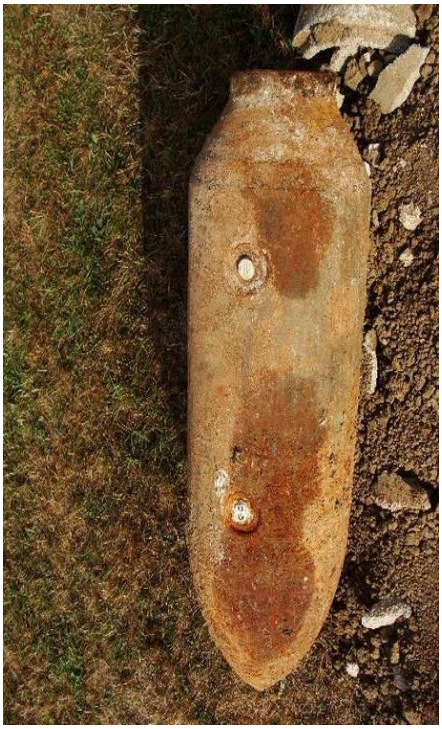
Explosive weight: 125-130kg

Explosive filling: TNT

Bomb dimensions: 1,640 x 512mm

Bomb diameter: 368mm

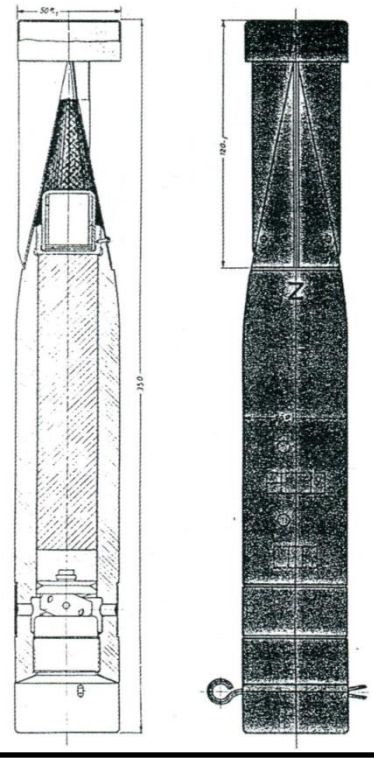
Bomb colour: Dark green, sky blue or aluminium



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WWII GERMAN INCENDIARY BOMBS

GERMAN INCENDIARY BOMBS – B-1 EZ



The German "Elektronbrandbombe" B-1 EZ was designed burn at extreme temperatures, which could destroy most buildings made of combustible materials. Many incendiary bombs were dropped as target markers for bomber crews equipped with high explosive bombs.

Type: Incendiary

Bomb weight: 1.0 and 1.3kg

Explosive weight: 8-15g

Explosive filling: Nitropenta

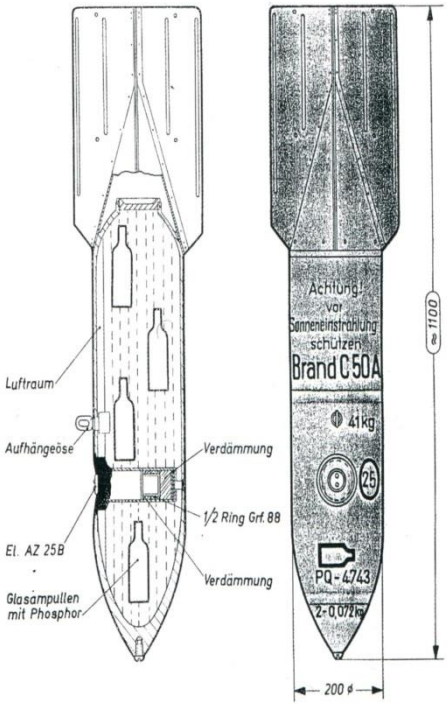
Bomb dimensions: 350 x 50mm

Bomb diameter: 50mm

Bomb colour: Unpainted magnesium, dark green tail



GERMAN INCENDIARY BOMBS – C-50 A



The German "Liquid Brandbombe Brand" C-50 A was used for all targets where an incendiary effect was to be expected. Until October 1942, all C-50 A bombs were filling with a phosphorous/carbon disulphude solution.

Type: Incendiary

Bomb weight: 41kg

Explosive weight: 0.03kg

Explosive filling: Granulatfüllung

Bomb dimensions: 1,100 x 280mm

Bomb diameter: 200mm

Bomb colour: Blue-grey or dark green

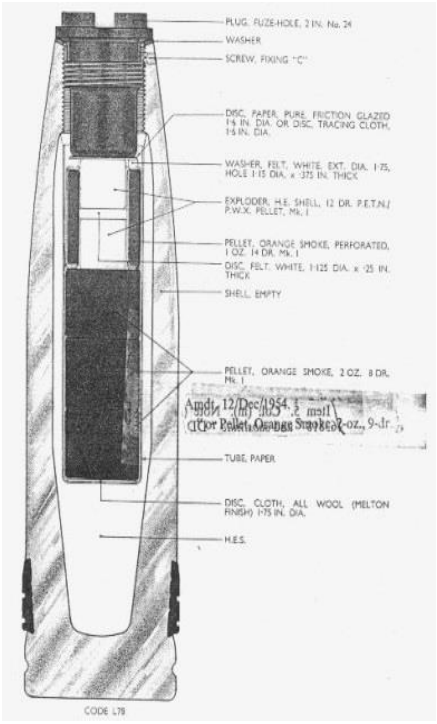


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WWII BRITISH HEAVY ANTI-AIRCRAFT PROJECTILES

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BRITISH ANTI-AIRCRAFT PROJECTILES – 3.7”



The British 3.7” anti-aircraft artillery projectile was designed to defend ground targets from the threat of enemy aircraft. The “three-seven” gun was one of the most commonly used heavy anti-aircraft artillery guns in WWII, with over two thousand built.

Type: Anti-aircraft

Projectile weight: 12.7kg

Range: 9,754m

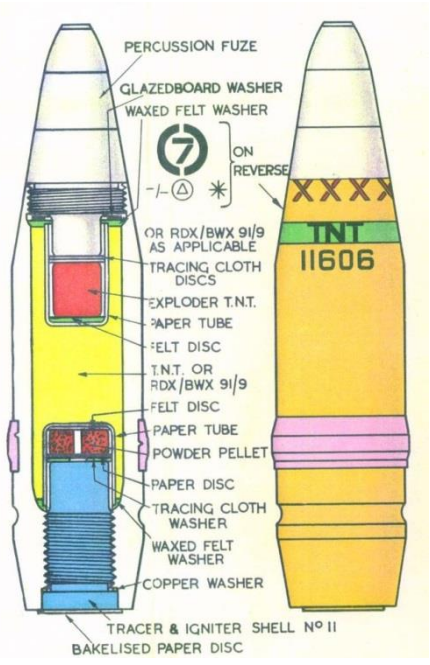
Rate of fire: 10-20rpm

Projectile dimensions: 94 x 360mm

Fuze type: Proximity



BRITISH ANTI-AIRCRAFT PROJECTILES – 40MM



The British 40mm anti-aircraft artillery projectile was designed to defend ground targets from the threat of enemy aircraft. The 40mm projectile have different functions, a green body denoted it was high explosive, whilst a red tip meant that it was an incendiary projectile.

Type: Anti-aircraft

Projectile weight: 0.9kg

Range: 7,160m

Rate of fire: 120rpm

Projectile dimensions: 40 x 172mm

Explosive filling: TNT

Fuze type: Percussion

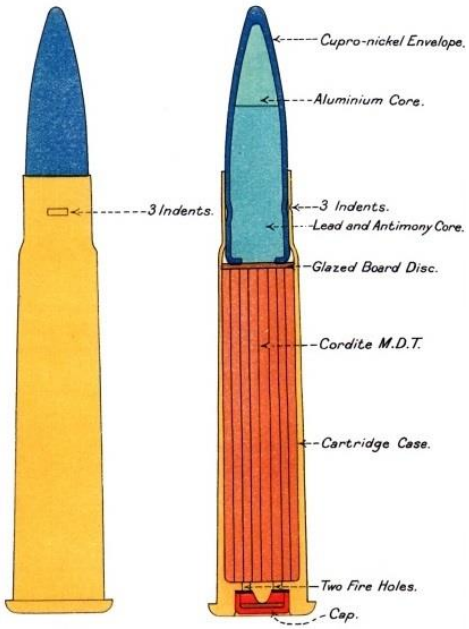


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WWII ALLIED SMALL ARMS AMMUNITION

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BRITISH SMALL ARMS AMMUNITION – .303 ROUND



The British .303 round was the standard British military cartridge from 1889 until the 1950s. The round was used by the short magazine Lee Enfield (SMLE), the P-14, Lewis guns and the Bren gun.



Used by: Rifles, machine guns

Case length: 78.1mm

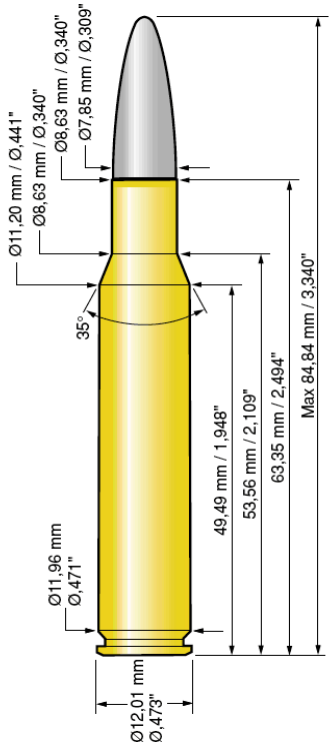
Case diameter: 7.7mm

Case weight: 11.3g

Case type: Rimmed, bottleneck

Propellant: Cordite/Nitrocellulose

AMERICAN SMALL ARMS AMMUNITION – .30-06



The American .30-06 round was the standard Rifle cartridge during WWII. The round was used by a variety of different guns used by the British army such as the Lewis gun and M1917 Enfield.



Used by: Rifles

Case length: 63.3mm

Case diameter: 12mm

Case weight: 9.8g

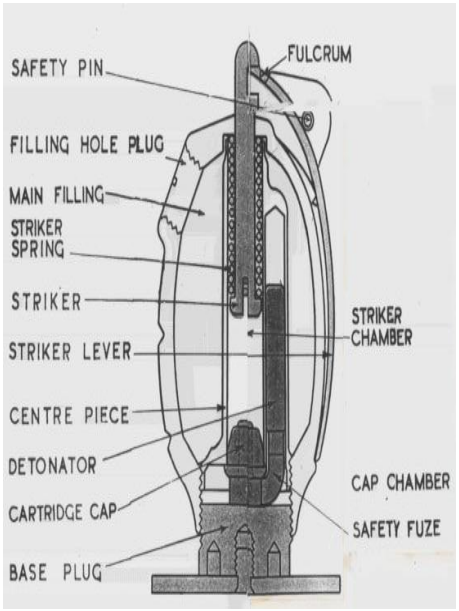
Case type: Rimless, bottleneck

Propellant: Nitrocellulose

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WWII LAND SERVICE AMMUNITION

BRITISH LAND SERVICE AMMUNITION – MILLS BOMB NO. 36



The British "Mills bomb" was the standard British grenade in WWII, and was in service from 1915 until the 1980s. Over 70 million Mills grenades were produced in WWI alone.

Grenade weight: 765g

Grenade length: 95.2mm

Grenade diameter: 61mm

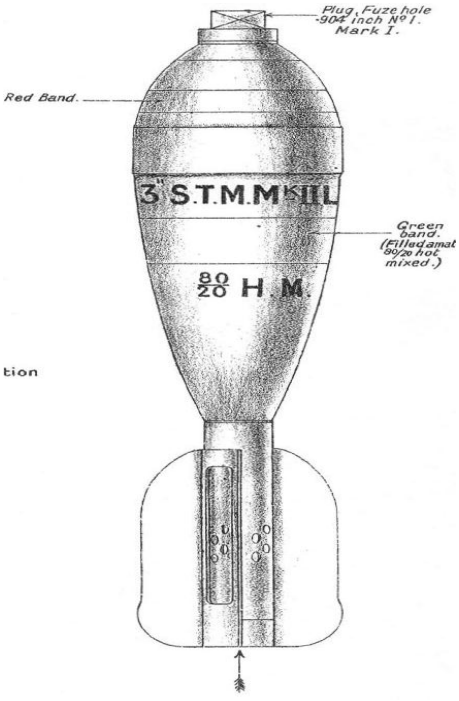
Explosive filling: Baratol

Detonation timer: 4-7 seconds

Danger radius: 91.44m



BRITISH LAND SERVICE AMMUNITION – 3-INCH MORTAR



The Mark II 3-Inch mortar was introduced in 1936 as a replacement for the Stokes Mark I mortar, and became the standard for the British Army until the 1960s.

Shell diameter: 81.28mm

Shell weight: 4.54kg

Explosive filling: Amatol

Rate of fire: 10rpm

Mortar range: 2,560m

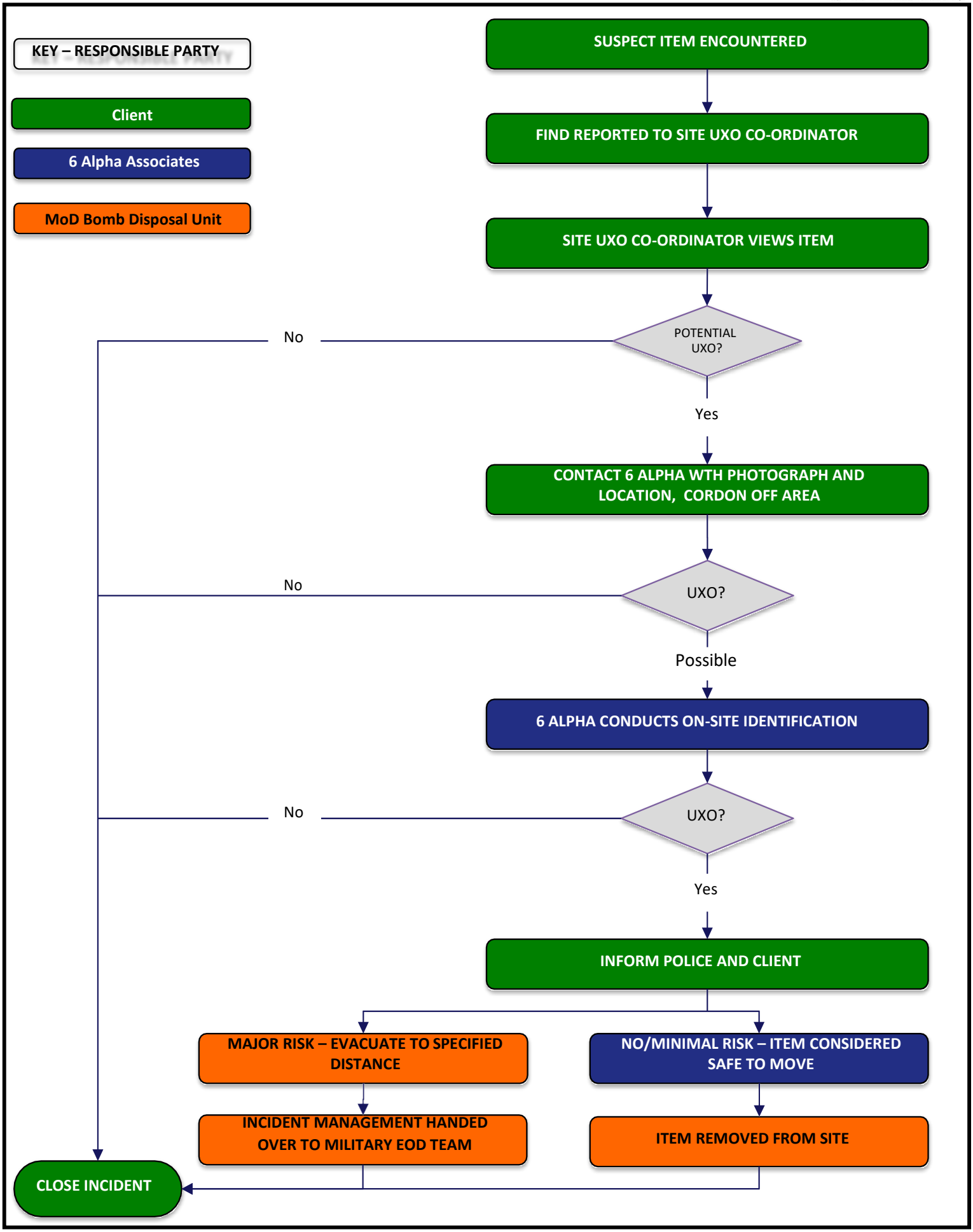


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Appendix 3

Procedure on Finding a Suspect Item

PROCEDURE ON FINDING SUSPECT ITEM



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