



Blackwin Street

John Southworth

Operational Unexploded Ordnance (UXO) Emergency Response Plan

Meeting the requirements of the UK's Construction Industry and Information Association's

UXO Risk Management Framework:

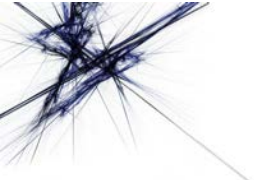
"Unexploded Ordnance (UXO) – A Guide for the Construction Industry" (C681)
and in compliance with the Construction (Design and Management) Regulations 2015

6 Alpha Associates Ltd

Project No.: 11095

4th March 2024





Disclaimer

This Guide and the procedures it contains are designed for specific works at Blackwin Street where the risk of an unexploded ordnance encounter has been reduced As Low As Reasonably Practicable (ALARP). These recommendations are project and operation specific; they are not transferable.

Document Control

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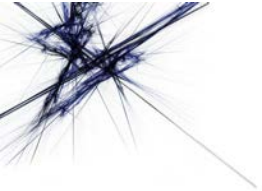
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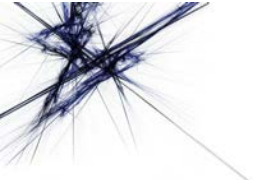
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- Appendix 2** Procedure on Finding a Suspect Item



1 Introduction

The aim of this document is to provide information and guidance to *John Southworth* on the risk from unexploded ordnance (UXO) that has been identified at the site described as Former Forrester House, Blackwin Street, Manchester, M12 5JY. (the Site), and on the measures to be taken in the event that UXO is encountered during planned intrusive activities on site prior to or during construction and redevelopment activities.

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 construction and redevelopment works, although a significant number of other UXO threat items, including large high-explosive unexploded bombs (HE UXB), have also 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 and the environment. 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.

1.1 Aims and Objectives

Historical research associated to the Site, indicates that there is a risk of encountering UXO during intrusive activities.

The aim of this document is to provide detail on both strategic planning to site management and 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 ground investigation works.

2 Regulations

There is no formal control or legislative guidance relating to either UXO or commercial Explosive Ordnance Disposal (EOD) activities. Therefore, this document has been produced taking into consideration the overarching legislation with regard to the proposed ground works planned at the site and the potential risk of uncovering buried UXO:

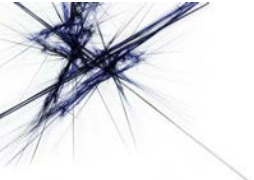
- ⚙ Personal Protective Equipment (PPE) at Work Regulations;
- ⚙ Management of Health and Safety at Work (MHSW) Regulations;
- ⚙ Control of Substance Hazardous to Health (COSHH) Regulations;
- ⚙ Explosives Act;
- ⚙ Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR);
- ⚙ Construction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

Although the Health & Safety at Work Act and the Construction (Design & Management) Regulations do not specifically require measures to mitigate the risk from UXO, there is an obligation on those responsible to ensure that comprehensive risk assessments are taken to identify all hazards, including those that may result from UXO; that present a risk to planned on-site construction and or redevelopment activities and to implement appropriate mitigation measures to reduce those risks ALARP.

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

1. *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.*
2. *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.*
3. *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:

- 
1. *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.*
 2. *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—*
 - a. *Carrying out or liable to be affected by construction work;*
 - b. *Maintaining or cleaning a structure; or*
 - c. *Using a structure designed as a workplace.*
 3. *If it is not possible to eliminate these risks, the designer must, so far as is reasonably practicable—*
 - a. *Take steps to reduce or, if that is not possible, control the risks through the subsequent design process;*
 - b. *Provide information about those risks to the principal designer; and*
 - c. *Ensure appropriate information is included in the health and safety file.*
 4. *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 Site UXO Coordinator

A Site UXO coordinator should be appointed ahead of any intrusive works commencing. The appointment should be a person e.g. the Site Manager, the Project Manager, the Health & Safety Manager; who is to be present onsite whilst any and all intrusive works into previously undisturbed ground are being carried out.

If a suspicious item, that may be UXO, is discovered then, in the absence of an Explosives Ordnance Disposal Engineer (EODE) who, if present onsite would take responsibility for the following, the Site UXO Coordinator, would assume responsibility for:

-  Briefing the site personnel with the actions to be taken;
-  Assist with the co-ordination of the evacuation;
-  Liaise with *6 Alpha*, the Client and the Police.

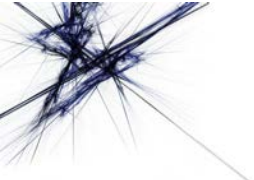
The Site UXO Coordinator should familiarise themselves with the contents of this document and other relevant documents associated to the UXO risk and mitigation measures that may be available, specifically the Detailed UXO Threat and Risk Assessment desktop report and the risk assessment method statement; and ensure they retain the following contact details:

-  *Greater Manchester Police, Openshaw, Manchester M11 1PP, – 101 01618725050*
-  *Manchester Royal Infirmary, Manchester Royal Infirmary, Upper Brook St, Manchester M13 9NZ– Phone Number; 01612764147*
-  *6 Alpha Associates Limited – 020 3371 3900.*

3.2 Evacuation Planning (see Appx.3)

Evacuation should be implemented in circumstances where a suspicious item, that may be UXO, has been encountered. The requirement for evacuation will be decided by the attending EODE and or Site UXO Coordinator

The extent of and need for evacuation will initially be determined and influenced by a number of factors e.g. the circumstances of encounter, the size of the item, the location and position of the item; but in general all non-essential personnel should be evacuated away from the location of the item so that as a minimum they are out of line of sight, behind and below hard cover and as far away as possible and practicable.



If a suspicious item, that may be UXO or that is confirmed as UXO, is encountered which presents a viable or potential risk of harm to sensitive receptors on or off site, then the following should be implemented (and see Appx.3 'Procedure on Finding an Suspected UXO Item'):

1. Communicate the incident to the site via the recognised signal/messaging method whilst also, if and when deemed necessary and required, alerting the appropriate external (off-site) appointments, agencies and organisations so action beyond those deemed as site responsibilities can commence.
2. The EODE, if present, or the Site UXO Coordinator will take charge of the evacuation, with assistance from nominated site personnel where appropriate, directing site personnel to move beyond the hazardous area.
3. The EODE / Site UXO Coordinator will direct and implement cordoning off the hazardous area and restrict access back into that, until the Police are on the scene and in a position to take control.
4. Persons should be directed to evacuate to the muster point, if possible and practicable via pre-planned evacuation routes, but changing these as necessary to remain out of line of sight of and behind cover from the suspicious item.
5. All personnel at the muster point should be checked off against the site attendance register to ensure no personnel remain on site.
6. Under no circumstances should site personnel re-enter the hazardous area until it has been declared safe to do so by the appropriate appointment.

NOTE: Do not attempt to enforce ANY EVACUATION beyond the boundaries and extent of the site. By way of example, it may be necessary to evacuate to a distance of 1,000m in multiple or all directions from the hazardous item if that was confirmed as a large HE UXB. Evacuation beyond the site boundary can only be enforced by the Police.

4 Unexploded Ordnance

The major effects of a partial or full detonation of a device are shock, blast, heat and shrapnel damage. The detonation of a 50kg buried bomb would damage brick or concrete structures up to 16m away and protected personnel on the surface up to 45m away. Larger ordnance is more destructive, with an accepted safety distance for a 500kg HE device being 1000m.

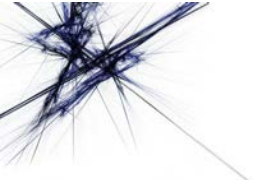
Explosives rarely become inert or lose effectiveness with age but over time mechanisms such as fuzes and gains can become more sensitive and therefore more prone to detonation. This applies equally to items that have been submersed in water or embedded in sand, gravel or similar materials.

Once initiated, the effects of the detonation of explosive ordnance (such as shells or bombs) are usually extremely fast, often catastrophic and invariably traumatic to the personnel involved. The degradation of a shell or bomb 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.

4.1 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;
-  *British* Anti-Aircraft Artillery (AAA) Projectiles;
-  Small Arms Ammunition (SAA);
-  Land Service Ammunition (LSA).



5 Identification of Ordnance

In this section *6 Alpha* have outlined the basic details about the munitions including those likely to be found on site. However, at Appendix 2, there are examples of a range of munitions to indicate the variety of ordnance found on construction sites in *Britain*. In addition, *6 Alpha* can provide posters to display in the site office on request.

5.1 German High Explosive Bombs

General-purpose bombs 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. The body 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). The presence of a tail unit may indicate that an UXB is buried at depth in the region.
-  **Fuze** – With a German UXB it is most likely that the bomb would have a mechanical or electrical transverse fuze. In some cases a bomb may contain two fuzes. On a German UXB 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 *UK* were of the Oil Bomb variation, where a flammable liquid was used 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 inches, and the overall length is 43.2 inches. The filling is 15 litres of a mixture of 86 per cent benzene, 10 per cent rubber, and 4 per cent phosphorus. It has a bursting charge of picric acid.

By 1942, Oil Bombs had been superseded by a smaller and more intensely burning IB made of magnesium. These weighed only 1 or 2 kg 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. 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 Artillery Projectiles

A shell is a projectile, which, as opposed to a bullet, is not solid but contains an explosive or other filling. Most shells are aerodynamic and hence, tend to have similar shapes to bullets, i.e. a cylinder topped by a curved shaped nose and some shells have a tapering base. Illustrations of typical shells are presented in Appendix 2.

5.3.1 High Explosive Shells

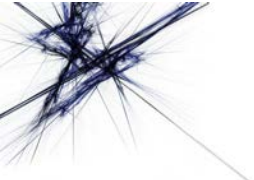
The most common type of shell is High Explosive. High Explosive shells have a strong case, bursting charge and a fuze. When the fuze initiates the shell, the bursting charge shatters the case and scatters hot, sharp fragments of steel at high velocity. The armour piercing shell was common in naval warfare; these shells had to withstand punching through armour plate. Shells designed for this purpose had a greatly strengthened case with a specially hardened and shaped nose, and a much smaller bursting charge or even no bursting charge for smaller calibres.

The fuze of a shell has to keep the shell safe from accidental functioning during storage, due to (possibly) rough handling, fire, etc. It also has to survive the violent launch through the barrel, then reliably function at the correct time. To do this it has a number of arming mechanisms, which are successively enabled under the influence of the firing sequence.

Sometimes one or more of these arming mechanisms fails and, if the fuze is installed on an HE shell, it fails to detonate on impact. Potentially far more hazardous, are fully armed shells on which the fuze fails to initiate the HE filling. This may be due to shallow, low velocity or soft impact conditions.

5.3.2 Anti-Aircraft Artillery (AAA)

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 around 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.

5.4 Small Arms Ammunition

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

SAA is primarily cartridge-based. 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.

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.

5.5 Land Service Ammunition

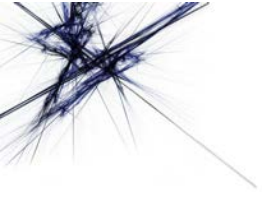
LSA is generally (although not exclusively) employed by land-based military forces and may typically consist of *inter alia*, mortars, grenades, light-anti-armour weapons and artillery projectiles. Such items are generally designed to be carried by personnel and consequently, their quantity of High Explosive is likely to be limited in comparison with other types of ordnance.

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



6 Actions on Discovery of Suspect Items

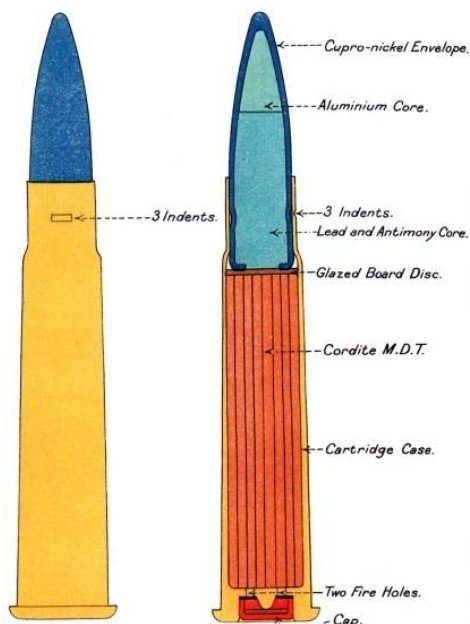
A 'Procedure on Finding an Suspected UXO Item' flow diagram is included at Appendix 3, which indicates the process that should be followed when finding and dealing with a suspect item that may be or is confirmed as UXO.



Appendices

Examples of Unexploded Ordnance

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

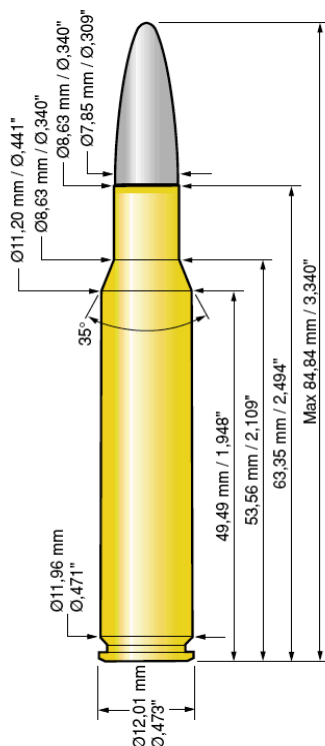
Case weight: 11.3g

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

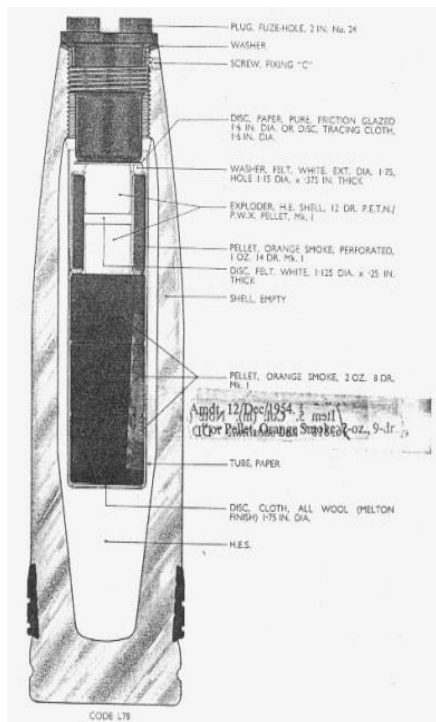
Case weight: 9.8g

Case type: Rimless, bottleneck

Propellant: Nitrocellulose



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

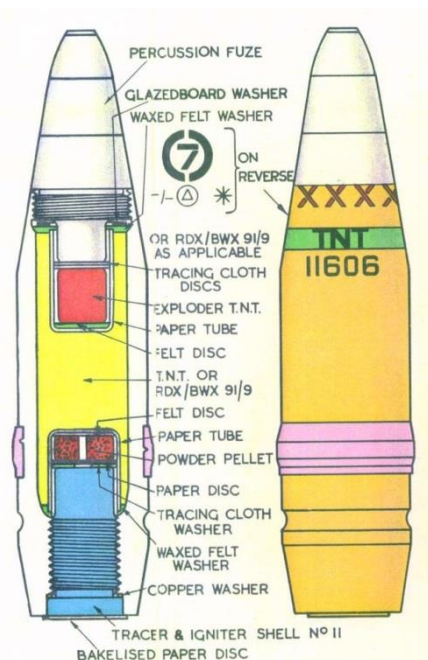
Rate of fire: 10-20rpm

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

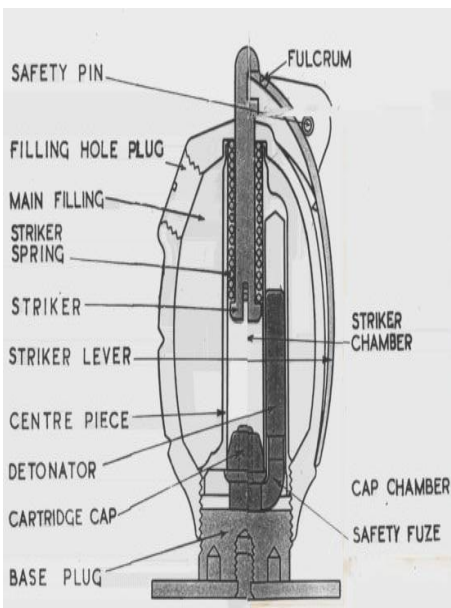
Projectile dimensions: 40 x 172mm

Explosive filling: TNT

Fuze type: Percussion



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

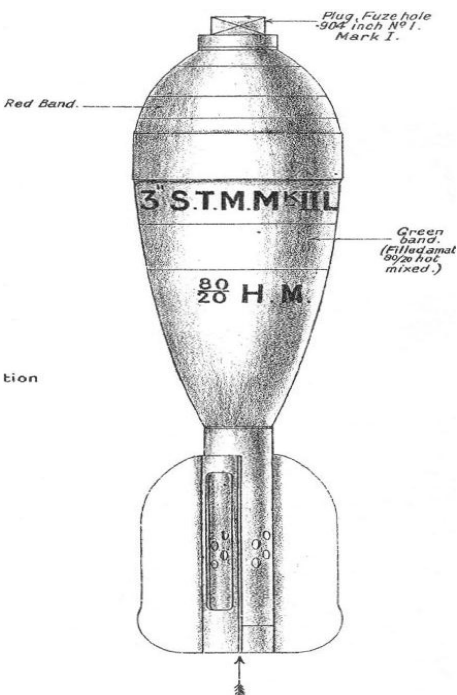
Explosive filling: Baratol

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



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

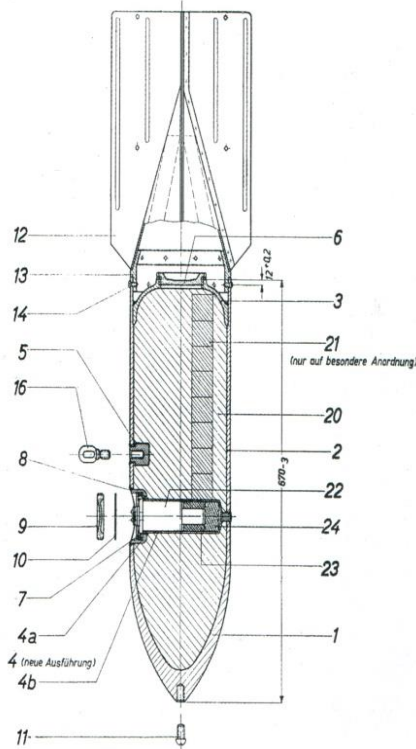
Explosive weight: ~25kg

Explosive filling: TNT or Amatol

Bomb dimensions: 1,090 x 280mm

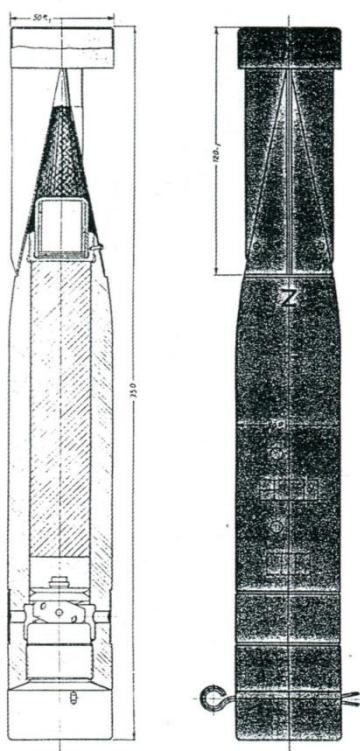
Bomb diameter: 200mm

Bomb colour: Dark grey or green



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

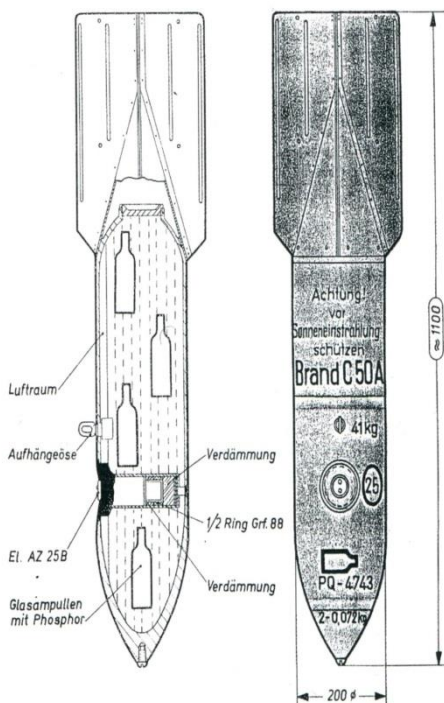
Bomb diameter: 50mm

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 disulphide solution.

Type: Incendiary

Bomb weight: 41kg

Explosive weight: 0.03kg

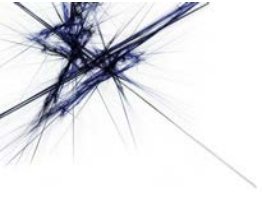
Explosive filling: Granulatfüllung

Bomb dimensions: 1,100 x 280mm

Bomb diameter: 200mm

Bomb colour: Blue-grey or dark green





Procedure on Finding a Suspect Item

KEY – RESPONSIBLE PARTY

On-site Contractor

6 Alpha On-Site EODE

Police / MoD Bomb Disposal Unit

Suspicious object uncovered
during intrusive works

Inform Site Management
& 6 Alpha

Inspect / assess object

POTENTIAL
UXO

NO

YES

Confirm initial assessment

CONFIRMED
UXO

NO

YES

Consult with Site Management /
Inform Civil Police

HIGH RISK – UNSAFE TO MOVE
EVACUATE TO SPECIFIED DISTANCE

NO / LOW RISK – SAFE TO MOVE

INCIDENT MANAGEMENT HANDED OVER
TO MILITARY BOMB DISPOSAL TEAM

ITEM REMOVED FROM SITE

CLOSE INCIDENT