UXO Considerations for Ranges

Unexploded Ordnance

The hazards from working in and around UXO and UXO contaminated areas are very serious and potentially life threatening. Dangerous UXO items are often hidden, buried, or hard to recognize even for trained personnel.

Coordinate all onsite activities with installation safety and range operations personnel

Purpose

This section provides guidance for managing MEC (Munitions and Explosives of Concern) and UXO (Unexploded Ordnance) concerns during the planning, design, and construction of live-fire ranges. The section is a general guide only. Every project has a unique set of circumstances and challenges; it would be impossible to account for every situation. Close coordination with all stakeholders including the RTLP-MCX and Ordnance and Explosives (OE) Center of Expertise (CX) is extremely important; refer to the contact information below. Refer to the Department of Defense Manual, DoD 6055.09-M-V7 and USACE Engineer Manual, EM 385-1-97 along with the information contained in this document. Change 1 to EM 385-1-97, Chapter III contains guidance specifically for the determination of the appropriate level of UXO support for a project.

Impact

Military units employ and conduct live fire training with weapons and ammunition that can produce explosive duds. This includes both service and some training rounds. While current regulations require firing dud-producing weapons into a dudded impact area, historical records

are not always accurate or complete enough to show every site used. This means that there is always at least some risk of encountering UXO. The risk generally increases for locations in or near impact areas, which are typical range sites. For SRP projects, the program determines the likelihood of encountering UXO before beginning work on a new range. The likelihood is defined in levels of risk; typically identified as Low, Medium (or Moderate), High or a combination of these levels. Installations use that risk along with other factors when selecting the site for a range.

UXO clearance generally takes place prior to any construction activities; there may be additional support provided during construction. For typical SRP projects, UXO clearance is only in the construction footprint and only to the extent that provides for the relative safety during the construction and instrumentation of the range. Clearance of the entire footprint can be cost prohibitive on large ranges. In addition, it is fiscally wasteful to clear ranges that will be re-contaminated with dud producing rounds.

The total project cost is generally higher in areas that are contaminated, or potentially contaminated, with UXO. There are a few primary drivers for the cost increase. First, UXO Clearance along with the associated support during construction can be significant costs. Second, construction in areas at risk of UXO contamination can be more expensive than typical due to the restricted access and/or reduced production rates from working in and around areas with a higher risk of UXO. Finally, UXO clearances can also increase the total time required to complete the construction/instrumentation of a range; increasing the amount of time that the site is not available to the installation. Account for these additional cost and schedule impacts during the planning process.

Policy

An Army policy known as ‘the clean site policy’ defines responsibility for the investigation, documentation, and remediation/cleanup efforts associated with environmental contaminants on Military Construction (MILCON) project sites. This policy includes MILCON sites contaminated with unexploded ordnance (UXO). *No MILCON funding will be provided for remediation of UXO for FY2004 projects or projects completed later.* In other words, MILCON funds cannot be used to clear UXO, rather installation Operations and Maintenance (O&M) funding is used. For most SRP funded range projects, the proponent, Department of the Army G3 Training (DAMO-TR), provides central funding for the remediation of UXO to the Ordnance and Explosives Center of Expertise (OE CX) at US Army Corps of Engineers Engineering and Support Center, Huntsville (HNC).

Points of Contact

The U.S. Army Engineering and Support Center, Huntsville (CEHNC) is the Mandatory Center of Expertise (MCX) for the Range and Training Land Program (RTLP).

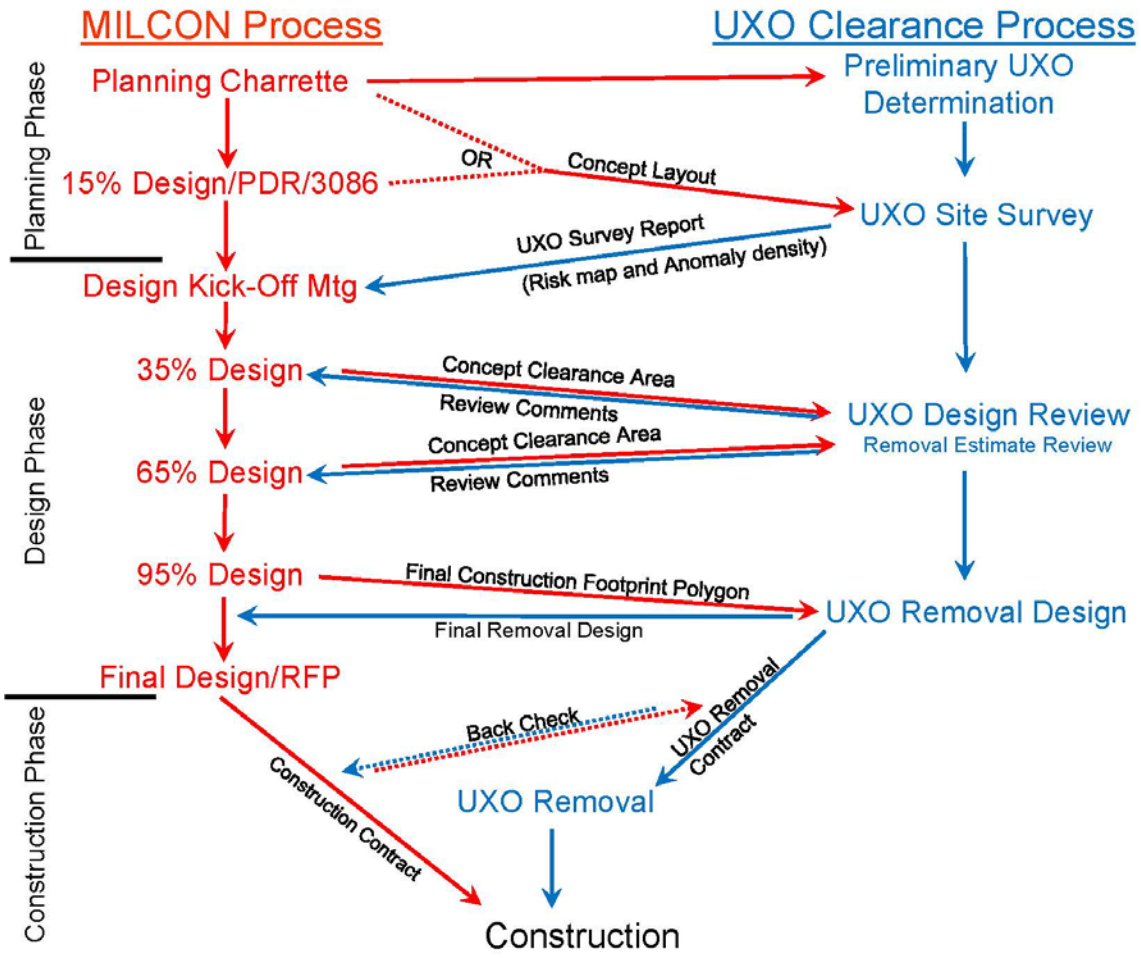
EMAIL RTLP or (256) 895-1534

CEHNC is also the Center of Expertise (CX) for Ordnance and Explosives (OE).

OEDirectorate@HND01.usace.army.mil or (256) 895-1563

Range Design/Construction Process

The planning/design/construction process for a range in UXO contaminated area requires the coordination of all stakeholders to provide the highest quality range at the lowest total cost. The following figure shows the coordination points between the Construction and UXO removal processes. The following sections further explain the processes and coordination required at each phase.



RANGE DESIGN / CONSTRUCTION PROCESS

General UXO Safety

UXO training and safety support is normally a requirement for entering medium and high-risk areas. In some cases, it is required for low risk or uncharacterized areas as well. The support is generally required during topographic surveying, geotechnical investigations, and other preliminary onsite operations. UXO training often extends to the construction phase of a project as a requirement for construction personnel. Coordinate all onsite activities with installation safety and Range Operations personnel.

Site Characterization

A site characterization will determine if UXO contamination is present, the type, and estimated density of anomalies and contamination. This must be done prior to, or at the beginning of the planning/design process. Qualified UXO safety specialists are required do the characterization in accordance with EM 385-1-97. For SRP funded projects, the OE-CX performs the site characterization. Consider the results of the characterization in the design process. Include the risk maps and clearing limits in the construction contract. The OE CX also provides a letter memo for areas characterized as low risk.

Project Planning

The risk of encountering UXO on a proposed range construction site can increase the cost of a project significantly. The increases are for both removal of UXO contamination and the actual construction of the range project. Failure to identify and program funding for UXO clearance, and increased MILCON costs, properly could adversely affect or cause the loss of a project. The initial submittal of the DD1391 is the first opportunity to communicate those funding requirements. As stated above, the UXO removal cost is no longer part of the MILCON estimate, but must be discussed in Tabs A, E and J of the DD1391. Note that the DD1391 only identifies the funding requirement; it does not actually program the funding.

DD Form 1391, Tab A

Include a sentence in the Description of Proposed Construction stating the expectation and proposed disposition of UXO on the project site. Use one of the following statements as applicable:

> *"There is a low risk of encountering unexploded ordnance contamination on the project site."*

> *"There is a high risk of encountering unexploded ordnance contamination on the project site. Clearance will be performed prior to construction start using other appropriations."*

DD Form 1391, Tab E, Furnishings and Equipment

To identify funding for UXO removal and support for the construction project, include a line item in Tab E with O&M (OMA, OMAR, OMNG, etc.) as the PROC APPR. This line item includes the costs for the UXO clearance, as well as the costs for UXO construction support. The footnote for the applicable line item should provide a list of assumptions and contain either of the following standard statements:

> *"There is a low risk of encountering unexploded ordnance contamination on the project site."*

> *"There is a moderate/high risk of encountering unexploded ordnance contamination on the project site. Surface clearance will occur on approximately____ acres at an estimated cost of $_____ per acre. Subsurface clearance will occur on ____ acres at an assumed cost of $_____ per acre. Government oversight will be provided at an assumed*

cost of $_____. The Total Cost of Surface and Subsurface clearance for this project is $_____."

DD Form 1391, Tab J, Environmental Analysis

Include a statement discussing the project site investigation or characterization for UXO performed in support of the project. Use one of the following statements as applicable:

"*There is a low risk of encountering unexploded ordnance contamination on the project site."*

"There is a moderate/high risk of encountering unexploded ordnance contamination on the project site based on initial site assessment conducted on _____. A full site characterization is scheduled for_____."

Cost Estimates

The cost of UXO clearance and support during construction is a function of several factors, the types of UXO, anomaly density, required clearance depth, terrain, ground cover and vegetation, soil properties, etc. Normally, UXO clearance is only in those areas that will be disturbed during construction (building foundations, tree/vegetation clearing, grubbing operations, excavations, trenches, etc.) plus areas required for construction access. The OE CX provides the estimates for SRP funded projects and can assist in estimating the costs for non-SRP funded projects or clearances.

Ensure that the construction cost estimate includes a consideration of increased cost of construction in UXO contaminated areas.

Project Design

For a MILCON range on a site with areas of moderate or high risk of UXO, the Government uses a separate UXO removal contract in support of and in conjunction with the normal construction contract. The primary purpose of the UXO removal contractor is the safety of the construction and instrumentation process. It is not for the safety of the future users of the range; that is different funding.

Strategy

The UXO clearance cost is primarily a function of the size and depth of the cleared area. The clearance costs in those areas can vary based on expected UXO types, anomaly densities, types of soils and vegetation, and other variables. Since the Government's goal is to provide the new range safely and at the lowest total project cost, UXO clearance of the entire range footprint may not be necessary. The designs for the two contracts are very interrelated; each references the other. The two designers must work together to determine the area and depth of the UXO clearance. The designer of the construction contract is in the best position to determine the best and most efficient method to construct the range. The designer for the removal contract is in the best position to determine the safest and most efficient method to clear the site.

At a minimum, coordinate the two major cost drivers; clearance footprint and depth of construction. The construction designer should also coordinate with the removal designer to avoid the high removal cost areas when possible, (highest risk areas, heavily vegetated areas, etc.).

Construction Footprint

The construction footprint is the area where construction within the range boundaries will actually take place plus any additional areas required by the construction contractor; stockpile areas, equipment access, etc. Since in most cases only the construction footprint requires UXO clearance, minimizing the construction footprint and contractor access corridors minimizes the clearance cost. Conversely, allowing the construction contractor maximum flexibility on the worksite by expanding cleared areas can reduce the construction cost, but increases clearance costs. The goal is to achieve a balance that minimizes the combined cost of both contracts.

Construction Depth

The construction depth is the maximum depth of construction below the existing grade. UXO clearance is to this depth plus a buffer of one to two feet. Typically, deeper construction increases the cost of the clearance. A construction design that places all downrange features on fill generally minimizes the clearance cost. However, doing that can increase the construction cost, reduce realism, and add sustainability issues to the range. Again, the goal is to achieve a balance that minimizes the combined cost of both contracts while maximizing the effectiveness of the range.

Design Recommendations

Below are a number of construction techniques to decrease the amount of UXO clearance. Each has advantages and disadvantages, discuss with the PDT.

- Design the range features to avoid the highest risk areas
- Place roads and target emplacements on top of existing grade or on fill
- Minimize grubbing in line of sight clearing areas
- Place fill on un-grubbed areas
- Design cable network and trench route to follow roads and trails
- Construct backfill pad over potential UXO contamination
- Dictate construction schedule to minimize the safety support
- Allow some flexibility in siting downrange features to permit UXO avoidance

Construction Package

The construction package must convey to the contractor all UXO constraints and requirements for the construction of the range. Include, at a minimum, any training requirements, site access constraints, UXO cleared areas, reporting instructions, safety considerations, schedule constraints, coordination requirements, risk maps, etc.

The following sections contain suggested language to include on the drawings and in the specifications. Tailor the language to the specific situation; coordinate closely with the UXO removal design.

Specifications

If encountering UXO is unexpected at a project site, adapt the following text and include in the specifications.

Environmental Protection

Tailor the following and add to the Environmental Protection Section.

EMERGENCY UNEXPLODED ORDNANCE (UXO) RESPONSE

Medium and High risk areas in the construction footprint will be cleared of UXO by others. UXO support by others will be available during intrusive site work. Coordinate all UXO support through the Contracting Officer. There is still a risk of encountering UXO in low risk and UXO cleared areas. In the event UXO, or items resembling UXO, is encountered during construction activities, immediately stop work in the area and contact the Contracting Officer and [_____] to conduct an emergency response. Include an evaluation of this scenario and procedures, with contact numbers, in the health and safety plan (HASP) for the fieldwork.

Summary of Work

Tailor the following and add to the Summary of Work Section.

GOVERNMENT-INSTALLED WORK

Initial Unexploded Ordnance (UXO) removals (clearances) will be performed by the Government's UXO contractor to a maximum of construction depth plus [one foot] in medium/high risk construction footprint areas in advance of the construction contractor, as indicated. During construction, any additional UXO clearances deeper than [the depth of detection] [_____] may need to be conducted in lifts by the UXO contractor in conjunction with the construction contractor. Accordingly, it is anticipated that the UXO contractor will sweep and clear each lift followed by the construction contractor removing the lifts once each lift clearance is complete. UXO construction support personnel will be onsite during intrusive construction activities in direct support of the construction contractor and construction effort.

At the commencement of intrusive (ground disturbing) construction activities, low risk areas as well as the med/high risk areas which were previously cleared will receive construction support by the Government UXO contractor. Specifically UXO standby support as defined by EM 385-1-97 will be provided in which Government UXO construction support personnel will be at the project site and will investigate any potential UXO found during intrusive construction activities.

In the event that an object resembling military munitions is discovered during construction activities, construction contractor personnel should stop work in the immediate vicinity of the discovery and contact the Contracting Officer and [_____] to investigate the item. Should a suspect discovery be confirmed to contain an explosive hazard, Government UXO construction support personnel will remove or destroy the item, during which time the construction contractor personnel will be required to maintain a safe distance from the item specified by the Government's UXO construction support personnel.

Drawings

The construction contract drawings must show the UXO risk maps and the limits of the UXO clearance. A special section in the drawing package specifically for UXO removal is the recommended format. The construction drawings must be coordinated with drawings in the UXO removal contract. The drawings in this section should delineate limits of UXO clearance (similar to limits of construction, tree clearing, etc.) to indicate the clearance performed in the marked area(s). The UXO removal section must include all notes that describe the clearance and construction support procedures and describe all of the requirements of and limits on the construction contract. For firm-fixed price bidding, include all information necessary for the contractors to estimate the cost of all work in the bid package.

Tailor the following typical notes for the project.

1. An Unexploded Ordnance (UXO) Survey was performed at the site and portions of the construction footprint were assessed as having a [medium, high] risk for finding UXO. [Other areas were assessed to have a low risk of finding UXO]. A UXO removal (clearance) will be performed at the site in the medium/high risk construction footprint areas prior to construction; however, the completion of these clearances does not completely eliminate the possibility of encountering UXO in those areas. [UXO clearances will not be performed in the low risk areas, and similarly, while deemed unlikely, the possibility of encountering UXO in a low risk does exist.]

2. A boundary survey will be provided to the construction contractor that depicts the limits of the areas cleared and the depth to which the areas were cleared.

Note: No.2 does not apply to sites that were assessed to be completely low risk.

3. Work only within the clearance limits and areas initially characterized as low risk unless escorted by construction support personnel.

4. At the commencement of intrusive (ground disturbing) construction activities the [medium, high] risk areas which were previously cleared will receive construction support by [Government UXO contractor personnel, installation EOD personnel]. [Areas which were initially assessed to be low risk will also receive construction support.]

5. Specifically "on-call" construction support in accordance with DoDM 6055.09-M-V7 and EM385-1-97, Change 1, will be provided. [Government UXO construction support personnel will be at the project site] [Installation EOD personnel will be on-call] and will investigate any potential UXO findings during intrusive construction activities.

6. In the event that an object resembling military munitions is discovered during construction activities, stop work in the immediate vicinity of the discovery and contact the Contracting Officer and [Government UXO construction support personnel] [installation EOD personnel] to investigate the item. Should a suspect discovery be confirmed to contain an explosive hazard, the item will be removed or destroyed, during which time construction contractor personnel will be required to maintain a safe distance from the item as specified by the [Government UXO construction support personnel] [installation EOD personnel].

7. Maximum coordination will be required to maintain flexibility in redirecting personnel and work effort away from UXO destruction/removal processes in the event that items possessing an explosive hazard are discovered.

8. Each field employee is required to complete a UXO safety course provided by Range Control before commencing work. Subsequent new field employees are required to complete the safety course prior working at the site.

Construction

Background

The objective of UXO support activities is to ensure the safety of construction personnel by employing the techniques of trained UXO personnel. The guiding principle of explosives safety is limiting the potential exposure to the minimum number of personnel for the minimum time to the least number of explosive hazards consistent with safe and efficient operations.

General

The construction contractor and inspection personnel, for the most part, must remain within the low risk and cleared areas. Work outside of those areas generally requires escort by the UXO onsite safety support.

Construction Support

Construction support consists of having UXO safety personnel onsite during the intrusive work. It is generally included as part of the UXO removal contract for construction in areas of medium and high risk, but may also be included for construction in some low risk areas. The purpose of the construction support is to keep the construction site safe. The support primarily includes investigating and disposing of UXO or suspected UXO items discovered during the construction process. It can also include supporting the construction contractor in ordnance avoidance. Clearing of small areas is also sometimes included.

References

- DoDM 6055.09-M-V7, DoD Ammunition and Explosives Safety Standards: Criteria for Unexploded Ordnance, Munitions response, Waste Military Munitions, and Material Potentially presenting and Explosive Hazard.
- EM 385-1-97, Explosives, Safety and Health Requirements Manual.
- ER 1110-1-8153, Engineering and Design - Ordnance and Explosive Response UXO Procedures.pdf