

DDESB-KO

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MEMORANDUM FOR US ARMY TECHNICAL CENTER FOR EXPLOSIVES SAFETY
(ATTENTION: SIOAC-ES)
COMMANDER, NAVAL ORDNANCE CENTER
(ATTENTION: CODE N71)
HEADQUARTERS AIR FORCE SAFETY CENTER
(ATTENTION: SEW)
MARINE CORPS SYSTEM COMMAND (AM)

SUBJECT: Guidance for Clearance Plans

The attachment is provided to assist in the implementation of Chapter 12, DoD 6055.9-STD. Representatives from this office and the Services gathered to discuss this issue and, largely through the efforts of the US Army Technical Center for Explosives Safety, a strawman was developed and is attached. The attached should serve as general guidance and should receive wide distribution, both within your Services and to your contractors. It is not all-inclusive and must be used in conjunction with criteria in the remainder of the Standard.

POC is Mr. Robert G. Newbern, Jr at DSN 221-2555 or 703/325-2555 or **Error!**
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Signed by
W. RICHARD WRIGHT
Colonel, USA
Chairman

Atch, As stated

cc(w/o Atch):
DALO-AMA
CNO(N411)
AFSC/SEP
CEHNC-OE-CX (w/Atch)

Explosives Safety Submissions for Removal of Ordnance and Explosives (OE) from Real Property

1. **Reason for OE.** Provide a brief description of why OE exists in the specific area(s) covered by the submission. Here are examples of documents containing this information: Inventory Project Reports, Preliminary Assessments, Historical Records Searches, Archives Search Reports, and Engineering Evaluations/Cost Analyses.

2. **Maps.** Furnish the following maps.

a. **Regional map.** Provide a map showing the regional location of the site. For example, provide a state map with the site shown on it.

b. **Site map.** Furnish an overall map of the site showing the following:

(1) The OE areas covered by the submission (sometimes, a submission covers only some of the OE areas at a site). Show other OE areas not covered by this submission and explain them - perhaps a previous submission covered them, or maybe they will be in a future submission.

(2) The OE removal depth for each OE area. If OE will be removed to a depth less than the default removal depth, explain why. See enclosure 2 for information on removal depths.

(3) The location of any magazines to be used for storage of demolition explosives and/or recovered OE.

(4) The location of any planned or established demolition areas to be used to destroy recovered OE.

(5) The existing or planned use of each OE area after the clearance. Describe the use in terms of these categories:

(a) Construction activity, whether commercial, residential, recreational, utility, or other.

(b) Farming, agriculture, surface recreation, vehicle parking, or surface supply storage.

(c) Livestock grazing or wildlife preserves.

(d) Other (explain).

c. **Q-D maps.** (Note: The Q-D map and the site map may be shown on the same map.) Provide quantity-distance (Q-D) map(s) for the following areas (it is possible that more than one map will be needed to show everything in sufficient detail). Scaled maps, 1-inch equals not more than 400 feet are preferred. A smaller scale is acceptable if distances can be accurately shown. If unscaled maps are used, then the maps must label distances (see paragraph 8 on quantity-distance {Q-D}). The Q-D map(s) must show these areas:

(1) Each OE area to be cleared under the submission.

(2) The location of magazines for the storage of demolition explosives and/or recovered OE.

(3) Areas planned or established for the intentional detonation or burning of OE will have an exclusion area associated with them. Each exclusion area will be defined by a public withdrawal distance. Show each area and the exclusion zone around it. Identify every inhabited building, occupied area, and public (those not supporting the clearance operation) exposure inside the exclusion zone. Describe measures to be taken to eliminate/minimize risk for exposures within the exclusion zone (example: evacuation of inhabited buildings, blocking off public highways).

d. **Soil sampling maps.** For OE areas involving explosives in the soil, provide a map outlining the area sampled and the location and depth of sampling points. Identify field screening methods used and concentrations of explosives for each sampling point. In addition, address the methods to be used to reduce explosives concentrations to below 10 percent by weight (e.g., blending) and methods which will be used to reduce the explosives hazards (e.g., wetting the soil prior to blending). Identify environmental or legal considerations which may be important

3. **Amount and type of OE.** Provide the expected amount(s) and type(s) of OE based on historical research or data generated from surface or intrusive sampling.

a. **Most probable munition.** For Q-D purposes, a most probable munition must be established for each OE area. The most probable munition is the round with the greatest fragment distance that can reasonably be expected to exist in any particular OE area.

b. If only historical research is available (i.e., no sampling data is available), then select the most probable munition (which will determine the exclusion zone) from the types of rounds that historical research indicates were fired.

c. If sampling has been performed, then select the most probable munition from the types of rounds found during sampling.

d. If, during the course of actual removal, a round with a greater fragment range is encountered, then Q-D arcs must be adjusted and an amendment to the safety submission is required.

e. For explosive contaminated soil, the most probable munition concept doesn't apply. Instead, the concept of maximum credible event (MCE) applies. For soil, the MCE is the concentration of explosives times the weight of the mix. For example, 1000 lb. of soils containing 15% TNT has an MCE of 150 lb. When the concentration varies within the area, weighted averages or any other valid mathematical technique can be used, as long as the technique is explained and technically supported in the submission.

f. The MCE concept also applies to buildings. MCEs for explosive contaminated buildings slated for cleanup or dismantlement must be estimated on a case-by-case basis and the rationale for the estimation must be included in the safety submission.

4. **Start date.** State when the OE removal action is scheduled to start. This is the date intrusive operations begin. Site preparation activities such as surveying, gridding, flagging anomalies, and intrusive sampling don't need an explosives safety submission.

5. **Frostline.** State the depth of the frostline for the area. Where OE is above the frontline yet located below the removal depth, describe what provisions will be made for continued surveillance of the area (frost heave will push OE upward over time).

6. **Clearance techniques.** Describe the techniques to be used to detect, recover, and destroy OE.

a. These techniques can be (but are not required to be) described using excerpts from the contractor's work plan for the removal action.

b. When describing the method of detection, describe the capabilities and limitations of the method.

(1) Describe the selection criteria for the explosives remediation technology based on the local geology and topography of the explosives remediation sites.

(2) Ensure and provide a statement that the equipment is capable of detecting the smallest item expected to the detection depth. Example: "The Smith Mark 32 magnetometer can detect a 90mm projectile to a depth of four feet" (in this example, a 90mm projectile is the smallest item expected and the removal depth is four feet)

(3) Address limitations imposed by terrain, soil type, etc.

c. Describe quality assurance/quality control (QA/QC) standards and pass/fail criteria for QA/QC control audits.

d. Describe the process that will be used to determine that the OE scrap presents no explosion hazards.

e. Describe procedures for disposition of OE scrap removed from the site or generated during the clearance.

7. **Alternate techniques.** If the on-site method to destroy OE is something other than detonation (examples: bioremediation, incineration, etc.), provide a brief description of the method.

8. **Quantity-Distance.** Various activities at an OE removal site require Q-D siting in the OE safety submission. The locations of some of these activities can and must be shown on the submission's Q-D maps because the locations are known in advance. The locations of other activities, such as blow-in-place, cannot and need not be shown on the submission's Q-D maps because their locations are not known in advance. However the submission must state the size of the exclusion zone for these disposal activities, which in effect establishes a Q-D "footprint" for the activity, wherever it may occur. The technique used to determine this footprint must be described for each munition to be disposed of. There are three activities where locations are known in advance and can be shown on maps; there are three other activities for which locations aren't known in advance and therefore use the footprint concept. All six activities are discussed below:

a. **OE areas.** OE areas must be sited and shown on the submission's Q-D maps.

(1) IBD applies from OE areas to non-project personnel while surface or intrusive removals are taking place. Project personnel are those contractor and DoD employees who are on-site to conduct the OE removal, plus authorized visitors. Non-project personnel includes everybody else. The IBD is the fragment distance for the most probable munition for the area.

(2) Preliminary site work such as surveying, laying search lanes, and detecting anomalies do not require an exclusion zone for Q-D purposes.

b. **Magazines.** Magazines used to store demolition explosives and recovered OE must be sited and their location shown on the submission's Q-D maps.

(1) IBD applies from magazines to non-project personnel. Use IBD in DoD 6055.9-STD unless you can provide a sound rationale for other distances.

(2) Describe the type of magazine used: commercial portable type, aboveground, shed, earth-covered, etc.

(3) State the NEW limit and hazard class to be stored in each magazine (for example, "100 lb. NEW of Hazard Division (HD) 1.1"). In general, recovered OE is considered HD 1.1 unless there are obvious reasons it isn't (example: all expected OE in particular areas are HD 1.3 pyrotechnics).

c. **Planned or established demolition areas.** These areas must be sited and shown on the submission's Q-D maps.

(1) A planned or established demolition area is an area that is used repetitively to destroy OE during the removal project. It may be the installation's detonation ground (an established area) or a new area planned for intentional detonation of recovered OE. Blow-in-place are not planned or established demolition areas but an exclusion zone must still be used when the shot occurs.

(2) An exclusion zone must be provided around each planned or established demolition area. The size of the exclusion zone may be based on either (a) or (b) below:

(a) Default distances in DoD 6055.9-STD, which are:

2500 ft for munitions up to 5-inch caliber or K328, whichever is larger
4000 ft for munitions 5 inch caliber or larger or K328, whichever is larger

(b) Distances other than these defaults, if the technically supportable rationale for the distance is included in the safety submission. Such a rationale must address primary fragments, blast, and crater ejecta. Earth cover or sandbags are often used to reduce the exclusion zone to the size desired. The Huntsville Center of the Army Corps of Engineers has more information on earth cover and sandbags at (205) 895-1653 or -1655.

d. **“Footprint” areas.** There are three types of footprint areas: blow-in-place (BIP), OE collection points within a search grid, and consolidated shots within a search grid. The submission doesn't have to show the locations of these areas on its Q-D maps because their locations aren't known in advance. But, the safety submission, however, must state the size of the IBD arc or exclusion zone that will apply around these areas.

(1) **Blow-in-place:** The exclusion zone is determined using the same rules as for established demolition areas. See paragraph 8.c.(2).

(2) **Collection points** are areas where recovered OE that is safe to move is temporarily accumulated within a search grid pending transport to another area for storage or destruction. Collection points have same exclusion zone as the most probable munition in the area being worked. For this reason, Q-D arcs from collection points are never any larger than those already in the submission as drawn around the OE area containing the collection point, but since on an actual project site only small portions of the overall OE area are being worked on a given day, the Q-D arcs from collection points will have actual use in establishing daily exclusion zones.

(3) **In-grid consolidated shots.** These occur when recovered OE that is safe to move is collected and destroyed within a search grid (in order to remain on the range or there may be no “established demolition area”). In contrast to an established demolition ground, consolidated shots occur within a search grid rather than at a separate area. Consolidated shots use the same Q-D as established demolition areas; see paragraph 8.c.(2).

9. **Off-site disposal.** If recovered OE cannot be destroyed on site and must be transported off site for disposal, explain how explosives safety requirements will be met during transportation and off site disposal. Also, discuss the environmental restrictions and legal aspects that influence this process.

10. **Technical support.** Summarize Explosive Ordnance Disposal (EOD), Technical Escort Unit (TEU), and/or contractor support.

11. **Land use restrictions.** For real property to be released outside DoD, summarize any land use restrictions or other institutional controls to be placed on the property.

12. **Public involvement.** Briefly discuss the public planning document(s) that ensure involvement of public and local officials where there is a risk to the public as a result of the clearance action.

13. **After action report.** At the conclusion of the project, the installation or agency performing the clearance will furnish a copy of an after action report to each office that reviewed the safety submission. This report will list the OE found by type, location, and depth. The U.S. Army Corps of Engineer's "Removal Report" is an example of such a document.

14. **Amendments and corrections** to explosives safety submissions. During the course of a project the hazards, risks, or explosives safety controls may change. Many of these changes require an amendment to the submission. Other changes are less important and require only a correction to the submission. See enclosure 3 for details.

Terms

Active installations. Active installations are defined as installations under the custody and control of the Department of Defense (DoD). They include operating installations, installations in a standby or layaway status, and installations awaiting closure. Examples include but are not limited to posts, camps (including National Guard camps), forts, depots, activities, ports, ammunition supply points, basic load ammunition storage areas, and ammunition plants.

Exclusion Zone. A safety zone established around an OE work area. Only project personnel and authorized, escorted visitors are allowed within the exclusion zone. Examples of exclusion zones are safety zones around OE intrusive activities and safety zones around areas where OE is intentionally detonated.

Formerly Used Defense Sites (FUDS). Those properties previously owned, leased, used, or otherwise possessed by the United States and under the jurisdiction of the Secretary of Defense.

Institutional controls. Methods of controlling OE hazards without physically removing the OE. Includes, without being limited to, security fencing or other measures to limit access; provision of alternate water supplies; temporary evacuation and housing of threatened individuals not otherwise provided for; post-removal site control, where appropriate; land repurchase; deed restrictions, and any emergency assistance that may be provided under the Disaster Relief Act of 1974.

Most probable munition. The round with the greatest hazardous fragment range that can reasonably be expected to exist in any particular OE area.

Ordnance and explosives (OE). Consists of either (1) or (2) below.

(1) Ammunition, ammunition components, chemical or biological warfare materiel, or explosives that have been abandoned, expelled from demolition pits or burning pads, discarded, buried, or fired. Such ammunition, ammunition components, and explosives are no longer under accountable control of any DoD organization or activity.

(2) Explosive soil. Explosive soil refers to mixtures of explosives in soil, sand, clay, or other solid media at concentrations such that the mixture itself can explode if given sufficient stimulus. This term differs from the term “explosives contaminated soil,” which means soil containing explosives at any concentration, explosive or not.

(a) The concentration of a particular explosive in soil necessary to present an explosion hazard depends on whether the particular explosive is classified as "primary" or "secondary." Guidance on whether a particular explosive is classified as primary or secondary is available from your service explosive safety center. Call the Air Force Safety Center at (505) 846-2662, DSN 246-2662; the Naval Ordnance Center at (301) 743-6081; DSN 354-6081; or the U.S. Army Technical Center for Explosives Safety at (815) 273-8741, DSN 585-8741.

(b) Primary explosives are those extremely sensitive explosives (or mixtures thereof) that are used in primers, detonators, and blasting caps. The U.S. Army Environmental Center (AEC) is currently conducting studies to determine what concentration of primary explosives in soil renders the mixture explosive. Until these studies are completed, soils with primary explosives must be sampled and tested to determine if they present explosion hazards. Guidance on sampling and testing is available from the USAEC, (410) 612-6851.

(c) Secondary explosives are bursting and boosting explosives (i.e., they are used as the main bursting charge or as the booster that sets off the main bursting charge). Secondary explosives are much less sensitive than primary explosives. They are less likely to react if struck or when exposed to friction or to electrical sparks.

(d) Soil containing 10 percent or more by weight of any secondary explosive or mixture of secondary explosives is considered explosive soil and is OE. This determination was based on information provided by the USAEC as a result of studies conducted and reported in USAEC Report AMXTH-TE-CR 86096.

(e) Soil containing propellants (as opposed to primary or secondary high explosives) may also present explosion hazards. Guidance on sampling and testing is available from the USAEC, (410) 612-6851.

OE Scrap: Inert munitions related material recovered during the course of an OE removal. Examples are fragments, empty cartridge cases, expended smoke grenades, etc.

Real property: Consists of land, improvements, structures, and fixtures, and includes bodies of water.

Removal action: A type of response action where the material causing the hazard is physically removed.

Response action: The process of reducing the risk of exposure resulting from military ordnance and explosives. Actions may include detection; render safe or elimination of explosive properties on- or off-site; transportation off-site to a storage or treatment facility or other location suitable for detonation; deed restrictions on the use of property; zoning restrictions, fencing; public education; or other action necessary to protect the public.

Stakeholders: Federal, state and local officials, community organizations, property owners, and others having an interest or involvement, or having a monetary or commercial involvement in the real property that is to undergo an OE removal action.

Removal Depths

1. **Establishing a depth.** The preferred method to establish a removal depth is to first estimate the OE depth using site specific information, particularly data from surface and intrusive sampling. For impact areas, an alternate method to estimate OE depth in the absence of site specific information is to use a maximum penetration source document. This method can be used if site characterization information is deemed inadequate. One such source document is the Conventional Weapons Effects Program (CONWEP), a computer program that can predict projectile penetration depths. It is available to U.S. government agencies from the U.S. Army Waterways Experiment Station, ATTN: CEWES-SS-R, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180, commercial (601) 634-3668.

2. **Changing the depth.** The proposed removal depth is approved via the OE safety submission. However, after the removal has actually begun, the removal depth may be changed based on actual conditions encountered. For example, when OE is consistently found at less than the approved removal depth, the removal depth may be reduced. Such modifications will be submitted as an amendment to the approved OE safety submission.

3. **Frostline vs. removal depth.** At some sites, OE can be located down to or below the frostline.

a. In determining the removal depth, the risk assessment must consider the frost line. A phenomenon known as frost heave can move objects to the surface during the freeze and thaw cycles. Frostline depths can be obtained from your supporting facility engineers.

b. In cases where OE is not cleared to at least the depth of the frostline, the safety submission must address the plan and procedures for performing geophysical surveys and maintenance for the life cycle of the site. The purpose of these surveys is to monitor the site for upward migration of OE.

4. **Default removal depths.** When site-specific information is not sufficient to determine removal depths, the following default removal depths may be used for interim planning purposes. These defaults are guidelines based on the projected end use of the land. The depths are based on a 1992 U.S. Army sponsored study of cleanup options at Jefferson Proving Ground and a 1975 U.S. Army Corps of Engineers study. Both considered the risk to land users from residual ammunition and explosives. The depths provided are not arbitrary in that they represent a minimum risk to users when the land is cleared to that depth.

DEFAULT REMOVAL DEPTHS

<u>PLANNED END USE</u>	<u>REMOVAL DEPTH</u>
Commercial, residential, recreational, or utility construction activity	10 ft. or excavation depth plus 4 ft. whichever is greater
Farming, surface recreation, vehicle parking, or surface supply storage	4 ft
Livestock grazing or wildlife preserve	1 ft

Amendments and Corrections to OE Explosives Safety Submissions

Definitions:

Amendment: A change that requires approval. Submit amendments through the same approval chain as the original submission.

Correction: A change that doesn't require approval. Submit corrections up the chain for information only.

Amendments

1. A change in the planned reuse changes the clearance.

a. For example, assume the original safety submission states the property will be cleared to four feet and released for use as a vehicle parking area.

b. Then, the plans change. The area will now become a nature preserve instead of a vehicle parking area. As a result, the clearance depth changes to one foot.

2. A change in the clearance depth changes the planned reuse.

a. For example, assume that the safety submission states a four-foot clearance will be done. But then, funds are cut and there's only enough money to do a one-foot clearance.

b. As a result, the reuse of the land must be further restricted.

c. In this case, submit an amendment to the submission explaining how the change in clearance depth changed the planned reuse.

3. The land use restrictions (to be placed in land transfer documents) change for any reason.

a. For example, assume the safety submission states the land will be cleared to four feet and restricted to surface recreation, surface storage, and vehicle parking after the land is released.

b. Next, the land is cleared. But all OE was shallow and there is no reason to believe any OE exists deeper than four feet.

c. In this case, the land should be released with no restrictions. But, an amendment must be submitted requesting approval for this change. The amendment should give the results of the clearance (what was found and how deep) and explain why it is highly unlikely that OE would be found below four feet.

4. The estimated OE depth changes, causing a change in the clearance depth.

a. For example, assume the submission indicates a four-foot clearance, but it is later determined that the maximum depth of OE is only two feet. Submit an amendment requesting approval for a two-foot removal depth with technically supportable rationale why the new depth is proper.

b. Another example - assume the submission calls for a two foot clearance but it is later determined that OE exists down to four feet and that a four foot clearance should be performed. Submit an amendment requesting approval for the four-foot depth.

5. The clearance depth changes from below the frostline to above it.

a. The DoD 6055.9-STD states that when OE is located below the clearance depth yet above the frost line, follow-on monitoring is required to check for upward migration due to frost heave.

b. The amendment should give the frostline depth, state what the old clearance depth was, what the new clearance depth is, an explanation for the change, and what the follow-on monitoring procedures will be.

6. At a FUDS, property owners or other stakeholders cause a decrease in the area to be cleared. For example, assume the safety submission says a 200-acre area will be cleared. Then, a property owner denies right of entry onto his 100 acres of the 200-acre area. Provide an amendment to the submission explaining the situation.

7. The removal action incorporates new or modified engineering controls to mitigate blast and fragment hazards from intrusive activities, BIPs, or demo ground shots.

a. For example, assume the submission states that an 800-foot exclusion zone applies to digging anomalies.

b. Later, project managers decide to use a suppressive shelter instead of the 800 feet exclusion zone.

c. This situation would require an amendment explaining the basis of design of the shelter. If tests were done to validate the design, include test data.

8. **Q-D arcs increase.** Examples:

a. During OE removal, a munition is found requiring a greater exclusion zone than those in the approved submission.

b. Another example: project personnel need to increase the types or quantity of demolition materials to be stored in a magazine on site, and such increase requires a larger IBD arc. .

9. **A new magazine storage area or demolition ground is established.** Submit an amendment to obtain siting approval.

Corrections

1. Use common sense in deciding whether to send in a correction to the approved submission. When in doubt, call your Major Command or your service explosive safety center (Air Force Safety Center, U.S. Army Technical Center for Explosives Safety, Naval Ordnance Center).

2. Here is an example where a correction is appropriate:

(a) The area to be cleared increases, but nothing else changes. For example, assume the safety submission is for a four-foot removal at a 200-acre area which contains 155mm projectiles as deep as seven feet, and the 200 acres will be released for surface recreation after the removal. Later, it is determined that 100 more acres must be added to the removal, but nothing else changes (i.e., no change in clearance depth, land use restriction, or change in Q-D caused by a different munition). In this case, submit a correction to the submission.

Use common sense! Adding a few acres to the 200 acre area, for example, wouldn't require a correction in this example!

