- U.S. Naval Explosive Ordnance Disposal School, Eglin Air Force Base, Florida (or Indian Head, Maryland, prior to Spring 1999)
- The EOD Assistant's Course, Redstone Arsenal, Alabama
- The EOD Assistant's Course, Eglin Air Force Base, Florida
- Other DoD-certified course

USACE specifically requires that UXO safety officers be graduates of the Army Bomb Disposal School and/or the Naval EOD School and have at least 10 years of experience in all phases of UXO remediation and applicable safety standards. Senior UXO supervisors must be graduates of the same programs and have had at least 15 years of experience in all aspects of UXO remediation and at least 5 years of experience in a supervisory capacity.[98]

6.2.8 Assessment Depths

In addition to safeguarding UXO personnel from the hazards from explosives, the DoD explosives safety standard also mandates protecting the public from UXO hazards. Even at a site that is thought to be fully remediated, there is no way to know with certainty that every UXO item has been removed. Therefore, the public must be protected from UXO even after a munitions response action has been completed. The types and levels of public safeguards will vary with the level of uncertainty and risk at a site. Public safeguards include property clearance (e.g., depth of response) to the appropriate depth for planned land uses and enforcement of designated land uses.

DDESB standards establish assessment depths to be used for **interim planning in the absence of adequate site-specific information** (See Table 6-1 and text box). ESS approvals rely on the development of site-specific information to determine response depth requirements. When site-specific data are not available, DDESB interim planning assessment depths are used in an ESS and amended as site-specific data are developed during the course of a response action.

EPA/DoD Management Principles on Standards for Depths of Clearance

- In the absence of site-specific data, a table of assessment depths is used for interim planning purposes until the site-specific information is developed.
- Site-specific data are necessary to determine the actual depth of clearance.

The response depth selected for response actions is determined using site-specific information such as the following:

- Geophysical characteristics such as bedrock depth and frost line (see Chapters 3 and 7 and text box on the next page).
- Estimated UXO depth based on surface detection and intrusive sampling.
- In the absence of sampling data, information about the maximum depth of ordnance used on-site based on maximum penetration source documents.
- Actual planned land use that may require deeper excavation than the default clearance

[98] *Ordnance and Explosives Response: Engineering and Design*, U.S. Army Corps of Engineers, EP 1110-1-18, April 24, 2000.

depths (e.g., a commercial or industrial building with foundations deeper than 10 feet).

- Remediation response depth a minimum of 4 feet below the excavation depth planned for construction (DDESB requirement).
- Presence of cultural or natural resources (e.g., potential risk to soil biota or archeologically sensitive areas)

Other factors that affect the munitions response depth include the size of the range, the cost of the munition response (depends on many variables, including range size and terrain), and the practicality of finding and excavating all of the UXO.

If UXO detection capabilities are not sensitive enough or funds are not available to remove UXO to the depth needed to meet site specific response requirements, then the proposed land use must be changed so that risks to human health and the environment are managed appropriately. Site records should include information concerning the depth to which UXO was removed, the process by which that depth was determined, and notice of the risks to safety if the end land use is violated.

Frost Line and Erosion

The ultimate removal depth must consider the frost line of the site and the potential for erosion. A phenomenon known as **frost heave** can move ordnance to the surface during the freeze and thaw cycles. If ordnance is not cleared to the frost line depth, or if the site conditions indicate erosion potential (such as in agricultural areas), a procedure must be put in place to monitor the site for migration of ordnance. (See Chapter 3, Section 3.3.3, for more information on this topic.)

Table 6-1. Assessment Depths To Be Used for Planning Purposes

Planned Land Use	Depth
Unrestricted – Commercial, Residential, Utility, Subsurface, Recreational (e.g., camping), Construction Activity	10 ft*
Public Access – Agricultural, Surface Recreational, Vehicle Parking, Surface Supply Storage	4 ft
Limited Public Access – Livestock Grazing, Wildlife Preserve	1 ft
Not Yet Determined	Surface

*Assessment planning at construction sites for any projected end use requires looking at the possibility of UXO presence 4 feet below planned excavation depths.

Source: *DoD Ammunition and Explosives Safety Standards*, DoD Directive 6055.9-STD, Chapter 12, July 1999. The DDESB is in the process of revising Chapter 12 of DoD 6055.9-STD.

6.2.9 Land Use Controls

Land use controls include institutional controls (e.g., legal or governmental), site access (e.g., fences), and engineering controls (e.g., caps over contaminated areas) that separate people from potential hazards. They are designed to reduce ordnance and explosive risk over the long term without physically removing all of the OE. Land use controls are necessary at many sites because of the technical limitations and prohibitive costs of adequately conducting a munitions response at CTT ranges to allow for certain end uses, particularly unrestricted use (see text box).

The DoD explosives safety standard specifically addresses a requirement for institutional controls when OE contamination has been or may still be on the site: "Property transfer records shall detail past munition and explosive contamination and decontamination efforts; provide requisite residual contamination information; and advise the user not to excavate or drill in a residual contamination area without a metal detection survey."[99]

Examples of Land Use Controls

- Security fencing or other measures to limit access
- Warning signs
- Postremoval site control (maintenance and surveillance)
- Land repurchase
- Deed restrictions

The appropriate land use control depends on site-specific factors such as proximity to populations, land use, risk of encountering OE, community involvement, and site ownership (both current and future). It is important to coordinate activities with the appropriate Federal, State, local, and Tribal governments in the development and implementation of land use controls to ensure their effectiveness even after the response action has been completed (see text box on next page).

The EPA policy, "Institutional Controls and Transfer of Real Property under CERCLA Section 120 (h)(3)(A), (B), or (C)," recognizes that although a variety of land use controls may be used to manage risk at sites, the maintenance of site access and engineering controls depends on institutional controls. Institutional controls include the governmental and legal management controls that help ensure that engineering and site access controls are maintained. The Federal agency in charge of a site has responsibilities beyond implementing the institutional controls. EPA policy requires the responsible agency to perform the following activities:[100]

- **Monitor** the institutional controls' effectiveness and integrity.
- **Report** the results of such monitoring, including notice of violation or failure of controls, to the appropriate EPA and/or State regulator, local or Tribal government, and designated party or entity responsible for enforcement.
- **Enforce** the institutional controls should a violation or failure of the controls occur.

In order to ensure long-term protection of human health and safety in the presence of potential explosive hazards, institutional controls must be enforceable against whomever may gain ownership or control of the property in the future.

[99]Department of Defense, *DoD Ammunition and Explosives Safety Standard*, DoD 6055.9-STD, July 1999.

[100]*Institutional Controls and Transfer of Real Property Under CERCLA Section 120 (h)(3)(A), (B), or (C)*, Interim Final Guidance, U.S. EPA, January 2000.

EPA/DoD Interim Final Management Principles on Land Use Controls

- Land use controls must be clearly defined, established in coordination with affected parties, and enforceable.
- Land use controls will be considered as part of the development and evaluation of response alternatives for a given CTT range.
- DoD will conduct periodic reviews to ensure the long-term effectiveness of response actions, including land use controls.

6.3 Managing Explosives Safety

DoD Directive 6055.9 establishes the roles and responsibilities for DDESB and each of the military components. DDESB oversees implementation of safety standards throughout DoD and may conduct surveys to identify whether such standards are appropriately implemented. The military components conduct similar reviews within their respective services. At ranges where investigation, response action, and real property transfer are the major focus, the implementation of explosives safety requirements is normally documented in two ways:

- **Site Safety and Health Plans (SSHPs)** describe activities to be taken to comply with occupational health and safety regulations. SSHPs are often part of a work plan for investigation and response. Although implementation is overseen by DDESB, approval of specific SSHPs is typically conducted by the individual military component responsible for the response action (e.g., Army, Navy, or Air Force) through their explosives safety organizations.

- **Explosives Safety Submissions (ESSs)** describe the safety considerations of the planned response actions, including the impact of planned clearance depths on current and future land use. All DoD ESSs are submitted to and approved by DDESB, as described in Section 6.3.2 and 6.3.3.

Many requirements documented in detail in the SSHP are summarized in the ESS.

6.3.1 Site Safety and Health Plans

SSHPs fulfill detailed requirements for compliance with the occupational safety and health program requirements of CERCLA, OSHA, and the military components.[101,102,103] SSHPs are based on the premise of limiting the exposure to the minimum amount of OE and to the fewest personnel for the shortest possible period of time. Prior to the initiation of on-site **investigations, or any** design, construction, or operation and maintenance activities, an SSHP must be prepared and

[101]National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. § 300.430 (b)(6).

[102]Occupational Safety and Health Administration Standard, 29 C.F.R. § 1910.120 (b)(4), 29 C.F.R. § 1926.65 (b)(4).

[103]*Ordnance and Explosives Response: Engineering and Design*, U.S. Army Corps of Engineers, EP 1110-1-18, April 24, 2000.