DRAFT RECLAMATION SAFETY AND HEALTH STANDARDS
RELEASE

Comments on this draft release must be submitted to acryns@usbr.gov by [9/7/20].

Background and Purpose of the Following Draft Reclamation Safety and Health Standards (RSHS)

The RSHS are being updated by the Bureau of Reclamation Safety and Occupational Health Office to reflect new guidance from Reclamation, the Department of the Interior, and the Occupational Safety and Health Administration. This public release is intended to provide the public an opportunity to comment on each updated section in draft form. This process will enhance transparency and eliminate potential confusion about Reclamation’s safety standards.

The RSHS are incorporated into the Reclamation Manual through SAF 01-01, Occupational Safety and Health Directive – General. The Reclamation Manual is used to clarify program responsibility and authority and to document Reclamation-wide methods of doing business. All requirements in the Reclamation Manual are mandatory for Reclamation employees.

See the following pages for the draft RSHS.
Section 22

Excavation Operations

22.1 Scope

This section establishes requirements for all excavation operations at Bureau of Reclamation (Reclamation) facilities and Reclamation activities at other facilities. Tunnel and shaft constructions are not covered in this section (Reclamation Safety and Health Standards (RSHS) Section 23, Tunnel and Shaft Construction). Trenching operations 20 feet in depth or more are considered drilling operations and not covered in this section (RSHS Section 27, Reclamation Drilling Standards).

22.2 General Requirements

Reclamation’s excavation work plans (EWPs) shall ensure the safety of employees and the public while protecting public and Reclamation property. All EWPs must comply with standards and regulations in Occupational Safety and Health Administration (OSHA) 29 CFR 1926 Subpart P, Excavations, and the Department of the Interior (DOI) Department Manual (DM) Series 27 Part 485, Safety and Occupational Health Program.

22.3 Responsibilities

22.3.1 Area Office Safety Professional

22.3.1.1 Shall review and provide feedback on the EWP (22.6.2).

22.3.2 First-Line Supervisors

22.3.2.1 Shall review and sign EWPs.

22.3.2.2 Shall review and sign Job Hazard Analyses (JHAs) for excavation work.

22.3.2.3 Shall ensure all employees are trained or certified for assigned excavation duties.

22.3.2.4 Shall designate in writing the qualified competent person.

22.3.2.5 Shall designate the excavation planner.

22.3.3 Competent Person

22.3.3.1 Shall stop work and take prompt corrective measures in dangerous, hazardous, or unsafe situations.

22.3.3.2 Shall complete required training or have experience equivalent to the requirements in 22.4.
22.3.4  Excavation Planner

22.3.4.1  Shall prepare and update, after any change in conditions, the EWP (22.6.2).

22.3.4.2  Shall oversee all work site inspections.

22.3.5  Pipefitters and Welders

22.3.5.1  Shall immediately report any condition change or hazard increase to the first-line supervisor or on-site competent person.

22.3.5.2  Shall incorporate ergonomic considerations into the work planning with the competent person (e.g., prolonged exposure to kneeling, bent over, or awkward body positions).

22.4  Training Requirements for Competent Persons

22.4.1  Initial

The competent person must take OSHA 3015 Excavation, Trenching, and Soil Mechanics and OSHA 7410 Managing Excavation Hazards, or be trained on, or be able to demonstrate expertise in, the following elements:

- Types of excavations;
- Methods to analyze soil and work site conditions;
- Determining need for and type of protective systems;
- Analyzing protective systems for strength and suitability, proper installation, movement, and final removal;
- Knowledge of the types and configurations of shielding systems;
- Identify and monitor potential hazardous atmospheres;
- Recognizing signs of developing hazards;
- Issuing stop work authority and taking corrective measures;
- Knowledge in types of and conditions requiring shoring system use;
- Determining proper location and management of spoil piles;
- Traffic control and proper use of barricades and stop logs for vehicular hazard control;
- Planning public protection;
- Protecting workers and the public from hazards and heavy equipment use; and
- Conducting preliminary work site investigations.

22.4.2  Refresher

Refresher training is necessary when OSHA makes a change to 29 CFR 1926 Subpart P.

22.4.3  Proficiency Qualification

The first-line supervisor will consider a competent person proficient when an expertise in the elements of 22.4.1.1 is demonstrated.
22.4.4 Lack of Proficiency
The first-line supervisor shall remove a competent person demonstrating a lack of proficiency from a work site. The competent person must attend refresher training and the first-line supervisor determines when reintegration at a work site may commence.

22.4.5 Recordkeeping
All Reclamation training records shall be kept in the DOI official repository.

22.5 Hazard Identification, Assessment, and Safety Measures

22.5.1 Soil Classification
Prior to the creation of the EWP, a competent person must conduct a soil classification and, throughout the work, evaluate the soil conditions to determine if there is a change from previous classification(s). Type C soil classifications provide the highest safety protections and will not require soil reclassification.
Table 22-1. Soil Classification System and Properties

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Criteria</th>
<th>Other Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable Rock</td>
<td>Natural solid mineral that can be excavated with vertical sides and remain intact while exposed.</td>
<td>-</td>
</tr>
<tr>
<td>Type A</td>
<td>Cohesive soil with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater.</td>
<td>Cannot be Type A if soil is:</td>
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<tr>
<td></td>
<td></td>
<td>• Fissured;</td>
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<td></td>
<td></td>
<td>• Subject to vibration from heavy traffic, pile driving, etc.;</td>
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<td></td>
<td></td>
<td>• Previously disturbed;</td>
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<td></td>
<td></td>
<td>• Part of sloped, layered system where layers dip into excavation on a slope of greater than 4:1; or,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Subject to other factors requiring it to be classified as less stable material.</td>
</tr>
<tr>
<td>Type B</td>
<td>Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf.</td>
<td>Type B soil can also be:</td>
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<tr>
<td></td>
<td></td>
<td>• Granular cohesionless soils such as angular gravel, silt, silt loam, sandy loam, and in some cases, silty clay loam and sandy clay loam;</td>
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<tr>
<td></td>
<td></td>
<td>• Previously disturbed soils except those which would otherwise be classified as Type C soil;</td>
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<tr>
<td></td>
<td></td>
<td>• Soil that meets the requirements of Type A, but is fissured or subject to vibration;</td>
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<td></td>
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<td>• Dry rock that is not stable; or,</td>
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<td></td>
<td></td>
<td>• Part of sloped, layered system where layers dip into excavation on a slope of 4:1, but only if the soil would otherwise be classified as Type A.</td>
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<tr>
<td>Type C</td>
<td>Cohesive soil with an unconfined compressive strength of 0.5 tsf or less.</td>
<td>Type C soil can also be:</td>
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<td></td>
<td></td>
<td>• Granular soils including gravel, sand, and loamy sand;</td>
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<td></td>
<td></td>
<td>• Submerged soil or soil from which water is freely seeping;</td>
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<td></td>
<td></td>
<td>• Submerged rock that is not stable; or,</td>
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<tr>
<td></td>
<td></td>
<td>• Part of sloped, layered system where layers dip into excavation on a slope of 4:1 or steeper.</td>
</tr>
</tbody>
</table>

**TYPE C SOIL CANNOT BE BENCH**

**22.5.2 Locating Underground Utilities**
To request approval to dig, the excavation planner shall contact underground utilities or state central utility locator services at least 2 weeks prior to the start of work. Adjust the EWP based on the results of underground utility locations.

**22.5.3 Hazardous Atmosphere**
Excavations may have potential for hazardous atmospheres (e.g., oxygen deficiency). Keep a log of any on-site air monitoring available for workers and other personnel (OSHA 29 CFR 1926.651(g), *Hazardous Atmospheres*). The on-site competent person shall take precautions to prevent exposure to hazardous atmospheres. Precautions shall include respiratory protection or ventilation (OSHA 29 CFR 1926 Subpart E and Subpart C *General Safety and Health Provisions*).

22.5.4 **Vehicular Traffic**

Protect workers from vehicle hazards on and adjacent to the work site. Stop logs shall be capable of preventing the work site’s largest vehicle mass and momentum. Barricades shall keep standard vehicles from encroaching on the excavation. Traffic control is required if the work will impact public roads or the safety of workers or visitors on private roads. Some states require approved traffic control plans and/or qualified flaggers (RSHS section 9, *Signs, Signals, and Barricades*).

22.5.5 **Safe Work Positioning**

Stand clear of vehicles being loaded or unloaded. Ensure all personnel and adjacent equipment are outside the reach of the operational swing of heavy machinery. Stand outside the operational zone of lifted or suspended loads.

22.6 **Pre-Job Briefing and Planning Requirements**

22.6.1 **Preliminary Work Site Inspection**

In preparation for the EWP, an excavation planner must inspect the work site and adjacent areas to determine conditions and potential hazards that would require special safety measures or mitigation.

22.6.2 **EWP**

Completed by the excavation planner with the input from the competent person and other workers who may conduct the work. Includes preliminary site inspection results, soil classification, work planning, safe work release from underground utilities, site layout, public protection, traffic control, hazard identification, environmental hazards management plans, JHAs, and all other applicable details to safely conduct the excavation work. This plan will detail all phases of excavation operations including:

- Details of excavation work (e.g., width, depth, type of work, etc.);
- Notation of possible safety hazards (e.g., overhead and adjacent hazards);
- Mitigation plan for identified and probable safety hazards;
- Designation and creation of specifications for the protective system(s);
- Emergency response actions and contacts;
22.6.3 Public Protections

Prior to initiating excavation operations, address safety measures to ensure public protection. Use advance warning through community outreach, direct communications, and appropriate signage.

22.7 Hazardous Environmental Conditions

22.7.1 Rain and Stormwater Runoff

Drainage for precipitation on the work site shall direct rainwater away from the excavation, prevent accumulation, and not leave the work site unless it is allowed by a separate stormwater management plan. Melting snow or ice can become a water hazard. Use diversion ditches, dikes, or other means to prevent rainwater or other precipitation from entering the work site. Prevent stormwater runoff from entering the work site or interfering with material spoils piles.

22.7.2 Groundwater

Work shall stop immediately if groundwater seeps or flows into the work site. Work cannot resume until all groundwater is removed and no longer flows into the excavation.

22.7.3 Wind

Loose materials and spoil piles must be managed so wind will not blow materials in or off the work site. Blowing particles or materials shall not interfere with the ability of workers to safely do their duties.

22.8 Safety Equipment

22.8.1 Emergency Rescue Equipment
Equipment (e.g., breathing apparatus, safety harness, basket stretcher) shall be identified in the JHA and readily available where hazardous atmospheres exists or may reasonably be expected to develop. This equipment shall be attended when in use. Workers do not need to wear a harness with a secured lifeline for excavation operations, unless defined as a confined footing or other similar dig. These types of operations would become drilling or shaft work (RSHS Section 23).

22.9 Safe Practices

22.9.1 Simple Sloping

Excavations 5 feet deep or more (trenches) must have sloping or shoring. Excavations less than 20 feet in depth must not exceed slopes of 53 degrees for Type A soils, 45 degrees for Type B soils, and 34 degrees for Type C soils. Slope is measured from the horizontal plane. Slopes shall be excavated to form sloping configurations for Type C soils per Figure 22-1.

![Figure 22-1. Simple Slope, Sloping, and Benching of a Type C Soil](image-url)
22.9.2 Sloping with Shielding
Sloping may be used in conjunction with shielding. Combination shielding and sloping systems must match the Type C soil configuration found in Figure 22-2 or be designed by a registered professional engineer (P.E.) who specializes in sloping and shoring systems.

![Combination Sloping with Shielding of a Type C Soil](image)

Figure 22-2. Combination Sloping with Shielding of a Type C Soil

22.9.3 Simple Benching
Benching is only allowed in Type A or Type B soils. Benching is only allowed in excavations less than 20 feet deep. Maximum allowable slope is ¾:1. Simple benching has a single bench cut made adjacent to the bottom of the excavation (Figure 22-3).

![Simple Bench - Type A Soil](image)

Figure 22-3. Simple Benching, Sloping, and Benching, Type A Soil
22.9.4 **Tiered (Multiple) Benching**
Tiered, or multiple, benching has more than one cut into the slope of the excavation. Tiered benching shall only be used in Type A soils (Figure 22-4).

![Figure 22-4. Tiered (Multiple) Benching for Type A Soil](image)

22.9.5 **Alternative Benching**
Benching systems must follow Figures 22-3 or 22-4 or be designed by a registered P.E. with expertise in excavation operations.

22.9.6 **Shielding/Protective Systems**
Shall either be designed by a registered P.E. with expertise in shielding/protective systems or be a purchased manufactured shielding/protective system. Shall be in good working order and condition, free from damage and defect, and used per the system design specifications. Shall be installed properly to restrict lateral or other hazardous movement of the shield under sudden lateral loads. Shall protect against hazards of cave-in or collapse during ingress, egress, and while workers are inside the system. Workers shall not be inside shields when shields/protective systems are being installed, removed, or moved.

22.9.7 **Ingress and Egress**
For excavations 4 feet or more in depth, stairs, ramps, or ladders must be provided as a safe means of egress. Each worker must be within 25 linear feet in the direction of lateral travel to a ramp, stair, or ladder and shall have at least 2 means of egress. If a barrier or other hazard prevents the worker from reaching the other side of the excavation easily, egress options must be on the same side as the worker. Ladders shall extend from the bottom of the excavation to no less than 3 feet above the surface. Ramps shall be a minimum of 4 feet wide and only used for personnel. No equipment may be used, stored, or moved on ingress/egress ramps (RSHS Section 13, *Walking and Working Surfaces*).
22.9.8 Spoil Piles
Shall be a minimum of 2 linear feet horizontally away from the open excavation area. Shall be placed so that spalling, raveling, or sloughing will not encroach upon the open excavation area clear space. Shall be maintained to keep spoil pile materials from being a hazard to workers, others on the work site, and the general public.

22.10 Definitions

Benching  Method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels. Benching cannot be done in Type C soil.

Cohesive Soil  Soil which is clay (fine grained soil), or soil with a high clay content, which has the property of sticking together tightly and does not crumble. It is hard to break up when dry and exhibits significant cohering unity when submerged.

Competent Person  An individual, designated by the first-line supervisor, who can identify existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to workers, and who has authorization to take prompt corrective measures to eliminate these hazards.

Excavation  Any man-made cut, cavity, trench, or depression in the earth’s surface formed by earth removal. Simple excavations are typically less than 5 feet in depth, and trenches are deeper excavations that go to 20 feet in depth.

Excavation Work Plan (EWP)  The work details to be conducted at an excavation site.

Fissured  Soil material that tends to break along definitive planes of fracture with little resistance, or a material that has open cracks in an exposed surface.

Granular Soil  Soil material that is mainly gravel, sand, or silt (coarse grained soil) with little to no clay content. It has no cohesive strength. Some moist granular soils exhibit false cohesion but cannot be molded and will crumble when dry.

Hazardous Atmosphere  An atmosphere that may expose workers to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness.

Layered System  Two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered systems.
Maximum Allowable Slope

Steepest incline of an excavation face that is acceptable for the most favorable site conditions. It is expressed as a ratio of horizontal distance to vertical rise. (H:V)

Raveling

Movement of individual particles of soil in shallow troughs on the veneer of the soil.

Respiratory Protection

Controls used to reduce or eliminate the hazards associated with air contaminated by harmful dusts, fogs, fumes, mists, gasses, smokes, sprays, vapors, or other hazardous particulates in the air.

Shielding

A trench box or other complex, walled, protective system used to protect workers in trenching excavations.

Shoring

Aluminum hydraulic or other types of engineered support systems to prevent soil movement and cave-ins.

Sloping

Cutting back the excavation or trench wall at an angle inclined away from the excavation.

Sloughing

Clumps or slabs of soil breaking away from the main soil body and falling off slopes, banks, or vertical cuts.

Soil Classification System

Method of categorizing soil and rock deposits in a set hierarchy.

Spalling

Breaking off flakes or small clusters of soil from the larger soil mass.

Stable Rock

Natural, solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil

Soil which is under water or free seeping.

Trench

A narrow excavation, in relation to its length, made below the surface of the ground. Generally, the depth of a trench is greater than its width, but not where the width is greater than 15 feet (measured at the bottom of the trench). A trench shall be no greater than 20 feet in depth.

22.11 References


