# Chapter 35 – Digging, Trenching, & Excavation Procedures

## 35.1 Scope

This chapter addresses the requirements and safe practices to assure the safety of employees who work in or around Digging, Trenching, and Excavation activities performed at the Glenn Research Center (GRC). These requirements apply to all work involving excavation, digging, and trenching, grading, or ditching (EDTGD) operations. The Facilities Division Soil Coordinator shall be notified of all (EDTGD) activities to be conducted at GRC.

Note: At Plum Brook Station, the on-site safety staff will perform the responsibilities of the Safety Branch. Procedure GRC P7030.022 will be used for Plum Brook Station.

## 35.2 Policy

It is Glenn Research Center's policy to evaluate all Digging, Trenching, and Excavation activities to eliminate or minimize the potential of cave-ins, review environment contamination, contacting underground utilities, or subsurface encumbrances. No digging, trenching, or excavation activities will be performed unless the requirements of OSHA Standards 1926 sections 650-652, Glenn Safety Manual, and a site specific Health and Safety Plan (HASP) has been approved by the Safety Branch and Environmental Management Branch (EMB).

## 35.3 References

- GRC Environmental Programs Manual, Chapter 34 - Handling, Reuse, and Disposal of Soil.
- NASA Form C-133, Soil Determination Checklist.
- OSHA 1926 Sections 650 - 652.
- Glenn Safety Manual, Chapter 9, "Lock out - Tag out".
- Glenn Safety Manual, Chapter 16, "Confined Space Entry".
- Glenn Safety Manual, Chapter 17, "Construction Safety.
- Excavation Permit

## 35.4 Applicability

This chapter is applicable to all persons, NASA civil servants, on-site support service contractor, and construction contractors, performing work at Glenn Research Center.

## 35.5 Definitions

a. Benching - a method of protecting employees from cave ins by excavating the sides of an excavation to form one or series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels.
b. COTR - Contracting Officer's Technical Representative.

## Chapter 35 – Digging, Trenching, & Excavation Procedures

c. Digging, Trenching, and Excavation activities - All work involving excavation, digging, and trenching, grading, or ditching operations.
d. Competent Person – individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous , unsanitary, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate or control these hazards and conditions.
e. Confined Space - A space that is large enough and so configured that an employee can bodily enter and perform work and has limited or restricted means of entry or exit and is not designed for continuous employee occupancy.
f. Excavation and Trench - An Excavation is any man-made cut, cavity, trench, or depression in an earth surface that is formed by earth removal. A Trench is a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth of a trench is greater than its width, and the width (measured at the bottom) is not greater than 15 ft (4.6 m). If a form or other structure installed or constructed in an excavation reduces the distance between the form and the side of the excavation to 15 ft (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.
g. Hazardous Atmosphere - an atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, and irritating, oxygen-deficient, toxic, or otherwise harmful that may cause death, illness, or injury to persons exposed to it.
h. Ingress and Egress - an "entry" and "exit," respectively. In trenching and excavation operations, they refer to the provision of safe means for employees to enter or exit an excavation or trench safely.
i. Protective System - refers to a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, and from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.
j. Registered Professional Engineer - a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer who is registered in any state is deemed to be a "registered professional engineer" within the meaning of OSHA 1926 650-652 Subpart P when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.
k. Shield - a structure that is able to withstand the forces imposed on it by a cave in and thereby protects employees within the structures. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job built in accordance with 1926.652 c3 or c4. Shields used in trenches are usually referred to as trench boxes or trench shields.
l. Shoring - a structure such as metal hydraulic mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
m. Sloping - a method of protecting employees from cave ins by excavating to form sides of an excavation that are inclined away from the excavations so as to prevent cave ins. The angle of incline required to prevent a cave in varies with differences in

such factors as the soil type, environment conditions of exposure and application of exposure and application of surcharge loads.

n. Support System - structures such as underpinning, bracing, and shoring that provide support to an adjacent structure or underground installation or to the sides of an excavation or trench.
o. Subsurface Encumbrances - underground utilities, foundations, streams, water tables, transformer vaults, and geological anomalies.
p. Underground Installations - Utilities such as sewer, telephone, fuel, electric, water, and other product lines, tunnels, shafts, vaults, foundations, and other underground fixtures or equipment that may be encountered during excavation or trenching work.
q. Glenn Research Center (GRC)
r. Plum Brook Reactor Facility (PBRF)
s. Health and Safety Plan (HASP)
t. Environmental Management Office (EMO)

## 35.6 General Program Requirements

a. In the event of the unexpected discovery of human remains and/or cultural materials, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains. In the event that human remains and/or cultural materials are found during digging, trenching, or excavation activities, all project-related construction shall cease within a 50-foot radius of the remains/materials. The responsible Federal agency official shall be notified immediately. At Glenn Research Center the responsible Federal agency official is the Environmental Management Branch. The EMB will follow the procedures and requirements contained in 43 CFR Section 10.3 through 10.5 and 25 USC Section 3(c) and (d).
b. Employees who work in or around excavations must be provided training according to their work activities.
c. The excavation or trench must either be sloped or supported as required to comply with OSHA requirements.
d. Traffic around the site must be controlled, and barricades, signs, and/or flag persons used as needed to control both vehicular and pedestrian traffic.
e. Utilities on the site must be protected and suitable precautions taken if any utility will be disturbed by the work.
f. Employees must use personal protective equipment (PPE) as required by their approved HASP.
g. Each department covered by this program must appoint one or more competent person(s) to ensure compliance with this program. Excavation work may involve safety hazards not addressed by this program.
h. Work conducted on or around electrical utilization systems addressed using procedures from the Electrical Safety Program.
i. Work that may impact existing utilities that need to be locked and tagged out by following procedures from the Lockout/Tag out Program.

j. Work conducted in areas where hazardous atmospheres or gases could accumulate (e.g. landfills, manure pits, gas distribution lines, or hazardous materials storage locations) are covered under the Confined Space Program.
k. Fall hazards covered under the Fall Protection Program Chapter 34 of the Glenn Safety Manual.
l. Work requiring burning or welding will require a Hot Work Permit prior to the start of any work of this nature in or around the trench, ditch or excavated site.
m. Work associated with fuel powered equipment.
n. High noise levels.

## 35.7 Responsibilities

35.7.1 Requestor

The Requestor is a member of a GRC organization, support service or construction contractor performing digging, trenching, or excavation activities. The requestor is responsible for:

a. Initiating a Digging, Trenching, and Excavation permit and submitting it to the contractor's COTR.
b. The Requestor shall submit a Glenn Mapping System (GMS) Work Request C-314 to the COTR of the Surveying & Mapping contract for utility clearance and record drawing information.
c. The requestor shall request an Environmental Review of the soil through the COTR for a soil characterization and disposal requirements.
d. Assuring that all personnel working at the job site are trained and aware of the hazardous of Digging, Trenching, and Excavation.
e. Ensuring that all items outlined in the permit request are properly defined and resolved prior to entering an environment involving excavation, digging, and trenching, grading, or ditching operations one foot deep or greater.
f. Performing digging, trenching, and excavation activities in a safe manner, avoiding underground utilities and structures identified on the digging, trenching, and excavation permit.
g. Notifying the Safety Branch and COTR if an unexpected underground utility or structure is found during the digging or excavation activity or if an underground utility or structure is hit or broken during the digging and excavation activity. The requestor will notify the emergency dispatch (9-1-1) if using a NASA internal telephone or 216-433-8888 if using a cell phone on the lab.
h. Comply with all of the requirements of the above listed reference documents and other regulations in regard to safe performance of job site.
i. Must coordinate their work with the lab utilities to assure that related activities such as utility shutdown are addressed.
j. Assign a competent person who has been trained for the hazards of digging, trenching, and excavation.

## Chapter 35 – Digging, Trenching, & Excavation Procedures

### 35.7.2 Contractor's COTR

The contractor's COTR is responsible for:

a. Review the Digging, Trenching, and Excavation permit prior to submitting it to the Safety Branch.
b. Ensuring that all items outlined in the permit are properly defined and completed.
c. Ensuring that known underground utilities and structures have been identified and physically located and marked on a drawing to be reviewed by the Safety Branch and requestor.
d. Ensuring that the requirements of the above identified reference documents is met.
e. Ensuring that Digging, Trenching, and Excavation activities are conducted in a safe manner and avoiding the underground utilities and structures identified on the Digging, Trenching, and Excavation Permit.
f. Will assure that the Safety Branch site specific HASP is being implemented and followed.
g. Will assure that the excavation is in stable materials, the sides of all excavations must be protected against hazardous ground movement. Excavations must be shored or sloped sufficiently to prevent any hazardous ground movement. Shoring or sloping shall be in accordance with OSHA 1926 sub part 650.
h. Will assure that a daily inspection of the excavation will be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard the employees. Additional inspections of excavations shall be made by a competent person after every rainstorm or other hazard increasing occurrence, and protection against slides and cave-ins shall be increased if deemed necessary.
i. Will assure that when employees are required to be in trenches, 4 feet (1.2 m) deep or more, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than 25 feet (7.6 m) of lateral travel. Will assure that digging, trenches and excavations sites are adequately barricaded and identified.
j. Assure that warning lights are placed by excavations and trenches to provide sufficient warning of danger.
k. Will assure that when a hazardous atmosphere could exist, monitors specific to the agent of concern will be worn or used by the employees.

### 35.7.3 Safety Branch

The Safety Branch is responsible for:

a. Review and approve the digging, trenching, & excavation drawing and permit.
b. Will ensure that known underground utilities and structures have been identified and physically located and marked.

## Chapter 35 – Digging, Trenching, & Excavation Procedures

c. Will ensure that precautions will be taken to protect existing underground utilities and structures.
d. Will ensure that all responsible organizations have given their input for the proposed excavation site.
e. Will ensure that adequate safety control measures have been identified and implemented.
f. Approving (by signature) or disapproving the Digging, Trenching, and Excavation Permit.
g. Will monitor the overall effectiveness of the program through audits and annual reviews.
h. Will do atmospheric testing, other technical assistance, or equipment selections needed. The Safety Branch will provide or assist with arranging site worker training and competent person training. The Safety Branch will conduct an annual audit of the program and will maintain records relating to training and audits.

35.7.4 Environmental Management Branch (EMB)

The Environmental Management Branch is responsible for:

a. Reviewing the Digging, Trenching, and Excavation drawings and permit request.
b. Will validate all soil testing procedures are followed in accordance with established criteria.
c. Will ensure that requirements outlined in Chapter 34 of the Environmental Programs Manual are fulfilled.
d. Will ensure that adequate environmental control measures have been identified and implemented.
e. Approving (by signature) or disapproving the Digging, Trenching, and Excavation Permit.
f. Complete the C-133 and determine soil disposal.

35.7.5 Plum Brook Reactor Facility (PBRF) Manager

If the proposed Digging, Trenching, and Excavation activities occur within the boundaries of the Plum Brook Reactor Facility, the PBRF Manager is responsible for:

a. Reviewing the Digging, Trenching, and Excavation permit to ensure there are no conflicts between the proposed Digging, Trenching, and Excavation activity and the underground utilities and structures
b. Approving (by signature) or disapproving the Digging, Trenching, and Excavation Permit.

35.7.6 Employees

a. Each employee has the responsibility to follow established procedures, enter an excavation only after receiving training, and must have a complete understanding of the safe work practices to be followed while working in an excavation area or surroundings by reading and signing the Health and Safety Plan.
b. Employees must wear required personal protective equipment in accordance with the Safety Branch Personal Protective Equipment Program.

## 35.8 Requestors HASP Requirements

The Requestor identifies a task requiring digging or excavation of soil. The following information is required and shall be included the HASP as a minimum. Please refer to Chapter 17 for a complete description of the HASP.

a. Location where the excavation will take place
b. Identify the type and condition of soil.
c. Length and depth of the excavation
d. Identification of means of ingress and egress
e. Identification of underground utilities
f. Define any vehicular traffic exposure
g. Identify the competent person(s) at the job site
h. Identify all related equipment and materials / chemicals to be used at the site
i. Assess confined space requirements
j. Define protective system and equipment to be used
k. Define emergency procedures
l. How the requirements of the C133 will be met

The Requestor implements the requirements of GRC Environmental Programs Manual, Chapter 34 - Handling, Reuse, and Disposal of Soil.

The Requestor completes Part I of the Digging, Trenching, and Excavation Permit and submits it to the Requestor's Supervisor. If the Requestor is a contract employee, the Digging, Trenching, and Excavation Permit is submitted to the Contractor's COTR.

The Requestor's Supervisor or Contractor's COTR reviews the Digging, Trenching, and Excavation Permit)

To ensure that known underground utilities and structures have been identified and physically located and marked on a drawing.

If all safety concerns have been adequately addressed, the Safety Branch approves the Digging, Trenching, and Excavation Permit by signing and dating the Permit. If the

Safety Branch disapproves the Permit, it is returned to the requestor with an explanation of the safety deficiencies.

If all environmental concerns have been adequately addressed, the EMB approves the Digging, Trenching, and Excavation Permit by signing and dating the permit. If EMB disapproves the permit, it is returned to the requestor with an explanation of the safety deficiencies.

If the proposed digging, trenching, and excavation activities occur within the boundaries of the Plum Brook Reactor Facility, the PBRF Manager will review the digging, trenching, and excavation permit to ensure there are no conflicts between the proposed digging, trenching, and excavation site and any underground utilities and structures. If all safety concerns have been adequately addressed, the PBRF Manager will approve the digging, trenching, and excavation permit by signing and dating the permit. If the PBRF Manager disapproves the digging, trenching, and excavation permit it will be returned to the requestor with an explanation of the safety deficiencies on the permit.

### 35.9 Training Requirements

All individuals involved in Digging, Trenching, and Excavation activities will be trained in the hazards associated with these activities and in the emergency action to take if an underground utility or structure is hit or broken during digging or excavation.

All personnel involved in a "Hazardous Waste" excavation shall have OSHA 40hr. HAZWOPER training. Hazardous waste areas shall be determined by EMB and documented on the C-133.

## DIGGING, TRENCHING, AND EXCAVATION PERMIT

1. Requestor's Name_____ Phone No._____
2. Requestor's Organizational Code: _____ Date: _____
3. Contract No. / Project Title:_____
4. Contractor: _____ Sub Contractor: _____
5. Excavation: (Please include drawings or sketch)

## Chapter 35 – Digging, Trenching, & Excavation Procedures

a) Location of work:
_____

b) Depth / Width of work: _____
_____

6. Reason for excavation:
_____

7. Excavation dates: Start_____ Finish_____

8. HASP Approved _____
Safety Branch

Signatures:

---

(1) Requestor (date)

---

(2) Contractor's Rep (date)

---

(3) Facility Manager (date)

---

(4) Building Manager(s) (date)

---

(5) FD Soil Coordinator (date)

---

(6) Environmental Mgmt. Branch (date)

---

**SOIL HANDLING DIRECTIONS:**
_____
_____
_____ .

(7) Safety Branch (date)_____

(8) Survey Crew:
a) Prior to "Excavation" _____
b) Prior to Backfill of Excavation_____