

FESHM 7030: EXCAVATION

Revision History

Author	Description of Change	Revision Date
Jim Niehoff	Added applicability statement for Fermilab Leased Spaces.	December 2017
Jim Niehoff	<ul style="list-style-type: none"> • Added definition of Exclusion Zone • Added EJULIE definition • Added Utility Locate Administrator and Utility Subject-Matter Experts definitions • Added Figure Nos 1 and 2 • Changed 7 to 10 days and changed 14 to 18 days, removed term business days. • Added Electronic Excavation Permit • Removed term Fermi-JULIE • Changed 4.1 to Chief Safety Officer • Added 75 year permit retention per DOE • Removed Appendix A 	March 2017
Jim Niehoff	<ul style="list-style-type: none"> • Changed high gas service from 100 psi to 2 psig. • Damage to a gas line as a result of construction is considered reportable regardless of pressure. • Added duration time for an excavation process. 	December 2015
Jim Niehoff	Incorporated lessons learned related to extending an excavation permit, see Section 5.3.2, Item No. 8.	June 2012
Jim Niehoff	Implemented waiver process and developed a map depicting restricted waiver areas.	June 2011
Russ Alber	Removed Appendix Matrix and removed procedures.	March 2010
Tom Prosapio	Defined critical and non-critical work (emergency), updated permitting process.	July 2002
Ed Crumpley	Initial release Chapter 7030.	December 1999

TABLE OF CONTENTS

1.0	PURPOSE	2
2.0	SCOPE	2
3.0	DEFINITIONS	2
4.0	RESPONSIBILITIES	4
4.1	Chief Safety Officer	4
4.2	Division/Section Head	4
4.3	Construction Coordinator/Task Manager (CC/TM)	5
4.4	Design Coordinator	5
5.0	PROGRAM DESCRIPTION	5
5.1	Standardized Color for Utility Locators	5
5.2	Design Phase	6
5.3	Construction Phase	6
5.3.1.	Excavation Permit Process	6
5.3.2.	Excavation Activities	7
5.4	Closeout Phase	8
5.5	Excavation Permit Record Retention	8
6.0	SPECIAL CONSIDERATIONS	8
6.1	Excavations – Emergency Situations	8
6.2	Restricted Areas, Waiver Prohibited	8

1.0 PURPOSE

Safeguarding our workers and utilities is a continuous process that begins in the project planning and design phase and runs through documentation of as-built conditions. This chapter establishes a process to be followed by all divisions and sections when confronted with an excavation as a phase of work.

It is the intent of this chapter to provide guidance regarding actions needed to obtain an excavation permit prior to any activity that penetrates the soil and complementary procedures when operating under FESHM 7010 (Subcontractor Construction Safety Program) and FESHM 2060 (Hazard Analysis for Fermilab Employees). This chapter is not a primer on how to do a safe excavation. Standards to follow when opening an excavation can be found in the Code of Federal Regulations 29 CFR 1926 Subpart P.

This chapter only applies to the Fermilab site. Leased spaces will follow the rules and regulations set forth by the partnering institute and/or state or local codes and standards.

2.0 SCOPE

Existing utility locations will be considered during the design phase of all proposed work that involves excavation. Where appropriate, designs should be modified to minimize interferences with existing utilities.

Procurement documents will clearly spell out Fermilab's expectations and requirements regarding excavation activities.

A completed permit is required before the start of any excavation activity and must be kept current when an excavation is underway. The process, electronic version of the excavation permit and the paper version of the permit is maintained by FESS Lockout/Tagout (LOTO) procedures will be applied before excavating in the proximity of buried electrical cable and/or high-pressure gas lines. Special planning and precautions must be taken and the Hazard Analysis (HA) must be approved by the Chief Safety Officer or designee when deactivation of an existing electrical cable or high-pressure gas line in the area of an excavation is not possible.

As found and as-built utility information will be gathered and stored in a retrievable system. The preferred method for storing this information is Facilities Engineering Services Section Geographic Information System (GIS). The data/Information contained in this GIS is continuously being verified and updated and is for information purposes only. At a minimum, the GIS map depicting the restricted buffers around beam lines and solid waste areas must be reviewed by the Subcontractor's Safety Subcommittee (S-3) and Radiation Safety Subcommittee (RSS) the first quarter of every calendar year.

3.0 DEFINITIONS

- **Competent Person** - One who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

- **Construction Coordinator (CC)** - A person specifically assigned to oversee the work of a construction subcontract for conformance to the subcontract agreements. Construction Coordinators serve as the primary construction point of contact between the Subcontractor and Fermilab.
- **Design Coordinator** – A person assigned the responsibility for assembly of complete design documents for the purpose of bidding and/or construction
- **Electric Cable** – Any buried medium or high-voltage electrical cable whether direct buried, in conduit or in a reinforced concrete duct bank.
- **Excavation** - Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal. This includes directional drilling but does not include farm tillage operations.
- **Electronic Excavation Permit (EJULIE)** - An electronic on-line request form for generating an excavation permit. Facilities Engineering Services Section (FESS) maintains and administers this system.
- **Exclusion Zone** – A zone designated on the surface by the use of standard color coded markings, which contains the width of the utility plus 18 inches on each side of the utility. Standard excavation techniques are not allowed in this zone, see Figure No. 1 for example.

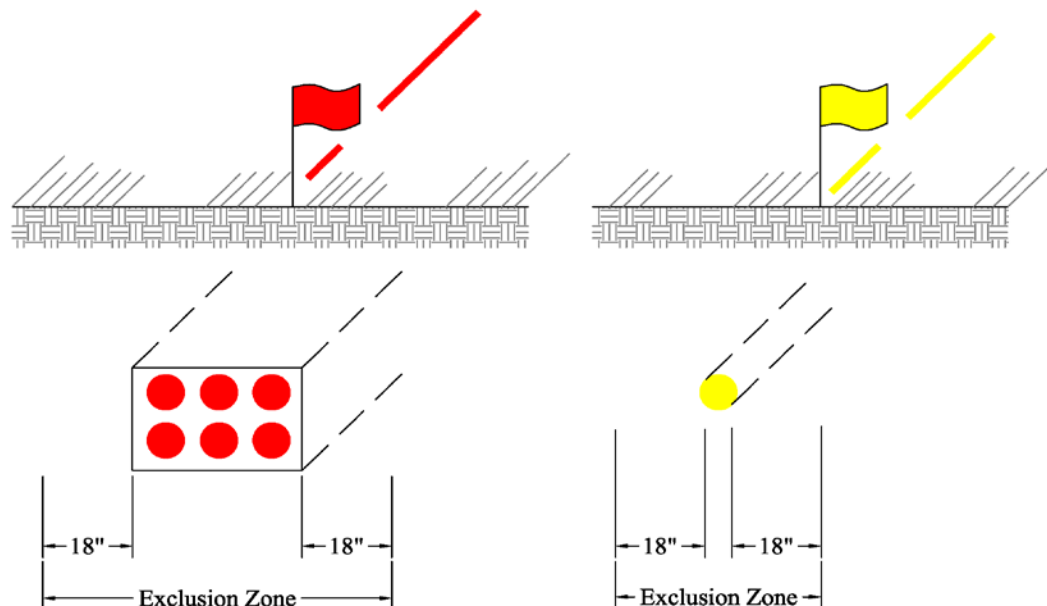


Figure No. 1

- **Fiber Optic** – Thin, flexible fibers with a glass core which transmit light signals/data. Fiber optic cables are used at Fermilab for safety interlocks, timing links for accelerator operation, communication and large amount of experimental data. Additionally, there are several privately owned fiber optic lines in established easements that transverse the Fermilab site.
- **Geographic Information System (GIS)** – A system that captures, stores, manages, and presents geographic data such as utilities, buildings, land use, and other special infrastructure. The GIS is considered the source documentation of utilities and is used in conjunction with the EJULIE system. The URL is: <http://fermilabgis.fnal.gov/ArcGISPortal/index.xhtml>
- **High-Pressure Gas Service** – For purposes of this chapter is defined as any gas service at or above 2 psig.
- **JULIE** – Joint Utility Locating Information for Excavators.
- **Potholing** – Potholing is the practice of digging a test hole to expose underground utilities to determine the horizontal and vertical location of the utility. Potholing methods only includes:
 - Vacuum Excavation - Vacuum excavation consists of air or water pressure to break up the soil and a vacuum device to collect the spoil
- **Task Manager (TM)** – A division/section-designated individual specifically assigned to oversee and direct a work activity. An approved TM list indicating individual experience and competency to direct specific work activities can be found at: <http://esh.fnal.gov/xms/Audience-Pages/TM-CC-SC>
- **Utility Locate Administrator** – A Facilities Engineering Section designee responsible for the procedures, process and issuing the completed excavation permits.
- **Utility Subject-Matter Experts** – Individuals having knowledge and locating authority to identify buried utilities and signing off of the designated buried utility.
- **Waiver** – A written relinquishment of executing the excavation process and permit, typically prepared by Construction Coordinator/Task Manager (CC/TM).

4.0 RESPONSIBILITIES

4.1 Chief Safety Officer

- The Chief Safety Officer or their designee must sign the Excavation Hazard Analysis when electrical, fiber optic cables and/or high-pressure gas service within exclusion zone or crossing an excavation cannot be de-energized or depressurized.

4.2 Division/Section Head

- Implementation of the requirements of this chapter for those construction activities managed by his/her staff.

- Assignment of a qualified CC/TM.

4.3 Construction Coordinator/Task Manager (CC/TM)

- Submit Excavation Permit
- Submit as-built existing and/or new utility locations to the GIS system.
- Assure a competent person signs the excavation permit.
- Obtain Chief Operating Officer’s approval of the HA if work near energized electrical cables or high-pressure gas lines is anticipated.
- Provide supervision during live work activities
- Preparing and submitting the electronic excavation permit (EJULIE)

4.4 Design Coordinator

- Verify proximity of excavation to accelerator enclosures and Solid Waste Management Units (SWMU’s) as well as any special delineated areas.
- Incorporate as-built existing and/or new utility locations into the design drawings into the Fermilab’s GIS system.

5.0 PROGRAM DESCRIPTION

5.1 Standardized Color for Utility Locators

Paint, flags, or other marking schemes will use color as specified in Figure No. 2.

<div style="background-color: red; color: white; text-align: center; padding: 5px;">RED</div>	Electric Power Lines, Cables, Conduit, and Lighting Cables
<div style="background-color: yellow; text-align: center; padding: 5px;">YELLOW</div>	Gas, Oil, Petroleum, or other Gaseous Material
<div style="background-color: orange; text-align: center; padding: 5px;">ORANGE</div>	Communications, Telephone, CD Data Fiber Optic, Alarm Signals, CATV, etc.
<div style="background-color: blue; color: white; text-align: center; padding: 5px;">BLUE</div>	Domestic, Cooling Pond, Chilled Water, Industrial Cooling Water, & Low Conductivity Water lines
<div style="background-color: green; text-align: center; padding: 5px;">GREEN</div>	Sanitary Sewer Lines
<div style="background-color: purple; text-align: center; padding: 5px;">PURPLE</div>	Storm Water Lines

Figure No. 2

5.2 Design Phase

When it is recognized that completion of a task will include excavation, the design team will identify existing underground utilities and incorporate reasonable accommodations into the design to minimize the likelihood of damage. The TM is responsible for any and all required engineering/design activities for T&M activities. Design Coordinators are responsible for the engineering/design activities associated with fixed-price construction work. The design team will identify existing utilities using some or all of the following:

- Existing utility maps
- Previous design and as-built documents, including; accelerator enclosure clearance zones, radiation shielding assessments, and delineated special areas such as Solid Waste Management Unites (SWMU's)
- Utility Locate Administrator will arrange for the location of utilities
- Test holes
- On-site physical review
- Corporate knowledge

The design team will incorporate all known utility information into design and construction drawings.

Contracts for projects including excavation activities shall require:

- An Excavation Permit before beginning any excavation.
- Field marking of the proposed excavation zones and maintenance of the locator markings.
- Notification to Fermilab of any damage to existing utilities.
- Submission of as-built drawings with utility line coordinates and elevations for inclusion into Fermilab's GIS System.

5.3 Construction Phase

5.3.1. Excavation Permit Process

1. The requestor can prepare an excavation permit through the EJULIE application identifying the area and depth (volume) of the excavation; however, only trained and approved CC/TM can oversee the excavation activity. To request an Fermilab Excavation Permit, complete an Excavation Permit through the online EJULIE application. <http://fess-ogfp.fnal.gov:8095/eJulie>
2. If practical, the CC/TM or subcontractor shall mark the perimeter of the proposed excavation in the field using stakes and tape, white flags, or white paint.
3. Excavation permit process will normally take ten (10) days for a single area less than one (1) acre (208-ft x 208-ft) and eighteen (18) days for larger/multiple areas greater than one (1) acre or if the area has numerous utilities.

4. An excavation permit will be issued when all Utility Subject-Matter Experts have signed off on their responsible utility.
5. For further information, reference Facilities Engineering Services Excavation Procedure on requesting an EJULIE.

5.3.2. Excavation Activities

1. The CC/TM shall review and sign the excavation permit with the subcontractor competent person.
2. The excavation permit & sketch must be available for reference at the excavation site.
3. During the excavation activity, the CC/TM will verify that the existing and new utilities are documented and that the location flags are removed after project completion.
4. The CC/TM is to conduct a preparatory meeting prior to the beginning of any excavating activity. Suggested agenda items include:
 - Review permits, HA, LOTO, disablements
 - Review shop drawings, materials on hand
 - Confirm utility location markings are legible
 - Discuss routing of existing utilities and interferences
 - Confirm extent of excavations
 - Establish inspection stop points
 - Coordinate location of actual utility positions
 - Establish schedule for any further meetings

Suggested attendees include:

- CC/TM
 - Subcontractor superintendent
 - Excavating foreman
 - Machine operators
 - Subcontractor safety representative
5. Electrical cables, fiber optic cables, and/or high-pressure gas service in the area of the excavation will be de-energized/depressurized and LOTO procedures implemented. The Chief Operating Officer or his/her designee must sign the Excavation Hazard Analysis when electrical cables and/or high-pressure gas service is within exclusion zone or crossing an excavation cannot be de-energized or depressurized.

Note: *This requirement is waived when performing potholing excavation method.*

6. CC/TM presence is strongly recommended at the excavation site when:
 - a. Excavation activity first begins or enters a new phase.

- b. Excavating within 5' of markings of energized electrical cable and/or high-pressure gas lines.
 - c. Excavating under existing utilities.
 - d. Excavating across roadways
 - e. Potholing existing utilities.
7. Any incident involving damage to existing utilities shall be reported and investigated per the procedures in FESHM 3020, "Incident Investigation".
8. Excavation permit is only valid seven days after issuance; however, the CC/TM may extend the excavation permit. Prior to extending an excavation permit, the CC/TM must verify with the GIS web map that additions or modifications have not been made to the utilities in the area of the excavation.

5.4 Closeout Phase

At the completion of each excavation activity, the CC/TM will submit as-found and as-built information to the Utility Locate Administrator and GIS System with locations and depths of existing and installed utilities.

5.5 Excavation Permit Record Retention

After the completion of excavation work, the Excavation Permit must be stored for seventy-five (75) years, in accordance with DOE Records Retention requirements, ADM Section 37.

6.0 SPECIAL CONSIDERATIONS

6.1 Excavations – Emergency Situations

There may be instances where a system, utility or facility failure requires an immediate excavation to make repairs or where timeliness is of the utmost importance to preserve life or property. Applying the requirements of this chapter when an emergency arises may prove to be unfeasible when speed of repairs is essential. Under these circumstances, the CC/TM is authorized to waive the requirements of this chapter. However, the CC/TM shall take special care to identify high-risk utilities before proceeding.

In case of emergencies and the EJULIE application is unavailable then a paper permit will be issued by Utility Locate Administrator.

6.2 Restricted Areas, Waiver Prohibited

There may be times when it is known with certainty that the volume where an excavation is being considered is free of buried utilities. This certainty may have been reached by various means including corporate memory of construction of the facility, review of as built information or other means. The CC/TM may provide a waiver in writing to the Utility Locate Administrator for their files that such an area is devoid of buried utilities and/or corporate

knowledge. This waiver must be based on corporate knowledge and shall be attached to the HA, in effect, will become the permit. Before any waiver is considered, the GIS web map must be reviewed to verify that the proposed excavation does not conflict with these restricted areas and that no new utility has been installed in the proposed excavation area.

This waiver cannot be executed if the area in question is within the special considerations, that is, if excavation on or within buffers of beam-lines, archeology sites, solid waste areas shown on GIS link are restricted and therefore; waivers are prohibited.