

SUBJECT AREA CONTENT

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Management System: [Worker Safety and Health](#)

Subject Area: Excavation Safety

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Effective Date: Dec 19, 2017 (Rev 4.4) Periodic Review Due: Dec 19, 2020	Subject Matter Expert: John Ellerkamp Jr Dari Scuola	Management System Executive: Gail Mattson	Management System Steward: Gail Mattson
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Introduction

Operations involving excavation can result in hazards that are difficult to control. Cave-ins and contact with buried utilities are just a couple of these hazards. This subject area was established to assist in identifying, evaluating, and controlling the risks and hazards presented by work associated with excavations. All excavation work, regardless of the level of complexity, requires pre-planning. All work must be conducted according to the [Work Planning and Control for Experiments and Operations](#) Subject Area.

This subject area defines the procedures for all excavation by BNL staff and non-BNL staff involving BNL programs on- or off-site. Excavations are defined as any human-made cut, cavity, trench, or depression in an earth surface formed by earth removal or any operation that bores into the strata below. For this subject area this definition is expanded to include environmental characterization (e.g., core drilling), jack hammering, indoor drilling/digging operations, pipe jacking, and sheet piling. Ancillary digging for non-excavation projects (e.g., driving electrical ground rods, and shallow trenching for routing utilities) must also comply with these requirements.

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Definitions

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[Required Sections of Digging Permit](#)

Forms

[Daily Excavation Checklist](#)

Training Requirements and Reporting Obligations

This subject area contains training requirements. See the [Daily Excavation Checklist](#).

This subject area does not contain reporting obligations.

External/Internal Requirements

Requirement Number	Requirement Title
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29 CFR 1910	Labor/Occupational Safety and Health Standards
29 CFR 1926	Labor/Safety and Health Regulations for Construction
BSA Contract No. DE-SC0012704 - Clause C.4	Statement Of Work
BSA Contract No. DE-SC0012704 - Clause I.131 (DEAR 970.5223-1)	INTEGRATION OF ENVIRONMENT, SAFETY, AND HEALTH INTO WORK PLANNING AND EXECUTION (DEC 2000)
DOE-STD-1090-07	Hoisting and Rigging

References

29 CFR 1926 Subpart P, Excavations

[Digging Permit, F&O Policies, Procedures and Risk Assessment](#) page

[Land Use Institutional Controls](#) Web site

[Personal Protective Equipment and Respirators](#) Subject Area

[Work Planning and Control for Experiments and Operations](#) Subject Area

Standards of Performance

Managers shall analyze work for hazards, authorize work to proceed, and ensure that work is performed within established controls.

Managers shall ensure that scopes of work properly consider all elements of the Laboratory's operational priorities.

All staff and users shall identify, evaluate, and control hazards in order to ensure that work is conducted safely and in a manner that protects the environment and the public.

All staff and guests shall promptly report accidents, injuries, ES&H deficiencies, emergencies, and off-normal events in accordance with procedures.

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PROCEDURE: PRE-PLANNING FOR EXCAVATION

Management System: Worker Safety and Health		
Subject Area: Excavation Safety		
1. Pre-Planning for Excavation		
Effective Date: Dec 19, 2017	Subject Matter Expert: John Ellerkamp Jr Dari Scuola	Management System Executive: Gail Mattson

Applicability

This information applies to project managers planning excavation on-site and off-site.

Required Procedure

The Project Manager or designee does the following.

Step 1	<ul style="list-style-type: none"> • Check site utility maps and consult with appropriate Utility Representative (see Digging Permit, Sections D and E for telephone numbers) and F&O Facility Project Manager and F&O Facility Complex Engineer for existing known buried utilities (active and abandoned). • Check site maps and investigate, as appropriate, the potential for soil/pavement/floor contamination (radioactive or chemical) and the potential for uncovering buried unexploded munitions. Pay special attention to the sanitary system map to identify location of D-waste lines. The vicinity of any sewer or waste line or underground tank is considered radiologically contaminated until proven otherwise. • Review the Land Use Institutional Controls Web site, in consultation with the Long Term Response Actions Point of Contact (POC), to determine whether any institutional controls are in place for this work area. If institutional controls are in place for that location, the Long Term Response Actions POC must assist in identifying the specific controls and how they may impact the planned work. • Due to the historical nature of BNL, it is imperative to conduct a thorough background check that includes the history of activities in the vicinity using all available engineering drawings. Use the Historical Site Review Report for BNL, July 1997 and the recent Priority I & II Studies for Areas of Concern and environmental interest. Contact the Environmental Protection Division for current environmental information and to verify historical activities.
Step 2	<p>If necessary and permissible by project requirements, select an alternate location for those locations with</p> <ul style="list-style-type: none"> • High potential for chemical or radioactive contamination; • Buried munitions; • Direct buried electrical cables or other vital services.
Step 3	<p>If the location cannot be changed, contact the Facility Support Representative, the ESH Coordinator, the Work Control Manager, and the Environmental Compliance Representative for the following:</p>

	<ul style="list-style-type: none"> • Sampling for characterization; • Safety instructions; • Estimate of additional requirements associated with contamination; • Posting of appropriate warning signs at job site.
Step 4	<p>Contact appropriate safety personnel for Job Safety Analysis if</p> <ul style="list-style-type: none"> • Excavation is in the vicinity of above grade utilities; • There are known direct buried electrical cables; • There is possible contamination; • There is potentially unexploded ordnance.
Step 5	<p>Notify potentially affected facilities through the F&O Facility Project Manager, or as directed in organization-specific work planning procedures, of the intent to excavate in the area and to establish an agreeable time.</p> <p>Note: Efforts must be made to ensure continuity of utilities and minimal programmatic interruptions, which may be affected by the excavation, by either supplying backup water or power; or re-scheduling the excavation to a less risky time.</p>
Step 6	<p>Determine the proper soil type, i.e., type A, B, or C soil using the procedures specified in 29 CFR 1926 Subpart P Appendix A "Soil Classification" to determine the parameters for excavation protection.</p> <p>Note: Most soil on Long Island is Type C soil.</p>
Step 7	<p>Obtain approval of excavation drawings by a Registered Professional Engineer (RPE) for cave-in protection for any excavation greater than 20 feet in depth; or where an excavation may undermine nearby structures; or nearby structures could adversely impact the excavation.</p> <p>Note: Specifications for all non-metallic piping installation projects must include a copper "toneable" wire (or equivalent) to allow for easy location for future excavations in the area.</p>
Step 8	<p>Locate utility services. Once located, place the appropriate color-coded marker at the excavation site. See the Color Code for Utility Marking exhibit.</p> <p>Note: If utilities are known to be in the vicinity, but cannot be accurately marked, the probable location or general areas should be marked. The Utility Representative notes on the Digging Permit that utility locations are estimated.</p>

References

29 CFR 1926 Subpart P, Excavations, Appendix A Soil Classification

[Digging Permit, F&O Policies, Procedures and Risk Assessment](#) page

[Land Use Institutional Controls](#) Web site

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PROCEDURE: COMPLETING THE DIGGING PERMIT

Management System: Worker Safety and Health		
Subject Area: Excavation Safety		
2. Completing the Digging Permit		
Effective Date: Dec 19, 2017	Subject Matter Expert: John Ellerkamp Jr Dari Scuola	Management System Executive: Gail Mattson

Applicability

This information applies to BNL staff who complete the digging permit.

Required Procedure

A Digging Permit is required for **all** excavations greater than 6 inches in depth. The Project Manager or designee initiates the Digging Permit and ensure its completion before the start of excavation. The Plant Engineering Division, Maintenance Management Center (ext. 2468), will issue a work order number. Copies of the permits must be retained at the site, distributed as directed on the permit, and kept on file for reference, until such time as the excavation is filled in.

Step 1	<p>The Project Manager or designee calls the Maintenance Management Center (MMC), ext. 2468, and obtains a work order number for the excavation. The work order number must appear on the digging permit.</p> <p>Note: All Digging Permits require a Plant Engineering Work Order issued by MMC.</p> <p>For emergency excavations, where it is not practical to obtain a Digging Permit, the responsible supervisor reviews available site maps for location of utilities, and takes reasonable precautions to prevent injury and damage during excavation. Concurrence is required from the excavation project's Department Manager/Division Chair and an ES&H Representative.</p>
Step 2	<p>The Project Manager or designee contacts appropriate BNL staff for completion of the Digging Permit. Depth, location, and method of excavation determine which sections of the Digging Permit must be completed. See the exhibit Required Sections of Digging Permit. Follow all instructions provided on the Digging Permit.</p>
Step 3	<p>The Project Manager or designee gives excavation details including location of known utilities to the Utility Representative.</p>
Step 4	<p>The Project Manager or designee contacts the F&O Facility Complex Engineer for the affected facility to ascertain if any facility-specific utilities are located at the proposed excavation site.</p>
Step 5	<p>The Project Manager or designee identifies the location of a proposed excavation in the field, in person, and when necessary places markers.</p>

Step 6	The Project Manager or designee requests utility marking within a specified distance of the proposed excavation site.
Step 7	The Plant Engineering (EP) Assistant Manager of Operations/Environment contacts the Utility Call Center at (631) 661-6000 to mark the natural gas lines in the vicinity and indicate marking expiration date on the Digging Permit. Note: Forty-eight hours notice is required for marking natural gas lines.
Step 8	The Project Manager/Construction Inspector or designee notifies the EP Assistant Manager of Operations/Environment if the excavation is not complete within 10 days.
Step 9	The EP Engineering & Construction Support (E&CS) Surveyor reviews the markings and makes additional comments, as appropriate, after all applicable Utility Representatives have marked the excavation site for their lines and signed Section D of the Digging Permit.
Step 10	The Project Manager or designee forwards the Digging Permit to the EP E&CS Surveyor, and where applicable, the Facility Support Representative for completion of Section C of the Digging Permit.
Step 11	The Project Manager or designee ensures that a Competent Person is assigned to the job (when required) and that this individual completes and signs Section J of the Digging Permit.

References

[Digging Permit, F&O Policies, Procedures and Risk Assessment](#) page

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PROCEDURE: CONDUCTING THE EXCAVATION

Management System: Worker Safety and Health		
Subject Area: Excavation Safety		
3. Conducting the Excavation		
Effective Date: Dec 19, 2017	Subject Matter Expert: John Ellerkamp Jr Dari Scuola	Management System Executive: Gail Mattson

Applicability

This information applies to BNL staff and non-BNL staff conducting excavations on-site and off-site.

Required Procedure

All appropriate pre-planning and permits must be in place before an excavation starts. A complete set of project drawings with a description of the project and the need for the excavation must be kept in a project file.

Step 1	<p>Before starting the excavation the Project Manager or designee briefs the contractor or Plant Engineering staff doing the work on the following:</p> <ul style="list-style-type: none"> • Discuss scope of work; • Require that excavation staff review the digging permit, marked-up utility drawings, and understand that they are responsible for inspecting and maintaining utility markings for the duration of the project; • Date and sign Section 'I' of the Digging Permit; • Discuss hand-digging procedures with the staff doing the work; • Ensure that proper digging techniques for locating utilities are used for each active excavation; • Communicate any safety instructions or special concerns or conditions noted on the Digging Permit by Utility Representatives or Radiological Control Division Facility Support Representatives to contractor and/or BNL supervisory staff before starting the excavation. <p>When excavation approaches the estimated locations of underground installations, every effort must be taken to determine the exact location of the service by instrumentation, cautious hand digging, and probing.</p>
Step 2	<p>When an excavation approaches a suspected or known underground utility, the Project Manager or designee establishes a 100-ft exclusion zone where no cars will be parked and no one except authorized personnel will be permitted to enter.</p>
Step 3	<p>Before an excavation can be done crossing a road, the Project Manager or designee contacts</p> <ul style="list-style-type: none"> • Safeguards and Security Division to halt all traffic on that road;

	<ul style="list-style-type: none"> Community, Education, Government & Public Affairs (CEGPA) to send out a broadcast e-mail alerting all staff of the road closures.
Step 4	<p>The Project Manager or designee assigns a Competent Person (CP) to all excavations of greater than 5 feet deep, or where there is worker exposure to cave-ins, or hazardous environment.</p> <p>Cave-in protection must be in place before staff enter an excavation greater than 5 feet deep.</p> <p>Note: A minimum of two persons should be at the site for any excavation greater than 5 feet deep.</p>
Step 5	<p>The CP must inspect the excavation at the start of each work shift and as needed throughout the shift, and following every rainstorm.</p> <ul style="list-style-type: none"> Document the inspection on the Daily Excavation Checklist. Note and initial any needed changes in protective system requirements on the Section F, 9-11 on the Digging Permit. Include the "working copy" of the Digging Permit in the project file.
Step 6	<p>Staff stop all work immediately if an unexpected utility, contamination, or unexploded ordnance is discovered. All staff exit the excavation. Contact the Project Manager or designee for resolution of safety issues before excavation restarts.</p> <ul style="list-style-type: none"> If the discovery is a potentially energized electrical cable, contact the Electrical Maintenance and Services Supervisor. The Electrical Supervisor responds to the site to evaluate the situation and provide instructions on how to protect workers from electrical hazards when the job continues. If the discovery is a utility other than electrical, contact the appropriate utility contact, listed on the Digging Permit, for an evaluation of hazards and directions for continuing safely. Hand digging is the only method of excavation permitted in the vicinity of D-Waste lines or any buried utility until the location of that service has been confirmed. Where active utilities have been identified in the area of a dig, to the maximum extent possible, efforts will be taken to shut down those services. If suspected unexploded munitions are discovered, immediately contact Safeguards & Security at extension 911 or 631-344-2222. If suspected contaminated material is unearthed, immediately contact the appropriate Facility Representative. To prevent spread of contamination, do not leave the excavation site. <p>The Project Manager or designee must convey all necessary information to individuals at the site and ensure that all necessary precautions are taken before the job resumes. Note: All unexpected discoveries during excavations, including utility strikes, must be immediately reported to the responsible Facility Manager, who notifies the ORPS Occurrence Categorizer.</p>
Step 7	<p>The Project Manager or designee consults with appropriate staff if the scope of the excavation changes, and to determine what additional utility markings are required or additional protective measures are to be taken.</p>
Step 8	<p>The Project Manager or designee documents all discrepancies discovered during the excavation, and disseminates information to appropriate staff, e.g., F&O Facility Project Manager, F&O Facility Complex Engineer.</p> <p>Notify Plant Engineering's Engineering & Construction Support (E&CS) Surveyor in writing of discrepancies noted in utility maps versus actual conditions or of unknown utility locations discovered during excavation. Include areas of contamination and unexploded ordnance.</p>
Step 9	<p>The E&CS Surveyor</p>

	<ul style="list-style-type: none"> • Surveys all utilities discovered during the excavation and records those locations on "as built" drawings and BNL utility maps; • Locates newly installed utilities on "as built" drawings and utility maps before the excavation is backfilled; • Checks and updates utility maps and distributes them by the designated E&CS group.
Step 10	Staff locate excess materials a safe distance (minimum of 2 feet) from the edge of the excavation.
Step 11	Staff entering the excavation site wear Personal Protective Equipment. See the Personal Protective Equipment and Respirators Subject Area for information.
Step 12	Workers doing the excavation notify the Project Manager or designee if they encounter groundwater (other than by design).
Step 13	Return the area to pre-excavation conditions when the work is completed. Note: If an open excavation is left unattended, adequate warning signs and barricades must be provided.
Step 14	The Project Manager or designee maintains a completed copy of the Digging Permit at the site of the excavation and distributes copies of the completed Digging Permit as indicated on the permit.

References

[Personal Protective Equipment and Respirators](#) Subject Area

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PROCEDURE: EXCAVATION IN THE APARTMENT AREA

Management System: Worker Safety and Health		
Subject Area: Excavation Safety		
4. Excavation in the Apartment Area		
Effective Date: Dec 19, 2017	Subject Matter Expert: John Ellerkamp Jr Dari Scuola	Management System Executive: Gail Mattson

Applicability

This information applies to all BNL and contractor management and staff conducting excavations or ground penetrations in the apartment area or working on propane equipment in the apartment area.

Required Procedure

This procedure addresses concerns about potential damage to underground propane lines in the Apartment Area due to excavation work and to address the work on propane equipment in the Apartment Area.

The F&O Facilities Operations Office uses the MAXIMO system to flag all Apartment Area Work Orders and ensure that individuals performing work in the Apartment Area are aware of this procedure.

Personnel that need to dig in the Apartment Area or perform work on propane equipment in the Apartment Area will be trained on the requirements of this procedure.

Individuals performing excavations in the Apartment Area must follow these steps:

Step 1	Prepare a Work Permit in accordance with the section Work Planning and Control for Operations in the Work Planning and Control for Experiments and Operations Subject Area. Note: The Work Permit ESS&H Risk, Complexity, and Work Coordination Levels will be "Moderate".
Step 2	Complete a Digging Permit in accordance with the section Completing the Digging Permit in this subject area.
Step 3	Warning: Do not use fence stakes as they may damage an underground propane pipe and cause a leak. Before starting work, establish an isolation zone around the excavation area described in the digging permit. The isolation will be defined by plastic construction fencing supported by stanchions that do not penetrate the ground.
Step 4	Lockout/tagout (LOTO) propane tank(s) in the vicinity of the excavation work area, if any propane supplies are affected.
Step 5	Shut off propane supplies to appliances (hot water heaters and gas-fired driers) for the areas affected by the propane tank(s) LOTO.

Step 6	Depressurize the propane gas pipes from the isolated propane tank(s). This operation should be conducted in a well-ventilated area free of ignition sources, such as at the propane tank's dome.
Step 7	Conduct the excavation in accordance with the section Conducting the Excavation in this subject area.
Step 8	Perform the excavation work.
Step 9	After all excavation and backfilling operations have been completed, pressure test pipes to 30 psi using an inert gas for 1 hour to verify that the pipes were not damaged.
Step 10	If the piping passes pressure test, remove lockout/tagout and restore propane service at the propane tank(s).
Step 11	Open the supply valve to each appliance that was locked out/tagged out and relight the appliance pilot lights, if applicable, in all affected areas. Note: The apartment area's gas-fired dryers do not have pilot lights.
Step 12	Monitor the area for propane leaks.

References

[Work Planning and Control for Experiments and Operations](#) Subject Area

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EXHIBIT: BNL DEVELOPED AND UNDEVELOPED AREAS

Management System: [Worker Safety and Health](#)

Subject Area: [Excavation Safety](#)

BNL Developed and Undeveloped Areas

Effective Date: Dec 19, 2017

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EXHIBIT: COLOR CODE FOR UTILITY MARKING

Management System: [Worker Safety and Health](#)

Subject Area: [Excavation Safety](#)

Color Code for Utility Marking

Effective Date: Dec 19, 2017

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EXHIBIT: REQUIRED SECTIONS OF DIGGING PERMIT

Management System: [Worker Safety and Health](#)

Subject Area: [Excavation Safety](#)

Required Sections of Digging Permit

Effective Date: Dec 19, 2017

[Required Sections of Digging Permit](#) is provided as a Word file.

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FORM: DAILY EXCAVATION CHECKLIST

Management System: [Worker Safety and Health](#)

Subject Area: [Excavation Safety](#)

Daily Excavation Checklist

Effective Date: Dec 19, 2017

The [Daily Excavation Checklist](#) is provided as a Word file.

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DEFINITIONS

Definition: Excavation Safety

Term	Definition
as built drawings	Drawings of an area showing utility configurations, as they are known to exist at the current time.
competent person	A BNL employee, guest or contractor who is (per OSHA 1926 Subpart P, Excavations) capable of identifying existing and predictable hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them. This person must be knowledgeable about soil analysis; the use of protective systems; and the requirements of the OSHA Subpart P and this subject area.
excavation	Any human-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.
excavation hazards	Hazards associated with digging operations such as trench cave-ins; exposure to contaminated materials; contact with energized electrical lines or high-pressure steam lines.
F&O Facility Complex Engineer	The resident technical authority for their assigned complex. Consults with and advises the Facility Complex Manager on engineering matters that relate to the complex's facilities and operations. Ensures that facilities within the complex are kept in compliance with relevant building, equipment and safety codes. Provides technical support for complex operations involving the installation of new equipment, modification of existing equipment, and repair and maintenance of all facility and infrastructure support systems. Manages the configuration of assigned facilities.
F&O Facility Project Manager	Manages and operates specific facility(s) within a designated complex area, related equipment and systems; ensuring resolution of problems, maintaining safe and reliable operations. Serves as the single point of contact for the execution of the obligations agreed to between the approving parties of the Facility Use Agreements (FUA). Note: This is not a one to one replacement of all the responsibilities of the former Building Manager, but contains many of the Building Managers' responsibilities as described in the Building Manager R2A2.
significant building	Any BNL building or structure that is used as a place of assembly; contains a scientific experiment, or is a facility supporting an experiment such that a disruption in utilities to that building will degrade safety or interrupt an experimental schedule.
utility representative	A person knowledgeable about locations of services and designated by Plant Engineering's Operations and Maintenance (O&M) Utility Supervisor to mark a utility (e.g., Tower Line Supervisor or Group Leader). If not an O&M utility, the representative is the knowledgeable individual designated by management of that utility to locate and mark utilities.
worker exposure	The term used for an individual entering an excavation that is deeper than 4 feet or shallower involving other factors that could contribute to a cave-in or other personnel hazard (e.g., workers position in a trench, vibration ,or surface water)