1. PURPOSE

This document provides requirements for work in and around *excavations* (see def.) and *surface penetrations* (see def.) in order to ensure worker safety. This document implements requirements from codes and standards along with *contractor* (see def.) requirements. Any applicable regulatory or contractor requirements must be followed, with the most stringent requirement being met.

2. APPLICABILITY

This document applies to all subcontractors working in and around excavations and surface penetrations at the Idaho National Laboratory (INL), as specified in their contract with contractor. Stricter requirements may be imposed by subcontractors upon their employees or subtier contractors. The requirements of this document shall be followed by subcontractors; however, the means of implementation may vary as determined by the subcontractor.

3. REQUIREMENTS

3.1 General Requirements

NOTE 1: *When required, the subcontractor will support the contractor* Point-of-Contact *(PO;. see def.) and the Subsurface Investigation Team (SIT) to determine the exact location of the excavation. This may include survey support in the form of flagging or marking the excavation area, walk downs, or other site identification activities.*

NOTE 2: *The SIT will mark interferences. When locating underground utilities, a reasonable attempt will be made to identify the actual location, including the elevation of the utility within the area of the area to be excavated. The elevation and location of the physical interference is important in determining the areas of allowable machine excavation.*

NOTE 3: *The SIT performs work to MCP-1388, "Subsurface Investigations, Excavations, and Surface Penetrations," a contractor's procedure. The subcontractor will follow and support this process. The SIT information is documented through the company's form application available on the company's Construction website and included in work control documentation. MCP-1388 also lists activities exempt from the SIT process.*

3.1.1 Before performing any soil disturbance/excavation work or surface penetration, a subsurface investigation shall be performed. The contractor POC shall be contacted to obtain the results of any applicable subsurface investigation. [29 CFR 1926.651(b)].

3.1.2 A *competent person* (see def.) shall perform the following:

A. Monitor the work to ensure work it is in compliance with this document

B. Inform all affected employees of the SIT survey results

C. Conduct a pre-job briefing for excavations.

[Company Requirement]

3.1.3 The job supervisor is responsible for the following for the SIT survey:

A. Review the layout of imbedded utilities and interferences

B. Ensure the ground or surface (floor, wall, ceiling) are marked, clearly visible and maintained. The markings must match the information in the work control documents as specified by the SIT survey.

C. Provide feedback through redline drawings and/or photos to the STR as to the location of utilities/interferences as exposed during the work activity so that information can be updated by the SIT

D. For surface penetration, ensure that no surface-mounted energy sources, utilities or equipment is in the path of the boring or cutting equipment

E. Use depth control stops on equipment, when appropriate to protect systems.

F. Drill or cut from the most congested side of the surface ensuring that no hazardous energy source or equipment is in the power tool bit or blade path

G. If the subsurface investigation was inconclusive in identifying ALL embedded or non-embedded cables or piping, or if the surface penetration is to occur within 6 in. of embedded or non-embedded cables or piping, ensure that appropriate lockout/tagout measures are taken.

NOTE: *Process for the exemptions for lockout/tagout are listed in MCP-1388 and alternative measures will be listed in the work control document.*

3.1.4 If previously unidentified utilities are encountered during excavation/surface penetration activities, then the work shall be stopped and the contractor POC shall be notified. [Company Requirement]

3.2 Excavations

3.2.1 Excavations shall be performed in accordance with 29 CFR 1926, OSHA Construction Industry Standards, Subpart P.

3.2.1.1 The Excavation Safety Checklist as found in Appendix A shall be used and completed by a competent person.

3.2.2 Excavations with the potential for a hazardous atmosphere shall be evaluated for hazardous atmosphere before entry. [29 CFR 1926.651(g)]

3.2.3 If an evaluation indicates that a structure is endangered or potentially endangered, then the work shall be stopped and the contractor POC shall be notified. [Company Requirement]

3.2.4 When practical, sloping shall be used as the initial type of protective system for personnel working in an excavation. [Company Requirement]

NOTE: *All soils located at the INL are classified as type "C" soils unless otherwise determined by a competent person.*

3.2.5 Type "C" soils excavated 5 feet deep or more shall be sloped with an angle of incline not steeper than 1.5 feet horizontal to 1-foot vertical (34 degrees from horizontal).

3.2.5.1 Other sloping requirements shall be determined by an excavation competent person based on soil classification.

3.2.5.2 For soils other than type "C," Appendix A and B of 29 CFR 1926 Subpart P, shall be used, or shall be shored per work control documentation and Appendix C, D, E, and F of 29 CFR 1926 Subpart P. [29 CFR 1926.652(b)]

3.2.6 If an excavation is in a road that vehicles must cross, then it shall be covered with metal plating or equivalent material designed to carry a truck rear axle load of at least twice the maximum intended vehicle load, as determined by a qualified person, qualified in structural design. [Company Requirement]

3.2.7 All excavations within 5 ft horizontally or 2 ft vertically of marked underground energized wiring, non-abandoned piping, pressurized piping, or other identified potential obstructions of an unknown nature not present in a concrete ductbank shall be dug by hand (see Note) as documented on a work control document. [Company Requirement]

NOTE 1: *Environmental conditions including, but not limited to, deep frost, water soil saturation, etc. that can cause unpredictable soil behavior will be considered prior to application of the 2 ft-5 ft rule described above in 3.2.7.*

NOTE 2: *Non-obtrusive excavation equipment such as vacuum excavation or air lances will be considered an acceptable alternative to hand digging where conditions allow.*

3.2.8 If an excavation blocks a doorway, ramp, or other exit or entrance to a building, the contractor POC shall be contacted to determine whether an Outage Permit is required. [Company Requirement]

3.2.9 If an excavation blocks a doorway, ramp, or other exit or entrance to a building, the entrance shall be locked or barricaded and posted with a Danger or Caution sign(s). [Company Requirement]

3.2.10 Excavation areas shall have barriers and be properly marked before the excavation operations begin. [Company Requirement]

3.2.10.1 Barriers shall be maintained, at a minimum, of 10 feet from the edge of any open excavation.

OR

3.2.10.2 Barricades will be installed.

3.2.11 All employees shall comply with posted area requirements before entering the barricaded excavation area. [Company Requirement]

3.2.12 Personnel shall remain clear of the swing radius of heavy equipment while the equipment is in operation with spotters and/or barricades used to control personnel from entering the swing radius of operating equipment. [Company Requirement]

3.2.13 All protective systems (support systems, shield systems, and other protective systems) shall be evaluated by a registered professional engineer or competent person to determine the following:
[29 CFR 1926.652]

A. They are designed to have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

B. They are designed in accordance with 29 CFR 1926.652(c).

3.2.14 Heavy equipment, such as backhoes or trucks, shall be kept back from the edge of an excavation beyond the distance where there is any danger of cave-in. [Company Requirement]

NOTE: *"Employees performing work at excavation grade level, installing shoring, accessing/egressing excavations (or performing other activities) and are exposed to falls of six feet or greater will be protected by the use of fall protection methods prescribed in PRD-2002 Fall Protection."*

3.3 Surface Penetrations

3.3.1 The safety review of surface penetration activities shall include the following to prevent unintended intrusions: [29 CFR 1926.651]

3.3.1.1 The subsurface investigation shall identify and mark the position of all imbedded cables and piping.

Exception: A subsurface investigation is not required for cutting into precast concrete:

3.3.1.1.1 The physical location/layout of imbedded cables and piping shall be verified by the work supervisor/foreman.

3.3.1.2 If the SIT determined the subsurface investigation was not adequate to identify all embedded cables or piping, or, if the surface penetration is to occur within 6 inches of imbedded cables or piping, the following requirements shall be met:

3.3.1.2.1 Electrical circuits, cable and piping systems that serve the affected area shall be de-energized and placed into a safe work condition in accordance with company Lockout and Tagout processes.

3.3.1.2.2 If it is infeasible to perform lockout and tagout, for reasons of increased hazards or operational limitations, a detailed work plan shall be prepared describing the safe work practices that will be followed to mitigate the hazards associated with intrusion.:

3.3.1.2.2.1 The detailed work plan shall describe how to avoid intrusion.

3.3.1.2.2.2 Protective clothing and personal protective equipment shall be worn to completely mitigate the potential hazards (i.e., electrical, steam, etc.) of intrusion.

3.3.1.2.3 Equipment shall meet the following requirements:

3.3.1.2.3.1 Non-conductive equipment (e.g. fiberglass ladders, tools, etc.) shall be used.

3.3.1.2.3.2 Grounded or double insulated tools shall be used.

3.3.1.3 A shunt device (see Appendix B, Shunt Activation) shall be used when using grounded electric handheld tools (i.e., drills, saws, etc.) when cutting or drilling into concrete.

Exception 1: A shunt is not required when core drilling or cutting into precast concrete.

Exception 2: A shunt is not required for double insulated motors or battery-operated motors, steel surfaces or wet surfaces.

3.3.1.3.1 If the shunt device activates during drilling or sawing, the device shall be disengaged and the reason for activation shall be determined.

3.3.1.3.2 The need for attaching a grounding strap to tools shall be evaluated when a shunt has activated.

4. DEFINITIONS

See LST-27

5. REFERENCES

5.1 Source Documents

10 CFR 851, "Worker Safety and Health Program"

29 CFR 1926, Subpart P, "Excavations, Trenching, and Shoring"

ANSI D6.1, *Manual on Uniform Traffic Control Devices for Streets and Highways*

5.2 Related Requirements

The following documents may also contain requirements that apply to this activity:

MCP-1388, "Subsurface Investigations, Excavations, and Surface Penetrations"

PRD-2002, "Fall Protection"

PRD-2012, "Lockouts and Tagouts"

PRD-2110, "Confined Space"

6. APPENDIXES

Appendix A, Form 440.31, "Excavation Safety Checklist"

Appendix B, Shunt Activation

Appendix A

Excavation Safety Checklist

(This appendix is equivalent to company Form 440.31)

(To be completed by an Excavation Competent Person)

Site Location: _____ WO No.: _____ Project Title: _____

Date: _____ Time: _____ Excavation Competent Person: _____ S No.: _____

Supervisor/Foreman at Excavation: _____

Soil Classification: _____ Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

INDICATE FOR EACH ITEM: YES – NO – N/A (Not Applicable)

1. General Inspection of Job-Site:	**YES**	**NO**	**N/A**
A. Surface encumbrances (trees, boulders or other hazards) are removed or supported	☐	☐	☐
B. Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation	☐	☐	☐
C. Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation	☐	☐	☐
D. Barriers provided at all excavations, wells, pits, shafts, etc, as required	☐	☐	☐
E. Walkways and bridges over excavations 6 feet or more in depth are equipped with standard guardrails	☐	☐	☐
F. Warning vests or other highly visible clothing provided and worn by all employees exposed to vehicular traffic	☐	☐	☐
G. Warning system established and utilized when mobile equipment is operating near the edge of the excavation	☐	☐	☐
H. Adequate protection is provided for employees working below other employees on the faces of sloped or benched excavations	☐	☐	☐
I. Vibrations from equipment or traffic do not pose a problem to trench stability	☐	☐	☐
J. Excavations under 5 feet in depth and not sloped/shored are in sound condition.	☐	☐	☐

NOTE: *An excavation competent person may determine that sloping/shoring is appropriate for excavations under 5 feet in depth.*

INDICATE FOR EACH ITEM: YES – NO – N/A (Not Applicable)

		YES	NO	N/A
2.	**Utilities:**			
	A. Known utilities located	☐	☐	☐
	B. Areas where 2–5 Rule is applicable for known underground utilities are specifically identified	☐	☐	☐
	C. Underground installations protected, supported or removed when excavation is open.	☐	☐	☐
3.	**Means of Access and Egress:**	**YES**	**NO**	**N/A**
	A. Lateral travel to means of egress no greater than 25 feet in excavations 4 feet or more in depth	☐	☐	☐
	B. Ladders, if used in excavations, are secured and extended 3 feet above the edge of the protective system	☐	☐	☐
	C. Materials and integrity of structural ramps used by employees or equipment in good condition and meet requirements.	☐	☐	☐
4.	**Wet Conditions:**	**YES**	**NO**	**N/A**
	A. Precautions taken to protect employees from the accumulation of water	☐	☐	☐
	B. Water removal equipment monitored (when in use)	☐	☐	☐
	C. Trench walls and bottoms are free of water seepage.	☐	☐	☐
5.	**Hazardous Atmosphere:**	**YES**	**NO**	**N/A**
	A. Atmosphere within the excavation tested whenever there is a reasonable possibility of an oxygen deficiency, combustible, or other harmful contaminant exposing employees to a hazard	☐	☐	☐
	B. Adequate precautions taken to protect employees from exposure to an atmosphere containing less than 19.5% oxygen and/or other hazardous atmospheres.	☐	☐	☐
	C. Ventilation provided to prevent employee exposure to an atmosphere containing flammable gas in excess of 10% of the lower explosive limit of the gas	☐	☐	☐
	D. Testing conducted as required by industrial hygienist to ensure that the atmosphere remains safe.	☐	☐	☐
6.	**Protective Systems:**	**YES**	**NO**	**N/A**
	Sloping			
	A. The top of excavations/slopes is free of any tension cracks	☐	☐	☐
	B. Soil and rock are stable with no significant fracture planes	☐	☐	☐
	C. Excavation is free of caving or sloughing	☐	☐	☐
	D. Angle of slope is appropriate for the type of soil	☐	☐	☐

INDICATE FOR EACH ITEM: YES – NO – N/A (Not Applicable)

Shoring/Shield	**YES**	**NO**	**N/A**
E. Excavation of material to a level no greater than 2 feet below the bottom of the shoring system	☐	☐	☐
F. Materials and equipment used for shoring/shield system are in good condition	☐	☐	☐
G. Members of support system securely fastened to prevent failure	☐	☐	☐
H. Tabulated design data is maintained at the jobsite during construction of the system for a shoring system designed by a RPE. The data must identify the RPE who approved the data.	☐	☐	☐

Trench Box	**YES**	**NO**	**N/A**
I. Excavation of material to a level no greater than 2 feet below the bottom of the trench box	☐	☐	☐
J. Trench box extends at least 18 inches above the trench or slope of trench	☐	☐	☐
K. Trench box supports are securely fastened to prevent failure	☐	☐	☐
L. Shield system placed to prevent lateral movement	☐	☐	☐
M. Tabulated design data or the certified design itself maintained at the jobsite for a trench box system designed by a RPE during construction of the system. The data or design must identify the RPE who approved the data.	☐	☐	☐

Remarks:

I hereby attest that the following conditions existed and that the preceding items were checked or reviewed during this inspection. Additional remarks are provided where deficiencies exist(ed).

Excavation Competent Person Printed Name	Excavation Competent Person Signature	Date & Time

Appendix B

Shunt Activation

1. SHUNT DEVICE ACTIVATION

1.1 Worker: If a shunt device activates when cutting or drilling, perform the following before installing the external grounding strap:

1.1.1 Worker: Stop work.

1.1.2 Worker: Notify supervision.

1.1.3 Worker: Disengage the shunt device.

1.1.4 Job Supervisor, Facility Representative, and Worker: Determine the reason for shunt device activation.

1.1.5 Job Supervisor: Notify the NFM, FM, and/or Manager of Buildings (MOB), and, the Maintenance manager, DD&D manager, or Projects Construction manager, as applicable.

1.1.6 NFM, FM, and/or MOB, and, as applicable, the Maintenance Manager, DD&D Manager, or Projects Construction Manager: Perform the following:

1.1.6.1 Determine alternatives such as relocating the proposed surface penetration and, as applicable, utilize other SI methods (for example, portable X-Ray system or radiography) to identify more suitable penetration locations.

1.1.6.2 Based on the type of shunt being used, determine the need to connect an external grounding strap as follows:

1.1.6.2.1 Observe shunt manufacture's instruction.

1.1.6.2.2 Determine the need for an electrical engineer's evaluation for the proper installation of the external grounding strap.

1.1.6.2.3 Notify worker to install ground strap.

1.1.6.3 Ensure the work control documents mitigate the worst-case hazardous energy identified, and, as appropriate, mitigate and/or minimize risk to the building/embedded equipment.

1.1.6.4 Evaluate the need to revise the work control document.

1.1.6.5 Give approval to continue cutting or drilling into surfaces.