

Construction Procedure *for*
Concrete
Structure (Floor,
Wall, and Ceiling)
Penetration
Permits
At LLNL

(Formerly known as MOP 03001)

Revision 10
December 9, 2004

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(Floor, Wall and Ceiling)
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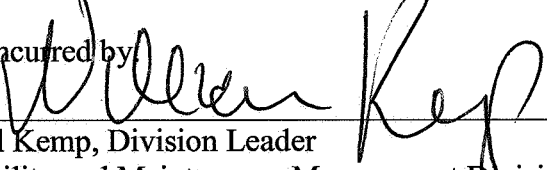

Bruce Fritschy, Permit Office Supervisor
Technical Administration Group

Date: 12/10/04

Concurred by:


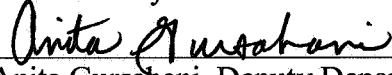
Bill Wells, Team Leader
Environmental Safety & Health Team 4

Date: 12/10/04

Concurred by:



Bill Kemp, Division Leader
Facility and Maintenance Management Division

Date: 12/10/04

Concurred by:


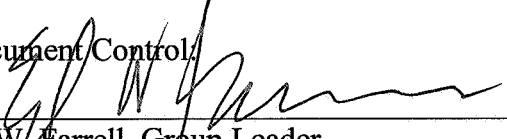
Anita Gursahani, Deputy Department Head
Plant Engineering Department

Date: 12/13/04

Approved by:


Ed Helkenn, Department Head
Plant Engineering Department

Date: 12/13/04

Document Control:


Ed W. Farrell, Group Leader
Support Services Group Leader

Date: 12/10/04

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1. Purpose

The purpose of the Concrete Structure Penetration Permit procedure is to detail the process and requirements of receiving an approved Concrete Structure Penetration work permit for all work at Sites 200 and 300. Concrete penetration is defined any disturbance of a concrete or cinder block surface using, but not limited to, saw cutting, core drilling, jack hammering, and use of power and pneumatic tools. The Concrete Structure Penetration Permit Process is required to minimize the risk of injury to personnel and to eliminate unplanned outages due to damage of embedded utilities. The Concrete Structure Penetration Permit Process also allows for identification and documentation of as-built drawings showing locations of previously mislabeled, inaccurate, or unknown embedded utilities.

2. Application

All potential concrete penetration jobs greater than 3” in depth at Sites 200 and 300 must, at a minimum, be brought to the attention of the Permit Office to be scheduled for a locate. It will then be determined by the Permit Office if a permit is necessary. Variances will be given by the Permit Office on a case-by-case basis. Floor, wall, and ceiling penetration through non-concrete materials (such as drywall) is covered under Plant Engineering IWS/SP 11345, “Wall and Ceiling Penetration.”

3. Variances

All asphalt and sidewalk removal will be treated as slab on grade (soil permit) and fall under PROC-CON-0003, "Construction Procedure for Soil Excavation (Digging, Grading, Tunneling, Trenching, and/or Drilling) Permits."

For Concrete Structure Penetration outside the exterior perimeter fence at Site 200, or Site 300, contact the Permit Office for special instructions. Please see Attachment 2 for the contact list.

Possible variance situations are detailed as follows:

- A permit is not required for single-point penetrations less than 3 inches in depth (i.e., for anchors). However, the RI shall ensure the proposed work area has been thoroughly scanned for embedded utilities and solid objects using the instruments referred to in this procedure. The minimum requirement shall be scanning of a proposed work site with an Electronic Metal Locator such as the Zircon MT6 or equivalent, capable of detecting ferrous and non-ferrous metal up to a depth of 6 inches in concrete. The scan must occur prior to the start of work.
- All sawcuts will require a ground penetrating radar (GPR) scan, regardless of depth.
- Moveable preformed cast concrete structures (i.e. manhole, Christy boxes, and vaults) will not require a permit. Call the Permit Office for more information.
- Other variances (such as drilling into concrete slabs where it has been documented that no utilities are embedded) may be issued a variance at the discretion of the Permit Office.

4. Definitions

4.1 Requester

Any LLNL or contract employee may request a locating survey to determine the location of buried utilities and/or substructures.

4.2 Responsible Individual (RI)

An RI must be an LLNL Employee and comes primarily from the groups listed below.

1. Project Managers from Plant Engineering
2. Construction Managers for Purchase Order (PO) construction subcontracts and blanket contracts
3. Construction Coordinators for Labor Only construction subcontracts
4. Maintenance / Operations Lead or First Line Supervisors in crafts
5. Second Line Supervisors
6. Maintenance Coordinators for PE facility maintenance work orders
7. Utility Managers, Engineers, and Coordinators in UTel
8. Those individuals whom program management has assigned the responsibilities and who have the skills, knowledge and abilities to manage a soil excavation project safely and within the guidelines set forth by this procedure. When the RI falls into this category, the cognizant Program Associate Director Facility Manager (ADFM) must provide the permit office with a completed certification form. The completed form along with successful completion of the RI testing requirement (see below) will constitute qualification of those individuals. The form may be obtained at intranet site location: http://www-r.llnl.gov/plant_eng/safety/ism/permit_Forms.html

An RI must also be certified annually before any permits will be issued. Go to the Plant Engineering web page for access to the RI Certification and testing page: http://www-r.llnl.gov/plant_eng/ After successful completion of the test, the RI's name is automatically entered into L-Train as successfully completing the requirement.

An RI may also delegate his responsibility for the portions of this procedure after the permit has been issued. The RI must assure the designee has the skills, knowledge, and abilities (SKAs) to assume this responsibility.

4.3 Utility Locators

Utility locators are technicians who use special instruments to find utility lines embedded in concrete or underground. Concrete scans must be performed by LLNL Locators. Outside contractor utility locations are not permissible unless the contractor is approved through the Permit Office except for X-ray scanning for locating embedded objects in concrete. Outside contractors must have a third party certification and be approved by the Permit Office. Contact the Permit Office for a list of approved vendors, or to request that a vendor go through the approval process.

5. Roles and Responsibilities

5.1 Requester:

The requester is responsible to notify the Permit Office of all potential concrete projects and to make sure that the Permit Office and Utility Locators have all the information they need to start the process and undertake the utility line location.

5.2 The Responsible Individual (RI):

- Ensures external vendors or contractors follow this procedure.
- Acts as the central point of contact to the Permit Office, Utility locators, project requesters/management, and workers regarding issues pertaining to the permitted penetration.
- Is responsible for the safety of the job site and the correct implementation of this procedure. Additionally, the RI must follow the Integrated Safety Management (ISM) procedures set forth in the Environment, Safety & Health (ES&H) Manual. Any two safety related violations on the same project will result in a letter of violation to the RI and their Supervisor.

5.3 Utility Locators:

- Must keep current on all training and technology advances.
- Use their knowledge to provide the client with the best, most accurate concrete scans they can and to provide clear documentation of the results to both the Permit Office and the client.

NOTE: It is recognized by the Locating industry, that the accuracy of locating utilities within soil or concrete is not error free. The profession of locating buried utilities requires a combination of advanced instruments and equipment, properly trained personnel, and experience in solving utility-locating issues.

5.4 The Permit Office (at Sites 200 & 300):

- Manages the Permit Process and database.
- Coordinates the efforts of various parties in the permit process.

6. Process

See Attachment 1 for a flow chart of the typical Permit Process. For examples of all permit forms, go to http://www-r.llnl.gov/plant_eng/safety/ism/permit_Forms.html

6.1 Pre-Permit Initiation Requirements

The RI, in conjunction with the Requester:

- Ensures his/her RI certification is valid.
- Reviews as-built and historical construction project drawings and documents available by request from the Print Room in B551E and/or from program personnel and submit all information to the Permit Office in B516 to expedite the utility location survey/Permit process.
- Uses the “Lessons Learned” web site for additional Concrete Structure Penetration information. http://www-r.llnl.gov/plant_eng/services/facilities/soil_concrete.html
- Thoroughly examines the physical location of the project.
- Determines if a Structural Engineering Evaluation (SEE) is required.
- Outlines the perimeter of the project area in white (per California Code 4216) in preparation for embedded utility Locating using non-permanent means. Use of white or manila colored tape is preferred; however, white washable crayon or soapstone is also acceptable. Use of pencil as a marker is not recommended.

6.2 Permit and Utility Location Survey Initiation

The Requester must schedule a Locator Survey through the Site 200 Permit Office (Building 516, Extension 3-PRMT) and supply marked-up drawings of the area.

- From the day the utility location survey is scheduled with in-house locators to the day a permit may be issued is about **14 calendar days**. Emergencies will be handled accordingly.
- All project technical information must be supplied to the Permit Office before the permit is issued and after the project is completed.
- The scope of work is communicated to the Locator through verbal and written drawings and documents at this stage.
- Complex scenarios must be identified to the Utility Locator(s) and Utility Locator Supervisor.

NOTE: Penetrations of slabs on grade that extend outside the building envelope must have a survey of both the soil and the concrete. Please refer to the Soil Excavation Permit Procedure, PROC-CON-0003, for more detail.

6.3 Utility Location Survey

The Utility Locators:

- Review the scope of the Concrete Structure Penetration project with the RI. On complex jobs, a walkthrough of the job site may be required at both the beginning and the end of the utility locating survey.
- Conduct a visual inspection of the job site, field verify the markings of the defined job site and document the findings on the Locator Concrete Structure Penetration Field Survey Checklist (see http://www-r.llnl.gov/plant_eng/safety/ism/permit_Forms.html for a link to the sample.)
- Use California Code 4216 standard colors to mark utilities and any other solid objects when identified, using non-permanent means. Use of colored tape is

preferred however, washable crayon, or soapstone is also acceptable. Use of pencil as a marker is not recommended. Black tape will indicate solid objects when the exact identity of the object is unknown.

- Perform a visual inspection of the job site and document the findings on the Field Survey Checklist.
- On all sketches, identify embedded utilities and / or solid objects to a level of detail which includes the North direction marker, street names, building number, floor number, room number, As-built drawing numbers, and any other identifying markings that help to define the area.
- Identify and mark all embedded or exposed utilities and potential hazards such as exposed conduit, manholes, valve boxes, transformers, etc, prior to penetration.
- Identify and contact utility representatives in regard to unknown utility line routing, high voltage manholes, low voltage circuits, cable vaults, etc, where applicable.
- Document the results of the utility location survey using photos, printouts of scans, sketches, as-built drawings and / or historical project documents.
- Communicate and document the findings of the utility location survey with an enlarged site map, notes, sketches, photos, and drawings to the RI and Permit Office.
- Use a second Locator to verify the results of the first Locator on complex jobs.
- Produce the Locators Report (see http://www-r.llnl.gov/plant_eng/safety/ism/permit_Forms.html for a link to the sample) for the specific project.
- Store and archive electronic files and / or images related to the Locator survey for historical purposes
- The Utility Locators use the following trade equipment or equivalent as a minimum requirement for locating embedded utilities:

- a. Ferromagnetic scanners (detect ferrous and non-ferrous metal up to 6 inches deep)
 - b. Ferromagnetic scanning Detection
 - c. Ground Penetrating Radar (certification required)
 - d. 60 Hz passive Scan
 - e. Radio frequency where applicable
- At the Locator's discretion, additional areas may be scanned outside the project perimeter and may require additional As-built drawings and other data to assist in performing hazard assessments.

6.3.2 **The Permit Office**

- Ensures an automated email will be sent to the RI 3 calendar days prior to the expiration of the Locator's survey if an approved permit has not been issued.

6.4 **Permit Generation**

- The RI must obtain the Concrete Structure Penetration Permit within 15 calendar days of the Locating survey and before work is started. See Attachment 3 for the contact list.
- Any variances from the permit process will be granted through the Permit Office on a case by case basis.
- The Permit Office Issues the Permit and provides the RI with the Permit Package. The RI will need to add documentation of any other pre-excavation reviews, permits, and paperwork. (See http://www-r.llnl.gov/plant_eng/safety/ism/permit_Forms.html for a link to Sample Concrete Permit forms.)
- A Concrete Penetration Permit is approved for 30 days. However, Permit extensions may be granted a maximum of 5 times, each for a period of 30 calendar days. Extensions beyond the maximum shall require a new permit to

be issued. At the discretion of the Permit Office, the job may need to go through the entire permit process in order to obtain the new permit.

6.5 Permit Approval

- 6.5.1 **The Outage Requirement:** The RI must obtain all appropriate outages if there are utilities in the vicinity of the excavation site. If outages are not a viable option due to program requirements, the appropriate program representative (FM or ADFM) signature is required on the Permit (see link below) before work begins to exempt the RI from this outage requirement. The Permit Office will not approve the permit until this step has been accomplished. Potential outages are: Low Voltage, High Voltage, and Mechanical. For High Voltage and Mechanical outages, contact UTel. For Low Voltage outages, contact the Technical Administration Group of Plant Engineering.

http://www.llnl.gov/es_and_h/hsm/doc_3.05/doc3-05.html#s9

- 6.5.2 **The RI Signature** indicates that he/she fully agrees to the scope of the document, is aware of all the requirements, and agrees to perform the work within the requirements of this procedure.
- 6.5.3 **The Permit Office** or designated representative signature indicates that the requirements of this procedure have been met up to this point.

6.6 The Concrete Penetration Permit Package

The permit package consists of:

- Job Safety Analysis (JSA)
- Approved Concrete Structure Penetration Permit
- Locator Concrete Penetration Field Survey Check List
- Utility Locators Report with printouts and electronic files, sketches, photos, etc.
- As-Built Drawings

- Historical Construction Project Drawings and Documentation
- A Site Map with Enlarged Project Section
- A Structural Engineer Evaluation (SEE) (where necessary)
- Hazard Assessment (where necessary)
- Any Applicable Utility Outage Documentation, such as for Low Voltage and High Voltage (please see PROC-CON-0004 for Low Voltage permit requirements, or call UTel for the procedure on High Voltage).

6.7 Pre-Penetration Reviews and Requirements

6.7.1 The RI

- Communicates all project technical information to the project staff members, Service Providers, and Contractors prior to the beginning of work to assure complete understanding of project and safe project operation. Items to be communicated include the scope and any conditions of the permit
- Requests and reviews a completed Locating survey of the mapped area.
- Ensures Hazard Assessments are performed of buildings and utility vaults where decommissioning, deactivation, decontamination, and demolition are taking place.
- Makes project pre-start notifications a minimum of 48 hours prior to start of work.
- Determines if a structural review and approval (Structural Engineer Evaluation or SEE) is required by a California Civil/Structural Engineer. SEEs are required when performing any penetrations to primary structural members (beam and columns) and / or penetrations 6 inches or greater in diameter into floors, walls or ceilings. If multiple penetrations conjoin to create a penetration larger than 6" in any direction, the SEE is also required. If a SEE is required, concrete penetrations can not begin until the SEE is performed and comments have been recorded. Please see Attachment 2 for the Contact List.

- Completes a Job Safety Analysis (JSA). The completed JSA shall be delivered to the Permit Office within 24 hours after start of project. See http://www-r.llnl.gov/plant_eng/safety/ism/permit_Forms.html for links to the sample Concrete Structure Penetration Job Safety Analysis Checklist and other permit forms. .

6.7.2

The Permit Office

- Sends out an automated “Out of Compliance” e-mail to the RI and Permit Office Supervisor if the JSA is not submitted within 24-hours of the start of construction. The RI must respond immediately to avoid job shutdown.
- Sends out an automated “Out of Compliance” e-mail to the RI and Permit Office Supervisor if a Structural Engineer Evaluation was needed and not performed.
- Any “Out of Compliance” job will be shut down by the Permit Office.

6.8

Permit Compliance Inspections

All Permitted projects are subject to field compliance inspections. Field Inspections can occur without prior notification and are performed to assure compliance with ES&H requirements, safety, and adherence to this procedure. Field inspections will be performed by the TAG group when projects are performed by LLNL crafts. Field inspections will be performed by Inspection/Construction Coordinators or the TAG group for work performed by vendors / contractors.

All incidents that have been found to deviate from this procedure will be reported to the Permit Office immediately. Reported incidents will be reviewed and corrective actions will be implemented.

Out of Compliance Projects: Any project found to be out of compliance with the permit, whether from lack of appropriate JSA, Structural Review, other reviews, or other field requirements will be shut down by the Permit Office.

Any two safety related violations on the same project will result in a letter of violation to the RI and their Supervisor.

6.9 Concrete Penetration Work

The RI must:

- Create and maintain a safe work site.
- Minimize risk of damage to equipment and facilities.
- Plan the project to minimize unplanned utility outages.
- On an annual basis, ensure that all LLNL and supplemental labor crafts personnel and subcontractor employees review the video, “LLNL Soil Excavation & Penetration Permit Process Awareness”. See the Permit Office or appropriate line management for availability.
- Each day, communicate the scope and the requirements of the permit to the LLNL and supplemental labor crafts personnel and subcontractor employees prior to the start of work.
- Each day, agree upon scope of work for that day with the LLNL and supplemental labor crafts personnel and subcontractor employees prior to the start of work.
- Identify and communicate acceptable and unacceptable work methods that are consistent with the permit to the LLNL and supplemental labor crafts personnel and subcontractor employees.
- Assign appropriate responsibilities to specific individuals.
- Ensure external vendors or contractors follow this procedure.
- Ensure any change of scope is reflected as a new Locating survey, and a new Permit.
- Assure the Concrete Structure Penetration is performed using the appropriate techniques and equipment as per 29 CFR.

- Post a copy of the Permit Package in clear view at the job site for the duration of the project.
- Ensure the Locator's markings are clearly visible prior to and during the Concrete Structure Penetration.
- Report any damaged utilities to the Permit Office first for a Locator response, secondly contact the appropriate LLNL Utility organization. See Attachment 2 for Contact information.
- Coordinate the removal of all recycled material or excess dirt from the project site with Environmental Protection Dept (EPD). See Attachment 2 for the Contact list.
- Make sure appropriate Personal Protective Equipment (PPE) is used:
 - Insulated gloves – a minimum rating of Class 2 insulated gloves rated at 17kV with moisture absorbing liners and protective leather outers.
http://www.llnl.gov/es_and_h/hsm/doc_11.01/doc11-01.html#10.3.9
 - Insulated Safety Work Boots – a minimum electrical insulation rating of 17kV and to include steel toe protection.
http://www.llnl.gov/es_and_h/hsm/doc_16.01/doc16-01.html#23.3.12
The insulated boots and gloves must be tested and approved in accordance with manufacturer's standards.
- Make sure appropriate General Protective Equipment is used:
 - Ground Fault Circuit Interruption (GFCI) – shall be utilized when electrical equipment is used in these operations.
- All penetrations remain within the marked perimeter.
- If during the Concrete Structure Penetration an embedded utility is encountered that has not been previously identified, stop work immediately and call the Permit Office and the LLNL Utility organization. Please see the contact list on Attachment 2.



WARNING: If during penetration an Electrical Line is damaged, and there has been an injury, call 911 on LLNL internal telephones or 447-6880 on cellular telephones. If no injury has occurred call the LLNL Shift Supervisor Office and the Permit Office. Please see Attachment 2 for

contact information.



WARNING: If during penetration a Gas Line is damaged, evacuate the area and dial 911 on LLNL internal telephones or 447-6880 on cellular telephones. If no injury has occurred call the LLNL Shift Supervisor Office and the Permit Office. Please see Attachment 2 for contact information.

6.10 Project Completion and Close Out

The project is complete when the area has been cleared of debris and / or returned to service.

6.10.1 The RI must:

- Ensure the project area has been cleared of debris and / or returned to service.
- Submit the data listed below to the Permit Office upon completion of the project:
 - As-Built drawings showing updated project data
 - Revised As-built drawings, sketches, photos, and printouts showing project data and locations of embedded utilities and solid objects.
 - Photographs or digital photograph files.
 - Approved and Complete Permit Package as posted at the job site.
 - Historical Construction Project Drawings and Documentation showing project updates
 - A Site Map with Enlarged Project Section
 - A Structural Engineer Evaluation (SEE) (where applicable)
 - Outage documentation (Low Voltage, High Voltage, and/or Mechanical) where outages were necessary.

6.10.2 The Permit Office shall:

- Store and archive final Permit documentation.
- Route applicable drawings and markups from completed project for update in CAD.

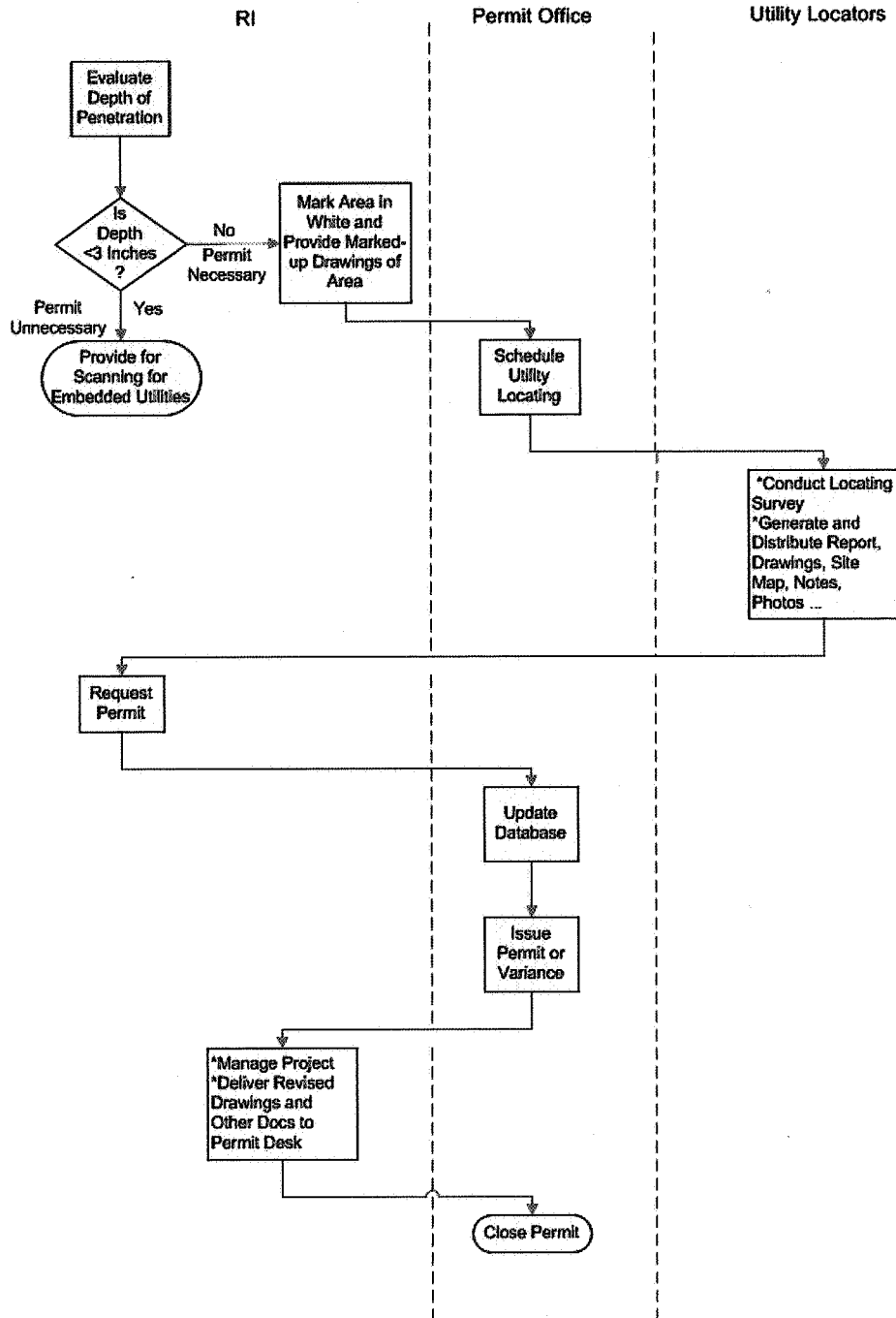
- Ensure an automated email will be sent to the RI upon expiration of the permit.
- Send out electronic notices of the permit/dig completion.

7. Work Controls

7.1 Change Control

This document shall be reviewed periodically by the Originator or the Originator's supervisor and maintained by the Facilities Maintenance Management Division. The most current version of this document and all PE Procedures shall be used at all times. Obsolete versions shall be removed from service.

Attachment 1: Flow Chart for Typical Concrete Penetration Permit



Attachment 2

Contact Reference List

<u>Group to Contact</u>	<u>Primary Contact</u>	<u>Alternate Contact</u>
<u>Structural Engineer Evaluation Services</u>	Madhu Kamath Site 200 B551E, Room 220 423-7860	Mark Sampson Site 200 B551E, Room 225 423-0985
<u>Utility Locators</u>	Bruce Fritschy B516, Room 218E 423-5677 Cell phone 519-0967	Contact the Permit Office 3-PRMT
<u>Permit Office</u>	Plant Engineering Site 200 423-PRMT Site 300 at 423-5211	If the Permit Office is not available, please contact the LLNL Shift Supervisor
<u>LLNL Shift Supervisor Office</u>	Site 200 call 422-9762 Site 300 call 423-5247	
<u>Technical Administration Group</u>	Bruce Fritschy B516, Room 121 423-5677 Cell Phone 519-0967	Dennis Chew B516, Room 128 422-8120 Cell Phone 525-5720