1.0 Policy

Shutdown procedures are vital for a coordinated, efficient interactions between the construction team and the San Francisco Public Utilities Commission (SFPUC) operations group. For this reason, Water System Improvement Program (WSIP) project construction shutdowns shall be coordinated with the project Operations Representative (OR). The OR works with the SFPUC Shutdown Delivery Team (SDT) to coordinate planned project shutdowns for a specific WSIP project; therefore, planned project shutdowns must be scheduled, approved, and implemented in an orderly, safe fashion with minimal impact on Operations and the other WSIP project shutdowns. A flow chart showing the Master System Shutdown Scheduling (MSSS) process is shown in Attachment 022-6.

Approved Lock Out/Tag Out (LOTO) protocol shall remain in full force and effect until all work, including all connections, is fully completed on existing lines, including service connections and all required testing. This includes all appurtenant thrust blocks, restraints and backfill to be complete as specified on/or shown on the contract drawings. Unless prior written arrangements to the contrary are made with SFPUC Operations, Contractor shall not relinquish control of the work, i.e. turn in keys to lock box, until such work is completed and formally acknowledged to be complete by the Project CM.

This shutdown procedure applies to all personnel working on the WSIP to the extent that their work is affected by this WSIP Construction Management (CM) Procedure and does not conflict with specific SFPUC policies or the Contract under which the work is executed.
2.0 Description

This procedure defines the tasks, sequence and responsibilities for execution of systems shutdowns during the construction phase of the WSIP Program. This procedure also describes how issues identified during the process will be managed and resolved. It will be necessary to adapt this procedure to the actual scope and content of each project. The facility testing and start-up process detail description is provided in CM Procedure No. 039, System Testing and Start-up.

3.0 Definitions

3.1 System Shutdown

System Shutdown is the 1) closing/opening of valves and/or depressuring and draining of pipelines or system components and/or 2) de-energizing or isolating system components including electrical systems. Shutdowns are typically executed in order to allow for inspections, tie-ins or replacement/upgrade of pipeline or system components. Shutdowns may affect a portion of a transmission system, a facility component, a facility, a control system, or an entire system.

3.2 System Outage Request (SOR)

System Outage Request (SOR) shown in Attachment 022-1 is a request made by the Contractor after award of the contract, through the Project CM, to a SFPUC Water Enterprise Operating Division to shutdown a portion of a system in order to perform work.

3.2.1 A SOR is needed for full or partial shutdowns and hot taps. One (1) SOR is required for each pipeline or facility shutdown. Once the SOR is approved, it will be re-forecast in the WSIP Master System Shutdown Schedule.

3.3 Operational Change Request (OCR)

An Operational Change Request (OCR) is a SFPUC-generated request to take a system, or portion of a system out of service. The OCR includes the Contractor’s SOR submittal and other operational details concerning maintenance of service and equipment during the shutdown. The OCR is prepared by the project Operations Representative and is approved by the Operations Division Manager.

3.3.1 The OCR requires a Work-Around Plan as presented in Section 5.13 for certain critical shutdowns. Please note that the three (3) SFPUC operating divisions have different versions of the OCR.

These OCR versions are;

- Water Supply & Treatment Division, Attachment 022-2.
- City Distribution Division, Attachment 022-4.
3.4 **WSIP Master System Shutdown Schedule and WSIP System Shutdown Matrix**

WSIP shutdowns are scheduled in an iterative fashion using two documents, the WSIP Master System Shutdown Schedule and the WSIP System Shutdown Matrix.

3.4.1 The Master System Shutdown Schedule (bar chart) shows all shutdowns required for implementation of the WSIP program. This is the official WSIP shutdown schedule. Two variations of this schedule are produced monthly, one variation is sorted by time and the second variation is sorted by geographical area (WSIP regions). The Master System Shutdown Schedule facilitates an overview of system impacts during shutdowns. The Master System Shutdown Schedule, an extract of the official WSIP schedule provided by the project teams, is electronically maintained and updated for the Shutdown Coordinator (SDC) by SFPUC Project Control and Scheduling Bureau (PCSB).

3.4.2 The Master System Shutdown Matrix (chronological table), based on input from WSIP Operational Representatives and Project Teams, shows WSIP shutdowns and hot taps operational shutdowns, and some WSIP or operational activities which potentially could impact shutdowns. The Master System Shutdown Matrix is a detailed document maintained by the SDC.

3.5 **Construction Kick-off Meeting**

Construction Kick-off Meeting lead by the Project CM is a coordination meeting held shortly after the Notice to Proceed (NTP) with City and Contractor staff. Shutdown responsibilities, equipment purchasing lead times, and schedule-related matters are reviewed at this meeting.

3.6 **Pre-shutdown Meeting**

Pre-shutdown Meeting lead by the Project CM with participation by the Project Shutdown Delivery Team is a coordination meeting held approximately thirty (30) calendar days prior to a shutdown to confirm the status of Contractor and City activities that will occur before, during and after the shutdown.

3.7 **The Shutdown Delivery Team (SDT)**

The Shutdown Delivery Team includes the Project Manager or Regional PM, Project CM, Operations Representative(s), PE, EMB Systems Engineering Representative(s), Health and Safety Representative, Water Quality Division Representative, Communications Representatives, and the Shutdown Coordinator.

3.8 **Lockout /Tagout (LOTO)**

3.8.1 Lockout/Tagout (LOTO) is a safety procedure necessary to isolate a pipeline/tank or system component from the potential release of hazardous energy while employees perform work. The LOTO plan must accompany the OCR.
3.8.2 Hazardous energy may include electrical, mechanical, hydraulic, pneumatic, chemical, and other sources. Refer to SFPUC LOTO program (Attachment 022-7).

3.8.3 An isolated pipeline or tank may involve confined space entry. Guidelines addressing confined space entry, minimizing potential engulfment, and the necessary plan for managing incidental water are given in Attachment 022-9.

3.9 **Hydraulic Analysis**

A system shutdown hydraulic analysis is a study of how the water pressure, or hydraulic grade line (HGL), within a water transmission and delivery system is affected by a facility shutdown, and is used to analyze potential consequences to meeting system delivery goals, refer to Section 6.1 for details.

3.10 **Out of Service Date**

The date that Operations starts to remove a SFPUC facility from service. Subsequently, Operations performs joint lockout/tagout, dewateres, de-energizes, and/or prepares a facility to turnover to the Contractor via the Project CM. The out of service date is the start of the shutdown.

3.11 **Back in Service Date**

The date that Operations finishes restoring a SFPUC facility to service. Beforehand, Operations receives the facility from the Contractor via the Project CM, ends joint lockout/tagout, refills, disinfects, re-energizes, and/or prepares a facility for service. The back in service date is the end of the shutdown.

4.0 **Responsibilities**

4.1 **Project Construction Manager (Project CM)**

The Project Construction Manager (Project CM), with the assistance of the Shutdown Coordinator, Regional Project Manager, Regional Construction Manager, and Operations Representative shall;

4.1.1 Serves as the lead person to deliver the shutdown with the assistance of the OR and is a member of the SDT.

4.1.2 Coordinates with the Contractor to develop and implement project specific system shutdown plans during construction and notifies the SDC of changes to the shutdown schedule, duration, or scope.

4.1.3 Ensures Contractor shutdown responsibilities are reviewed at the Construction Kick-off meeting and are reflected in the Contractor’s baseline schedule.

4.1.4 Ensures Contractor prepares details of contractor staff, schedule, equipment and materials to be employed during a shutdown.
4.1.5 Assists the RPM in updating the Work-Around Plan, for certain critical shutdowns, started by the project team with assistance of the Shutdown Delivery Team.

4.1.6 Notify Water Enterprise Operations, Shutdown Coordinator and project Communications Representatives of updates to the Master System Shutdown Schedules from the Pre-Shutdown Meetings with the Contractor, refer to Section 5.6.

4.1.7 Periodically checks on the status of Contractor’s acquisition of long-lead purchase items necessary for shutdowns.

4.1.8 Monitors Contractor’s work as per Section 5.8.

4.1.9 Certify that the Contractor’s shutdown-related testing has been performed as per Section 5.9.

4.1.10 Reviews and signs the Contractor’s SOR.

4.1.11 Notify SDT of start and completion of the Contractor’s portion of the shutdown work as per Section 5.10.

Further details on Project CM responsibilities are given in procedure Section 5.

4.2 Operations Representative (OR)

4.2.1 The SFPUC project Operations Representative (OR) reviews and signs the SOR.

4.2.2 The SFPUC project Operations Representative (OR) communicates with the Operations Division Manager regarding an operational change request (OCR), coordinates with SFPUC Water Quality Division (WQD), Systems Engineering Group of Engineering Management Bureau (EMB), and Operations Maintenance to ensure support before, during and after the shutdown; executes turnover of affected area to Project CM and accepts area on behalf of Water Enterprise after completion of the shutdown.

4.2.3 The OR prepares the detailed Operational Change Request (OCR). This OCR must be approved not less than twenty one (21) calendar days prior to the shutdown.

4.2.4 The OR coordinates the facility joint LOTO to be performed prior to turning over the section or component to the Project CM, refer to Section 5.7. Every shutdown involving LOTO must have a written LOTO plan which identifies all energy sources and corresponding LOTO control points and methods. SFPUC Health and Safety can waive the LOTO requirement in certain cases where LOTO does not apply. Water Enterprise Operations designates facility lead operations personnel to coordinate the facility LOTO tasks including the written LOTO plan. One of the check-off items in the OCR is completion of the LOTO plan. A LOTO plan is an attachment to the OCR and is fundamentally important to the safety of all City, CM Consultant, and Contractor personnel during a shutdown. The OR coordinates the LOTO with the Contractor and project CM team and the PCM
Operations

4.2.5 Every pipeline shutdown where there is incidental water passing the valve, needs a written plan (incidental water management plan) for how the water will be controlled to prevent possible engulfment situations from developing. If SFPUC is responsible for the water and/or primarily SFPUC employees will enter the pipe, the OR prepares the plan. Also, each plan needs to address how water will be removed (e.g. sandbag berm and pumps, gravity feed from blowoff, etc.) and how water levels will be monitored such that levels cannot rise to a level that a failure could result in an inundation threat to downstream workers. If the Contractor is responsible for the water and only the Contractor’s employees are the primary people entering the pipe, the Contractor prepares the written plan. All written plans for controlling incidental water must have a documented review by appropriate operations personnel coordinated by the OR.

4.3 Operations Division Manager

4.3.1 The Operations Division Manager approves the completed OCR; provides personnel, equipment, materials and chemicals for City’s portion of the work for the shutdown; and notifies wholesale customer of shutdowns.

4.3.2 The Operations Division Manager ensures that the San Francisco Regional Water Quality Control Board (RWQCB) and affected environmental agencies are notified.

4.3.3 The Operations Division Manager ensures that the system components are dewatered and isolated or de-energized.

4.3.4 The Operations Division Manager ensures that the safety protocols are followed for facility turn-over to Project CM. The OCR should not be approved by the Operations Division Manager without the attached LOTO plan unless LOTO is inapplicable.

4.3.5 The Operation Division Manager ensures that the section or component can be returned to service; that filling, sanitary work practices, disinfection, discharge dechloramination, and discharge pH adjustments are performed; and that the section or component is returned to service. Note that discharges to a combined sewer do not require dechloramination or pH adjustment.

4.3.6 Approves the Contractor’s work plan by signing the SOR or attaching the SOR to the signed OCR.
4.4 **Shutdown Coordinator (SDC)**

The WSIP Shutdown Coordinator (SDC) reports directly to the WSIP Director. The SDC tasks, duties and activities:

4.4.1 Organizes and facilitates monthly Shutdown Coordination meetings and other necessary shutdown meetings;

4.4.2 Maintains the WSIP Master System Shutdown Matrix;

4.4.3 Checks the Master System Shutdown Schedule dates for consistency with the Shutdown Matrix;

4.4.4 Tracks all shutdown-related activities;

4.4.5 Reviews and takes action for compliance issues as required by the Risk Mitigation Plan for any deviation;

4.4.6 Coordinates and updates requirements for shutdowns and the Shutdown Business Plan;

4.4.7 Facilitates evaluation of changes to scope or schedule of shutdowns;

4.4.8 Reviews the shutdown portions of the construction contract;

4.4.9 Reviews the contractor-submitted SORs for consistency and completeness and signs the SOR;

4.4.10 Stops a WSIP shutdown lacking the necessary SORs, OCRs, or LOTO plans;

4.4.11 Assists the Project CM in the planning and execution of shutdowns including the preliminary review of the draft Work-Around Plan for certain critical projects;

4.4.12 Maintains a tracking tool to track formal letters and meetings with wholesale customers, refer to Section 6.3;

4.4.13 Reviews and develops contract specifications related to system shutdowns;

4.4.14 Prepares the Shutdown Summary Report (Attachment 022-5) which are incorporated in the Lessons Learned Report (refer to CM Procedure No.030, Project History/Lessons Learned) and the Project Closeout Report PM Procedure 3.14; and,

4.4.15 Prepares the semi-annual BAWSCA shutdown report (see section 6.2).

4.5 **Regional Project Manager (RPM)**

4.5.1 The Regional Project Manager (RPM) ensures protocol reviews and approvals of all elements for shutdown planning.

4.5.2 The Regional Project Manager reviews and coordinates all changes to established schedules for regional project. The RPM will review these potential schedule changes with the Shutdown Coordinator and the individual project teams.
4.5.3 The RPM is responsible and leads the preparation and updates for the Project Work–Around Plan for certain critical shutdowns.

4.6 Regional Construction Manager

4.6.1 Oversees the Project CM activities related to shutdowns.

4.6.2 Reviews and signs the SOR.

4.7 Contractor

4.7.1 The Contractor is responsible for setting the shutdown dates in the Baseline Schedule within typically 2 weeks of the start of construction.

4.7.2 The Contractor is responsible for preparing a detailed Contractor shutdown work plan, contingency plan, and sanitary work practices plan as part of the SOR as described in Technical Specification 01650, Shutdowns of the project specifications.

4.7.3 The Contractor submits System Outage Request (SOR) not less than sixty (60) calendar-days prior to the shutdown. The SOR shutdown duration is from the out of service date to the back in service date. The Contractor’s work duration is a subset of the shutdown duration and is from the date the facility is turned over to the Contractor until the date the Contractor turns the facility over to the SFPUC. The shutdown schedule in the SOR work plan must clearly show the out of service date, the facility turnover to the Contractor date, the facility turnover back to the SFPUC date, the back in service date, and the Contractor’s shutdown work tasks.

4.7.4 The Contractor notifies Project CM, if a need to reschedule develops; and coordinates delivery of materials and equipment prior to shutdown.

4.7.5 The Contractor, if responsible for handling incidental water, develops the plan for handling the water passing the valve and how the water will be controlled to prevent possible worker engulfment situations from developing. Also, each plan needs to address how water levels will be monitored such that levels cannot rise to a level that a failure could result in an inundation threat to downstream workers. All written plans for controlling incidental water must have a documented review by appropriate Contractor safety personnel and then submitted to the SFPUC.

4.7.6 The Contractor is solely and totally responsible for construction safety before, during, and after the shutdown.

4.7.7 The Contractor executes Contractor’s work to be performed during the shutdown once Operations turns the facility over to the Contractor.
4.7.8 The Contractor returns the isolated facility sections to the Project CM.

4.7.9 The construction contract provides guidance to the Contractor on available shutdown windows and system constraints affecting planned shutdowns.

- The Contractor must propose dates for planned project shutdowns within the shutdown windows prescribed in the contract, if any. In some instances, Contractor proposed shutdowns for a particular time period may be denied based on conflicts with shutdowns for other WSIP construction contracts, conflicts with operational shutdowns for maintenance, or other factors beyond the control of the Contractor. In rare instances, once a shutdown is underway the Contractor may be asked to terminate the shutdown and ready the water system component for to return to service.

5.0 Implementation

The overall procedure for system shutdown is defined by the following activities:

5.1 Review Contractor Shutdown Responsibilities at the Construction Kick-off Meeting

5.1.1 The Project CM reviews Contractor shutdown responsibilities at the Construction Kick-off Meeting. This includes a reminder on the importance of the adhering to the shutdown dates in the SOR and an outline of everything expected in the SOR package. Also, this includes a reminder on the importance of LOTO and a summary of the joint LOTO responsibilities.

5.1.2 The Shutdown Delivery Team reviews the Contractor shutdown responsibilities at the Construction Kick-off Meeting, refer to Section 3.6.1.

5.1.3 The Project CM advises the Contractor of the criticality of taking possession of equipment, especially the long-lead purchase items, in a timely manner so as to meet the shutdown dates.

5.1.4 The Project CM shall notify Water Enterprise Operations, Shutdown Coordinator and project Communications Representatives of any updates to the Master System Shutdown Schedules, refer to Section 6.3.1.

5.1.5 If the Project CM, Operations Representative and Shutdown Coordinator agree that interim smaller scale shutdown only involves a portion of a facility or just electrical controls, then the standard level of approvals, review, notification, lessons learned, etc. should be scaled back proportionately. LOTO plans cannot be scaled back unless they are inapplicable.

5.2 Notify Affected Communities About Construction

5.2.1 The Project CM provides confirmation and any new information necessary for municipality courtesy notifications and “courtesy review” to the SFPUC Communications representative related to Contractor submittals for staging.
areas, lay down areas, parking, traffic control, on-site chemical storage, and other appropriate matters. The basic agreements with the affected communities should already be in place.

5.2.2 For most projects, there should already be a memorandum of understanding or a memorialized agreement concerning the upcoming construction activities.

5.3 **Preparing Detailed Shutdown Plan and System Outage Request**

The Contractor submits a detailed System Outage Request (SOR, refer to Attachment 022-1) to the Project CM who reviews it. The Project CM forwards the SOR to the OR and SDC. The SDC will post the SOR on the SDT shutdown common drive. The Project CM provides courtesy copies of the SOR to the Regional Construction Manager and to the Regional Environmental Compliance Manager or the Environmental Compliance Manager. The OR provides the SOR to the Water Enterprise Operations Manager to be included as an attachment to the OCR. One SOR is required for each shutdown. The SOR schedule is shown in Attachment 022-8.

5.4 **Preparation and Monitor Detailed Operational Change Request**

5.4.1 The Operations Representative, with assistance from the SFPUC lead operations person for a particular facility, prepares a detailed Operational Change Request (OCR, refer to Attachments 022-2, 3, or 4) in coordination with the Water Quality Division. This detailed OCR must be reviewed and approved by the Operations Division Manager no less than twenty-one (21) calendar days prior to the shutdown. The shutdown is not approved until the Division Manager signs the OCR which contains the LOTO plan and SOR as attachments. Also, the Work-Around Plan, for certain critical shutdowns, must be attached to the OCR.

5.4.2 The Project CM and SDC shall monitor and assist to insure timely completion (21 calendar days prior to shutdown) and approval of the OCR.

5.5 **Monitor Contractor’s Progress Against Shutdown Dates**

5.5.1 The Project CM will monitor Contractor’s progress against the approved shutdown schedule and notify the OR and the SDC if there is a risk that the shutdown dates will not be met. A variance may impact other projects and planned shutdowns.

5.5.2 Shutdowns are not independent activities, but are tied to operational changes, other shutdowns, and seasonal constraints. Therefore, it is essential that it be known well ahead of time if the Contractor will not be able to achieve the shutdown at or within the planned time.

5.6 **Conduct Pre-Shutdown Meeting**

Thirty (30) calendar days prior to the shutdown, the Project CM will conduct a pre-shutdown meeting with the Contractor, SDC, and OR to confirm the status of all Contractor and SFPUC activities that will occur before, during and after the shutdown.
5.7 Coordinate Operations De-watering and Lockout/Tagout

5.7.1 Water Enterprise Operations has responsibility to isolate, dewater and/or de-energize, and execute LOTO prior to turning the section over to the Project CM. SFPUC operating divisions in some cases have tailored the SFPUC LOTO program to fit their needs and have their own LOTO guidelines incorporating all the elements of Attachment 9.

5.7.1.1 SFPUC Construction Management Bureau employees must always put their own locks and tags on the lockout points when the employees are working in the area where they are exposed to the hazardous energy (i.e., the same LOTO points as the Contractor and operations). This Policy would also apply if a SFPUC Engineering Management Bureau engineer or other City employees enters the work area refer to Attachment 022-7.

5.7.2 The Project CM with OR support will confirm technical and safety suitability before turning the section over to the Contractor and informing the Contractor to commence work.

5.7.3 The Project CM confirms Contractor readiness for the shutdown and safety before turning the section or component over to the Contractor.

5.7.4 The Project CM notifies the SFPUC Supervisory Control and Data Acquisition (SCADA) representative that the facility is being taken out of service.

5.8 Monitor Contractors Work and Progress

5.8.1 Project CM, with assistance from QA Inspectors, shall monitor the progress of Contractor’s work and perform Quality Assurance. Project CM shall notify the OR and the SDC if Contractor’s progress jeopardizes the scheduled completion.

5.8.2 The Project CM oversees Contractor’s shutdown-related work and responds to quality, safety, leakage, schedule, or sanitary work practices issues.

5.9 Conduct Testing and Acceptance

The Project CM, with assistance from QA Inspectors, shall certify the Contractor’s testing including welding, pressure/leak tests, other Contract-required tests, Contractor’s portion of sanitary work practices/disinfection work, and Contractor’s portion of the drainage/discharge work; and when completed, accept the work, refer to CM Procedure No. 039, System Testing and Startup for details.

5.10 Notify Operations of Completion of Contractor’s Shutdown Work

The Project CM, upon completion and acceptance of Contractor’s work, will notify the OR, facility SCADA representative, and the SDC of completion of the Contractor’s shutdown work, and confirm that the system is ready to be refilled, disinfected (if necessary) and/or re-energized. The Project CM coordinates with the Contractor and
the lead from the facility to remove the Contractor’s and CM team’s locks and tags associated with LOTO.

5.10.1 Additional coordination details are provided in CM Procedure No. 039, System Testing and Start-up.

5.11 Change Management During Construction

5.11.1 Changes to scope and schedule may occur after award of the construction contract. It is necessary that the Project CM closely monitor the Contractor’s progress towards shutdown dates and report any variances to the SDC and the OR as soon as they are recognized. Likewise, it is important that the SDC and the OR closely monitor Operations Division progress on the Operations portion of the work.

5.11.2 Should a change become necessary, the Project CM, the SDC and the OR will meet to determine the potential impact of the change, refer to CM Procedure No. 016, Change Management Process. If this group and the Shutdown Delivery Team agree that a change is necessary/possible, the SDC shall ensure that PCSB, WQD, and wholesale customers are formally notified.

5.12 Prepare Shutdown Summary Report

5.12.1 The Project CM will provide project records, digital images, and a briefing to the SDC.

5.12.2 The SDC with the assistance of the Project CM is responsible for preparing the Shutdown Summary Report (Attachment 022-5), including Lessons Learned (CM Procedure No. 030 & PM Procedure No. 3.14) for application to subsequent shutdowns. The Shutdown Summary Reports are not required for WSIP hot taps and are optional for standalone shutdowns.

5.13 Prepare Work-Around Plan

The purpose of this section is to provide guidance to Water Supply Improvement Program (WSIP) project teams on developing a Work-Around Plan as a contingency in case a system shutdown(s) needs to be rescheduled. The Work-Around Plans are inapplicable to hot taps which are technically not shutdowns. The project team prepares the draft Work-Around Plan prior to NTP under the direction of the Project Manager. The Regional Project Manager is the lead for preparing a Work-Around Plan for construction contracts which have already started and the Work-Around Plan that was never written.

The Regional Project Manager is the lead for preparing the Work-Around Plan for construction contracts which have already started and the Work-Around Plan that was never written.
The Regional Project Manager is the lead for preparing the Work-Around Plan update with participation and support from the Shutdown Delivery Team including the Project CM.

5.13.1 The March 2008 “WSIP Risk Mitigation Plan” Mitigation Measures, Subsection 10-4 specifies for Work-Around Plans for each shutdown which may affect other shutdowns that cannot be rescheduled. The Work-Around Plan is associated with:

- Identification of critical and standalone shutdowns.
- Identification of less important shutdowns that could be moved to allow the more critical shutdowns to take place.
- Identification of options for allowing the contractor to continue construction activities even though the shutdown window has been delayed.

5.13.2 The Work-Around Plan is linked to the designation of critical and standalone shutdowns as defined below:

**Critical Shutdown** - a shutdown that has a schedule dependent relationship to another shutdown (may affect, or be affected by, other shutdowns if delayed); or is limited to certain pre-determined times of the year within which it can occur; or has limitations on when it can occur due to system operations, maintenance requirements, or other non-WSIP system shutdowns.

**Standalone Shutdown** - any shutdown which does not have limitations on when it can occur due to system operations, maintenance requirements, or other non-WSIP system shutdowns.

The critical and standalone shutdowns are designated in the WSIP Shutdown Matrix and in the WSIP Master System Shutdown Schedule. Most of the shutdowns listed in the System Shutdown Matrix are critical shutdowns. Work-Around Plans are inapplicable to WSIP standalone shutdowns.

5.13.3 The Work-Around Plans are linked to the identification of critical shutdowns:

- The most critical WSIP shutdown identified is the Coast Range Tunnel (CRT) shutdown identified with the Alameda Siphons 4 shutdown (AS4/3) and the Tesla Treatment Facility shutdown (TTF/1). This CRT most critical shutdown took place in January 2010.
- The New Crystal Spring Bypass Tunnel shutdown (NCSBT/2) is a most critical shutdown for the Northern Peninsula and is scheduled for January 2011.
- Other critical shutdowns are any of the various Bay Division Pipeline shutdowns.
The following system shutdowns must have Work-Around Plans:

- Alameda Siphon No. 4; AS4/3 (CRT Shutdown) CUW 35902
- Tesla Treatment Facility; TTF/1 (CRT Shutdown) CUW 38401
- New Crystal Springs Bypass (Polhemus) Tunnel; NCSBT/2 CUW 35601
- Bay Division Pipeline Reliability Upgrade - Pipeline; BDPL5P/4 CUW 36802
- Bay Division Pipeline Reliability Upgrade - Pipeline; BDPL5P/1 CUW 36802
- Bay Division Pipeline Reliability Upgrade - Pipeline; BDPL5P/2 CUW 36802
- Bay Division Pipeline Reliability Upgrade - Tunnel; BDPL5T/3 CUW 36801
- Bay Division Pipeline Reliability Upgrade - Tunnel; BDPL5T/4 CUW 36801
- Bay Division Pipeline Reliability Upgrade - Tunnel; BDPL5T/5 CUW 36801

Other system shutdowns are less critical due to system redundancy as long as they are not performed simultaneously with other shutdowns which could potentially make them critical shutdowns.

As of the November 2010, all of the above shutdowns have written Work-Around Plans.

5.13.4 The Work-Around Plan is linked to options for the Contractor to deal with shutdown delays.

- The Contract Technical Specification, 01650, Shutdowns covers the Contractor requirements for scheduling shutdowns including incentives (early completion or incentive bonuses) or deterrents (liquidated damages) for timely completion of the contract work associated with a particular shutdown, as appropriate.
- The specifications include provisions for potential shutdown delay contingencies such as contractor construction activity re-sequencing, contractor demobilization/remobilization, or other appropriate delay mitigation measures.
5.13.5 For each shutdown the Project Shutdown Delivery Team confirms or needs to identify the following basic Work-Around Plan information:

a. Shutdown name
b. Date
c. Project team member preparing Work-Around Plan information
d. Shutdown description
e. Project name
f. Shutdown window duration
g. Shutdown out-of-service duration
h. Seasonal constraints and changes
i. System/other constraints
j. Related shutdowns (list as many as needed)
   o Shutdown name
   o Date
   o Project team member who prepared Work-Around Plan information:
   o Shutdown description
   o Project name
   o Shutdown window duration
   o Shutdown out-of-service duration
   o Seasonal constraints
   o System/other constraints
   o Related shutdown (list as many as needed)

5.13.6 Much of the above information is available from the current WSIP Master System Shutdown Matrix and the Master System Shutdown Schedule. Note that the forecasted shutdown dates are to be used for the Work-Around Plan.

5.13.7 A Work-Around Plan update is needed if a particular shutdown needs to be rescheduled due to new circumstances. Under the direction of the Regional Project Manager, the project teams need to outline the Work-Around options and actions required for both the primary shutdowns and the related shutdown. This effort must be coordinated with the Shutdown Coordinator, and the Shutdown Delivery Team.

5.13.8 The Operational Representatives will play a key role in developing work-around options in conjunction with the Shutdown Delivery Team which meets at least monthly to review the shutdown schedules. The Work-Around Plan must be an attachment to the OCR (sample OCR Attachments 022 - 2, 3, or 4).

5.13.9 There are several factors to consider in developing a Work-Around Plan. Below are some of the possible considerations in developing the Work-Around Plans:
a. Analyze shutdown period/duration for feasibility.
b. Check on operational staffing resources.
c. Analyze potential “what if” scenarios.
d. Meet operational targets (demands [average, diurnal, and maximum day], replenishment, system pressures/grade lines, shutdown durations, reservoir water storage levels, water quality, etc.).
e. Analyze risk involved with simultaneous shutdowns and sequencing of shutdowns.
f. Review status of associated water system facilities.
g. Review water system facilities under construction.
h. Review back-up facilities.
i. Determine alternate sources.
j. Determine effects of conservation or alternate sources for contingency planning.
k. Examine shutdown specific considerations.
l. Perform hydraulic analyses.
m. Consider hydrology and reservoir levels.
n. Review wholesale customer impacts.
o. Review contractor’s contingency plan for termination of shutdown.
p. Examine impact on most critical shutdowns.

The schedule for the Workaround Plan in show in Attachment 022-8.

6.0 Other Procedural Requirements

The following activities are not specific to the subject CM procedure, but are necessary to complete the shutdown process:

6.1 Hydraulic Analyses

6.1.1 A hydraulic analysis is prepared in advance of most approved shutdowns in order to evaluate the impact of the shutdown in conjunction with other scheduled shutdowns on short-term delivery capacity and ability to meet long-term hydrologic goals. This analysis is prepared by the SFPUC EMB Systems Engineering Group in coordination with the Operations Division. The analysis may need to be revised for any changes in the shutdown schedule.
6.1.2 If a change to the original shutdown schedule is proposed through a System Outage Request (SOR), then the OR, in preparing the Operational Change Request (OCR), must consult with the Operations Division Manager and EMB Systems Engineering Group to determine whether an update to the hydraulic analysis is warranted for the proposed change. This update to the analysis may be required as part of the OCR, or may be waived by the Operations Division Manager.

6.1.3 In preparing an OCR, the OR and Operations Division Manager may request that the analysis be updated by EMB System Engineering Group to evaluate the effects of schedule changes. A satisfactory hydraulic analysis may either be a requirement of the OCR, or may be waived by the Operations Division Manager.

6.2 **Semi-Annual Master System Shutdown Schedule Update to BAWSCA**

Semi-Annual Master System Shutdown Schedule updates to BAWSCA is prepared by Project Control Service Bureau (PCSB) and issued by the WSIP Director. The SDC reviews the Semi-Annual Master System Shutdown Schedule update and prepares a summary report for signature by the WSIP Director.

6.3 **Customer Notification**

Water Enterprise Operations will formally and individually notify customers of Shutdowns 12-18 months in advance and then 4-6 weeks prior to the actual system shutdown. It is necessary that the Project CM notify the SDC and the OR if there is a change to the shutdown.

6.4 **Hot Work**

Some WSIP construction activities do not fall into the shutdown category; but, are quasi-shutdowns or hot work. These activities also need to be tracked along with the shutdowns in order to keep Operations personnel aware of construction work activity at their facilities, including the number of people and amount of equipment at their existing facility. The Operations group/supervision at the facility is to be updated on a frequent basis on the status of the hot work and Contractor’s activity so that a clear understanding of potential hazards/risks to Operations and to construction can be identified and communicated swiftly and correctly among the parties involved in the hot work.

The work included is a part of a contract with the SFPUC and therefore operations needs to know who, how many and where Contractor’s personnel will be on any given day and those areas/systems the contractor will be working with or working on.

The information required will be included in the Access Request Form (Attachment 022-10); add pages with additional information for clarity as necessary. This form precedes the Contractor’s hot work activity.
Operations personnel are to be updated frequently (daily if necessary) on the status of the hot work and to additionally advise Construction Management and Contractor of relevant changes to operations which affect construction work.

7.0 References

• Technical Specifications Division 01: General Requirements 01650: SHUTDOWNS.
• Lockout/Tagout, OSHA Title 29. CFR Part 1910.147.
• California Code of Regulations, Title 8 (CCR), Sections 3314 and 2320.4-2320.6.
• CM Procedure No. 016, Change Management Process
• CM Procedure No. 030, Project History/Lessons Learned
• CM Procedure No. 039, System Testing and Start-up
• WSIP Risk Mitigation Action Plan, March 2008, prepared by SFPUC and Parsons
• PM Procedure No. 3.14, Project Closeout Report

8.0 Attachments

022-1 WSIP System Outage Request (SOR) Form (Contractor)
022-2 Water Supply & Treatment Division (WS&TD) Operational Change Request (OCR) Form
022-3 Hetch Hetchy Water and Power (HHWP) Operational Change Request (OCR) Form/Shutdown Approval Procedure
022-4 City Distribution Division (CDD) Operational Change Request (OCR) Form (Out of Service/Return to Service Record)
022-5 WSIP Shutdown Summary Report Format
022-6 Monthly Revision of Master System Shutdown Schedule (Flow Chart)
022-7 SFPUC Lockout/Tagout Program, November 1, 2012
022-8 Typical Shutdown Events Schedule
022-9 Guidance on Procedures for Confined Space Entry Work in Water System Pipelines
022-10 Access Request Form
022-11 Revision Control Log
SAN FRANCISCO PUBLIC UTILITIES COMMISSION
WATER SYSTEM IMPROVEMENT PROGRAM

SYSTEM OUTAGE REQUEST FORM

This form is to be prepared by the Contractor to request an outage of any portion of the SFPUC water treatment system and/or transmission and delivery system to allow the Contractor to perform contracted work requiring a system outage.

The Contractor proposing an outage must prepare a “Proposed System Outage Work Plan”. This plan is to be filled in as completely as possible and submitted to the City Representative. The City Representative will forward the SOR to the concerned Operations Division for review and approval.

Significant scope changes or changes in the overall schedule will require an amended work plan and supplementary review and approval.

CONTRACTOR’S NAME AND CONTACT INFORMATION:
(Provide multiple contacts including emergency contact numbers):

SHUTDOWN NAME:

FACILITY/FACILITIES AND DATES TO BE SHUTDOWN:

CONTRACTOR’S WORK PLAN (Attach Work Plan meeting the requirements of Specification 01650 of the contract General Requirements):

CONTRACTOR’S REPRESENTATIVE__________________________________________

Date________________________

FACILITY/FACILITIES AND DATES TO BE SHUTDOWN:
CONCUR:

PROJECT CONSTRUCTION MANAGER

REGIONAL CONSTRUCTION MANAGER

PROJECT OPERATIONS REPRESENTATIVE

WSIP SHUTDOWN COORDINATOR

THIS CONTRACTOR-INITIATED SYSTEM OUTAGE REQUEST IS NOT CONSIDERED APPROVED UNTIL IT HAS BEEN SIGNED BY THE OPERATIONS MANAGER AND A COPY IS DELIVERED TO THE CONTRACTOR BY THE CITY REPRESENTATIVE.

THIS SYSTEM OUTAGE REQUEST IS NORMALLY ACCOMPANIED BY AN SFPUC INTERNALLY GENERATED FORM REFERRED TO AS AN OPERATIONAL CHANGE REQUEST PREPARED BY THE CONCERNED SFPUC OPERATING DIVISION.

APPROVAL OF CONTRACTOR’S SHUTDOWN WORK PLAN:

OPERATIONS MANAGER

DATE
**INSTRUCTIONS FOR COMPLETING THIS FORM**

This form is to be used for any project within the Regional Water System that requires a full shutdown, hot tap, or any other work that would directly impact normal system operations. This form, including all supplemental information indicated in under "Planning Checklist", shall be completed by the shutdown coordinator.

Once the indicated information is collected and attached, this form shall be routed to the section heads of each section for review and approval as indicated herein. If additional information and/or details become available after initial approval, this form shall be amended to include that additional information and re-routed for supplemental review and approval. Any changes to scope and/or schedule shall require supplemental review and approval.

**SHUTDOWN COORDINATOR INFORMATION**

<table>
<thead>
<tr>
<th>Date of Initial Request</th>
<th>Shutdown Number</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Name of Shutdown Coordinator</th>
<th>Contact Number</th>
</tr>
</thead>
</table>

**PLANNING CHECKLIST**

(Shutdown coordinator shall check the appropriate box, and attach additional sheets as necessary)

<table>
<thead>
<tr>
<th>Included</th>
<th>N/A</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td><strong>Shutdown Outage Request (SOR):</strong> If the work performed is in support of a contractor's outage request, include a copy of the approved SOR and all SOR supporting documents including details on the contractor's confined space work and the contractor's Incidental Water Management Plan, if applicable.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td><strong>OCR Work Plan:</strong> Attach a copy of the completed work plan template that describes the work required for the initial shutdown, work performed by WSTD crews during the shutdown, and the work required for return to service. This attachment is required for all shutdowns.</td>
</tr>
<tr>
<td>☐</td>
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<td><strong>Hydraulic Impacts and Limitations:</strong> Attach a summary list of impacts of the shutdown to the Regional Water System. Include a copy of the hydraulic analysis. Shutdowns that remove supply sources or restrict transmission system capacity may require consultation with the System Operations Manager.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td><strong>RWQCB Notice of Temporary Discharge:</strong> Attach notification to the RWQCB that details the locations of each discharge point, the approximate flow rates and overall volume of each discharge, and the Best Management Practices utilized to minimize erosion.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td><strong>Environmental Review Summary:</strong> Attach a list all environmental issues that require review and/or mitigation. Include all additional required regulatory agency notifications and copies of applicable permits and/or environmental documents. Consult the Natural Resources Division for guidance.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td><strong>Disinfection Plan:</strong> Prepare and attach a plan developed by the WQD to disinfect any potable facilities that are depressurized to support the work. Include estimates of time required for disinfection as well as quantity and type of chemicals used for disinfection.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td><strong>Incidental Water Management Plan (IWMP):</strong> If the work performed involves pipe entry by WSTD staff behind a single isolation butterfly valve, an IWMP shall be prepared.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td><strong>Lock-Out/Tag-Out (LOTO) Plan:</strong> Include one LOTO plan for all equipment to be locked out by WSTD, including those locked out by either O&amp;M and SYSOPS personnel.</td>
</tr>
</tbody>
</table>
### REQUIRED NOTIFICATIONS

(Shutdown coordinator shall complete and make the requisite notifications as necessary)

<table>
<thead>
<tr>
<th>Notice</th>
<th>Rent</th>
<th>Agency</th>
<th>Date of Notice</th>
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<tbody>
<tr>
<td></td>
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<td>SFPUC City Distribution Division</td>
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<td>SFPUC Natural Resources Division</td>
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<td>SFPUC Water Quality Division</td>
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<td>SFPUC Health and Safety Division</td>
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<td>Regional Water Quality Control Board</td>
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<td>California Department of Public Health</td>
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</tr>
</tbody>
</table>

### REVIEWER APPROvals

(This form requires a signature from each reviewer listed, even if the work is not applicable to that section)

<table>
<thead>
<tr>
<th>Approved</th>
<th>Not Applicable</th>
<th>Comments Attached</th>
<th>Reviewer</th>
<th>Reviewer Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>WSTD System Operations Manager</td>
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<td></td>
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<td></td>
<td>WSTD Operations and Maintenance Manager</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>WSTD Maintenance Engineering Senior Engineer</td>
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</tbody>
</table>

### ADDITIONAL COMMENTS

(Shutdown coordinator to complete as necessary)

```

```

### DIVISION MANAGER APPROVAL

(This signature is required for all projects)

Request Approved By: ____________________________  Water Supply and Treatment Division Manager  ____________________________  Date: ____________________________
<table>
<thead>
<tr>
<th><strong>INSTRUCTIONS FOR COMPLETING THIS FORM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This form is to be used to document the work associated with a system shutdown and must accompany all OCR's submitted for review and approval. All applicable fields shall be completed as indicated. Attach a diagram detailing the shutdown. <strong>This form shall be completed by the shutdown coordinator.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>KEY CONTACT INFORMATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Initial Request:</td>
</tr>
<tr>
<td>Shutdown Coordinator:</td>
</tr>
<tr>
<td>WSTD General Foreman:</td>
</tr>
<tr>
<td>WSTD Field Foreman:</td>
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<tr>
<td>WSTD Field Foreman:</td>
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<tr>
<td>WSTD Field Foreman:</td>
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<tr>
<td>WSTD Field Foreman:</td>
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<tr>
<td>WQD Field Operations Rep:</td>
</tr>
<tr>
<td>NRD Field Biologist:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PROJECT INFORMATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shutdown Number:</td>
</tr>
<tr>
<td>Facility/Asset Impacted:</td>
</tr>
</tbody>
</table>

**Scope of Work:** (include initial shutdown, work by WSTD during shutdown, and return to service):
### PROJECT INFORMATION (continued)

<table>
<thead>
<tr>
<th>Anticipated Schedule:</th>
<th>Action Taken</th>
<th>Date</th>
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<tbody>
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</table>

**Description of Contingency Plan:**


### ANTICIPATED OVERTIME

(Shakedown coordinators will check the appropriate box, and attach additional sheets as necessary)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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</table>

☐ ☐ Will overtime work be required? If so, attach a copy of the approved Planned Overtime Request Form.
# REGIONAL WATER SYSTEM

## RWQCB NOTICE OF TEMPORARY DISCHARGE

### Water Supply and Treatment Division

### INSTRUCTIONS FOR COMPLETING THIS FORM

This form is to be used to document the treated water discharges associated with the system shutdown described in the OCE. It is required that this notification be made to the Regional Water Quality Control Board (RWQCB) at least 7 calendar days prior to the actual discharge taking place. This form shall be completed by the shutdown coordinator.

### KEY CONTACT INFORMATION

<table>
<thead>
<tr>
<th>Name of Shutdown Coordinator:</th>
<th>Contact Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSTD General Foreman:</td>
<td>Contact Number:</td>
</tr>
<tr>
<td>WSTD On-Site Field Foreman:</td>
<td>Contact Number:</td>
</tr>
<tr>
<td>WSTD On-Site Field Foreman:</td>
<td>Contact Number:</td>
</tr>
<tr>
<td>WSTD On-Site Field Foreman:</td>
<td>Contact Number:</td>
</tr>
</tbody>
</table>

### DISCHARGE INFORMATION

(Shutdown coordinator shall provide the information indicated below for all discharge sites)

<table>
<thead>
<tr>
<th>Shutdown Number:</th>
<th>WO Number:</th>
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</thead>
<tbody>
<tr>
<td>Pipeline:</td>
<td></td>
</tr>
<tr>
<td>Dates of Discharge:</td>
<td>Start Date</td>
</tr>
<tr>
<td>Time of Discharge:</td>
<td>Start Time</td>
</tr>
</tbody>
</table>

### Discharge Summary Table

<table>
<thead>
<tr>
<th>Water Type</th>
<th>Static/Spray</th>
<th>Portable</th>
<th>Site Number</th>
<th>Site Name</th>
<th>GPS Coordinates</th>
<th>Anticipated Discharge</th>
<th>Affected Water Body</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>North (deg)</td>
<td>Flow (gpm)</td>
<td>Volume (gal)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>West (deg)</td>
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WSIP Construction Management Procedure No. 022, Rev. 6, Page 25 of 70
REGIONAL WATER SYSTEM
RWQCB NOTICE OF TEMPORARY DISCHARGE
Water Supply and Treatment Division

EROSION CONTROL
(Site owner should provide details on the methods to mitigate erosion, including all BMPs utilized.)

SHUTDOWN COORDINATOR SIGNATURE

Notification Prepared By: ____________________________
Signature of Shutdown Coordinator: ___________________
## REGIONAL WATER SYSTEM
### INCIDENTAL WATER MANAGEMENT PLAN
Water Supply and Treatment Division

### INSTRUCTIONS FOR COMPLETING THIS FORM
This form is to be used to document the work associated with a confined space pipe entry behind a single block butterfly valve and must accompany all OCRs submitted for review and approval. All applicable fields shall be completed as indicated. Attach a diagram detailing the shutdown. This form shall be completed by the shutdown coordinator.

### JOB INFORMATION
- **Shutdown Number:**
- **Job Work Order Number:**
- **Shutdown Coordinator:**
- **WSTD General Foreman:**
- **WSTD Field Foreman:**
- **WSTD Field Crew:**
- **Pipeline to be Isolated:**
- **Valves Closed to Isolate Pipeline:**

### PIPE ENTRY DETAILS
- **City and Cross Street(s):**
- **GPS Coordinates:**

### DEWATERING PLAN (describe in detail)

<table>
<thead>
<tr>
<th>Leaking Valve(s):</th>
<th>Estimated Leakage Rate (gpm):</th>
</tr>
</thead>
</table>

**Description of Dewatering Method:**
(Describe how leakage water will be removed, e.g., sandbag berm and pumps, gravity feed from a blow-off, etc. Provide specific details regarding the number, size and types of pumps used, design of sandbag berm, size of blow-off used for gravity discharge, etc. Attach drawing as necessary)

**Water Level Monitoring Plan:**
(Describe in detail how water levels will be monitored: include high water level that triggers evacuation in the event of catastrophic valve failure or unmanageable leakage rate)
### DEWATERING PLAN (continued)

**Communications Plan:**
(Describe in detail how communications will occur between staff in and out of the pipe, including how emergency evacuations will be communicated)

### ADDITIONAL COMMENTS

(Comment box for additional comments if necessary)

---

**SHUT DOWN COORDINATOR SIGNATURE**

Prepared By: ___________________________  Signature of Shutdown Coordinator: ___________________________  Date: __________

---

WSIP Construction Management Procedure No. 022, Rev. 6, Page 28 of 70
REGIONAL WATER SYSTEM  
LOCK-OUT/TAG-OUT (LOTO) PLAN  
Water Supply and Treatment Division

INSTRUCTIONS FOR COMPLETING THIS FORM

This form is to be used to document the lock-out/tag-out protocols associated with a system shutdown and must accompany all OCR's submitted for review and approval. All applicable fields shall be completed as indicated for both O&M and SYSOPS facilities. This form shall be completed by both the O&M and SYSOPS Supervisors, as applicable, with review by the Overall LOTO Coordinator.

KEY CONTACT INFORMATION

<table>
<thead>
<tr>
<th>Position</th>
<th>Contact Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shutdown Coordinator:</td>
<td></td>
</tr>
<tr>
<td>Overall LOTO Coordinator:</td>
<td></td>
</tr>
<tr>
<td>O&amp;M Supervisor for LOTO:</td>
<td></td>
</tr>
<tr>
<td>SYSOPS Supervisor for LOTO:</td>
<td></td>
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<tr>
<td>Construction Manager for LOTO:</td>
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</tbody>
</table>

PROJECT INFORMATION

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
<tr>
<td>Shutdown Number:</td>
<td></td>
</tr>
<tr>
<td>WO Number:</td>
<td></td>
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<tr>
<td>Facility/Asset Impacted:</td>
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<tr>
<td>LOTO Dates:</td>
<td></td>
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<tr>
<td>LOTO Times:</td>
<td></td>
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</tbody>
</table>

Scope of Work: (describe the purpose of this LOTO plan, and the key groups/contractors affiliated with this LOTO Plan):

Lock Box Plan: (describe how it is to be managed, where it will reside, and who will control it):

WSIP Construction Management Procedure No. 022, Rev. 6, Page 29 of 70
## LOTO Protocol and Sign-Off

(All M and/or STO PF Supervisor shall complete the table below, and attach additional sheets as necessary)

Attach a system or facility schematic showing all energy sources associated with the shutdown.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Energy Source Type (Hydraulic, electric, pneumatic, etc.)</th>
<th>Equipment, Device or Energy Source Name</th>
<th>Energy Source Isolation Type</th>
<th>Describe the Means of Locking Out Equipment, Device or Energy Source</th>
<th>Date, Time and Initials of Lock On</th>
<th>Date, Time and Initials of Lock Off</th>
</tr>
</thead>
<tbody>
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</table>
SINGLE BLOCK ANALYSIS

(Shutdown coordinator shall complete and attach a system or facility schematic showing all valves associated with shutdown)

Provide a list of all single block valves involved in the shutdown, and indicate the size and type of valve, the installation date for each valve and any known maintenance issues associated with the valve. Reference the same item number indicated in the LOTO Protocol and Sign-Off. Attach additional sheets as necessary.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Valve Name</th>
<th>Valve Size and Type</th>
<th>Installation Date</th>
<th>Indicate Valve Condition and Any Known Maintenance Issues</th>
</tr>
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<tbody>
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<tr>
<td>SINGLE-BLOCK ANALYSIS (continued)</td>
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</tbody>
</table>
For all single-block butterfly valves in the shutdown, provide reason(s) for not providing a double-block isolation (e.g. system configuration limitations, system demand, etc.):

| Provide details on pressure surge mitigation utilized during shutdown. |

<table>
<thead>
<tr>
<th>ADDITIONAL COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Complete as necessary)</td>
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</table>

<table>
<thead>
<tr>
<th>APPROVAL SIGNATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signed: [Signature of O&amp;M Supervisor for LOTO]</td>
</tr>
<tr>
<td>Signed: [Signature of Facilities Coordinator]</td>
</tr>
<tr>
<td>Reviewed: [Signature of Overall LOTO Coordinator]</td>
</tr>
<tr>
<td>Approved: [Signature of M&amp;O System Owner Representative]</td>
</tr>
</tbody>
</table>
SHUTDOWN APPROVAL PROCEDURE

The purpose of this document is to prescribe the procedure that is to be followed in order to shutdown any portion of the Water and Power transmission and delivery system within the Hetch Hetchy Operation System.

The person/section proposing a shutdown needs to prepare a “Proposed Shutdown Planning Checklist”. (Copy attached) It is to be filled in as completely as possible and circulated to the appropriate reviewers for their comments and concurrence.

After the checklist has been completed, the entire package is to be submitted to the Superintendent of Operations for review and approval. As more information and details become available, they are to be amended to the original checklist. Significant changes and changes in the overall schedule will require supplementary review and approval.

FACILITY(IES) AND DATE TO BE SHUTDOWN:

______________________________________________________________________________

______________________________________________________________________________

PROPOSER:

______________________________________________________________________________ Phone No.: __________

APPROVAL:

Superintendent of Operations: __________________________________________________________________________

Date: ______________
SHUTDOWN PLANNING CHECKLIST

FACILITY(IES) TO BE SHUTDOWN:

__________________________________________________________________________

__________________________________________________________________________

PROPONEENT:

_________________________________________ Phone No.: __________

SHUTDOWN COORDINATOR:

_________________________________________ Phone No.: __________

OBJECTIVE(S) OF THIS SHUTDOWN: WORK ORDER NUMBER:

__________________________________________________________________________

__________________________________________________________________________

REVIEWERS:

<table>
<thead>
<tr>
<th>Reviewer</th>
<th>Does Not Apply</th>
<th>OK</th>
<th>See Attached Comments</th>
<th>Serious Difficulties</th>
<th>Reviewer’s Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Planning</td>
<td>___</td>
<td>___</td>
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<td>___</td>
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</tr>
<tr>
<td>Maintenance Eng.</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>Environmental</td>
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<tr>
<td>M&amp;R Water Operations Maintenance</td>
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<td>___</td>
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<td>___</td>
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<tr>
<td>Water Quality</td>
<td>___</td>
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<td>___</td>
<td>___</td>
</tr>
<tr>
<td>SFWD Supply &amp; Treatment</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>
COORDINATION MEETING:
A shutdown coordination meeting(s) shall be held of all interested and affected parties to ensure that proper planning, scheduling and coordination is being achieved. Multiple meetings will be held if necessary – particularly for complex jobs involving key facilities.

KEY CONTACTS:
List the key contact person(s) for the various bureaus, sections and/or divisions.

<table>
<thead>
<tr>
<th>Person</th>
<th>Section, Division, Etc.</th>
<th>Office Phone</th>
<th>Pager Number</th>
<th>Cellular Number</th>
<th>Radio Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

IMPACTS AND LIMITATIONS THIS SHUTDOWN WILL HAVE UPON THE SYSTEM:
(Attach separate sheet if necessary)

BASIC PLAN:
- Attach separate sheet(s) outlining in a general chronological order the various activities of work to be performed, when, how and by whom.
- Include contingency plans for maintaining service if certain key components of the system fail during this shutdown.
- Include estimates of time and resources it will take to return the shutdown facility to service if need be in case of an emergency.
- Identify safety and/or environmental issues that require review and/or technical assistance.
- What activities need to be mitigated; what measures (be specific) will be undertaken to mitigate those activities.
- What agencies/groups need to be notified? What permits are required?
- List all equipment, materials, manpower and other resources needed to perform the work. Are they available? If not, how will they be obtained? Will overtime be required?
- Identify those unknowns that may adversely affect the performance of the work as planned. List all assumptions that are being made.
- If appropriate, attach drawing(s) and/or map(s) showing the area where the work is to be performed, the work to be performed, configurations of the system and/or anything else that might be pertinent.

ACTIVITY/TASK LIST:
Attach separate sheet(s), being as specific as possible, enumerating each and every activity and task necessary to be performed. If possible, this listing should include the person responsible for supervising the activity, time/date(s) of when the activity is to be performed, the person(s) responsible for performing the activity and the work order number(s) covering the activity.

SCHEDULE/TIMELINE:
Attach a timeline schedule showing the major phases of work to be performed and the dependency of any one phase of the work upon any other phase(s) of work.
City and County of San Francisco
Hetch Hetchy Water and Power

Application for Work:

<table>
<thead>
<tr>
<th>Requested by:</th>
<th>Date:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>gk clark</td>
<td>06/18/2008</td>
<td>13:10</td>
</tr>
</tbody>
</table>

2. Procedure Required:

<table>
<thead>
<tr>
<th>Conf. Space</th>
<th>L.O.T.O.</th>
<th>N.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

3. Switching to Be Started:

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAT</td>
<td>06:30</td>
<td>06/27/2008</td>
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</tbody>
</table>

4. Work to Be Started:

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAT</td>
<td>06:45</td>
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</table>

5. Work to Be Completed:

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>SAT</td>
<td>15:30</td>
<td>06/27/2008</td>
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</tbody>
</table>

6. Work Location:

Warehouse building

7. Equipment:

480 volt main service disconnect & main 120/208 volt panel.

8. Boundaries:

Open 480 V breaker for Moccasin camp circuit “C” to the end of the line.

9. Purpose:

To install grounding bushings, properly ground and bond electrical distribution equipment. Repair one burned electrical connection on 120/208 volt panel.

10. Special Setups for Work:

Possibly provide 120 volt power (either cord fed from Field Office or use small generator to feed UPS in Tech Shop for electronic equipment that serves shops & water lab non-telephone communications.

11. Hasing/Rotation Required:

YES [ ] NO [X] 30-45 minutes

12. Emergency Restoration:

Light precipitation [ ]

13. Weather:

Clear weather only [X] Master Log Number: 0

14. Master Sub:

APPLICATION RECEIVED BY: Valotton
APPLICATION APPROVED BY: Griffin
CLEARANCE WORK TO BE ISSUED TO: Clark, K.
APPLICANT SIGN ON TIME: DATE:
APPLICANT SIGN OFF TIME: DATE:

22. Notification of Customers or Utilities of Clearance:

<table>
<thead>
<tr>
<th>Company</th>
<th>Notification Sent To</th>
<th>Date and Time</th>
<th>Confirmation</th>
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<tr>
<td>HHWP</td>
<td>Howay, P</td>
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<td>Letman, P</td>
<td>9/24/2008</td>
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<tr>
<td>HHWP</td>
<td>Brady, R</td>
<td>9/24/2008</td>
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<tr>
<td>HHWP</td>
<td>Clark, K</td>
<td>9/24/2008</td>
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<tr>
<td>HHWP</td>
<td>Managers list</td>
<td>9/24/2008</td>
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</tr>
</tbody>
</table>

24. Remarks:

Operations to open and red tag Circuit "C" 480 V breaker in SE corner of MSY which will de-energize 480 volt panel in Warehouse, Carpenter Shop, Camp air compressor @ Line Shop and Lift Station.
This request form is to be used for system shutdowns, testing, startups, etc. The party requesting an operational change will need to prepare a documentation package. Fill out the attached planning checklist and circulate package to the appropriate reviewers for their comments and approval. Include as much documentation/information as possible in the package.

After the checklist has been completed, the entire package is to be submitted to the Operations Manager for review and approval. As more information and details become available, the documentation packet should be amended. Significant changes to scope and/or schedule will require supplemental review and approval.

FACILITY / FACILITIES:

OBJECTIVE:

PROPOSED DATE

PROONENT PHONE

CDD COORDINATOR PHONE

APPROVAL

OPERATIONS MANAGER

DIVISION MANAGER

DATE
## REVIEWERS:

<table>
<thead>
<tr>
<th>Department</th>
<th>Not Applicable</th>
<th>OK</th>
<th>See Attached Comments</th>
<th>Serious Difficulties</th>
<th>Reviewer’s Signature</th>
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</thead>
<tbody>
<tr>
<td>WS &amp; T</td>
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<tr>
<td>Systems Engineering</td>
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<tr>
<td>Maintenance</td>
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<tr>
<td>CDD Operations</td>
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<tr>
<td>PUC - Health and Safety</td>
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## NOTIFICATIONS

<table>
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<th>Notes</th>
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<tr>
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<tr>
<td>RAWSCA (wholesale customers)</td>
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<td>Communications</td>
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<td>SFFD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHER</td>
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</tr>
</tbody>
</table>
Planning Checklist: (Include documentation for the following and mark box as "NA" to those that don't apply)

- Basic Plan/Schedule: Attach separate sheet(s) outlining in a general chronological order the various activities of work to be performed, when, how, and by whom.

- Impacts and Limitations: List the impacts of the shutdown to the Local Water System.

- Environmental Review: Environmental issues that require review and/or technical assistance. What activities need to be mitigated; what measures will be undertaken to mitigate those activities? What agencies/groups need to be notified? What permits are required, etc.?

- Personnel/Safety: List all equipment, materials, manpower and other resources needed to perform the work. Are they available? If not, how will they be obtained? Will overtime be required? Have safety concerns been identified and addressed? Has SFPUC's Health & Safety been involved, etc?

- Documentation: If appropriate, attach drawing(s) and/or map(s) showing the area where the work is to be performed, configurations of the system and/or any other pertinent information. Model runs verifying the proposed system configuration should be included where appropriate.

- Contingency Plan: Include plans for maintaining service if certain key components (a pipeline or pump station, etc.) of the system fail during this shutdown. Include estimates of time and resources it will take to return the offline facility to service if needed, in case of an emergency.

- Coordination Meeting: A shutdown coordination meeting(s) shall be held of all interested and affected parties to ensure that proper planning, scheduling and coordination is being achieved. Multiple meetings will be held if necessary – particularly for complex jobs involving key facilities.
**KEY CONTACTS**

List the key contact person(s) for the various bureaus, sections, and/or divisions.

<table>
<thead>
<tr>
<th>Name</th>
<th>Division &amp; Section</th>
<th>Office Phone</th>
<th>Pager Number</th>
<th>Cell Phone</th>
<th>Radio Number</th>
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</thead>
<tbody>
<tr>
<td>Dan McAuliffe</td>
<td>CDD</td>
<td>(415) 550-4901</td>
<td></td>
<td>(415) 748-0500</td>
<td>502</td>
</tr>
<tr>
<td>Bill Teahan</td>
<td>CDD</td>
<td>(415) 550-4949</td>
<td></td>
<td>(415) 601-8779</td>
<td>503</td>
</tr>
<tr>
<td>Don Lampe</td>
<td>CDD</td>
<td>(415) 620-4078</td>
<td></td>
<td>(415) 613-4786</td>
<td>601</td>
</tr>
<tr>
<td>Paul Ito</td>
<td>CDD</td>
<td>(415) 405-4503</td>
<td>(415) 207-3643</td>
<td>(415) 560-4243</td>
<td>808</td>
</tr>
<tr>
<td>Gateroom Office</td>
<td>CDD</td>
<td>(415) 550-4951/52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alan R. Wong</td>
<td>W2D</td>
<td>(415) 620-4012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carolyn Jones</td>
<td>H &amp; S</td>
<td>(415) 695-7320</td>
<td>(415) 201-6093</td>
<td>(415) 619-8157</td>
<td></td>
</tr>
<tr>
<td>Dee Culino</td>
<td>WST</td>
<td>(650) 608-3810</td>
<td></td>
<td>(650) 302-0420</td>
<td></td>
</tr>
</tbody>
</table>

CDD Radio Room  | (415) 550-4650  
Lake Merced PS | (415) 333-9300 |

**OTHER NOTES**

Preparer: ______________________________ Date: ____________

Date updated/revised: __________________ Date updated/revised: __________________

Date updated/revised: __________________ Date updated/revised: __________________

Date updated/revised: __________________ Date updated/revised: __________________
SHUTDOWN SUMMARY REPORT

This form is to be prepared by the Shutdown Coordinator to document the results of the shutdown and prepare a Lessons Learned Summary for possible use on future shutdowns. The results are to be shared with concerned CM and Operations Personnel.

SHUTDOWN CONTROL NUMBER: ________________________________

PROJECT AND CONTRACT NUMBER: ________________________________

PROJECT CM: __________________________________________________

OPERATIONS REPRESENTATIVE: ________________________________

FAILITY SHUTDOWN: _____________________________________________

PURPOSE: ______________________________________________________

SCHEDULED START: _____________________________________________

ACTUAL START: ________________________________________________

SCHEDULED COMPLETION: _______________________________________

ACTUAL COMPLETION: __________________________________________

SCHEDULED DURATION: __________________________________________

ACTUAL DURATION: _____________________________________________

ESTIMATED INTRUSION: __________________________________________

ACTUAL INTRUSION: ______________________________________________

TYPE DECHLORINATION: _________________________________________

DISCHARGE PROBLEM: __________________________________________

SIGNIFICANT CHANGES FROM PLAN: ______________________________

WHAT SHOULD HAVE BEEN DONE DIFFERENTLY? ___________________

________________________________________________________________

WHAT WERE THE LESSONS LEARNED? ______________________________

________________________________________________________________

Prepared and Submitted by: __________________________________________
Water System Improvement Program (WSIP) Monthly Revision of Master System Shutdown Schedule

WSIP Construction Management Procedure No. 022, Rev. 6, Page 42 of 70
San Francisco Public Utilities Commission
Lockout/Tagout Policy

Summary:
The Lockout/Tagout Policy establishes guidelines, practices, and procedures to protect the San Francisco Public Utilities Commission (SFPUC) employees, outside Contractors, Consultants, and all other outside servicing personnel from hazards caused by the unexpected flow of energy (in any form) or the unexpected operation/movement of equipment, machinery, components or materials.

Authority:
California Code of Regulations, Title 8 (CCR 8) including, but not limited to:
General Industry Safety Orders, §3314
Electrical Safety Orders, §2320.4-2320.6

Scope:
This Policy and its procedures apply to SFPUC employees. In addition the procedures apply to outside contractors or servicing personnel working on SFPUC facilities and SFPUC systems.

This Policy applies to energy sources such as, but not limited to: electrical, electromagnetic, kinetic (moving items), mechanical, hydraulic, pneumatic, chemical, radiation, thermal, physical, and potential energy from suspended or elevated parts or material (gravity), or energy stored in springs.

This Policy applies to activities such as, but not limited to: erecting, installing, constructing, repairing, adjusting, inspecting, cleaning, servicing, overhauling, operating or maintaining the equipment, process, components, machinery, or materials.
SAN FRANCISCO PUBLIC UTILITIES COMMISSION
LOCKOUT/TAGOUT POLICY

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Revised 10/31/2012

WSIP Construction Management Procedure No. 022, Rev. 6, Page 44 of 70
1. POLICY
   It is the policy of the San Francisco Public Utilities Commission that before any employee
   performs service or maintenance on machinery or equipment where the unexpected start-up,
   energizing, or release of stored energy (including engulfment), could occur and cause injury, then
   equipment, component, or machine must be isolated and rendered inoperative; placed in a Zero
   Energy State.

2. OBJECTIVE
   The objective of the Lockout/Tagout (LOTO) Policy is to establish a control system to prevent the
   unexpected operation or movement of equipment, components, machinery, or material or the
   unexpected flow of energy in any form in a process or facility in order to:
   2.1. Protect personnel from possible injury caused by the inadvertent movement of
       equipment/processes encountered during cleaning, servicing, repairing, inspecting, and
       adjustment operations.
   2.2. Comply with applicable regulatory standards.
   2.3. Communicate lockout/tagout procedures to anyone who may be affected by the process

3. SCOPE
   3.1. This Policy and its procedures apply to SFPUC employees. In addition the procedures apply
       to outside contractors or servicing personnel working on SFPUC facilities and SFPUC
       systems.
   3.2. This Policy applies to energy sources such as, but not limited to: electrical, electromagnetic,
       kinetic, mechanical, hydraulic, pneumatic, chemical, radiation, thermal, physical, and potential
       energy from suspended or elevated parts or materials, or energy stored in springs.
   3.3. This Policy applies to activities such as, but not limited to: erecting, installing, constructing,
       repairing, adjusting, inspecting, cleaning, servicing, overhauling, operating or maintaining
       equipment, components, and processes.
   3.4. EXCEPTIONS
       This Policy does not apply to the following:
       3.4.1. Work on cord and plug connected electric equipment for which exposure to the hazards
               of unexpected energization or start up is controlled by unplugging the equipment and
the plug is under the exclusive control of the employee performing the servicing or maintenance.
3.4.2. Tapping operations involving pressurized systems provided that the employer demonstrates that (1) continuity of service is essential; (2) shutdown of the system is impractical; (3) documented procedures are followed and special equipment is used which will provide proven effective protection.

4. RESPONSIBILITIES
4.1. General Manager:
   Overall responsibility for safety throughout the SFPUC rests with the General Manager, who establishes the SFPUC’s goals and policies. Responsibilities include the following:
   4.1.1. Adopt and enforce the SFPUC’s Lockout/Tagout Policy.
   4.1.2. Support budget for lockout/tagout operations, training, and equipment.
   4.1.3. Exercise oversight review on lockout/tagout issues.

4.2. Assistant General Managers and Division Managers:
   4.2.1. Implement the SFPUC’s Lockout/Tagout Policy within their areas of responsibility.
   4.2.2. Ensure that personnel under their jurisdiction can identify lockout/tagout situations.
   4.2.3. Ensure that employees have been trained on lockout/tagout procedures.
   4.2.4. Establish a system that includes documentation for training.
   4.2.5. Budget and provide for operations, training, and equipment necessary to comply with this Policy.
   4.2.6. Identify Authorized and Affected Persons.

4.3. SFPUC Health and Safety Program:
   4.3.1. Ensure policies and procedures satisfy current regulatory requirements.
   4.3.2. Provide technical support for Lockout/Tagout operations and procedures.
   4.3.3. Provide training/retraining for Authorized and Affected Employees.
   4.3.4. Audit Lockout/Tagout policy and operations.

4.4. Supervisors:
   4.4.1. Identify locations and situations that require lockout/tagout.
   4.4.2. Provide locks and tags and other equipment necessary for safe lockout/tagout.
   4.4.3. Ensure all safety procedures are followed.
   4.4.4. Require proper use and maintenance of lockout/tagout equipment.
   4.4.5. Know lockout/tagout hazards, including all forms of available and stored energy.
   4.4.6. Understand types of energy and methods of control.
   4.4.7. Train employees to follow lockout/tagout procedures.
   4.4.8. Follow lockout/tagout procedures and ensure that energy sources are controlled or eliminated.
San Francisco Public Utilities Commission

Health and Safety Policy

Title:

LOCKOUT/TAGOUT (LOTO) POLICY

4.5. Employees:
   4.5.1. Know and obey lockout/tagout procedures.
   4.5.2. Understand types of energy sources and methods of control.
   4.5.3. Know lockout/tagout hazards, including all forms of available and stored energy.
   4.5.4. Do not perform maintenance unless energy sources have been controlled or eliminated
   using lockout/tagout procedures.
   4.5.5. Use lockout/tagout equipment properly.
   4.5.6. Respect the locks and tags of other employees.

5. DEFINITIONS

5.1. Owner/System Operator:
   The Owner/System Operator is the person in charge of operation of the equipment,
   components, machinery (i.e., facility superintendent, stationary engineer, plant operator,
   head of operations, or designated representative). This person, or their agent, is responsible
   for taking the equipment in and out of operation. When work is done in non-SFPUC buildings
   by SFPUC employees, a designated SFPUC employee will act as the owner for the project
   duration.

5.2. Owner’s Out of Service Tag:
   Marked "Danger, Do Not Operate/Valve Closed" or other similar wording. Used by the
   "owner" to indicate that the particular equipment, valve, de-energized switch, etc., is out of
   service and shall not be operated. These tags can be removed only by a supervisor or
   designated employee of the owner that tagged the equipment and only after all other danger
   tags have been removed. These tags must be used with a lockout device whenever possible.

5.3. Employee’s Repair in Progress Tag:
   Marked "Danger, Do Not Operate, Repair in Progress" or other wording as needed. Used by
   employees in conjunction with the owner's Out of Service Tag to signify the presence of
   someone inside or working on the equipment. The "Repair in Progress" Tags can be
   removed only by the employee whose name is on the tag or under certain conditions as noted
   in Section 7.3.2. All employees are to use these Repair in Progress Tags for their own
   personal safety. Each employee will secure a Repair in Progress Tag on his/her own lock.

5.4. Energy isolating device:
   A device that physically prevents the transmission or release of energy, including-but, not
   limited to, the following: A manually operated electrical circuit breaker; a disconnect switch; a
   manually operated switch by which the conductors of a circuit can be disconnected from all
   ungrounded supply conductors and, in addition, no pole can be operated independently; a
   slide gate; a slip blind; a line valve; a block; a chain and padlock, and/or any similar device.
used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

5.5. Affected Employee:
An employee whose job requires him/her to operate or use equipment, components, machinery, or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed under lockout/tagout.

5.6. Authorized Employee:
A person who locks out or tags out machines, equipment, or components to perform servicing or maintenance on that machine or equipment. The Authorized Employee must have sufficient knowledge to competently determine effective and safe LOTO procedures for the specific system being locked out. An Affected Employee becomes an Authorized Employee when that employee’s duties include performing, cleaning, repairing, servicing, setting-up and adjusting operations covered under this section.

6. GENERAL PROVISIONS
6.1. Compliance:
All SFPUC personnel shall comply with the provisions of the Lockout/Tagout Policy and procedures. Employees not complying with this policy and its accompanying procedures shall be subject to appropriate personnel action.

6.2. Division Specific Procedures:
Each “Operating Division” (WST, CDD, Hetch Hetchy, Wastewater and Power) shall develop their own Division-specific LOTO Program and Procedures. Operating Division-specific LOTO Program and Procedures are to be completed no later than 180 days after this Policy is signed by the General Manager. The Division’s program shall be based on this SFPUC wide LOTO Policy and relevant regulations. The Division specific Program and Procedure shall address:
- Division specific definitions
- Division specific “Written LOTO Plans” format.
- Division specific procedures for applying and removing locks and tags
- Division specific Lock Box procedures.
- Any other Division specific LOTO procedures.

6.3. LOTO Plans
A Written LOTO Plan is required for all LOTO work except as specified in paragraph 6.4. The written plan must include:
- A “Job Specific Title” for the plan.
- The date of the plan.
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- A description of the purpose for the LOTO and related relevant information.
- The dates, groups, facilities, contractors, and others affected by this LOTO.
- If a lock box(s) will be used include in the plan how it (they) will be managed, where the box(s) will reside, who will control the box(s).
- Describe all Equipment, Energy Source(s), or Device(s) to be locked out.
- The device use or method use to lock out each point
- Describe each appurtenance, air valve, or device that, if not functioning properly, could result in the unexpected release of water or energy into the work area.
- The sequencing of the shut down and placement of locks when the shutdown requires a specific sequence for safely shutting down the system.
- The name and signature of the preparer.
- The name and signature of the approver of the plan.
- A signature line for outside Contractors or other servicing personnel confirming they have received and reviewed the plan to their satisfaction and have attended a LOTO walk-through including the inspection of control devices and placement of locks.

6.4. Exception to Written LOTO Plan Requirement:
Written LOTO Plans are not required when ALL of the following conditions are met:
- The machine, equipment, or component has a single energy source which can be readily identified and isolated;
- The isolation/locking out of that single energy source will completely de-energize and deactivate the machine, equipment, or component;
- A single lockout device will achieve a lock-out condition;
- The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance;
- The servicing or maintenance does not create hazards for other employees;
- The Division, in utilizing this exception, has had no accidents involving the unexpected activation or re-energizing of the machine, equipment or component during servicing or maintenance during the past 12 months.

6.5. Locks and Tags
6.5.1. Physical locks and tags shall be the authorized method used for the lockout/tagout of energy sources. LOTO designated locks and tags shall not be used for any purpose other than personnel protection and removal of equipment from service.
- Lockout/tagout instructions are specified in the facilities’ Lockout/Tagout procedure.
6.5.2. Affected employees will be provided with locks and tags in sufficient numbers to complete their jobs. Employee locks shall be individually keyed. The employee shall be the only person to retain the key to that lock when it is in use. Owner Locks may be keyed alike if in accordance with Division specific procedures.
6.5.3. A multiple lockout device will be utilized as necessary where more than one lock is to be placed on the energy isolating device(s). Each employee exposed to the unexpected release of energy must still have his/her own lock and Repair in Progress Tag on the equipment, device, or lock box.

6.5.4. Individual locks and tags shall be applied and removed by each employee exposed to the unexpected release of energy, except those special situations where specific facility procedures have been developed that provide protection equivalent to individual locks and tags.

6.5.5. As long as any lock and tag is in place, the equipment, component, or machinery shall not be restarted. Locks and tags shall only be removed by the employees that placed them. (Unless certain circumstances exist, see Paragraph 7.3.2.). Under certain conditions, as outlined in paragraph 7.3.2, a supervisor may remove another employee’s lock and/or tag.

6.5.6. Only Authorized Employees may remove tags from the energy isolating device of equipment, and/or operate a locked out/tagged out system or piece of equipment. Unauthorized lock and/or tag removal shall result in appropriate personnel action, up to and including termination.

6.5.7. Upon completion of duties, the Authorized Employee shall remove locks and tags they are responsible for in a timely manner.

6.5.8. Any employee assigned to work on equipment may, at any time, request his/her supervisor to explain how to make the job safer or where to place locks or tags.

6.5.9. Where equipment, components, or machinery is lockable, the use of a lock and tag is required.

6.5.10. Where equipment, components, or machinery is not lockable and cannot be made lockable, tagout application and special energy isolation procedures shall be utilized. Some exposures may require additional protective techniques or mechanical safeguards, as follows:

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flywheel/Press rams</td>
<td>Blocks, pins, etc.</td>
</tr>
<tr>
<td>Chemicals or steam lines etc.</td>
<td>Slip blinds, chained valves, disconnecting/line breaking, etc.</td>
</tr>
<tr>
<td>Mixers, Chemicals, etc.</td>
<td>Fuse, heater removal, drive shaft disconnect, etc.</td>
</tr>
<tr>
<td>Hydraulic/Pneumatic Systems.</td>
<td>Automatic bleeding devices, blanking, etc.</td>
</tr>
</tbody>
</table>
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6.5.11. All forms of energy within the system or equipment, component, or machinery being worked on shall be isolated, locked and tagged.
6.5.12. When locks are used in the lockout/tagout application, they shall always be accompanied by appropriate tags.
6.5.13. Energy isolating devices shall be clearly labeled or identified to indicate their function unless located and arranged so the purpose is evident. Such identification is necessary to reduce possible errors in applying the lockout/tagout devices.
6.5.14. The lockout/tagout of electrical energy sources shall occur at the circuit disconnect switch. (Note: In situations where the circuit cannot be positively interrupted, the responsible supervisor shall develop procedures providing equivalent protection. Feasibility of effective circuit isolation shall be mandated in future engineering improvements.)
6.5.15. The use of electrical control circuitry or SCADA to accomplish lockout/tagout is prohibited since it does not offer positive personnel protection. Examples:
   • Electrical shorts. (Water in lines and some types of dust can supply a path to close the control circuit.)
   • Vibration or component failure.
   • Remote or interlocked switches not affected by control circuitry.
6.5.16. Locks shall be purchased specifically for lockout applications. They shall be of such design and durability that removal by other than normal means would require excessive force or unusual techniques. In addition, they shall possess individual keying capability for employee locks.
6.5.17. Tags shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible. The tag attachment device shall be a non-reusable type, attached by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds (equivalent to a one-piece, all-environmental tolerant nylon cable tie).
6.5.18. All tags are to show the Division, workgroup/section, phone number, first and last name of the "tagger", and the date, time, and reason for tag.

6.6. Lock Box
6.6.1. When many pieces of equipment at one or more locations must be locked out, a Lock Box(es) may be used to implement the LOTO. When lock boxes are used a written description of the use, control, management, and “ownership” of the lock box(es) shall be included in the written LOTO Plan.
6.6.2. The Lock Box/Lock Box System shall be designed to ensure that any one affected employee, while in the LOTO protected work, can have their lock(s) placed in such a way that they are assured they are fully protected from any unexpected release of energy.
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7. PROCEDURES

7.1. Application Survey

7.1.1. Each supervisor shall conduct a survey on a job by job basis to determine when and how the equipment, machinery, process can be safely isolated.

7.1.2. The survey should determine if energy isolating devices are available, adequate and practically located for positive protection.

7.1.3. A plan shall be developed to correct the surveyed deficiencies or provide interim alternative protection in order to make the lockout/tagout system effective.

7.2. Sample Procedures for Application of Lockout/Tagout

7.2.1. The equipment owner must notify Affected Employees that a lockout is required and the reason therefore.

7.2.2. The equipment owner removes the equipment from service and ensures that it is safe for necessary repairs by locking out, de-energizing, and disconnecting, blocking, or other means for isolating and releasing energy sources.

7.2.3. The equipment owner signifies this responsibility has been carried out when he/she attaches the isolating device and the signed Out of Service Tag to the de-energized equipment.

7.2.4. The equipment owner must place their Out of Service Tags first and remove them last, after the equipment has been released by the employee or work group assigned to repair the equipment.

7.2.5. The employee(s) assigned to the repair or servicing of the equipment shall first verify that all forms of energy have been identified, released, and locked out by completing one or more of the following:

- Operate the equipment/process controls (push buttons, switches, etc.) to verify that energy isolation has been accomplished. Controls must be deactivated or returned to the off (non-operation) position.
- Check the equipment/process by use of test instruments and/or visual inspection to verify that energy isolation has been accomplished.
- If residual energy is detected, action must be taken to relieve or restrain the energy. Operate the switch, valve, or other energy isolating devices so that the energy source(s) (electrical, mechanical, hydraulic, etc.) is disconnected or isolated from the equipment. Stored energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc., must also be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
- Then the employee(s) shall place their personal locks and signed and dated tags in addition to the equipment owner’s tag and lock. The employee’s immediate supervisor will be responsible for monitoring compliance of the placement of tags.
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7.2.6. In the event a job is incomplete by the end of the shift, each affected employee will remove his/her personal lock and tag leaving the owner’s lock and tag for protection of the equipment. When the work is resumed, the employee will again hang his/her lock and tag in addition to the owner’s lock and tag. The owner’s locks and tags will remain on the energy isolation devices until the job is completed and they are removed by the owner.

7.2.7. When the repair is complete, the Authorized Employee will notify the equipment owner to advise them that the repair (or their part of the repair) has been completed. The equipment is now released back to the owner.

7.2.8. The equipment owner removes the Out of Service tag once he/she has verified that the equipment is safe to return to service.

7.3. Lock and Tag Removal

7.3.1. Each affected employee must remove his/her own personal lock and tag when their work is completed, but in no case later than the end of their work shift.

7.3.2. A supervisor may remove an affected employee’s tag and cut off a personal lockout device if necessary only if he/she has made absolutely certain that the employee is not in the workplace. Prior to pulling the lock and tag, the supervisor MUST do the following:

- Check to see if the employee has left the premises;
- Call the employee’s residence/cellular phone to see if he/she has arrived at home;
- Ensure that the equipment owner is notified of the status of the equipment (e.g. repair in progress, or repair completed) before removing an employee’s tag and lock;
- Inspect the equipment and surrounding area to make certain that no one will be in danger if the equipment is allowed to be operated;
- After confirming all the above items in this subsection are accomplished the supervisor may delegate the actual tag and lock removal to a designated employee.
- Ensure that employee knows that his/her lock and tag was removed before he/she resumes work at the facility.

7.3.3. The equipment owner shall be notified when the work is complete and overall lockout/tagout has been cleared.

7.3.4. Before equipment/process energization a visual inspection of the work area shall be made to ensure that all personnel are in the clear and that all non-essential items have been removed and components are operationally intact.
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8. SPECIAL APPLICATIONS
   8.1. Lockout/Tagout Interruption (Energized Testing/Troubleshooting)
       In situations where the energy isolating device(s) is locked/tagged and there is a need for
       testing or positioning of the equipment/process, the following sequence shall apply:
       1. Equipment owner shall be notified and he/she will approve and monitor testing;
       2. Clear equipment/process of tools and materials;
       3. Clear affected personnel;
       4. Remove the energy isolating device(s) of locks/tags according to established
          procedures;
       5. Proceed with test;
       6. De-energize and re-lock/tag energy isolating device(s) to continue the work;
       7. Operate controls, etc. to verify energy isolation;

   8.2. Special Cases
       In special cases involving low voltage lighting or circuitry (6-12 volts), small piping
       (instrument, air or water), the supervisor will use his/her judgment to determine whether
       tagging and locking is necessary, and obtain upper management’s approval in writing. This
       decision would be based on the types and amounts of stored energy in the particular system
       and its ability to cause injury.

   8.3. Use of Butterfly Valves for Isolation of Permit Required Confined Spaces
       8.3.1. The use of a single butterfly valve (BV) to isolate a permit-required confined space from
               a water engulfment hazard, such as in a water transmission pipeline entry, is permitted
               provided all of the following requirements are met;
               ▪ The specific BV valve is evaluated by a qualified person(s) with sufficient
                 knowledge of the valve capabilities and system operation parameters to render a
                 competent professional assessment on whether the valve could catastrophically fail
                 during the specific project in question.
               ▪ A written Lockout/Tagout Plan is developed and implemented per this
                 Lockout/Tagout Policy.
               ▪ A written Incidental Water Management Plan is also developed and implemented for
                 control of any nuisance water passing the BV, and to prevent a secondary
                 engulfment hazard. This plan must address who is responsible for incidental water
                 control, the method for control and removal, the details for the water diversion
                 devices and equipment, details on how the incidental water will be discharged, the
                 procedure for regular monitoring of water levels, and the procedure for notifying
                 downstream personnel of emergency situations.
               ▪ All other safety measures as required by the SFPUC Confined Space Entry Policy
                 are met.
8.3.2. Isolation by a single BV is not permitted in the following confined space entry situations;
   - When there is insufficient operational and/or engineering data available to render a competent professional assessment on the safety of the BV.
   - For the isolation of wastewater or in wastewater systems.
   - For the isolation of chemical or steam lines or hazardous atmospheres.
   - For smaller BV’s that is frequently operated for process control or on branch pipelines, or other significant safety concerns.

8.3.3. When use of a single BV is not permitted for isolation, an alternate protective measure is required, such as double block and bleed, blind flange, or physically disconnecting the pipe.

8.4. Pipeline Isolation, Dewatering, Air Valve Release Verification
   8.4.1. Upon successful isolation of a pipeline, the stored energy or water must be released prior to entry. To accomplish this task the pipeline must be dewatered. A person knowledgeable of the system must determine which appurtenances could, if not properly functioning properly, result in the unexpected release of water into a work zone. These appurtenances must be listed individually on the written LOTO Plan and each must be confirmed to have operated properly to ensure they have released any stored water.

   8.4.2. The shutdown supervisor must prepare a dewatering plan. The plan should include:
          - Confined space entry locations and the limits of the entry/inspection area.
          - Locations of blow off valves (BO) and dewatering locations.
          - Estimated discharge volume at each discharge location.
          - Recorded discharge volume at each discharge location.
          - The sequence in which automatic vacuum valves (AVV) and air relief valves (ARV) are to open to atmosphere.
          - Field crew confirmation that each AVV and ARV operated correctly during depressurization and is open to atmosphere.

   8.4.3. Each entry location must be confirmed dewatered and hazard free prior to entry.

9. CONTRACTOR AND OUTSIDE SERVICING PERSONNEL
   9.1. The equipment owner will ensure that contractor and/or outside servicing personnel are notified of SFPUC lockout/tagout requirements before work begins. Contractors and/or outside servicing personnel must follow the SFPUC Division specific LOTO procedures unless the contractor and/or servicing personnel have total control of the hazardous energy source.
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9.2. Contractors, Consultants, and all other outside servicing personnel affected by or before assuming LOTO responsibilities, will provide an authorized person to attend the LOTO walk through with the Owner. They will be a signatory to the LOTO Plan document confirming their attendance during walk through including inspection of control devices and placement of locks as directed by SFPUC Operations personnel.

9.3. The Contractor or Outside Servicing personnel must receive a copy of the Written LOTO Plan and have it immediately available as needed.

10. HIGH VOLTAGE WORK*

10.1. Special written procedures (i.e. Codes of Safe Practice) shall be developed to describe the lockout/tagout measures necessary when employees are required to work on high voltage circuits or equipment (greater or equal to 600 volts).

10.2. During application of lockout/tagout on High Voltage electrical equipment, a Qualified Electrical Worker shall use appropriate test equipment (meter) to test the circuit elements and electrical parts, to verify the equipment is de-energized. The test shall detect any residual electrical voltage or back feed. The test equipment shall be checked for proper operation before and immediately after the test.

10.3. Protective equipment used during this application shall be:
10.3.1. Maintained in safe, reliable condition;
10.3.2. Periodically inspected and tested.

10.4. If energy isolating devices are installed in a central location under the exclusive control of a system operator, all the following requirements apply:
10.4.1. The employer shall use a procedure that affords employees a level of protection equivalent to that by the implementation of personal lockout or tagout devices.
10.4.2. The system operator shall place and remove lockout and tagout devices in place of the Authorized Employee.
10.4.3. Provisions shall be made to identify the Authorized Employee who is responsible for the lockout or tagout devices, and to ensure that an Authorized Employee requesting removal or transfer of a lockout or tagout device is the one responsible for the lockout/tagout devices.

11. EXCEPTIONS TO PROCEDURE
11.1. In special instances where the Lockout/Tagout procedure cannot be practically applied, a “special lockout/tagout procedure” shall be developed that provides an equivalent level of
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protection. Those procedures shall be in writing and must have prior approval of the
equipment owner, and the SFPUC Health and Safety Program.

11.2. Copies of these procedures will be issued as follows:
- Copies to all affected employees concerned with this special procedure.
- A copy incorporated into the job specific Code of Safe Practices
- Copies to the SFPUC Health and Safety Program.
- Install a sign to indicate a special lockout/tagout procedure that is required on the
equipment or process.

12. TRAINING

12.1. Initial Training
The SFPUC shall provide training to ensure that the purpose and function of the energy
control program are understood by employees and owners and that the knowledge and skills
required for the safe application, usage, and removal of the energy controls are acquired by
employees. The training shall include the following:

12.1.1. Authorized Employees shall receive training in the recognition of applicable
hazardous energy sources, the type and magnitude of the energy available in the
workplace, and the methods and means necessary for energy isolation and control.

12.1.2. Affected Employees shall be instructed in the purpose and use of the energy control
procedure and the recognition of hazards

12.1.3. All other employees, whose work operations are or may be in an area where
lockout/tagout procedures may be utilized, shall be instructed about the procedure.

12.2. Tagout Training
Employees shall also be trained in the following limitations and characteristics of tags:
- Tags are essentially warning devices affixed to energy isolating devices, and do not
  provide the physical restraint on those devices that is provided by a lock.
- When a tag is attached to an energy isolating means, it is not to be removed without
  authorization of the person responsible for it, and it is never to be bypassed, ignored,
  or otherwise defeated.
- Tags must be legible and understandable.
- Tags and their means of attachment must be made of materials which will withstand the
  environmental conditions encountered in the workplace.
- Tags may evoke a false sense of security.
- Tags must be securely attached to lockout devices.
- Tagout device attachment shall be non-reusable.

12.3. Employee Retraining
12.3.1. Each Division will establish its own policy regarding the frequency of refresher
training. Minimally:
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12.3.2. Retraining shall be provided for employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

12.3.3. Additional retraining shall also be conducted whenever a periodic inspection indicates it is needed.

12.4. Documentation
The Learning Management System (LMS) will be utilized to document training required under this policy.

13. ANNUAL REVIEW
The SFPUC will conduct an annual audit review of this policy to ensure that the procedures and requirements are being followed, and to identify and correct any problem areas. The annual audit review will be documented.
APPENDIX A:

SAMPLE LOCKOUT/TAGOUT PROCEDURE SUMMARY

1. IDENTIFY service or maintenance that requires lockout/tagout

2. NOTIFY equipment owner of job

3. OWNER
   a. Determines how to isolate equipment; prepares a written LOTO Plan, and develops special procedures if needed.
   b. Isolates equipment (locks/block(s), etc.) and documents action(s) on written LOTO Plan.
   c. Tests equipment to verify energy isolation (and release) has been accomplished.
   d. Attaches Owner's Out of Service lock(s) and tag(s).
   e. Notifies Authorized Employee (service or maintenance employee who will work on equipment).

4. AUTHORIZED EMPLOYEE:
   a. Reviews the written LOTO Plan and verifies if the equipment has been properly isolated.
   b. Tests equipment to verify energy isolation has been accomplished.
   c. Adds Employee's Repair in Progress lock(s) and tag(s). (When many employees are involved, one lock and Repair in Progress Tag are hung on the equipment and the key is placed in a lock box. Subsequent employee locks and Repair in Progress Tags are hung on the lock box).
   d. Performs service or maintenance work.
   e. Removes his/her lock and tag at the end of the job (if finished in one day) or at the end of the shift each day (if the job is not complete). (The owner's tag remains on the equipment until the job is finished.)
   f. Notifies Owner when job is complete.

5. OWNER:
   a. Verifies equipment is safe to return to service.
   b. Removes Owner's tag(s) and lock(s), returns equipment to service, and documents actions on the Written LOTO Plan.
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**Typical Shutdown Events Schedule**

<table>
<thead>
<tr>
<th>CM Procedure</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>022 Section</td>
<td>CONSTRUCTION SCHEDULE (includes shutdown schedule)</td>
</tr>
<tr>
<td></td>
<td><strong>SHUTDOWN DURATION</strong></td>
</tr>
<tr>
<td>4.1</td>
<td>CONSTRUCTION SCHEDULE</td>
</tr>
<tr>
<td>4.7.3</td>
<td>Contractor Submits SOR</td>
</tr>
<tr>
<td>5.6</td>
<td>Contractor Pre-shutdown Meeting</td>
</tr>
<tr>
<td>5.4.1</td>
<td>OR Prepares OCR and LOTO</td>
</tr>
<tr>
<td>5.13</td>
<td>Project Team Creates Workaround Plan</td>
</tr>
<tr>
<td>5.13.7</td>
<td>Shutdown Delivery Team and Project Team Update Workaround Plan</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Division OPS Manager Approves OCR and LOTO Plan</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> All durations are calendar days</td>
</tr>
<tr>
<td></td>
<td>LOTO - Lockout/Tagout</td>
</tr>
<tr>
<td></td>
<td>NTP - Notice to Proceed</td>
</tr>
<tr>
<td></td>
<td>OCR - Operational Change Request</td>
</tr>
<tr>
<td></td>
<td>SOR - System Outage Request</td>
</tr>
</tbody>
</table>

Revised: 1/7/11
Inter-Office Memo
SFPUC Health and Safety Program

To: WST, HHWP, CDD, PMB, CMB, EMB, AECOM

FROM: Carolyn Jones
Health and Safety Program Manager

SUBJECT: Guidance on Procedures for Confined Space Entry Work In Water System Pipelines

DATE: 3/14/2011

Introduction: The purpose of this letter is to address various questions on confined space entry processes and procedures that have arisen following the receipt of a December 22, 2010 letter from Cal/OSHA, Water System Improvement Project BDPL-5 East Bay (see attached). The official name of that project is Bay Division Pipeline Reliability Upgrade Project – Bay Division Pipeline No. 5 (CUW 368-02) and there are two construction contracts, one in the East Bay and one on the Peninsula. The letter was in response to the East Bay contractor’s concerns about permit-required confined space (PRCS) entry requirements for pipeline isolation procedures and it summarized the related meeting between Cal/OSHA and SFPUC representatives on November 4, 2010. The Cal/OSHA letter documented their acceptance of the use of a single butterfly valve (BV) for PRCS isolation for one shutdown for the BDPL 5 project, including their rationale. The letter also identified several areas of Cal/OSHA concern, including engulfment in the event of a major earthquake, and secondary engulfment hazards from incidental water passing the valve.

Several SFPUC managers and staff have asked for clarification about PRCS procedures for other projects, both WSIP (contractor) projects and SFPUC Operations projects and inspections. The information below addresses those questions and it summarizes the procedural changes that have been developed from several meetings and discussions with H&S, WST, HHWP, PMB, CMB, and AECOM/WSIP Safety staff. Aspects of this procedure may also be applicable to PRCS for WWE facilities.

Areas of Concern:

1. What are the pipeline entry hazards that Cal/OSHA is concerned about?

All water system pipeline entries have two water engulfment hazards – the primary hazard from an inability of the valve(s), specifically BVs, to provide complete and continuous isolation (with no failure potential) from system water, and the secondary hazard from failure to control incidental water passing the valve(s).

2. Do the findings of the Cal/OSHA letter on the single BV isolation apply to other shutdowns?

The Cal/OSHA letter specifically states that their letter applies only to that one shutdown and that other shutdowns must be individually evaluated for engulfment hazards.
3. What safety-related procedures are required to isolate a section of transmission pipeline from the primary engulfment hazard, to allow personnel to enter the pipe?

   a. The work must follow the requirements of Title 8, California Code of Regulations (CCR) Sections 5156 – 5158, Confined Spaces, and Sections General Industry Safety Orders 3314 and Electrical Safety Orders 2320.4-5 for control of hazardous energy.

   b. All PRCS entries require initial evaluation to identify the potential hazards; of which only primary and secondary engulfment is addressed in this letter (other hazards such as hazardous atmosphere must also be evaluated). Appropriate controls must be identified and implemented to control those hazards. The evaluation process must be done by a qualified person(s), meaning that the evaluator has sufficient knowledge of the job-specific valve(s) design and condition to determine the likelihood (if any) for valve failure. There is no requirement for the evaluation to be done by a professional engineer or a safety professional; rather, it is the responsibility of the owner (i.e., the respective SFPUC Division or Program level management) to identify the appropriate qualified persons.

   The evaluation process should incorporate available information such as, engineering design data and drawings, valve model, manufacturer’s data, valve history information, valve age and condition, valve type (e.g., butterfly or gate), operational data, site data, and/or any other information necessary to render a competent professional assessment on whether the valves in question can catastrophically fail (e.g., could they open or break unexpectedly, leading to flooding and engulfment while workers are inside the pipeline). The evaluation process must also include valves associated with pipe cross-ties, branch lines, service connections, and any chemical injection points, if their failure could cause engulfment of the work area.

   Since there are many varieties of BVs, the failure analysis done for the specific BDPL 5 shutdown, approved by Cal/OSHA, may or may not be applicable to other BVs for other shutdowns. For valves for which there is no operational or engineering data available to make this assessment, additional protective measures, such as but not limited to double block and bleed, are required for isolation.

   c. Because PRCS isolation is achieved through both equipment controls (adequate valve performance) and process/operations controls (Lockout/Tagout, LOTO), the evaluation process must also include review of the job-specific LOTO Plan. A written LOTO Plan is now required for all pipeline shutdowns as part of WSIP Construction Management Procedure 022, System Shutdowns. LOTO is not required for hot taps.

   The LOTO Plan must be prepared by knowledgeable/qualified persons. It must be submitted as part of the Operational Change Request (OCR) document, and responsibility for reviewing and approving the OCR includes review and approval of the LOTO Plan. LOTO Plan review criteria include identification of all sources of energy, identification of each corresponding control point (valve, switch, etc.), method of LOTO for each control point, sequence for implementation, and responsible person to perform LOTO. The LOTO Plan must also include any information necessary for coordination of LOTO actions, including a lockbox, with/between the equipment...
owner (SFPUC), contractors, and other affected parties such as Construction Management staff. The LOTO Plan review process must include Operations, Health and Safety, and the WSIP Shutdown Coordinator for WSIP shutdowns.

The designated SFPUC LOTO supervisor will meet with the contractor and provide LOTO coordination information concerning the shutdown prior to the outage. The information will include: valves to be isolated, past valve leak rate data, date and time of LOTO, names of LOTO personnel (SFPUC and Contractor), and other hazards identified in the professional assessment. All issues raised in this meeting must be addressed or additional information must be gathered and provided to the contractor.

d. When pipeline confined space entry projects are being planned, effort should be made to minimize the duration of entry and the number of people in the pipeline. In addition, alternate non-entry methods should be evaluated (for example, the use remote operated vehicles for inspection).

4. When is “double block and bleed” required for pipeline isolation?

Cal/OSHA initially stated to one of the Bay Division Pipeline contractors that a single BV could not be used for providing water system isolation for PRCS entry work in the pipeline, and that “double block and bleed” was always required. The SFPUC met with Cal/OSHA over several months to discuss their regulatory requirement, and we presented operational information on the water system, technical information on potential for valve failure on the BV in question, our procedures for LOTO, the limited amount of time that personnel would be in the pipe, and our history of safe work in the pipelines. Based on this information, Cal/OSHA agreed that risk of engulfment from water in this particular section of pipeline was adequately controlled by use of this single BV.

It is important to recognize that while the determination for this specific situation recognized that the BV provided adequate protection, each future pipeline shutdown must be evaluated on its merits. Cal/OSHA revised its initial position that a single BV would never be sufficient for isolation. The evaluation process as discussed in #3 above is necessary to determine the acceptability of future isolation procedures. There are circumstances where a single BV is not appropriate for isolation, and double block and bleed, or a blind flange is required (such as for chemical lines, steam lines, smaller valves that are frequently operated for process control or on branch pipelines, or other significant safety concerns). Note that inflatable bladders or other temporary barriers cannot substitute for required double block and bleed or blind flanges.

5. What safety-related procedures are required for protection from the secondary incidental water engulfment hazard?

a. In response to incidental water concerns raised by Cal/OSHA on the BDPL-5 project, the following requirements have been identified by H&S, WSIP, and SFPUC Operations staff. Each pipeline entry shutdown requires that a detailed written plan be developed for incidental water management to prevent a situation where workers are endangered by the build-up and sudden release of this water. If Operations staff will be responsible for incidental water management,
the incidental water management plan will be developed by the SFPUC, and submitted as part of the OCR. When the project specifications identify the contractor as responsible for incidental water management, the contractor will develop the plan and submit it as part of the System Outage Request (SOR) for review by CM staff and/or the Operations Representative.

b. The incidental water management plan must address contractor and SFPUC roles and responsibilities as appropriate, the method for water control, the procedure for regular monitoring of water levels, and the procedure for notifying downstream personnel in a timely manner of any emergency situations. This plan must include dewatering and discharge away from the worksite.

6. Does Cal/OSHA have to review and/or approve the isolation procedures, LOTO Plan, or incidental water management plan each time?

There is no requirement by Cal/OSHA for review and/or approval on a shutdown-specific basis. The Cal/OSHA letter specifically states “In analyzing future projects to determine whether or not the work will trigger permit-required confined space requirements, you [the SFPUC] must include engulfment by water as one of the factors in your determination.” However, sufficient project documentation should be kept to address any future questions on how our review and evaluation were done.

7. What are the requirements for work inside or adjacent to tunnels?

Tunnel construction activities (construction, alteration, repairing, and/or renovating) must comply with the Cal/OSHA Tunnel Safety Orders. Tunnel inspection or maintenance activities (routine activities in a completed tunnel that do not significantly alter the tunnel structure) must at least comply with the Cal/OSHA Confined Space regulations, although the employer can choose to follow the Tunnel Safety Orders. Either way, the isolation requirements for work inside tunnels are consistent with the requirements and procedures described above addressing potential engulfment hazards.

Additionally, when work is done in pipelines that are connected to tunnels, remember that the Tunnel Safety Orders must be followed, unless the pipeline is physically isolated from any tunnel gas hazards. Physical isolation means a water block, mechanical block, or disconnected section of pipe. A single closed BV would not be sufficient isolation unless there was water behind the valve. This Tunnel Safety Orders applicability to pipeline work adjacent to tunnels is irrespective of the tunnel classification.

Please let me know if you need further information. I can be reached at 415-550-3577, or cjones@sfwater.org.

w/attachment
December 22, 2010

David Briggs, Division Manager
Water Supply and Treatment
San Francisco Public Utilities Division
P.O. Box 730
Millbrae, CA 94030

RE: Water System Improvement Project BDPL-3 East Bay

Dear Mr. Briggs:

This is to summarize the points discussed at the November 4, 2010 meeting in Division headquarters, regarding the designation of a permit-required confined space for work underway on the BDPL-3 project in the East Bay. As part of that work, contractor’s employees are replacing pipeline sections in several locations on a 66-inch diameter water pipeline, and must enter the pipeline for the final welding of the sections. While arrangements have been made to extract welding gases and fumes and provide fresh air, concerns have been expressed about the hazard of engulfment by water. Permanent butterfly valves on the pipelines upstream from the work will be closed off during this work, but no other coddernams or other forms of blanking or blinding the pipeline will be installed to completely isolate the work areas from water during the project.

At the meeting, Division staff made clear that when there is a foreseeable hazard of engulfment, repair work of this kind on water pipelines triggers all the requirements of a permit-required confined space, found in Section 51.57 of the General Industry Safety Orders. However, your staff explained in some detail why engulfment was not a hazard on this project:

1. The water in the pipeline is not under pressure, other than the pressure of gravity, and that pressure was less than half the design strength of the butterfly valves. A butterfly valve has a large disc closure member, which pivots on its stem. The valve opens and closes when the stem is rotated one-quarter turn. The side of the disc that is pointed upstream has a larger surface area than the side facing downstream, because of the flange on the outside edge which closure against the valve seat when the valve is shut. In the event of a failure, this difference in surface area forces the valve shut, rather than open. In the event of any failure, water pressure would force the valve shut, rather than force it open.

2. Even in the event of an earthquake, engulfment would not occur downstream of the valves. Each valve body is one large cast iron object. The valve stem is several inches in diameter, and embedded inches into the valve body on top and bottom. In the event of a major earthquake, the pipeline around the valve would fail before the valve did. Water on the upstream side of the valve might escape elsewhere, but would not suddenly burst through the valve.
3. While the valve is expected to leak, this is not the same as an engulfment hazard, and is generally controlled through conventional dewatering methods such as weirs and pumps. In the event that the amount of water leaking from the valve cannot be adequately controlled, the workers welding the seams on the inside of the pipe can easily be evacuated through manholes in the immediate area of the work.

Based on this information, Division staff agreed that the work in pipeline sections below these particular valves, on Water System Improvement Project BDPL-5, did not have to be treated as permit-required confined spaces because of the risk of engulfment by water. The Division’s agreement about this particular set of circumstances does not apply beyond this particular project. In analyzing future projects to determine whether or not the work will trigger permit-required confined space requirements, you must include engulfment by water as one of the factors in your determination. If you need assistance in advance of those projects, you may always contact the Cal/OSHA Consultation Service or our unit.

Thank you for your interest in worker safety.

Sincerely,

[Signature]

Joel Foss, Acting Principal Safety Engineer,
DOSH Research & Standards Safety Unit

cc: Lea Welsh, Chief, Division of Occupational Safety and Health
Vicky Haz, Program Manager, Cal/OSHA Consultation Service
## Revision Control Log

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<td>August 17, 2009</td>
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<td>February 17, 2012</td>
<td>• Revised Section 1.0; Text added</td>
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