

# FACILITIES WELDING AND BRAZING OPERATING PROCEDURE

## APPLICATION

Safe welding and brazing activities at LBNL.

Applies to Facilities Plant Operations, Small Projects, and Capital Projects for all persons performing welding on LBNL property.

## SPECIAL INSTRUCTIONS

Facilities Division management determines the type of welding and the need for subcontract welders. Certified welding will be performed by certified welders. This work is generally structural and for maintaining pressure boundaries of plumbing/piping on construction projects.

Welding operations in the Facilities Division are either subcontracted or initiated by work orders to request work in Plant Operations and Small Projects Scheduled Work Center, according to Administrative Procedure, ADMN-070 "Facilities Welding and Brazing."

LBNL Facilities construction contracts may include building plans, drawings, and/or specifications as applicable. Facilities Small Projects Scheduled Work Center and the subcontract welders are required to follow the LBNL Facilities Master Specifications for Structural Steel Section M05120, Aluminum Section M05130, and Plumbing Piping Section M15410, when performing welding. The specifications detail welding parameters, joint configuration, type of weld, and filler materials. They include engineering specifications, approvals, certifications, and inspection/testing requirements according to the appropriate governing codes.

Non-certified welding and brazing are performed by the LBNL Facilities Division. The welding activities provided by the Plant Operations and Small Projects Scheduled Work Center also include non-certified welding/brazing and certified orbital welding. LBNL Facilities Division personnel do not perform welding and brazing on Safety Class (SC), Safety Significant (SS), or Vital Safety Systems (VSS), Structures, Systems and Components (SSC), as identified by current Quality Assurance Programs (Ref. 10 CFR 830 Subpart A and DOE Orders 414.1B, Quality Assurance). If the requirements for SC, SS, VSS and SSC type welds are requested of Facilities, they will be forwarded to the Engineering Division for an appropriate application of orders, standards and execution.

The types of welding typically performed by the Facilities Division include:

- Mild steel pipe: Building 37 cooling towers, water pressure approximately 60 PSI;
- Hard facing;
- Manhole covers risers, after asphalt repaving;
- Stainless brackets for fume hood fire sprinklers (flat plate to coupling);
- Vacuum pipe systems: ½-inch aluminum couplings, up to 4-inch pipe size systems;
- Repair truck lift gate brackets (mild steel);
- Repair aggregate chutes for dump truck (mild steel);
- Repair of up to 6-inch gas main, with 2-inch disk, mild steel, gas pressure approximately 15 PSI;
- Repair bus bicycle rack brackets; mild steel;
- Repair and fabricate piping/tubing for liquid nitrogen systems (brazing) by the HVAC shop and O&M vacuum shop;
- Orbital welding by certified welder;
- Emergency repair work involving pipe and plumbing systems shall be in accordance with the California Plumbing Code CPC Section 103.1.2: "repairing of leaks in pipes, valves or

fixtures, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes, or fixtures.”

## REQUIREMENTS

EH&S—PUB-3000, Chapter 12, *Fire Prevention and Protection*

Permitting documents for welding activities include Hot Work Permits and may include others, such as Confined Space Entry Permits, and Radiological Work Permits. Additional safety and personal protective equipment (PPE) requirements for eye protection, head protection, protective clothing, respiratory protection, and hearing protection are addressed separately in specific EHS programs: PPE, Respiratory Protection, and Hearing Conservation. Typical controls and PPE used are appropriate open ventilation, HEPA filtered and non-filtered local exhaust, weld-rated lenses for eye protection, safety glasses, leather gloves, ear protection, respiratory protection, weld hoods/face shield and weld blind screens as necessary.

Records of assessments and monitoring data are tracked in an electronic database. For each monitored project, a full description of the hazard, controls, employee name, similar exposure group (SEG), PPE, and results of monitoring is recorded in this database. The applicable exposure limit, regulatory source of that limit, measured result, and notation of any threshold exceeded is included. Records are available electronically and are also stored in physical archives.

## SAFETY TRAINING

All LBNL welders attend appropriate EH&S training courses. Training classes specific to the hazards encountered in welding activities include:

- Compressed Gas and Cryogen Safety (EHS0231);
- Confined Space Hazards (EHS0275);
- Hot Work Permit Training (EHS0535);
- Fire Extinguisher Safety (EHS0530);
- Fire Extinguisher Safety Retraining (EHS0531);
- Lead Hazard Awareness Training (EHS0330);
- Respirator Training (EHS0310).

Required EHS training for all employees is specified by the completion of a Job Hazard Analysis. Training documentation is maintained in a database, and electronic retraining reminders are sent out to employees and Supervisors.

## WELDING EQUIPMENT—SPECIALIZED

- Orbital welding machine for 1/8-inch up to 2-inch tubing;
- Stainless tubing is welded using 2% serrated tungsten electrodes;
  - The welding machine is programmed by the operator, and the weld is performed by the machine. The operator only keys in the settings.

## WELDING MATERIALS

### Storage

Facilities Plant Operations controls weld filler materials by single area storage per the individual shop, using welding and brazing materials. Typical weld filler materials that are stored and used include: 7018: 1/8", 5/32"; 6010: 1/8", 5/32", 3/16"; 308 SS, and hard-face electrodes.

Storage of weld filler materials consists of cabinets and the use of the Electrode Stabilizing Oven. The oven is a Phoenix Type 50A, Model 10, with a temperature range of 300 degrees Fahrenheit – Average.

Purchase of welding equipment/materials

Facilities Division management utilizes a procurement system that requires supervision approval of all purchase requisitions listing the type of weld filler materials specified.

The Facilities Division specifications for weld filler materials are in accordance with LBNL master specifications.

Specification of materials for certified welds will coincide with the specification for certified welding.

Specification of materials for noncertified welding will coincide with the type of machine and materials to be welded.

Facilities management will approve all materials ordered by Plant Operations personnel.

**RESPONSIBILITIES AND CONTROLS**

Provide signature lines as follows:

REV NO.	SME/Title	REV/Title	APPROVED/Title	DATE	EFFECTIVE DATE
4	 5/15/09 Frederick T. Angliss Facilities Chief Civil Structural Engineer	 5/18/09 William Mattson Facilities Scheduled Work Center Mechanical Services Supervisor	 Dennis Nielsen Facilities Small Projects Department Head	5/20/09	MAY 20 2009
	 5/15/09 Michael C. Dong Facilities Operations Utility Manager				