

**Engineering Division  
Central Fabrication Shops  
Mechanical Fabrication Quality Control Procedure**

**1.0 Purpose**

- 1.1 This procedure ensures The Central Fabrication Shops mission to produce mechanical fabrications and services that meet or exceed the specifications of the requestor.

**2.0 Revision History**

Revision Number	Date	Description

**3.0 Persons Affected**

- 3.1 Applies to LBNL Engineering Division, Mechanical Engineering Department, Central Fabrication Shops personnel.

**4.0 Policy**

- 4.1 Assures compliance with LBNL Publication 3111 - Operating and Quality Management Plan
- 4.2 Inspections are performed using a Graded Approach. See Appendix A.
- 4.3 Inspection results are provided to the requestor upon delivery, in the format and at the detail level requested.

**5.0 Definitions**

- AWS – American Welding Society
- Graded Approach – The complexity and detail of part and assembly inspections are dependent on the cost of the items and the amount of information that the requestor requires.
- Calibration – The process of measuring against a standard traceable to NIST
- Coordinate Measuring Machine (CMM) - A CMM is a computer-controlled machine that uses touch probes, video or lasers to measure the surface of a part and calculate deviations from nominal.
- Gage Block - Square or rectangular blocks that are a known and calibrated length.
- Gage Pin - Round pins of a known and calibrated external diameter and roundness.

- HV – High Vacuum
- NIST – National Institute of Standards and Technology
- Ring Gage - Circular gages of a known and calibrated internal diameter and roundness.
- Thread Gage - Gages with a precise thread form of a known and calibrated size.
- UHV – Ultra High Vacuum

## **6.0 Responsibilities**

- 6.1 The Central Shops Manager is responsible for ensuring compliance with this procedure.
- 6.2 The Central Shops Manufacturing Coordinator is responsible for ensuring that materials, vendor supplied items, fabrications and services meet or exceed requestor specifications.
- 6.3 The Central Shops Quality Control Manager is responsible for ensuring sound inspection methodology as well as maintaining the serviceability of inspection equipment, including periodic calibration and certification of specified machines, instruments and gages.
- 6.4 Central Shops employees are expected to produce fabrications and services that meet or exceed the specifications of the requestor.

## **7.0 Procedures**

### **7.1 Materials**

- 7.1.1 For fabrications specifying certified materials, the materials are ordered from outside vendors with a specification that hardcopy certifications be supplied upon delivery. Upon receipt by Central Fabrication the material is visually inspected to catch gross errors. The certifications are then compared to the specifications to confirm conformance. The certifications are held in the Central Fabrication office until the project is complete and provided to the requestor with the completed fabrication.
- 7.1.2 For fabrications not specifying material certification, the materials are ordered from outside vendors and visually inspected by Central Fabrication personnel to discover gross errors. Other than the fact that expert crafts people certainly may discover material errors based on visual and machining/fabricating characteristics of a given material, no other methodology is employed to assure adherence to specifications for non-certified materials.

- 7.1.3 Non-conforming materials are quarantined in the Shop's receiving area until such time as they can be returned to the supplier.

## **7.2 Vendor Supplied Items**

- 7.2.1 Where vendor supplied components are incorporated into Central Shops fabrications, the items receive at a minimum, a visual inspection by Planning Office and crafts personnel on receipt. More rigorous assurance to specification conformance is provided as outlined below under **Machined and Fabricated Features** and at the level specified by the requestor.

## **7.3 Machined and Fabricated Features**

- 7.3.1 Fabricated item/assembly feature form, size, location, orientation and surface finish are assured conformance with requestor specification through one or more of the following as appropriate to the level of control specified by the requestor.
  - 7.3.2.1 In-process inspections performed by crafts personnel employing visual methods as well as mechanical and/or optical measuring instruments, gage blocks, gage pins and thread gages.
  - 7.3.2.2 In-process and final inspections performed by metrology professionals and employing NIST traceable calibrated and or certified mechanical and/or optical measuring instruments, gage blocks, gage pins and thread gages.

## **7.4 Welding Operations**

- 7.4.1 All Central Fabrication Shops welding operations are performed by Qualified Welding personnel and in compliance with LBNL Welding Policy.
- 7.4.2 Where specified by the requestor, fabrications requiring AWS certified welders and performed by Central Shops personnel, the AWS certification documentation is provided to the requestor along with the results of any in-process and/or final inspections as performed by a certified welding inspector and/or inspection laboratory.
- 7.4.3 Where Central Fabrication Shops, on behalf of a requestor, procures welded fabrications from an outside vendor that require certified welding, the certification documentation is requested of the vendor and subsequently supplied to the requestor.

## **7.5 Services**

- 7.5.1 HV and UHV cleaning are performed to ALS Engineering Specification 10156.
- 7.5.2 Painting and Powder Coating are performed to ALS Engineering Specification 10068.

## **7.6 Calibration of Inspection and Gaging Equipment**

- 7.6.1 It is every employee's responsibility to treat the measuring machines and gages with respect and care. If a measuring machine or gage is found to be damaged or in need of maintenance or calibration it will be brought to the attention of the appropriate supervisor.
- 7.6.2 The Zeiss Accura and Faro Gold Arm coordinate measuring machines will have maintenance and calibration performed on an annual basis either on location or at the vendor's facility to NIST traceable standards.
- 7.6.3 Designated Gage blocks and Gage Pins will be calibrated Bi-annually or as necessary at the vendor's facility to NIST traceable standards.
- 7.6.4 Designated Gage Pins and Ring Gages will be calibrated Bi-annually or as necessary at the vendor's facility to NIST traceable standards.
- 7.6.5 Designated Thread Gages will be replaced with new gages on an annual basis.
- 7.6.6 Calibration records will be maintained in the engineering inspection room.