



*LIGO Laboratory / LIGO Scientific Collaboration*

LIGO-Q0900001-v5

3 February 2010

**Advanced LIGO Supplier Quality Requirements**

Jeff Lewis, Bob Anderson, Calum Torrie

Distribution of this document:  
LIGO Scientific Collaboration  
and LIGO Suppliers

**California Institute of Technology**  
**LIGO Project – MS 18-34**  
**1200 E. California Blvd.**  
**Pasadena, CA 91125**  
Phone (626) 395-2129  
Fax (626) 304-9834  
E-mail: [info@ligo.caltech.edu](mailto:info@ligo.caltech.edu)

**Massachusetts Institute of Technology**  
**LIGO Project – NW22-295**  
**185 Albany St**  
**Cambridge, MA 02139**  
Phone (617) 253-4824  
Fax (617) 253-7014  
E-mail: [info@ligo.mit.edu](mailto:info@ligo.mit.edu)

**LIGO Hanford Observatory**  
**P.O. Box 1970**  
**Mail Stop S9-02**  
**Richland WA 99352**  
Phone 509-372-8106  
Fax 509-372-8137

**LIGO Livingston Observatory**  
**P.O. Box 940**  
**Livingston, LA 70754**  
Phone 225-686-3100  
Fax 225-686-7189

<http://www.ligo.caltech.edu/>

email: [quality@ligo.caltech.edu](mailto:quality@ligo.caltech.edu)

## Contents

<b>1. Scope</b>	<b>3</b>
<b>2. Supplier Quality System</b>	<b>3</b>
<b>2.1. Certified or Compliant</b>	<b>3</b>
<b>2.2. Calibration Program</b>	<b>3</b>
<b>3. Procurement Process</b>	<b>3</b>
<b>3.1. Pre-RFP/RFQ Supplier Visit</b>	<b>3</b>
<b>3.2. LIGO Procurement Documentation</b>	<b>3</b>
<b>3.3. Pre-Award Inspection</b>	<b>3</b>
<b>4. Manufacture, Assembly, and Inspection Requirements</b>	<b>4</b>
<b>4.1. Manufacturing Planning / Traveler</b>	<b>4</b>
<b>4.2. First Article Inspection</b>	<b>4</b>
<b>4.3. In-Process Inspection</b>	<b>4</b>
<b>4.4. Final Inspection</b>	<b>4</b>
<b>4.5. Source Inspection</b>	<b>4</b>
<b>4.6. Discrepant Material</b>	<b>4</b>
<b>4.7. Drawing and Specification Change Control</b>	<b>5</b>
<b>4.8. Welding Certifications</b>	<b>5</b>
<b>4.9. End Item Data Package</b>	<b>5</b>

## 1. Scope

This document is intended for Suppliers and potential Suppliers to LIGO when specified on the Statement of Work (SOW). Supplier requirements are defined, including: the Supplier's Quality System; inspection, material handling, packaging and shipping procedures.

## 2. Supplier Quality System

### 2.1. Certified or Compliant

During the Request for Proposal (RFP) or Request for Quote (RFQ) process, preference will be given to potential and current suppliers who are currently ISO 9001, AS9100, or TS16949 certified. LIGO can still contract with suppliers who are not certified but those suppliers typically have ISO 9001 compliant Quality Systems. Potential suppliers having neither an ISO 9001 certified nor compliant Quality System will be required to create a quality document addressing the main points of ISO 9001 with respect to the LIGO work. Only potential suppliers lacking certification shall submit a copy of their Quality System along with the bid package for consideration.

### 2.2. Calibration Program

The supplier shall maintain an ISO 9001 compliant calibration program of all instruments and tools required for the inspection of all LIGO production parts and assemblies manufactured by the supplier or sub-contractor.

## 3. Procurement Process

### 3.1. Pre-RFP/RFQ Supplier Visit

A LIGO representative may conduct a visit or audit to gage a potential supplier's Quality System, facilities, equipment and personnel capabilities, and capacity. The LIGO representative can explain any LIGO specific requirements that are not clear.

### 3.2. LIGO Procurement Documentation

LIGO will provide the supplier with the following documentation in support of the bid process (if applicable):

- 3.2.1. Statement of Work (SOW)
- 3.2.2. Technical documents, drawings, and specifications, identified by revision. Solid Models are available on request.
- 3.2.3. On-line access to all applicable LIGO specifications

### 3.3. Pre-Award Inspection

Prior to contract award LIGO staff may perform an audit of the prospective supplier's Quality System. The audit scope includes but is not limited to:

- Understanding of the various LIGO requirements and specifications. This should be an opportunity for both parties to communicate.
- Supplier QA/QC program and how it will be implemented for Advanced LIGO contracts.
- Manufacturing methodologies, especially as regards cleanliness and use of approved materials and fluids.
- Cleaning and packaging methodologies compared to RFP/RFQ requirements.
- Critical worker certification levels (i.e., welding, electrical, CNC, etc.).

- Calibration program review.

## 4. Manufacture, Assembly, and Inspection Requirements

### 4.1. Manufacturing Planning / Traveler

Unless otherwise instructed, the supplier shall create planning for each manufacturing job which identifies the following components. This planning shall be available for review by LIGO before, during, or after manufacturing.

- The schedule of operations, including the type of process to be performed (ie, mill, lathe, deburr, outside processing, etc.)
- Machinist sign-off and date, including quantity conforming and non-conforming
- Identification and definition of the inspection points during the manufacturing process
- Inspector sign-off and date, including quantity conforming and non-conforming
- Identification of process specifications, as applicable, for internal and external processes
- Identification of operational constraints, as appropriate (ie, no abrasive metal removal techniques for parts destined for Ultra High Vacuum use.)

### 4.2. First Article Inspection

LIGO may wish to witness or inspect the First Article part before the rest of the order is completed. The requirement for this will be defined on the Statement of Work if applicable.

### 4.3. In-Process Inspection

In-process inspections shall be performed where subsequent assembly stages will prevent/limit inspection access, and to detect defects early in the process. In-process inspections shall be identified in the manufacturing planning (see Section 4.1 above).

### 4.4. Final Inspection

The Supplier shall conduct a Final Inspection of all component parts and assemblies to verify completion and conformance of the following items:

- Conformance to all applicable drawings, SOW, and specifications.
- End Item Data Package review (refer to SOW for complete list)
- LIGO property control documentation, when LIGO materials are in possession of a supplier.
- Evidence of safety requirements compliance, if applicable.
- Shipping documentation such as the manifest or shipper.
- Verification of the adequacy of the shipment packaging and weather protection.
- Verification that transportation environmental controls and monitoring requirements will be satisfied.
- 

### 4.5. Source Inspection

Source inspection by LIGO personnel may be required. The supplier will be notified of this in advance of shipping the components.

### 4.6. Discrepant Material

Discrepant parts must be identified and segregated immediately upon detection. If the discrepant parts are required to complete an order and the parts can be reworked to comply with the drawing and/or specifications and with no effect on the delivery date

then LIGO does not need to be notified. If the parts can be reworked to comply with the drawing and/or specifications but the rework process will adversely affect the delivery date, then the LIGO Contracting Officer must be notified.

Please immediately contact LIGO to discuss discrepant parts that cannot be reworked to comply with the drawing and/or specification. Suppliers should use the LIGO form [Q110001 Request for Deviation](#) to formalize a request to submit or rework discrepant parts which will not comply to the drawing and/or specifications. Email the completed form to [quality@ligo.caltech.edu](mailto:quality@ligo.caltech.edu) for a disposition.

The supplier must retain records of any rework processes as part of the job traveler package.

#### **4.7. Drawing and Specification Change Control**

All drawings and specifications will be controlled by the suppliers Quality Assurance Department, including receipt and distribution. Upon receiving the order/contract, all drawings will be verified as to correct number and revision.

Controlled documents must be kept updated at every document change or engineering change. The contract administrator under the guidance of QA will insure that all controlled documents, whether in house or out, will be updated.

Occasionally, LIGO may need to revise drawings for design or manufacturing reasons after the purchase order has been issued. These changes are normally discussed with the supplier in advance of official notification to come to a common agreement on the feasibility and implications of the desired changes. When the change will have no adverse effect on the cost or delivery of the part(s) then a Technical Directive Memorandum will be issued by LIGO to formally document the change. If the change is estimated to affect either cost or delivery of the part(s), then a Change Request will be initiated and sent to the supplier, followed by a revised Purchase Order.

Upon receipt of drawing and specification changes, the supplier Quality Assurance or other appropriate personnel will remove obsolete drawing and/or specifications and issue the latest drawing and/or specification to proper personnel. Obsolete drawings shall either be marked "obsolete" if needed for records or destroyed.

#### **4.8. Welding Certifications**

Suppliers of parts or assemblies requiring welding which will be used in an Ultra High Vacuum environment must refer to LIGO specification [E0900048 Welding Specification for Weldments used within the Advanced LIGO Vacuum System](#). This specification details numerous welding specific requirements. The SOW will state if this specification is invoked for a certain part or order.

#### **4.9. End Item Data Package**

The end item data package is the set of required documents to be supplied to LIGO upon delivery of ordered parts or services. Refer to the Statement of Work (SOW) for the complete list of documents to be included.