



**Statement of Work**

**Fabrication of Vacuum Pod components  
 for Advanced LIGO BSC-ISI Seismometers**

The following documents are incorporated into and made a part this purchase order. Click on the following LIGO Document Control Center (DCC) links to access these documents or go on line to the LIGO Public DCC at <https://dcc.ligo.org/> to access the DCC#.

**1.0 Terms:**

<u>DCC #</u>	<u>Description</u>
<a href="#">C080185-v1</a>	Laser Interferometer Gravitational Wave Observatory (LIGO) Commercial Items or Services Contract General Provisions California Institute of Technology "Institute", LIGO Rev 11/12/08
<a href="#">F0810001-v4</a>	Technical Direction Memorandum.

**2.0 Quality Control:**

<u>DCC #</u>	<u>Description</u>
<a href="#">Q0900001-v4</a>	Advanced LIGO Supplier Quality Requirements, dated 4/15/09, describes following contractor/supplier QA/QC actions for this procurement:
<input type="checkbox"/> 3.1 Pre-Award Inspection	<input checked="" type="checkbox"/> 3.9 Discrepant Material Storage
<input checked="" type="checkbox"/> 3.2 Supplier In Process Quality Control	<input checked="" type="checkbox"/> 3.10 Quality Records
<input checked="" type="checkbox"/> 3.3 In Process Inspection	<input type="checkbox"/> 3.11 Drawing and Specification Change Control
<input checked="" type="checkbox"/> 3.4 Pre-Ship Inspection	<input checked="" type="checkbox"/> 3.12 Welding Certification
<input checked="" type="checkbox"/> 3.5 Receiving Inspection	<input checked="" type="checkbox"/> 3.13 End Item Data Package (including Certifications of Compliance)
<input checked="" type="checkbox"/> 3.6 Discrepant Material	<input type="checkbox"/> 4.1 Design Verification
<input checked="" type="checkbox"/> 3.7 Material Review Action	<input checked="" type="checkbox"/> 4.2 Raw Material Procurement
<input checked="" type="checkbox"/> 3.8 Material Review Actions at Contractor	<input checked="" type="checkbox"/> 4.3 Traceability of Materials
	<input checked="" type="checkbox"/> 4.4 Calibration Program
	<input type="checkbox"/> 4.5 Critical Interface
	<input checked="" type="checkbox"/> 4.6 Cleanliness
	<input checked="" type="checkbox"/> 4.7 Packaging
	<input checked="" type="checkbox"/> 4.8 Storage
	<input checked="" type="checkbox"/> 4.9 Transport
	<input type="checkbox"/> 4.10 Customs

For the above list the Supplier shall: 1) Identify the corresponding sections/paragraphs in their existing QA/QC system 2) meet or exceed the design requirements contained in the attached engineering documents for each area called out.

### 3.0 End Item Data Package:

At the time of delivery of the parts, the Supplier shall also provide the following data, as a minimum:

- Any as-built modifications (with approval of the LIGO Contracting Officer) as mark-ups to the drawings
- Material certifications
- Dimensional & QC inspection reports—this shall include a report showing that parts have been inspected and fall within specified tolerances.
- Certificate or statement of compliance with all contract and drawing process restrictions.
- Certification that each of the pods has been tested to assure that the leak rate is less than  $10^{-9}$  torr-liter/sec.

### 4.0 Included Documents:

The drawings cited below are only partially dimensioned. In addition to the drawings, the contractor will be provided with CAD solid models of the parts (SolidWorks Professional 2009, SP5.0)

<u>DCC #</u>	<u>Description</u>
<a href="#">D0900649-v1</a>	Trillium 240 Pod Top-hat
<a href="#">D0900650-v1</a>	Trillium Pod Base Flange
<a href="#">D047823-v4</a>	L4C Vacuum Chamber Top
<a href="#">D047822-v4</a>	Baseplate Flange L4C Pod
<a href="#">D0900859-v1</a>	GS13 Pod Top Hat
<a href="#">D0900860-v1</a>	Flange Pod Base GS-13
<a href="#">E0900048-v5</a>	Welding Specification for Weldments used within the Advanced LIGO Vacuum System
<a href="#">E0900364-v1</a>	Metal components intended for use in the AdvLIGO Vacuum System

### 5.0 Scope:

This RFQ is for the fabrication of various individual parts detailed in the six (6) unique drawings included in this package. These parts will be assembled by ALIGO to create vacuum pods for use in the Advanced LIGO BSC-ISI subsystem. The EXTERIOR of these pods (and their individual parts) will be in contact with a vacuum environment.

### 6.0 Quantity Required:

D0900649-v1	Trillium 240 Pod Top-hat	total qty: 48
D0900650-v1	Trillium Pod Base Flange	total qty: 48
D047823-v4	L4C Vacuum Chamber Top	total qty: 96
D047822-v4	Baseplate Flange L4C Pod	total qty: 96
D0900859-v1	GS13 Pod Top Hat	total qty: 96
D0900860-v1	Flange Pod Base GS-13	total qty: 96

## **7.0 Delivery Requirements:**

The deliveries are FOB at these destinations, i.e. the contractor has responsibility for shipping title and control of goods until they are delivered and the transportation has been completed. The contractor selects the carrier and is responsible for the risk of transportation and for filing claims for loss or damage.

Shipping Location:

These items will be shipped to:

LIGO Livingston Observatory (LLO)  
Attn: Joe Hanson and Tom Gentry  
19100 LIGO Lane  
Livingston, LA 70754

Shipping Containers:

The contractor is responsible for providing shipping containers and transportation which protects these parts from damage from the transportation environment (weather, handling, accidents, etc.). Mating edges of parts should be especially protected from damage during shipping.

## **8.0 Manufacturing:**

### **8.1 Precedence**

The Statement of Work (SOW) sections below regarding processing or fabrication of the parts are meant to convey the scope and nature of the requested work. If there is a conflict between the SOW and the drawing, the drawing has precedence.

The parts are to be produced using the CAD models which will be provided to the contractor upon award. If there are discrepancies between the drawings and the CAD model, the model takes precedence.

### **8.2 Restrictions**

- Machine all surfaces to remove oxides and mill finish. Abrasive removal techniques are not acceptable.
- All machining fluids must be fully synthetic, water soluble (not simply water miscible) and free of sulfur, chlorine, and silicone.
- Thoroughly clean part to remove all oil, grease, dirt, and chips with soap and water. Follow with solvent (acetone) wipe. Pay close attention to tapped holes.

### **8.3 Materials**

Material is specified on the drawings. All materials specified by drawings or SOW have been approved for use in the UHV environment in LIGO. No materials may be substituted or added without prior knowledge and testing by LIGO. Cast tooling plate is not permitted.

### **8.4 Machining**

All parts are to be machined. No grinding or lapping with abrasive wheels, cloth or stones is permitted. No sanding of any type. No parts shall be cast or molded. Water soluble (not just water miscible) cutting fluid (lubrication) is to be used for all machining operations. The use of cutting fluids or lubricants, which contain sulfur, chlorine or silicone compounds is prohibited.

## 8.5 Welding

For weld requirements see [E0900048](#)-v5 also referenced in the “Included Documents” section of this SOW.

## 8.6 Finishing

Any required surface finish is defined in the drawings.  
Localized scratches, digs and blemishes should be minimized.

## 8.7 Marking

Marking location is shown on the drawings.

All parts must be marked with a part number, revision code and serial number at the location indicated on the drawing. Marking is to be accomplished by mechanically scribing, stamping or engraving (no dyes or inks).

If not indicated in the drawing, mechanically scribe, stamp or engrave as follows:

<drawing number> - <revision code>, <type number if applicable>

<unique 3 digit serial number starting at 001 for the first part and incrementing thereafter>

As an example:

D0900026-v1

S/N – 001

The serial number must be a sequential 3-digit number, starting with 001, for each part.

Also where indicated, mechanically scribe, stamp, or engrave (no dyes or inks) any LABELS shown on drawing sheets.