



## Statement of Work For Fabrication of SUS QUAD Storage Containers

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 Scope

This Statement of Work (SOW) is for the fabrication of 2 types of storage containers (UPPER STRUCTURE and LOWER STRUCTURE) per the unique drawings included in this package for the Advanced LIGO Quadruple Suspension (QUAD). The containers will provide long term storage for ultra high vacuum (UHV) prepared assemblies waiting to be installed in vacuum. Materials and designs have been chosen for these containers such that they can easily be cleaned by LIGO.

### 2 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.

### 3 Quality Control

<u>DCC #</u>	<u>Description</u>
<a href="#">Q0900001-v4</a>	Advanced LIGO Supplier Quality Requirements, dated 2/10/10, 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 type="checkbox"/> 3.10 Quality Records
<input checked="" type="checkbox"/> 3.3 In Process Inspection	<input checked="" 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 type="checkbox"/> 3.7 Material Review Action	<input type="checkbox"/> 4.2 Raw Material Procurement
<input checked="" type="checkbox"/> 3.8 Material Review Actions at Contractor	<input 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 and 2) meet or exceed the design requirements contained in the attached engineering documents for each area called out.

#### 4 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
- Certificate or statement of compliance with all contract and drawing process restrictions.
- Dimensional & QC inspection reports—this shall include a report showing that parts have been inspected and fall within specified tolerances.

##### 4.1 Dimensional & QC Inspections

Assembly of one unit of each type is required to confirm form/fit. Inspection will be performed at vendor site by LIGO staff.

#### 5 Drawing Packages and Requirements

[E0900364](#)

##### Metal Components intended for use in Adv LIGO Vacuum

Note that the chemical cleaning requirement should be quoted with the bid package as an Option.  
See Section 9 below.

[D1002222](#)

##### UPPER STRUCTURE STORAGE CONTAINER

See Assembly Drawing

Note: The viton gasket for this type of container (D1002222) will be provided by LIGO.

[D1002118](#)

##### LOWER STRUCTURE STORAGE CONTAINER

[D1002248](#)

LS Container Support Rails

[D1002247](#)

LS Container LSAT Clamp

[D1002120](#)

LS Front Panel

Front Panel

Back Skin

[D1002119](#)

LS Weldment

Basic Weldment

Top and Bottom Skin

Side Skin

Back Skin

End Plug

3D CAD files are available upon request and are provided as reference only. All parts are to be manufactured to the referenced 2D drawings. If there are any discrepancies between the drawings and the CAD files, the drawings take precedence.

#### 6 Quantity Required

The total quantity required by assembly drawing number is as follows. Note the Bill of Materials on the assembly drawings.

Container Type	Deliver To	Qty
D1002222 QUAD Upper Structure Storage Container	LHO	8
D1002222 QUAD Upper Structure Storage Container	LLO	5
D1002118 QUAD Lower Structure Storage Container	LHO	8
D1002118 QUAD Lower Structure Storage Container	LLO	5

## 7 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 Locations: All parts are to be shipped to these locations in the quantities listed in Section 6 above.

LIGO Livingston Observatory (LLO)  
 Attn: Gary Traylor and Virginia Brocato  
 19100 LIGO Lane  
 Livingston, LA 70754

LIGO Hanford Observatory (LHO)  
 Attn: Betsy Bland and Jodi Fauver  
 127124 North Route 10  
 Richland, WA 99354

Shipping Containers:

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

### 7.1 Delivery Schedule

One of each fully assembled D1002118 and D1002222 first article units are due for inspection by LIGO personnel **2 weeks ARO**. All further deliveries are to be completed **6 weeks ARO**. If this cannot be accommodated, please provide an alternative delivery schedule for consideration with your bid package. Early and/or partial deliveries are welcome.

## 8 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 this SOW and the drawing, the drawing has precedence.

### 8.2 Machining

All parts shall be manufactured in accordance with LIGO specification E0900364.

## 8.2.1 D1002118

### D1002120 FRONT PANEL

- Machine all surfaces of the frame to remove oxides and mill finish, use of abrasive removal techniques is not allowed.
- Sheet stock to be free of defects, dings, and scratches, and have a workmanlike finish. Surface imperfections such as handling marks, shallow pits, and scratches are acceptable provided they are within 10% of specified wall or 0.002" (0.05mm), whichever is greater.

### D1002119 WELDED STRUCTURE

- All tubes and sheets to be free of defects, dings, and scratches, and have a workmanlike finish. Surface imperfections such as handling marks, shallow pits, and scratches are acceptable provided they are within 10% of specified wall or 0.002" (0.05mm), whichever is greater.
- Each tube should be individually wrapped and protected from scratches, pitting and digs during transport and handling.
- Prior to welding, all parts must be thoroughly cleaned to remove all oil, grease, ink markings, dirt and chips using soap and water or solvent (acetone).
- **Note the callout for chemical cleaning of STRUCTURE SHELF on PAGE 3 of D1002119 required prior to welding.**

### D1002247 LSAT CLAMP

- Machine all surfaces to remove oxides and mill finish, use of abrasive removal techniques is not allowed.

### D1002248 SUPPORT RAILS

- Material to be as received.

## 8.2.2 D1002222

### ALUMINUM WELDED COVER

- 32 micor-inch finish as rec from supplier. If surface finish is higher than the standard 32 Ra micro-inch, the surface finish shall be discussed with LIGO officer prior to acceptance.

### ALUMINUM ANGLE FOR COVER FLANGE

- Material to be chosen such that localized digs, scratches and blemishes are minimized.

### ALUMINUM BASE PLATE

- Machine all surfaces of 1/2" plate.

### ALUMINUM L-CHANNEL

- Material to be chosen such that localized digs, scratches and blemishes are minimized.
- Feet to be welded to base plate at corners.

## 8.3 Welding

- All dimensions apply after welding.
- **All welds shall be done on the interior of the container such that no seams are exposed on the interior of the box.** Seams will trap contamination and be hard to clean.
- All welds must be continuous.

- All welds must be complete joint penetration welds or partial penetration welds.
- The container should fully seal at the welds, such that the container is air tight.
- No trapped volumes are permitted. Weldments with crevices are considered non-cleanable since these crevices act as traps for cleaning solutions.
- All welders should be certified to American Welding Society (AWS).

## **9 OPTIONS**

Please quote as an option the Alkaline Soak Cleaning of all units (D1002118 and D1002222) post fabrication as per Section 5.1 of E0900364.