LIGO LABORATORY
California Institute of Technology
1200 E. California Blvd.
Pasadena, CA 91125

Statement of Work
Fabrication of
HAM SMALL TRIPLE SUSPENSION
STRUCTURES

The following documents are incorporated into and made a part of 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 Scope:

This SOW is for the fabrication of the Structure assembly per the unique drawing included in this package as part of the Advanced LIGO HAM Small Triple Suspension Structure.

2.0 Terms:

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

3.0 Quality Control:

DCC #	*Description*
Q0900001-v4	Advanced LIGO Supplier Quality Requirements, dated 2/10/10, describes following contractor/supplier QA/QC actions for this procurement:

☒	3.1 Pre-Award Inspection	☒	3.9 Discrepant Material Storage	☒	4.4 Calibration Program
☒	3.2 Supplier In Process Quality Control	☒	3.10 Quality Records	☐	4.5 Critical Interface
☒	3.3 In Process Inspection	☒	3.11 Drawing and Specification Change Control	☒	4.6 Cleanliness
☒	3.4 Pre-Ship Inspection	☒	3.12 Welding Certification	☒	4.7 Packaging
☒	3.5 Receiving Inspection	☒	3.13 End Item Data Package (including Certifications of Compliance)	☒	4.8 Storage
☒	3.6 Discrepant Material	☐	4.1 Design Verification	☒	4.9 Transport
☐	3.7 Material Review Action	☒	4.2 Raw Material Procurement	☐	4.10 Customs
☒	3.8 Material Review Actions at Contractor	☒	4.3 Traceability of Materials		

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.

4.0 Included Documents:

The drawings cited below are fully dimensioned. In addition to the drawings, the contractor will be provided with CAD solid model of the part (SolidWorks Professional 2009, SP5.0).

DCC #	*Description*
D020023-v2	Structural weldment Assembly, HSTS
E0900048-v6	Welding Specification for Weldments used within the Advanced LIGO Vacuum System

5.0 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
- Welding and Welding Personnel certifications (see requirements in E0900048 above)
- Heat treatment certifications
- Dimensional & QC inspection reports—this shall include a report showing that parts have been inspected and fall within specified tolerances. **Dimensional inspection reports for first, last, and an additional 3 structures.**
- Certificate or statement of compliance with all contract and drawing process restrictions

6.0 Quantity Required:

D020023-v2	STRUCTURAL WELDMENT ASSEMBLY, HSTS	total qty: 24

7.0 Delivery Requirements:

See RFQ.

8.0 Manufacturing:

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.

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

2. Machining

Please note that the structure has machining requirements after welding, and post-weld stress relief heat treatment, to mate with other components.

All surfaces of all parts are to be machined, except the inner surfaces and outer radii of the tubing. Abrasive removal techniques are not acceptable. No grinding or lapping with abrasive wheels, cloth or

stones is permitted. No sanding of any type. No parts shall be cast or molded. Blanchard grinding is acceptable if all ground surfaces are machined afterwards.

All machining fluids must be fully synthetic, fully water soluble and free of sulfur, silicone, and chlorine. Upon award of contract, vendor will be required to supply MSDS sheets for all proposed machining fluids for approval prior to starting work.

Treatment of raw materials and work-in-process materials with respect to cleanliness is covered in the welding specification, E0900048.

All tapped holes for heli-coils are to be machined according to the Emhart Helicoil Systems Catalog HC2000, Rev 4, page 17. The contractor is NOT responsible for insertion of heli-coils and dowel pins.

3. Materials

Material is specified on the drawings. The square stainless steel tubing may have a wall thickness of 7 gauge (0.180") or 3/16" (0.188") depending on availability. Vendor should indicate in their quote which wall thickness they plan to use. 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.

All stainless steel tubing must meet the requirements specified in the welding specification, LIGO-E0900048, and must be approved by LIGO prior to the start of welding.

4. Welding

All welds are to be per E0900048 referenced in the "Included Documents" section of this SOW.
All dimensions apply after heat treatments.

Note that E0900048 calls for the structures to undergo a post weld stress relief heat treatment and to be pickled and passivated. Please make sure to list sub-contractor information with the bid package.

5. Marking

Each structure 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 101 for the first part and incrementing thereafter>

As an example:

D020023-V2 S/N – 101

The serial number must be a sequential 3-digit number, **starting with 101**, for each part. Also where indicated, mechanically scribe, stamp, or engrave (no dyes or inks) any additional markings called out on drawing sheets.

6. Finishing

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