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

Statement of Work
Fabrication of Machined Large Plates for Advanced LIGO BSC-ISI

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 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.

2.0 Quality Control:

DCC #	*Description*
Q0900001-v3	Advanced LIGO Supplier Quality Requirements, dated 4/15/09, 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.

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.

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)

DCC #	*Description*
D0900894-v1	Drawing, Stage 0 Monolithic Half Bottom
D0900895-v1	Drawing, Stage 0 Monolithic Half Top
D0901516-v1	Drawing, Optical Table, Down-facing
D0901517-v1	Drawing, Optical Table, Up-facing
D0901518-v1	Drawing, Keel Plate, Down-facing
D0901519-v1	Drawing, Keel Plate, Up-facing
D0901520-v1	Drawing, Mid-plate
D0902503-v1	Drawing, Stage 1 Close out plate cover
D0902273-v1	Drawing, Close Out Plate, Stage 1
D0902279-v1	Drawing, Base Plate, Stage 1
E0900364-v1	Metal components intended for use in the AdvLIGO Vacuum System

5.0 Scope:

This RFQ is for the fabrication of a number of sets of machined parts, per the ten (10) unique drawings included in this package, for use in the Advanced LIGO BSC-ISI subsystem.

6.0 Quantity Required:

A total of fifteen (15) sets of EACH of the ten drawings included in this SOW are required.

7.0 Delivery Requirements:

Supplier shall notify the Institute (LIGO) as soon as a set of ten (10) plates is ready for shipment. LIGO then shall conduct its **final inspection** of that set on site **at Supplier's facility** prior to shipment, which inspection location is agreed to in lieu of the Institute's premises stated in General Provision 11 – Inspection and Acceptance. After LIGO completes its final inspection of a set of plates, Supplier shall ship and deliver that set to its destination identified in the Shipping Location instructions below. LIGO shall **accept** each set of plates **at the Shipping Location** after it confirms no loss or damage has occurred since final inspection.

Shipping Location:
The first set of ten (10) plates will be delivered to LIGO MIT:

MIT LIGO
c/o Myron MacInnis
NW-17
175 Albany St
Cambridge MA 02139

The remaining 14 sets are to be delivered to Astro Pak Inc., the LIGO-designated UHV chemical cleaning vendor at the following address:

Astro Pak
12201 Pangborn Avenue
Downey, CA 90241

Shipping Containers:
The Supplier is responsible for providing shipping containers and transportation which protects these parts from damage from the transportation environment (weather, handling, accidents, etc.). In particular as these aluminum plates are heavy, care must be taken to ensure that handling does not result in scratched or dented/nicked parts; point or line loads on the corners and edges can cause upsets in the part surfaces. The shipping containers are included in the Contract price and will not be returned to Supplier.

Specifically for these shipping containers:
-One shipping container will be needed for each part.
-Each container will be constructed of 3/4 inch plywood and dimensional lumber to securely hold each plate.
-Each container shall have a permanent marking stating that they are not to be stacked.
-Three lifting eyes per plate are to be inserted into the 1/2-13 holes located 120 degrees apart.

8.0 Delivery Schedule:

1.) one (1) set of ten (10) parts to MIT LIGO by 8/6/2010
2.) two (2) sets of ten (10) parts to chemical cleaning vendor by 8/27/2010
3.) two (2) sets of ten (10) parts to chemical cleaning vendor by 9/24/2010
4.) two (2) sets of ten (10) parts to chemical cleaning vendor by 10/29/2010
5.) four (4) sets of ten (10) parts to chemical cleaning vendor by 12/17/2010
6.) four (4) sets of ten (10) parts to chemical cleaning vendor by 2/11/2011

9.0 Manufacturing:

9.1 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.

9.2 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.
- Helicoils: Helicoils may be installed for handling. No other Helicoils should be installed by the machine shop.
- *NOTE: machine shop is NOT responsible for helicoils shown in any BSC plate drawings in this SOW.*

9.3 Materials

Plates are 6061-T6 aluminum. Material certifications are required for all parts. All materials specified on 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.

9.4 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.

9.5 Welding

No parts are to be welded except as part of a LIGO approved repair.

9.6 Finishing

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

9.7 Marking

The standard note in the drawings indicate that the part number and serial number are to be marked with .07" high characters. This should be considered a minimum.
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.