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

Statement of Work
TMS Suspension Springs
C-1200457-v1

1.0 Scope (LIGO sub-system)

This Statement of Work covers the manufacturing of two types of maraging steel 'thin' curved blade springs according to LIGO Specification E0900023-v11. Parts will be manufactured from LIGO supplied material.

2.0 Document Access

Many supplemental documents and specifications are incorporated into and made a part this Statement of Work. Click on the document links to access these documents from the LIGO Document Control Center (DCC) or go on line to the LIGO Public DCC at https://dcc.ligo.org/ to access the DCC#.

3.0 Commercial Terms and Applicable LIGO Specifications:

Note: The documents listed below are invoked for this Statement of Work and comprise additional requirements which are integral to this Statement of Work.

- LIGO-C080185-v1 LIGO Commercial Items or Services Contract General Provisions
- LIGO-Q0900001-v5 Advanced LIGO Supplier Quality Requirements
- LIGO-E0900023-v11 Process for Manufacturing Cantilever Spring Blades for AdvLIGO

4.0 Quality System:

Referring to the above referenced LIGO Specification Q0900001, Suppliers should include a copy of their current ISO 9001, AS9100, or TS16949 certification in their bid package. Suppliers lacking current certification should send a copy of their Quality Manual with their bid package.

5.0 Parts to be manufactured, Quantity Required, and Inspection requirements:

Drawing #	Part Description	Total Qty:	Parts to be Inspected
LIGO-D1200116-v1	aLIGO TMS Upper Stage Blade Spring	21	Serial #'s 001 thru 021 (All Parts)
LIGO-D1200117-v1	aLIGO TMS Lower Stage Blade Spring	21	Serial #'s 001 thru 021 (All Parts)

Notes:
(1) Refer to section 7.6.1 of this SOW for scope of inspection required.
(2) See section 7.7 for Part Number and Serial Number marking requirement.
(3) The above drawings are to be revised prior to purchase order for this work. The change to each drawing will consist primarily of a decrease in curve radius, with negligible change to flat pattern dimensions. The decrease in curve radius in each case will be on the order of 5%.

6.0 Manufacturing Facilities, Equipment, and Capability:

LIGO personnel will inspect the manufacturer's facilities and equipment to ascertain that the manufacturer possesses adequate and appropriate facilities, equipment, and capability for the stated work. Manufacturer must insure that all sub-contractors have the necessary facilities, equipment, and capabilities for the sub-contracted work. LIGO reserves the right to inspect all sub-contractors' facilities.

7.0 Manufacturing Requirements:

7.1 Fabrication:

7.1.1 All parts are to be manufactured in strict accordance with LIGO Specification E0900023-v11 and all additional requirements of this SOW. Manufacturer is responsible for all sub-contractors' conformance to LIGO Specification E0900023-v11 wherever applicable, including handling and protection of parts, and to all additional and applicable requirements of this SOW. All parts are 'thin' curved springs as described in section 2.2 of LIGO Specification E0900023-v11.

7.1.2 Included with price and delivery quote, manufacturer will supply a complete outline of the intended manufacturing process.

7.1.3 For each completed part, the two major surfaces must be finished per LIGO Specification E0900023-v11 and the drawings, to a 32 µinch Ra [.8 µm Ra] roughness maximum. For each completed part, all non-major surfaces including hole surfaces must be finished to a 63 µinch Ra [1.6 µm Ra] roughness maximum (not per Specification E0900023-v11 or the drawings).

7.1.4 All completed parts must consist of 100% virgin material, free of repairs such as plugs or welds.

7.2 Material:

LIGO will supply the raw material for all parts from stock on hand. This material is Maraging Steel C-250, circa 2002 per AMS 6512D, .27 inch thick sheet.

NOTE: LIGO Specification E0900023-v11 , section 2.1, requires Maraging Steel C-250 per AMS 6520. This discrepancy is noted and approved by LIGO.

7.3 Tooling:

7.3.1 LIGO possesses some tooling specifically for production and inspection of the parts of this SOW. This tooling may be useful to the manufacturer and is available for their use. This tooling will remain the property of LIGO.

7.3.2 Manufacturer will supply all further necessary tooling for production and inspection of the parts. This tooling, for an agreed NRE, will be the property of LIGO.

7.4 Sub-Contracted Work:

LIGO expects that at least 2/3 (by dollar value) of the contracted work be performed by the Supplier named on the Purchase Order. All sub-contracted work shall be done in accordance with the manufacturing process agreed to prior to award of prime contract. The Supplier shall be responsible for all sub-contracted work.

7.5 Precedence:

If any conflict is perceived among the drawings and other invoked documents of this SOW (see section 3.0 for other invoked documents), the manufacturer is requested to contact a LIGO representative for resolution.

7.6 Inspection of Parts:

LIGO reserves the right to source inspect at manufacturer's facility after:

- flat fabrication
- rolling (curve forming)
- heat treat

7.6.1 All completed parts (Serial Numbers 001 through 021 for both Part Numbers) shall be inspected by the manufacturer for full conformance to the specifications of the drawings, except as stated in section 7.1.3 of this SOW.

7.6.2 Prior to delivery, manufacturer will provide complete drawing conformance inspection reports for all parts according to Part Number and Serial Number. See section 8.0, this SOW.

7.7 Marking of Parts:

Each part is to be numbered in an approximate location as noted on the drawing. Marking is to be scribed, engraved (a vibratory tool may be used), or laser applied. No inks or dyes are permitted. Marking shall consist of part number with revision, followed by a three digit serial number. Serial numbers shall start at 001 and proceed consecutively. Character height shall be .10" minimum.

Example: D1200116-V2 S/N 004

7.8 Manufacturing Environment and Protection of Parts:

7.8.1 LIGO personnel will initially inspect the manufacturer's facility to ascertain acceptable moisture control, general air quality control, and general facility cleanliness control. All sub-contractors must agree that LIGO may similarly inspect their facilities.

7.8.2 Parts must be protected from moisture at all times up to and including time of delivery. These requirements apply to all sub-contractors, and Manufacturer is responsible for all sub-contractors' conformance to them. These requirements are in addition to the various protection and special handling requirements throughout LIGO Specification E0900023-v11.

8.0 End Item Data Package:

Before delivery of the parts, the Supplier shall provide the following data, as a minimum:

- Any as-built modifications (with approval of the LIGO Contracting Officer) as mark-ups to the drawings
- Heat Treat and/or Stress Relief certifications, if applicable
- Inspection reports according to Sections 5.0 and 7.6.1&2 of this SOW
- Certificate of compliance for each part number stating conformance to contract and drawing requirements

9.0 Delivery Requirements:

9.1 Shipping Containers and Packaging:

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.

9.2 Shipping Destination:

The deliveries are FOB at these destinations, i.e. the Supplier has the 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.

These items will be shipped to:

California Institute of Technology (CIT)
attn: Ken Mailand
LIGO Project MS 100-36
391 S. Holliston Ave.
Pasadena, CA 91125

9.3 Delivery Schedule:

All completed items due at the above address 12 weeks ARO.