



**Statement of Work
 Fabrication of Custom In-Vacuum Cables V25M
 for Advanced LIGO HAM-SEI GS-13 and L-4C Seismometers**

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:

<u>DCC #</u>	<u>Description</u>
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:

<u>DCC #</u>	<u>Description</u>
Q0900001-v4	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 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 type="checkbox"/> 3.4 Pre-Ship Inspection	<input 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 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 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:
- o Any as-built modifications (with approval of the LIGO Contracting Officer) as mark-ups to the drawings
 - o Material certifications
 - o Dimensional & QC inspection reports—this shall include a report showing that parts have been inspected and fall within specified tolerances.
 - o Certificate or statement of compliance with all contract and drawing process restrictions.

4.0 Included Documents:

In addition to the drawing cited below, if requested, the contractor will be provided with the CAD solid model of the part (SolidWorks Professional 2009, SP5.0)

<u>DCC #</u>	<u>Description</u>
D1000227-v4	Custom Cable Specification V25M
E0900364-v1	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 drawing included in this package. These parts will be assembled by the Supplier to create in-vacuum cables for use in the Advanced LIGO HAM-SEI subsystem. These cables (and their individual parts) will be in contact with an Ultra High Vacuum (UHV) environment. Please note that some of the parts for the assembly of the cables will be supplied by LIGO, as listed in the notes of the drawing.

6.0 Quantity Required:

D1000227-v2	Custom Cable Spec. V25M	total qty: 55
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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:

Gary McIntyre
California Institute of Technology
391 S. Holliston Ave.
MS 18-34
Pasadena, Ca. 91125

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: These items are intended for UHV (Ultra High Vacuum) and as such have restrictions on materials, processes, cleaning and handling. Refer to the information for Metal components intended for use in the Adv LIGO Vacuum System [LIGO-E0900364](#) for guidance.

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.

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.
- The backshell is not to be welded or cast.
- Use of Scotch-Brite™ (or similar products) is not permitted. Use stainless steel wool instead.

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.

8.4 Machining

All parts are to be machined. No grinding or lapping with abrasive wheels, cloth or stones is permitted. 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 Finishing

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

8.6 Cleaning and Handling

Best shop practices are to be employed during the assembly/manufacture of these cable assemblies. In particular all parts should be clean, free of particulates and oils, greases, soaps, etc. All parts should be handled with powder-free, latex gloves if at all possible (to prevent transfer of oils from ungloved hands). Assembly should be performed in a clean shop space.

Assembly tooling should be cleaned to prevent cross-contamination to the cable assemblies.

The final cable assemblies should be packaged in clean non-shedding bags.