



**COMPONENT SPECIFICATION**

**TITLE**  
**LARGE OPTICS SUSPENSION (LOS)**  
**FIXTURES AND COMPONENTS FABRICATION SPECIFICATION**

APPROVALS:	DATE	REV	DCN NO	BY	CHK	DCC	DATE
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**1 INTRODUCTION**

**1.1. Objectives and Scope**

The scope of this document is limited to the specifications for the fabrication of the LOS (Large Optics Suspension) fixtures and components.

**1.2. Applicable Documents**

- LIGO-D960132: Large Optic Suspension Assembly, LOS1;Reference only - not required for fabrication
- LIGO-L970196: Part Numbers and Serialization of Detector Hardware
- LIGO-E970152: Large Optic Suspension Fixtures and Components Quality Conformance Worksheet

**2 SPECIFICATION FOR FABRICATION**

**2.1. Physical Configuration**

Build in accordance with the drawings referred to on:

- LIGO-D960132: Large Optics Suspension Assembly; Ref only - not required for fabrication
- D960050 Magnet/Standoff Assembly Fixture
- D960147 Guide Rod Fixture
- D960753 Wire and Optics Fixture
- D960763 Test Mass Fixture
- D970074 Magnet-to-Dumbbell Standoff Fixture
- D970169 Magnet Strength Fixture
- D970180 Winch Fixture
- D970616 Coil Strength Fixture
- D960144 LOS Suspension Block
- D960134 LOS Clamp, Suspension Block
- D960146 LOS Guide Rod
- D960149 LOS Side Standoff
- D960499 LOS Chamfer Stop
- D970075 Dumbbell Standoff
- Screw, Hex Head, 3/8-16 x 1.50, Conductive Teflon material
- D970615 PAM Screw



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### LARGE OPTICS SUSPENSION (LOS) FIXTURES AND COMPONENTS

D970617 Sensor/Actuator PAM Bracket  
D970540 LOS2 Suspension Block  
D970550 LOS2 Guide Rod Fixture, BS  
D970552 LOS2 Magnet/Standoff Assembly Fixture  
D970553 LOS2 Test Mass Fixture, BS  
D970568 LOS1c Guide Rod Fixture, RM 4k  
D970573 LOS1d Guide Rod Fixture, ITM 2k  
D970574 LOS1b Guide Rod Fixture, ITM 4k  
D980183 LOS Clamp, Short  
D980184 LOS Clamp, Long

## 2.2. Fabrication

### 2.2.1. Protection from Contamination

Some of the fixtures and components are made of stainless steel (see drawings). No carbon steel hooks, fork lift forks, grapples or chains shall be allowed to contact the stainless steel.

Stored materials (raw materials or work-in-process) shall be protected from the shop atmosphere when not being handled (or worked on) by plastic sheets or similar protective covers. Polyethylene plastic sheet is acceptable. Raw materials shall be protected from contamination throughout the fabrication process. All fixturing and set-up shall be done in clean manufacturing space. Smoking is not allowed in any suspension storage or manufacturing area.

### 2.2.2. Part Machining

- **Liquid contaminants/Machining Lubricants**

Liquids containing hydrocarbons or other contaminants, other than the machining fluids specified herein, shall not be allowed to come into contact with suspension material at any time. All machining fluids shall be water soluble and free of sulfur, chlorine and silicone; such as Cincinnati Milacron's Cimtech 410 (stainless steel).

- **Grinding & Abrasive Cloth/Paper**

Grinding (with abrasive wheels, cloth, or stones), or use of abrasive cloth or paper, is permitted on suspension components, except where noted, if the ground or impacted surface is subsequently skimmed with a carbide tool to remove any residual contaminants. The use of oil free Arkansas stones are also approved to remove slight imperfections in the machined surfaces. Sand paper may be used on the Teflon portions of the Fixtures.



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#### 2.3. Quality Assurance/Control

##### 2.3.1. Identification

Separate parts and assemblies shall be marked with laser marking or acid etch techniques. Also, a vibratory tool with a minimum tip radius of 0.0005" is acceptable for marking on surfaces which are not hidden from view. Engraving is also permitted.

Separate parts and assemblies to be serialized according to the document titled Part Numbers and Serialization of Detector Hardware, LIGO-L970196. This document allows for "bag-and-tag" type of identification for small parts.

##### 2.3.2. Serial Number

The Serial number shall be of the format:

Dxxxxxx-y S/N *nnn* Where

Dxxxxxx-y is the LIGO piece part or assembly drawing number, Dxxxxxx, including the revision letter, -y, to which the hardware item was built, and

*nnn* is the sequential serial number, 001 through 999, in the order produced.

##### 2.3.3. Quality Assurance Provisions

A first article(s) for each of the large quantity components shall be produced and inspected. Caltech will approve the first article(s) before committing to production fabrication.

All suspension fixtures and components shall be inspected for form, fit, dimensions and workmanship. Inspect the mechanical parts and fixtures of the Large Optics Suspension per the Large Optic Suspension Fixtures and Components Quality Conformance Worksheet, LIGO-E970152.

##### 2.3.4. Purchaser Access

Non-escort privileges for the buyer, owner, government and owner representatives to all areas of the facilities where work is being performed shall be arranged. This will include access to all areas where material is being processed and stored. The purchaser shall have the right to witness all manufacturing processes.

##### 2.3.5. QA Approval

LIGO QA reserves the right to inspect and approve vendor/fabricator QA plan and processes.

##### 2.3.6. Travelers

QA travelers shall accompany all material from delivered raw stock to final components and assemblies.