LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -
CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Document Type **LIGO-E970132-00 - D** Sep,19 1997

LARGE OPTICS SUSPENSION ASSEMBLY QUALITY CONFORMANCE WORKSHEET

Janeen Hazel and Seiji Kawamura

Distribution of this draft:

detector

This is an internal working note
of the LIGO Project.

California Institute of Technology
LIGO Project - MS 51-33
Pasadena CA 91125
Phone (818) 395-2129
Fax (818) 304-9834
E-mail: info@ligo.caltech.edu

Massachusetts Institute of Technology
LIGO Project - MS 20B-145
Cambridge, MA 01239
Phone (617) 253-4824
Fax (617) 253-7014
E-mail: info@ligo.mit.edu

WWW: http://www.ligo.caltech.edu/

1 SCOPE

This Quality Conformance Worksheet is to be completed during the preparation and assembly of all Large Optics Suspensions, D960132, and kept with the traveler record for the assembly.

2 PURPOSE

This QCW details the processes that LIGO personnel will use to ensure compliance with LIGO Project Quality requirements for the acceptance/qualification of large optics suspensions. Trained/qualified personnel will follow the instructions outlined in the Large Optics Suspension Assembly Specification, LIGO-E970038-A-D for the detection and recording of deficiencies that could indicate failure to meet specifications. Completed worksheets will also be used in the future to streamline these processes and increase reliability and repeatability.

Suspension Serial Number_____

Suspension Name_____

Date_____

3 COMPONENTS

3.1. MAGNETS

Quantity_____

Manufacturer's name_____

Purchase Order No._____

Serial No./Lot No._____

Magnet Strengths:

1._____

2._____

3._____

4._____

5._____

6._____

7._____

8._____

Within +/- 5% of strength values:_____yes _____no

3.2. SENSOR/ACTUATOR HEAD ASSEMBLIES

Quantity_____

Serial Nos._____

Coil Strengths

1._____

2._____

3._____

4._____

5._____

6._____

3.3. Mechanical Parts of the Suspension Assembly

D960133 Large Optic Suspension Structure Assembly Serial No._____ Date_____				
zone	dimension (in)	inspected value	within spec	out of spec
B-C2,SH1	2X,6.364			
C2,SH1	4X,6.364			
C-D2,SH1	2X,14.535			
D2,SH1	4X,13.755			
E3,SH1	2X,6.364			
E4,SH1	2X,4.568			
D5,SH1	2X,17.661			
B6,SH1	2X,4.313			
E4,SH1	FLATNESS .002			
B4,SH1	FLATNESS .002			
C3,SH2	4X,4.84			

D960133 Large Optic Suspension Structure Assembly Serial No._____ Date_____				
zone	dimension (in)	inspected value	within spec	out of spec
D3,SH2	4X,15.30			
F2,SH2	13.719			
F3,SH2	.891			
G4,SH2	2X,4.500			
G1,SH2	4X,7.906			
H2,SH2	4X,.594			
H2,SH2	2X,11.500			
B5,SH3	(6X)2X,.487			
B5,SH3	(6X)2X,R.0625+.0010 -.0000			
B-C5,SH3	(6)2X.281			
C4,SH3	(6) DIA 1.063			

D960144 Suspension Block Serial No._____ Date_____				
zone	dimension (in)	inspection value	within spec	out of spec
A2	4.000			
A3	1.250			
C1	.156			
C2	1.327			
C3	4X,.250			
B3	.500			
C4	FLATNESS .002			

3.4. Mechanical Parts of the Fixtures for the Suspension Assembly

D970074 Magnet-to-Dumbbell Standoff Fixture
Serial No._____
Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
B3	25X,DIA.077+.002/-.000			

D960050 Magnet/Standoff Assembly Fixture, Sheet 2, Positioning Ring Detail
Serial No._____
Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
G3	DIA 10.375 [BOLT CIRCLE]			
E1	6.364 +/-.001			
C2	6.364+/-.001			
G5	90 DEG. APART			
G7	.077 DIA +.004/-.000,4PL			
C6	9.914 DIA +.010/-.000			

D960050 Magnet/Standoff Assembly Fixture, Sheet 3, Holding Ring Detail
Serial No._____
Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
F2	10.375 DIA [BOLT CIRCLE]			
F5	90 DEG. APART			
C6	9.914 +.010 DIA -.000			

D960147,Guide Rod Fixture, Sheet 2 of 3, Base Plate,

Serial No._____

Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
H4	9.843 DIA			
C5	2X,.799			
B-C5	2X,1.13			
D3	2X,6.292			
E4	2X,5.172			
F6	4X,.094 DIA			
F-G6	2X,1.058			
G6	2X,.885+.000 -.001			
G5-6	2X,3.000			
G7	4X,60 DEG			
G7	2X,.105			
B1	FLATNESS .001			

D960147,Guide Rod Fixture, Sheet 3 of 3, Left Block, Top

Serial No._____

Date:_____

zone	dimension (in)	inspection values	within spec	out of spec
C1	.250			
B-C2	45 DEG			
B-C2	.982			
C2	1.515			

D960147,Guide Rod Fixture, Sheet 3 of 3, Left Block, Top

Serial No._____

Date:_____

zone	dimension (in)	inspection values	within spec	out of spec
C1	1.500			
C-D3	.125			
D3	1.241			
D3	.518+.001 -.000			
D3	2X,.094 DIA			
E3	3.000			
E3	2X,60 DEG			
F2	.056			
G2	.056+/-.002			
G2	60 DEG			
F3	.345			
F3	.063			
G3	90 DEG			
G4	2X,.053			
F4	.086			

4 OPTIC PREPARATION

D960147, Guide Rod Fixture, Sheet 3 of 3, Right Block, Top

Serial No._____

Date:_____

zone	dimension (in)	inspection values	within spec	out of spec
C8	.250			
B-C7	45 DEG			
B-C7	.982			
C7	1.515			
D8	1.500			
C-D6	.125			
D6	1.241			
D5	.518+.001 -.000			
D5	2X,.094 DIA			
D-E6	3.000			
E6	2X,60 DEG			
F7	.056			
G7	2X,.124			
G7	90 DEG			
F6	.268			
G6	.063			
G6	90 DEG			
G6	.053			
G5	.190			
G5	.053			

D960753, Wire and Optics Fixture Assembly, Sheet 2 of 3, Cradle

Serial No._____

Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
C2-3	3.000			
D3	R4.921			
F4	2.452			
F3	1.864			
F4	4.096			
F4	6.844			
E5	2X,3.596			
G7	.020			
F8	.020			

D960753, Wire and Optics Fixture Assembly, Sheet 3 of 3,
Teflon Bracket, Metal Bracket and Teflon Strap

Serial No._____

Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
A2	3.000			
A2-3	.383			
A3	.410			
B1	5.441			
C2	R4.921			
F1	9.972			
D5-6	.500			
E7	1.000			
D8	5.187			

D960763, LOS Test Mass Fixture, 2 Degree Wedge

Serial No._____

Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
B5	2X,1.000 DIA C'BORE			
D4	4X,2.125 DIA			
E3	9.842 DIA			
B6	2.0 DEG			
E6	3.937			
B6	2X,.079 +/-.012 x 45 DEG CHAMFER			

D970180, Winch Fixture

Serial No._____

Date:_____

zone	dimension (in)	inspection value	within spec	out of spec
A2	1.75			
B2	.250			
C2	.156			
C3	R.50			

D960145, LOS Height Adapter Assembly Serial No._____ Date:_____				
zone	dimension (in)	inspection value	within spec	out of spec
D5	FLATNESS .002			
D/E6	FLATNESS .002			
G5	4X,2.75			
G4	20X, 2.000			
G5	8X, 1.750			
D8	5.866			

4.1. Magnet-to-Dumbbell Standoff Fixture

Check the fixture for residual glue in each of the holes. Inspect the holes. Occasionally, when removing the assemblies from the fixture, the blunt instrument used to break the adhesive from the insides of the holes will deform the soft Delrin of the fixture. If any of the holes are deformed in shape and out of tolerance, mark the fixture so as not to use that hole in the future. Clean each of the holes thoroughly to remove residual glue.

Adhesive cure start date/time_____

Adhesive cure end date/time_____

Mark magnet polarities in fixture

Adhesive cure start date/time_____

Adhesive cure end date/time_____

Mark magnet polarities on holding plate

4.2. Magnet/Standoff Assembly Fixture

Name of optic_____

Serial No._____

Wedge_____

Sketch of wedge orientation:

Check the fixture for residual glue in each of the holes. Inspect the holes. Be sure to clean each of the holes thoroughly to remove any residual glue.

Adhesive cure start date/time_____

Adhesive cure end date/time_____

Mark up the figure below with the magnet polarities

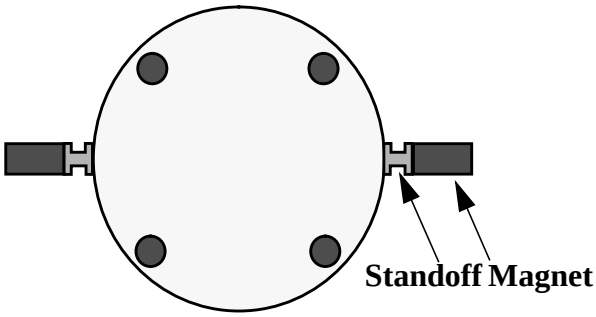

Figure 1

4.3. Guide Rod Fixture

Check to make sure the optic has not moved from its orientation on the base plate.

Mark up Figure 1 with the polarities of the magnet/standoff assemblies used.

Adhesive cure start date/time_____

Adhesive cure end date/time_____

5 OPTIC HANGING AND BALANCING

Relative to the top of the optical table -

Record the level in horizontal position: _____one end_____other end.

Record the level in vertical position: _____one end_____other end.

Length of lever arm_____

Optic unbalance_____

Adhesive cure start date/time_____

Adhesive cure end date/time_____

Optic unbalance after adhesive curing_____,date/time_____

optic cleaned. time/date_____ initials_____

optic baked. time/date_____ initials_____

6 SENSOR/ACTUATOR HEAD INSTALLATION

Sensor/Actuator Head Positioning

Sensor/Actuator Head	*unblocked voltage*	*positioned head voltage value*

Safety stops all have a gap of 1mm to the optic