



**SPECIFICATION**

**SPECIFICATION FOR BSC WORK PLATFORMS**

APPROVALS	DATE	REV	DCN NO.	BY	CHECK	DCC	DATE
AUTHOR:							
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**SPECIFICATION FOR BSC WORK PLATFORMS**

**1.0 Scope**

1.1 This specification covers the minimum requirements of the Engineering, Materials, Fabrication, Inspection, Testing, and Preparation for Shipping and Shipment of Work Platforms and Walking Plates for the Advanced LIGO modification of the LIGO Observatories. Any attachments are incorporated herein by reference and made a part of this specification.

The Buyer requests a Lump Sum Price for all Components (FOB LIGO Sites).

The required components are part of the Advanced LIGO upgrade of the Laser Interferometer Gravitational-Wave Observatory (LIGO). LIGO is operated by Caltech and the Massachusetts Institute of Technology (MIT) under a NSF grant and includes two observatories, one located in the Hanford Reservation (near Richland, WA) and a second in Livingston, LA.

The California Institute of Technology (Caltech) is the Buyer for these components. The Seller is the successful bidder who is awarded this contact.

1.2 It is the Seller’s responsibility to follow these requirements or to propose alternate procedures and specifications to meet the requirements. All alternate approaches must be approved by the Buyer before use.

1.3 Seller is responsible for the detailed Engineering/Design and Fabrication of Aluminum Structural Work Platforms, Stair Modules and Walking Plates that are detailed herein. The design shall meet all detailed requirements of this specification

1.4 The following components quantities are required at each LIGO delivery locations:

LIGO SITE	Platform A, B, C, D	Platform E	Stair Module	Walking Plates (Sets)
Hanford WA	4	4	4	4
Livingston LA	2	2	2	2

All components shall be delivered to the applicable LIGO sites FOB jobsite per the schedule in Section 2 of this specification.



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**2.0 SCHEDULE**

All components shall be designed and fabricated per the following schedule:

- Kickoff Meeting - 1 week after PO award
- PDR meeting - 3 weeks after PO award
- FDR Meeting - 5 weeks after PO award
- Delivery of one set of all components by: 01 Feb 2011
- Delivery of all WA Site components by: 01 May 2011
- Delivery of all LA Site components by: 01 July 2011

**3.0 DESIGN REQUIREMENTS**

**3.1 General**

3.1.1 All platforms shall be designed to meet the requirements of this specification and all applicable Codes and Standards of Section 4.

3.1.2 All platforms shall be aluminum structures which can be field assembled using only bolted connections. All nuts, bolts, washers and lock washers required shall be provided by the Seller.

3.1.3 OSHA compliant handrails shall be provided on the outside edge of each platform. The hand-rail design shall be the removable type, dropping into reinforced holes. Toe-boards shall be provided at the edge of all platforms.

3.1.4 The Seller is responsible for the detailed Engineering/Design and Fabrication of Aluminum Structural Work Platforms, Stair Modules and Walking Plates that are detailed herein. The Buyer's drawings detail the Maximum Overall Dimensions of each component. The walking surface height and surface area shall be designed to the dimensions shown. The structural members and legs shall be designed by the Seller to meet the overall weight loading and design requirements of each component.

3.1.5 Each platform leg shall have an anchor plate (with 4 holes sized for ½ inch bolts) at the bottom of each leg.



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3.1.6 The reduced strength of the Heat-Affected Zones of all aluminum welding areas shall be allowed for in all design calculations.

3.1.7 All platform components shall be delivered clean without paint.

**3.2 BSC Platform Walkway A, B, C, D**

3.2.1 The BSC Platform Walkway A, B, C and D are used as a work platform system by bolting them together. The design must also allow Platforms A, B and C to be safety used together without D by adding some bolted cross-bracing. All connections between platforms must be bolted. The platforms shall be designed to meet the dimensions and requirements of drawing D1001990-v1 in the SOW-C1000266-v?.

D1001990-v1 Detail	
Platform A	View 5
Platform B	View 4
Platform C	View 6
Platform D	View 2
Platform A, B, C, D Assembly	View 3
Platform A, B, C Assembly	View 7

Individual platforms A, B, C and D shall be aluminum structures which can be field assembled using only bolted connections. The weight of individual components (Legs, braces, walking surfaces) shall be minimized so that each work platform can be assembled inside a cleanroom without the use of an overhead crane. Checker-Plate shall be used for all platform walking surfaces.

3.2.2 Each platform (A,B,C,D) shall be designed to meet Loading Requirements as defined in OSHA “Heavy Duty Scaffolding” per CFR 29 Part 1910 subpart D Standard 1910.29.

The Design Loading of each platform shall be:

- 75 LB. Live Load per square foot of platform surface (Per 1910.29(a)(2)(ii)(b) “Heavy”)
- Plus one 300 Lb. (over 1 Sq. Ft.) of concentrated equipment load anywhere on the platform

3.2.3 Each individual platform (A,B,C or D) shall be capable of being lifted by an overhead crane without the use of a spreader-beam. Removable lifting eyes shall be provided in the corner of each platform designed to lift the maximum required load.

3.2.4 Each individual platform (A,B,C,D) shall weigh less than 9800 Lb.

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### **3.3 BSC Module E**

3.3.1 The BSC Module E shall be designed in 2 halves (E1,E2) and bolted together to form the complete work platform. The design must also allow each half to be free-standing to facilitate site assembly. All connections between platform halves shall be bolted.

Each platform E half section (E1,E2) shall be an aluminum structure which can be field assembled using only bolted connections. The weight of individual components (Legs, braces, walking surfaces) shall be minimized to facilitate field assembly. Checker-Plate shall be used for all platform walking surfaces.

3.3.2 Platform E shall be designed to meet the dimensions and requirements of drawing D1002926-v1 in the SOW (C1000266-v?). Each platform half section (E1, E2) shall be designed to meet Loading Requirements as defined in OSHA “Heavy Duty Scaffolding” per CFR 29 Part 1910 subpart D Standard 1910.29.

The Design Loading of each E platform (E1/E2) shall be:

- 75 LB. Live Load per square foot of platform surface (Per 1910.29(a)(2)(ii)(b) “Heavy”)
- Plus one 300 Lb. (over 1 Sq. Ft.) of concentrated equipment load anywhere on the platform
- Plus the weight of a free-standing cleanroom which will be placed on the platform by the Buyer (Cleanroom Weight is 800 Lb. and has a footprint of 7 Ft. by 10 Ft. – with lockable wheels).

3.3.3 Each E platform half section (E1,E2) shall be capable of being lifted by an overhead crane without the use of a spreader-beam. Removable lifting eyes shall be provided in the corner of each platform designed to lift the maximum required load.

3.3.4 Each E platform half section (E1,E2) shall weigh less than 9800 Lb.

3.3.5 A self-contained aluminum spiral staircase module shall be provided as part of the E platform assembly. The spiral staircase shall be a free-standing assembly which bolts to the E platform assembly as shown on drawing D1002926-v1 in the SOW (C1000266-v?). The staircase shall have railings and an OSHA complaint safety gate at the top staircase landing. The Spiral Staircase module shall be designed so that any of the 3 sides can be butted up

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against the E module (by a movable railing system at the top landing of the staircase and multiple bolt holes on each side).

The stair module shall be capable of being lifted by an overhead crane without the use of a spreader-beam. The module shall have lifting eyes at the 4 corners near the top of the module. Each step and the landing of the stair module shall have a minimum load rating of 300 Lb.

### **3.4 Walking Plates**

3.4.1 An aluminum walking surface (Walking Plates) shall be fabricated per Dwg. D1002410-v1. The Walking Plates shall be fabricated in 4 pieces and when bolted to the Buyer's 104 ½ inch flanged vessel shall form a safe walking surface. Each of the 4 pieces of the Walking Plate system shall be designed to match the hole pattern of the 104 ½ inch flange (See Dwg. D961106-v1 in the SOW-C1000266-v?). The bottom surface of the walking plates shall be smooth, free from burrs and weld spatter. The top surface (walking area) shall also be smooth.

3.4.2 The Walking Plates shall have OSHA Toe-Boards on the inside and outside of the walking surface.

3.4.3 The outside circumference of the Walking Plates shall have reinforced holes where OSHA hand railings can be installed. The removable hand railings sections shall be provided as part of the Walking Plate system.

### **3.5 Conflicts**

Questions regarding this specification or discrepancies and conflicts between this specification and drawings and the referenced specifications and codes shall be referred to the Buyer for resolution.

### **3.6 Design Reviews**

The Seller shall conduct a Preliminary Design Review (PDR) and a Final Design Review (FDR) for all supplied equipment per the attached schedule (See Section 2 of this specification). All design and fabrication drawings shall be submitted to the Buyer for review 5 days prior to all reviews. Approval of the FDR is required prior to ordering materials or starting any fabrication work. A minimum of 5 working days shall be allowed for drawing review and approval.

**SPECIFICATION FOR BSC WORK PLATFORMS****4.0 Codes and Standards**

4.1 The latest editions of the following specification, codes, and standards, including revisions and supplements in effect at the time of award of the contract for the work of this specification, form a part of this specification in their entirety except as modified by this specification. The Buyer's Drawings and Specification do not undertake to repeat all requirements written in the following codes, ordinances, and standards.

4.2 American National Standards Institute (ANSI)/American Welding Society (AWS)

- Aluminum Structural Welding Code ANSI/AWS D1.2/D1.2M
- Aluminum Design Manual-2010
- Other applicable ANSI/AWS Standards

4.3 American Society for Testing and Materials (ASTM)

- ASTM B429/B429M Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
- ASTM A307 Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners
- ASTM A325 Standard Specification for High-Strength Bolts for Structural Steel Joints
- ASTM A490 Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel
- ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts
- ASTM E165 Recommended Practice for Liquid Penetrant Inspections
- ASTM F436 Standard Specification for Hardened Steel Washers

4.4 Federal Occupational Safety and Health Act (OSHA)

4.5 Other Applicable federal, LA and WA state, and local codes

**5.0 Materials**

5.1 All components shall be made of aluminum of domestic origin or from Canada, Germany or Japan.

5.2 Aluminum shapes, plates, and bars shall conform to ASTM Standards for the intended use.



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5.3 Components shall meet the following standards:

- High-strength bolts shall conform to ASTM A325, Type 1. Hot forged bolts will not be permitted.
- Nuts shall conform to ASTM A563 for the recommended grade and style and the Supplementary Requirements S1.
- Washers shall conform to ASTM F436.
- Common bolts shall conform to ASTM A307, Grade A.

5.4 Certified material test reports (CMTRs) for structural aluminum shall be provided to the engineer prior to the start of fabrication.

### 6.0 Fabrication

6.1 All fabrication shall be done to drawings approved by the Buyer.

Workmanship and fabrication shall be in accordance with the standards and codes referenced in section 3 of this specification except as specifically modified by this specification.

6.2 Materials shall have clean surfaces before fabricating. Joint surfaces, including those adjacent to washers, shall be free of dirt, loose scale, burrs, or other defects that would prevent solid seating of all parts.

6.3 Fabricated members shall be free of twists, bends, or loose joints.

6.4 Bolt holes shall be drilled or punched to locations 1/16 inch larger than the nominal diameter of bolt unless otherwise specified on the design drawings. If the thickness of the material is greater than the nominal diameter of the bolt plus 1/8 inch, the holes shall be drilled or sub-punched and reamed. Errors in hole size or location shall be cause for rejection.

6.5 Aluminum Welding shall be in accordance with AWS D1.2

Welders, tackers, and welding operators shall hold current certification in accordance with AWS D1.2 to perform the type of welding required.

The technique of welding employed, the appearance and quality of welds made, and methods used in correcting defective work shall conform to AWS D1.2.

Tack welds which are not incorporated into the final weld and inadvertent arc strikes shall be removed and ground smooth.

Welds run-off tabs shall be cut off and ground smooth at the ends of the finished member.



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Stud connectors shall be installed in accordance with and meet the requirements of AWS D1.2.

- 6.6 Dimensional tolerances as shown on the Buyer's drawings are to be adhered to. Multiple assemblies made from the same drawing are to be interchangeable during field erection.

**7.0 Quality Assurance / Inspection**

- 7.1 The Seller shall have a Quality Assurance Plan in effect at all times specifying inspection, testing and documentation procedures that will ensure that the equipment furnished under the specification will meet in all respects the requirements of this specification. The responsibility for inspection rests with Seller's Q.A. Department.
- 7.2 The Buyer or his representative reserves the right to conduct reviews, inspection, or tests of the work included in this specification at times that he deems necessary to maintain schedule or quality. The fabricator shall provide cooperation and assistance with such reviews, inspections, or tests as the Buyer may require.
- 7.2 The Seller shall perform a 100% dimensional and visual inspection of each component including the welds on each assembly. All dimensions shall be within established tolerances. All welds shall be free of splatter, slag, undercut, overlap and shall meet the requirements specified in AWS-D1.2.
- 7.3 All inspections reports shall be provided to and approved by the Buyer before each component will be released for shipment.
- 7.4 A certificate of compliance shall be furnished to the Buyer for each component stating that the requirements of the applicable drawings and this specification have been met.

**8. Component Marking**

- 8.1 Each Platform is to be tagged with a part number consisting of the Sellers drawing number and the platform letter destination (A,B,C,D,E).
- 8.2 Each Platform and Stair Module shall have a permanent sign attached per OSHA standards stating the maximum number of people and the maximum weight of equipment loading that is allowed on the platform at any one time. All signs shall be approved by the Buyer.



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### **9.0 Component Cleaning**

- 9.1 After the Component inspection report has been approved by the Buyer, the component shall be cleaning prior to being prepared for shipment.
- 9.2 Components shall be pressure washed using a Buyer approved procedure prepared by the Seller. The wash detergent shall be selected to avoid any damage to the component aluminum surfaces. The component shall be thoroughly rinsed with clean water after washing. After rinsing, the component shall be air dried prior to wrapping.

### **10.0 Non-Escort Privileges and Inspection Rights**

Non-escort privileges for LIGO, Government and LIGO representatives to all areas of the facilities where the work is being performed shall be arranged. This will include access to all areas where material is being processed or stored.

### **11.0 Preparation for Shipment**

- 11.1 All components shall be prepared for shipment per a Buyer approved Procedure prepared by the Seller. The requirements of this section shall be incorporated in the Seller's procedure.
- 11.2 After successful Inspection, Cleaning and Drying at the Sellers site, all components shall be wrapped in clean heat sensitive plastic shrink-wrap for protection during shipment to the LIGO sites. The shrink-wrap shall be carefully heated to stabilize the wrap against the platforms and stair assemblies. After loading on the trucks for shipment to the site, the components shall be covered with two layers of clean tarps. The tarps shall be attached so the top layer tarp can be removed before the load is moved into the LIGO buildings.
- 11.3 All components shall be stored indoors in a dry location prior to shipping.