

SPECIFICATION FOR

STRUCTURAL CARBON STEEL FABRICATION AND PAINTING

JAN 31 1997

FOR

LIGO VACUUM EQUIPMENT

Hanford, Washington
and
Livingston, Louisiana



EXPIRES 8/5/97

PREPARED BY:

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PROJECT MANAGER:

Paul Bay 10/3/96

Information contained in this specification and its attachments is proprietary in nature and shall be kept confidential. It shall be used only as required to respond to the specification requirements, and shall not be disclosed to any other party.

REV	LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE
2		sm 11/30/97	RES 11/30/97	9.0, 9.1.2, 9.1.3, 9.1.4, 9.1.5 DEO 0425
1		RDC 10/10/96	RES 10/11/96	4.1.2.3 - CORRECTED TYPO. 6.2.5.3 - DELETED LAST SENTENCE RE: FLUX-CORE.
0		RES 9/30/96	RES 10/3/96	RELEASED FOR PURCHASE/FABRICATION DEO#0242

PROCESS SYSTEMS INTERNATIONAL, INC.				SPECIFICATION	
INITIAL APPROVALS	PREPARED	DATE	APPROVED	DATE	Number
	R Curtis	9/30/96	RES	10/3/96	V049-2-139
					LIQO-E970036-02-V
					Rev. 2

Title

SPECIFICATION FOR STRUCTURAL STEEL FABRICATION AND PAINTING

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1.0 SCOPE

- 1.1 Furnish and fabricate, structural carbon steel in accordance with attached drawings and specification. In the event of conflict between referenced specifications, and requirements herein, these requirements shall take precedence.
- 1.2 Structural steel on the project will primarily consist of support structures, equipment, and miscellaneous items. All carbon steel will be shop and finish coat paint (see Section 9.0 for requirements) by the fabricator.
- 1.3 Bidding Instructions
 - 1.3.1 Responses to this inquiry shall be as per attached Instructions to Bidders.
- 1.4 Attachments
 - 1.4.1 Drawings as delineated.

2.0 DEFINITIONS

- 2.1 The following terms used in this specification shall be understood to mean:
 - 2.1.1 Engineer - refers to Process Systems International, Inc. (PSI)
 - 2.1.2 Fabricator - The corporation, partnership, or individual committed to furnish steel in accordance with this specification.

3.0 GENERAL

- 3.1 The fabricator shall furnish, as specified, all material and deliver structural and miscellaneous steel such as, but not limited to, columns, beams, bracing and all essential clips, gussets, and separators, as shown on contract drawings.
- 3.2 Substitutions of specified member size or change in details or dimensions of any kind shall not be permitted without the prior written approval of the engineer. Written proposals for substitutions of steel members in place of those specified may be submitted for consideration only if specified sizes are not readily available.
- 3.3 Questions regarding this specification or discrepancies and conflicts between this specification and drawings and the referenced specifications and codes shall be referred to the engineer for resolution.
- 3.4 Shop and erection drawings shall be submitted to the engineer for review and approval prior to starting work. A minimum of 10 working days shall be allowed for drawing review.

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4.0 APPLICABLE PUBLICATIONS

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.

4.1.1 American Institute of Steel Construction (AISC)

1. Manual of Steel Construction, including the following:
 - a. Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings
 - b. Code of Standard Practice for Steel Buildings and Bridges
 - c. Specification for Structural Joints using ASTM A325 or A490 bolts
 - d. AISC Quality Certification Program
2. Structural Steel Detailing Manual

4.1.2 American Society for Testing and Materials (ASTM)

1. ASTM A36 Standard Specification for Structural Steel
2. ASTM A53 Standard Specification for Welded and Seamless Steel Pipe
3. ASTM A307 Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners
4. ASTM A325 Standard Specification for High-Strength Bolts for Structural Steel Joints
5. ASTM A490 Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel
6. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shape
7. ASTM A501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
8. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts
9. ASTM E165 Recommended Practice for Liquid Penetrant Inspections
10. ASTM F436 Standard Specification for Hardened Steel Washers

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- 4.1.3 American Welding Society (AWS)
 - 1. D1.1 Structural Welding Code
- 4.1.4 Steel Structures Painting Council (SSPC)
 - 1. SSPC-SP6 Commercial Blast Cleaning

5.0 MATERIAL

- 5.1 All material shall be of domestic origin or from Canada, Germany or Japan.
- 5.2 Carbon steel structural steel shapes, plates, and bars shall conform to ASTM A36.
- 5.3 Steel pipe shall conform to ASTM A53, Grade B.
- 5.4 Structural steel tubing shall conform to ASTM A500, Grade B or ASTM A501.
- 5.5 High-strength bolts shall conform to ASTM A325, Type 1. Hot forged bolts will not be permitted.
- 5.6 Nuts shall conform to ASTM A563 for the recommended grade and style and the Supplementary Requirements S1.
- 5.7 Washers shall conform to ASTM F436.
- 5.8 Common bolts shall conform to ASTM A307, Grade A.
- 5.9 Weldable steel stud connectors shall be of the automatic-end-weld type conforming to AWS 1.1.
- 5.10 Stainless steel shapes shall conform to ASTM A479 Gr. 304; structural tubing to ASTM A554 Gr. 304; plate to ASTM A240 Gr. 304.
- 5.11 Certified material test reports (CMTRs) for structural steel shall be provided to the engineer prior to the start of fabrication.

6.0 FABRICATION

- 6.1 Shop fabricated structural steel shall be assembled into units as large as possible consistent with shipping limitations.
- 6.2 Workmanship and fabrication shall be in accordance with the referenced AISC publications except as specifically modified by this specification.

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- 6.2.1 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.
- 6.2.2 Fabricated members shall be free of twists, bends, or loose joints.
- 6.2.3 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.
- 6.2.4 Column baseplates exceeding 15/16 inch in thickness shall be thermal cut by machine to the size specified.
- 6.2.5 Welding shall be in accordance with AWS D1.1
 - 1. Welders, tackers, and welding operators shall hold current certification in accordance with AWS D1.1 to perform the type of welding required.
 - 2. The technique of welding employed, the appearance and quality of welds made, and methods used in correcting defective work shall conform to AWS D1.1.
 - 3. Except for stud connectors, welds shall be either by manual shielded metal-arc welding, submerged arc welding, or flux cored arc welding processes. Electrodes shall conform to AWS or A5.5, E70 series, for manual shielded metal-arc welding. For submerged arc welding, electrodes and granular flux shall conform to AWS 5.17, F7X-EXXX Classification. For flux cored arc welding, electrodes and flux shall conform to AWS A5.20, E70 T-X series.
 - 4. Tack welds which are not incorporated into the final weld and inadvertent arc strikes shall be removed and ground smooth.
 - 5. Welds run-off tabs shall be cut off and ground smooth at the ends of the finished member.
 - 6. Stud connectors shall be installed in accordance with and meet the requirements of AWS D1.1.
- 6.3 When field welding is specified on the engineer's drawings, the fabricator shall furnish and install suitable erection supports, subject to approval by the engineer, for erecting and welding of field connections.
- 6.4 Dimensional tolerances as shown on the PSI drawings are to be adhered to. Multiple assemblies made from the same drawing are to be interchangeable during field erection.

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7.0 SCHEDULE

- 7.1 See Attachment "B" for assembly quantities and delivery schedule.
- 7.2 All of the above items shall be shipped to the Buyer directly (Westborough, Massachusetts).

8.0 INSPECTION AND TESTING

- 8.1 The engineer, owner or his representative reserves the right to make 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 engineer may require.
- 8.2 The fabricator shall perform a 100% dimensional and visual inspection of all 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-D1.1. Reports on the above shall be provided with each shipment upon receipt at PSI. At PSI, the reports and the assembly will be verified during receipt inspection.
- 8.3 A certificate of compliance shall be furnished to the Buyer stating that the requirements of the applicable drawings and this specification have been met.

9.0 PAINTING

Fabricated parts shall be spray painted by the fabricator with one (1) prime coat and one (1) finish coat of Thurmalox 260 self priming heat resistant coating manufactured by Dampney Co., Everett, Ma. in accordance with the manufacturers' recommendation.

- 9.1 Surface Preparation.
Fabricator shall sand blast all exposed surfaces in accordance with SSPC-SP-6.
- 9.1.2 Prime coat: Thurmalox 260 prime coat shall be applied to a dry film thickness of 2.0- 2.5 mils.
- 9.1.3 Finish coat: Thurmalox 260 finish coat shall be applied to a dry film thickness of 2.0- 2.5 mils.
- 9.1.4 Total film thickness: 4.0-5.0 mils.
- 9.1.5 Color: Thurmalox 1-07 "Spring Gray".

10. PIECE MARKING

Each fabricated part is to be tagged with a part number consisting of the drawing number and a "P" number. The part number will be shown on the PSI assembly drawings.

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ATTACHMENT "A"
LIGO QUALITY ASSURANCE REQUIREMENTS SUMMARY

LIGO VACUUM EQUIPMENT	VENDOR:					JOB NO.: V59049
EQUIPMENT: CARBON STEEL FABRICATION/PAINTING	VENDOR ENG. OFFICE:					DWG. NO.:
PSI P.O. NO:	VENDOR FACTORY:					SPECNO: V049-2-139
TESTING INSPECTION AND DOCUMENTATION RECORD	Submittal After P.O.	Witnessed by PSI	Approval by PSI	Copies Req'd for PSI Files	Record in Mfr's File	Remarks: Inspector: Date:
MILESTONE SCHEDULE			X	2	X	
VENDOR Q.A. PLAN			X	2	X	
PREP FOR SHIPMENT PROCEDURE			X	2	X	
WELDING PROCEDURES			X	2	X	
ASSEMBLY DRAWINGS			X	2	X	
CERTIFIED MATERIAL TEST REPORTS			X	2	X	
IN-PROCESS INSPECTIONS			X	2	X	
OPERATION & MAINTENANCE MANUALS						
SHOP DIMENSIONAL INSPECTION			X	2	X	