



		IDENTIFICATION			
		TUBE MILL			
TITLE SPIRAL WELD PIPE MILL SPECIFICATION	REFERENCE NO. 953571		SHT <u>1</u> OF 4		
	OFFICE PSE		REVISION 0		
	MADE BY KSD	CHKD BY SWP	MADE BY	CHKD BY	
	DATE 10/25/95	DATE 12/14/95	DATE	DATE	
PRODUCT LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY					

## 1.0 SCOPE

1.1 This specification describes the technical requirements for the SPIRAL WELD PIPE MILL that will be used to manufacture the LIGO beam tube sections. The beam tube sections will be incorporated into the LIGO facilities at Hanford, Washington and Livingston, Louisiana by CBI [PURCHASER]. The LIGO Project is administered by the California Institute of Technology [Caltech] for the National Science Foundation [NSF].

## 2.0 CODE REQUIREMENTS & REFERENCED LIGO SPECIFICATIONS

- 2.1 All equipment delivered by the SELLER must comply with all applicable EPA, OSHA, fire and electrical codes for the LIGO sites at Hanford, Washington and Livingston, Louisiana.
- 2.2 Referenced Specifications:  
LIGO Specification C-240-186, "Beam Tube Material Specification".

## 3.0 DESIGN AND PERFORMANCE REQUIREMENTS

- 3.1 The spiral weld pipe mill shall be capable of producing unstiffened beam tube sections with the following characteristics:
- \* Outside Diameter = 49.000" MIN.  
49.250" MAX.
  - \* Outside Circumference = 153.938" MIN.  
154.723" MAX.
  - \* Straightness = 0.25" MAX. Deviation From A Straight Line Along The Full Length Of Tube And At Any Location Around The Tube.
  - \* Length Of Tubes = 65'-0 1/2 MIN. [ Long Tube ]  
65'-0 3/4 MAX. [ Long Tube ]  
62'-9 1/2 MIN. [ Short Tube ]  
62'-9 3/4 MAX. [ Short Tube ]
  - \* Length Of 16 Termination Tubes = 40'-0 MIN.
  - \* Flatness Of Cut Tube Ends = 1/4" MAX.
  - \* Perpendicularity Of Cut Ends To Axis Of The Tube = 1/4" MAX.
- 3.2 The spiral weld pipe mill shall accommodate coil material [ furnished by Purchaser ] with the following characteristics:
- \* Strip Width = 16" To 36"
  - \* Strip Width Tolerance = 0.010 MAX. Variation Among Coils Of The Same Width



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		<b>REFERENCE NO.</b> 953571		<b>SHT 2 OF 4</b>	
<b>PRODUCT</b> <b>LIGO BEAM TUBE MODULES</b> <b>CALIFORNIA INSTITUTE OF TECHNOLOGY</b>		<b>OFFICE</b> <b>PSE</b>		<b>REVISION</b> 0	
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- \* Strip Thickness = 0.125" Nominal [ 0.120" MIN / 0.133" MAX ]
- \* Strip Material Specification = SA-240 Type 304L HRAP [ CBI Specification C-240-186 ]
- \* ID Of Coil = 20" [ Mill Standard ]
- \* OD Of Coil = 70" [ Approximate MAX Coil Size ]
- \* Weight Of Coil = 38000# [ Approximate MAX Coil Weights ]

3.3 The spiral weld pipe mill shall be capable of fitting coil strips for welding while operating at strip speeds of 10" to 100" per minutes within the following tolerances and parameters:

- \* Seam Gap = 0.010" MAX.
- \* Seam Mismatch = 0.031 " MAX.
- \* Edge Offset At Coil Splice = 0.010" MAX.
- \* Welding equipment shall be located at approximate 6:00 O'clock for inside and 12:00 O'clock for outside spiral welds. Material to torch distance shall remain constant during welding.
- \* The mill drive system shall be a variable speed DC drive and shall operate without speed fluctuations.

#### 4.0 MILL SYSTEMS AND COMPONENTS SUPPLIED BY SELLER

The spiral weld pipe mill equipment furnished by the SELLER shall constitute a complete system capable of producing tube sections as specified in Section 3.0 of this specification. The equipment furnished by the SELLER shall include, but not be limited to the following:

- 4.1 Uncoiler With Driven Snubber And Peeler
- 4.2 Coil End Breaker
- 4.3 Driven Pinch Roll
- 4.4 Strip Guides AS Necessary
- 4.5 Straightener
- 4.6 Metal Joiner Table
  - \* Plasma Cutoff, Including Equipment
  - \* Purge Arrangements
- 4.7 Main Drive [ Direct Current ]
- 4.8 Over / Under Support
- 4.9 Seam Beveling System
- 4.10 Strip Edge Brushes
- 4.11 Prebend Stand
- 4.12 Three Roll Pipe Forming Table Including One Forming Mandrel



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4.13 ID Weld Mounting Arrangements And Purge Arrangements

4.14 ID Laser Weld Seam Tracking

4.15 Gap Control - Electromechanical

\* Laser Controlled If ID Laser Seam Tracker Can Be Used As Sensor

4.16 Diameter Control

4.17 OD Weld Mounting Arrangements And Purge Arrangements

4.18 OD Laser Weld Seam Tracker

4.19 Discharge Table

\* Horizontal Support Stands

\* Vertical Support Stands

\* Pipe Cutoff - Plasma Flying Cutoff With Spark Catcher

\* Pipe Kickoff

4.20 Complete Hydraulic And Electrical Systems

\* 440 Volt, 3 Phase, 60 HZ

## **5.0 GENERAL REQUIREMENTS FOR EQUIPMENT SUPPLIED BY SELLER**

5.1 All rollers, brushes, guides and supports that are in contact with the coil material and formed tube sections to be fabricated of stainless steel.

5.2 Bearings and rollers to be sealed to prevent the mill from contaminating the tube surface with oil or grease.

5.3 Equipment to be marked with assembly weights and with piece marks to facilitate reassembly. shipping assemblies to be properly packaged for shipping.

## **6.0 ADDITIONAL REQUIREMENTS FOR SELLER**

6.1 Provide two (2) weeks of training time for PURCHASER'S equipment operators. Training time to be split between SELLER'S facility and PURCHASER'S Hanford, Washington site.

6.2 Provide integration of PURCHASER supplied welding equipment into the spiral mill.

6.3 Provide the design of the spiral pipe mill. This shall include placement drawings for the spiral pipe mill and pipe exit equipment, drawings showing the plant area required for the spiral pipe mill, and recommendations for handling of coil material and fabricated tubes into and out of the spiral pipe mill.

6.4 Provide two (2) copies of operation and maintenance manuals for all equipment.

6.5 Provide two (2) copies of recommended spare parts list.

6.6 Provide two (2) copies of foundation drawings, including required embeds and trenches.

6.7 Provide two (2) copies of assembly and layout drawings.



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6.8 Provide equipment weights and loads.

6.9 Technical assistance and supervision during qualification and acceptance testing at SELLER'S facility and for assembly and qualification and acceptance testing at PURCHASER's Hanford, Washington site.

#### **7.0 MATERIAL, EQUIPMENT, AND SERVICES PROVIDED BY PURCHASER**

7.1 Welding equipment and necessary information required to integrate the weld process into the pipe mill for the inside and outside spiral welds and coil slice weld.

7.2 Coil material for qualification and acceptance tests, commissioning and training.

7.3 Labor for the installation of the mill at Hanford, Washington.

#### **8.0 QUALIFICATION AND ACCEPTANCE TESTING**

8.1 Prior to shipment from the SELLER'S facility, SELLER shall completely assemble the spiral weld pipe mill in order to perform a qualification test. The qualification test shall consist of the production of 100' of beam tube that meets the dimensional requirements of Section 3.1 and weld joint fit-up requirements of section 3.3, using coil material that meets the requirements of Section 3.2. SELLER shall notify Purchaser a minimum of two weeks prior to conducting qualification test. The Purchaser shall witness the qualification test. The spiral weld pipe mill equipment shall not be shipped from the SELLER'S facility until Purchaser acknowledges successful completion of the qualification test in writing.

8.2 After spiral weld pipe mill has been reassembled at the PURCHASER'S Hanford, Washington site, SELLER shall conduct an acceptance test. The acceptance test shall consist of the production of a 65' beam tube section that meets the dimensional requirements of Section 3.1 and the weld joint fit-up requirements of Section 3.3, using coil material that meets the requirements of Section 3.2. The PURCHASER shall witness the acceptance test. Final acceptance of the spiral weld pipe mill equipment shall be based upon successful completion of the acceptance test and shall be acknowledged in writing.

## NUMBERS - CATEGORY "E"

LIGO # (LIGO-E95xxx-00-x)	Assigned To	Document Title
E950094-00- <del>E</del>	<del>B. YONG</del>	<del>Minutes of Grounding &amp; Shielding Mtg. 1/10/95</del>
E950095-00- B	L. JONES	PBI SPECIFICATION?
E950096-00- B	"	CLEAN ROOM SPECIFICATION
E950097-00- B	"	WELD SHELTER SPECIFICATION
E950098-00- F	A. SIBEL	OS B Requirements
E950099-00- D	Kate	OSB for the office
E950100-00- D	"	Grounding Plans for the office
E950101-00- E	Lezzarini	
E950102-00- B	Jones	Equip Qualification Test - CBI
E950103-00- B	"	WA BTE BID PACKAGE
E950104-00- D	Billingsley	Polishing Specification, Pathfinder
E950105-00- B	JONES	BT Termination Fundation
E950106-00- E	Lezzarini	
E950107-00- E	↓	
E950108-00- E		
E950109-00- E		
E950110-00- E		
E950111-00- E		
E950112-00- E		
E950113-00- E		
E950114-00- E		
E950115-00- E		
E950116-00- B		JONES
E950117-00- B	Jones	CBI'S Special Weld Pipe Mill Spec.
E950118-00-		