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CBI	IDENTIFICATION C-240-EJ LIGO-E970010-04-B			
TITLE EXPANSION JOINT MATERIAL SPECIFICATION	REFERENCE NO. 953571(930212)		SHT 1 OF 5	
	OFFICE LIGO		REVISION 4	
PRODUCT LIIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	MADE BY WJC	CHKD BY RJW	MADE BY SWP	CHKD BY MLT
	DATE 3/23/94	DATE 3/23/94	DATE 2/3/97	DATE 2/3/97

0.1 SCOPE

This specification gives the technical requirements for the sheet material used in the LIGO expansion joints. The expansion joints are to be used to manufacture a high vacuum tube with low hydrogen outgassing for laser application. The specification only covers material with thicknesses less than or equal to 0.130".

1.0 MATERIALS

1.1 This material shall conform to the requirements of ASME Specification SA-240 Type 304L with the additional supplementary requirements described in this specification.

1.2.0 Applicable Codes

1.2.1 ASME Boiler & Pressure Vessel Code, Section II, "Materials", the 1992 Edition with the 1993 Addenda.

1.2.2 LIGO Specification 1100004, "Beam Tube Module Specification", dated May 11, 1993.

1.2.3 LIGO Specification 1100007, "Process Specification for Low Hydrogen, Type 304L Stainless Steel Vacuum Products", dated April 5, 1993.

1.2.4 ASME SA-240, "Specification for Heat-Resisting and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels".

1.2.5 ASME SA-480, "Standard Specification for General Requirements for Flat-Roll Stainless and Heat-Resisting Steel Plate, Sheet, and Strip".

1.2.6 ASTM A-700, "Standard Packages for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment".

1.2.7 The latest revision of Specification C-CMBS1, "Coil Material Bake Specification".

1.3 Any apparent conflicts between the requirements given herein and the applicable ASME Specification shall be brought to the attention of CBI for clarification.

APPROVED	
M. Tellalian	April 11, 1997
CBI	DATE
J Jones	7/25/97
CALTECH	DATE

2.0 MANUFACTURE

2.1 Thickness Tolerance

The expansion joint sheet material shall be furnished to the thickness specified in the purchase order. The thickness tolerance shall -0.000" / +0.003".

2.2 Width Tolerance

The sheet material for the expansion joints shall be cut to the width specified in the purchase order. The width tolerance of the finished sheets shall be as specified in ASME SA-480 specification.

2.3 Flatness and Camber Tolerance

The sheet material for the expansion joints flatness and camber tolerance(s) shall meet the specified tolerances for hot rolled stretcher leveled material in ASME SA-480 specification.

2.4 Surface Finish

The surface finish of the material shall be no smoother than 2.5 microns RMS. Hot rolled, Annealed, and Pickled (HRAP) surface finish is acceptable.

2.5 Chemistry and Physical Properties

The material shall meet the chemistry and physical requirements as specified in SA 240 Type 304L material specification with the following additional restrictions:

- The sulfur content of the material shall not be less than 0.010% or greater than 0.020% by heat and product analysis.

2.7 Cleanliness

This material is intended for use in a high vacuum tube for laser application. Potential sources of hydrocarbon contamination shall be eliminated. Also, the material shall be wrapped and covered at all times that the material is not being processed to minimize possible exposure to contaminants.

3.0 - PREPARATION FOR BAKING (by others)

Each coil of material that is produced will be baked by others as specified in the latest revision of Specification C-CMBS1, "Coil Material Bake Specification".

4.0 MATERIAL TESTING

4.1 Mechanical tests shall be performed on each coil of material as described in ASME 480 with the additional supplementary requirements as described herein. One tension test shall be performed on specimens taken from all coils.

4.2 After baking and before slitting the material, a 75" long by full width sheet of material shall be cut from the end of one coil from each bake lot for hydrogen outgas test coupons. Care shall be taken during cutting, handling, and packaging operations to keep the coupon material clean. Each sheet of coupon material shall be packaged separately in clean waterproof wrapping. The coupon sheets shall be identified with the identification of the bake lot and of the coil from which the sheet was removed.

5.0 INSPECTION / WITNESS

5.1 The purchaser shall have the right to witness all manufacturing processes.

5.2 The purchaser shall be informed 5 working days before the coil material is hot rolled.

6.0 REJECTIONS AND REPAIR OF DEFECTS

6.1 No weld splices or repair welding is permitted to the material.

7.0 IDENTIFICATION

7.1 Identification of the material shall be maintained through all manufacturing processes.

7.2 If material identity is lost, the plate shall be re qualified by making all tests that were required for the material or as indicated in this specification.

7.3 Marking the finished materials with marking fluids, die stamps, and / or electro-etching is not permitted. A vibratory tool with a minimum tip radius of 0.005" is acceptable for marking the finished materials. All other marking methods must be approved by the purchaser prior to use. Unless noted otherwise on the purchase order, the material identification shall be located across the width of the material within three inches of the outside end of the finished coils and within three inches of the short edge or each sheet of material that is cut from the coil.

8.0 DOCUMENTATION

8.1 The Certified Material Test Report (CMTR) shall be mailed to the purchaser within 48 *hours after shipment of the material.*

8.2 A record of the material thickness for each coil of material is required. Thickness shall be measured and recorded at both edges and the center of the coil material at 300 feet intervals along the length of the coils.

9.0 PACKAGING, STORING AND SHIPPING

9.1 The material shall be packaged for shipment as described in ASTM A700-94, Section 12.4.9 and 12.4.10 with the additional supplementary requirements as described herein.

- During the 444°C bake the coil material shall be packaged as shown in Figure 64 of A700-94. Only unpainted and uncoated plain carbon steel or stainless steel banding materials shall be used to package the material. Only stainless steel or aluminum pads and edge protectors shall be used to package the material.
- After the 444°C bake the coil material shall be package as shown in Figure 67 of ASTM A700-94.
- Cut lengths of materials for the expansion joints shall be packaged as shown in Figure 91 of A700-94. In addition, the material shall be wrapped in waterproof wrapping material.

9.2 The beam tube material shall be wrapped in waterproof paper and covered with a tarp immediately after all steel processing operations have been completed to minimize contamination. The material shall remain packaged and covered until it is necessary to remove the covering and packaging material for further processing.

9.2 The material shall be and shipped as specified in the purchase order.

10.0 NON-ESCORT PRIVILEGES AND INSPECTION RIGHT

The National Science Foundation (NSF) and Caltech, through their authorized representatives, have the right to inspect and evaluate the work performed or being performed under this specification, including the premises where the work is being performed at all reasonable times. The NSF and Caltech shall be provided access to all areas of the facilities where the work is being performed under this specification. This shall include access to fabrication, assembly, cleaning, and test areas for the purpose of monitoring activities. The vendor shall furnish all reasonable equipment and assistance for the safe and convenient inspection of the work if requested.