Fermi National Accelerator Laboratory

P.O. Box 500 - Batavia, Illinois - 60510

Fermilab Engineering Specification
LCLS-II 1.3 GHz and 3.9 GHz Cryomodule Stand Specification
ED000xxxx, Rev. -

Rev.	Date	Description	Originated By	Checked By	Approved By
-	8 Sep 2016	Initial Release	*Michael McGee*		

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1. INTRODUCTION

The Cryomodule Stand Assembly is an essential component required for the support and installation of the LCLS-II (35) 1.3 GHz and (2) 3.9 GHz Cryomodules and an operational set of spares. The cryomodule stand provides the support, stability and restraint of the 1.3 GHz and 3.9 GHz Cryomodules during LCLS-II operation at SLAC.

2. SCOPE

This document describes the requirements necessary to specify, manufacture, and procure the Cryomodule Stand Assembly. Vendor shall offer for acceptance a fully fabricated Cryomodule Stand Assembly, according to this document, associated drawings, and quality control specifications.

3. TECHNICAL REQUIREMENTS

3.1 General description

The majority of the material of the cryomodule stand is carbon steel (A-36) with a mix of Grade 5, Grade 8 and stainless steel hardware. The cryomodule stand footprint is 30" width x 41-1/2" length and extends 21-1/8" in height. Following welding, each weldment and component (as specified on the drawings) shall receive a surface coating of electro-less Nickel plating. Note that threaded holes shall not be plated.

3.2 Dimensional conformance

The Fermilab drawings and all drawings referenced shall be used by the Vendor for configuration control and dimensional conformance. Dimensional variances and overall envelope configuration shall be maintained within specified tolerances.

Table 3.1: Engineering drawings of the Cryomodule - Adjustable Support Assembly F10063423.

Item	Drawing number	Description	Material	Rev.
1	FC0060795	HHH Bolt - 1"-8 x 3.0 LG, A325 Structural	A325 Steel	- - -
2	F10063415	Flanged Clearance Sleeve, Aisle Side	A500 Steel	- - -
3	FC0050276	Ball Joint Rod End - Female 1"-12, UNF, LH END	Steel	- - -
4	FC0050275	Ball Joint Rod End - Female 1"-12, UNF, RH END	Steel	- - -
5	F10038397	Nut, HEX - 1"12 Thread, 1-1/2" Wide, 55/64" High, Naval Brass	Naval Brass	A
6	F10036694	Disk, CMTS-1 Adjustable Support	1045 Steel	B
7	F10036155	Rod, LH/RH Threaded Coupling - CMTS-1 Adjustable Support	316 SS	A
8	F10037687	SLAC/LCLS-II Cryomodule - Support Base Weldment	See parts list	- - -
9	F10058265	SLAC/LCLS-II Cryomodule - Adjustable Plate Weldment	See parts list	- - -

10	F10045789	Seismic Restraint Shim Package	A36 Steel	- - -
11	FC0015318	Nut, HEX, 3/4-10 x 0.7344, G5S	Grade 5 Steel	- - -
12	FC0009889	HHCS, 3/4-10 x 4.5 LG, G8S, ZYC	Grade 8 Steel	- - -
13	FC0059725	Shoulder Screw 3/4-10 Thread 1 Dia x 2.5 LG, 18-8 SS	18-8 SS	- - -
14	FC0061152	SSCS M24 x 3 x 40mm LG, GR 8, 8, Black Oxide	Grade 5 Steel	- - -
15	FC0060794	Washer, 1.062 ID x 2.0" OD, GR8 Yellow Chrome Plated Steel	Steel	- - -
16	F10061472	Seismic Support Assembly, Wall Side, Weldment	See parts list	- - -
17	F10063572	Plate, Aisle Seismic Support	A500 Steel	- - -
18	FC0060165	Washer, M24, 25 mm x 44mm 4.5 Thk	Steel	- - -
19	FC0060788	Washer, 21.0mm ID x 37.0 mm OD, 18-8 SS	18-8 SS	- - -
20	FC0019522	Dowel Pin, 0.375 OD X 1 LG, SS 18-8	18-8 SS	- - -
21	F10036193	Screw, Adjusting - CMTS-1 Adjustable Support	1045 Steel	C
22	FC0060789	HHCS M20 x 2.5 x 45 mm LG, SS	SS	- - -
23	FC0014677	Nut, HEX , M36 x 4 x 29, BR	Brass	- - -
24	FC0060796	HHH Bolt - 1"-8 x 3.5 LG, A325 Structural	A325 Steel	- - -
25	FC0061151	SSCS M24 x 3 x 60 mm LG, GR 8, 8, Black Oxide	Grade 5 Steel	- - -
26	F10064069	Flanged Clearance Sleeve, Wall Side	A500 Steel	- - -

In the drawings, the US system of units is used as the primary dimensions. Stated in square brackets, are the dimensions in metric units, where applicable. Note that in Drawing F10036193 the opposite is true, metric units are primary and the US system appears in square brackets.

The drawings supplied as part of this request for proposal are to be considered near-final release. Minor modifications will be done by Fermilab during the RFP open period, and a final set of drawings will be given to the Vendor at the time a contract is awarded.

3.3 Material

The material used in the fabrication of the Cryomodule Stand components shall conform to the specifications in associated drawings. It is the responsibility of the Vendor to ensure that ALL material used is traced to the stated specification.

3.4 Cleanliness

This Cryomodule Stand Assembly will be coated. Therefore, the surface of each weldment and machined part shall be cleaned to remove all rust and foreign material. The vendor shall follow the notes on the drawings and at a minimum, the part must be free of dirt, grease, oil, chips, and burrs.

3.5 Welding

All welding process and inspection must be in accordance with ANSI/AWS D1.1

Welding filler materials for steel: E70XX

The Vendor shall ensure that no entrapped gases, fluxes, pits, cracks, or like imperfections are left in the heat affected zones. All fillet welds shall be smooth for cosmetic appearance.

Post cleaning of welds with a wire brush only is acceptable and required to leave the surface in a bright finish condition with no trace of solvent residue.

3.6 Precision machining

Assembly shall be free of sharp edges, corners or burrs. All tolerances given shall adhere to the drawings and any deviation needs to be pre-approved by Fermilab.

3.7 Steel surface coating and treatment

After the weldments and parts have passed final inspection, steel surfaces shall be Electroless Nickel plated (using a deposit range between 0.0003" – 0.0005"). One exception exists, the steel surfaces found within SEISMIC RESTRAINT SHIM PACKAGE (F10045789) shall receive a black oxide coating.

Also, certain mating parts which require low friction contact shall receive a (DL-5) Dicronite dry film lubricant coating (as indicated) on drawings F10045789, F10061472 and F10063572.

Finally, Induction hardening to 55 HRC of rod spherical area (indicated on F10036193) and harden both sides of disk to 60 HRC at a depth of 0.020" (indicated on F10036694) to print.

3.8 Reduced magnetic susceptibility

After welding, parts shall be subject to magnetic measurement. The remnant field to be less than or equal to 3 Gauss at contact. This is part of the standard QC process.

Avoid handling low carbon steel parts with a magnetic lift.

3.9 First article of inspection

One completed stand will be inspected at the Vendor's site before proceeding with the remainder of the order. This includes demonstration of the functional and magnetic requirements.

4. VENDOR FURNISHED MATERIALS AND SERVICES

The Vendor shall provide all materials necessary to fabricate complete deliverables. There will be no material provided by Fermilab or partner lab.

The Vendor shall provide manufacturing engineering services required to generate internal shop drawings and all documentation needed to manage and support their suppliers.

The Vendor shall provide all labor to assemble and supervise the manufacture of all components regardless of where these are made: within the Vendor's plant or in a second facility or sub-contractor.

The Vendor shall fabricate jigs and fixtures required to complete the assembly F10063423.

5. QUALITY ASSURANCE

Fermilab reserves the right to perform a vendor visit to assess vendor's QA program prior to the start of fabrication. If applicable, the vendor shall submit a detailed written fabrication inspection plan which shall enable the vendor to provide a schedule for inspection hold points. The vendor must document, implement, and maintain a Quality Assurance Program consistent with the requirements of ISO 9001 or approved equivalent. If the vendor does not have an approved equivalent, Fermilab must approve the vendor's QA plan.

The completed Cryomodule Stand Assembly shall be made available to Fermilab or partner lab for inspection as a first article of inspection, during, and/or after fabrication. Advanced notice of two weeks shall be provided to Fermilab or partner lab for travel arrangements.

The Vendor shall maintain records of all inspections. This information shall be made available for inspection to any Fermilab or partner lab technical representative.

Fermilab reserves the right to have its technical or procurement representatives witness any or all manufacturing steps and inspections established under the Vendor's quality assurance program to demonstrate compliance with this specification. Any information of a proprietary nature must be identified in the bid response. The assembly will be inspected again at our partner lab prior to final acceptance.

5.1 The vendor is required to provide material certificates, base material and filler materials material certificates, heat treatment documents, welding documents, coating certificates, etc. if requested.

5.2 The vendor is required to provide an inspection report showing measurements of all dimensions without the specified tolerance stated on the drawing of least 10% of the completed lot, but the percentage is based on the total number of stands.

5.3 In the event of incompleteness or error in Fermilab supplied drawings, the vendor shall notify Fermilab to obtain design directives.

5.4 Any bolts supplied or part of an assembly shall be as per print and shall conform to ASTM A307, JIS SS400, ASTM A325M Type 1, or equivalent. The use of counterfeit bolts is strictly forbidden.

6. SHIPMENT

Assembly and packing instructions are to be determined at the time of contract award.

The Vendor shall ship the cryomodule stand properly packed, to ensure that damage is not incurred during shipment, in accordance with transportation industry standards. This shall include weather protection. Sizing shall be such that handling is facilitated and weight limitations imposed by the transportation industry can readily be met.

All deliverables including documentation shall be catalogued and offered for acceptance to Fermilab or partner lab at the time of Cryomodule Stand Assembly delivery. Documentation must accompany the products such that Fermilab or partner lab receiving personnel clearly understand the contents and can match delivery to a purchase order.

A packing list of loose items shall be included in any kits required.

The complete order shall be shipped to our partner lab:

SLAC National Accelerator Laboratory
2575 Sand Hill Rd
Menlo Park Ca 94025

7. TECHNICAL MILESTONES

The Vendor shall provide a fabrication and inspection schedule within 4 weeks of contract award and maintained during the term of the contract. The following technical milestones list will be included, but not limited to:

7.1 Initial meeting or discussion [to review the drawings, detailed scheduled, and other relevant issues]

7.2 Material delivery

7.3 Assembly completion

7.4 Vendor QA inspection

7.5 Shipping date

A production timeline that meets our delivery schedule for fabrication, starting from time of award running through F.O.B. shall be provided as part of the bid package. Following Fermilab's approval of timeline and contract award, it is the responsibility of the Vendor to comply with and meet dates specified in approved timeline.

For submittals that require Fermilab's approvals, Vendor shall wait for the approval notices to continue fabrication activities.