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1 Scope:

This specification describes the procedure for cradle welding, mechanical survey measurements, and Fiducial/cover disk welding on the D1 Dipole Cold Mass Assemblies.

2 Applicable Documents:

The following documents, of the issue in effect at the time of release for manufacture, form a part of this procedure to the extent specified herein:

RHIC-MAG-Q-1004	Discrepancy Reporting Procedure
RHIC-MAG-Q-1000	Procedure for Control of Measurement Test Equipment
RHIC-MAG-R-8792	Removal of Cold Mass Twist

BNL Drawings:

14010119	Assembly, LHC D1 Shell Welding
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3 Requirements:

Assembly work shall be done in accordance with the drawings and parts lists, and the installation and welding sequence described below.

All welding shall be performed by welders qualified in accordance with ASME Section IX. The welding parameters shall be set in accordance with those specified during welding process development.

3.1 Material/Equipment

25-1785.01-5 Cradle Welding Fixture
Electronic Digital Micrometer Depth Gauge (Starrett No. 735BZ-6RL)
Electronic Digital Micrometer Height Gauge (Starrett No. 752)
25-1821.01-5 Fiducial Inspection Bracket
25-1782.02-5 LHC Cold Mass Lifting Beam

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3.2 Safety Precautions

3.2.1 Operators shall be trained by their cognizant technical supervisor and qualified in the operation of the welding equipment.

3.2.2 No welding shall take place unless all welding screens are in place around the welding station, and all personnel not directly involved with the welding process are outside the screens. Any personnel inside the screens shall wear protective gear to prevent eye injury, and shall be clothed to prevent burns caused by intense ultra-violet light.

3.2.3 All lifting and handling operations requiring overhead crane operations shall be performed by holders of valid Safety Awareness Certificates. They shall also be trained and certified in the use of the appropriate lifting device by the Cognizant Engineer or Technical Supervisor.

3.3 Procedure

3.3.1 Cradle welding

3.3.1.1 Weld cover patches over all shell holes except at the ten designated survey locations (see assembly drawing).

3.3.1.2 Install the cradles onto the three cradle support assemblies. Measure and record the inclination of each cradle support and calculate the average.

3.3.1.3 Fit an insulating blanket over each cradle so that the angled legs of the cradle protrude through the mating cut-outs in the blanket.

3.3.1.4 Using 25-1782.02-5, crane lift the cold mass unit and rest it on the cradle assembly fixture rollers. Use the alignment angle to align the lead end plate with the scribe line on the fixture. Be certain that the shell with survey holes is facing up indicating that the unit is right-side up.

3.3.1.5 Using the twist bridge, measure and record the inclination at all survey locations (5 points). Calculate the average twist of the cold mass. Verify that the values are within tolerance, ≤ 1 milliradian RMS. If outside this range, consult with the Cognizant Engineer. Should twist removal be required, flame straightening per RHIC-MAG-R-8792 may be required.

3.3.1.6 Position the axial restraints along side the cradle as shown on the assembly drawing and clamp in place.

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- 3.3.1.7 Using a spirit level, rotate the cold mass to level it with respect to the cradle supports (preliminary angle adjustment).
- 3.3.1.8 Fillet weld the axial restraint blocks to the shell using ER385 filler wire (P/N 12010441-03) as shown on the assembly drawing.

NOTE

Power up the inclinometer LED display and allow it to warm up for at least one hour in order for it to stabilize.

- 3.3.1.9 Using the inclinometer, rotate the cold mass so that the average twist equals the average cradle support angle (from paragraph 3.3.1.2) within 0.2 milliradians. Release hydraulic pressure to rollers and lower the cold mass onto the cradles.
- 3.3.1.10 Tack weld the cradles to the axial restraint blocks using filler wire (P/N 12010441-03) as shown on the assembly drawing. Monitor the cold mass inclination during welding and add additional weld as required to ensure that each cradle be parallel to within 0.2 milliradians with respect to the plane defined by the average cold mass twist after welding is complete and the welds have cooled.
- 3.3.1.11 Wrap each of the three blankets around the cold mass shell and secure the ends temporarily with masking tape.
- 3.3.1.12 Check each cradle with .002 feeler stock for full contact with the fixture.
- 3.3.2 Inspect Welds
 - 3.3.2.1 Call for a certified weld inspector to inspect and sign off on all welds.
 - 3.3.2.2 Mark finished assembly with part number and serial number as shown on the assembly drawing.

4 Quality Assurance Provisions

- 4.1 The Quality Assurance provisions of this procedure require that all assembly and test operations be performed in accordance with the procedural instructions contained herein.
- 4.2 Measuring and test equipment used for this procedure shall contain a valid calibration label in accordance with RHIC-MAG-Q-1000.

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4.3 All discrepancies shall be identified and reported in accordance with RHIC-MAG-Q-1004.

5 Preparation for Delivery:

N/A