FABRICATION PROCEDURE FOR BNL 15T PULSED MAGNET CRYOSTAT

A. SHOP PREFABRICATION/SUB-ASSEMBLY WORKS:

Position the coil on so the 0 degree line is oriented at the twelve o’clock position.

Note: The bottom of the coil assembly crate must be at least 4” from floor or table.

Remove the crate except the area at the bottom support to expose the coil assembly.

After inspection, document final dimensions for ID of first coil. Machine the spline shaft so the OD is .5 mm less than the ID of first coil. Cut the spline shaft to its final length.

Fabricate the coil shroud ID 3mm larger than the OD of third coil plus G10 strips

1. Fit, weld spline shaft to inner vessel flare (head) and attach backing ring (Ref. Sketch 12 -- Drwg 0402111SA)

2. Fit weld inner pressure cylinder to head and fit weld cylinder to mating flange. (Ref. Sketch 1 -- Drwg 0402101SA).

3. Fit, weld vacuum vessel head to vacuum vessel cylinder, then fit weld vacuum vessel bellows. (Ref. Sketch 2)

4. Fit, weld vacuum vessel (head) flare to vacuum vessel bore tube. (Ref. Sketch 3 -- Drwg 0402201SA).

5. Fit, weld plenum plate assembly with all spacers. (Ref. Sketch 4 -- Drwg 0402104SA).

6. Position and weld the plenum plate assembly to the spline shaft. (Ref. Sketch 5).
Reference the coil restraint keys inside the first coil: Position the plenum plate assembly so the 0 degree line of the plenum plate assembly is aligned with the 0 degree line of the coil assembly after telescoping the assembly into the coil assembly. (Ref. Sketch 5).

7 Fabricate outer flange assembly.  
(Ref. Sketch 6 – Drwg 0402102SA -- Sketch 6A and Sketch 6B show the arrangements at both sides of the outer flange).

8 Fabricate inner pressure vessel fixed support assembly.  
(Ref. Sketch 7 -- Drwg 0402300A).

9. Fabricate inner pressure vessel assembly two slide support assemblies.  
(Ref. Sketch 8 – Drwg 0402401A).

10. Fabricate two coil support strap assemblies.  
(Ref. Sketch 9 --- 0402108SA).

11 Fabricate He/LN2 inlet/outlet 2” tube assembly.  
(Ref. Sketch 10 – Drwg 0402106SA).

12. Fabricate a shaft assembly, shaft OD = 6.625”, ID = 4.625”, 12 ft long, three 7.0” OD, 6.7” ID, 1.0” width, and two removable flanges with six ½ “ bolt holes.  
(Ref. Sketch 11).

Fabricate 2 fixed supports 12 ft apart, hold capacity 15000 lbs.

Note: One end of shaft OD must be 6.625” max after removing the end flange.

13 Fabricate the power lead /instrumentation assembly.  
(Ref. Sketch 14 --- Drwg 0402500A)
14. Fabricate the He/LN2 inlet/outlet bellows assembly.
   (Ref. Sketch 13 -- Drwg 0402201SA)

B. INTEGRATION:

STEP # 1

Slide the plenum / spline shaft assembly (sketch 5) inside the coil assembly so the “0” degree line of the plenum plate lines up with the “0” degree line of the coil. The spacers on the plenum plate should against the coil surface. Slide the dummy tube inside the inner pressure spline bore tube. Slide the inner flange (040210011) over the dummy bore tube so the threaded holes face out. Slide the coil shroud (040210017) over the dummy tube so the cut out toward the coil assembly. Slide the inner pressure vessel head assembly, cylinder and bellows (sketch 1).

STEP # 2

Support and seam weld the coil shroud.

Note:

The seam weld on shroud must be in the middle of the two G-10 strips on the third coil to avoid damaging the G-10 strip. The seam weld line is about 30 degrees from the top of the coil assembly

STEP # 3

Weld the HE/LN2 inlet/outlet box end plate (040210037P01) to shroud.

STEP # 4

Position and install the He/LN2 inlet/outlet tube assembly (sketch 10) on shroud. Use stainless steel tabs 1/8” thick about .5” wide by 1” height as spacers for the 2” tube, tack weld tabs to 2” tube and shroud. Weld the He/LN2 inlet/outlet box end plate (040210037P02) to shroud.
STEP # 5

Position and weld He/LN2 inlet/outlet housing box (040210037P03) to two end plates (040210037P01, 040210037P02) and shroud (040210017).

STEP # 6

Slide the inner pressure head, cylinder sub-assembly built to sketch 1 over the coil assembly and butt weld the head to the flare (04021002).

Note:
1. The threaded pad must be on top.
2. Temporarily support the magnet with wood contours, install rubber or foam on the wood top contour to protect the magnet insulation from damaging and to prevent the spline shaft from bending.
3. 

STEP # 7

Note: DO NOT INSTALL THE SEALS

Remove the dummy shaft. Support the assembly from floor Install and bolt (24 bolts at equal spaces) the outer flange assembly (sketch 6) to the inner vessel mating flange (040210031). Position the inner flange (040210011) so the two lugs on top and 30 degrees from the coil “0” degree line. Bolt to the outer flange (040210009) to the inner flange (040210011) (12 bolts at equal spaces) Weld inner flange to the spline shaft end. Slide the larger OD side of the Magnet Inner Bellows (040210035) over the spline shaft. Position and weld the Magnet Inner Bellows to the inner flange

STEP # 8

Reinstall the dummy shaft. Remove the outer flange assembly (sketch 6) Install 2 strap assemblies (sketch 9) that connect inner pressure vessel mating flange (040210031) and inner flange (040210011).
STEP # 9

Install the two seals on the outer flange assembly (sketch 6).
Install the outer flange assembly
Bolt the outer flange to the mating flange and inner flange (Ref. Sketches 15 and 16 for the tighten sequences and required torques).

STEP # 10

Remove the dummy shaft assembly
Pressure test the assembly per the ASME Section VIII, DIV 1, UG-100.
PNEUMATIC TEST.
Insulate the inner pressure vessel cylinder and head with 30 layers MLI.

STEP # 11

Re install the dummy shaft assembly.
Install two G10 lateral vacuum load support rings (040220008P and 040220010P).
Slide the vacuum vessel head/cylinder/bellows, sketch 2 over the inner pressure vessel assembly so the two G10 lateral vacuum load support rings touch the inner pressure head.
Weld the outer vacuum vessel bellows (040220004) to the inner pressure vessel mating flange (040210031).

STEP # 12

Install the fixed front support and two slide supports G10 cylinders (040230005) to the inner pressure vessel cylinder (040210004).
Weld the three vacuum vessel support bellows (040230003) to the vacuum vessel.
Weld the three stainless steel base plates (040230004) to the three vacuum vessel support bellows.

STEP # 13

Remove the dummy shaft assembly.
Slide the vacuum bore tube/flare, sketch 3, inside the inner pressure vessel spline shaft (040210001).
Weld the inner bellows to the vacuum vessel bore tube.
Weld the flare head of sketch 3 to the vacuum vessel head of sketch 2.

STEP # 14

Install the vacuum vessel pump out/relief assembly.
Pump out and leak check

STEP # 15

Install the Q foil heater