

WBS Number: 162
WBS Title: Coil Electrical Leads
Job Number: 1601-162
Job Title: Coil Electrical Leads
Job Manager: Paul Goranson

Description:

This effort covers all coil leads that connect the coil terminals to the buswork at the boundary of the cryostat. The lead cables are all the same except for length, and will be procured from a qualified vendor. All installation will be performed as per

Assumptions:

outside engr rate = 120 \$ per hour
 outside fab rate = 60 \$ per hour
 outside inspection/technician rate = 80 \$ per hour

TOTAL MATERIAL COST = \$86,687

Purchased parts:

set of cables \$0
 misc attachment hardware \$11,091 @10\$/ft
 thermal transition box material \$0
 subtotal, purchased parts **\$11,091**

Lead bundles consist of six, 250 MCM cable with teflon sleeve. Lead ends are cooled by bleed liquid nitrogen supplied by the coil coolant header (WBS 161)
 Leads connect from coil terminals to buswork at bottom of machine.
 Each coil is connected separately except PF1 and PF2, which are connected in series within the central solenoid assembly

Purchased materials for in-house fabrication and sub-assembly

None required \$0
 subtotal purchased materials 0

Worksheet, TF Coils:

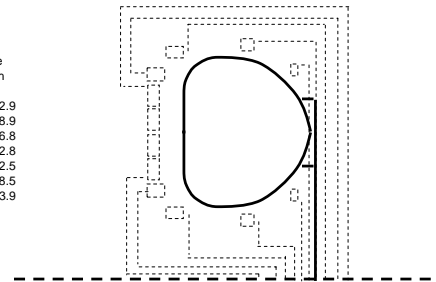
Lead cost, TF Coils

Terminations, assembly \$200 ea
 Cable with teflon insulation, reinforced \$50 per foot
 teflon outer jacket 18
 Total number of cables 277
 Total length of cables
 Total cable cost **\$17,452**

Geometry

radius of vertical runs 12 ft
 height of upper terminals 11 ft
 height of lower terminals 7 ft

Lengths	terminal radius (m)	height from floor (ft)	cable length (ft)	
coils at 10, 130, 250 degrees	3.00	11.00	12.9	
coils at 70, 190, 310 degrees	3.00	7.00	8.9	
coils at 30, 150, 270 degrees	3.00	11.00	16.8	
coils at 90, 210, 330 degrees	3.00	7.00	12.8	
coils at 50, 170, 290 degrees	3.00	11.00	22.5	
coils at 110, 230, 350 degrees	3.00	7.00	18.5	
Subtotals			73.9	
Total length	222 ft			
25% extra for bends, offsets	55			
Total procured length	277 ft			
Avg length per cable	15 ft			



Basis of Estimate

Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL

Based on recent experiences on NCSX and UT work being done at MDL

Based on recent experiences on NCSX and UT work being done at MDL

Based on recent experiences on NCSX and UT work being done at MDL

WBS Number: 162
WBS Title: Coil Electrical Leads
Job Number: 1601-162
Job Title: Coil Electrical Leads
Job Manager: Paul Goranson

Worksheet, PF Coils:

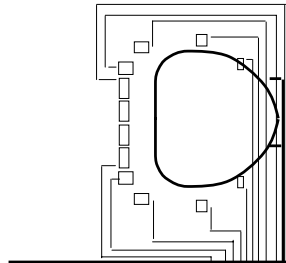
Lead cost, PF Coils

Terminations, assembly	\$200 ea
Cable with teflon insulation, reinforced	
teflon outer jacket	\$50 per foot
Total number of cables	10
Total length of cables	181
Total cable cost	\$11,052

Geometry

radius of vertical runs	10 ft
height of upper runs	12 ft
height of connection to buswork	0 ft

Lengths	terminal radius (m)	height from midplane (m)	top length (ft)	bottom length (ft)
TF Coils				
PF1, PF2, connected in series as assy	0.00	1.30	29.7	14.3
PF3	0.00	1.30	29.7	14.3
PF4	0.69	1.60	26.5	13.0
PF5	2.23	1.50	7.6	7.6
PF6	2.80	1.00	4.1	4.1
External Trim Coils				
Mod Coils				
Subtotals			97.7	53.2
Total length	151 ft			
20% extra for bends, toroidal offsets	30			
Total procured length	181 ft			
Avg length per cable	18 ft			



Based on recent experiences on NCSX and UT work being done at MDL

Based on recent experiences on NCSX and UT work being done at MDL

Worksheet, Error field correction coil leads:

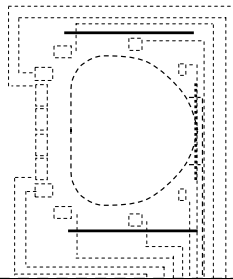
Lead cost, Error field coils

Terminations, assembly	\$200 ea
Cable with teflon insulation, reinforced	
teflon outer jacket	\$50 per foot
Total number of cables	2
Total length of cables	104
Total cable cost	\$5,620

Geometry

radius of vertical runs	12 ft
height of upper terminals	12 ft
height of lower terminals	6 ft

Lengths	terminal radius (m)	height from floor (ft)	cable length (ft)
coils at 0 degrees, top and bottom	3.00	12.00	13.9
Subtotals			13.9
Total length	84 ft		
25% extra for bends, offsets	21		
Total procured length	104 ft		
Avg length per cable	52 ft		



Based on recent experiences on NCSX and UT work being done at MDL

Based on recent experiences on NCSX and UT work being done at MDL

WBS Number: 162
WBS Title: Coil Electrical Leads
Job Number: 1601-162
Job Title: Coil Electrical Leads
Job Manager: Paul Goranson

Worksheet, Mod coils:

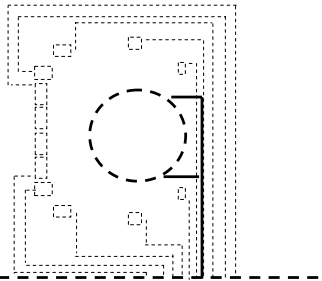
Lead cost for modular coils

Terminations, assembly	\$200 ea
Cable with teflon insulation, reinforced	\$50 per foot
teflon outer jacket	36
Total number of cables	547
Total length of cables	547
Total cable cost	\$34,529

Geometry

radius of vertical runs	12 ft
height of upper terminals	10 ft
height of lower terminals	8 ft

Lengths	terminal radius (m)	height from floor (ft)	cable length (ft)
coils at 10, 130, 250 degrees	3.00	10.00	11.9
coils at 70, 190, 310 degrees	3.00	8.00	9.9
coils at 30, 150, 270 degrees	3.00	10.00	15.8
coils at 90, 210, 330 degrees	3.00	8.00	13.8
coils at 50, 170, 290 degrees	3.00	10.00	21.5
coils at 110, 230, 350 degrees	3.00	8.00	19.5
Subtotals			72.9
Total length	219 ft		
25% extra for bends, offsets	55		
Total procured length	547 ft		
Avg length per cable	15 ft		



Based on recent experiences on NCSX and UT work being done at MDL

Based on recent experiences on NCSX and UT work being done at MDL

Worksheet, lead thermal transition box

66 leads, 11 to a box

	size (in)	number reqd	cost ea	total
sheet material, foil backed insul. foam	1 x 48 x 96	5	25	\$ 125
end seals	1" tube x 6"	22	20	\$ 440
cryo epoxy		.5 lb	28	\$ 14
misc mount hardware, ss base frame				\$ 500
foam caulk	16 oz	4	4	\$ 16
acrylic sheet window	3/8" x 12 x 24	1	62	\$ 62
assembly	40 hr each=	40		
			\$	1,157 each
number required for test floor				6
		Total hrs for fab		240
		Total M&S	\$	6,943

Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL
 Based on recent experiences on NCSX and UT work being done at MDL