

**NCSX June 2007 ETC
TABLE I - DESIGN LABOR**

WBS Number: 161
WBS Title: LN2 Distribution System
Job Number: 1601-161
Job Title: LN2 Distribution System
Job Manager: Paul Goranson

Description:

This element covers the design of the electrical leads within the cryostat, serving all the coils: the TF (WBS 131), PF (WBS 132), External Trim (WBS 133), and Modular (WBS 14) Coils.

Task ID	Multiplier	Unit	Number of Units	Hours	HOURS								Basis of Estimate
					ORNL EM	ORNL DSN	ORNL RM	EMEM	EMSM	EMSB	EMTB	EAEM	
Title I an II Design													
Pro-E models (avg)	4	hrs/model	40	160	160								See Worksheet below - based on recent experience at MDL
assy dwgs	8	hrs/dwg	11	88	88								See Worksheet below - based on recent experience at MDL
Detail drawings	4	hrs/dwg	6	24	24								See Worksheet below - based on recent experience at MDL
installation dwg	8	hrs/dwg	11	88	88								See Worksheet below - based on recent experience at MDL
cooling schematic	20	hrs/dwg	1	20	20								See Worksheet below - based on recent experience at MDL
electrical schematic	0	hrs/dwg	1	0	0								See Worksheet below - based on recent experience at MDL
I&C schematic	20	hrs/dwg	1	20	20								See Worksheet below - based on recent experience at MDL
stress analysis	40	hrs/calc	1	40	40								See Worksheet below - based on recent experience at MDL
thermal analysis	40	hrs/calc	1	40	40								See Worksheet below - based on recent experience at MDL
special analysis (electromagnetics)	160	hrs/calc	0	0	0								See Worksheet below - based on recent experience at MDL
fab specifications	160	hrs/spec	2	320	320								See Worksheet below - based on recent experience at MDL
preliminary and final design reviews	80	hrs/rev	2	160	160								See Worksheet below - based on recent experience at MDL
meetings/reporting/presentations	10%	% of tot hrs		96	96								See Worksheet below - based on recent experience at MDL
Subtotal Title I & II Design				1056	1056	0	0	0	0	0	0	0	
Title III													
Disposition of deviation requests and non-conformances	1	hrs per	38	38		38	0	0	0	0	0	0	Based on recent experience on NCSX
As-built drawings	2	# dwgs	29	58	58	0	0	0	0	0	0	0	Based on recent experience on NCSX
Procurement coordination				80	0	0	40	40	0	0	0	0	Based on recent experience on NCSX
Subtotal Title III Design				176	0	58	0	78	40	0	0	0	
				1290.6	176	58.6							

**NCSX June 2007 ETC
TABLE I - DESIGN LABOR**

WBS Number: 161
WBS Title: LN2 Distribution System
Job Number: 1601-161
Job Title: LN2 Distribution System
Job Manager: Paul Goranson

Notes and worksheets

LN2 distribution system

	total	Vessel Torus,	Port Extensions	NBI duct	Manifolds	Headers	
Pro-E models	33	10	13	2	6	2	models for each type of tube, manifold, and header
assy dwgs	5	1	1	1	1	1	
Detail drawings	6	0	0	0	4	2	drawings of each manifold and header
installation dwg	4	1	1	1	1		on drawing per type of part
cooling schematic	0						
electrical schematic	0						
I&C schematic	0						
stress analysis	1						
thermal analysis	1	1					one analysis for all cooling lines
special analysis	0						
procurement specifications	1						one procurement spec for the tubing, piping and fittings
preliminary and final design reviews	1						one review for all the plumbing
meetings/reporting/presentations	15%						

Flow Control System

	total						
Pro-E models	6						elements added to piping system
assy dwgs	6						
Detail drawings	0						
installation dwg	6						
cooling schematic	1						block flow diagram
electrical schematic	1						actuator electrical schematic, if applicable
I&C schematic	0						
stress analysis	0						
thermal analysis	0						
special analysis	0						
procurement specifications	1						one procurement specification for all flow control elements
preliminary and final design reviews	0						reviews covered under WBS 191
meetings/reporting/presentations	10%						

NCSX June 2007 ETC
TABLE I - DESIGN LABOR

WBS Number: 161
WBS Title: LN2 Distribution System
Job Number: 1601-161
Job Title: LN2 Distribution System
Job Manager: Paul Goranson

Local I&C	
Pro-E models	1
assy dwgs	0
Detail drawings	0
installation dwg	1
cooling schematic	0
electrical schematic	0
I&C schematic	1
stress analysis	0
thermal analysis	0
special analysis	0
procurement specifications	0
preliminary and final design reviews	1
meetings/reporting/presentations	10%

Notes:

1. LN2 distribution system instrumentation consists of a single thermocouple placed on each return header inside cryostat
2. There will be a single supply and return header for each field period which supplies the TF coils and the upper and lower PF coils
3. Reviews and procurement specs for T/C are covered as part of WBS 171