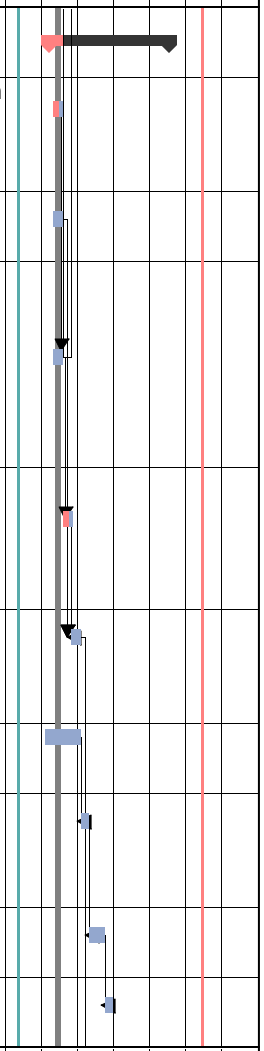
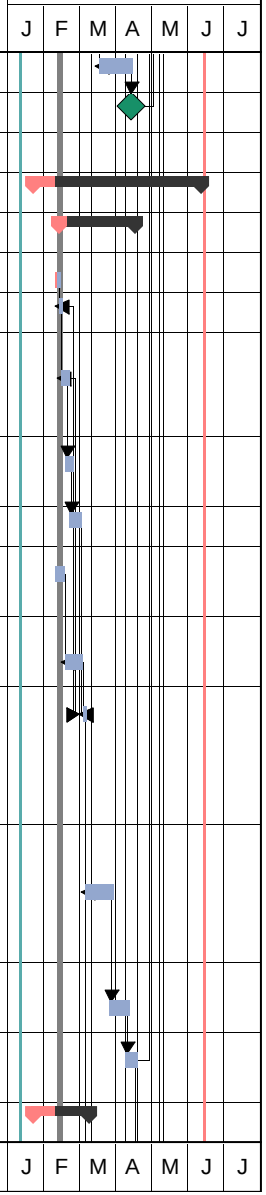
	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
1	Complete design of MC interface hdw	**75.00**	**2/5/07**	**5/18/07**		**13%**				
2	Establish design criteria for bolted joints	5.00	2/12/07	2/16/07		75%	0.00	Reiersen	Reiersen to add section to Fan document on friction, circulate for approval.	
3	Re-measure the CTE of Stellalloy in PPPL samples	5.00	2/12/07	2/16/07		0%	5.00	Gettelfinger		
4	Update bolted joint design spreadsheet with revised desing criteria. Select shim material, load washer material, and spherical washer material. Consider performance impact the the CTEs.	5.00	2/12/07	2/16/07	2FF	0%	0.00	Williamson	Material selection is critical	
5	Update analyses to determine shear loads reacted by friction and beneficial placement of new bolts	5.00	2/19/07	2/23/07	4FF	75%	0.00	Brooks	Need to update per new design criteria, friction test results, placement of bolts, and revised assessment of preload	
6	Conduct PDR to review requirements, design, and development plan for bolted joints	5.00	2/26/07	3/2/07	3, 4, 5	0%	5.00	Williamson	PDR to be based on incomplete testing of shims, but need to establish a baseline	
7	Develop design for shims in unbolted regions of inner leg	20.00	2/5/07	3/2/07		0%	0.00	Williamson		
8	Conduct PDR to review requirements, design, and development plan for shims in unbolted region of inner legs	5.00	3/5/07	3/9/07	7	0%	0.00	Williamson	PDR to be based on incomplete testing of shims, but need to establish a baseline	
9	Develop fabrication drawings of shims in unbolted regions	10.00	3/12/07	3/23/07	8	0%	0.00	Williamson		
10	Conduct FDR for inbd shims. Resolve issues.	5.00	3/26/07	3/30/07	9	0%	0.00	Williamson		
										J F M A M J J

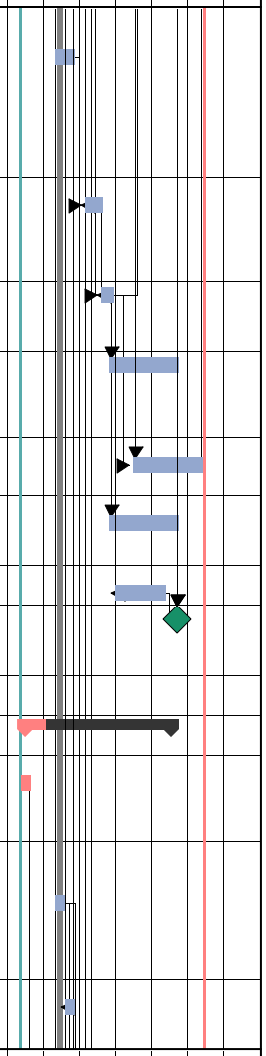
	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
11	Develop specs and drawings for Station 2 and 3 assemblies	15.00	3/12/07	3/30/07	6, 63	0%	30.00	Cole		
12	Conduct MC interface FDR	0.00	5/11/07	5/11/07	11, 22, 38, 51, 63, 80	0%	0.00	Williamson		
13	Resolve issues, release assembly spec and drawings	5.00	5/14/07	5/18/07	12	0%	18.00	Williamson		
14										
15	**Bladder tests**	**65.00**	**1/15/07**	**4/13/07**		**25%**				
16	Develop fill procedure for bladder. Document results of bladder testing (SS and Teflon) to date.	5.00	1/15/07	1/19/07		100%	0.00	Dudek	**Done. Dudek provided report at 2/12 meeting.**	
17	Review structural analyses to determine bladder performance requirements. Establish bladder test parameters, e.g. contact pressure.	15.00	1/22/07	2/9/07		100%	0.00	Fan	Fan reviewed analysis. Provided data to Dudek and Williamson. Williamson to modify bladder design with highest pressure.	
18	Set up test equipment to determine CTE and stiffness and to perform cyclic testing. Procure bladders for testing.	5.00	1/22/07	1/26/07	16	0%	10.00	Gettelfinger	May conflict with COF testing	
19	Perform tests to determine bladder properties and qualify the design for the given load conditions	5.00	2/12/07	2/16/07	17, 18	0%	15.00	Gettelfinger		
20	Determine if "one size fits all". Modify bladder extent in region of highest pressure. Develop procurement drawings for bladders.	5.00	2/12/07	2/16/07	17	25%	0.00	Williamson	Delayed due to availability of only one designer	
21	Procure/fab prototype bladder for C-C installation	10.00	2/19/07	3/2/07	20	0%	0.00	Dudek	Installation to be prototyped by Viola	
22	Conduct FDR of bladder design. Resolve FDR issues, release procurement drawings for fabrication	5.00	3/12/07	3/16/07	19, 102	0%	0.00	Williamson		
										J F M A M J J

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments
23	Procure bladders for first FPA (2 ea)	20.00	3/19/07	4/13/07	22	0%	0.00	Dudek	
24	Bladders available for FPA	0.00	4/13/07	4/13/07	23	0%	27.00		
25									
26	Shims and bushings (under bolts)	**102.00**	**1/22/07**	**6/12/07**		**13%**			
27	Coefficient of friction (COF) tests	**47.00**	**2/12/07**	**4/17/07**		**5%**			
28	*Fix MTS machine*	2.00	2/12/07	2/13/07		50%	0.00	Gettelfinger	
29	*Test Ekagrip samples*	2.00	2/14/07	2/15/07	28	0%	0.00		
30	*Prep new samples. Test shear strength of glass-epoxy joint at high/lower pressures*	2.00	2/16/07	2/19/07	29	0%	0.00		
31	*Contact Dick Reed for ideas about improving performance.*	3.00	2/20/07	2/22/07	30	0%	0.00		
32	*Test Reed's ideas*	5.00	2/23/07	3/1/07	31	0%	1.00		
33	*Get test specimens coated with alumina*	5.00	2/12/07	2/16/07		0%	0.00		
34	*Perform friction testing of alumina samples.*	10.00	2/19/07	3/2/07	33	0%	0.00	Gettelfinger	
35	*Select shim design, material, and surface coating for qualification testing. Conduct peer review of selection and future test plans.*	2.00	3/5/07	3/6/07	29, 30, 32, 34	0%	0.00	Williamson	
36	*Set up test fixture for qualification testing.* *Prepare samples for qualification testing.*	15.00	3/7/07	3/27/07	35	0%	0.00		
37	*Perform qualification tests (shear capacity and cyclic testing)*	10.00	3/28/07	4/10/07	36	0%	0.00	Gettelfinger	
38	*Document and conduct peer review of test results.*	5.00	4/11/07	4/17/07	37	0%	0.00	Gettlefinger	
39	Complete bushing design	**35.00**	**1/22/07**	**3/9/07**		**40%**			



	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
40	*Provide drawings bushing drawings for tension and shear tests.*	5.00	2/12/07	2/16/07		100%	0.00	Wiiliamson		
41	*Modify bushing drawings for compatibility with machining prior to installation. Drawings needed for bolted joint tests.*	5.00	2/19/07	2/23/07	40	0%	0.00	Williamson	Put G11 plug in shim with enough play to make installation practical.	
42	*Indentify candidate schemes for getting a bushing the fits tightly into the hole and around a stud. Prepare sketches.*	5.00	1/22/07	1/26/07		100%	0.00	Fogarty	Fogarty concept a winner	
43	*Measure holes on castings. Required to characterize OOT for bushings.*	10.00	2/19/07	3/2/07	42	0%	0.00	Fogarty		
44	*Finalize drawings for bushings.*	5.00	3/5/07	3/9/07	43	0%	7.00	Williamson		
45	Complete shim (and surrogate flange) design	**32.00**	**2/5/07**	**3/20/07**		**20%**				
46	*Develop drawings to fabricate surrogate flanges from Stellaloy in bolt tension tests*	5.00	2/5/07	2/9/07		100%	0.00	Williamson	Done. Dudek to reduce size somewhat. Presupposes that an assembly drawing of the test specimen has been released. Drawing #2	
47	*Develop drawings to fabricate surrogate flanges for shear tests*	5.00	2/12/07	2/16/07		0%	0.00		Shear test flanges to be fabricated from SS316, not Stellalloy. Presupposes that an assembly drawing of the test specimen has been released. Drawing #2	
48	*Develop drawings to fabricate shims for test specimens*	3.00	3/7/07	3/9/07	35	0%	0.00			
										J F M A M J J

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
49	*Measure flanges on (2) finished coils to determine range of shim thicknesses required.*	10.00	2/12/07	2/23/07		0%	7.00	Viola	Thought to be 0.5+/-0.025". Brooks suggested 3mil increments in thickness. Need second LT to proceed.	
50	*Define thickness increments required. FInalize drawings for shims.*	10.00	3/7/07	3/20/07	35, 49	0%	0.00	Williamson	Need to choose surface coating and insulating material	
51	Conduct FDR of shim and bushing design. Resolve issues.	5.00	3/21/07	3/27/07	44, 50	0%	0.00	Williamson		
52	Procure shims for first two flanges (A-A, A-B)	40.00	3/28/07	5/22/07	51	0%	0.00	Dudek	These will be ordered before the qualification testing is completed	
53	Procure shims for remaining flanges	40.00	4/18/07	6/12/07	38, 51	0%	0.00		After qualification testing is completed	
54	Procure bushing stock. Fabricate bushings.	40.00	3/28/07	5/22/07	51	0%	0.00			
55	Procure inboard shims	30.00	4/2/07	5/11/07	10	0%	7.00	Dudek		
56	Shims and bushings available for FPA.	0.00	5/22/07	5/22/07	52, 54, 55	0%	0.00			
57										
58	Nuts, bolts, and washers	**90.00**	**1/15/07**	**5/18/07**		**14%**				
59	Define reference geometry for bolted joint	5.00	1/15/07	1/19/07		100%	0.00	Williamson	Done. ORNL has provided drawings (SE140-190).	
60	Modify drawing to accommodate a hydraulic tensioner and to perform UT inspection. Release drawings to procure nuts and studs for testing.	5.00	2/12/07	2/16/07		0%	5.00		High priority.	
61	Release drawings to procure washer assemblies for testing.	5.00	2/19/07	2/23/07	4	0%	0.00			
										J F M A M J J

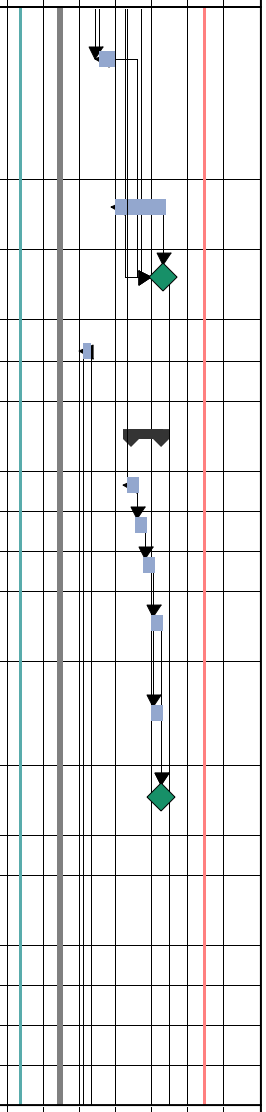


	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
62	Modify reference drawings to accommodate full complement of hydraulic tensioners (and other tightening devices) and UT inspection. Document number required for each part.	10.00	2/19/07	3/2/07	90	0%	0.00	Williamson	Choice of tools is critical	
63	Conduct FDR of nuts, studs, and washers. Resolve issues.	5.00	3/5/07	3/9/07	4, 62	0%	0.00	Williamson	Need to settle on washer material.	
64	Procure nuts studs and washers for start of FPA	50.00	3/12/07	5/18/07	63	0%	0.00	Dudek		
65	Nuts, studs, and washers available for FPA	0.00	5/18/07	5/18/07	64	0%	2.00			
66										
67	**Bolted joint tests**	**65.00**	**2/12/07**	**5/11/07**		**0%**				
68	Fabricate surrogate flanges for bolt tension tests	15.00	2/12/07	3/2/07	46	0%	20.00	Dudek		
69	Fabricate surrogate flanges for shear tests	15.00	2/19/07	3/9/07	47	0%	15.00	Dudek		
70	Fabricate shims for bolted joint tests	15.00	3/12/07	3/30/07	48	0%	0.00	Dudek		
71	Procure bushing materials. Fabricate bushings for testing.	15.00	2/26/07	3/16/07	41	0%	10.00	Dudek		
72	Procure nuts, studs, and washer assemblies for bolted joint tests.	15.00	2/26/07	3/16/07	60, 61	0%	0.00	Dudek	Includes all planned development activities, e.g. shear tests at	
73	Procure tools for tightening nuts	15.00	2/19/07	3/9/07	90	0%	0.00	Dudek		
74	Tension tests	**48.00**	**3/7/07**	**5/11/07**		**0%**				
75	*Develop design of test fixture and instrumentation*	5.00	3/7/07	3/13/07	35, 60	0%	0.00	Gettelfinger	Follows friction tests. May conflict with bladder test	
76	*Set up test fixture and equipment. Perform JHA and pre-job brief prior to proceeding.*	5.00	3/14/07	3/20/07	73, 75	0%	13.00	Gettelfinger		
										J F M A M J J

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
77	*Assemble test specimens*	5.00	4/2/07	4/6/07	68, 70, 71, 72, 73	0%	0.00	Gettelfinger		
78	*Perform bolt tension tests. Measure joint deflection and bolt preload. Test parameters include pre-tensioning, temperature, cycles, time (28 days), etc.*	20.00	4/9/07	5/4/07	76, 77	0%	0.00	Gettelfinger		
79	*Perform pullout tests for tapped*	3.00	4/9/07	4/11/07	76, 77	0%	0.00	Gettlefinger		
80	*Document and conduct peer review of test results*	5.00	5/7/07	5/11/07	78, 79	0%	0.00	Gettelfinger		
81	Shear tests of a bolted joint	**55.00**	**2/19/07**	**5/4/07**		**0%**				
82	*Assemble test specimens, ship to ORNL*	10.00	4/2/07	4/13/07	69, 70, 71, 72, 73	0%	0.00	Dudek		
83	*Develop design of test fixture and instrumentation*	5.00	2/19/07	2/23/07		0%	25.00	Freudenberg	Follows friction tests. May conflict with bladder test	
84	*Set up test fixture at ORNL*	10.00	4/2/07	4/13/07	82SS, 83	0%	0.00	Freudenberg		
85	*Measure joint deflection versus shear load. Conduct cyclic tests. Pull to failure.*	10.00	4/16/07	4/27/07	84	0%	0.00	Freudenberg		
86	*Document test results. Conduct peer review of test results.*	5.00	4/30/07	5/4/07	85	0%	5.00	Freudenberg		
87										
88	Perform assembly trials. Procure tools and tooling.	**80.00**	**1/22/07**	**5/11/07**		**8%**				
89	Survey each coil type using templates. Determine stud length constraints based on access limitations for torquing/tensioning.	10.00	1/22/07	2/2/07	59	0%	0.00	Viola		
										J F M A M J J

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
90	Choose tools for tightening nuts. Define features needed to tighten nut (including measuring preload). Determine which holes have adequate space to tighten nuts using templates. Repeat for special cases where inadequate space exits. Tabulate results.	10.00	2/5/07	2/16/07	89	0%	0.00	Viola	Iterative process with 80	
91	Identify areas that need to be measured in post-VPI and ground	**25.00**	**1/22/07**	**2/23/07**		**8%**				
92	*Identify "close points" when assembling*	5.00	1/22/07	1/26/07		25%	0.00	Brown	As are done	
93	*Perform gross (generic) fits of C-C, C-B, B-A, and A-A*	20.00	1/22/07	2/16/07		0%	0.00	Viola	C-C done. Work paced by Station1 . Needs 2nd LT.	
94	*Provide guidance to revise post-VPI procedure to include measurement points*	5.00	2/19/07	2/23/07	92, 93	0%	78.00	Brown		
95	Establish alignment mechanisms, metrology equipment complement and positioning requirements, etc. Conduct peer review.	5.00	2/5/07	2/9/07		75%	0.00	Viola		
96	Procure alignment mechanisms, fiducials, lifting equipment, etc. for assembly operations	40.00	2/12/07	4/6/07	95	0%	25.00	Dudek		
97	Develop procedures for torquing bolts	5.00	3/12/07	3/16/07	73	0%	0.00	Viola		
98	Determine fiducial types and locations	10.00	3/19/07	3/30/07	97	0%	0.00	Ellis	Ellis and Raftopoulos working on planr for fiducials.	
										J F M A M J J

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments
99	Perform trial x-y-z alignments. Use protoypical shims. Demonstrate capability to satisfy alignment requirements with individual shims of uniform thickness.	10.00	3/19/07	3/30/07	72, 73	0%	30.00	Viola	
100	Procure monuments and related metrology equipment	30.00	4/2/07	5/11/07	98	0%	0.00	Dudek	
101	Tools and tooling available for FPA operations	0.00	5/11/07	5/11/07	73, 96, 99, 100	0%	7.00		
102	Prototype bladder installation.	5.00	3/5/07	3/9/07	21	0%	0.00	Viola	
103									
104	Finalize preparations for assembly operations	**20.00**	**4/12/07**	**5/9/07**		**0%**			
105	Document assembly sequence	5.00	4/12/07	4/18/07	79	0%	0.00	Brown	
106	Finalize dimensional control plan	5.00	4/19/07	4/25/07	105	0%	0.00	Ellis	
107	Finalize assembly procedure	5.00	4/26/07	5/2/07	106	0%	0.00	Viola	
108	Establish back office support requirements and data flow	5.00	5/3/07	5/9/07	107	0%	0.00	Viola	
109	Train technicians in operation of the metrology equipment and measurement procedures	5.00	5/3/07	5/9/07	107	0%	0.00	Viola	
110	RLM authorization for assembly operations	0.00	5/9/07	5/9/07	108, 109	0%	9.00	Dudek	
111									
112	Get coils ready for Station 2 assembly operations								
113	Instrumentation								
114	New holes								
115	Measurements								
116	Electrical tests								



	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	2007 J F M A M J J
117	Flow tests									
118	Grinding									
119	Fitup checks									
120										
121	Start Station 2 assembly operations	0.00	5/22/07	5/22/07	12, 24, 56, 65, 101, 1	0%	16.00	Viola		
122										
123	All parts for Station 2 operations received	1.00	6/13/07	6/13/07	53	0%	0.00			
										J F M A M J J