NCSX Work Approval Form (WAF)

WBS Number: 142
WBS Title: Windings and Assembly
Job Number: 1421
Job Title: Design of Modular Coil Interfaces
Job Manager: David Williamson

Description:

Job 1421 consists of the effort to design the modular coil interfaces, including R&D.

Schedule:

Approvals:

_____	_____
Job Manager	Date
_____	_____
Responsible Line Manager	Date
_____	_____
Project Manager	Date
_____	_____
Engineering Department Head	Date

NCSX June 2007 ETC
TABLE I - DESIGN LABOR

WBS Number: 142
WBS Title: Windings and Assembly
Job Number: 1421
Job Title: Design of Modular Coil Interfaces
Job Manager:David Williamson

Description:
Title I, II and III Engineering for design of the modular coil interfaces.

NOTE: Title III for these components is included in Job 1802

FY07$K

Task ID		41MS	48MS	37STK	35TRVL	31OT	ORNL EM	EMEM	EMSM	EMSB	EMTB	EAEM	EASB	EEEM	EESM	Basis of Estimate
																see Table V - Basis of Estimate
Outboard Interface Design																see Table V - Basis of Estimate
IH4-020	Prepare outboard shim dwgs and release						60									see Table V - Basis of Estimate
INTRF-045	FDR outboard shims						40									see Table V - Basis of Estimate
	Resolve CHITs and issue shim drawings						60									
																see Table V - Basis of Estimate
Bolted Joint Tests																see Table V - Basis of Estimate
	Tension Tests of Bolted Joint															see Table V - Basis of Estimate
1421-3067	Procure 2 studs f/joint test.Use existing part							8								see Table V - Basis of Estimate
1421-3075	Setup test fixture &perform JHA & pre-job brief							8								
1421-3077	Meas joint deflect vs preload & loss of preload							24								see Table V - Basis of Estimate
1421-3079	Measure joint deflec & preload v. temp @80K							24								see Table V - Basis of Estimate
1421-3084	Measure joint deflection&preload v. cooldown cyc							24								see Table V - Basis of Estimate
1421-3087	Perform pullout tests for tapped holes							24								
1421-3081	Meas joint deflect & preload v. time (days) at R							160								see Table V - Basis of Estimate
1421-3090	Document&conduct review of test results							40								see Table V - Basis of Estimate
																see Table V - Basis of Estimate
	Bolt Shear Test at 77k															see Table V - Basis of Estimate
1421-3112B	Procure/fab parts for test&initial assembly						40									see Table V - Basis of Estimate
1421-3115B	Assemble & test						320									see Table V - Basis of Estimate
1421-3119B	Document test results						80									see Table V - Basis of Estimate
																see Table V - Basis of Estimate
Inboard Interface Design																see Table V - Basis of Estimate
IH1-001	Coil to coil analysis						520									see Table V - Basis of Estimate
1421-3125	Determine geometry&location of high COF shims&pl						80									
1421-3127	Structural analyses to performance rqmts for bol						240									see Table V - Basis of Estimate
1421-3132	PDR to review requirements, design,&development						40									
																see Table V - Basis of Estimate
AB/BC/AA welded joints																see Table V - Basis of Estimate
	Prepare winding form mods for weld clamping bolts						300									see Table V - Basis of Estimate
INTRF-050	Complete Shim fabrication drawings (ORNL)						240									see Table V - Basis of Estimate
	Release information for procurement of shim material						24									
INTRF-055	FDR AB/BC/AA inboard shims						40									see Table V - Basis of Estimate
																see Table V - Basis of Estimate
CC bolted joint																see Table V - Basis of Estimate
IH1-000	ESTABLISH CONCEPT						680									see Table V - Basis of Estimate
IH1-0000	PEER REVIEW OF JOINT CONCEPT						80									see Table V - Basis of Estimate
	Add bolt holes to C winding form for CC interface						140									see Table V - Basis of Estimate
	Bolt Reach and Access study (mockup)						200									see Table V - Basis of Estimate
	Prepare CC shim drawiings and release						360									see Table V - Basis of Estimate
	FDR CC inboard shims						40									see Table V - Basis of Estimate

NCSX June 2007 ETC
TABLE I - DESIGN LABOR

WBS Number: 142																
WBS Title: Windings and Assembly																
Job Number: 1421																
Job Title: Design of Modular Coil Interfaces																
Job Manager:David Williamson																
Welded Joint Tests																
	Procedure															
INTRF-035	PPPL Determine shim material						40									see Table V - Basis of Estimate
INTRF-001	PPPL buy SS plate for weld trials						8									see Table V - Basis of Estimate
INTRF-005	Weld distortion trials at PPPL on SS plate						40									see Table V - Basis of Estimate
INTRF-025	ORNL build pywood mockup of flange					140										see Table V - Basis of Estimate
INTRF-030	ORNL verify weld access, develop alternate welding methods					40										see Table V - Basis of Estimate
INTRF-010	Develop Weld Geometry Procedure					40										see Table V - Basis of Estimate
	Test															
INTRF-015	Weld trials on two MCWF's at PPPL						80									see Table V - Basis of Estimate
INTRF-020	Document results and update weld procedure						120									see Table V - Basis of Estimate
Overall interface																
INTRF-040	Analysis of tensil loads (ORNL)					320										see Table V - Basis of Estimate
1421-3134	Develop specs & dwgs for station 2 &3 assy					300										see Table V - Basis of Estimate
1421-3136	Conduct MC interface FDR incl job 1416					40										see Table V - Basis of Estimate
1421-3138	Resolve issues, release assembly drawings					240										see Table V - Basis of Estimate. **Specs in Job 1806**
FY07 Rebaseline exercise																
ECP53RBX05	FY07 Rebaseline Exercise					256										
Travel																
	trips for ORNL personnel to PPPL				$9k											6 trips at $1500 avg
	trips for PPPL personnel to UT MDL				$3k											2 trips at $1500 avg
	SUBTOTAL				$12k	4960	600									
unlisted, known labor hours																
	scheduled and unscheduled meetings/reporting/presentations (@ 25%)					1210	150									see Table V - Basis of Estimate
	TOTAL				**$12k**	**6170**	**750**									

NCSX June 2007 ETC
TABLE II - Materials and Subcontracts

WBS Number: 142					
WBS Title: Windings and Assembly					
Job Number: 1421					
Job Title: Design of Modular Coil Interfaces					
Job Manager:David Williamson					
Materials and Supplies					
			M&S-k$		
1421-3067	Procure 2 studs f/joint test.Use existing part		$1k	Based on stud quotation	
1421-3112	Test fixture for fatique testing		$10k	Based on fabrication estimate for hardware, see detail below	
IH1-001	Coil to coil analysis		$36k	Based engineering judgement for subcontract, see details below	
INTRF-001	PPPL buy SS plate for weld trials		$31k	Based on $15/lb SS plate, see detail below	
INTRF-005	Weld distortion trials at PPPL on SS plate		$1k	engr judgement for consumables	
INTRF-025	ORNL build plywood mockup of flange		$30k	Based on est costs for subcontract, see detail below	
INTRF-030	ORNL verify weld access, develop alternate welding methods		$20k	Based engineering judgement for subcontract, see details below	
	ORNL verify CC bolt reach access		$19k	Based engineering judgement for subcontract, see details below	
INTRF-015	Weld trials on two MCWF's at PPPL		$1k	engr judgement for consumables	
	TOTAL		$149k		

WBS Number: 142					
WBS Title: Windings and Assembly					
Job Number: 1421					
Job Title: Design of Modular Coil Interfaces					
Job Manager:David Williamson					
	Details				
	Test fixture for fatique testing				
	SST plate, G11 bushings and insulators material			$6k	
	LN2 can, bellows, support struts, G10 rods			$4k	see detail bill of matls below
				$10k	
	Analysis subcontract				
	12 weeks x 50% time	240	hours	$36k	
	stainless steel plate				
	1.5"x 4' x 8' plate @ $15/lb	2070	lbs	$31k	
	plywood mockup				
	plywood, paint, etc.	1	lot	$3k	
	labor, technicians	240	hours	$18k	2 techs for 3 weeks
	labor, supervision	60	hours	$9k	half time for 3 weeks
	total est. for contract			$30k	
	ORNL verify weld access				
	weld consumables	1	lot	$2k	weld wire, gas, etc.
	labor, technicians	160	hours	$12k	2 techs for 2 weeks
	labor, supervision	40	hours	$6k	half time for 2 weeks
	total est. for contract			$20k	
	ORNL verify CC bolt access				
	wood, glue, etc	1	lot	$1k	
	labor, technicians	160	hours	$12k	2 techs for 2 weeks
	labor, supervision	40	hours	$6k	half time for 2 weeks
	total est. for contract			$19k	

WBS Number: 142

WBS Title: Windings and Assembly

Job Number: 1421

Job Title: Design of Modular Coil Interfaces

Job Manager:David Williamson

Parts List For NSCX Shear testing:

Item	Description	Part number	Supplier	quantity	cost/item	Total Price	phone number
1	Del Seal CF Flanges - 4-1/2 Inch OD	110018 (Ref# 450000)	MDC	1	$48.00	$48.00	800-443-8817
2	4.5 OD half nipple with clearance holes	401004 (Ref# 150-1)	MDC	1	$110.00	$110.00	800-443-8818
3	Bellows (2" ID, 4.5" OD)	400005 (Ref# 250-x)	MDC	1	$330.00	$330.00	800-443-8819
4	Copper Gasket (4.5" flange)	191009 (Ref# GK-250)	MDC	12	$24.00	$288.00	800-443-8820
5	18" X 12" X 18.125" Stainless stell batch can	3763K221	McMaster	1	$524.53	$524.53	404 629-6500
6	Semi-Ridgid PVC insulation (low density 3/8")	9318k74	McMaster	4	$27.42	$109.68	405 629-6500
7	Vibration Damping Clamps	3015T133	McMaster	6	$20.56	$123.36	406 629-6500
8	18-8 Hex Head Cap Screws (4.25" long)	92240A559	McMaster	2	$21.42	$42.84	407 629-6500
9*	3" X 1.5" T-slotted Extrusion (cut to 19" long)	unknown	BertleKamp	4	unk	unk	865 588-7691 Wendel Copper
10*	3" X 1.5" T-slotted Extrusion (cut to 20" long)	unknown	BertleKamp	2	unk	unk	866 588-7691 Wendel Copper
9-10 alternative	This part can be orederd from mcmaster as "Aluminum Fractional T-Slotted Framing Svtems" **We cut it to size ourselves**	47065T138	McMaster	2	$76.60	$153.20	407 629-6500
11	G-10/FR4 Rod (3/16" diameter) sold by the foot	8669K23	McMaster	6	$3.03	$18.18	408 629-6500
10	1.5" diameter (17-4 PH) stainless precision ground rod (6' long) **see if you can get 4 feet long**	9095K25	McMaster	1	$290.81	$290.81	409 629-6500
11	2.0" diameter 4140 steel rod (12" long)	8935K151	McMaster	1	$38.81	$38.81	410 629-6500
12	2.5" diameter 4140 steel rod (12" long)	8935K191	McMaster	1	$56.15	$56.15	411 629-6500
13	4-48 NF Tap (Plug) **ask Joe/Jim if this is ok for them.**	2522A775	McMaster	3	$4.29	$12.87	412 629-6500
14	4-48 Socket Cap screws (3/8" long)	91251A836	McMaster	1	$8.40	$8.40	413 629-6500
15	Schaevitz LVDT's (GCA-121-125)	2350500	Schaevitz	4	$365.00	$1,460.00	800 745-8008
					Total Cost	$3,614.83	

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FY07$K

Task ID		Comments	41MS	48MS	37STK	35TRVL	31OT	EMSM	EMTB	EASB	EEEM	EESM	EESB	EETB	ECEM	ECSB	ECTB	RM2	RM3	Basis of Estimate
Outboard Interface Design																				
IH4-020	Prepare outboard shim dwgs and release								0											see Table V - Basis of Estimate
INTRF-045	FDR outboard shims								0											see Table V - Basis of Estimate
	Resolve CHITs and issue shim drawing								0											see Table V - Basis of Estimate
Bolted Joint Tests																				
	Tension Tests of Bolted Joint																			
1421-3067	Procure 2 studs f/joint test.Use existing part								48											see Table V - Basis of Estimate
1421-3075	Setup test fixture &perform JHA & pre-job brief								16											see Table V - Basis of Estimate
1421-3077	Meas joint deflect vs preload & loss of preload								24											see Table V - Basis of Estimate
1421-3079	Measure joint deflec & preload v. temp @80K								24											see Table V - Basis of Estimate
1421-3084	Measure joint deflection&preload v. cooldown cyc								24											see Table V - Basis of Estimate
1421-3087	Perform pullout tests for tapped holes								24											see Table V - Basis of Estimate
1421-3081	Meas joint deflect & preload v. time (days) at R								160											see Table V - Basis of Estimate
1421-3090	Document&conduct review of test results								0											see Table V - Basis of Estimate
	Bolt Shear Test at 77k																			
1421-3112B	Procure/fab parts for test&initial assembly								0											see Table V - Basis of Estimate
1421-3115B	Assemble & test								100											see Table V - Basis of Estimate
1421-3119B	Document test results								0											see Table V - Basis of Estimate
Inboard Interface Design																				
IH1-001	Coil to coil analysis								0											see Table V - Basis of Estimate
1421-3125	Determine geometry&location of high COF shims&pl								0											see Table V - Basis of Estimate
1421-3127	Structural analyses to performance rqmts for bol								0											see Table V - Basis of Estimate
1421-3132	PDR to review requirements, design,&development								0											see Table V - Basis of Estimate
	Conduct MC interface FDR																			see Table V - Basis of Estimate
AB/BC/AA welded joints																				
	Prepare winding form mods for weld clamping bolts								0											see Table V - Basis of Estimate
INTRF-050	Complete Shim fabrication drawings (ORNL)								0											see Table V - Basis of Estimate
	Release information for procurement of shim materia								0											see Table V - Basis of Estimate
INTRF-055	FDR AB/BC/AA inboard shims								0											see Table V - Basis of Estimate
CC bolted joint																				
IH1-000	ESTABLISH CONCEPT								0											see Table V - Basis of Estimate
IH1-0000	PEER REVIEW OF JOINT CONCEPT								0											see Table V - Basis of Estimate
	Add bolt holes to C winding form for CC interface								0											see Table V - Basis of Estimate
	Bolt Reach and Access study (mockup								0											see Table V - Basis of Estimate
	Prepare CC shim drawiings and release								0											see Table V - Basis of Estimate
	FDR CC inboard shims								0											see Table V - Basis of Estimate
Welded Joint Tests																				
	Procedure																			
INTRF-035	PPPL Determine shim material								0											see Table V - Basis of Estimate
INTRF-001	PPPL buy SS plate for weld trials								0											see Table V - Basis of Estimate
INTRF-005	Weld distortion trials at PPPL on SS plate								0											see Table V - Basis of Estimate
INTRF-025	ORNL build pywood mockup of flange								0											see Table V - Basis of Estimate
INTRF-030	ORNL verify weld access, develop alternate welding method								0											see Table V - Basis of Estimate
INTRF-010	Develop Weld Geometry Procedure								0											see Table V - Basis of Estimate
	Test																			
INTRF-015	Weld trials on two MCWF's at PPPL								600											see Table V - Basis of Estimate
INTRF-020	Document results and update weld procedure								0											see Table V - Basis of Estimate
Overall interface																				
INTRF-040	Analysis of tensil loads (ORNL)								0											see Table V - Basis of Estimate
1421-3134	Develop specs & dwgs for station 2 &3 assy								0											see Table V - Basis of Estimate
1421-3136	Conduct MC interface FDR incl job 1416								0											see Table V - Basis of Estimate
1421-3138	Resolve issues, release assembly spec&drawings								0											see Table V - Basis of Estimate
FY07 Rebaseline exercise																				
ECP53RBX05	FY07 Rebaseline Exercise								0											see Table V - Basis of Estimate
Travel																				
	Trips for ORNL personnel to PPPL																			
	Trips for PPPL personnel to UT MDL																			
	TOTAL								1020											

NCSX June 2007 ETC
TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 142
WBS Title: Windings and Assembly
Job Number: 1421
Job Title: Design of Modular Coil Interfaces
Job Manager:David Williamson

Uncertainty of the Estimate

	High	Medium	Low	Uncertainty Range (%)	Comments/Other Considerations
Design Maturity			x		
				-10 to +50	Major issue is continuous iteration of design
Design Complexity		x			Major uncertainty is C-C access for bolting at machine assembly

Note: High/Medium/Low uncertainty assessment from Job Manager. Uncertainty range based on AACEI recommended practice 18R-97 as amended for NCSX.

Residual Impacts

	Risk	Likelihood of Occurring (%)	Mitigation Strategies	Consequence if Occurs	
				Cost	**Schedule**
1	weld distortion found in R&D exceeds allowable assume double welding time	20%	add distortion control methods to welding procedure development, such as clamping bolts, peening, and alternate weld methods	$70k+sched hit	6 wks
2	C-C access insufficient for bolts redesign and re-analyze alternate solution at CC	20%	Prepare mockups and check access directly	$250k	

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Assumptions
Bladder design remaining and testing are in Larry Dudek's job 1431. Still need method to retain bladder and to provide bladder at B-A interface where bladder is much thicker

Engineering and Technician Hours

Color Key					Pro-E models (avg)	Pro-E models (complex)	assy dwgs	Detail drawings	installation dwg	cooling schematic	electical schematic	I&C schematic	stress analysis	thermal analysis	special analysis (electromagnetics)	assy/install specs and procedures	procurement/travel and associated specifications	R&D reports and test plans	preliminary and final design reviews	Planning	misc engr tasks	Comments for Engineering labor	crew size	shifts	time from detail	Comments for Technicisan labor
	ORNL			multiplier	40	80	100	60	40	0	0	20	240	40	160	40	40	80	40	16	1			8		
	PPPL			unit	hrs/model	hrs/model	hrs/dwg	hrs/dwg	hrs/dwg	hrs/dwg	hrs/dwg	hrs/dwg	hrs/calc	hrs/calc	hrs/calc	hrs/proc	hrs/spec	hrs/report	hrs/rev	hrs/wk	hrs			hrs/shift		
			Total Engr hours	Total Tech hours																						
Outboard Interface Design																										
IH4-020	Prepare outboard shim dwgs and release		60	0				1																		
INTRF-045	FDR outboard shims		40	0															1							
	resolve and issue shim drawings		60	0				1																		
Bolted Joint Tests																										
	Tension Tests of Bolted Joint																									
1421-3067	Procure 2 studs f/joint test.Use existing part		8	48																	8	engineering judgement	2	3		
1421-3075	Setup test fixture &perform JHA & pre-job brief		8	16																	8	engineering judgement	2	1		
1421-3077	Meas joint deflect vs preload & loss of preload		24	24																	24	engineering judgement	1	3		
1421-3079	Measure joint deflec & preload v. temp @80K		24	24																	24	engineering judgement	1	3		
1421-3084	Measure joint deflection&preload v. cooldown cyc		24	24																	24	engineering judgement	1	3		
1421-3087	Perform pullout tests for tapped holes		24	24																	24	engineering judgement	1	3		
1421-3081	Meas joint deflect & preload v. time (days) at R		160	160																	160	engineering judgement	1	20		
1421-3090	Document&conduct review of test results		40	0															1							
	Bolt Shear Test at 77k																									
1421-3112B	Procure/fab parts for test&initial assembly		40	0													1									
1421-3115B	Assemble & test		320	100																	320	full time for 2 engr following test	2.5	5		
1421-3119B	Document test results		80	0														1								
Inboard Interface Design																										
IH1-001	Coil to coil analysis		520	0									2						1							
1421-3125	Determine geometry&location of high COF shims&pl		80	0			1																			
1421-3127	Structural analyses to performance rqmts for bol		240	0									1													
1421-3132	PDR to review requirements, design,&development		40	0															1							
AB/BC/AA welded joints																										
	prepare winding form mods for weld clamping bolts		300			3		3																		
INTRF-050	Complete Shim fabrication drawings (ORNL)		240	0				4																		
	Release information for procurement of shim material		24																			No hours included - RTS added 24 hours				
INTRF-055	FDR AB/BC/AA inboard shims		40	0															1							
CC bolted joint																										
IH1-000	ESTABLISH CONCEPT		680	0		5	3	2											3							
IH1-0000	PEER REVIEW OF JOINT CONCEPT		80	0															2							
	Add bolt holes to C winding form for CC interface		140	0			1	1																		
	Bolt Reach and Access study (mockup)		200	0		2		2																		
	Prepare CC shim drawiings and release		360	0			1	1	3																	
	FDR CC inboard shims		40	0															1							
Welded Joint Tests																										
	Procedure																									
INTRF-035	PPPL Determine shim material		40	0																	40					
INTRF-001	PPPL buy SS plate for weld trials		8	0																	8					
INTRF-005	Weld distortion trials at PPPL on SS plate		40	0																	40					
INTRF-025	ORNL build pywood mockup of flange		140	0		1		1																		
INTRF-030	ORNL verify weld access, develop alternate welding method		40	0																	40					
INTRF-010	Develop Weld Geometry Procedure		40	0												1										
	Test																									
INTRF-015	Weld trials on two MCWF's at PPPL		80	600																	80				665	see detail below
INTRF-020	Document results and update weld procedure		120	0													1	1								
Overall interface design																										
INTRF-040	Analysis of tensil loads (ORNL)		320	0			1						1													
1421-3134	Issue interface drawings for comment		300	0			3									0						AA, AB, BC only				
1421-3136	Conduct MC interface FDR incl job 1416		40	0															1							
1421-3138	Resolve issues, release assembly spec&drawings		240	0												1					200					
FY07 Rebaseline exercise																										
ECP53RBX05	FY07 Rebaseline Exercise		256	0																16						
	Subtotal		**5560**	**1020**																						
	scheduled and unscheduled meetings/reporting/presentations (25%)		1390																							
	TOTAL		6950																							

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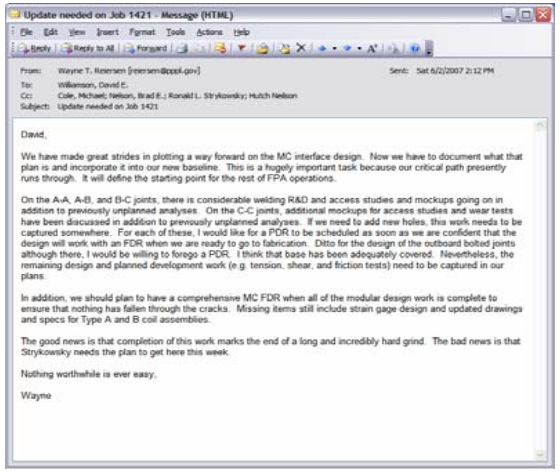


Update needed on Job 1421 - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

From: Wayne T. Reiersen [reiersen@pppl.gov] Sent: Sat 6/2/2007 2:12 PM
To: Williamson, David E.
Cc: Cole, Michael; Nelson, Brad E.; Ronald L. Strykowsky; Hutch Nelson
Subject: Update needed on Job 1421

David,

We have made great strides in plotting a way forward on the MC interface design. Now we have to document what that plan is and incorporate it into our new baseline. This is a hugely important task because our critical path presently runs through. It will define the starting point for the rest of FPA operations.

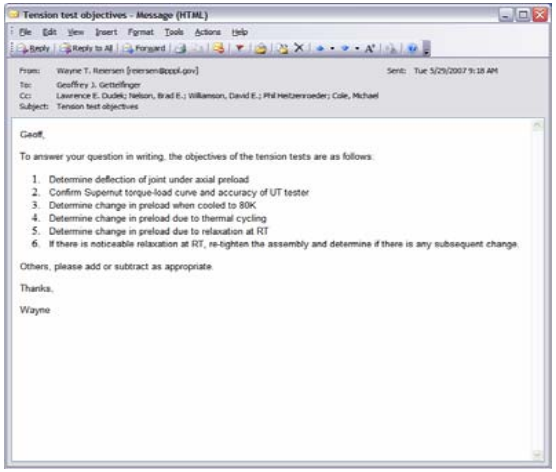
On the A-A, A-B, and B-C joints, there is considerable welding R&D and access studies and mockups going on in addition to previously unplanned analyses. On the C-C joints, additional mockups for access studies and wear tests have been discussed in addition to previously unplanned analyses. If we need to add new holes, this work needs to be captured somewhere. For each of these, I would like for a PDR to be scheduled as soon as we are confident that the design will work with an FDR when we are ready to go to fabrication. Ditto for the design of the outboard bolted joints although there, I would be willing to forego a PDR. I think that base has been adequately covered. Nevertheless, the remaining design and planned development work (e.g. tension, shear, and friction tests) need to be captured in our plans.

In addition, we should plan to have a comprehensive MC FDR when all of the modular design work is complete to ensure that nothing has fallen through the cracks. Missing items still include strain gage design and updated drawings and specs for Type A and B coil assemblies.

The good news is that completion of this work marks the end of a long and incredibly hard grind. The bad news is that Strykowsky needs the plan to get here this week.

Nothing worthwhile is ever easy.

Wayne



Tension test objectives - Message (HTML)

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From: Wayne T. Reiersen [reiersen@pppl.gov] Sent: Tue 5/29/2007 9:18 AM
To: Geoffrey J. Gettelfinger
Cc: Lawrence E. Dudek; Nelson, Brad E.; Williamson, David E.; Phil Heitzenroeder; Cole, Michael
Subject: Tension test objectives

Geoff,

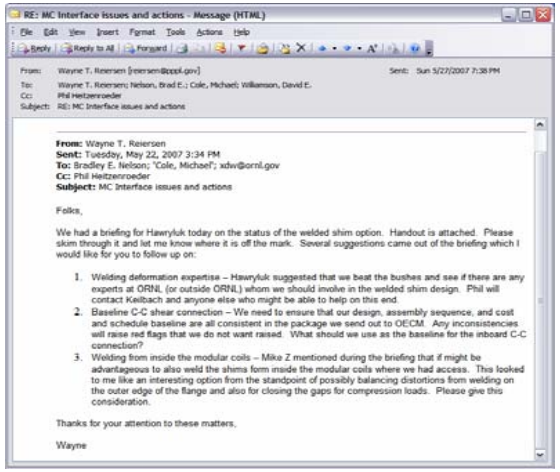
To answer your question in writing, the objectives of the tension tests are as follows:

1. Determine deflection of joint under axial preload
2. Confirm Supernut torque-load curve and accuracy of UT tester
3. Determine change in preload when cooled to 80K
4. Determine change in preload due to thermal cycling
5. Determine change in preload due to relaxation at RT
6. If there is noticeable relaxation at RT, re-tighten the assembly and determine if there is any subsequent change.

Others, please add or subtract as appropriate.

Thanks,

Wayne



RE: MC Interface issues and actions - Message (HTML)

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From: Wayne T. Reiersen [reiersen@pppl.gov] Sent: Sun 5/27/2007 7:38 PM
To: Wayne T. Reiersen; Nelson, Brad E.; Cole, Michael; Williamson, David E.
Cc: Phil Heitzenroeder
Subject: RE: MC Interface issues and actions

From: Wayne T. Reiersen
Sent: Tuesday, May 22, 2007 3:34 PM
To: Bradley E. Nelson; 'Cole, Michael'; xdw@ornl.gov
Cc: Phil Heitzenroeder
Subject: MC Interface issues and actions

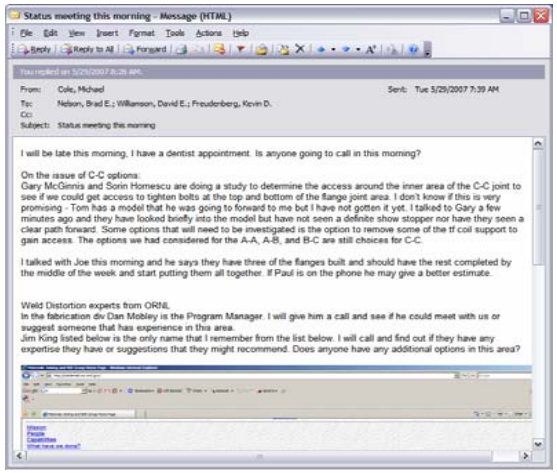
Folks,

We had a briefing for Hawryluk today on the status of the welded shim option. Handout is attached. Please skim through it and let me know where it is off the mark. Several suggestions came out of the briefing which I would like for you to follow up on:

1. Welding deformation expertise – Hawryluk suggested that we beat the bushes and see if there are any experts at ORNL (or outside ORNL) whom we should involve in the welded shim design. Phil will contact Keilbach and anyone else who might be able to help on this end.
2. Baseline C-C shear connection – We need to ensure that our design, assembly sequence, and cost and schedule baseline are all consistent in the package we send out to OECM. Any inconsistencies will raise red flags that we do not want raised. What should we use as the baseline for the inboard C-C connection?
3. Welding from inside the modular coils – Mike Z mentioned during the briefing that if might be advantageous to also weld the shims form inside the modular coils where we had access. This looked to me like an interesting option from the standpoint of possibly balancing distortions from welding on the outer edge of the flange and also for closing the gaps for compression loads. Please give this consideration.

Thanks for your attention to these matters,

Wayne



Status meeting this morning - Message (HTML)

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You replied on 5/29/2007 8:26 AM.

From: Cole, Michael Sent: Tue 5/29/2007 7:39 AM
To: Nelson, Brad E.; Williamson, David E.; Freudenberg, Kevin D.
Cc:
Subject: Status meeting this morning

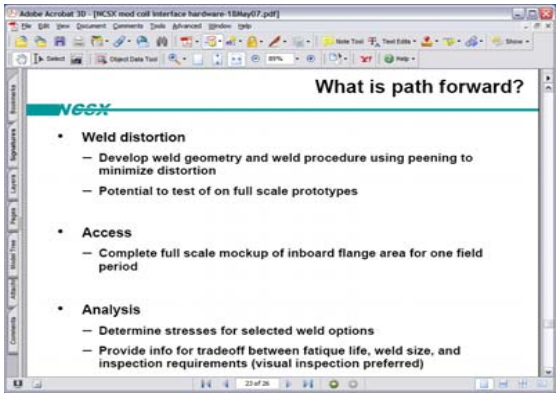
I will be late this morning, I have a dentist appointment. Is anyone going to call in this morning?

On the issue of C-C options:
Gary McGinnis and Sorin Hornescu are doing a study to determine the access around the inner area of the C-C joint to see if we could get access to tighten bolts at the top and bottom of the flange joint area. I don't know if this is very promising - Tom has a model that he was going to forward to me but I have not gotten it yet. I talked to Gary a few minutes ago and they have looked briefly into the model but have not seen a definite show stopper nor have they seen a clear path forward. Some options that will need to be investigated is the option to remove some of the tf coil support to gain access. The options we had considered for the A-A, A-B, and B-C are still choices for C-C.

I talked with Joe this morning and he says they have three of the flanges built and should have the rest completed by the middle of the week and start putting them all together. If Paul is on the phone he may give a better estimate.

Weld Distortion experts from ORNL
In the fabrication div Dan Mobley is the Program Manager. I will give him a call and see if he could meet with us or suggest someone that has experience in this area.
Jim King listed below is the only name that I remember from the list below. I will call and find out if they have any expertise they have or suggestions that they might recommend. Does anyone have any additional options in this area?

WBS Number: 142
WBS Title: Windings and Assembly
Job Number: 1421
Job Title: Design of Modular Coil Interfaces
Job Manager:David Williamson



NCSX June 2007 ETC
TABLE VI - Job 1421 Schedule Detail

Sum of	BQ								$K				hours					
WBS	JJJJ	sort code	ACT	TITLE	ES	EF	status comment	days	41	actual may cost	ORNL35	ORNL41	EA//EM	EM//EM	EM//TB	EMT/TB	ORNLDA	ORNLEM	
	1421		INTRF-100	Misc travel, meetings,reporting,presentations	5/1/2007	9/28/2007	25%	106			$12			150				1,210	
		REBASE1421	Re-baseline exercise	5/1/2007	6/15/2007		33											256	
		142A	IH4-020	Prepare outboard shim dwgs and release **for comment**	5/1/2007	6/15/2007	complete-A	33											60	
			INTRF-045	FDR prep outboard shims	6/18/2007	6/29/2007		10											40	
			INTRF-046	FDR outboard shims		6/29/2007		0												
			INTRF-047	Resolve chit's and issue shim drawings	7/2/2007	7/10/2007		6											60	
		142B	1421-3067	Procure 2 studs f/joint test.Use existing part	5/1/2007	7/25/2007		60	$1					8	48				
			1421-3075	Setup test fixture &perform JHA & pre-job brief	5/29/2007	5/30/2007		2						8	16				
			1421-3077	Meas joint deflect vs preload & loss of preload	5/31/2007	6/4/2007	adjust blue cells to g27,	3						24	24				
			1421-3079	Measure joint deflec & preload v. temp @80K	6/5/2007	6/7/2007	which used to be may	3						24	24				
			1421-3081	Meas joint deflect & preload v. time (days) at R	6/18/2007	7/16/2007	28	20						160	160				
			1421-3084	Measure joint deflection&preload v. cooldown cyc	6/8/2007	6/12/2007		3						24	24				
			1421-3087	Perform pullout tests for tapped holes	6/13/2007	9/16/2007		3						24	24				
			1421-3090	Document&conduct review of test results	7/17/2007	7/23/2007		5						40					
		142C	1421-3112B	Procure/fab parts for test&initial assembly	5/1/2007	7/25/2007		60	$10					40					
			1421-3115B	Assemble & test	7/26/2007	9/7/2007		31							100			320	
			1421-3119B	Document test results	9/10/2007	10/1/2007		16										80	
		142D	1429-3026	COF cyclic testing	5/1/2007	5/18/2007	complete-A	14		$30									
		142E	1421-3125	Determine geometry&location of high COF shims&pl	5/1/2007	6/13/2007	complete-A	31										80	
			1421-3127	Structural analyses to performance rqmts for bol	6/14/2007	6/20/2007	complete-A	5										240	
			1421-3131	PDR prep for requirements, design,&development	6/14/2007	6/22/2007		5										40	
			1421-3132	PDR to review requirements, design,&development		6/22/2007		0											
			IH1-001	Coil to coil scoping analysis	5/1/2007	6/15/2007		33				$36						520	
		142F	INTRF-049	prepare winding form mods for weld clamp bolts	6/13/2007	6/27/2007		11										300	
			INTRF-050	Complete Shim fabrication drawings (ORNL)	6/14/2007	7/2/2007		13										240	
			INTRF-051	Release info for procurement of shim material	5/1/2007	6/22/2007		38										24	
			INTRF-054	FDR prep AB/BC/AA inboard shims	8/2/2007	8/8/2007		5						40					
			INTRF-055	FDR AB/BC/AA inboard shims		8/8/2007		0											
		142G	1421-3140	Prep C-C shim drawings and release	8/20/2007	9/7/2007		14										360	
			1421-3142	FDR Prep for C-C shims	9/10/2007	11/6/2007		42										40	
			1421-3143	Add bolt holes to C winding form for CC interfac	7/19/2007	8/2/2007	need before INTRF 015	11										140	
			1421-3144	FDR C-C Shims		11/6/2007	was 11/30	0											
			1421-3145	Bolt reach & access study (mockup)	8/3/2007	8/10/2007		6										200	
			IH1-000	ESTABLISH CONCEPT	6/1/2007	7/23/2007		36										680	
			IH1-0000	PEER REVIEW OF JOINT CONCEPT	7/24/2007	8/2/2007		8										80	
		142H	INTRF-001	PPPL buy SS plate for weld trials	6/4/2007	6/15/2007		10	$31					8					
			INTRF-005	Weld distortion trials at PPPL on SS plate	6/18/2007	7/6/2007		14	$0					40	20				
			INTRF-010	Develop Weld Geometry Procedure	7/3/2007	7/10/2007		5					40						
			INTRF-025	ORNL build pywood mockup of flange	5/1/2007	6/20/2007		36				$30						140	
			INTRF-030	ORNL verify weld access	6/21/2007	6/25/2007		3				$20						40	
			INTRF-035	PPPL Determine shim material	5/1/2007	6/1/2007	complete-A	23					40						
		142I	INTRF-015	Weld trials on two MCWF's at PPPL	7/11/2007	7/30/2007		14	$1					80	600				
			INTRF-020	Document results and update weld procedure	7/31/2007	8/7/2007		6					120						
		142J	1421-3134	Issue interface dwgs for comment	5/1/2007	7/20/2007		57										300	
			1421-3135	FDR Prep	7/23/2007	8/8/2007		13										40	
			1421-3136	Conduct BC, AB, AA, MC interface FDR incl JOB 1416		8/8/2007		0											
			1421-3138	Resolve issues, release assembly spec&drawings	8/9/2007	8/15/2007		5										240	4,840
			INTRF-040	ANalysis of tensile loads (ORNL)	5/1/2007	8/8/2007		70										320	6,050