

FIVE PARTS KEEP TOGETHER

Energy Industries of Ohio

Manufacturing and Test Sequence (MTS) Coill C Shim

CO# 40851, Pattern SE (141-073-3) MS73220-2

Dated December 14, 2004 Revision: Original

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OPER. #	STATION	DESCRIPTION OF PROCESS	Name	Date
10	QUALITY RELEASE	Keep all parts together. Sign and date each step when all 5 parts have been completed. REVIEW AND APPROVE MTS. RECEIVED APPROVAL FROM EIO ON <u>Pda</u> FROM <u>12/15/04</u> SIGNED QUALITY MANAGER	<u>CL</u>	<u>4/21/05</u>
20	PATTERN NPAT SOP 0100REV2	APPLY APPROPRIATE PART NUMBER, SERIAL NUMBER, FOUNDRY MARK, TO THE PATTERN.	<u>CL</u>	<u>4/22/05</u>
30	MOLD MOLD SOP 0400 REV 8 CALIBRATION PER MOLD SOP 0900 REV 5 PREPARATION PER MOLD SOP 1100R2/1200R2/13 00R1 SAND TESTING PER MOLD SOP 1400R2/1500R3/16 00R2	MOLD PER WORK INSTRUCTIONS IN MAPICS ROUTING AND SOPS REFERENCED. ENGINEER OF RECORD - ROGER BROMAN, CONSULT ON MOLD-RELATED CONCERNS. MOLD MATERIALS REQUIRED PER MAPICS BOM. NOTIFY ENGINEER OF ANY SUBSTITUTIONS.	<u>CL</u>	<u>4/22/05</u>
40	POUR MELT SOP 0100R5 MELT SOP 0700R2 MELT SOP 0600R2	METAL MUST BE AOD REFINED OR AOD INGOT. VIRGIN METAL ADDITIONS ALLOWED. RECORD POURING TEMPERATURE: <u>2825</u> CASTING POURED AT: <u>1245 AM</u> DATE: <u>4/20</u> HEAT #s: <u>284</u> ELAPSED POUR TIME: <u>14</u> KEEL BLOCKS POURED: <u>40</u> Sample from ladle to be analyzed for final chemical analysis and reported on material certifications. Sample Taken by: <u>SR</u> Analyzed: <u>G Hunt</u> Date: <u>4/20</u>	<u>JG</u>	<u>4/22/05</u>
50	MELT SOP 0800R2	SHAKEOUT	<u>CL</u>	<u>4/29</u>
60	ARC RISE SOP 0100R1	REMOVE RISERS AS DIRECTED BY SUPERVISOR.	<u>BNVH</u>	<u>6/16/05</u>
70	HEAT TREAT HEAT SOP 0103R5	SOLUTION ANNEAL. With C-1 Coil.	<u>DCS</u>	<u>6/2/05</u>

Note: Make 15 additional test bars for mechanical testing.

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80	PHYSICAL TESTING	OBTAIN TEST SPECIMENS AND SUBMIT FOR PHYSICAL TESTING. REPORT RESULTS AS PART OF STEP 480.	W #	4/29
90	GRIND GWSA SOP 0100R3 GCHI SOP 0100R2	SWING GRIND TO REMOVE RISER REMAINS AND FLASH IF REQUIRED. CHIP AND HAD GRIND SURFACE OF PART AS REQUIRED.	CEG	6/16/05
100	SAND BLAST BLAS SOP 0100R6	SANDBLAST (REMOVE ALL BLAST MATERIAL FROM CASTING) SANDBLASTING WILL BE DONE USING RECYCLED SHARP ANGULAR AGGREGATE.	MTJ	6/16/05
110	VISUAL INSPECTION CQP-500 REV 4	VISUALLY INSPECT 100% OF COMPONENT ACCORDING TO ASTM A802 LEVEL 3 ALL CONDITIONS. IF OK CHECK HERE <input checked="" type="checkbox"/> . MARK AND REPAIR AT STEP 130. IF REJECTED CHECK HERE <input type="checkbox"/> .	VT - LEVEL II	5/28/05
NOTICE	WITNESS NOTIFICATION	PROVIDE NOTICE TO EIO AND DCMA AT LEAST FIVE DAYS IN ADVANCE OF LP STEP. EIO NOTIFIED ON 6/13 DCMA NOTIFIED ON 6/13	Q ENG OR QA MGR	CAF 6/16/05
120	100% L.P. CQP 0300 REV 10	L.P. 100% OF COMPONENT. ACCEPTANCE PER ASTM A903. ACCEPTANCE CRITERIA- LEVEL 2. IF OK CHECK HERE <input checked="" type="checkbox"/> . IF REJECTED CHECK HERE <input type="checkbox"/> . MARK AND REPAIR AT STEP 130. 280 ch	LP - LEVEL II	5/28/05
130	WELD SOP 0100 REV 7	EXCAVATE ANY DEFECTS FOUND DURING 100% VISUAL AND LP INSPECTION.		11/17/05
140	L.P. EXCAVATION CQP-300 REV 10	L.P. ALL EXCAVATIONS PRIOR TO WELDING TO ENSURE REMOVAL OF DEFECT. ACCEPTANCE PER A903. ACCEPTANCE CRITERIA- LEVEL 2.	LP - LEVEL II	
150	SAND BLAST BLAS SOP 0100R6	SANDBLAST (REMOVE ALL BLAST MATERIAL FROM CASTING) SANDBLASTING WILL BE DONE USING RECYCLED SHARP ANGULAR AGGREGATE.		
160	WELD MAP	MAP ALL WELDS WITH DIGITAL PHOTOMAPS. SERIALIZE DEFECTS ON CASTING. USE SCALE IN PHOTOS AND DOCUMENT SIZE. THIS IS TO BE PERFORMED BY SUPERVISOR, INSPECTION LEAD MAN OR THEIR DESIGNEE, FILE WITH QA. USE YELLOW MARKER. MUST SEND REPORT ON ALL WELDS OVER 10% OF NOMINAL WALL THICKNESS TO CUSTOMER. DEFECTS > 10% YES <input type="checkbox"/> . REPORT SENT BY <input type="checkbox"/> DATE <input type="checkbox"/> SIGN BY QA ENG. <input type="checkbox"/>		
NOTICE	WITNESS NOTIFICATION	PROVIDE NOTICE TO EIO AND DCMA AT LEAST FIVE DAYS IN ADVANCE OF XRAY AND LAYOUT STEPS. EIO NOTIFIED ON 6/13 DCMA NOTIFIED ON 6/13	Q ENG OR QA MGR	RUS

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170	CAF X-RAY COP 401 REV 5	X-RAY PER TECHNIQUE: To be determined. USE CALIBRATED DENSITOMETER FOR DENSITY VERIFICATION. ATTACH TECHNIQUE, READER SHEET FOR ALL RADIOGRAPHS. MUST INDICATE RADIOGRAPHER AND ASNT CERTIFICATION LEVEL ON READER SHEET.	RT - LEVEL II	<i>OK</i> <i>Dura</i> <i>6-28-05</i>
180	X-RAY COP 401 REV 5	X-RAY INTERPRETATION. ACCEPTANCE MSS SP 54. ATTACH TECHNIQUE, READER SHEET FOR ALL RADIOGRAPHS. MUST INDICATE RADIOGRAPHER AND ASNT CERTIFICATION LEVEL ON READER SHEET. IF OK CHECK HERE <input checked="" type="checkbox"/> AND SEND TO STEP 310. REJECTED CHECK HERE <input type="checkbox"/> MARK UP DEFECTS AND SEND THE CASTING TO STEP 200.	RT - LEVEL II	<i>Dura</i> <i>6-28-05</i>
190	LAYOUT	INSPECT CASTING TO VERIFY DIMENSIONS. THIS MAY BE PERFORMED BEFORE OR AFTER STEP 180. <i>2-2-05</i> DATE <i>10/28/05</i> RELEASED _____ (ENGINEER ONLY)		<i>INT</i> <i>10/28/05</i>
200	WELD SOP 0100 REV 7	EXCAVATE ANY DEFECTS FOUND DURING RADIOGRAPHY.		<i>NA</i>
210	L.P. EXCAVATION COP-300 REV 10	L.P. ALL EXCAVATIONS PRIOR TO WELDING TO ENSURE REMOVAL OF DEFECT. ACCEPTANCE PER A903. ACCEPTANCE CRITERIA- LEVEL 2.	LP - LEVEL II	
220	WELD MAP	MAP ALL WELDS WITH DIGITAL PHOTOMAPS. SERIALIZE DEFECTS ON CASTING, USE SCALE IN PHOTOS AND DOCUMENT SIZE. THIS IS TO BE PERFORMED BY SUPERVISOR, INSPECTION LEAD MAN OR THEIR DESIGNEE, FILE WITH QA. MUST SEND REPORT ON ALL WELDS OVER 10% OF NOMINAL WALL THICKNESS TO CUSTOMER. DEFECTS > 10% YES _____, REPORT SENT BY _____ DATE _____ DEFECTS < 10% _____ SIGN BY QA ENG.		
NOTICE	WITNESS NOTIFICATION	PROVIDE NOTICE TO EIO AND DCMA AT LEAST FIVE DAYS IN ADVANCE OF WELD STEP. EIO NOTIFIED ON _____ DCMA NOTIFIED ON _____	Q ENG OR QA MGR	
230	QA APPROVAL HOLD POINT	QA TO APPROVE ELECTRODE PRIOR TO USE. PROCEDURE USED: _____ MATERIAL USED: _____ QUALITY ENG. Name: _____ Date: _____		
240	WELD SOP 0100 REV 7	WELD REPAIR DEFECTS AS MARKED. FOR WELDS < 2" - WPS 10-SMAW-CF8MN1N MOD REV 1 FOR WELDS < 8" - WPS 15-GMAW-CF8MN1N MOD REV 2		
250	GRIND GCHI SOP 0100R2	HAND GRIND WELDS.		<i>V</i>

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260	L.P. WELD COP 0300 REV 10	L.P. WELD REPAIRS ACCEPTANCE PER ASTM A903. ACCEPTANCE CRITERIA-LEVEL 2. IF OK CHECK HERE _____ WASH AND SEND TO STEP 300. IF REJECTED CHECK HERE _____ AND RETURN TO STEP 220.	LP - LEVEL II	
	REPEAT	REPEAT STEPS 220 TO 260 AS REQUIRED TILL CLEAR THROUGH VISUAL INSPECTION & PENETRANT INSPECTION. DOCUMENT REWORK ON A SUPPLEMENTAL MTS	QA ENG	
270	TEST MAG PERM SOP MAG PERM 100, REV 1	TEST MAG PERMEABILITY REPAIR AREAS. RECORD ON WELD MAP LIST. TEST AT LEAST 5 POINTS PER WELD. ACCEPTANCE 1.02. IF OK CHECK HERE _____ AND GO TO STEP 290. IF REJECTED CHECK HERE _____.		
280	GRIND GCHI SOP 0100R2	GRIND AREAS OF NON COMPLIANCE AND RETURN TO STEP 270. REPEAT UNTILL COMPLIANCE IS ACHIEVED.	CA	10/30
290	CAF X-RAY DEFECTS REPAIRED BY WELDING COP 401 REV 5	X-RAY PER TECHNIQUE: To be determined. USE CALIBRATED DENSITOMETER FOR DENSITY VERIFICATION. ATTACH TECHNIQUE, READER SHEET FOR ALL RADIOGRAPHS. MUST INDICATE RADIOGRAPHER AND ASNT CERTIFICATION LEVEL ON READER SHEET.	RT - LEVEL II	10/30
300	X-RAY COP 401 REV 5	X-RAY INTERPRETATION. ACCEPTANCE MSS SP 54. ATTACH TECHNIQUE, READER SHEET FOR ALL RADIOGRAPHS. MUST INDICATE RADIOGRAPHER AND ASNT CERTIFICATION LEVEL ON READER SHEET. IF OK CHECK HERE _____ AND SEND TO STEP 310. REJECTED CHECK HERE _____ MARK UP DEFECTS AND SEND THE CASTING TO STEP 200.	RT - LEVEL II	
	REPEAT	REPEAT STEPS 200 TO 300 AS REQUIRED TILL WELDS CLEAR X-RAY. DOCUMENT REWORK ON A SUPPLEMENTAL MTS	QA ENG.	
310	SAND BLAST BLAS SOP 0100R6	SANDBLAST (REMOVE ALL BLAST MATERIAL FROM CASTING) SANDBLASTING WILL BE DONE USING RECYCLED SHARP ANGULAR AGGREGATE.	MMW	
			10/31/05	
NOTICE	WITNESS NOTIFICATION	PROVIDE NOTICE TO EIO AND DCMA AT LEAST FIVE DAYS IN ADVANCE OF VISUAL AND LP STEPS. EIO NOTIFIED ON 10/23 DCMA NOTIFIED ON 10/23	Q ENG OR QA MGR	10/30
320	FINAL VISUAL INSPECTION COP-500 REV 4	VISUALLY INSPECT 100% OF COMPONENT ACCORDING TO ASTM A802 LEVEL 2 ALL CONDITIONS. IF OK CHECK HERE <input checked="" type="checkbox"/> MARK AND REPAIR AT STEP 340. IF REJECTED CHECK HERE _____	VT - LEVEL II	10-31-05

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		MUST BE PERFORMED BY LEVEL II in VT.		
330	FINAL L.P. COP 0300 REV 10	FINAL L.P. 100% OF COMPONENT. ACCEPTANCE PER ASTM A903. ACCEPTANCE CRITERIA- LEVEL 1 FOR HIGH STRESSED AREAS, LEVEL 2 FOR ALL OTHER AREAS. SEE LP DRAWING. IF OK CHECK HERE <input checked="" type="checkbox"/> WASH AND SEND TO STEP 410. IF REJECTED CHECK HERE _____	LP - LEVEL II Kdd 10-31-05	
340	WELD SOP 0100 REV 7	EXCAVATE ANY DEFECTS FOUND DURING FINAL PENETRANT INSPECTION.	N/A	
350	L.P. EXCAVATION COP-300 REV 10	L.P. ALL EXCAVATIONS PRIOR TO WELDING TO ENSURE REMOVAL OF DEFECT. ACCEPTANCE PER A903.	LP - LEVEL II	
370	WELD MAP	MAP ALL WELDS WITH DIGITAL PHOTO/MAPS. SERIALIZE DEFECTS ON CASTING, USE SCALE IN PHOTOS AND DOCUMENT SIZE. THIS IS TO BE PERFORMED BY SUPERVISOR, INSPECTION LEAD MAN OR THEIR DESIGNEE. FILE WITH QA. MUST SEND REPORT ON ALL WELDS OVER 10% OF NOMINAL WALL THICKNESS TO CUSTOMER. NOMINAL WALL THICKNESS TO CUSTOMER. DEFECTS >10% YES _____, REPORT SENT BY _____ DATE _____ DEFECTS < 10 % _____ SIGN BY QA ENG.		
380	WELD SOP 0100 REV 7	WELD REPAIR DEFECTS AS MARKED. FOR WELDS <2" - WPS 10-SMAW-CF8MMNMN MOD REV 1 FOR WELDS <8" - WPS 15-GMAW-CF8MMNMN MOD REV 2		
390	GRIND GCHI SOP 0100 REV 2	HAND GRIND WELDS.		
400	L.P. WELDS COP 0300 REV 10	L.P. WELD REPAIRS ACCEPTANCE PER ASTM A903. IF OK CHECK HERE _____ WASH AND SEND TO STEP 460. IF REJECTED CHECK HERE _____ AND RETURN TO STEP 390.	LP - LEVEL II	
	REPEAT	REPEAT STEPS 390 TO 410 AS REQUIRED TILL WELDS CLEAR FINAL LIQUID PENETRANT INSPECTION. DOCUMENT REWORK ON A SUPPLEMENTAL MTS	QA ENG.	
410	TEST MAG PERM SOP MAG PERM 100, REV 1	TEST MAG PERMEABILITY REPAIR AREAS. RECORD ON WELD MAP LIST. TEST AT LEAST 5 POINTS PER WELD. ACCEPTANCE 1.02. IF OK CHECK HERE _____ AND GO TO STEP 430.		

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420	GRIND GCHI SOP 0100R2	GRIND AREAS OF NON COMPLIANCE AND RETURN TO STEP 420. REPEAT UNTILL COMPLIANCE IS ACHIEVED.	<i>NA</i>	
NOTICE	WITNESS NOTIFICATION	PROVIDE NOTICE TO EIO AND DCMA AT LEAST FIVE DAYS IN ADVANCE OF MAG PERM STEP. EIO NOTIFIED ON <u>10/23</u> DCMA NOTIFIED ON <u>10/23</u>	Q ENG OR QA MGR	<i>pm5</i>
430	FINAL MAG PERM INSPECTION SOP MAG PERM 100, REV 1	PERFORM MAG PERM TESTING WITH SEVERN GAUGE. ACCEPTANCE 1.02. CHECK THE ENTIRE SURFACE ON A 6" BY 6" GRID. REPORT RESULTS. USE A 6" SQUARE BLOCK TO INDICATE TEST LOCATIONS AND RECORD RESULTS. COMPLIANT AREAS WILL NOT BE MARKED. MARK NONCOMPLIANT AREAS WITH AN "X" FOR REPAIR. OK CHECK HERE <input checked="" type="checkbox"/> AND GO TO STEP 470. IF REJECTED CHECK HERE	<i>Ch</i>	<i>10/28</i>
440	GRIND GCHI SOP 0100 REV 2	HAND GRIND WITH SUITABLE CONE OR OTHER SIMILAR GRINDER AS REQUIRED TO ENSURE REMOVAL OF MATERIAL TO ACHIEVE MAG PERM REQUIREMENT. CIRCLE AREA REMEDIATE FOR RETEST.	<i>NA</i>	
450	RETEST MAG PERM SOP MAG PERM 100, REV 1	RETEST MAG PERMEABILITY AT FAILED TEST POINTS. MARK NONCOMPLIANT AREAS WITH AN "X" FOR REPAIR. ACCEPTANCE 1.02. IF OK CHECK HERE IF REJECTED CHECK HERE RETURN TO STEP 450	<i>NA</i>	
460	PHOTOGRAPH	TAKE DIGITAL PICTURES.	<i>SCS</i>	<i>10/31/05</i>
470	AUDIT REVIEW	PROCESS DOCUMENT TO PROGRAM MANAGER FOR COMPLIANCE AUDIT.	<i>Ch</i>	<i>10/31/05</i>
480	DOC. REVIEW	REVIEW DOCUMENTS AS REQUIRED IN CAF CHECKLIST. ALL DOCUMENTS NOTED TO BE ACCESSIBLE FOR AUDITING. (SHIPPER, C OF C, M.T.R., M.T.S., INSPECTION REPORT, X-RAY READER SHEETS AND HEAT TREAT CHARTS)	<i>Ch</i>	<i>10/31/05</i>
NOTICE	RELEASE FROM EIO	PROVIDE DOCUMENTS TO EIO. SENT ON <u>11/1</u> BY <u>Ch</u>	Q ENG OR QA MGR	
490	PACK AND SHIP	PACKAGE AND SHIP TO MAJOR TOOL.		
1000	REVISION HISTORY	ORIGINAL 12-14-04.	CARUUD	