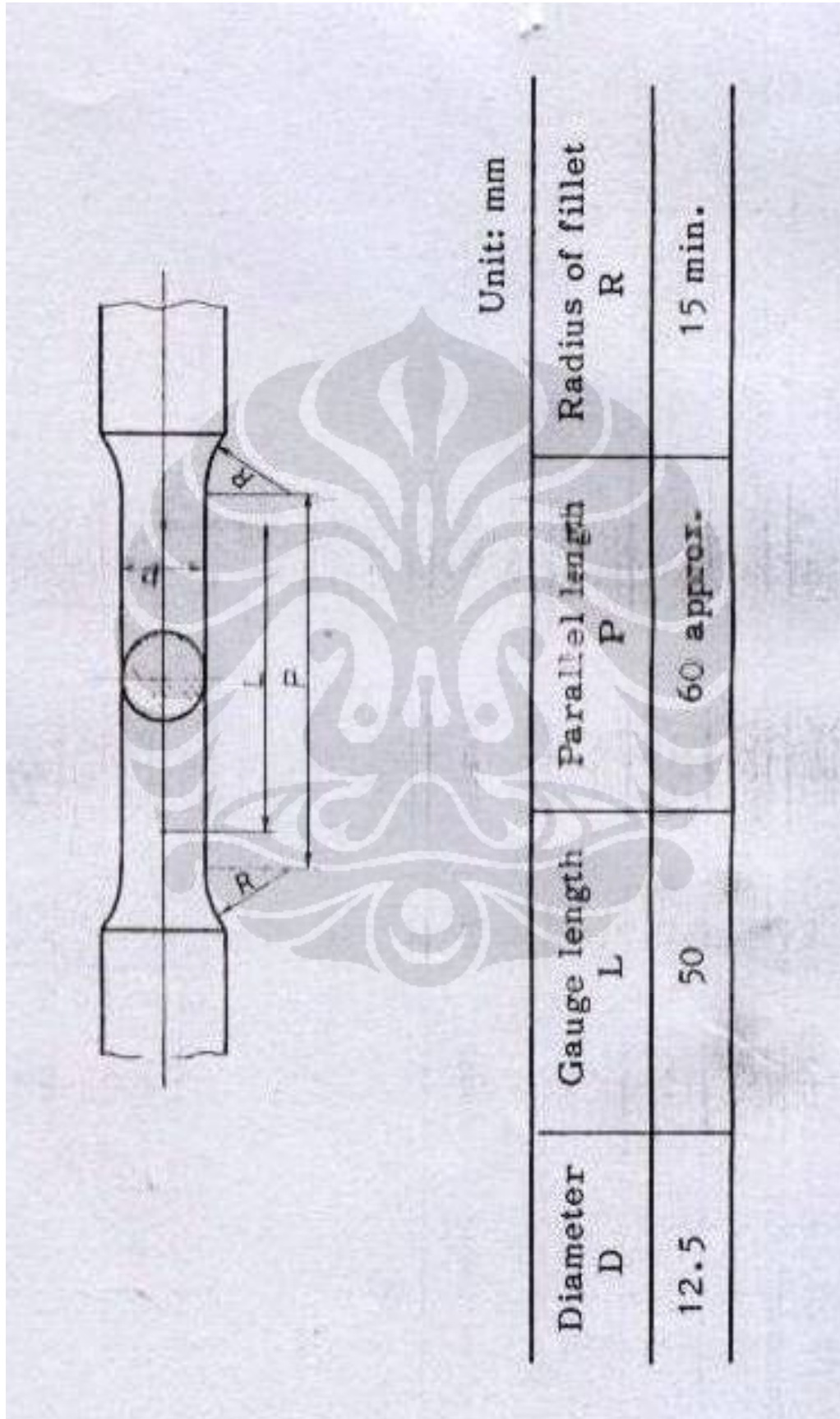


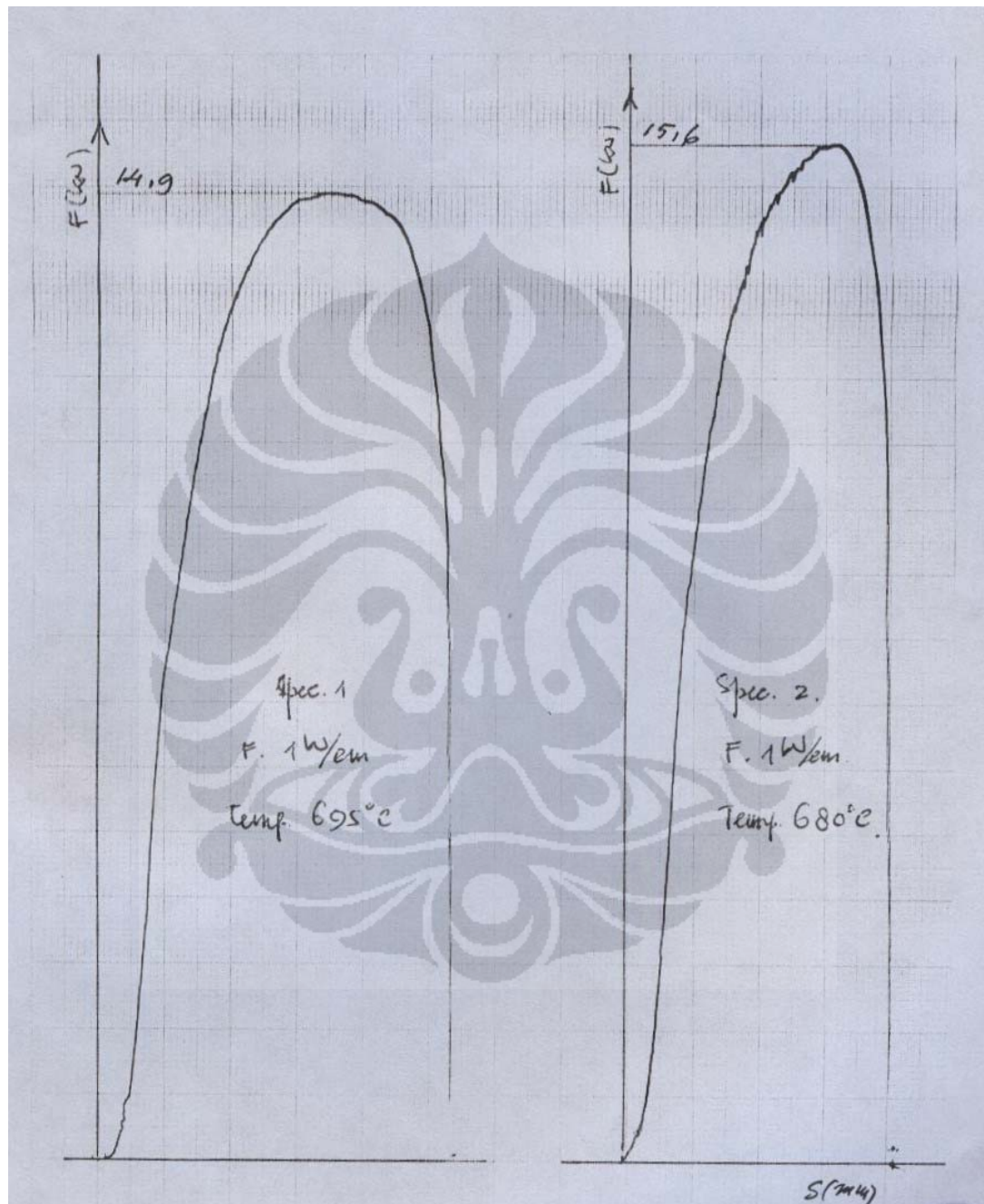


LAMPIRAN

Lampiran 1 Standart Sampel Uji Tarik



Lampiran 2 Kurva Tegang –Regang Hasil Uji Tarik Temperatur Tinggi



Lampiran 3 Hasil Pengujian Ketebalan Menggunakan *Ultrasonic Testing*

I. EXAMINATION DATA

CLIENT	: Pertamina UP III - Plaju	DATE OF TEST	: January 26÷27 th ,2008
OBJECT	: Thickness Out	EQUIPMENT	: Krautkramer/ WM2
ITEM NR.	: FCD2 - RFCCU	PROBE	: Pr-5 MHz
MATERIAL SPEC.	: A 240 - 304H (18Cr - 8Ni)	VELOCITY	: 5950 m/s
SERIAL NR.	: -	COUPLANT	: Aquasonic /Grease
TYPE & SIZE	: -	LEGEND	: 0° North or Top
SURFACE TEMP.	: Ambient		: 90° Clockwise
LOCATION	: RFCCU - Sungai Gerong	UNIT	: mm

II. RESULT OF MEASUREMENT

NR.	IDENTIFICATION OF PART	ORIENTASI OF MEASUREMENT						REMARK
		72°	144°	216°	288°	108°	252°	
	SHELL (cyclone area) :	A	E	D	C	E-A	C-D	Shell bag. bawah Header
1	<i>Replika No. 1:</i>	13.32	-	-	-	-	-	
2	Area: A	13.42	-	-	-	-	-	
3		13.55	-	-	-	-	-	
4	Area: B	13.12	-	-	-	-	-	
5		13.27	-	-	-	-	-	
6		13.19	-	-	-	-	-	
7	<i>Replika No. 2</i>	-	-	-	-	12.55	-	
8	Area: A	-	-	-	-	12.79	-	
9		-	-	-	-	12.57	-	
10	<i>Replia No. 3:</i>	-	13.65	-	-	-	-	
11	Area: A	-	13.82	-	-	-	-	
12		-	13.73	-	-	-	-	
13	Area: B	-	13.21	-	-	-	-	
14		-	13.52	-	-	-	-	
15		-	13.57	-	-	-	-	
16	<i>Replika No. 4</i>	-	-	13.12	-	-	-	
17		-	-	13.35	-	-	-	
18		-	-	13.36	-	-	-	No.6 ; No.8 Tidak diukur
19	<i>Replika No. 5</i>	-	-	11.87	-	-	-	Material Baru
20		-	-	11.73	-	-	-	
21		-	-	11.95	-	-	-	No.7 tidak diukur (mat. baru)
22	<i>Replika No. 9</i>	-	-	-	-	-	11.40	Material Baru
23		-	-	-	-	-	11.44	
24		-	-	-	-	-	11.61	
	SHELL :	C-D	B-C	A-B	E-A	D-E		Shell bag. atas Header
	Replika No. 10							
25	Area: A	12.86	-	-	-	-		
26		12.91	-	-	-	-		
27		13.11	-	-	-	-		
28	Area: B	13.47	-	-	-	-		
29		13.61	-	-	-	-		
30		13.56	-	-	-	-		
31	Replika No. 11	-	13.56	-	-	-		

32	Area: A	-	13.18	-	-	-		
33		-	13.31	-	-	-		
34	Area: B	-	13.26	-	-	-		
35		-	13.18	-	-	-		
36		-	13.30	-	-	-		
37	Replika No. 12	-	-	13.00	-	-		
38	Area: A	-	-	13.11	-	-		
39		-	-	12.94	-	-		
40	Area: B	-	-	13.28	-	-		
41				13.39				
42		-	-	13.64	-	-		
43	Replika No. 13	-	-	-	13.69	-		
44	Area: A				13.63	-		
45		-	-	-	13.60	-		
46	Area: B	-	-	-	13.10	-		
47					12.98	-		
48					12.70	-		
	SHELL (cyclone area):	A-E	A-B	B-C	A	D-E		
	THICKNESS IN :							Bagian atas Header
49	Replika No. 14	-	-	-	-	13.45		
50	Area: A	-	-	-	-	13.59		
51		-	-	-	-	13.54		
52	Area: B	-	-	-	-	13.46		
53		-	-	-	-	13.51		
54		-	-	-	-	13.24		

Lampiran 4 Hasil Pengujian Penetrant Testing

I. EXAMINATION DATA

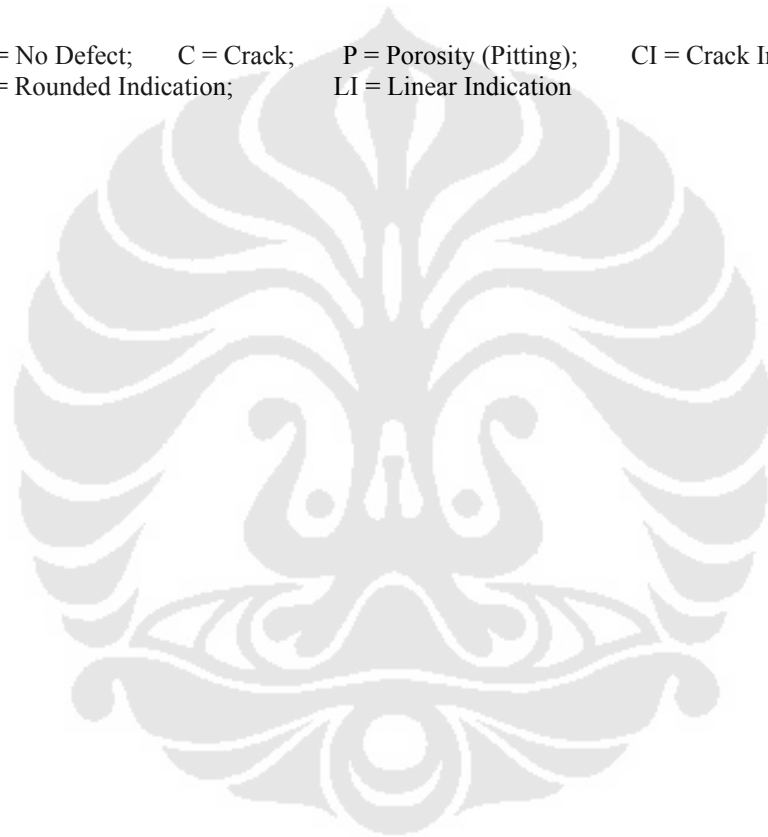
1	Client	: PERTAMINA UNIT PEMELIHARAAN III PLAJU			
2	Objective	: To detect the presence of any surface defect			
3	Date of Inspection	: January 25-27 th , 2008			
4	Plant / Location	: Site Plant / R-FCCU			
5	Item / Part	: FC D2 / Shell & Header			
6	Material Specification	: Stainless Steel -304			
7	Inspection Method	: Dye Penetrant			
8	Standard Reference	: Test Procedure ASME V Art.6			
9	Acceptance Criteria	: ASME VIII-Appendix 8			
10	Material of Penetrant	Magnaflux	SKL-SP Low Halogen	SKC-S Low Halogen	SKD-S2 Low Halogen
11	Testing Procedure	Technique	Dwell Time	Temperature	Remark
	Pre-cleaning	Spray	20 minutes	Ambient	Wipe
	Drying	Spray/Wipe	15 minutes	Ambient	-
	Apply Penetrant	Spray	20 minutes	Ambient	SKL-SP
	Cleaning Excess. Penet	Spray	15 minutes	Ambient	Cloth. + SKC-S
	Developing	Spray	10 minutes	Ambient	SKD-S2
12	Interpretation Condition	Lighting > 100 Lx	Record: Photography		
13	Surface Condition	As weld / As Rolled		Examiner : Dadang Kh. & Nursa	

II. RESULT OF INSPECTION

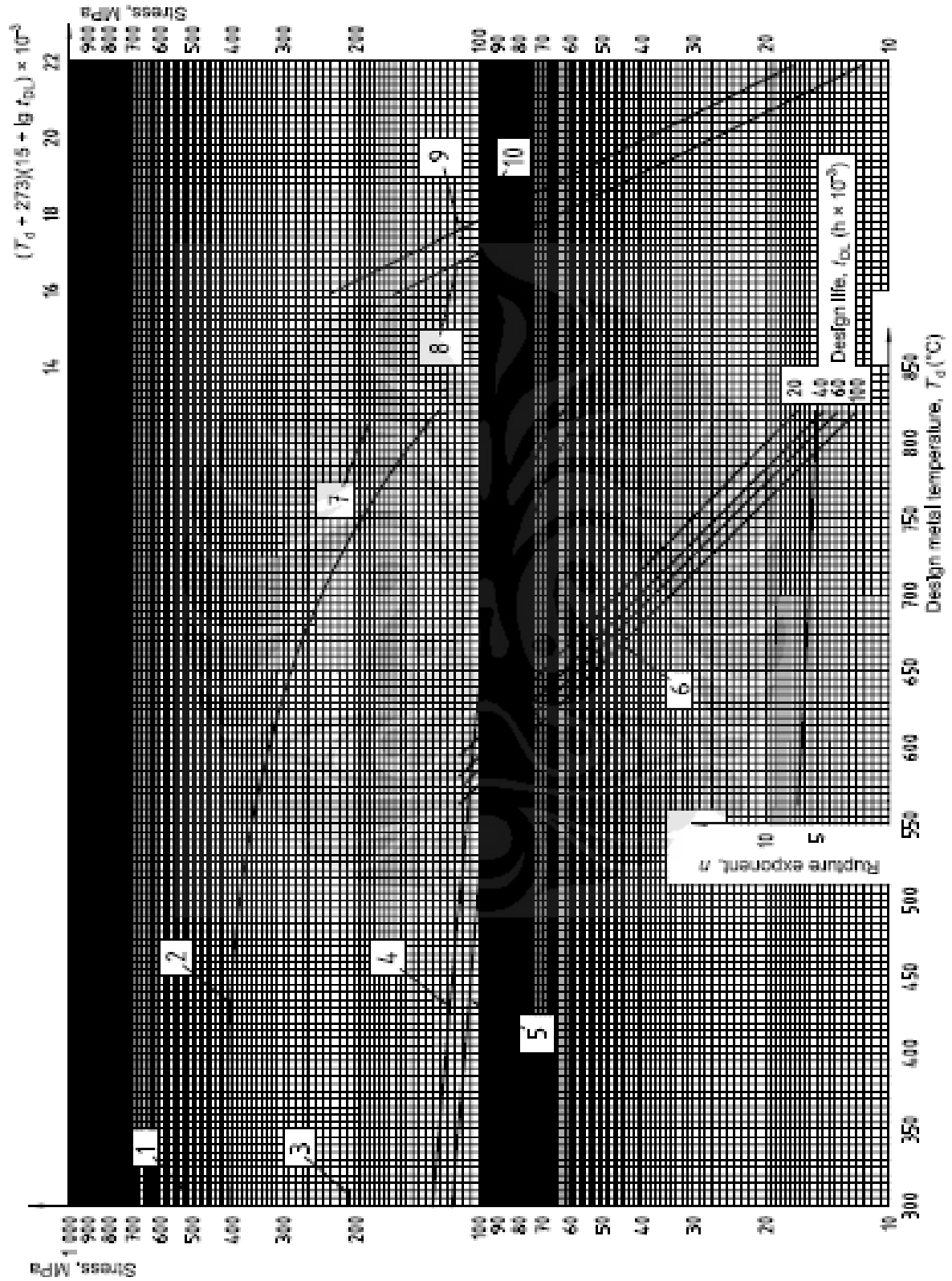
Nr.	Part Identification	Indication of Discontinuities		Judgment		Remark
		Type	Size (mm)	Repair	Accepted	
	TOP SHELL AREA:					
	lowerside of plenumshell (Outside);					See Sketch
1	Replica No.1 area (A / 72 °)	ND	-	-	√	
2	Replica No.2 area (E - A / 108 °)	Crack	12	√	-	
3	Replica No.3 area (E / 144 °)	ND	-	-	√	
4	Replica No.4 area (D / 216 °)	ND	-	-	√	
5	Replica No.5 area (D / 216 °)	ND	-	-	√	Patching plate
6	Replica No.6 area (D / 216 °)	ND	-	-	√	
7	Replica No.7 area (D / 216 °)	ND	-	-	√	Patching plate
8	Replica No.8 area (D / 216 °)	ND	-	-	√	
9	Replica No.9 area (D / 252 °)	ND	-	-	√	Patching plate
	Upperside of plenum shell (Inside);					
10	Replica No.10 area (C-D / 252 °)	ND	-	-	√	
11	Replica No.11 area (B-C / 324 °)	ND	-	-	√	
12	Replica No.12 area (A-B / 364 °)	ND	-	-	√	

13	Replica No.13 area (E-A / 108°)	ND	-	-	✓	
14	Replica No.14 area (D-E / 180°)	ND	-	-	✓	
	<i>Header plenum area (lower side);</i>					
15	Replica No.1 area (A / 72°)	ND	-	-	✓	
16	Replica No.2 area (A-B / 36°)	ND	-	-	✓	
17	Replica No.3 area (B-C / 324°)	ND	-	-	✓	
18	Replica No.4 area (A-E / 108°)	ND	-	-	✓	

Note: ND = No Defect; C = Crack; P = Porosity (Pitting); CI = Crack Indication
RO = Rounded Indication; LI = Linear Indication

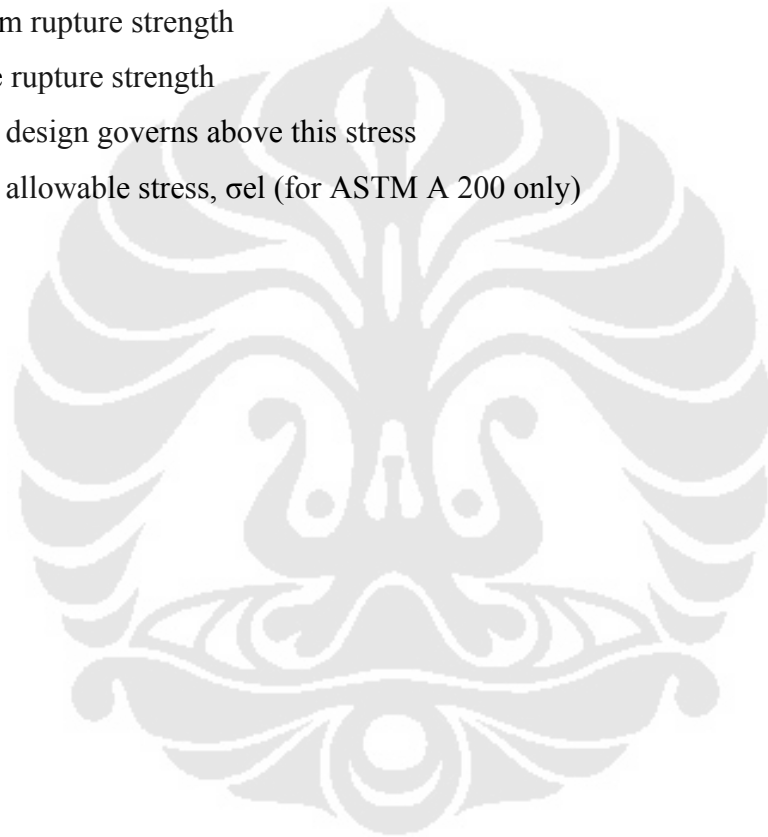


Lampiran 5 Kurva Tegangan (Larson Miller Paramter) untuk ASTM A 213, ASTM A 271, ASTM A 312 and ASTM A 376types 304 and 304H (18Cr-8Ni) stainless steels



Keterangan :

1. Specified minimum tensile strength
2. Tensile strength
3. Specified minimum yield strength
4. Yield strength
5. Elastic allowable stress, $el \sigma$
6. Rupture allowable stress, $rl \sigma$
7. Limiting design metal temperature
8. Minimum rupture strength
9. Average rupture strength
10. Elastic design governs above this stress
11. Elastic allowable stress, σ_{el} (for ASTM A 200 only)



Lampiran 6 Foto Inspeksi RFCCU



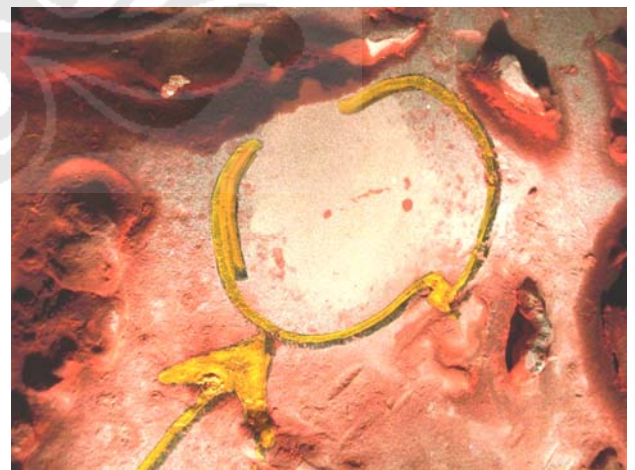
Prepared sebelum dilakukan pengambilan data Replika, Thickness dan Penetrant Test, area doubler.



Penetrant Test dilakukan setelah Replika pada lokasi titik No.1 (72°/A) pada shell plenum material lama.



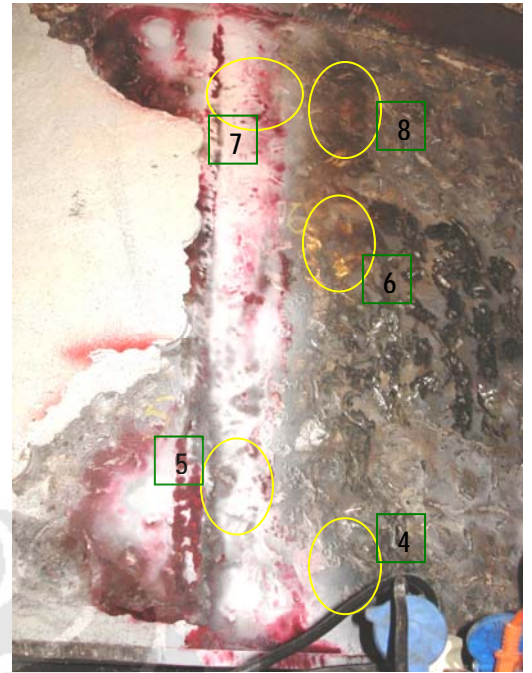
Titik No.2, ditemukan retak pada shell plenum lokasi (insert plate area) shell lama.



Panjang retak terlihat jelas setelah dilakukan Penetrant Test, pada titik No. 2 (108°/A-E).



Titik No. 3 (144°/E) setelah dilakukan Penetrant Test pada lokasi shell plenum lama.



Titik No. 4, 5, 6, 7 & 8 (216°/D) setelah dilakukan Penetrant Test pada lokasi shell plenum lama & baru (No. 5 & No. 7).



Titik No. 9 (252°/C-D) setelah dilakukan Penetrant Test pada lokasi shell plenum baru.



Titik No. 10 (252°/C-D) setelah dilakukan Penetrant Test pada lokasi shell plenum lama bagian atas header.



Titik No. 11 ($324^\circ/\text{B-C}$) setelah dilakukan Penetrant Test pada lokasi shell plenum lama bagian atas header.



Titik No. 12 ($36^\circ/\text{A-B}$) setelah dilakukan Penetrant Test pada lokasi shell plenum lama bagian atas header.



Titik No. 13 ($108^\circ/\text{E-A}$) setelah dilakukan Penetrant Test pada lokasi shell plenum lama bagian atas header.



Titik No. 14 ($180^\circ/\text{D-E}$) setelah dilakukan Penetrant Test pada lokasi shell plenum lama bagian atas header.

Lampiran 7 Uji Komposisi Kimia Material RFCCU



Department of Metallurgy and Materials Engineering
UNIVERSITY OF INDONESIA

CHEMICAL COMPOSITION TEST REPORT

Contract No. / No. Kontrak :

Standards / Standar : ASTM A751

Customer / Pemberi Kerja :

Materials / Material : 304H

	Fe	C	Si	Mn	P	S	Cr	Mo
1	70.5	0.0873	0.220	1.71	< 0.0030	< 0.0050	17.6	0.322
2	70.4	0.0529	0.222	1.72	< 0.0030	< 0.0050	17.5	0.314
3	70.4	0.0775	0.231	1.71	< 0.0030	< 0.0050	17.8	0.314
4	70.2	0.0596	0.208	1.76	< 0.0030	< 0.0050	17.9	0.315
Ave	70.3	0.0693	0.220	1.72	< 0.0030	< 0.0050	17.7	0.316

	Ni	Al	Co	Cu	Nb	Ti	V	W
1	8.67	0.0387	0.154	0.422	0.0241	0.0072	0.0878	0.0397
2	8.91	0.0122	0.166	0.405	0.0236	< 0.0020	0.0894	0.0546
3	8.59	0.0304	0.156	0.396	0.0221	0.0041	0.0878	0.0486
4	8.73	0.0190	0.159	0.401	0.0219	0.0021	0.0874	0.0449
Ave	8.73	0.0251	0.159	0.406	0.0229	0.0038	0.0881	0.0470