INSPECTION PLAN CRUDE CHARGE HEATER 11-F-101

Description	Equipment Information								
General	Refinery	Unit	Item No.	Name	Year Build	Manufacturer	Service	Drawing No.	
	RU VI	DTU	11-F-101	Crude Charge Heater	1994	Foster Wheeler Energy Ltd.	Crude Charge Heater		V-2156-101F-A-006

Spec.	Radiant				Convention				Material / Thickness (mm)								Others
	Temperatur (°C)		Press. (kg/cm²)		Temperatur (°C)		Press. (kg/cm²)		Radiant				Convention				COT/TMT
	Design	Opert	Design	Opert	Design	Opert	Design	Opert	Material	t (nom)	MAT	CA	Material	t (nom)	MAT	CA	
	393(out)	364(out)	14.3	9.4	305		14.3		A335-P9	7.11	4.22	3	A335-P5	7.11	4.083	3	364/471
									A312-TP316	3.404	2.116	1	A335-P9	7.11	4.22	3	364/533

Risk Ranking	2	Inspection interval : every T/A

Damage Mechanism	Kind / Type	Area / Parts	Possibilities of Occurence	Previous History
	Internal/external thinning, creep, Metalurgy changes, sensitization, scalling.	Radiant & convection Tubes, tube support	Low	Slight scalling on tube surface, microstructure ref. ERA stad. 5 pass 2 no. 21 & Stad. D pass 3 no. 22, beberapa tube lain mengalami sensitisasi pada batas butir & tidak ada indikasi creep.

Inspection Guide	Item	Area	Methods	Purpose	Interval	Quantity	Additional Attention
	Tubeskin Monitoring	Radian coil	acquisition data from DCS	Uneven tube wall temp.	On-Stream	All tube skin thermocouple	
	Infrared Thermography	Radian coil & heater casing	Infrared camera	Hotspot on tube & casing	On-Stream	All visible tube	
	Visual Inspection	Radian & convection	Thermocouple data	Degradation & anomalies	On-Stream & Every T/A	All accesible part	
		Radian & convection					
	Remote Visual Test	Radian tube	Video borescope	Degradation & anomalies	Every T/A	All accesible internal tube	
	Magnetic Test	Outlet tube(Austenicti	Thermocouple data	Carburation on SS tube	Every T/A	All accesible surface of SS tube	
	Tube sagging or bowing Meas.	Radian & convection		Tube creep	Every T/A	All indicated tube	
	Thickness Meas.	Radian & convection tube	Thermocouple data	Remaining thickness	Every T/A	100% radian tube & lower convection tube	
	Tube Dia. Meas.	Radian tube & lower convection	Thermocouple data	Creep	Every T/A	100% radian tube & lower convection tube	
	Hardness Meas.	Radian & convection tube	Thermocouple data	Hardening (carburation) or Softening	Every T/A	100% radian tube & lower convection tube	
	Insitu Metalogprahi	Radian & convection tube	Thermocouple data	Metalurgy Changes.	Every T/A	25 Sample on radian & tube support, 5 sample on convection tube & support	
	PT/MT	Radian tube & tube support	Thermocouple data	Crack on tube weld or support	Every T/A	100% radian tube & lower convection tube	
	Tube Reliability Assesment		Minimum thickness & stress	Remaining life	Every 2rd T/A		
			Creep rupture life	Remaining life	Every 2rd T/A		
	Intelligent Pigging	Radian & convection	Intelligen pig/scanning	Thinning, degradation &	Every 3rd T/A		
	Tube Removal for Creep & Metaloprahi Testing	Radian & convection tube	Metallographi, Physical & Mechanical Testing (creep	Phisycal & mechanical properties, microstructure	Every 3rd T/A	Cut 90cm Length of sample radian & convection tube	

Inspector Qualification	1. Plant Inspector with min. 8 years experience in heater inspection 2. NDT Inspector with min. 5 years experience 3. NDT Examiner with min. 5 years experience

Notes	Revision History	Rev. :	Date :	
	Others	Stationary Inspection Engineer Sec. Head		Signature :

QUALITY PLAN

PERTAMINA

No. QP	: /NRE-QP/2013	Revisi	: 0	Disiapkan oleh: **Stat Insp Junior Engineer**	Disetujui oleh: **Stationary Eng. Section Head**
Equipment	: **11-F-101 Crude Charge Heater**	Area	: 11		
Pekerjaan	: Cleaning, Perbaikan & Inspection	Tanggal	: 31 Juli 2013	**Novriandi**	**Slamet Hadicahyono**

	Kegiatan	Standar/ Acuan	Metode Pelaksanaan	Tools	MA I	HSE	PE	Stat.Eng.	HSC	Acceptance Criteria	Quality Control Report
A.	**Persiapan**										
1	Gasket Manway	Drw no.V2156-101F-A-006A			D			A		Dimensi & Spec. Sesuai standard	
2	Gasket Nozzle	Drw no.V2156-101F-A-006A			D			A		ANSI B16.20	
3	Pasang scaffolding	Safety			D	A				Sesuai standard	
4	Pasang blind/spades	Safety			D	FW			A	Sesuai blind list	
5	Pasang lampu penerangan	Safety			D	SW				Sesuai standard	
6	Tools : Kunci Pukul dan Palu	Safety			D					Sesuai standard	
7	Gasket Test HC	Safety			Rq	I			D	Sesuai standard	
8	Gas test / toxic/O2 content	Safety			Rq	D			I	Sesuai standard	
B.	**Pembongkaran/ Dismantling**										
1	Pekerjaan SAD by Pertamina									Sesuai standard	
2	Buka Manhole Radiant Section	Safety			D				I	Sesuai standard	
3	Neutralize with Na2CO3 or soda ash	NACE RP0170								Sesuai standard	
4	Menutup stack									Sesuai standard	
5	Buka Manhole/Cover Convection Section	Safety								Sesuai standard	
6	Buka burner system	Safety			D					Sesuai standard	
7	Buka Ducting APH	Safety			D					Sesuai standard	
C.	**Cleaning**										
1	Cleaning tube radian section	TKI			D		A	S	SW	Sesuai standard	
2	Cleaning tube convection section	TKI			D		A	S	SW	Sesuai standard	
3	Cleaning burner system	TKI			D		A	S	SW	Sesuai standard	
4	Cleaning inside furnace	TKI			D		A	S	SW	Sesuai standard	
5	Cleaning Ducting APH	TKI			D		A	S	SW	Sesuai standard	
D.	**Inspeksi Assessment & Rekomendasi**										
1	Cek, UT & Insitu metalography tube radiant section	API 530			S			D		Sesuai standard	
2	Cek tube convection section	API 530			S			D		Sesuai standard	
3	Cek tube hanger	TKI			S			D		Sesuai standard	
4	Cek tube guide	TKI			S			D		Sesuai standard	
5	Cek plate cabin	TKI			S			D		Sesuai standard	
6	Cek Ceramic fiber radiant section	TKI			S			D		Sesuai standard	
7	Ceki refractory convection Section	TKI			S			D		Sesuai standard	
8	Cek damper	TKI			S			D		Sesuai standard	
9	Cek expansion joint	TKI			S			D		Sesuai standard	
10	Cek inlet/ outlet nozzle	TKI			S			D		Sesuai standard	
11	Cek pipa outlet pass heater 8 pass	TKI			S			D		Sesuai standard	
12	Cek & PT thermocouple 16 bh	TKI, ASME V			S			D		Sesuai standard	
13	Kondisi burner tip dan air register	TKI			S			D		Sesuai standard	
14	Kondisi ducting APH	TKI			S			D		Sesuai standard	
15	Ukur tebal tube radiant section	ASME V			S			D		Sesuai standard	NDT Report
16	Ukur tebal tube convection section	ASME V			S			D		Sesuai standard	NDT Report
17	Insitu metalography radiant tube									Sesuai standard	
E.	**Perbaikan/ Repair**										
1	Kondisi tube radiant section	API 530			D			A		Rek.Sta.Eng	
2	Kondisi tube convection section	API 530			D			A		Rek.Sta.Eng	
3	Kondisi tube hanger	TKI			D			A		Rek.Sta.Eng	
4	Kondisi tube guide	TKI			D			A		Rek.Sta.Eng	
5	kondisi plate cabin	TKI			D			A		Rek.Sta.Eng	
6	kondisi Ceramic fiber radiant section	TKI			D			A		Rek.Sta.Eng	
7	Kondisi refractory convection Section	TKI			D			A		Rek.Sta.Eng	
8	Kondisi damper & refractory	TKI			D			A		Rek.Sta.Eng	
9	Kondisi expansion joint	TKI			D			A		Rek.Sta.Eng	
10	Kondisi inlet/ outlet nozzle	TKI			D			A		Rek.Sta.Eng	
11	Kondisi pipa outlet pass heater 8 pass	TKI			D			A		Rek.Sta.Eng	
12	Kondisi thermocouple 16 bh	TKI, ASME V			D			A		Rek.Sta.Eng	
13	Kondisi burner tip dan air register	TKI			D			A		Rek.Sta.Eng	
14	Kondisi ducting APH	TKI			D			A		Rek.Sta.Eng	
15	Kondisi steam tracing	TKI			D			A		Rek.Sta.Eng	
F.	**Install & Testing**										
1	Menyiapkan semua gasket yg baru	Drw no.V2156-101F-A-006A			D			A		Sesuai standard	

QUALITY PLAN	PERTAMINA	Disiapkan oleh: Stat Insp Junior Engineer	Disetujui oleh: Stationary Eng. Section Head
No. QP : /NRE-QP/2013	Revisi : 0		
Equipment : **11-F-101 Crude Charge Heater**	Area : 11		
Pekerjaan : Cleaning, Perbaikan & Inspection	Tanggal : 31 Juli 2013	**Novriandi**	**Slamet Hadicahyono**

	Kegiatan	Standar/ Acuan	Metode Pelaksanaan	Tools	MA I	HSE	PE	Stat.Eng.	HSC	Acceptance Criteria	Quality Control Report
2	Pasang manhole radiant section	TKI			D		I	A	SW	Sesuai standard	
3	Pasang cover convetion system	TKI			D		I	R	SW	Sesuai standard	
4	Pasang burner system	TKI			D		A	S	SW	Sesuai standard	
5	Hydrostatic test tube side	TKI			D			A	SW	Sesuai standard	
6	Pneumatic/N2 tube side	Safety			D			SW	FW	Sesuai standard	
G.	**Commisioning & Box up**									Sesuai standard	
1	Box up insulation cover	TKI			D	FW	FW	FW	FW	Sesuai standar	form box up
2	Lepas blind/spades	TKI			D	FW			A	Sesuai blind list	
3	Lepas scaffolding	Safety			D				SW	Sesuai standard	
4	Lepas lampu penerangan	Safety			D	SW			A	Sesuai standard	
5	Cleaning area	TKI								Sesuai standard	

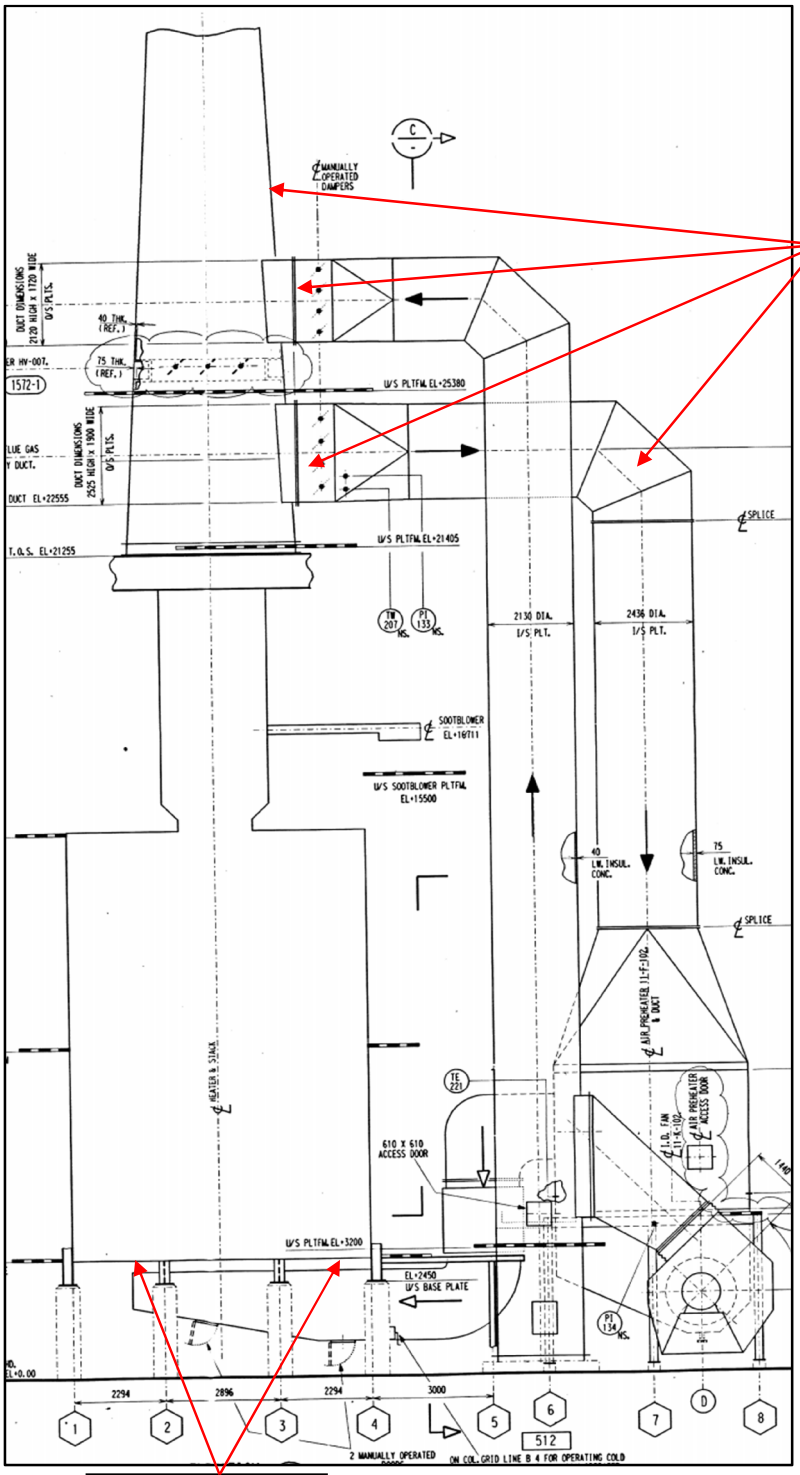
Catatan :

A = Acceptance, **D** = Do, **I** = Inspect, S**W** = Spot Witness, FW = Full Witness **S** = Support HP : Hold Point R: Review Rq: Required

Hal-hal yang perlu diperhatikan/ Metode Kerja

- Yakinkan setelah manhole dibuka dilakukan netralize dengan soda ash
- Yakinkan material (gasket, bolt & nut) yang terpasang sesuai spesifikasi

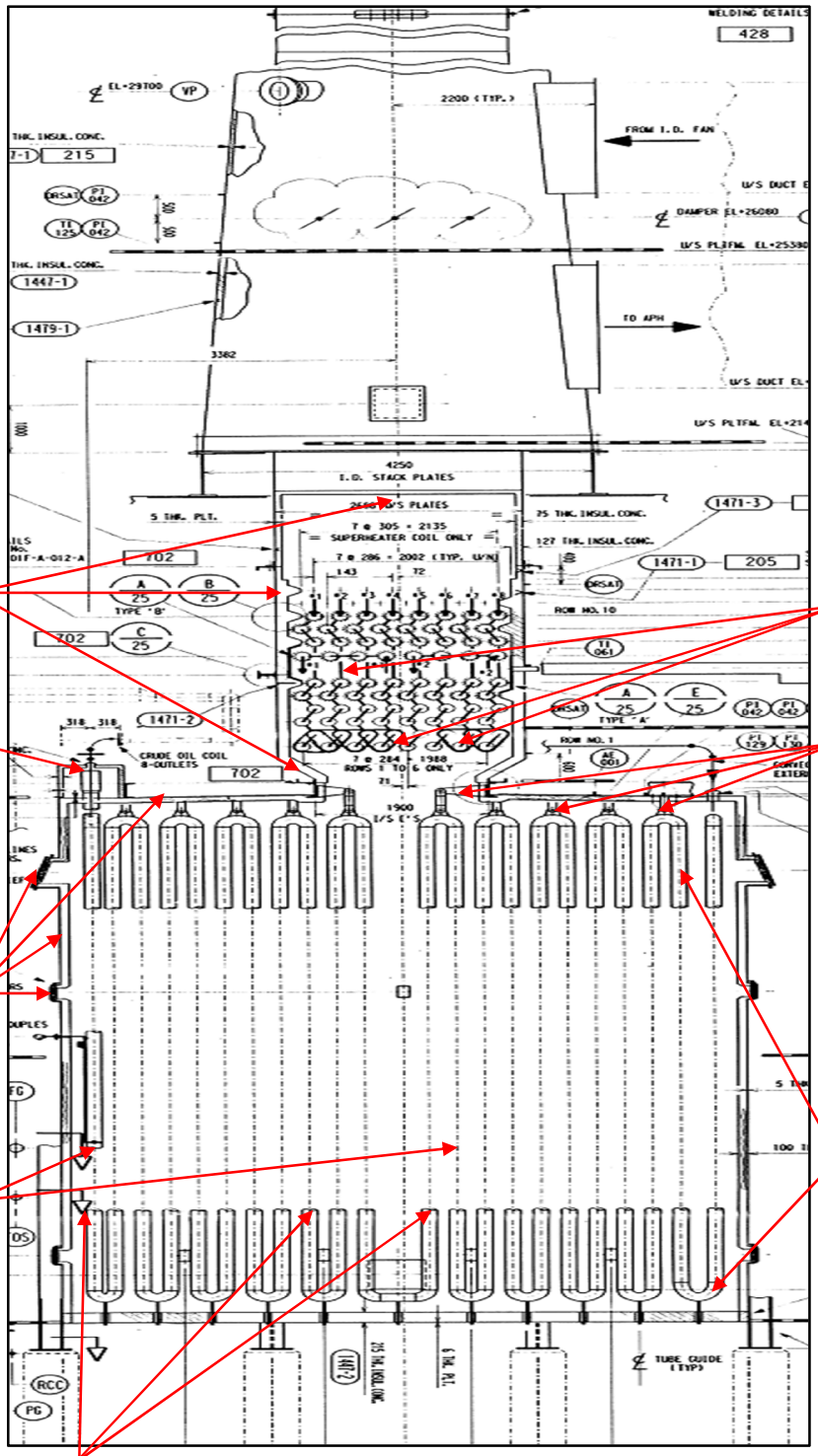
NDT MAP - GENERAL		Rev. 0
CRUDE CHARGE HEATER 11-F-101		
PT. PERTAMINA (PERSERO) REFINERY UNIT VI		
Check by:	Approved by:	



VT all accessible refractory lining on stack, hot/cold flue duct

VT & hammer test all refractory lining at floor & burner throat

NDT MAP - GENERAL		Rev. 0	PERTAMINA
CRUDE CHARGE HEATER 11-F-101			
PT. PERTAMINA (PERSERO) REFINERY UNIT VI			
Check by:	Approved by:		



VT all accessible refractory lining on breech & convection bank

Video Borescope (Remote VT) outlet from outlet flange.

VT all ceramic fiber insulation: arch, wall, peephole, explosion door, manhole

VT & PT all thermocouple clamp

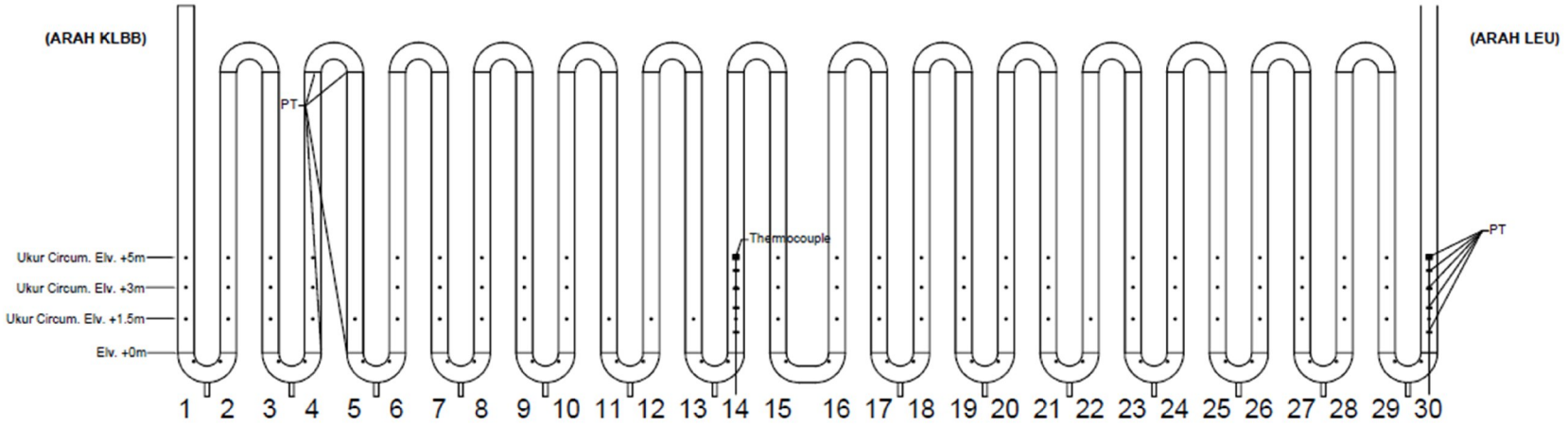
Magnet test on Austenitic SS tube to detect carburation

- UT/PT/Metalografi lower tube & support.
- VT all accessible tube, support & tubesheet.
- VT to find bowing & sagging.

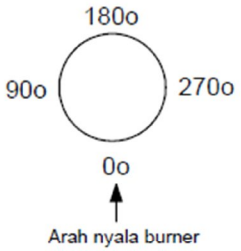
VT/PT 100% & Metalografi (sample) tube hanger, lug & pin.

- VT/PT/UT/Circ. 100% & Metalografi (sample) radian tube.
- VT to find bowing & sagging.

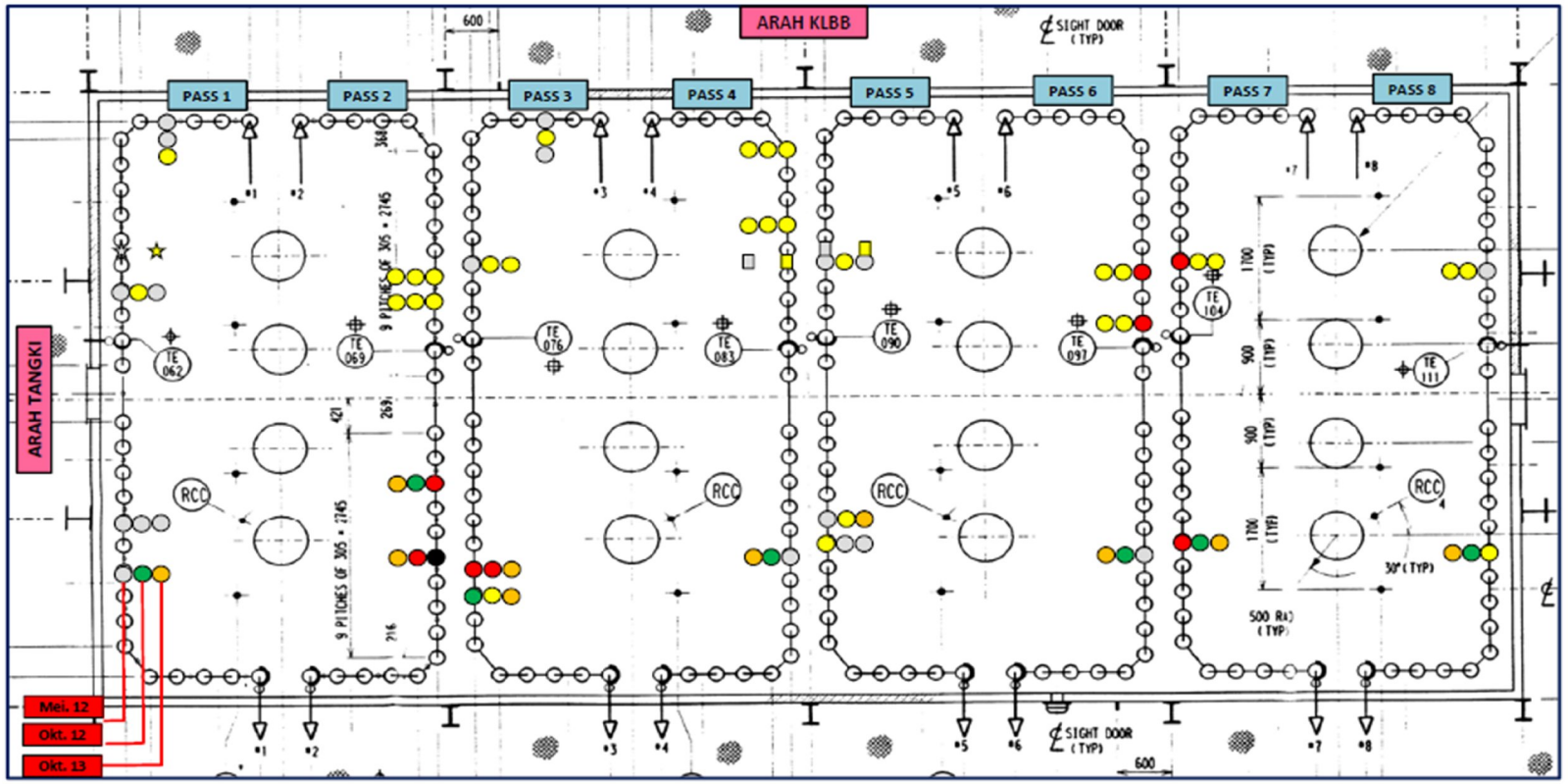
NDT MAP - UT MEASUREMENT & PENETRANT TEST		Rev. 0	PERTAMINA
CRUDE CHARGE HEATER 11-F-101			
PT. PERTAMINA (PERSERO) REFINERY UNIT VI			
Check by:	Approved by:		



NOTE:
1. 11-F-101 Terdiri dari 8 pass coil tube dengan 30 tube/pass yang terdiri dari 14 tube inlet mat'l A335-P9 dan 16 tube outlet mat'l A312-TP316.
2. per 1 no. joint tube terdiri dari 1 plain tube dan 1 Elbow180o SR.
3. Penomoran tube agar mengikuti format berikut : P1T14 dibaca Pass 1 Tube no. 14 atau P1E14 dibaca Pass 1 Elbow 180o No. 14.
4. Tube visual test (VT) 100% masing-masing setiap tube.
5. Circum weld joint di Penetrant Test (PT) 100% masing-masing setiap tube.
6. Thermowell di PT 100% sejumlah 16 Set.
7. Pengukuran circumference OD tube masing-masing setiap tube di elevasi 1.5, 3, 5m.
8. UT thickness dilakukan masing-masing setiap tube di elevasi 1.5, 3, 5m dengan orientasi 0o (hot face/bagian tube ke arah burner), 90o, 180o & 270o.



NDT MAP - INSITU METALOGRAPHI		Rev. 0	PERTAMINA
CRUDE CHARGE HEATER 11-F-101			
PT. PERTAMINA (PERSERO) REFINERY UNIT VI			
Check by:	Approved by:		



NOTE:
1. Terdapat ketidak konsistenan kesimpulan hasil pemeriksaan metalografi PCM Okt 2013 vs pemeriksaan sebelumnya, dimana pada pemeriksaan sebelumnya tube indikasi mengalami creep sedangkan pada pemeriksaan Okt 2013 tube hanya indikasi mengalami sensitisasi pada batas butir dan tidak terdapat kriteria tingkat kerusakan akibat sensitisasi tsb.
2.

Elbow	Hanger	Tube	
☆	□	○	Sensitisasi pd batas butir & tidak terjadi creep
★	■	●	Stadium E/5
★	■	●	Stadium D/4
☆	□	○	Stadium C/3
★	■	●	Stadium B/2
★	■	●	Stadium A/1
☆	□	○	Tidak di uji

INSPECTION CHECKLIST
FURNACE

STATIONARY INSPECTION ENGINEER
PT. PERTAMINA (PERSERO) REFINERY UNIT VI
No.

I. DATA PERALATAN

TYPE OF INSP.	: ONSTREAM/ OFFSTREAM	MATERIAL TUBE:		
AREA/TAG. NO	: CDU/11-F-101	RADIANT COIL		CONVECTION
DESIGN CODE	: API STD 530	INLET	OUTLET	
DESIGN PRESSURE	:			
MAX TUBE WALL TEMP°C	: 471°C/533 C			
FLUIDA SERVICE RADIANT	: CRUDE			
FLUIDA SERVICE CONVECTION	: STEAM			
FLUIDA GAST TEMP LEAVING RADIANT	: FUEL GAS 843°C/FUEL OIL 829°C			
FLUIDA GAS TEMP. LEAVING CONV.	: FUEL GAS 374°C/FUEL OIL 350°C			

HASIL PEMERIKSAAN

NO	PART DESCRIPTION	DAMAGE MODE*	DAMAGE CONDITION
1	FOUNDATION & SUPPORTS		
	a. CONCRETE		
	b. FIRE PROOFING		
	c. STRUCTUR STEEL		
2	CASING / THERMOGRAPHY		
	a. RADIANT (MAX 82°C)		
	b. CONVECTION (MAX 82°C)		
	c. STACK		
3	BURNER ASSEMBLY		
	a. AIR REGISTER		
	b. FLAME PATTERN		
4	RADIANT SECTION		
	a. TUBES *		
	b. REFACTORY		
	c. TUBE SUPPORT & GUIDES		
	d. SNUFFING STEAM NOZZLES		
	e. BRIDGE WALL		
5	CONVETION SECTION		
	a. TUBES		
	b. REFACTORY		
	c. TUBE GUIDE / HANGER		
5	DUCT		
	a. REFACTORY		
	b. BREECH CASING		

INSPECTION CHECKLIST
FURNACE
STATIONARY INSPECTION ENGINEER
PT. PERTAMINA (PERSERO) REFINERY UNIT VI
No.

6	STACK		
	a. STACK CASING		
	b. STACK ANCHOR BOLT		
	c. STACK REFACTORY / CASING		
7	EXPLOTION DOOR		
8	DAMPER		
	a. DAMPER BLADES		
	b. DAMPER SHAFT		
	c. DAMPER CONTROL & VALVE		
	d. DAMPER WIRE		
9	SOOT BLOWER		
10	AIR PREHEATER		
11	IDF/FDF		
12	OTHER :		
	- GASKET		
	- BAUT - BAUT		

INSPECTION SUMMARY :		
INSPECTED BY:	**INSPECTION DATE:**	**REVIEWED/APPROVED BY:**

III. LAMPIRAN

3.1 DOKUMENTASI KERUSAKAN

III. LAMPIRAN

3.2 SKETCH KERUSAKAN

Diisi dengan sketch lokasi pemeriksaan atau lokasi kerusakan/perbaikan yang dilakukan

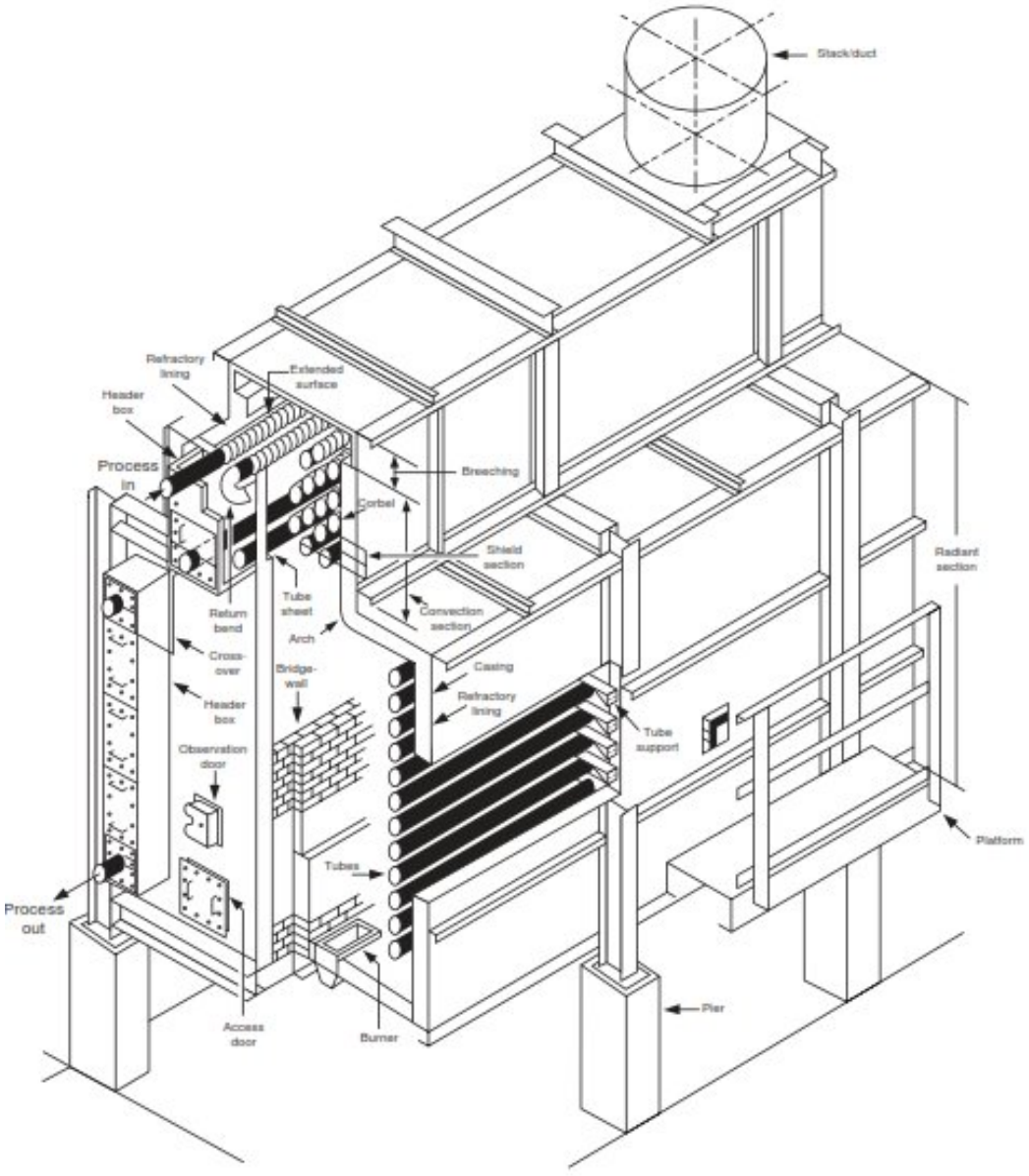


Figure 2—Box-type Heater with Horizontal Tube Coil Showing Main Components

INSPECTION/DAMAGE NOTE:

Diisi dengan catatan kerusakan/temuan pemeriksaan atau lokasi perbaikan.