

SHAMS POWER COMPANY

ENGINEERING DIVISION

INSPECTION & CORROSION SECTION

SHAMS 1

LOCATION : R1LCC10AC001

KKS : R1LCC10AC001

GRADE & CLASSIFICATION : 2

CERTIFICATE OF INSPECTION

The equipment detailed below was examined in accordance with the SHAMS code of practice for plant inspection,

ITEM : LP- Heater -1

LOCATION : SHAMS Plant

TYPE OF INSPECTION : Major

DATE OF INSPECTION : March, 2020

PLACE OF INSPECTION : IN-SITU

DATE OF LAST INSPECTION : Jan, 2016

REPORT :

1.0. SUMMARY

The above LP Heater -1 was taken off line, isolated, opened, vented & cleaned for major external & internal inspections.

2.0. SUBJECT

2.1. This is a horizontal carbon steel shell with 304 L tube bundle.

Item	Shell Side	Tube side
Design pressure	5/-1 bar	16 bar
Design temperature	99 C	99 C
Operation pressure	0.556 bar	10.05 bar
Operation temperature	-	-
Hydro test pressure	7.2 bar	22.9 bar
Fluid	Steam/condensate	Water
Material	Carbon Steel	304 L
Tube Number		1002
Tube diameter		5/8 inch
Tube thickness		1.65 mm
Tube length		9500 mm

The above equipment is/ is not considered suitable for further service under the present operating conditions

NEXT MAJOR INSPECTION DUE : March 2024

INSPECTED: Osman Ismail

ENDORSEMENT: 48 MONTHS

REVIEWED: Ali Al Masabai

3.0 HISTORY

This LP heater -1 was commissioned in 2013. Periodical inspection records since Oct.'2014 are available. Three tubes were plugged as it was taken as a sample for metallurgical investigation on years 2014, 2015 & 2016.

4.0. SCOPE OF INSPECTION

- 4.1 Visual Inspection
- 4.2 Eddy Current
- 4.3 Ultrasonic Thickness survey
- 4.4 Dye- penetrant
- 5.4 Borescope inspection

5.0. CONDITIONS FOUND

5.1. External (Shell side)

- 5.1.1 All painting and insulation found intact without any evidence of painting peel off or blistering and no evidence of any damage for insulation or insulation cover aluminum sheet.
- 5.1.2 All ladders, stairways and handrails found in satisfactory condition.
- 5.1.3 All concrete support found in satisfactory condition without evidence of cracking or spalling.
- 5.1.4 All external piping insulation found in satisfactory condition.
- 5.1.5 All earthing lugs found in satisfactory condition.

5.2. Internal (Tube side)

- 5.2.1 All tubes as could see internal surfaces found satisfactory condition without evidence of corrosion, apart from a considerable amounts of deposits which have cleaned by high pressure hydro jetting.
- 5.2.2 Three tubes were plugged as it was taken as a sample for metallurgical investigation on years 2014, 2015 & 2016.
- 5.2.3 All tube to tube sheet welds found in satisfactory condition.

6.0 NDT

6.1 Ultrasonic thickness survey

Ultrasonic thickness measurement was carried out on accessible locations of channel found satisfactory with average thickness 10.40 mm. See attached thickness measurement report.

6.2 Dye – Penetrant test

Dye – Penetrant test was carried out on tube to tube sheet welds found satisfactory. See attached thickness measurement report.

6.3 Eddy Current test

- Eddy current test was carried out on 56 tubes as sample out of total nos. 1018, results was not clear due to high amplitude noises caused by well-known inter-granular corrosion created during tube fabrication (for more details see attached integrity review report dated December 2017 and eddy current report). Meanwhile, RFT was used as a trail to detect carbon steel parts due to inter-granular corrosion but it was failed.

6.4 borescope Inspection

Due to presence of inter-granular corrosion, tube thickness cannot be accurately measured using eddy current technique and IRIS suitable probe for this diameter of tube not available in the market, borescope was utilized as visual inspection aid tool inside some tubes and outside from shell side, result was satisfactory (see attached videos and photos).

7.0. Recommendations

LP heater -1 should be open for inspection after four years as per SHAMS code of practice.

8.0 Inspection Grade and Interval

In accordance with the latest revision of SHAMS Code of Practice, this **LP Heater -1** was endorsed for 48 months under class 2, for next Major Inspection.

FREQUENCY : 48 MONTHS.

ENDORSEMENT : 48 MONTHS,

GRADE : 2

Next Major Insp. due : March, 2024

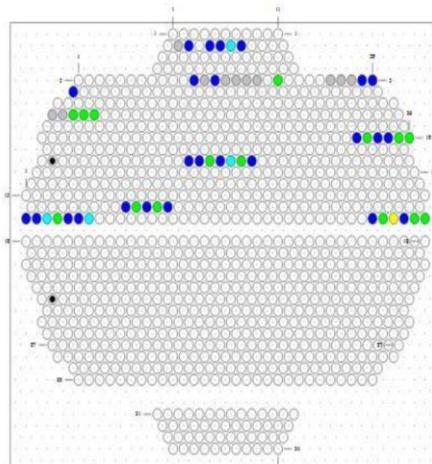
Photos





Tubes (3 plugged) , welds and internal surfaces of (channel & pass partition)

Tubes outside surfaces and baffles condition inside shell



Eddy current results

Tube NO. R9 T34 – boroscope (good condition)

ECT REPORT

Client: SHAMS POWER	DATE: 09/03/2020				
Site: Madinat Zayed, Abu Dhabi					
Equipment Serial No: HP Heater 1	Tube Orientation: U Tube				
Operator\Analyst: Yasir.A					
Tube Dimension: - OD: 15.9mm Thickness: 2.11 mm Tube Length:			Material: SS-304		
Method: ECT	Equipment\System: MS5800 (Sr/No:899458)		Probe: TEF-108-50		
Total No of Tubes: 1216 Nos.	Tubes Inspected: 466 Nos.		Maximum defect 49%		
Comments: Tubes were found as fairly cleaned condition. Most of the tubes are exhibiting noisy signals suspected the presence of ferromagnetic contents in the tube material. All of these tube data are appeared as ID Corrosion in ECT analysis whereas which could not be relevant if any changes occurred on electrical conductivity and magnetic permeability of the material under test. More over there is chances to miss real defect indications if any exist within the noisy signals region.					
<i>9 tubes were selected for boroscopy and found no visual defects in ID surface. ECT data images are attached in this report. Some tubes in the bottom row are showing the signs of OD Pitting.</i>					
Result: See details below					
Tube counting: Rows are counted from top to bottom and columns from left to right at east side Tube sheet WLL: Wall Loss, NDD: No Defect Detected, RST: Restricted					

Row	Column	Defect	Eval.	Remarks
1	1	0%	-	NDD
1	2	0%	-	NDD
1	3	0%	-	NDD
1	4	46%	ID	WLL
1	5	22%	ID	WLL
1	6	15%	ID	WLL
1	7	0%	-	NDD
1	8	0%	-	NDD
1	9	13%	ID	WLL
1	10	0%	-	NDD
1	11	11%	ID	WLL
2	1	15%	ID	WLL
2	3	14%	ID	WLL
2	4	24%	ID	WLL
2	5	11%	ID	WLL
2	6	26%	ID	WLL
2	7	28%	ID	WLL
2	8	1%	ID	WLL
2	9	28%	ID	WLL
2	10	27%	ID	WLL
2	11	13%	ID	WLL
2	12	22%	ID	WLL
2	13	14%	ID	WLL

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2	14	31%	ID	WLL
2	15	27%	ID	WLL
2	16	12%	ID	WLL
2	17	23%	ID	WLL
2	18	12%	ID	WLL
3	1	38%	ID	WLL
3	2	31%	ID	WLL
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3	9	44%	ID	WLL
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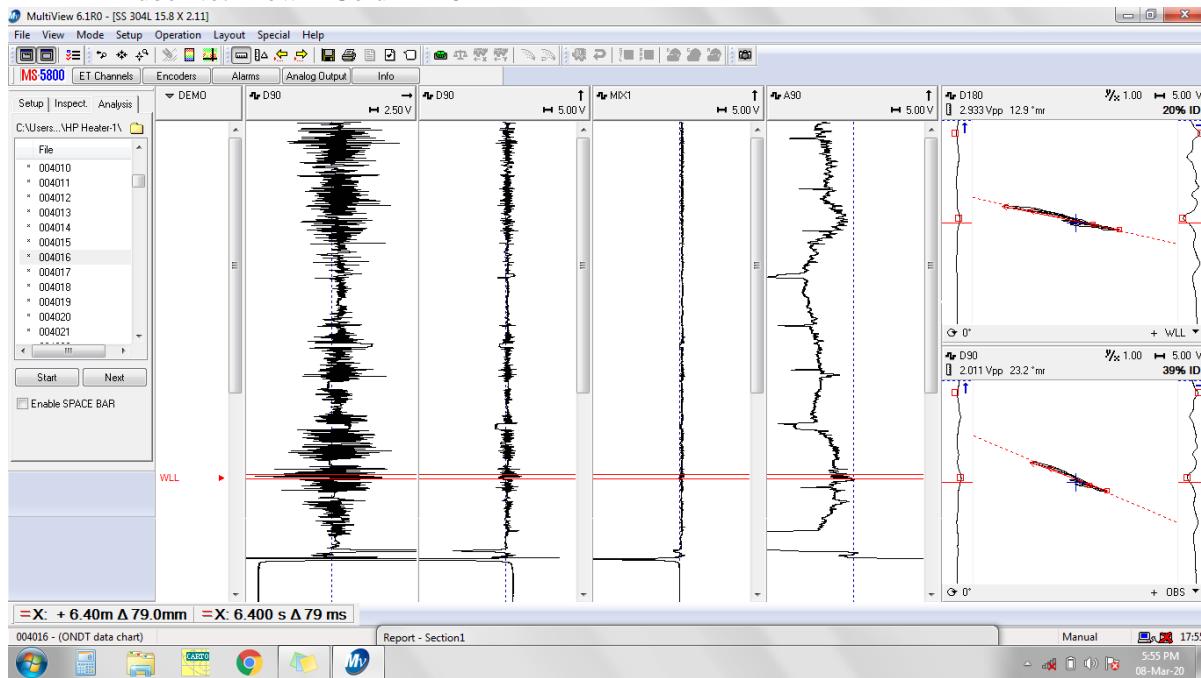
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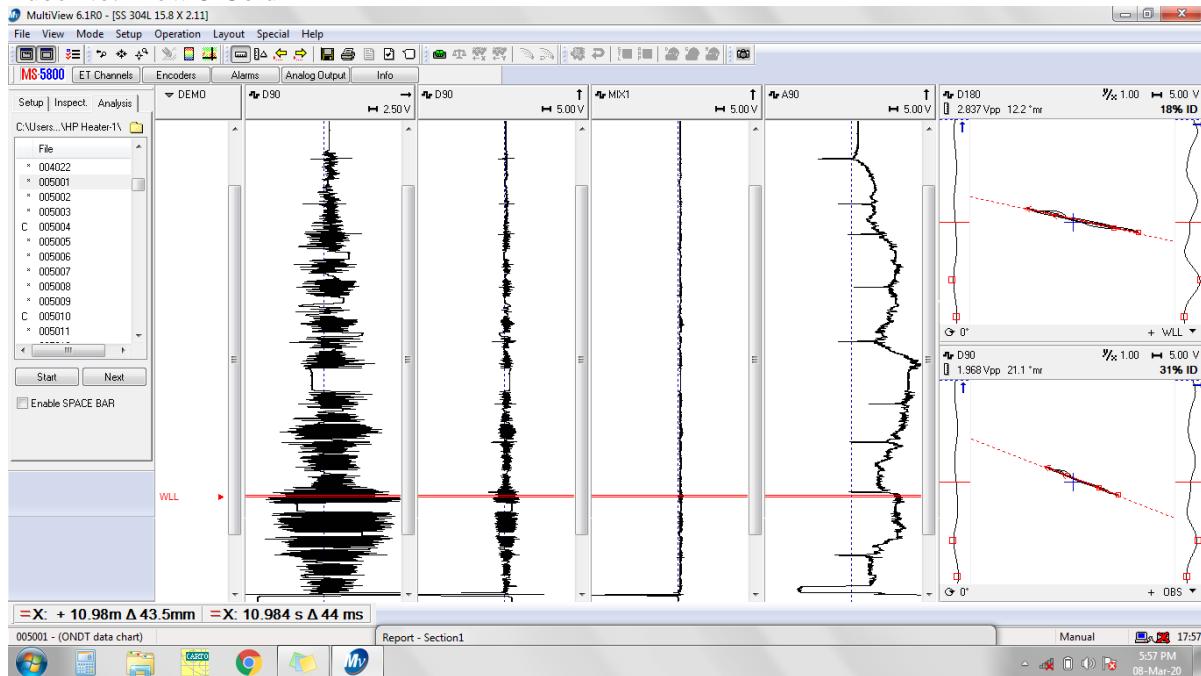
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37	9	26%	ID	WLL
37	10	23%	ID	WLL
37	11	19%	ID	WLL
37	12	24%	ID	WLL
37	13	10%	ID	WLL
37	16	40%	ID	WLL
38	2	44%	OD	WLL
38	4	36%	OD	WLL
38	6	48%	OD	WLL
38	8	42%	OD	WLL
38	9	0%	-	OBS

	TECHNICIAN	TPI	CLIENT
Name :	YASIR AHAMMED		
Signature :			
Date :	09.03.2020		

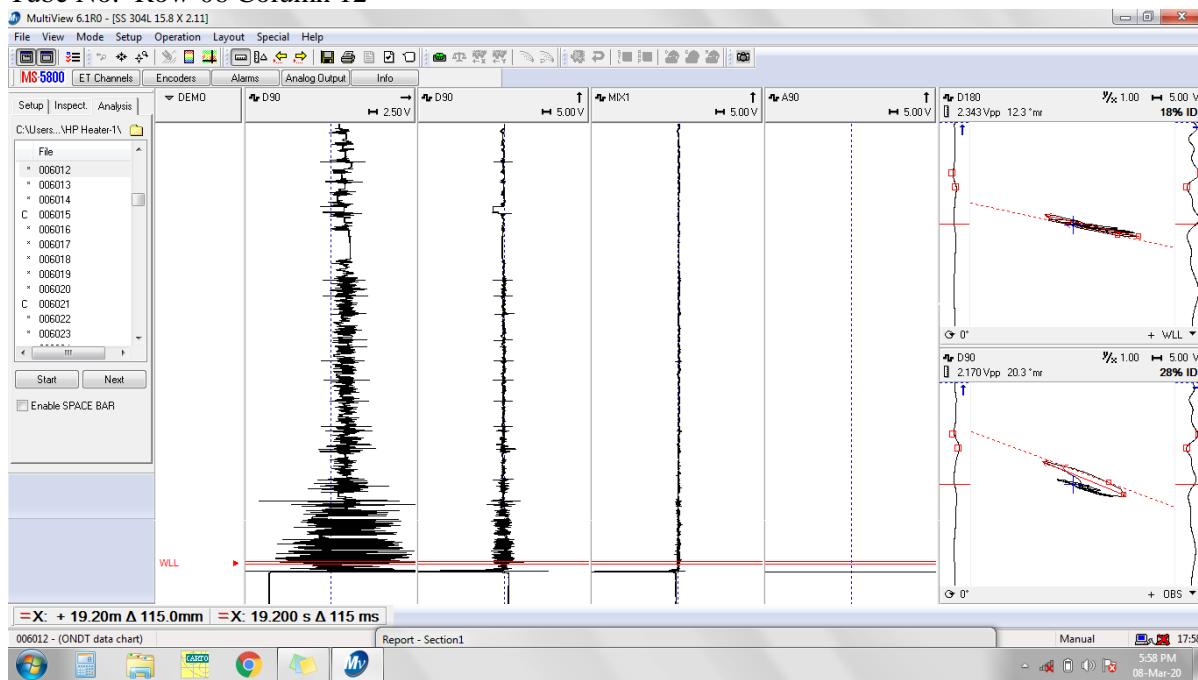
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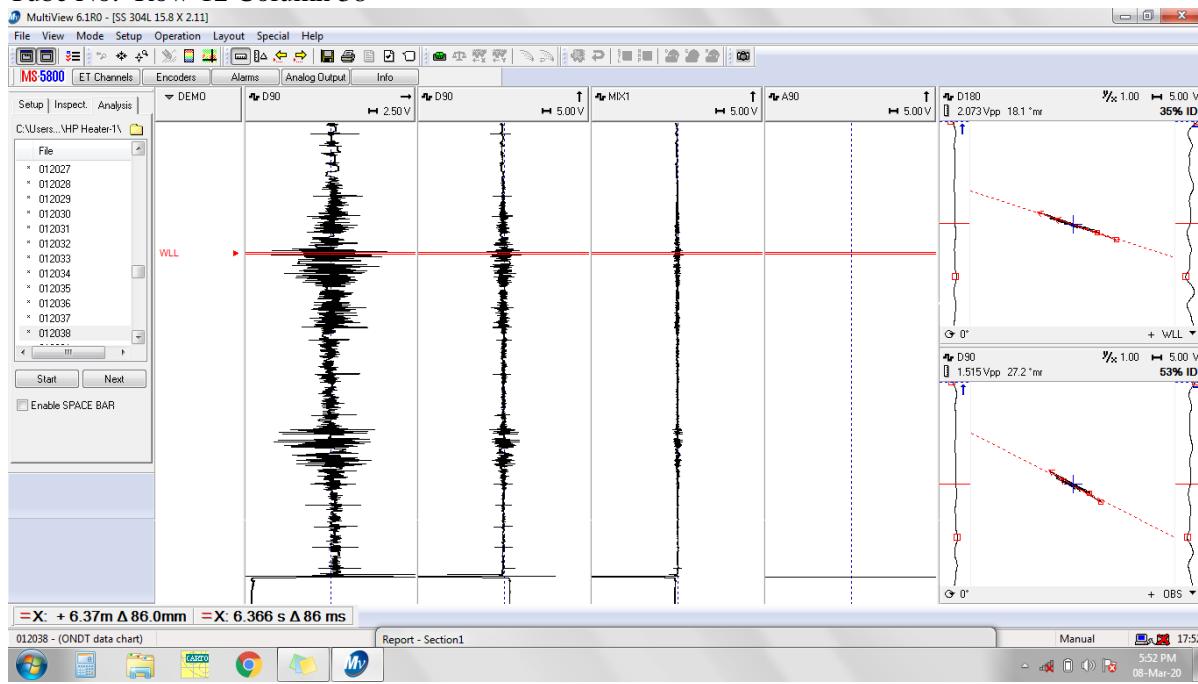
Tube No: Row-5 Column 1



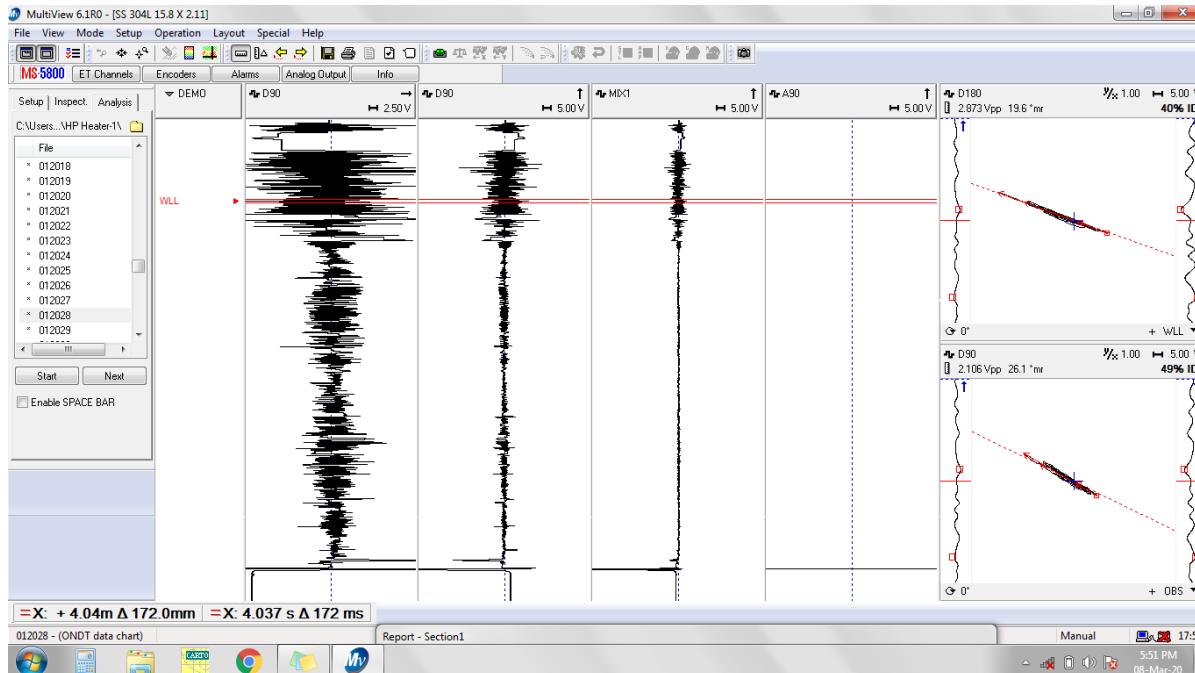
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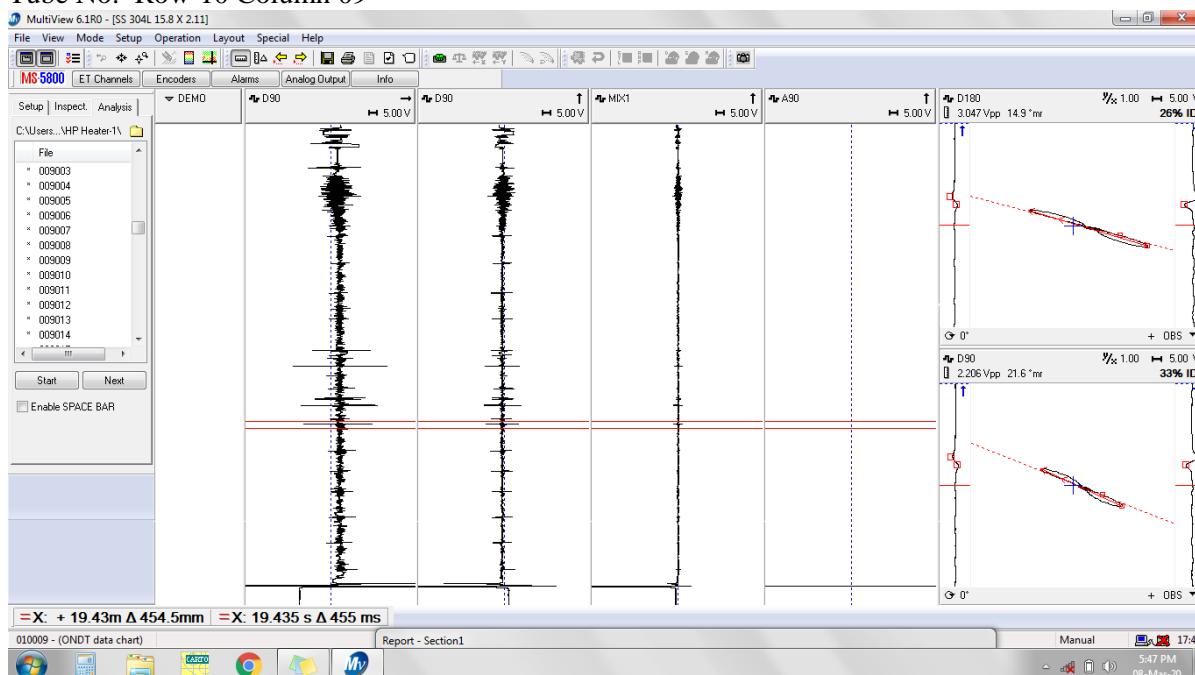
Tube No: Row-12 Column 38



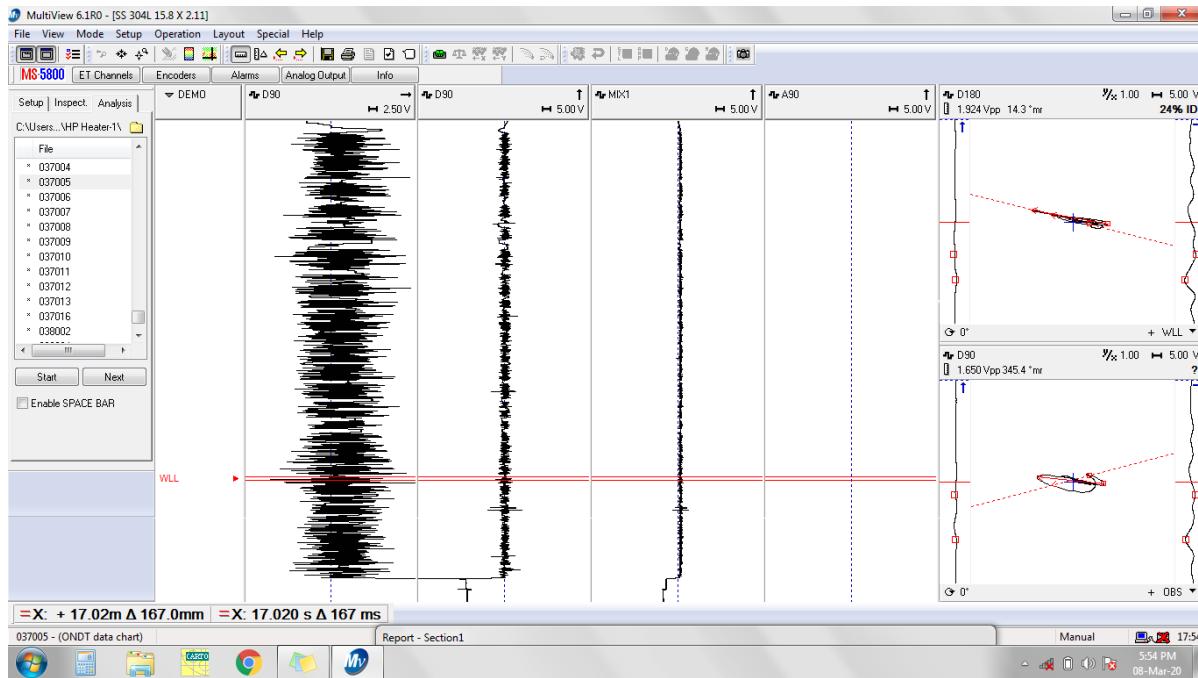
Tube No: Row-12 Column 28



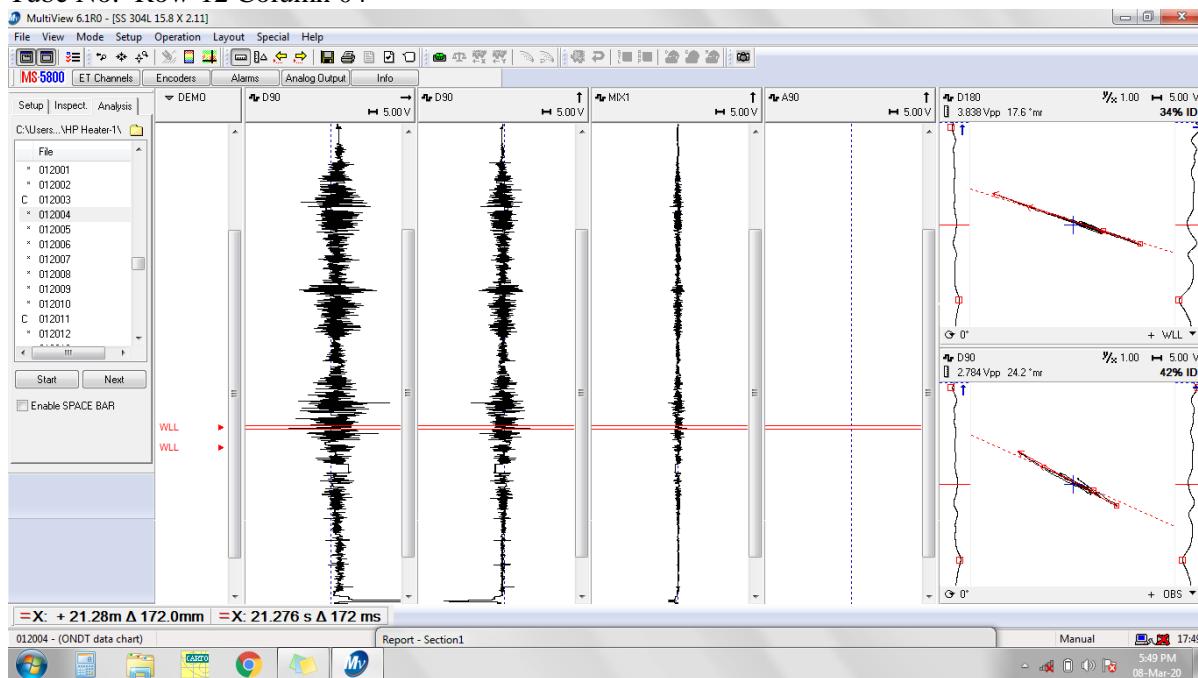
Tube No: Row-10 Column 09



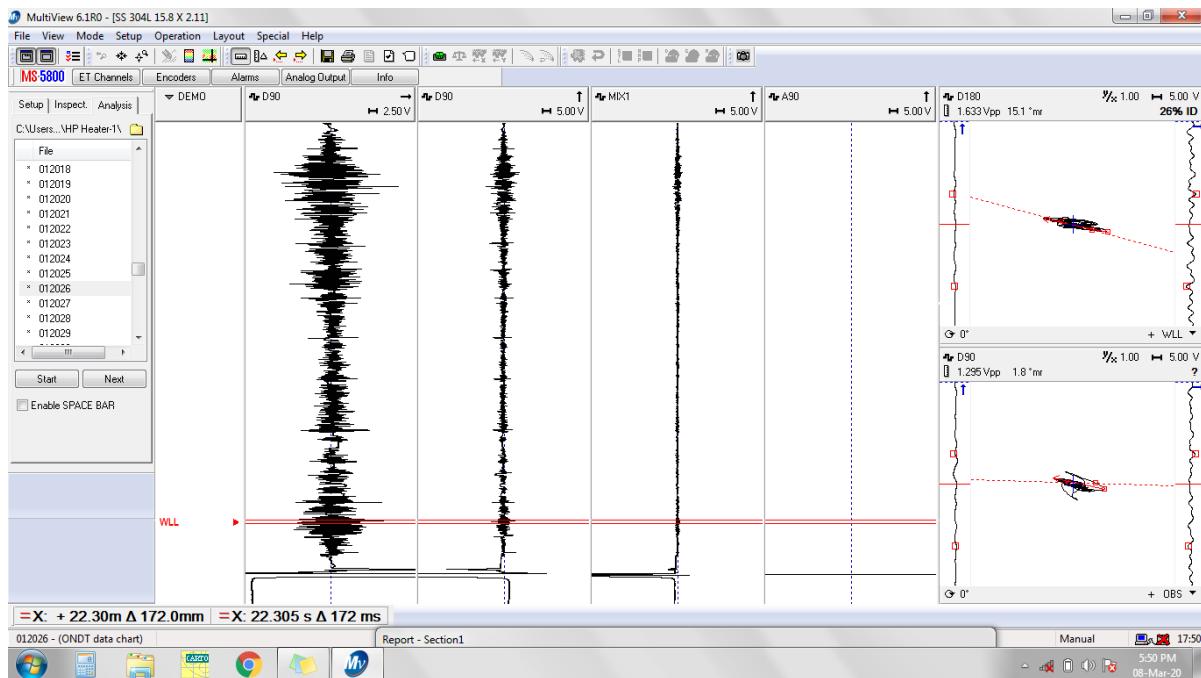
Tube No: Row-37 Column 05



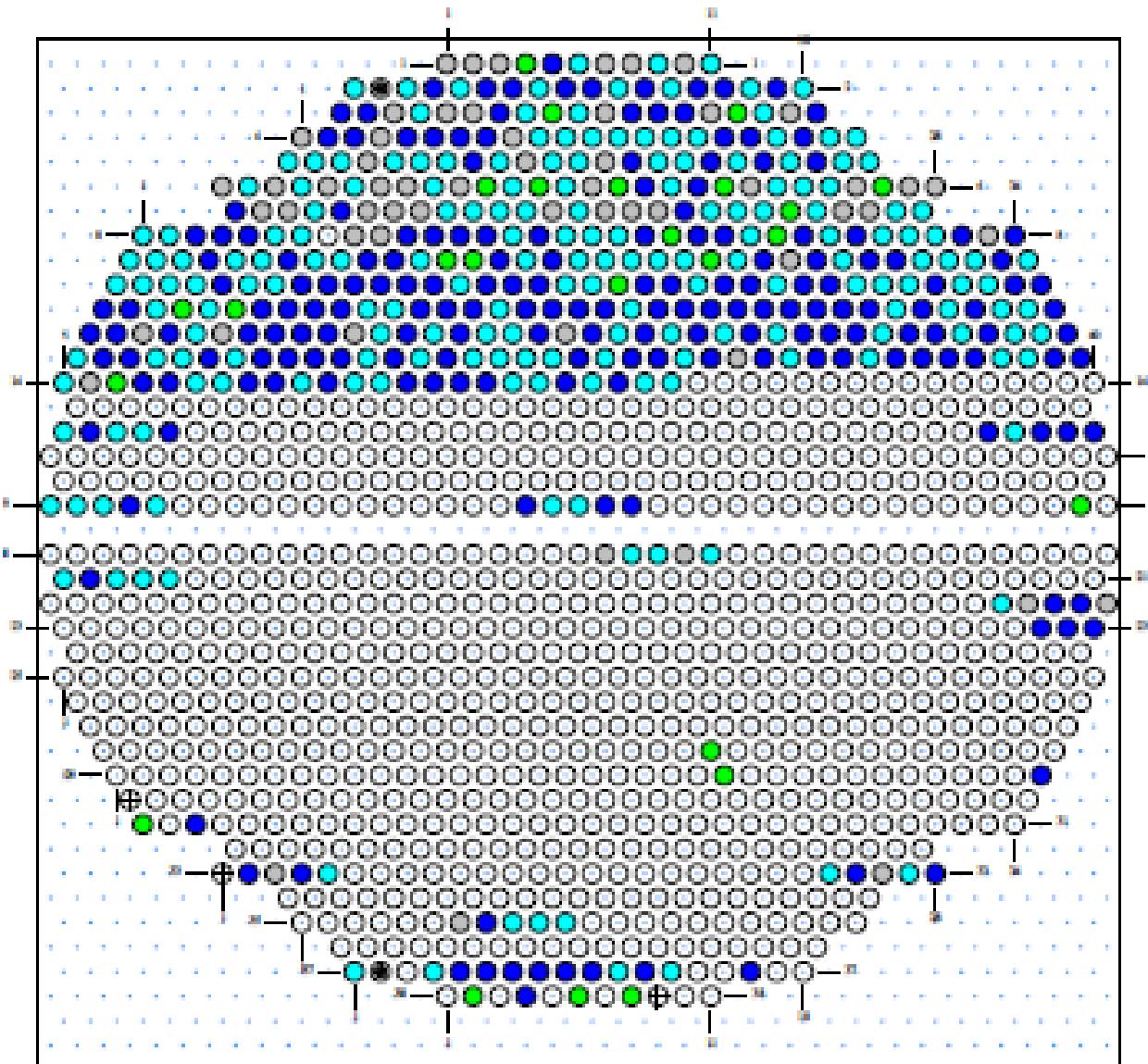
Tube No: Row-12 Column 04



Tube No: Row-12 Column 26



HEAT EXCHANGER DRAWING




 2 ● PLG Plugged
 0 ● 80 < Defect <= 100
 0 ● 60 < Defect <= 80
 23 ● 40 < Defect <= 60

192 ● 20 < Defect <= 40
 189 ● 0 < Defect <= 20
 57 ● No Defect Detected
 3 ● RST: Restricted

748 ○ Not Tested

International Inspection Services Ltd.

NON DESTRUCTIVE TESTING, HEAT TREATMENT, ADVANCED INSPECTION SERVICES,
CALIBRATION SERVICES AND MECHANICAL & METALLURGICAL LAB SERVICES

intertek.com

Form No.: IN-OPF-04 Rev. 13E Dtd. 20-03-2019

LIQUID PENETRANT EXAMINATION REPORT

Report No.:	AD / 53676	Date:	13.03.2020	Page: 1 Of 1
Client :	SHAMS POWER COMPANY	Job No. :	PROJECT :- SHAMS OUTAGE MARCH -2020	
Location :	MADINAT ZAYED	Item :	AS BELOW	
Material :	CS	Ref / Procedure No. :	INS/ASME/PT/001	
Thickness :	VARIOUS	Revision :	22	
Surface condition :	AS WELDED & CLEANED	Test Temp. :	AMBIENT (25°)	
Viewing condition :	DAY LIGHT (>1076 LUX)	Penetrant Type / Technique :	VISIBLE SOLVENT REMOVABLE	
Penetrant dwell time :	10 MIN	Dev. Time:	10 MIN	
Date of test :	13.03.2020	ACCP - Criteria :	ASME SEC VIII DIV-1	
Consumables Type & Batch	MAGNAFLUX - SPOTCHECK			

Penetrant Remover	Penetrant	Developer
SKC-S (BATCH NO-180108) JAN 2021	SKL-SP2 (BATCH NO-171201) DEC 2020	SKD-S2 (BATCH NO-180102) JAN 2021

Observation & Evaluation :

100% DPT WAS CARRIED OUT ON THE FOLLOWING ITEM

LP HEATER-1 (KKS-R1LCC10AC001)

PT WAS DONE ON TUBE END WELD JOINT

NO RELEVANT INDICATION WAS OBSERVED DURING THE TIME OF INSPECTION.

FOUND ACCEPTABLE AS PER THE SPECIFICATION.

RESULT	ACCEPT	REJECT
	<input checked="" type="checkbox"/>	<input type="checkbox"/>

REPORT FORMAT APPLICABLE ONLY FOR AUH & FUJ FACILITY

LEVEL II TECHNICIAN		CLIENT REP		AI / TPI	
Name : AFZAL ANSARI & INAMUL HAQUE	Sign :	Name :	Sign :	Name :	Sign :
Date : 13.03.2020	Level II No. 660	Date :		Date :	
Dubai Branch : P.O Box: 6130, Sharjah, U.A.E	Tel : 04 3241957	Fax : 04 3241957	Email: inspec.dxbcoor@intertek.com	INSPeC IS PART OF INTERTEK GROUP	
Sharjah Branch : P.O Box: 41227, Abu Dhabi, U.A.E	Tel : 06 5061300	Fax : 06 5361173	Email: inspec.shcoor@intertek.com		
Abu Dhabi Branch : P.O Box: 41227, Abu Dhabi, U.A.E	Tel : 02 6225820	Fax : 02 6225820	Email: inspec.adcoor@intertek.com		
Fujairah Branch : P.O Box: 7907, Fujairah, U.A.E	Tel : 09 2238754	Fax: 09 2238754	Email: inspec.fulcoor@intertek.com		
Oman Branch : P.O Box: 193, P.C. 131, Sultanate of Oman	Tel : 00968 2448 2391	Fax: 00968 2448 5855	Email: inspec.muscat@intertek.com		
Registered Office : 33-37 Athol Street, Douglas, IM1, Isle of Man. Company Number 010728V.				For Comments & Suggestions: Please email to suggestions.inspec@intertek.com	

Refer Doc-19 for Intertek General Terms and Conditions of Services. This report is valid only if signed and stamped (Numbered Stamp) by Level II / Level III.

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INSPEC

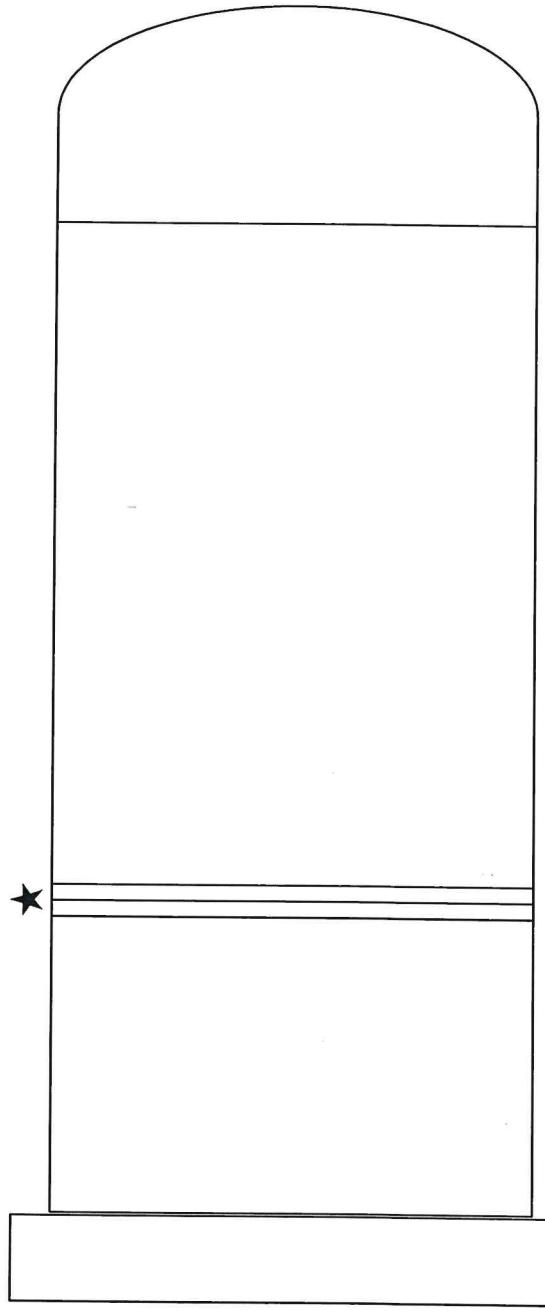
International Inspection Services Ltd

Intertek.com

Date :- 13.03.2020
Report No.: - AD-53676
Page No. :- 2 OF 2

LIQUID PENETRANT EXAMINATION - DRAWING SHEET

LP HEATER-1



★ PT DONE LOCATION

LEVEL II TECHNICIAN
INSPEC
Name :- AFZAL ANSARI
Sign :-
Date :- 13.03.2020



BOROSCOPE TESTING REPORT

CLIENT: SHAMS POWER COMPANY

LP HEATER-2

EQUIPMENT NO: R1LCC20-AC001

REPORT No.: INS/BOR/SHAMS/004/2020

DATE: 13/03/2020



Prepared By:

Reviewed By:

Reviewed By:

Approved By:

INTERTEK INSPEC

INTERTEK INSPEC

CLIENT/TPI

CLIENT

Dubai Branch : P.O.Box: 96535, Dubai, U.A.E
 Sharjah Branch : P.O.Box: 6130, Sharjah, U.A.E
 Abu Dhabi Branch : P.O.Box: 41221, Abu Dhabi, U.A.E
 Fujairah Branch : P.O.Box: 7907, Fujairah, U.A.E
 Oman Branch : P.O.Box: 193, P.C: 131, Sultanate of Oman
 Registered Office : 33-37 Athol Street, Douglas, IM1, 1LB, Isle of Man. Company Number 010728V.

Tel : 04 3241955 Fax: 04 3241957
 Tel : 06 5061300 Fax: 06 5361173
 Tel : 02 6225820 Fax: 02 6225830
 Tel : 09 2238754 Fax: 09 2238754
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 Email: inspec.adhcoor@intertek.com
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 Please email to: suggestions.inspec@intertek.com

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SECTION	DESCRIPTION
1.0	BOROSCOPY TESTING REPORT (INS/BOR/SHAMS/004/2020)
2.0	CERTIFICATES • INSPECTOR CERTIFICATE

1.0 BOROSCOPY TESTING REPORT

a) LP HEATER-2 (R1LCC20-AC001) SHELL SIDE

a) LP HEATER-2 (R1LCC20-AC001) SHELL SIDE



Form No.: IN-OPF-41 Rev. 05 Dtd.: 20-03-2019

BOROSCOPE TESTING REPORT

Report No.:	INS/BOR/SHAMS/004/2020	Date:	13-Mar-20	Page:	1	Of	1
Client :	SHAMS POWER COMPANY	Equipment :	R1LCC20-AC001				
Location :	MADINAT ZAYED						
Item :	LP HEATER-2	Type of construction:	U TUBE				
Equipment :	OLYMPUS IPLEX FX	Specification :					
Serial No. :	Y104888	Photographs :	ATTACHED				

Description :-

Boroscope inspection was carried out on LP HEATER-2 (R1LCC20-AC001)

Observations:-

Refer attachment for details.

Note:-

The above observations were as per the client who had witness the inspection.

TECHNICIAN / INSPECTOR

Name :	SIBIN.V.V
Sign :	
Date :	3/13/2020
Dubai Branch Sharjah Branch Abu Dhabi Branch Fujairah Branch Oman Branch Registered Office	
: P O Box: 96535, Dubai, U.A.E : P O Box: 6130, Sharjah, U.A.E : P O Box: 41227, Abu Dhabi, U.A.E : P O Box: 7907, Fujairah, U.A.E : P O Box: 193, P.C. 131, Sultanate of Oman : 33-37 Athol Street, Douglas, IM1, 1LB, Isle of Man. Company Number 010728V.	

CLIENT REP.

Name :	
Sign :	
Date :	

AI / TPI

Name :	
Sign :	
Date :	
Email: inspec.dxbcoor@intertek.com Email: inspec.shcoor@intertek.com Email: inspec.adhcoor@intertek.com Email: inspec.fujcoor@intertek.com Email: inspec.muscat@intertek.com	
INSPEC IS PART OF INTERTEK GROUP	
For Complaints & Suggestions: Please email to: suggestions.inspec@intertek.com	

Please see terms & conditions. This report is valid only if signed and stamped (Numbered Stamp) by Technician / Inspector

BOROSCOPE INSPECTION REPORT

SHELL-0°	SHELL-90°
 <p>AT120D/FF V96 ZOOM X1.0 BRT 7 2020/03/13 20:58 R01-C01 OLYMPUS</p>	 <p>AT120D/FF V96 ZOOM X1.0 BRT 7 2020/03/13 21:01 R01-C01 OLYMPUS</p>
Observation: Minor scales observed in visual inspection	Observation: Minor scales observed in visual inspection

SHELL-180°	SHELL-270°
 <p>AT120D/FF V96 ZOOM X1.0 BRT 7 2020/03/13 20:59 R01-C01 OLYMPUS</p>	 <p>AT120D/FF V96 ZOOM X1.0 BRT 7 2020/03/13 20:58 R01-C01 OLYMPUS</p>
Observation: Minor scales observed in visual inspection	Observation: Minor scales observed in visual inspection

2.0 CERTIFICATE

**INTERNATIONAL INSPECTION SERVICES LTD
(INTERTEK – INSPEC)
P. O. BOX 96535, DUBAI, U.A.E.**

C E R T I F I C A T E

Date of Assignment : 02nd August 2016

Certificate No : INS/VT/16/858

Issue Date : 02nd August 2016

Expiry Date : 01st August 2021

This is to certify

Mr. SIBIN V.V

Has demonstrated his ability successfully in both written and Practical examinations following training in accordance with the INTERTEK-INSPEC written Practice Document No. INS/SNT/WP/01 Revision 00 which is based on ASNT SNT TC 1A – 2006 edition in the following method and level shown below:

Method : Visual Testing. (Remote Visual Inspection by Fiber Optics)

Level : II (Two)

RESULTS	GRADE
General Examination	85.0%
Specific Examination	85.0%
Practical Examination	86.0%
Total for Average	256.0
Composite	85.33%



This certificate is only valid whilst the above person is employed by INTERTEK-INSPEC.



Intertek- INSPEC Certifying Authority

NDT Level III

Prolongation of validity

Date of renewal	Reference Document	Date of expiry	Examiner	Employer