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TECHNICAL REPORT

MFL Tank Floor Inspection

DEI, Lavrio
Tank T-7
Report No. FTR-4443 Rev. 0

Test Dates: 11-15/7/2022
Report Date: 22/7/2022

FT-GF-7.1.5E(6), Ref.: P 5.3

Revision History		
Rev.	**Date**	**Comments**
0	22/7/2022	First issue.

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DISCLAIMER

The present document is a presentation of the results of the test described and at the conditions described. It is not a certificate and/or suitability of fitness for service for the structure(s) tested. It presents the results and any relevant recommendations and opinions.

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Table of Contents

Executive Summary

This report presents the results of out of service inspection performed by MISTRAS Group Hellas on 11-15/7/2022, at DEI Lavrio, on the Tank T-7.

Work Scope

The following examinations have been carried out:

- Inspection of main floor plates with MFL floor mapping VS2i technique.
- Inspection of annular plates with MFL floor mapping VS2i technique.
- Manual UT inspection of the inner critical zone (100 mm from tank shell), an area which cannot be inspected by the MFL equipment.
- Min/Max values from an area of 100 mm every 3 meters on the outer circumferential of the annular rings.
- Five manual UT measurements per main floor plate and three per annular plate.
- Inspection of all areas near or under obstructions were the floor mapping VS2i scanner has not access using manual UT scanning.
- Follow-up / Verification of all MFL indications above 40% thickness loss.

Inspection of areas covered by patch plates was performed by Visual inspection and spot UT measurements. In overlapped areas Visual Inspection is the primary test method. Where signs of corrosion were detected, spot UT measurements were performed. In both cases indications higher than 40% thickness loss were recorded and reported along with the results of the bottom plates.

The above examinations do not constitute a full internal inspection of the Tank. The following are not included in the scope of work:

- Inspection of the sumps
- Inspection of welds.
- Inspection of pipes.
- Inspection of pipe post plates.

Inspection Results

Main Floor Plates

Six main plates were detected with top and bottom side thickness loss above 40%. Bottom side corrosion was found in plates 2.4, 9.1, 24.2 and 25.2 and top side pitting on plates 11.3 and 16. Furthermore, a hole was found in plate 25.2.

Annular Plates

Bottom side corrosion above 40% was detected in 8 annular plates.
Internal manual UT measurements indicated a plate thickness between 7.6 mm and 8.7 mm.
External manual UT measurements indicates bottom side corrosion all over the chime.
Thickness measurements were between 4.8mm and 8.6mm with the minimum located on A22 annular plate.
Moreover, all over the critical zone areas with weld spatter were present which prevented examination of the full area with manual UT inspection.

Sumps

Neither of the sumps was inspected due to thick layer of remaining sandblast. Client was informed and cleaning was requested but no actions were made as replacement of sumps was scheduled.

Tank Preparation

Tank floor was sandblasted and provided with thin coating (primer) for MFL and UT inspection. Also, critical zone, external chime and the sump was sandblasted prior to UT inspection.

Color Scale

The color scale used in this report is presented below.

Color Palette	THK loss (%)	Main Floor Plates Thickness (mm)	Annular Ring Plates Thickness (mm)
	30 – 39	4.2 - 3.7	5.6 - 4.9
	40 – 49	3.6 - 3.1	4.8 - 4.1
	50 – 59	3.0 - 2.5	4.0 - 3.3
	60 – 69	2.4 - 1.9	3.2 - 2.5
	70 – 79	1.8 - 1.3	2.4 - 1.7
	80 – 89	1.2 - 0.7	1.6 - 0.9
	90 – 100	0.6 - 0.0	0.8 - 0.0

Note

THK loss (%) is calculated according to the nominal plate thickness of 6.0 mm and 8.0 mm.

MFL Floor Mapping Summary Results

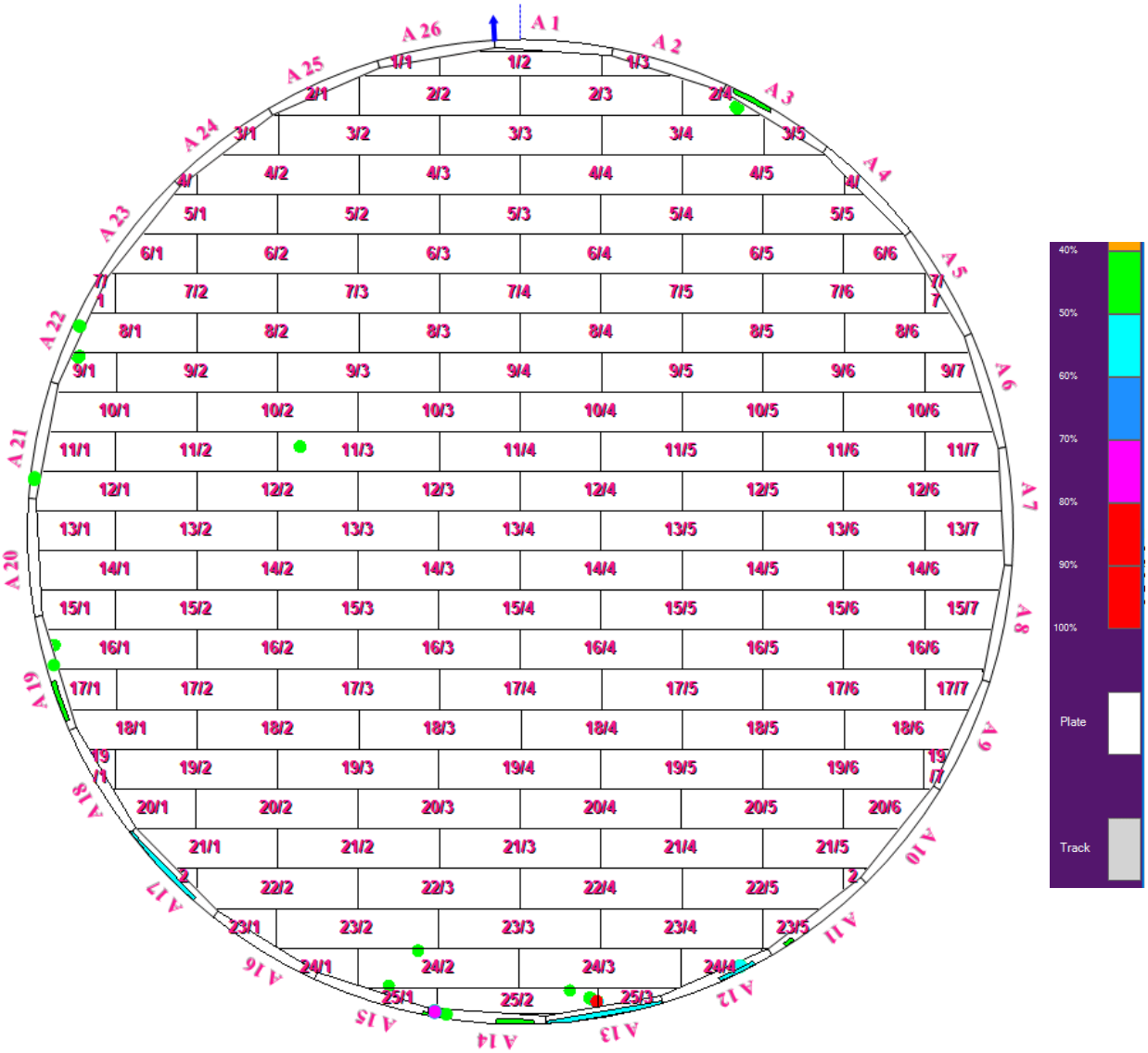

Figure 1 – Tank layout showing plate numbering system and MFL results with thickness loss above 40%. (Displayed discontinuities are not in scale, have been enhanced for viewing purposes)

Note: Due to display limitations, the dimensions of the annular ring plates are not represented according to their real dimensions as they are in the tank. For more information and details see section *'External and Internal Annular UT measurements Correlation Drawing*' on page 31.

Main Floor Plates Summary Results

The following table summarize the results of the main floor plates that were found with bottom side or top side corrosion above 40%, from either MFL (verified by UT) or UT measurements.

Plate Row / Column		MAX % Loss	Corrosion Side		No. Of marked areas > 40%	COMMENTS (MFL / UT / VISUAL)
			Bottom	Top		
2	4	42	✓		1	Bottom side pit
9	1	48	✓		1	Bottom side pit
11	3	40		✓	1	Top side pit with 4.0mm depth
16	1	40		✓	1	Top side pit with 4.0mm depth
24	2	41	✓		2	Two bottom side pits
25	2	100	✓		2	One area with bottom side corrosion and one Hole

Annular Ring Plates Summary Results

The following table summarize the results of the annular ring plates that were found with bottom side or top side corrosion above 40%, from either MFL (verified by UT) or UT measurements.

Annular Ring	MAX % Loss	Side of indication		No. Of marked areas > 40%	COMMENTS (MFL / UT / VISUAL)
		Bottom	Top		
A3	40	✓		1	One large area with extended bottom side corrosion
A11	40	✓		1	One area with bottom side corrosion
A12	59	✓		1	One large area with extended bottom side corrosion up to 59% thickness loss.
A13	55	✓		1	Extended bottom side corrosion all over the critical zone
A14	73	✓		2	One large area with 40% thickness loss and another bottom side pit with 73% thickness loss.
A15	40	✓		1	Small area with bottom side corrosion
A17	55	✓		1	Extended bottom side corrosion all over the critical zone.
A19	45	✓		2	Two areas with bottom side corrosion.

Tank Drawing

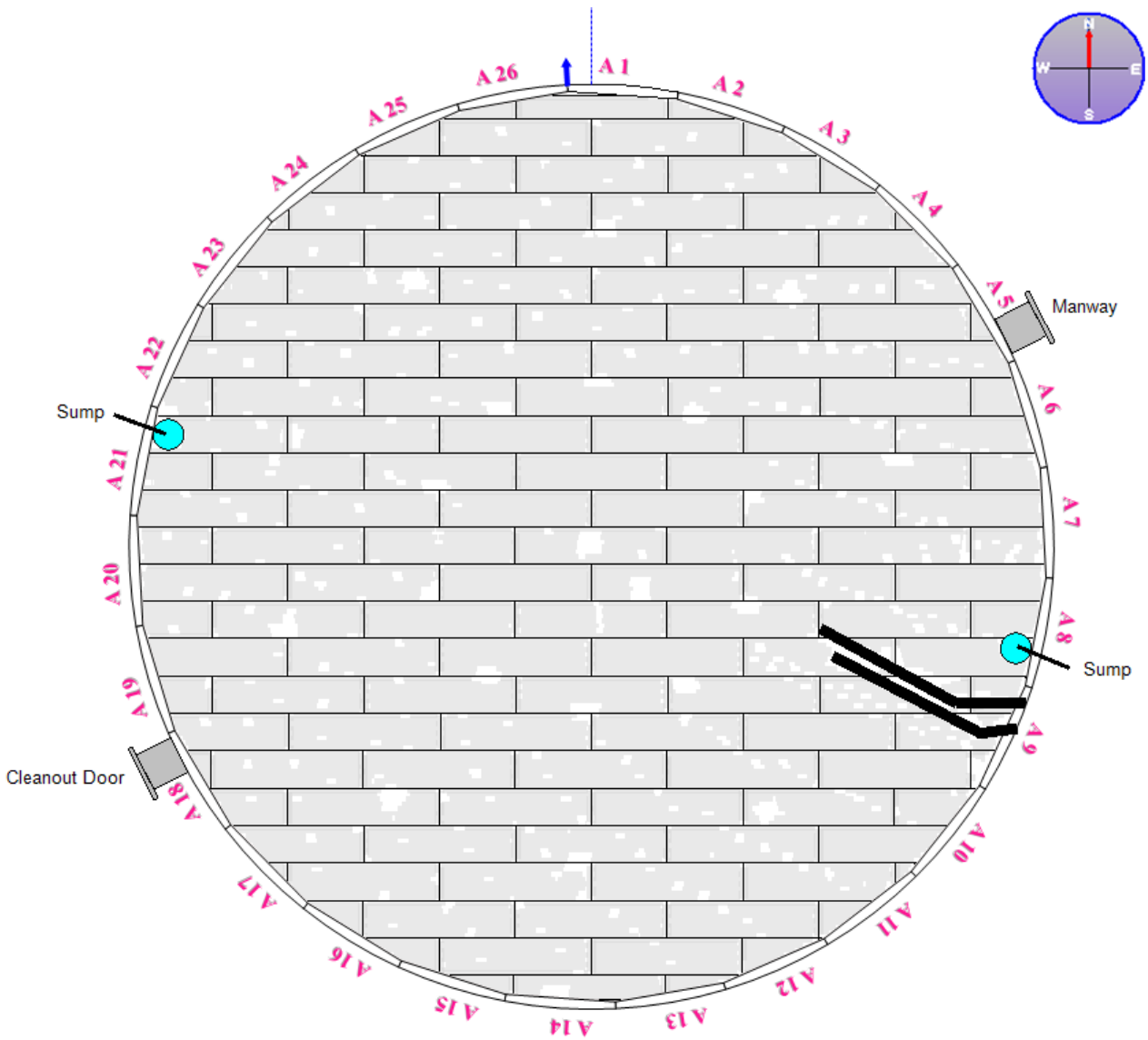

Figure 2 - Tank drawing showing internal piping, roof support, man ways & North direction.

Note: Due to display limitations, the dimensions of the annular ring plates are not represented as they are in the tank. For more information and details see section *'External and Internal Annular UT measurements Correlation Drawing*' on page 31.

MFL Floor Mapping Plate Result

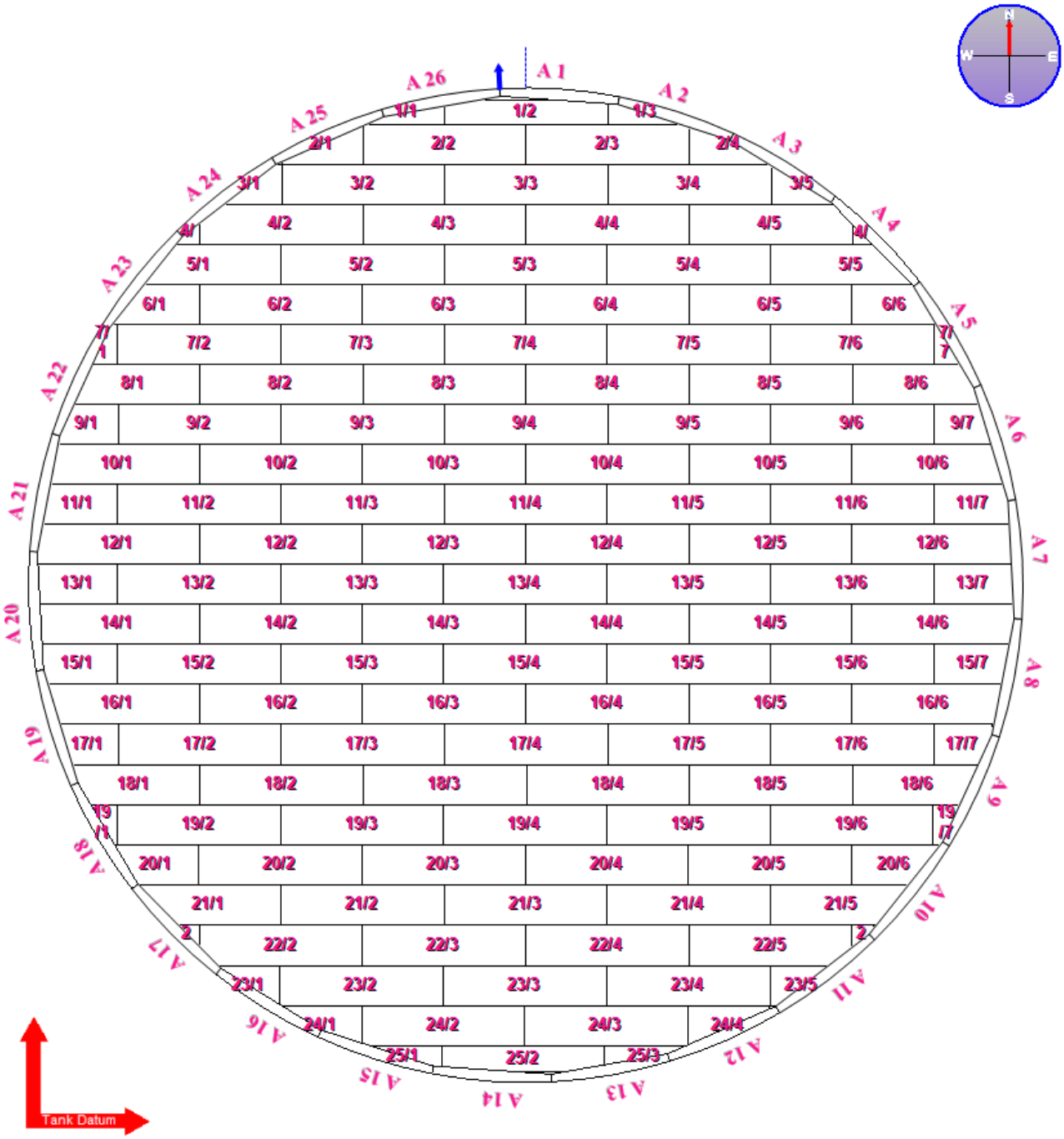

Figure 3 – Tank layout showing plate numbering system

Note: Due to display limitations, the dimensions of the annular ring plates are not represented as they are in the tank. For more information and details see section *'External and Internal Annular UT measurements Correlation Drawing*' on page 31.

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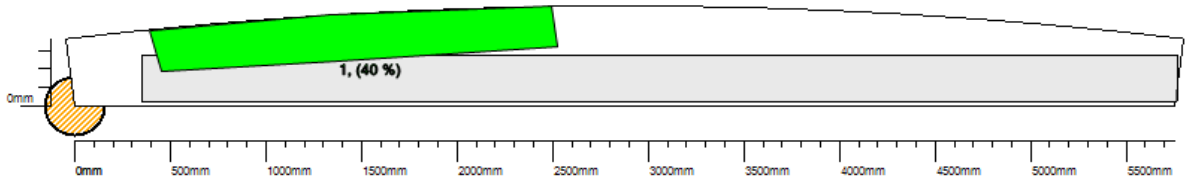
Annular 3

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 40%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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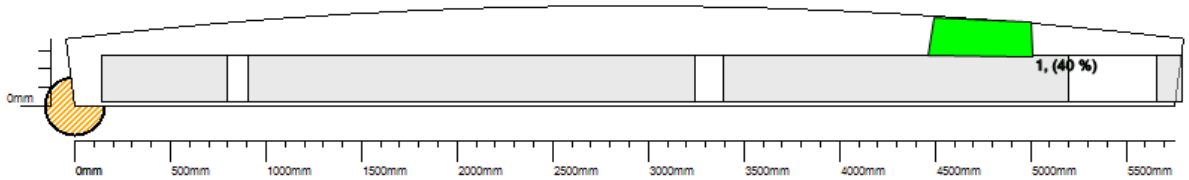
Annular 11

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 40%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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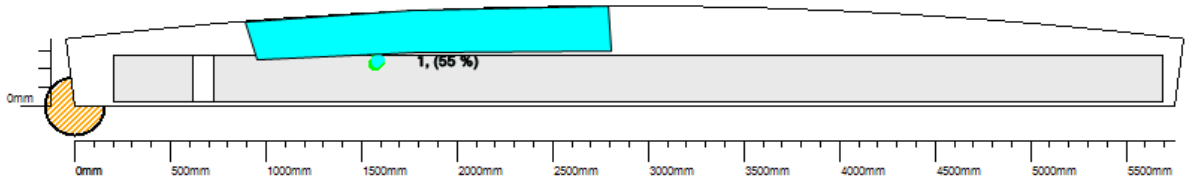
Annular 12

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 55%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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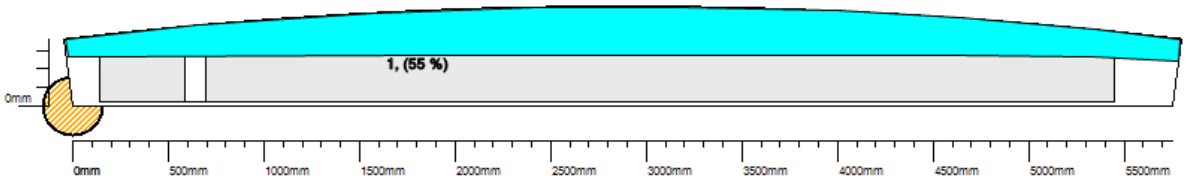
Annular 13

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 55%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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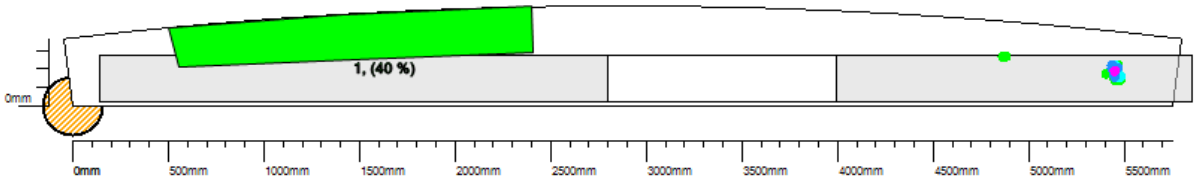
Annular 14

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 40%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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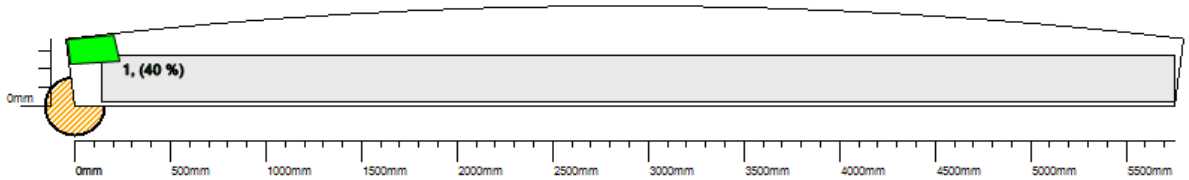
Annular 15

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 40%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

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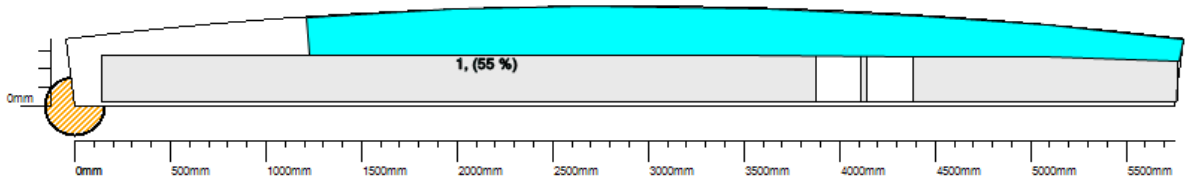
MISTRAS HELLAS A.B.E.E.

Annular 17

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 55%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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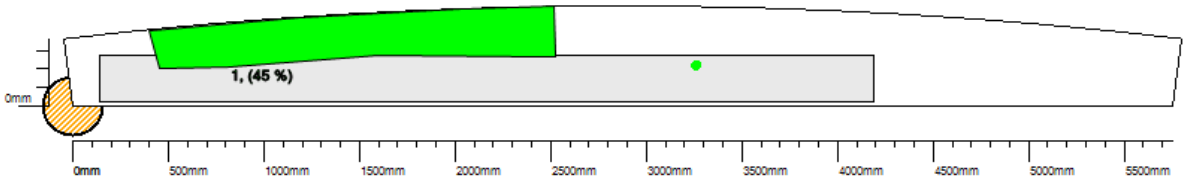
MISTRAS HELLAS A.B.E.E.

Annular 19

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%

M - 1: Loss: 45%
Bottom side corrosion



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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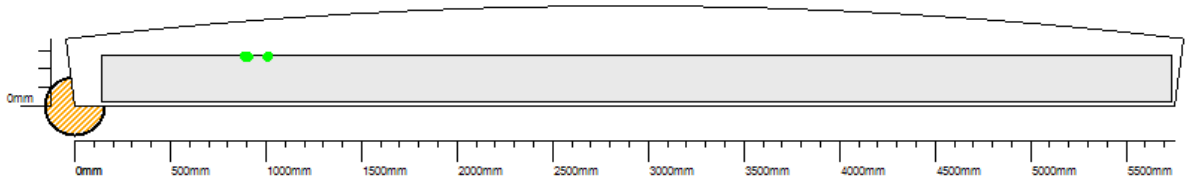
MISTRAS HELLAS A.B.E.E.

Annular 21

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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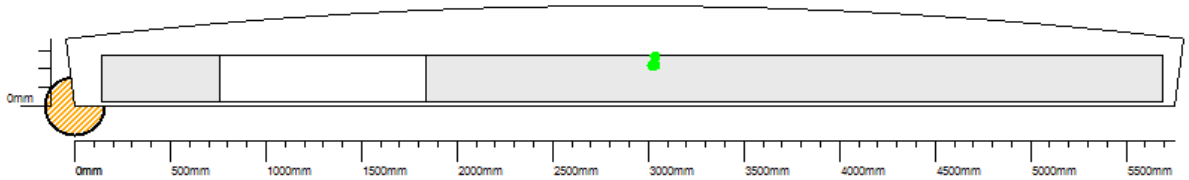
MISTRAS HELLAS A.B.E.E.

Annular 22

Tank No7
Date
Location LAVRIO
Client DEH
Operator JDA
Equipment Serial 2861013
Showing defects from TOP & BOTTOM
Number of tracks 1
Start corner 2
Side offset 25
Length 5938
Width 367
Lower Threshold: 40%
Upper Threshold: 100%
Import Threshold: 20%



Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

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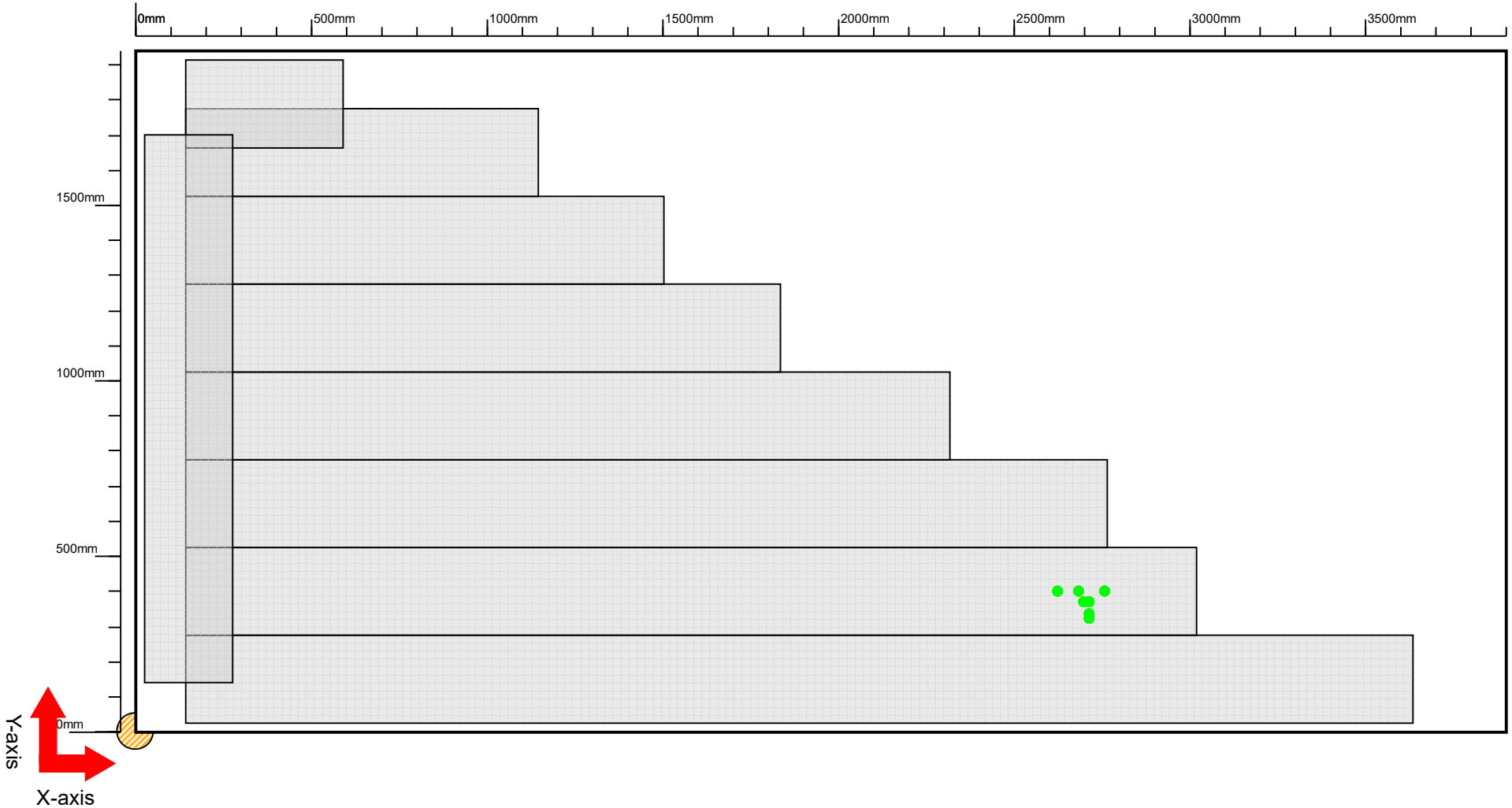

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MISTRAS HELLAS A.B.E.E.

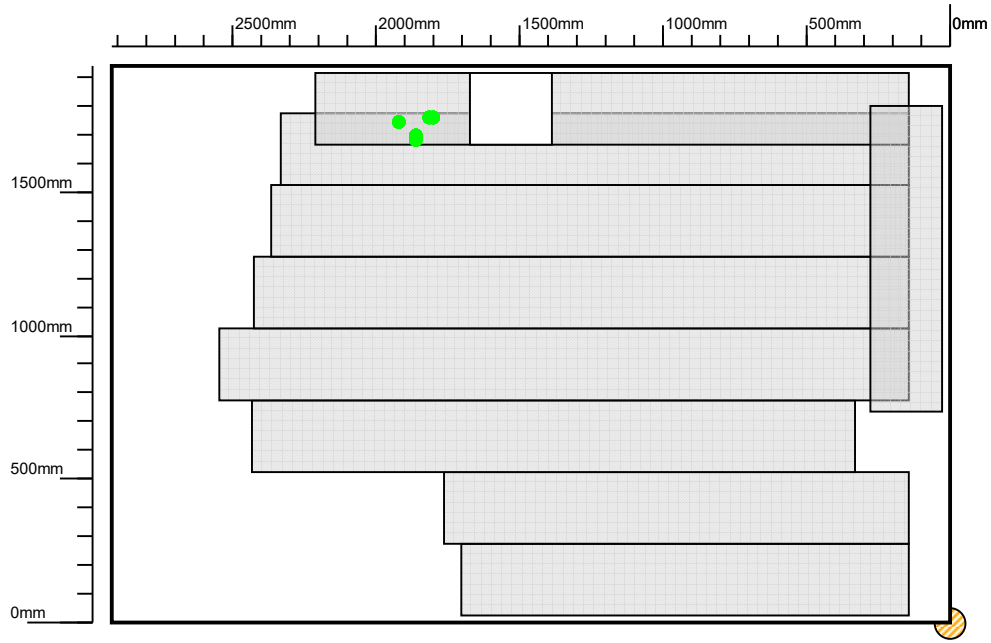
Row:	2	**Plate:**	4
Plate Length (mm):	3900	**Plate Width (mm):**	1940
Orientation:	Horizontal	**Scan Method:**	Parallel
Max discontinuity:	42	**Showing defects from:**	**TOP & BOTTOM**
Lower Threshold:	40%	**Upper Threshold:**	100% **(Import Threshold: 20%)**
Defect enhancment setting:	**7**		
Tank:	No7	**Operator:**	JDA
Date:		**Equipment Serial:**	2861013
Location:	LAVRIO		
Company:	MISTRAS		
Client:	DEH		

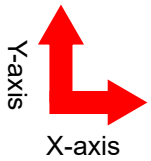
Discontinuity Colour Scheme

- 40% - 49%
- 50% - 59%
- 60% - 69%
- 70% - 79%
- 80% - 89%
- 90% - 100%
- Weld Discontinuity

Symbols

- Track
- Non-Scanned Area
- Plate Reference
- Tank Reference





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MISTRAS HELLAS A.B.E.E.

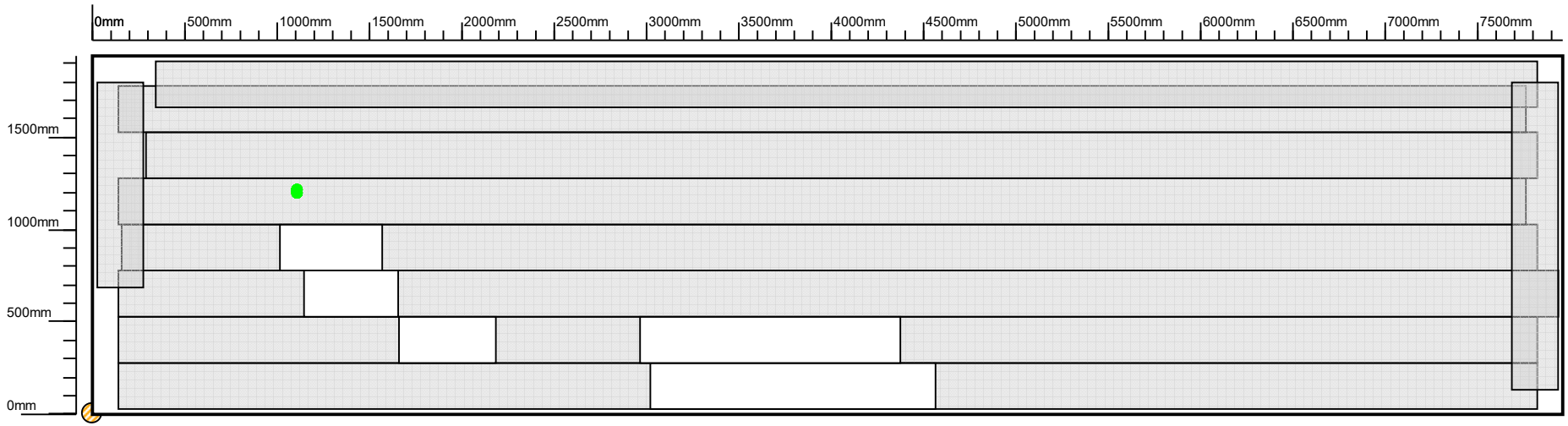
Row:	9	**Plate:**	1
Plate Length (mm):	2920	**Plate Width (mm):**	1940
Orientation:	Horizontal	**Scan Method:**	Parallel
Max discontinuity:	45	**Showing defects from:**	**TOP & BOTTOM**
Lower Threshold:	40%	**Upper Threshold:**	100% **(Import Threshold: 20%)**
Defect enhancment setting:	**7**		
Tank:	No7	**Operator:**	JDA
Date:		**Equipment Serial:**	2861013
Location:	LAVRIO		
Company:	MISTRAS		
Client:	DEH		

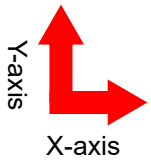
Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

Symbols

Track
Non-Scanned Area
Plate Reference
Tank Reference





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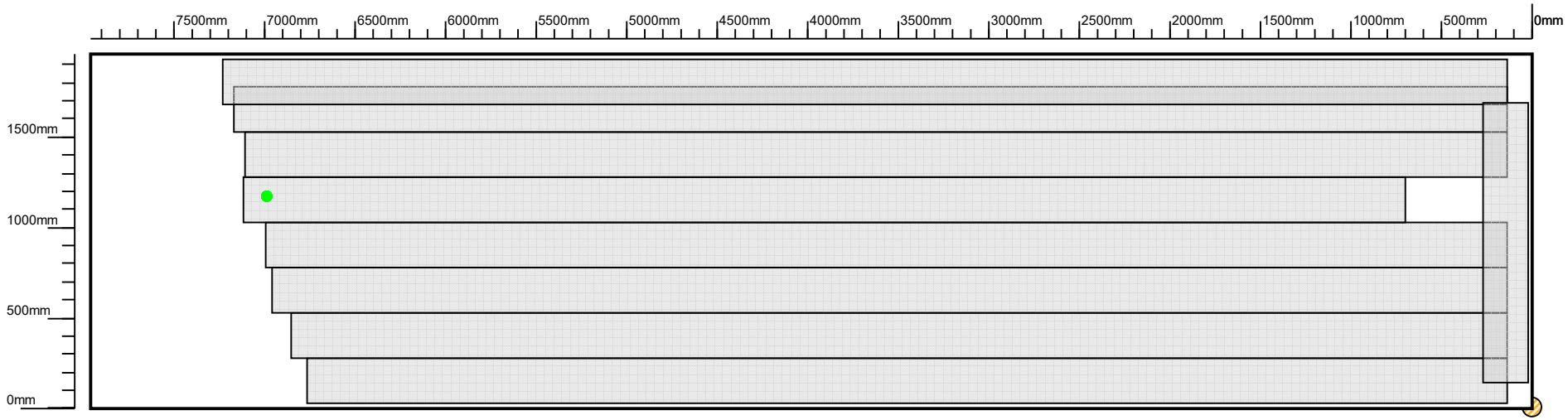
Row:	11	**Plate:**	3
Plate Length (mm):	7960	**Plate Width (mm):**	1940
Orientation:	Horizontal	**Scan Method:**	Raster
Max discontinuity:	43	**Showing defects from:**	**TOP & BOTTOM**
Lower Threshold:	40%	**Upper Threshold:**	100% **(Import Threshold: 20%)**
Defect enhancment setting:	**7**		
Tank:	No7	**Operator:**	JDA
Date:		**Equipment Serial:**	2861013
Location:	LAVRIO		
Company:	MISTRAS		
Client:	DEH		

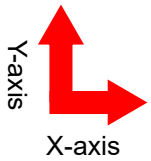
Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

Symbols

Track
Non-Scanned Area
Plate Reference
Tank Reference





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MISTRAS HELLAS A.B.E.E.

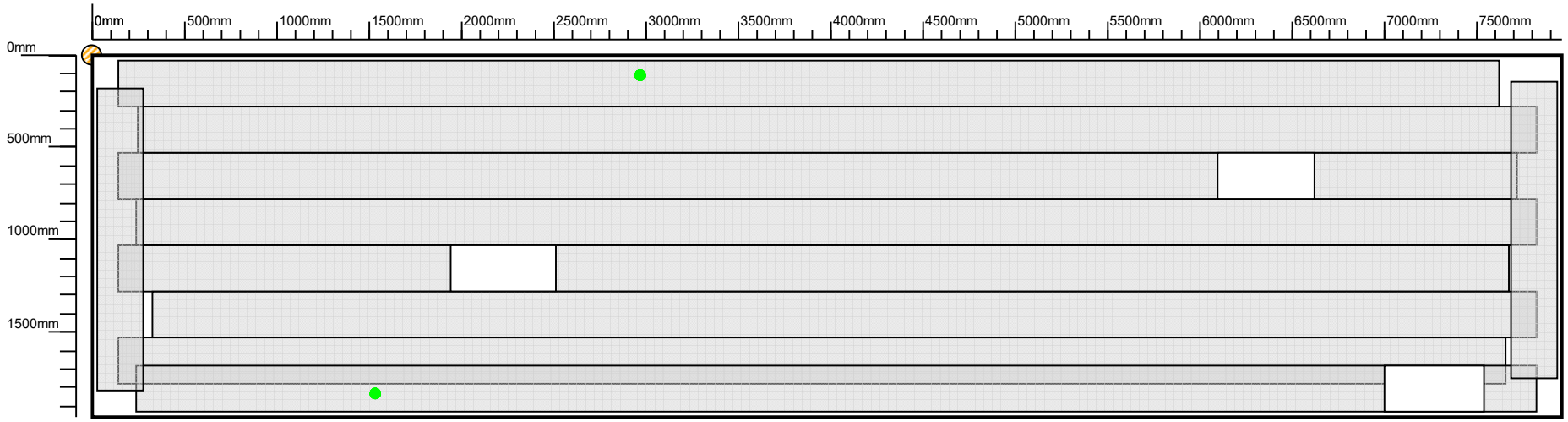
Row:	16	**Plate:**	1
Plate Length (mm):	7960	**Plate Width (mm):**	1960
Orientation:	Horizontal	**Scan Method:**	Parallel
Max discontinuity:	42	**Showing defects from:**	**TOP & BOTTOM**
Lower Threshold:	40%	**Upper Threshold:**	100% **(Import Threshold: 20%)**
Defect enhancment setting:	**7**		
Tank:	No7	**Operator:**	JDA
Date:		**Equipment Serial:**	2861013
Location:	LAVRIO		
Company:	MISTRAS		
Client:	DEH		

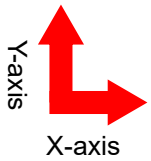
Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

Symbols

Track
Non-Scanned Area
Plate Reference
Tank Reference





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MISTRAS HELLAS A.B.E.E.

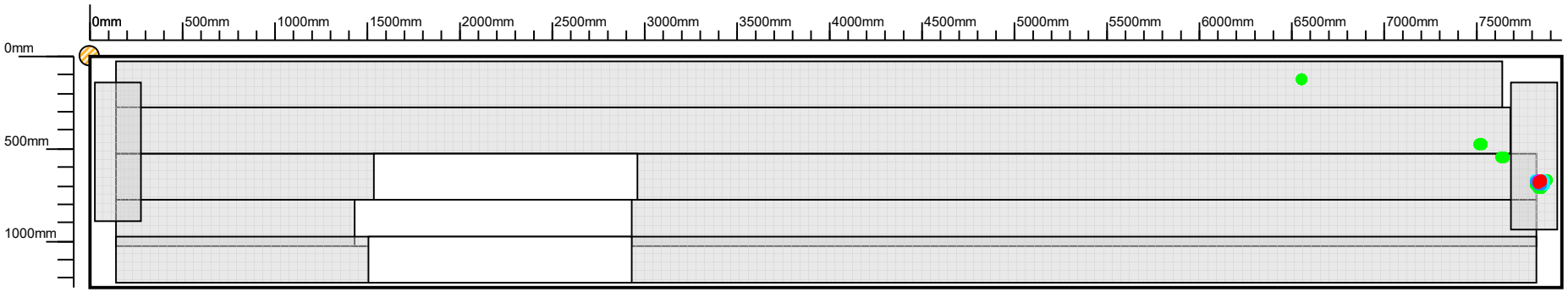
Row:	24	**Plate:**	2
Plate Length (mm):	7960	**Plate Width (mm):**	1960
Orientation:	Horizontal	**Scan Method:**	Raster
Max discontinuity:	41	**Showing defects from:**	**TOP & BOTTOM**
Lower Threshold:	40%	**Upper Threshold:**	100% **(Import Threshold: 20%)**
Defect enhancment setting:	**7**		
Tank:	No7	**Operator:**	JDA
Date:		**Equipment Serial:**	2861013
Location:	LAVRIO		
Company:	MISTRAS		
Client:	DEH		

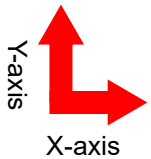
Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

Symbols

Track
Non-Scanned Area
Plate Reference
Tank Reference





Eddyfi Technologies

MISTRAS HELLAS A.B.E.E.

Row:	25	**Plate:**	2
Plate Length (mm):	7960	**Plate Width (mm):**	1250
Orientation:	Horizontal	**Scan Method:**	Parallel
Max discontinuity:	100	**Showing defects from:**	**TOP & BOTTOM**
Lower Threshold:	40%	**Upper Threshold:**	100% **(Import Threshold: 20%)**
Defect enhancment setting:	**7**		
Tank:	No7	**Operator:**	JDA
Date:		**Equipment Serial:**	2861013
Location:	LAVRIO		
Company:	MISTRAS		
Client:	DEH		

Discontinuity Colour Scheme

40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

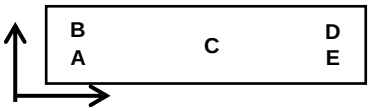
Symbols

Track
Non-Scanned Area
Plate Reference
Tank Reference

APPENDIX A: Manual UT Results

Manual UT Measurements on Floor Plates

Manual UT measurements were performed on five positions of each main plate. During the time of the inspection none of the inspected plates found with significant thickness loss.



Row / Meas. Point		Plate						
		1	2	3	4	5	6	7
1	A	6,2	6,3	6,3				
	B	6,3	6,3	6,2				
	C	6,1	6,2	6,0				
	D	6,2	6,2	6,3				
	E	6,3	6,3	6,3				
2	A	6,3	6,2	6,1	6,3			
	B	6,3	6,3	6,3	6,3			
	C	6,4	6,3	6,3	6,3			
	D	6,0	6,1	6,0	6,3			
	E	6,4	6,3	6,4	6,3			
3	A	6,4	6,3	6,3	6,4	6,3		
	B	6,3	6,2	6,2	6,3	6,3		
	C	6,4	6,2	6,3	6,3	6,2		
	D	6,4	6,2	6,3	6,2	6,3		
	E	6,4	6,2	6,3	6,2	6,1		
4	A	6,2	6,2	6,3	6,3	6,3	6,2	
	B	6,2	6,3	6,3	6,3	6,3	6,3	
	C	6,2	6,4	6,3	6,3	6,3	6,2	
	D	6,2	6,3	6,3	6,3	6,3	6,2	
	E	6,1	6,4	6,4	6,3	6,3	6,3	
5	A	6,2	6,2	6,3	6,3	6,1		
	B	6,2	6,2	6,3	6,2	6,1		
	C	6,2	6,3	6,3	6,3	6,3		
	D	6,2	6,4	6,3	6,2	6,1		
	E	6,2	6,3	6,3	6,3	6,3		
6	A	6,2	6,3	6,4	6,4	6,2	6,3	
	B	6,2	6,3	6,4	6,3	6,3	6,3	
	C	6,2	6,3	6,4	6,3	6,4	6,4	
	D	6,0	6,3	6,4	6,4	6,3	6,4	
	E	6,2	6,4	6,4	6,3	6,3	6,4	

Row / Meas. Point		Plate						
		1	2	3	4	5	6	7
7	A	6,3	6,3	6,3	6,4	6,5	6,5	6,4
	B	6,3	6,1	6,3	6,3	6,5	6,5	6,4
	C	6,3	6,4	6,4	6,4	6,4	6,5	6,3
	D	6,1	6,4	6,4	6,4	6,4	6,5	6,4
	E	6,1	6,3	6,4	6,4	6,4	6,5	6,3
8	A	6,3	6,3	6,3	6,4	6,4	6,4	
	B	6,3	6,3	6,3	6,4	6,4	6,4	
	C	6,3	6,3	6,3	6,3	6,3	6,3	
	D	6,3	6,3	6,3	6,3	6,4	6,2	
	E	6,3	6,4	6,3	6,4	6,4	6,4	
9	A	6,3	6,4	6,4	6,4	6,4	6,4	6,4
	B	6,3	6,3	6,4	6,4	6,3	6,3	6,4
	C	6,3	6,3	6,3	6,3	6,4	6,3	6,3
	D	6,3	6,3	6,3	6,3	6,3	6,2	6,4
	E	6,3	6,4	6,3	6,4	6,4	6,3	6,3
10	A	6,2	6,3	6,2	6,3	6,2	6,3	
	B	6,1	6,3	6,3	6,2	6,2	6,2	
	C	6,3	6,2	6,3	6,2	6,2	6,3	
	D	6,2	6,2	6,2	6,1	6,2	6,3	
	E	6,2	6,2	6,3	6,2	6,3	6,3	
11	A	6,3	6,2	6,4	6,4	6,4	6,4	6,4
	B	6,3	6,2	6,4	6,3	6,4	6,3	6,5
	C	6,4	6,4	6,3	6,4	6,4	6,4	6,4
	D	6,3	6,4	6,3	6,3	6,4	6,4	6,4
	E	6,3	6,4	6,4	6,4	6,4	6,4	6,3
12	A	6,2	6,4	6,2	6,4	6,2	6,3	
	B	6,3	6,4	6,2	6,5	6,2	6,4	
	C	6,3	6,4	6,2	6,4	6,2	6,3	
	D	6,4	6,4	6,3	6,4	6,2	6,4	
	E	6,3	6,4	6,3	6,4	6,2	6,3	
13	A	6,3	6,1	6,2	6,5	6,2	6,2	6,3
	B	6,2	6,2	6,2	6,4	6,2	6,1	6,3
	C	6,3	6,2	6,3	6,4	6,1	6,1	6,2
	D	6,3	6,1	6,2	6,3	6,1	6,1	6,3
	E	6,4	6,2	6,2	6,4	6,3	6,1	6,3
14	A	6,3	6,3	6,4	6,4	6,2	6,3	
	B	6,2	6,4	6,4	6,3	6,3	6,1	
	C	6,3	6,4	6,4	6,4	6,3	6,3	
	D	6,1	6,3	6,4	6,4	6,4	6,2	

Row / Meas. Point		Plate						
		1	2	3	4	5	6	7
	E	6,3	6,4	6,4	6,4	6,3	6,3	
15	A	6,1	6,2	6,3	6,3	6,1	6,4	6,3
	B	6,4	6,3	6,3	6,4	6,2	6,3	6,4
	C	6,2	6,3	6,3	6,4	6,3	6,3	6,3
	D	6,4	6,2	6,4	6,3	6,4	6,3	6,4
	E	6,3	6,3	6,4	6,3	6,3	6,4	6,3
16	A	6,4	6,4	6,4	6,3	6,3	6,4	
	B	6,4	6,3	6,4	6,4	6,3	6,4	
	C	6,4	6,4	6,4	6,4	6,4	6,3	
	D	6,4	6,4	6,4	6,3	6,3	6,3	
	E	6,4	6,4	6,3	6,3	6,4	6,3	
17	A	6,3	6,3	6,3	6,3	6,4	6,5	6,4
	B	6,3	6,2	6,4	6,3	6,3	6,4	6,4
	C	6,3	6,3	6,3	6,3	6,3	6,5	6,4
	D	6,3	6,3	6,3	6,4	6,4	6,4	6,4
	E	6,1	6,4	6,3	6,4	6,5	6,4	6,4
18	A	6,3	6,3	6,4	6,4	6,4	6,4	
	B	6,3	6,4	6,3	6,4	6,5	6,3	
	C	6,2	6,4	6,4	6,4	6,3	6,4	
	D	6,3	6,4	6,4	6,4	6,3	6,2	
	E	6,3	6,4	6,4	6,4	6,4	6,3	
19	A	6,4	6,3	6,4	6,5	6,4	6,4	6,3
	B	6,4	6,4	6,4	6,6	6,4	6,4	6,4
	C	6,3	6,3	6,4	6,4	6,5	6,4	6,4
	D	6,4	6,4	6,4	6,5	6,4	6,4	6,4
	E	6,4	6,4	6,4	6,5	6,4	6,4	6,3
20	A	6,3	6,1	6,4	6,3	6,4	6,2	
	B	6,3	6,1	6,4	6,4	6,4	6,1	
	C	6,3	6,4	6,5	6,4	6,3	6,2	
	D	6,2	6,5	6,3	6,4	6,3	6,2	
	E	6,1	6,4	6,4	6,4	6,3	6,2	
21	A	6,4	6,4	6,3	6,3	6,4		
	B	6,3	6,4	6,3	6,2	6,3		
	C	6,3	6,4	6,2	6,4	6,3		
	D	6,3	6,4	6,1	6,5	6,3		
	E	6,4	6,4	6,3	6,4	6,3		
22	A	6,5	6,1	6,2	6,3	6,3	6,2	
	B	6,4	6,3	6,3	6,3	6,4	6,3	
	C	6,2	6,0	6,3	6,4	6,4	6,3	
	D	6,4	6,4	6,4	6,4	6,3	6,3	

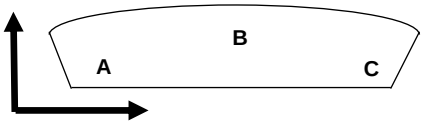
Row / Meas. Point		Plate						
		1	2	3	4	5	6	7
	E	6,5	6,2	6,3	6,3	6,4	6,2	
23	A	6,3	5,8	6,2	6,3	6,2		
	B	6,3	6,3	6,3	6,3	6,3		
	C	6,3	6,1	6,3	6,4	6,4		
	D	6,2	6,2	6,3	6,3	6,3		
	E	6,4	6,0	6,4	6,3	6,3		
24	A	6,3	6,3	6,3	6,3			
	B	6,4	6,3	6,3	6,3			
	C	6,3	6,3	6,3	6,3			
	D	6,4	6,2	6,2	6,3			
	E	6,3	6,3	6,3	6,4			
25	A	6,3	6,3	6,3				
	B	6,2	6,3	6,3				
	C	6,2	6,3	6,3				
	D	6,3	6,3	6,3				
	E	6,3	6,4	6,3				

(Yellow highlighted measurements indicate plate thickness loss above 40%)

Manual UT Measurements on Annular Ring Plates

Manual UT measurements were performed in three positions of each annular plate (A, B, C), as well as every 3 meters on the external circumferential of the annular ring and in the internal critical zone (0 mm to 100 mm from tank shell) of the annular plates.

TML point 1 is located at the center of North-East manway.



Annular plate	CRITICAL ZONE		Internal UT measurements			External UT measurements		
No.	MIN (mm)	MAX (mm)	A	B	C	TML No	Min (mm)	Max (mm)
A1	6,4	8,3	8,1	8,2	8,1	44	5,8	6,4
						45	6,0	7,0
A2	6,2	8,1	8,3	8,1	8,1	46	5,4	7,2
						47	5,2	7,0
A3	4,8	8,1	8,3	8,1	8,3	48	5,8	6,5
						49	5,2	6,1
A4	5,7	8,1	8,5	8,4	8,4	50	5,2	6,9
						51	5,8	6,3
A5	5,6	8,0	8,1	8,1	8,1	1	5,2	6,5
						2	N/A	N/A
A6	5,2	8,2	7,9	8,2	7,6	3	5,0	7,00
						4	5,8	6,8
A7	5,4	8,1	7,9	8,2	8,0	5	5	6,8
						6	N/A	N/A
A8	6,5	8,1	8,1	8,0	8,3	7	N/A	N/A
							N/A	N/A
A9	6,3	8,3	8,4	8,2	8,2	8	N/A	N/A
						9	N/A	N/A
A10	6,0	8,1	7,9	8,2	8,0	10	5,6	7,9
						11		
A11	4,8	8,2	8,1	8,2	8,1	12	5,5	7,2
						13	5,9	7,1
A12	4,3	8,2	8,2	8,3	8,0	14	5,8	7,1
						15	5,8	6,7
A13	3,8	8,1	8,2	8,1	8,2	16	5,2	6,9
						17	5,9	7,0
A14	4,8	8,3	8,1	8,5	8,6	18	5,9	6,8
						19	5,4	6,7

Annular plate	CRITICAL ZONE		Internal UT measurements			External UT measurements		
No.	MIN (mm)	MAX (mm)	A	B	C	TML No	Min (mm)	Max (mm)
A15	4,8	8,2	8,3	8,2	8,2	20	6,0	6,8
						21	5,2	6,8
A16	5,2	8,2	8,1	8,3	8,1	22	5,7	7,0
						23	6,0	7,0
A17	3,8	8,1	8,1	8,2	8,0	24	N/A	N/A
						25	N/A	N/A
A18	8,2	8,4	8,5	8,6	8,6	26	N/A	N/A
						27	N/A	N/A
A19	4,5	8,5	8,4	8,4	8,5	28	5,6	6,9
						29	5,9	7,1
A20	5,6	8,4	8,3	8,5	8,4	30	5,85	7,2
						31	5,75	8,5
A21	5,2	8,2	8,3	8,2	8,4	32	5,2	8,5
						33	5,95	6,7
A22	5,6	8,2	8,5	8,3	8,7	34	6,2	8,0
						35	4,8	7,6
A23	6,7	8,8	8,3	8,5	8,3	36	5,5	8,6
						37	5,45	7,9
A24	6,0	8,7	8,7	8,5	8,6	38	5,2	8,6
						39	6,4	7,9
A25	6,0	8,5	8,4	8,6	8,4	40	6,5	7,9
						41	6,0	8,3
A26	6,1	8,3	8,1	8,1	8,0	42	5,4	7,5
						43	6,4	7,2

(Yellow highlighted measurements indicate plate thickness loss above 40%)

External and Internal Annular UT measurements Correlation Drawing

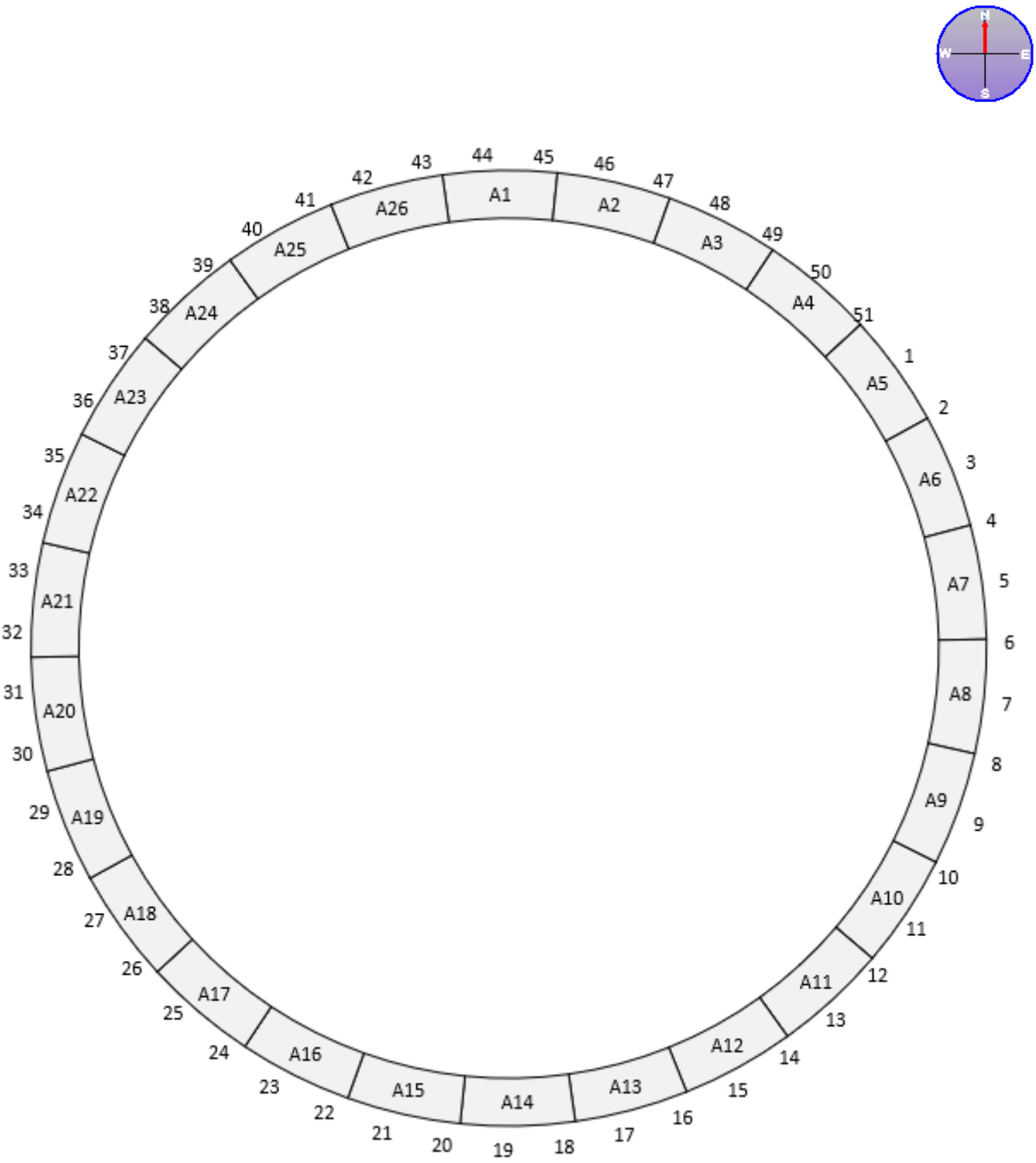


Figure 4 - The position numbers for the external UT thickness measurements are counted clockwise starting from the datum point 1, which start at the center of the north-east manway.

APPENDIX B: Information Summary

General Information	
Owner	DEI
Contractor	MISTRAS Group Hellas ABEE
Location	Lavrio
Inspection Procedure	MISTRAS Internal Procedure FT-IP-7.1.4E(2)

Equipment Information			
Type	Tank	***ID***	T-7
Material	Carbon Steel	***Build Code***	API 650
Nom. Thickness Main Tank floor plates	6.0 mm	***Nom. Thickness Annular Ring floor plates***	8.0 mm
Diameter	O.D. 49350 mm	***Height***	
Year Build	n/c	***Roof type***	Fixed
Coating (Yes/No) if any	Yes	***Insulation***	No
Product store	Fuel Oil		

MFL Equipment 1			
Manufacturer	Silverwing	**Model**	VS2i
S/N	9520812	**PC S/N**	1216-200191
Detection	32 Hall Effect sensors	**Speed**	0.5 m/sec
Scan Width	250 mm	**Min Sensitivity**	20% Bottom Side Corrosion
Max Single scan length	15000 mm	**Acquisition Software**	Silverwing Floormap 3.22
Calibration Plate	6.0 mm calibration plate with 20%-40%-60%-80% thickness loss 8.0 mm calibration plate with 20%-40%-60%-80% thickness loss		
Analysis Software	Silverwing Inspection Mapping System (SIMS) 6.0		

MFL Equipment 2			
Manufacturer	Silverwing	**Model**	VS2i
S/N	2861013	**PC S/N**	1204-200145
Detection	32 Hall Effect sensors	**Speed**	0.5 m/sec
Scan Width	250 mm	**Min Sensitivity**	20% Bottom Side Corrosion
Max Single scan length	15000 mm	**Acquisition Software**	Silverwing Floormap 3.22
Calibration Plate	6.0 mm calibration plate with 20%-40%-60%-80% thickness loss 8.0 mm calibration plate with 20%-40%-60%-80% thickness loss		
Analysis Software	Silverwing Inspection Mapping System (SIMS) 6.0		

UT Equipment 1			
Manufacturer / Model	Olympus / 38 DL+ Thickness gauge	***S/N***	161400614
Probe / Frequency	Karl Deutsh 10/6 Pb 4C / 4Mhz	**S/N**	142960
Detection Strategy	Echo-To-Echo & 1st back echo		
Couplant	Water & Gloutoline		
Calibration Block	5 Step Calibration Block 2.5 mm – 12.5mm / 2.5 mm step	**S/N**	114217

UT Equipment 2			
Manufacturer / Model	Olympus / 38 DL+ Thickness gauge	***S/N***	171476104
Probe / Frequency	Karl Deutsh 10/6 Pb 4C / 4Mhz	**S/N**	183175
Detection Strategy	Echo-To-Echo & 1st back echo		
Couplant	Water & Gloutoline		
Calibration Block	5 Step Calibration Block 2.5 mm – 12.5mm / 2.5 mm step	**S/N**	A22983

n/c: not communicated
n/a: not applicable

Table 1 - Inspection Record for MFL and manual UT

APPENDIX C: Photos

Figure 5 – Bottom side pitting on annular plates A12 and A13.

Figure 6 – Bottom side pitting on annular plate A17.

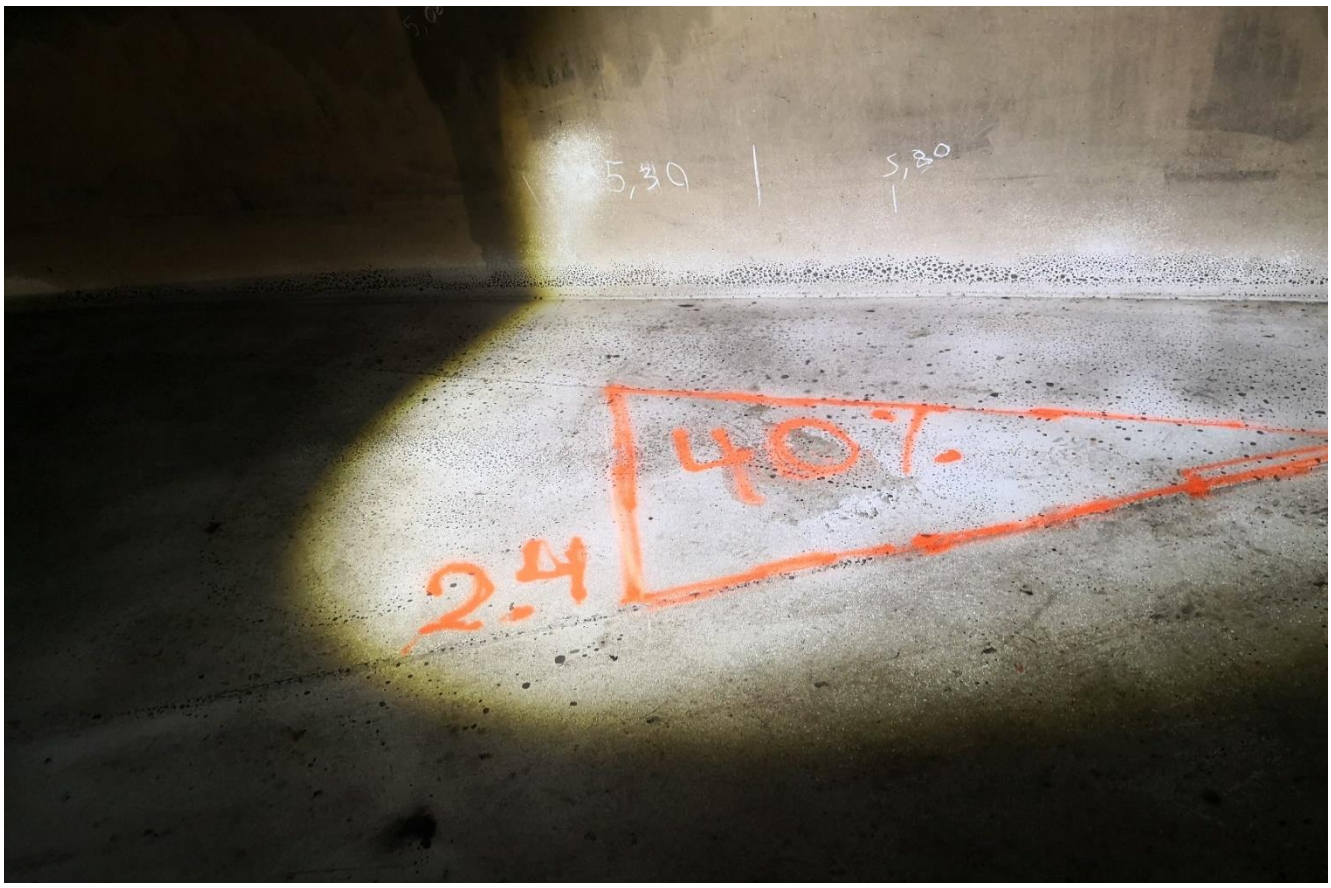


Figure 7 – Bottom side pitting on main floor plate 2.4

Figure 8 – Bottom side pitting and one hole on main floor plate 25.2

Figure 9 – Top side pit on main plate 11.3

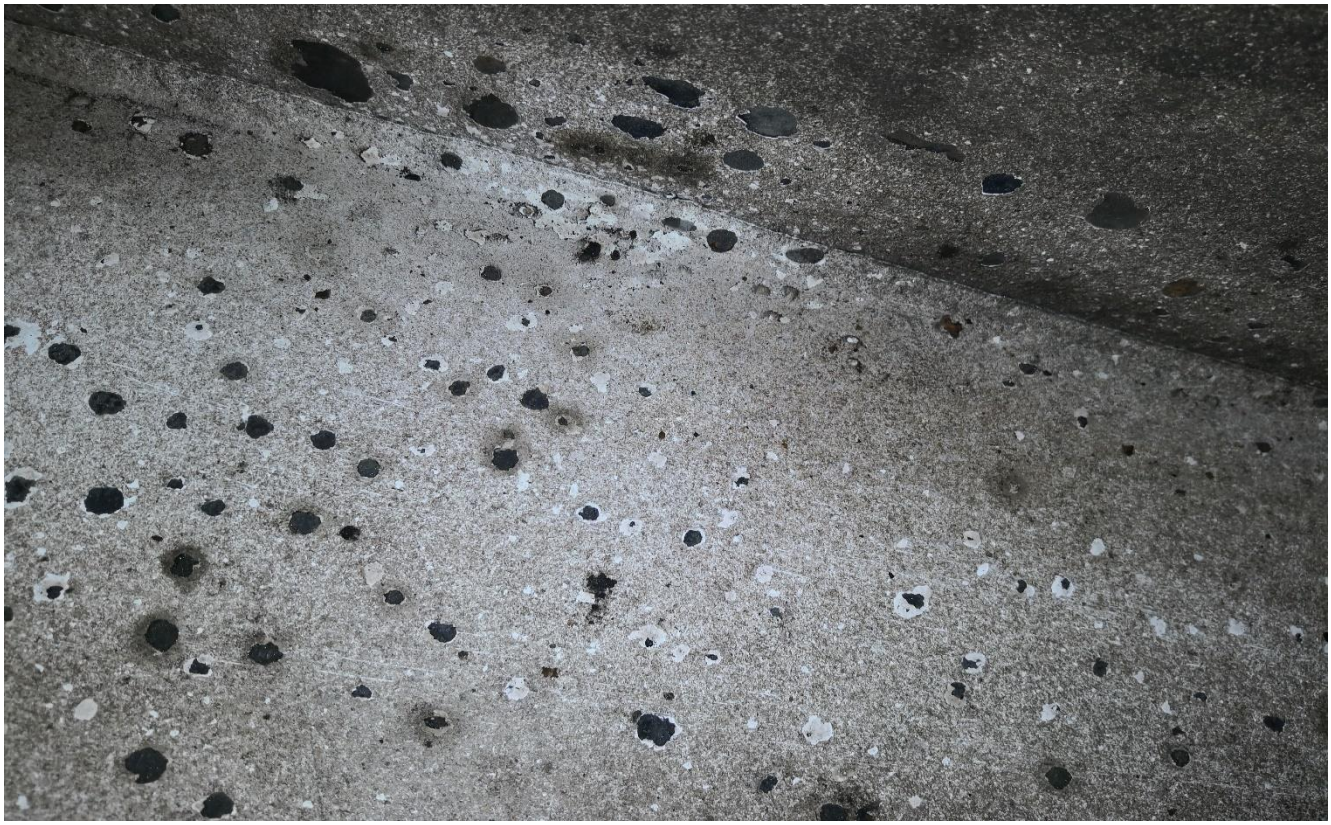


Figure 10 – Representative picture of bad surface on critical zone due to spatters.

Figure 11 – Top view of sump full of sandblast leftovers.

Figure 12 – External position of measurement No.1, which start at the center of the north man way

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