

SHELL PAKISTAN LIMITED

TENDER PACKAGE

CONVERSION OF MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION (TANK REPAIR WORKS)

Doc. No.	3059-GEN-TR-001B	Tender Package
Revision	2	-
Date	04-05-2021	Issue Date

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

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SCOPE OF WORK FOR TANK REPAIR WORKS

Consultant:



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1.0 PROJECT INTRODUCTION AND BACKGROUND

Shell Pakistan Limited (SPL) intends to renovate its Machike terminal foreseeing the future business growth potential for MoGas (SUP) and diesel (HSD).

The extension includes the change of service of MCH-02 — having the highest capacity among other storage tanks — from HSD to SUP and MCH-03/04/06 to HSD. The piping system is modified to make it in line with the desired service to adequately support the increasing volumes.

The tender package for the subject project is splitted in three sections as described below:

- Instrumentation Works — *Carried out by OTHERS*
- Tank Repair Works — *Doc.: 3059-GEN-TR-001B*
- Mechanical and Civil Works — *Carried out by OTHERS*

The Storage tank repair works include upgrading the storage tanks considering the fluid service; in terms of provisions/removal of fire water and foam solution application system, venting, and installation of IFC.

To carry out this up-gradation, it requires various activities to be considered by the contractor under the project scope. Details for the scope of work could be found later in this document.

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2.0 SCOPE OF WORK

The major scope of the project will be limited to:

1. Storage tank modifications.

The following describes the works required. This should be read in conjunction with the Bill of Quantities (BOQs), Specifications, and Drawings attached for a complete understanding.

2.1 DEFINITIONS

Owner:	Shell Pakistan Limited
Engineer/Consultant:	Petrochemical Engineering Consultants
Contractor:	The Company named as such in the deed.
Sub-Contractor/Vendor:	The Manufacturer / Supplier engaged by Contractor
Shall/ Must/ Is To Be:	A mandatory requirement
Should:	A non-mandatory requirement, advisory, or Recommendation

2.2 ERRORS OR OMISSIONS

The review and comment by the Owner/Engineer of any contractor's or its manufacturer's drawings, procedures, or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor of its obligations to comply with the requirements of this specification and other related parts of the contract documents.

2.3 DEVIATIONS

All deviations to this Specification, other specifications or attachments shall be brought to the knowledge of the owner in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the owner prior to execution of the work. Such deviations shall be shown in the documentation prepared by the contractor.

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2.4 CONFLICTING REQUIREMENTS

In the event of conflict, inconsistency or ambiguity between the contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the Contractor shall refer to the Owner/Engineer whose decision shall prevail.

3.0 TANK REPAIR WORKS

The following describes the works required. This should be read in conjunction with the Bill of Quantities (BOQs), specifications and drawings attached for a complete understanding.

The Mechanical Works includes but are not limited to:

1. Procurement in accordance with BOQ after verification from site.
2. Construction documentation.
3. Replacement of inlet diffuser for Tank# MCH-02 if needed as per site conditions shall be carried out in accordance with engineering drawings.
4. Tank modifications.
5. Provisions of foam solution application system on Tank# MCH-02.
6. Dismantling of foam solution application system from Tank# MCH-06.
7. Installation of Internal Floating Roof for Tank# MCH-02.
8. Dismantling of Internal Floating Roof for Tank# MCH-06.
9. Tank repair works for MCH-03/04 as per inspection report / disposition sheet shall be considered as the part of project scope.
10. Installation Tests (e.g. NDT, Hydrostatic pressure test).
11. Surface preparation and painting.
12. Finishing works (e.g. internal cleaning, touch-up paint, labeling and tagging).
13. Start-Up and Pre-commissioning Activities.
14. The Contractor shall issue all the necessary documentation required to undertake and to follow-up installation activities and to record all activities (as built dossier).

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4.0 INSTRUCTIONS TO BIDDERS

1. The information and data given is not intended to be an exhaustive list of all the requirements of the Contract. The Contractor's Scope of Work must be read in conjunction with the referenced documents, site requirements and all parts of the Contract. Contractor's Scope of works shall comprise all activities necessary to complete the Work in accordance with Shell requirements.
2. Contractor shall be responsible for supply of all materials including civil and electrical items modifications, fabrication, installation, erection, painting and coating, termination, testing and commissioning complete in all respect up to Shell requirement.
3. The items mentioned in the BOQ also consist of furnishing all plant, labour, equipment, machinery, consumables, and taxes / levies applicable for completing the work. The work shall be done, complete in all respects in accordance with specifications, drawings and Shell requirements.
4. Where applicable Invert Levels provided in drawings must be verified by contractor and shall be modified as per site requirements. Contractor shall measure invert levels with Total Station prior to concrete pouring to ensure drainage are constructed with correct levels. Also contractor needs to ensure that subsequent invert levels of existing trenches shall be verified and modified if required for smooth flow of liquid. Contractor must ensure that the scope is to ensure that water do not accumulate in any area and smoothly travel up to pond area.
5. The prices and rates to be quoted in the Bill of Quantities are to be full inclusive value of the works described under specified items including all costs and expenses which may be required in and for the construction of the works described, together with all risks, liabilities and obligations set forth and implied in all the documents referred to on which the tender is based.
6. Contractor shall arrange all utilities including water, electricity and any other consumables as required during execute phase.

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7. All work shall be carried out in accordance with the approved drawings and specifications. Any item and/or work required for completion of the project but not expressly indicated in this document shall be deemed to have been included in the quoted price by the contractor. Contractor shall highlight such items.
8. All drawings and other documents supplied for the purpose of bidding shall be returned with the tender bid. Tenderers unable to bid shall also return complete bid documents on the date of opening of the tender.
9. The quantities set out in the Bill of Quantities are the best engineering estimated quantities of the work and they are not to be taken as the actual and correct quantities of the work to be executed by the Contractor in fulfillment of the Contract.
10. Contractor shall follow all safety and security rules/procedures of the Owner. Further, contractor is liable to follow IOGP/CSSS.
11. The contractor shall be responsible for supplying and arranging electricity and potable water for construction and testing at his own cost.
12. Contractor shall familiarize with sites related to the work prior to submission of bid.
13. Contractor shall be responsible for the reinstatement of the system.
14. Where the nature of work and material demands, Contractor shall provide MTCs of all materials. Shell may perform Destructive Testing of any material for assurance purposes at Contractor's Cost. Similarly, Contractor shall be responsible for mechanical inspection test but not limited to Non Destructive Testing like Dye Penetration test, Magnetic Particle inspection, Radiography, hydrostatic testing etc. (as much as applicable) from Shell approved 3rd Party inspection service as per Inspection & Testing Plan.
15. Where the nature of work and material demands, the Contractor shall prepare WPS, PQR etc. as applicable to project and must engage Shell approved 3rd Party inspection service for approval. All welders must be qualified by Shell approved 3rd Party inspection service prior to any welding works.

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- 16. Contractor shall perform civil testing and inspection including but not limited to Mix Design Test, Cube test, compaction test etc. from a Shell approved laboratory as per Inspection & Testing Plan.
- 17. Contractor shall be responsible to prepare red marked drawings complete with dimension and elevations. Cost shall be deemed to have been including in the price quoted by the contractor without extra cost to the SPL.
- 18. Loading of materials from store/yard, transportation and unloading at the required job site shall be the contractor's responsibility and considered included in his unit rates.
- 19. If any welding works are involved, Contractor shall submit welding procedure for Shell approval.
- 20. Contractor shall arrange, store, erect proper scaffolding as per Shell requirements.
- 21. Contractor shall submit Quality Assurance (QA)/ Quality Control (QC) documents and HSSE documents for approval prior to mobilization as part of Shell HSSE Plan and IOGP/CSSS requirements.
- 22. Contractor shall depute HSSE personnel at site for assurance of following and maintaining safe working.
- 23. The Contractor shall prepare all necessary work methodologies/ plans/procedures as required by Shell and shall submit the same for approval prior to execution including but not limited to Contractor HSSE Plan, Risk Assessment Sheet, Method Statement/ JSA, Inspection & Testing Plans etc.
- 24. All material furnished by Contractor shall be approved by Shell before work is commenced. Only new, top quality materials from approved vendors/manufacturers will be acceptable to Shell.
- 25. All work shall be carried out by Contractor under the supervision of experienced personnel in accordance with Shell approved procedures, and the best and latest approved practices in the oil industry.

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- 26. Contractor shall also comply with the QA/QC, Safety, Planning and Scheduling requirements of the Contract throughout the execution of the Project.
- 27. Where hydrotesting is applicable, the contractor shall also bear the cost for the disposal of water after the completion of the hydro testing of the tank.

Safety

- 28. Prior to commencement of construction, the Contractor shall produce a written safety policy and procedure for Shell approval, which he shall enforce during all construction and commissioning activities. IOGP/CSSS must be followed as part of construction safety.
- 29. The procedure shall include as a minimum contingency plans for a plant emergency, fire precautions, accident procedure, safety training, lines of authority and responsibilities, etc. The Contractor shall designate a Safety representative who shall be responsible for the day-to-day coordination with Sell HSSE representatives on all safety aspects of the work.
- 30. Shell Permit to Work system and safety rules shall govern during installation and commissioning works. It is contractor's responsibility to obtain work permit. No works shall be allowed in installation premises without a valid work permit.
- 31. Contractor shall, at his own expense, supply his personnel, required in connection with the safe performance of the Work, with adequate protective personal clothing and other protective equipment which shall be maintained in good condition or replaced, and shall be worn on all relevant occasions as indicated by notices, instructions and good practice.
- 32. The Contractor shall be responsible for ensuring that the site is kept clean and tidy and that all scrap materials and tools are removed from the job site on completion of the Work.
- 33. All Electrical Installation, Erection shall be carried out by personnel having IECEEx certification for the specific job.

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Other Deliverables

34. The Contractor shall submit following as part of Proposal:
- Company Profile comprising of company strength, capabilities, manpower, staffing, certifications (ISO, IECEx, etc.), ERP Systems, Company Organogram, Safety Leadership, Trainings Records, Reward & Recognition Programs, Safety Statistics etc.
 - Project Execution Plan covering following areas:
 - a. Mobilization & Demobilization
 - b. All project specific activities including Civil, Mechanical, E&I Works etc.
 - c. QA/QC Requirements including Pre-commissioning, commissioning and handover activities.
 - d. Dismantling & Re-instatement
 - e. 3rd Party Certification of Scaffolding/NDT & any other test as part of QA/QC/Inspection & Testing Plan
 - f. Manpower and Equipment Deputation List
 - g. Temporary facility setup
 - h. As-Built project dossier and red marked drawings
 - i. Project Organogram
 - Project Schedule covering following areas:
 - a. Project Schedule should be Level-3 with milestones and critical path activities. Consideration of all project activities, Mobilization & Demobilization, correct sequence of activities, correct execution time against respective activity, shutdown requirements, development of documents like MS/JSA/ITP/HSSE Documents etc. in pre-mobilization phase, requirement of 3rd Party inspections, NDTs, other tests as per project requirements.
 - HSSE Plan covering following areas:
 - a. Understanding of PTW/MS/JSA, IOGP/CSSS & HSSE CF requirements.
 - b. HSSE Plan should be project specific i.e. cover only activities related to project and its associated mitigation requirement e.g. grinding works. Waste disposal, working at height, Scaffolding & earth works.
 - c. Activity / Task Risk Assessment
 - d. Understanding of project construction activities ensuring correct equipment are being deployed at site.
 - e. HSSE Management System i.e. HSSE Organization, target KPIs, safety strategy, internal trainings, Internal Audit & Inspections, Leadership Visits, Incident Management etc.

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BILL OF QUANTITIES

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

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BILL OF QUANTITIES MECHANICAL WORKS

Consultant:



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BILL OF QUANTITIES FOR TANK MODIFICATION

Consultant:



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SHELL PAKISTAN LIMITED CONVERSION OF MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION COST ESTIMATION FOR MODIFICATION WORKS ON VERTICAL STORAGE TANK								DOC. NO. : NRH CHK'D DATE REV	3059-AST-BOQ-001 MZK 05-03-21 0
SR#	ITEM DESCRIPTION	UNIT	QTY.	SUPPLY		CONSTRUCTION		REMARKS	
				UNIT RATE (PKR)	AMOUNT (PKR)	UNIT RATE (PKR)	AMOUNT (PKR)		
1.0	TANK MCH-02 (MOGAS TANK)								
1.1	Tank Size (D x H) = 39m x 15m Supply & installation of all material including plates, structure, pipes and fittings, nozzles & appurtenances, fabrication, erection, installation, testing, calibration of tank complete with appurtenances, etc., complete in all respect as per project specification and drawings.								
1.2	Nozzles and Appurtenances with Reinforcing Pad								
i	Still Wells for LT, TT & Gauge Hatch, Existing ATG nozzles shall be demolished & patch plates shall be welded.	Kg	1200					Ref. Dwg # 3059-AST-MCH02-APST-001 3059-AST-MCH02-APST-003	
ii	Circulation Vents	Kg	1700					Ref. Dwg # 3059-AST-MCH02-APST-002	
iii	Replacement of Inlet Diffuser along with supports (If required)	Kg	500					Ref. Dwg # 3059-AST-MCH02-APST-006	
iv	Replacement of Inlet Diffuser along with supports (If required)	Kg	250					Ref. Dwg # 3059-AST-MCH02-APST-008	
v	Installation of Roof Manhole cover	Kg	25					Ref. Dwg # 3059-AST-MCH02-APST-007	
vi	Foam Pourer along with piping & pipe supports.	Kg	50					Ref. Dwg # 3059-AST-MCH02-APST-004 (Supply of foam pourer catered in foam skid.)	
vii	Bridle connection for LSHH	Kg	100					Note: Contractor to ensure that orientation/location of Foam pourer shall not be coinciding with existing internal structure.	
viii	Wind Girder with Gusset Plates	Kg	2600					Ref. Dwg # 3059-AST-MCH02-APST-001	
Ref. Dwg # 3059-AST-MCH02-APST-005								Ref. Dwg # 3059-AST-MCH02-APST-005	
1.3	Emptying & De-commissioning of tank (Optional) De-commissioning, Dismantling of all skin valves with positive isolation (blind plate). Emptying, cleaning & dispose off product as per SPL instructions/requirements, degassing and make the tank compatible for MOGAS import complete in all respects as per SPL requirements.	Job	1						
1.4	Installation Of Floating Screen								
	Installation of Floating Screen (IFC) inside tank as per manufacturer recommendation. Work includes supplying , assembling of IFC, make hole in IFC and fixing /assembling of Negotiation Devices and Funnels as per drawings and as manufacturer recommendations, fixing of anti-rotation device by making holes in roof plate, adjustment of IFC legs, installation of IFC accessories like seal, manhole, ladder, etc., as per manufacturer recommendation and client satisfaction. Work also includes transportation from site, loading, unloading, assembling, installation. bolting up complete in all respect.	Job	1						
1.5	Calibration of Tank								
i	Calibration of tank with Optic Line Reference method.	Job	1					With PWD certification.	
1.6	Dismantling of ESV	Job	1						
1.7	Surface Preparation / Painting								
i	Surface preparation of the Tank by Grit Blasting to near white metal (SA 2.5)	m ²	5					If required.	
ii	Supply of painting material and application of painting on tank & appurtenances.	m ²	5					If required.	
1.8	Spiral Staircase Modification								
i	Installation of support under spiral staircase in order to properly support with tank foundation.	Job	1					As per site.	
SUB-TOTAL (PKR)				-		+	-		-

<p style="text-align: center;">SHELL PAKISTAN LIMITED CONVERSION OF MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION COST ESTIMATION FOR MODIFICATION WORKS ON VERTICAL STORAGE TANK</p>	 <small>Petrochemical Engineering Consultants</small>	DOC. NO.:	3059-AST-BOQ-001						
								PREP.	NRH
SR#	ITEM DESCRIPTION	UNIT	QTY.	SUPPLY (PKR)	AMOUNT (PKR)	CONSTRUCTION (PKR)	AMOUNT (PKR)	REMARKS	
2.0	TANK MCH-03 (HSD TANK)								
2.1	Tank Size (D x H) = 15m x 10m Supply & installation of all material including plates, structure, pipes and fittings, nozzles & appurtenances, fabrication, erection, installation, testing, calibration of tank complete with appurtenances, etc., complete in all respect as per project specification and drawings.								
2.2	Nozzles and Appurtenances with Reinforcing Pad								
i	Dismantling of PVSV & Installation of Free Vent.	Kg	100					Ref. Dwg # 3059-AST-MCH03-APST-002	
ii	Replacement of Still Well for TT & New Nozzle for LSHH.	Kg	180					Ref. Dwg # 3059-AST-MCH03-APST-001	
iii	Installation of Roof Manhole cover	Kg	25					Ref. Dwg # 3059-AST-MCH03-APST-004	
2.3	Painting of Piping								
i	Fire Water Sprinkler Line Surface preparation of the piping by Grit Blasting to near white metal (SA 2.5)	Job	1						
	Supply of painting material and application of paint on fire water sprinkler piping inside dyke wall, its allied structure as per attached project specification.	Job	1						
ii	Product Piping Surface preparation of the piping by Grit Blasting to near white metal (SA 2.5)	Job	1						
	Supply of painting material and application of paint on product piping inside dyke wall, as per attached project specification.	Job	1						
2.4	Calibration of Tank								
i	Calibration of tank with Optic Line Reference method.	Job	1					With PWD certification.	
2.5	Installation of ESV	Job	1						
i	Work includes re-calibration of ESV prior to installation.	Job	1						
2.6	Repair Work (If Any) Supply and Installation / Replacement / Repair of all specified material and as per recommendation of Inspection report including shell plates, roof plates, bottom plates, weld build-ups, structure, Spiral stair case and roof handrails, pipes and fittings, nozzles & appurtenances, scaffolding supply, fabrication, erection, installation, testing, sand blasting, painting / coating, calibration and commissioning of tank complete with vents, etc., complete in all respect as per inspection report, recommendations and drawings.	Job	1					This job includes all required recommendations in accordance with disposition/inspection reports.	
i	Work include supply of all material required, grinding, fabrication, cutting, beveling and rewelding of existing plates vertical & horizontal seams in lieu with API-653 (as per inspection report & Shell plate drawing), NDT required complete in all respect as per Shell requirement.	m	10						
a	Plates joints / seams Length (approx.)	Kg	100						
ii	Supply and installation of Patch plates. Work included but not limited to cleaning, grinding, leveling of the shell plate surfaces, fabrication of patch plates, fabrication, installation , welding and testing in lieu with API-653 and Inspection report.								
2.7	Surface Preparation / Painting:								
i	Surface preparation of the Tank by Grit Blasting to near white metal (SA 2.5)	m ²	5					If required.	
ii	Supply of painting material and application of painting on tank & appurtenances.	m ²	5					If required.	

<p style="text-align: center;">SHELL PAKISTAN LIMITED CONVERSION OF MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION COST ESTIMATION FOR MODIFICATION WORKS ON VERTICAL STORAGE TANK</p>								DOC. NO. : PREP. CHK'D DATE REV	3059-AST-BOQ-001 NRH MZK 05-03-21 0
SR#	ITEM DESCRIPTION	UNIT	QTY.	SUPPLY		CONSTRUCTION		REMARKS	
				UNIT RATE (PKR)	AMOUNT (PKR)	UNIT RATE (PKR)	AMOUNT (PKR)		
2.8	Spiral Staircase Modification								
i	Installation of support under spiral staircase in order to properly support with tank foundation.	Job	1					As per site.	
SUB-TOTAL (PKR)				-	-	+ -	-		
3.0	TANK MCH-04 (HSD TANK)								
3.1	Tank Size (D x H) = 15m x 10m Supply & installation of all material including plates, structure, pipes and fittings, nozzles & appurtenances, fabrication, erection, installation, testing, calibration of tank complete with appurtenances, etc., complete in all respect as per project specification and drawings.								
i	Removal of bottom plates	Ton	7						
ii	Installation of bottom plates (10mm Thk.)	Ton	7						50% Replacement is considered. (If Required)
3.2	Surface Preparation / Coating / Painting								
i	Surface preparation of the Tank bottom upper side by Grit Blasting to near white metal (SA 2.5)	m ²	180						
ii	Supply of coating material and application of coating of upper & under side of the bottom.	m ²	280						
iii	Surface preparation of the Tank roof upper side by Grit Blasting to near white metal (SA 2.5)	m ²	100						
iv	Supply of painting material and application of paint on external surface of Roof, Pipe and its allied structure as per attached project specification.	m ²	100						
3.3	Nozzles and Appurtenances with Reinforcing Pad								
i	Replacement of Still Well for TT & New Nozzle for LSHH.	Kg	180						Ref. Dwg # 3059-AST-MCH04-APST-001
ii	Replacement of Free Vent.	Kg	100						Ref. Dwg # 3059-AST-MCH04-APST-002
iii	Roof Manhole cover	Kg	25						Ref. Dwg # 3059-AST-MCH04-APST-004
3.4	Testing								
i	Vacuum testing of Bottom	Job	1						
ii	Hydrostatic Testing.	Job	1						
3.5	Calibration of Tank								
i	Calibration of tank with Optic Line Reference method.	Job	1						With PWD certification.
3.6	Installation of ESV								
i	Work includes re-calibration of ESV prior to installation.	Job	1						

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SR#	ITEM DESCRIPTION	UNIT	QTY.	SUPPLY		CONSTRUCTION		REMARKS	
				UNIT RATE (PKR)	AMOUNT (PKR)	UNIT RATE (PKR)	AMOUNT (PKR)		
3.7	Repair Work (If Any) Supply and Installation / Replacement / Repair of all specified material and as per recommendation of Inspection report including shell plates, roof plates, bottom plates, weld build-ups, structure, Spiral stair case and roof handrails, pipes and fittings, nozzles & appurtenances, scaffolding supply, fabrication, erection, installation, testing, sand blasting, painting / coating, calibration and commissioning of tank complete with vents, etc., complete in all respect as per inspection report, recommendations and drawings. i Work include supply of all material required, grinding, fabrication, cutting, beveling and rewelding of existing plates vertical & horizontal seams in lieu with API-653 (as per inspection report & Shell plate drawing), NDT required complete in all respect as per Shell requirement. a Plates joints / seams Length (approx.) ii Supply and installation of Patch plates. Work included but not limited to cleaning, grinding, leveling of the shell plate surfaces, fabrication of patch plates, fabrication, installation , welding and testing in lieu with API-653 and Inspection report.	Job	1					This job includes all required recommendations in accordance with disposition/inspection reports.	
3.8	Surface Preparation / Painting: i Surface preparation of the Tank by Grit Blasting to near white metal (SA 2.5) ii Supply of painting material and application of painting on tank & appurtenances.	m ²	5					If required.	
3.9	Spiral Staircase Modification i Installation of support under spiral staircase in order to properly support with tank foundation.	Job	1					As per site.	
3.10	Painting of Piping i Fire Water Sprinkler Line Surface preparation of the piping by Grit Blasting to near white metal (SA 2.5) Supply of painting material and application of paint on fire water sprinkler piping inside dyke wall, its allied structure as per attached project specification. ii Product Piping Surface preparation of the piping by Grit Blasting to near white metal (SA 2.5) Supply of painting material and application of paint on product piping inside dyke wall, as per attached project specification.	Job	1						
SUB-TOTAL (PKR)				-	+ -				-

<p style="text-align: center;">SHELL PAKISTAN LIMITED CONVERSION OF MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION COST ESTIMATION FOR MODIFICATION WORKS ON VERTICAL STORAGE TANK</p>	 <small>Petrochemical Engineering Consultants</small>	DOC. NO.:	3059-AST-BOQ-001						
								PREP.	NRH
								CHK'D	MZK
								DATE	05-03-21
								REV	0
SR#	ITEM DESCRIPTION	UNIT	QTY.	SUPPLY (PKR)	CONSTRUCTION (PKR)				REMARKS
4.0	TANK MCH-06 (HSD TANK)								
4.1	Tank Size (D x H) = 20m x 15m Supply & installation of all material including plates, structure, pipes and fittings, nozzles & appurtenances, fabrication, erection, installation, testing, calibration of tank complete with appurtenances, etc., complete in all respect as per project specification and drawings.								
i	Dismantling of Circulation vents & Installation of covers.	Kg	170						Ref. Dwg # 3059-AST-MCH06-APST-002
ii	Replacement of Free Vent along with existing roof nozzle.	Kg	240						Ref. Dwg # 3059-AST-MCH06-APST-001
4.2	Dismantling of IFC								
i	Work includes dismantling of IFC and Packing of dismantled items.	Job	1						
4.3	Installation of ESV								
i	Work includes re-calibration of ESV prior to installation.	Job	1						
4.4	Surface Preparation / Painting								
i	Surface preparation of the Tank by Grit Blasting to near white metal (SA 2.5)	m ²	5						If required.
ii	Supply of painting material and application of painting on tank & appurtenances.	m ²	5						If required.
4.5	Emptying & De-commissioning of tank De-commissioning, Dismantling of all skin valves with positive isolation (blind plate). Emptying, cleaning & dispose off product as per SPL instructions/requirements, degassing and make the tank compatible for HSD import complete in all respects as per SPL requirements.	Job	1						
4.6	Calibration of Tank								
i	Calibration of tank with Optic Line Reference method.	Job	1						With PWD certification.
SUB-TOTAL (PKR)				-	+	-		-	
5.0	SUPPLY & INSTALLATION OF QFT TANK								
5.1	QFT TANK FOR MCH-03								Ref. Dwg # 3059-AST-MCH03-APST-003
a)	Supply of all material including plates, structure and pipes & fittings, nozzles, funnel & appurtenances, fabrication, erection, installation and testing of fast flush tanks, etc., complete in all respect as per project specification and drawings.								
i	Shell Plates, Head Plates & top Cover with Funnel, Structures, Nozzles and appurtenances.	M.Ton	0.25						
ii	Supply and Installation of Level Gauge	No	1						
b)	Testing:								
i	Hydrostatic Testing.	Job	1						
c)	Surface Preparation / Painting / Coating:								
i	Internal and External surface preparation of entire surfaces of tank and its allied structure by Grit Blasting to near white metal (SA 2.5)	m ²	11						
ii	Supply of painting material and application of paint on external surfaces of entire tank, Pipe and its allied structure as per attached project specification.	m ²	6						
iii	Supply of coating material and application of coating of internal surfaces of tank.	m ²	6						
d)	Earthing								
i	Supply of all material and installation of Earthing points on tank.	Job	1						

<p style="text-align: center;">SHELL PAKISTAN LIMITED CONVERSION OF MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION COST ESTIMATION FOR MODIFICATION WORKS ON VERTICAL STORAGE TANK</p>							DOC. NO. : NRH PREP. CHK'D DATE REV	3059-AST-BOQ-001 MZK 05-03-21 0
SR#	ITEM DESCRIPTION	UNIT	QTY.	SUPPLY		CONSTRUCTION		REMARKS
				UNIT RATE (PKR)	AMOUNT (PKR)	UNIT RATE (PKR)	AMOUNT (PKR)	
5.2	QFT TANK FOR MCH-04							Ref. Dwg # 3059-AST-MCH04-APST-003
a)	Supply of all material including plates, structure and pipes & fittings, nozzles, funnel & appurtenances, fabrication, erection, installation and testing of fast flush tanks, etc., complete in all respect as per project specification and drawings.							
i	Shell Plates, Head Plates & top Cover with Funnel, Structures, Nozzles and appurtenances.	M.Ton	0.25					
ii	Supply and Installation of Level Gauge	No	1					As per Datasheet 3059-INS-DS-004
b)	Testing:							
i	Hydrostatic Testing.	Job	1					
c)	Surface Preparation / Painting / Coating:							
i	Internal and External surface preparation of entire surfaces of tank and its allied structure by Grit Blasting to near white metal (SA 2.5)	m ²	11					
ii	Supply of painting material and application of paint on external surfaces of entire tank, Pipe and its allied structure as per attached project specification.	m ²	6					
iii	Supply of coating material and application of coating of internal surfaces of tank.	m ²	6					
d)	Earthing							
i	Supply of all material and installation of Earthing points on tank.	Job	1					
SUB-TOTAL (PKR)				-	+ -			-
TOTAL COST (SUPPLY & CONSTRUCTION)				(PKR)				-
S.no	NOTE							
1	All Stud Bolts, Nuts & washers shall be hot dip galvanized.							

SHELL PAKISTAN LIMITED

DATA SHEETS

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

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Engineering
Consultants

SHELL PAKISTAN LIMITED

LEVEL GAUGE

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

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Engineering
Consultants

Shell Pakistan Limited		CONVERSION OF MCH-02 FROM HSD TO MOGAS AT MACHIKE TERMINAL					 PEC <small>Petrochemical Engineering Consultants</small>			
		DOCUMENT TITLE		DATA SHEET FOR LEVEL GAUGE						
		DOCUMENT NO.		3059-INS-DS-004		Rev-0				
GENERAL	1	Tag Number		08-LG-0301, 08-LG-0401						
	2	Service		Tank Level						
	3	Line Size		1"						
	4	Area Classification		ZONE-1, Gr.IIC, Ex d, T4						
	5	P & ID Drawing Number								
	6	Quantity		2						
PROCESS CONDITIONS	7	Fluid		HSD						
	8	Oper. Temperature	Max. Temperature	35	°C	50	°C			
	9	Oper. Specific Gravity		0.854						
	10	Tank Capacity		300 ltr.						
	11									
	12	Type		Reflex Type						
13	Distance from Centre of Vessel		VTS							
14	Sections Required		VTS							
15	Connection Size	Rating	1"	Flanged						
16	Connection Arrangement		Side & Side Centres							
17	Body Material		SS316							
18	Cover Material		SS316							
19	Gasket Material		Asbestos free graphite or VTS							
20	Float Material		-							
21	Sheet		No							
22	Illuminator	Power Supply	No							
23	Frost Extension	Length	N/A							
24	Calibration Range	Min	Max	N/A						
25	Bolting Materials		N/A							
26	All Wetted Part Materials to NACE		N/A							
27	Radiography or Dye-Penetrant of all Welds		None							
28	Mounting		Side							
GAUGE COCK	29	Drain Connection		1/2" NPT-F						
	30	Vent Connection		1/2" NPT-F						
	31	Gauge Connection	Type	1/2"	NPT-F					
	32	C-C Distance		HOLD						
PURCHASE	33	Manufacturer		VTS						
	34	Model		VTS						
	35	Price	Item Number							
	36									
	37									
NOTES :										
	1	VTS= Vendor to Specify								
05-03-21	0	ISSUED FOR TENDER					SR	MIJ	SMS	
DATE	REV	DESCRIPTION					PREP.	CKD	APPR	

SHELL PAKISTAN LIMITED

DRAWINGS MECHANICAL WORKS

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

SHELL PAKISTAN LIMITED

DRAWINGS FOR TANKS

Consultant:



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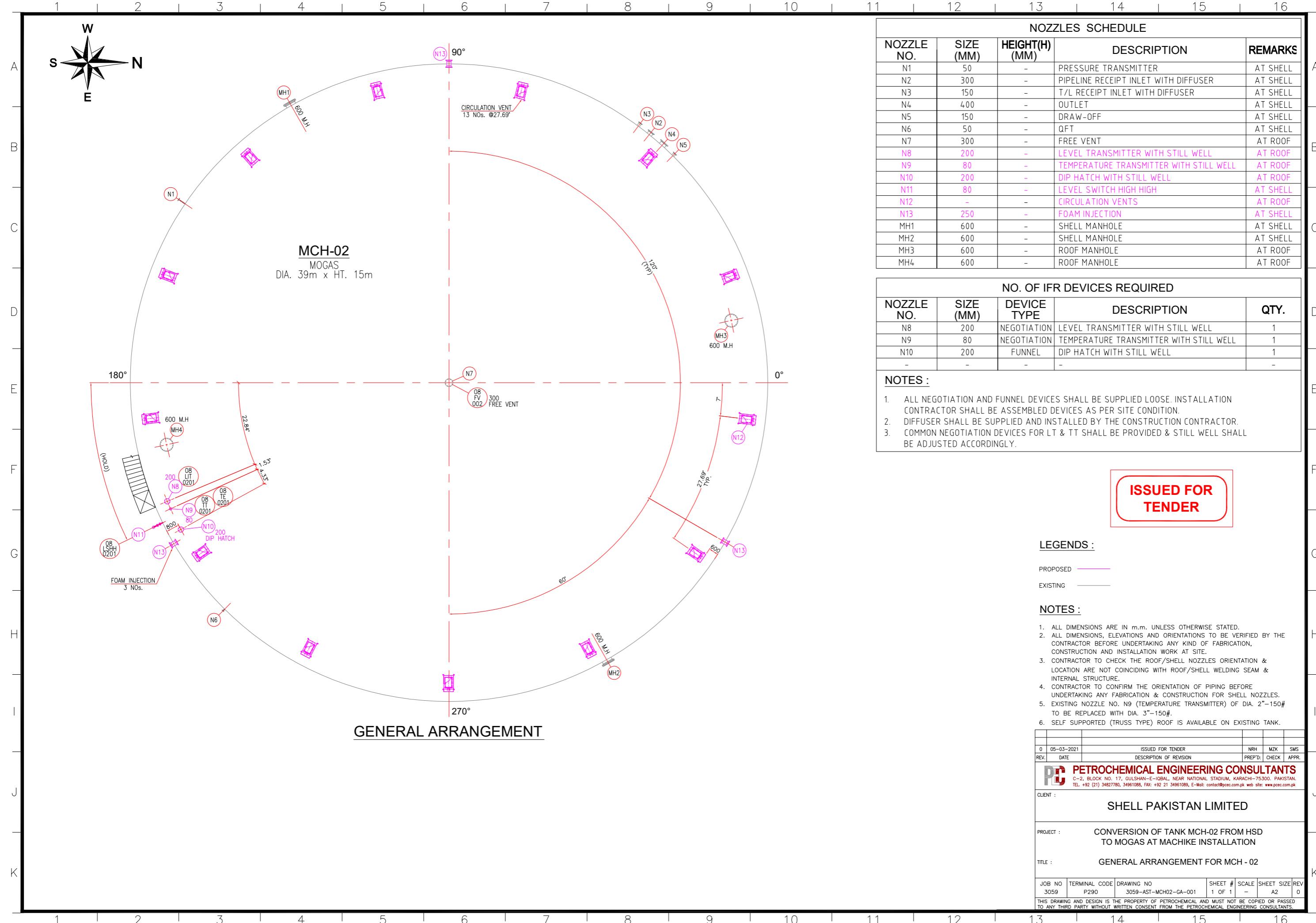
MCH-02

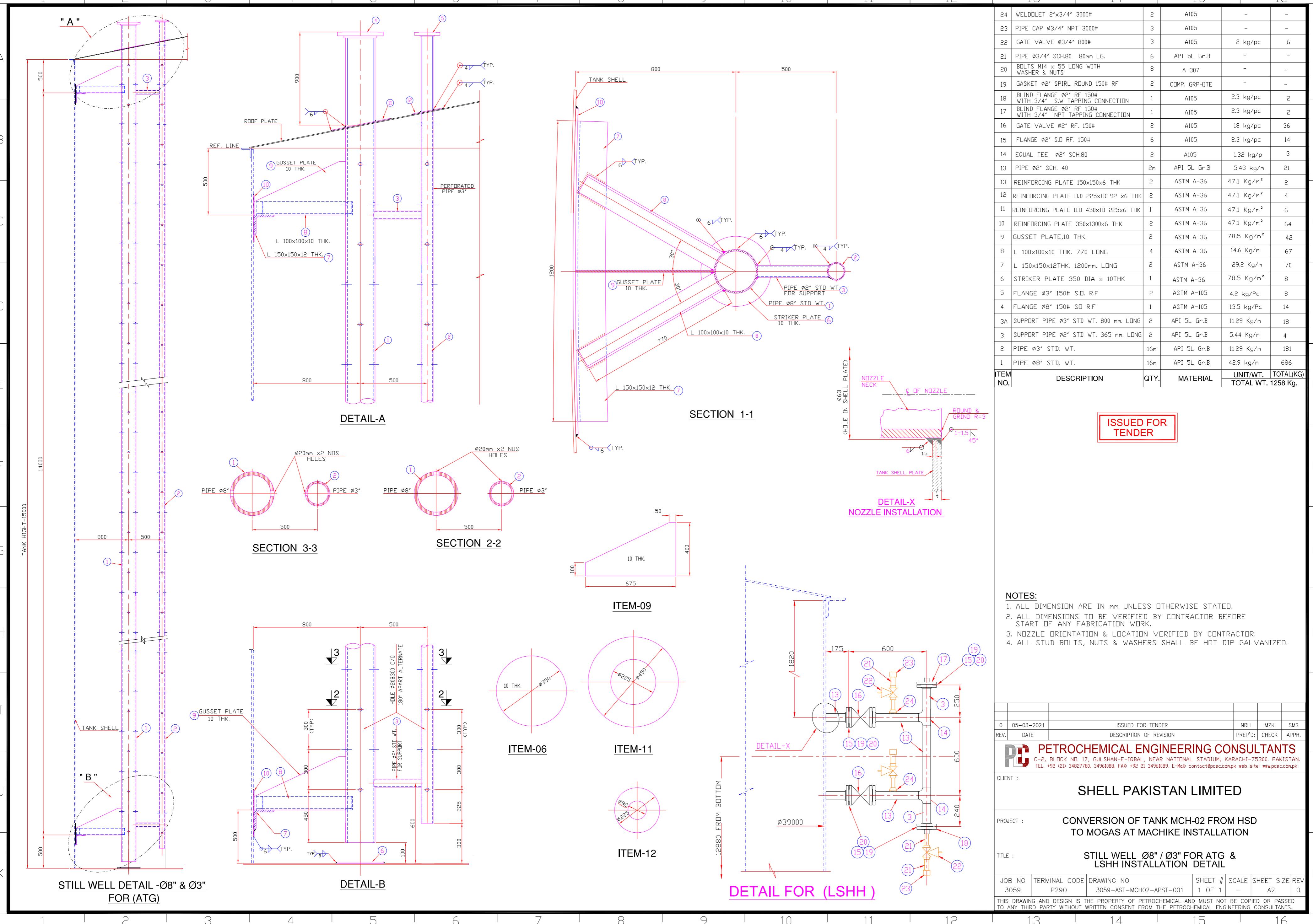
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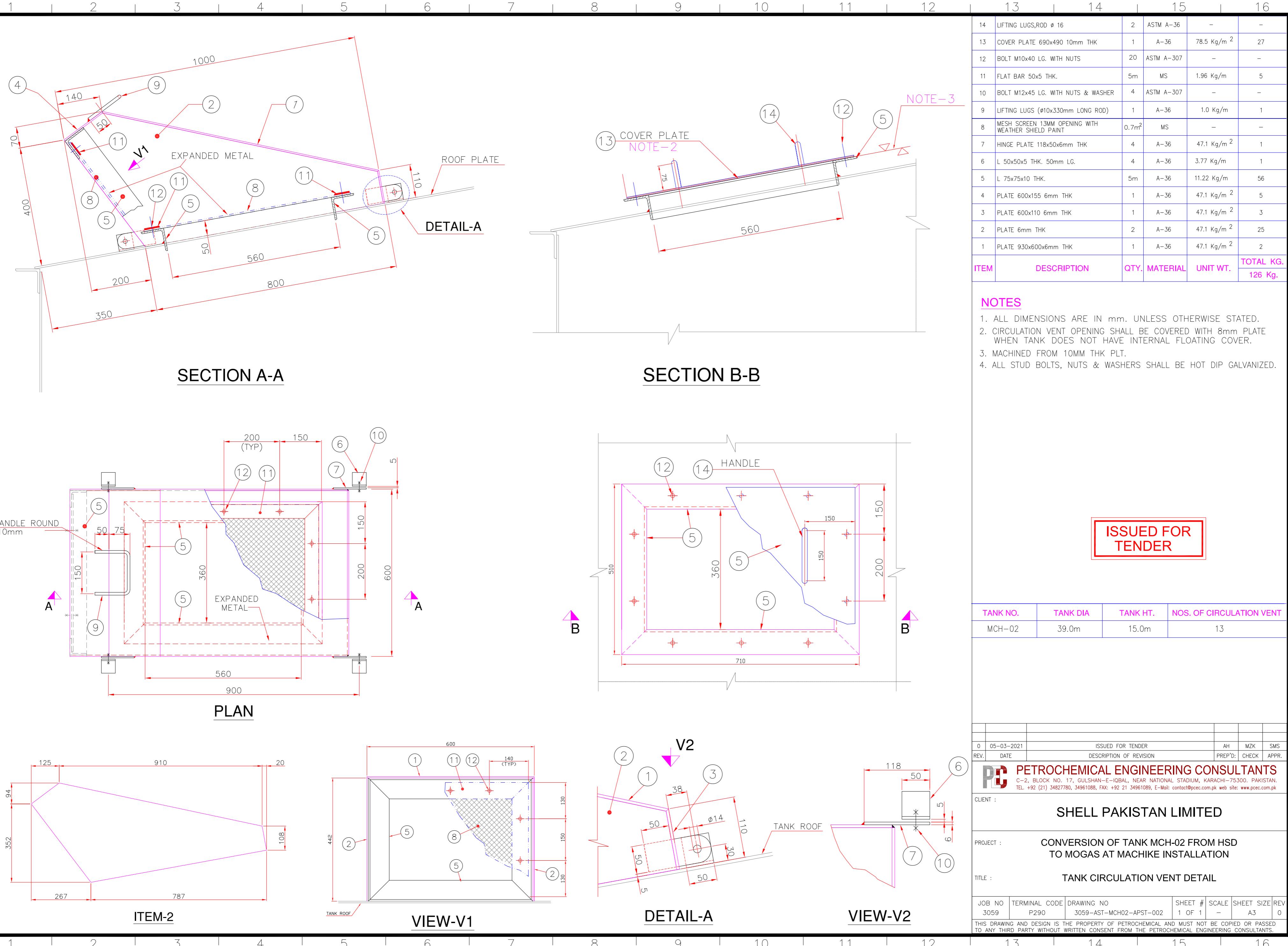


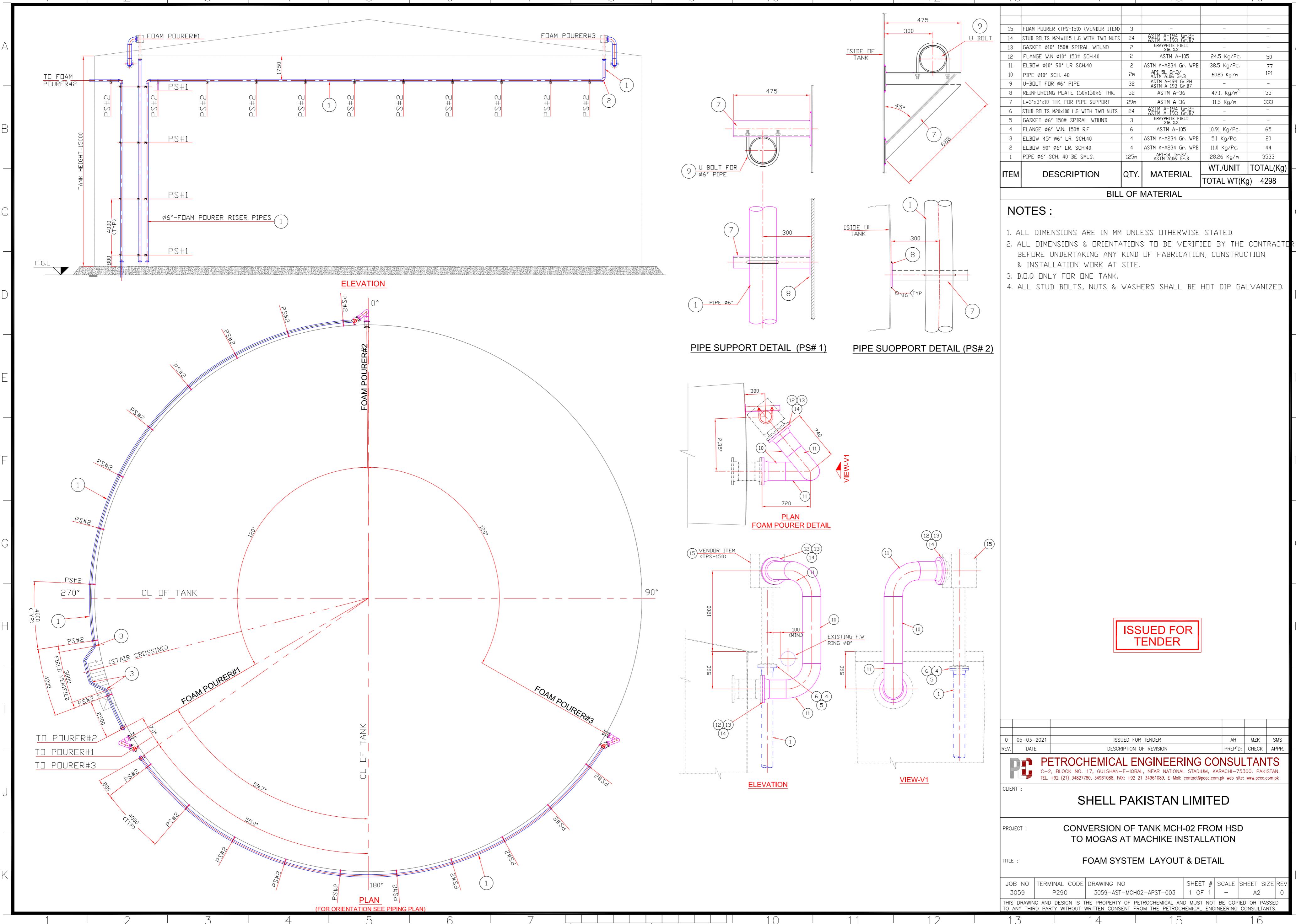
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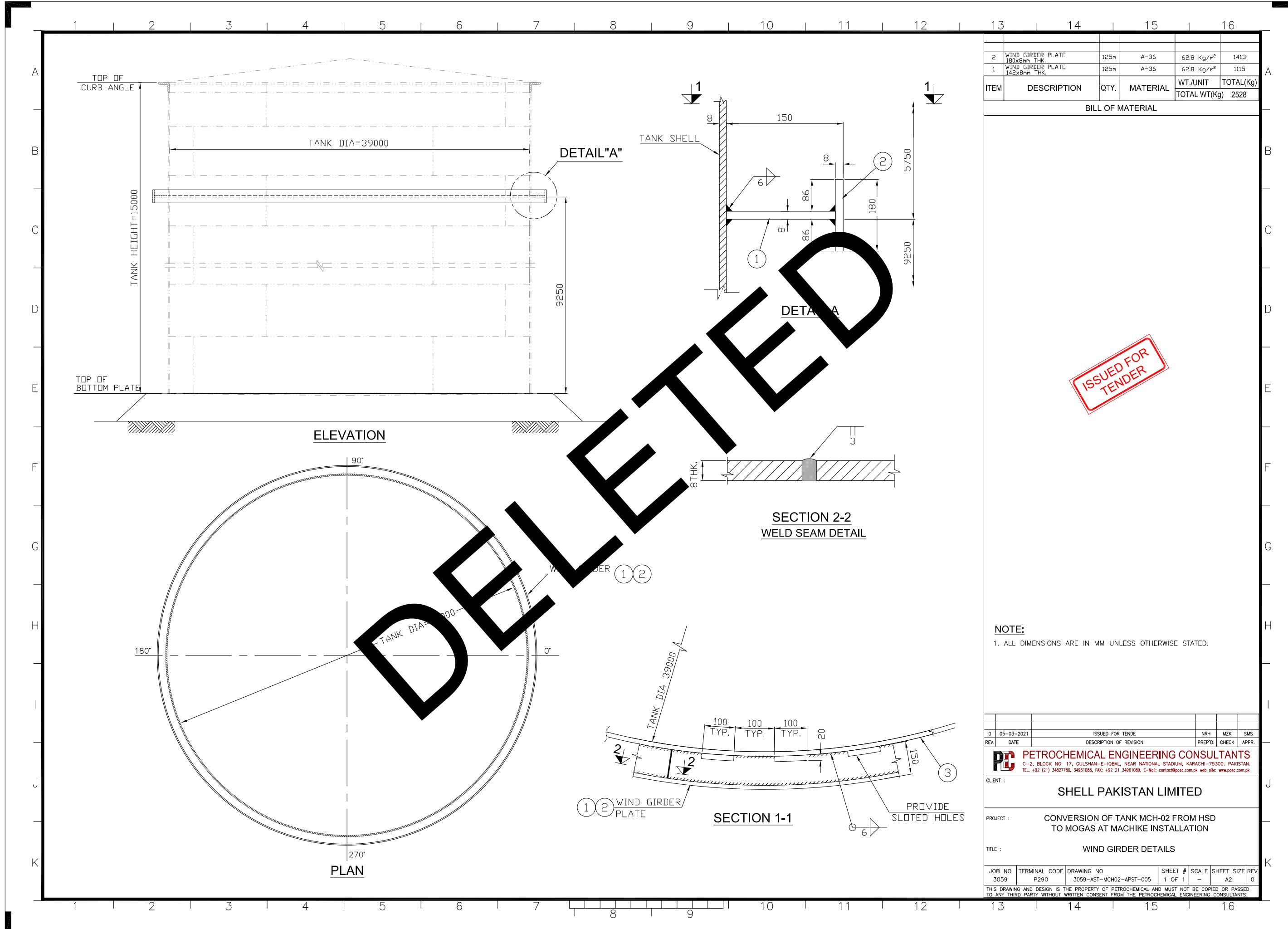
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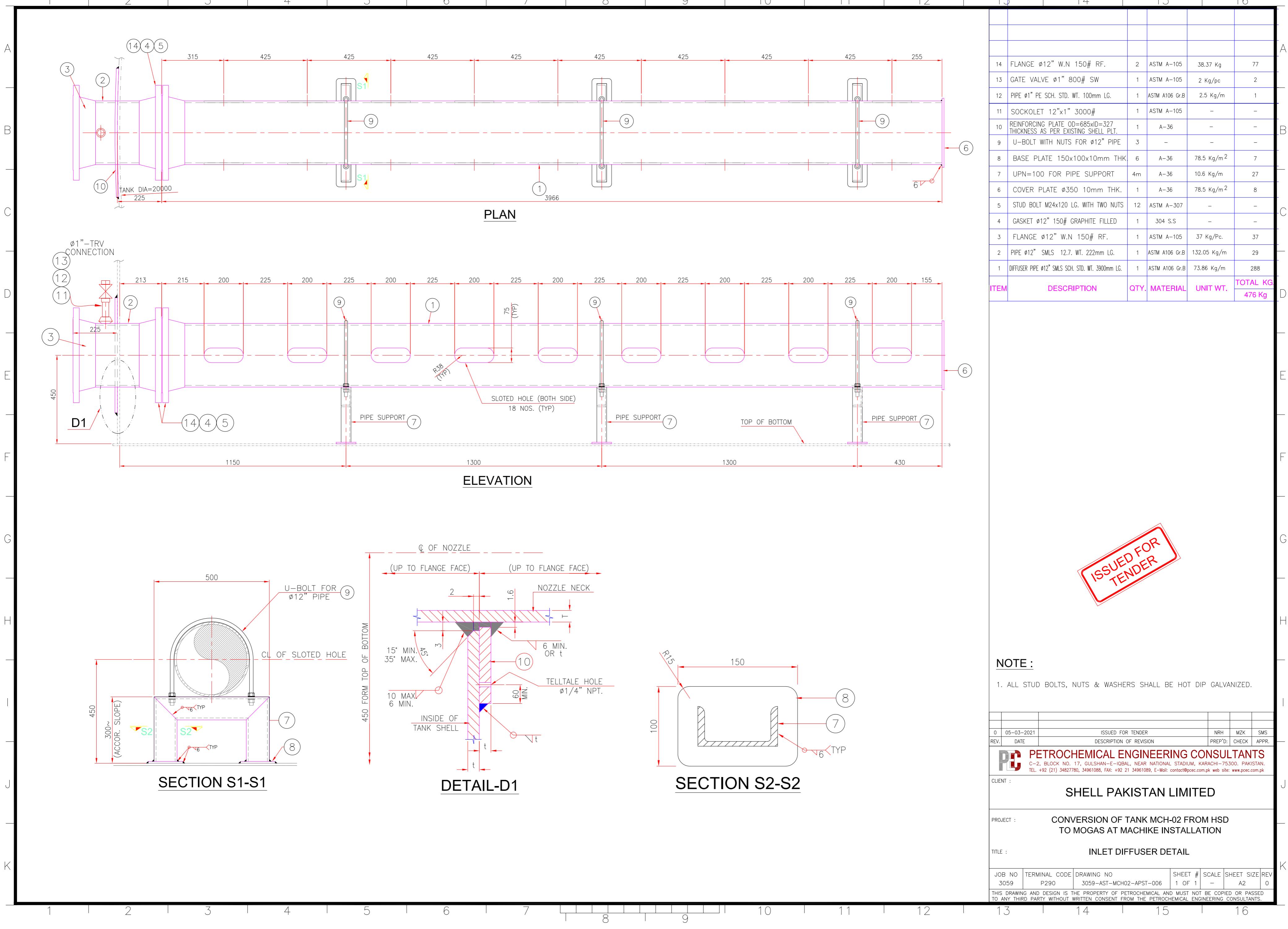












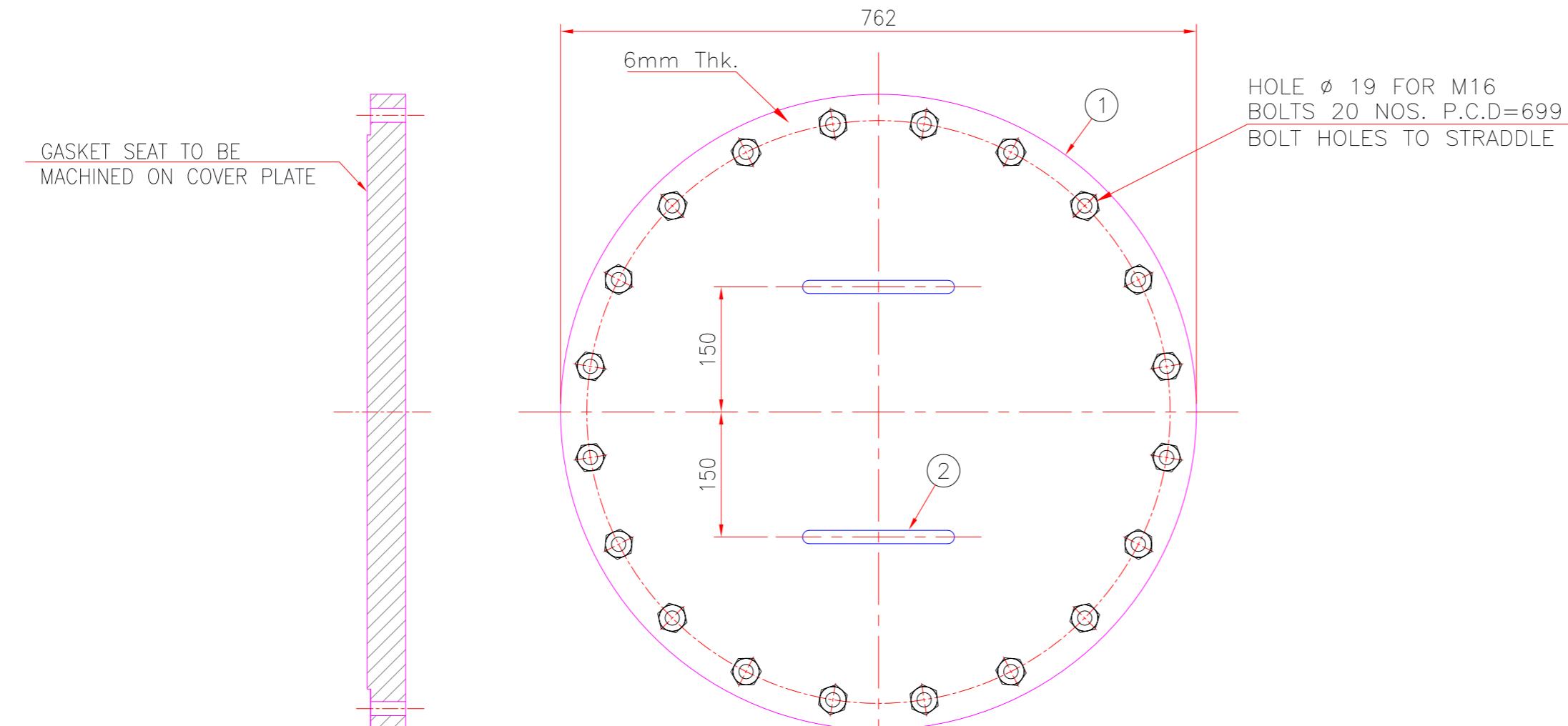
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16

4	STUD BOLTS M16 WITH 2 NUTS (M16 x 60mm L.G)	20	ASTM A-193 B7 ASTM A-194 2H	0.16 Kg/Pc.	3
3	GASKET OD=762, ID=600, 1.5mm Thk.	1	NON ASBESTOS FILLED	-	-
2	LIFTING LUGS (ø16x340 LONG ROD)	2	ASTM A36	1.5 Kg/m	1
1	COVER PLATE ø762 6 Thk.	1	ASTM-A36	47.1 Kg/m ²	21
ITEM	DESCRIPTION	QTY.	MATERIAL	W.T/UNIT	TOTAL(Kg)
				TOTAL WT.(Kg)	25

BILL OF MATERIAL

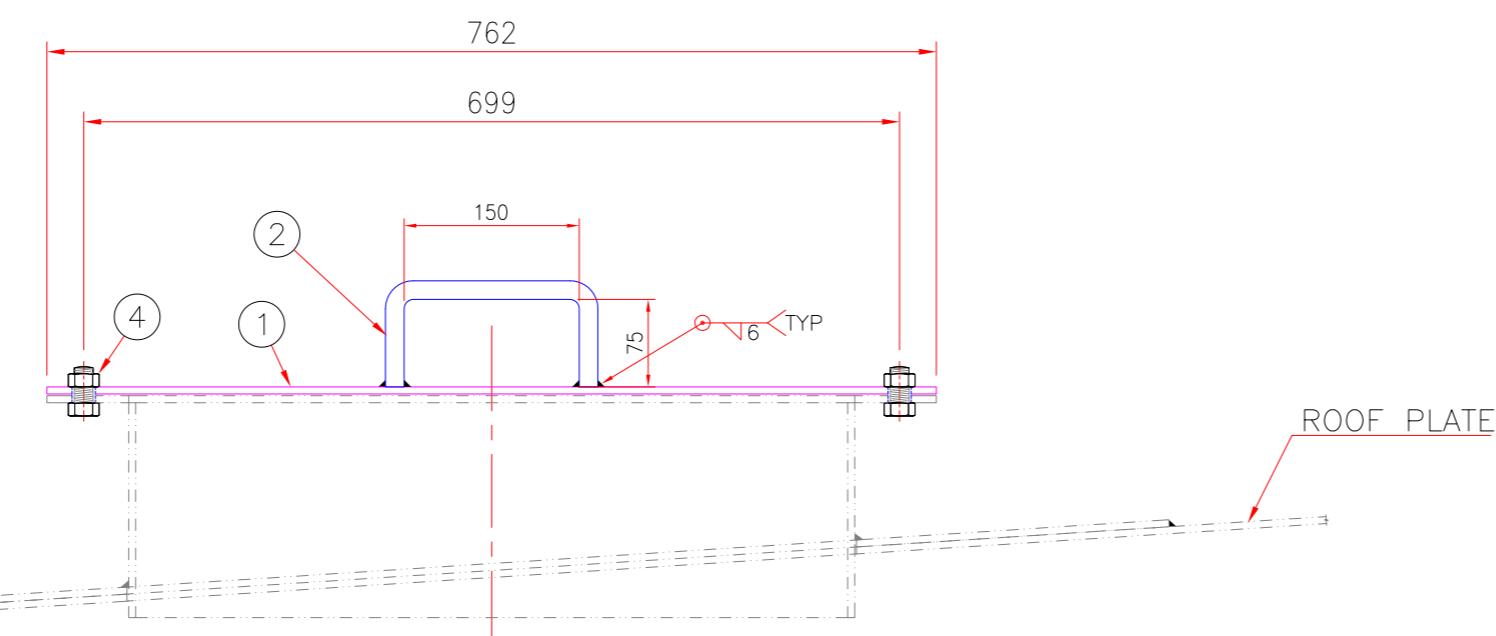
NOTES:

- ALL DIMENSION ARE IN mm UNLESS OTHERWISE STATED.
- ALL STUD BOLTS, NUTS & WASHERS SHALL BE HOT DIP GALVANIZED.



SECTION 3-3

PLAN



ELEVATION

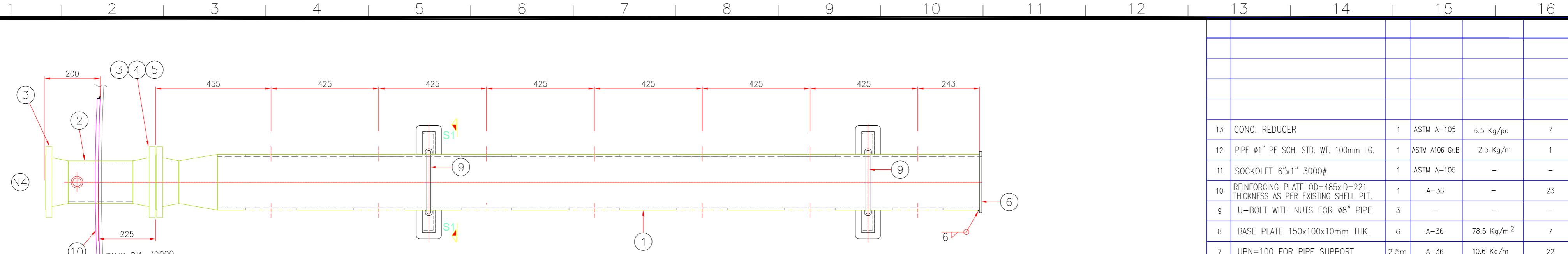
ISSUED FOR
TENDER

0	05-03-2021	ISSUED FOR TENDER	AH	MZK	SMS
REV.	DATE	DESCRIPTION OF REVISION	PREP'D:	CHECK	APPR.

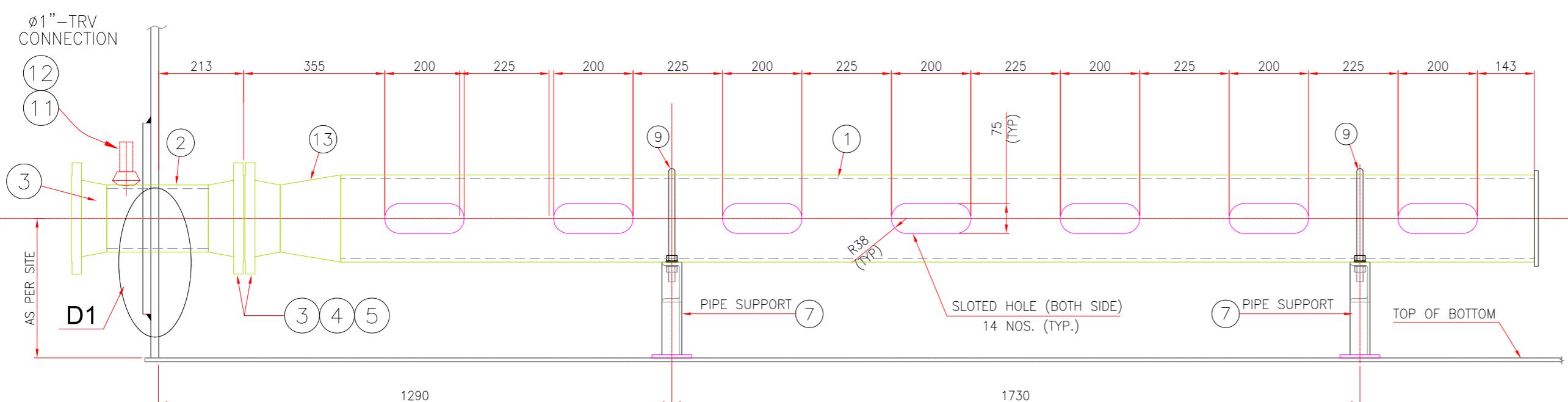
PETROCHEMICAL ENGINEERING CONSULTANTS
C-2, BLOCK NO. 17, GULSHAN-E-IQBAL, NEAR NATIONAL STADIUM, KARACHI-75300, PAKISTAN.
TEL: +92 (21) 34827780, 34961088, FAX: +92 21 34961089, E-Mail: contact@pcec.com.pk web site: www.pcec.com.pk

CLIENT :	SHELL PAKISTAN LIMITED				
PROJECT :	CONVERSION OF TANK MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION				
TITLE :	ROOF MANHOLE COVER DETAIL -Ø24"				
JOB NO	TERMINAL CODE	DRAWING NO	SCALE	HEET SIZE	REV
3059	P290	3059-AST-MCH02-APST-007	1 OF 1	-	A3 0

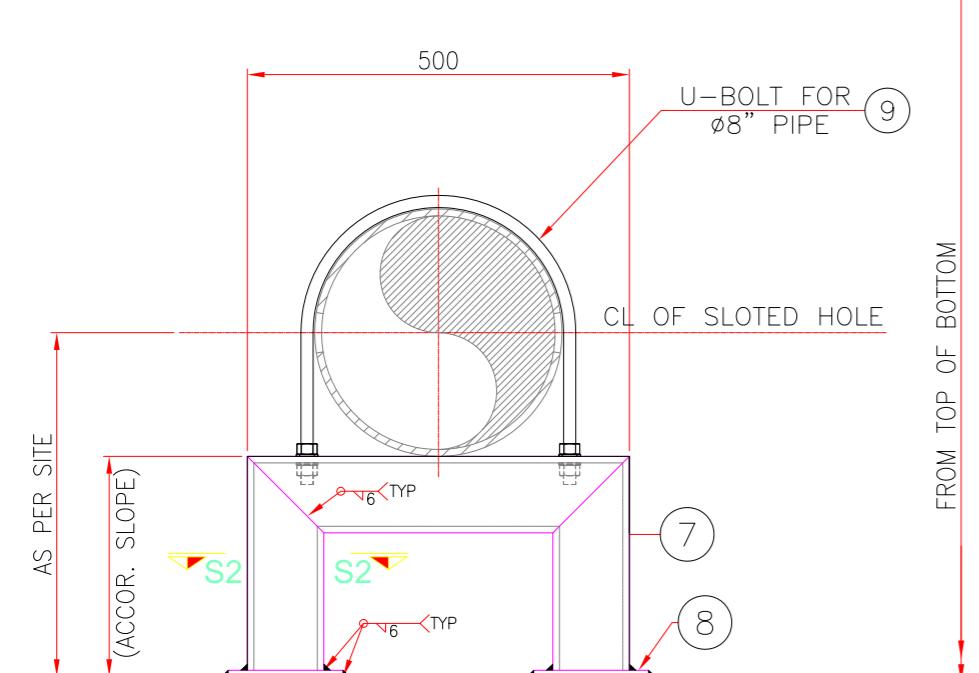
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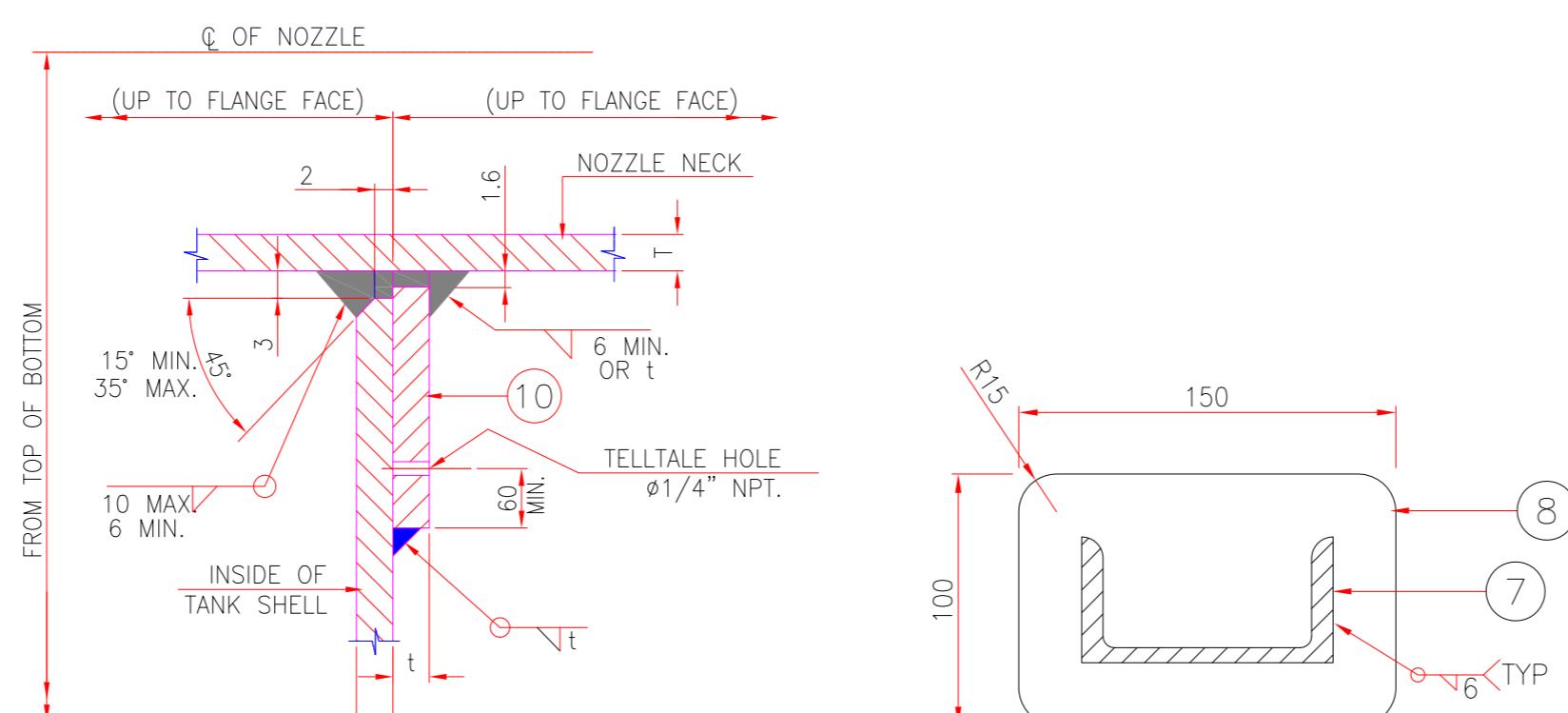
PLAN



ELEVATION



SECTION S1-S1



DETAIL-D1

SECTION S2-S2

**ISSUED FOR
TENDER**

NOTES :

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. ALL DIMENSIONS, ELEVATIONS AND ORIENTATIONS TO BE VERIFIED BY THE CONTRACTOR BEFORE UNDERTAKING ANY KIND OF FABRICATION CONSTRUCTION AND INSTALLATION WORK AT SITE.
3. ALL STUD BOLTS, NUTS & WASHERS SHALL BE HOT DIP GALVANIZED.

0	05-03-2021	ISSUED FOR TENDER	NRH	MZK	SMS
REV.	DATE	DESCRIPTION OF REVISION	PREP'D:	CHECK	APPR.

PCEC	PETROCHEMICAL ENGINEERING CONSULTANTS				
C-2, BLOCK NO. 17, GULSHAN-E-IBAL, NEAR NATIONAL STADIUM, KARACHI-75300, PAKISTAN.					
TEL: +92 (21) 34827780, 34961088, FAX: +92 21 34961089, E-Mail: contact@pcec.com.pk web site: www.pcec.com.pk					

CLIENT : SHELL PAKISTAN LIMITED

PROJECT : CONVERSION OF TANK MCH-02 FROM HSD
TO MOGAS AT MACHIKE INSTALLATION

TITLE : INLET DIFFUSER DETAIL

JOB NO	TERMINAL CODE	DRAWING NO	SCALE	HEET SIZE
3059	P290	3059-AST-MCH02-APST-008	1 OF 1	A2

REV 0

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SHELL PAKISTAN LIMITED

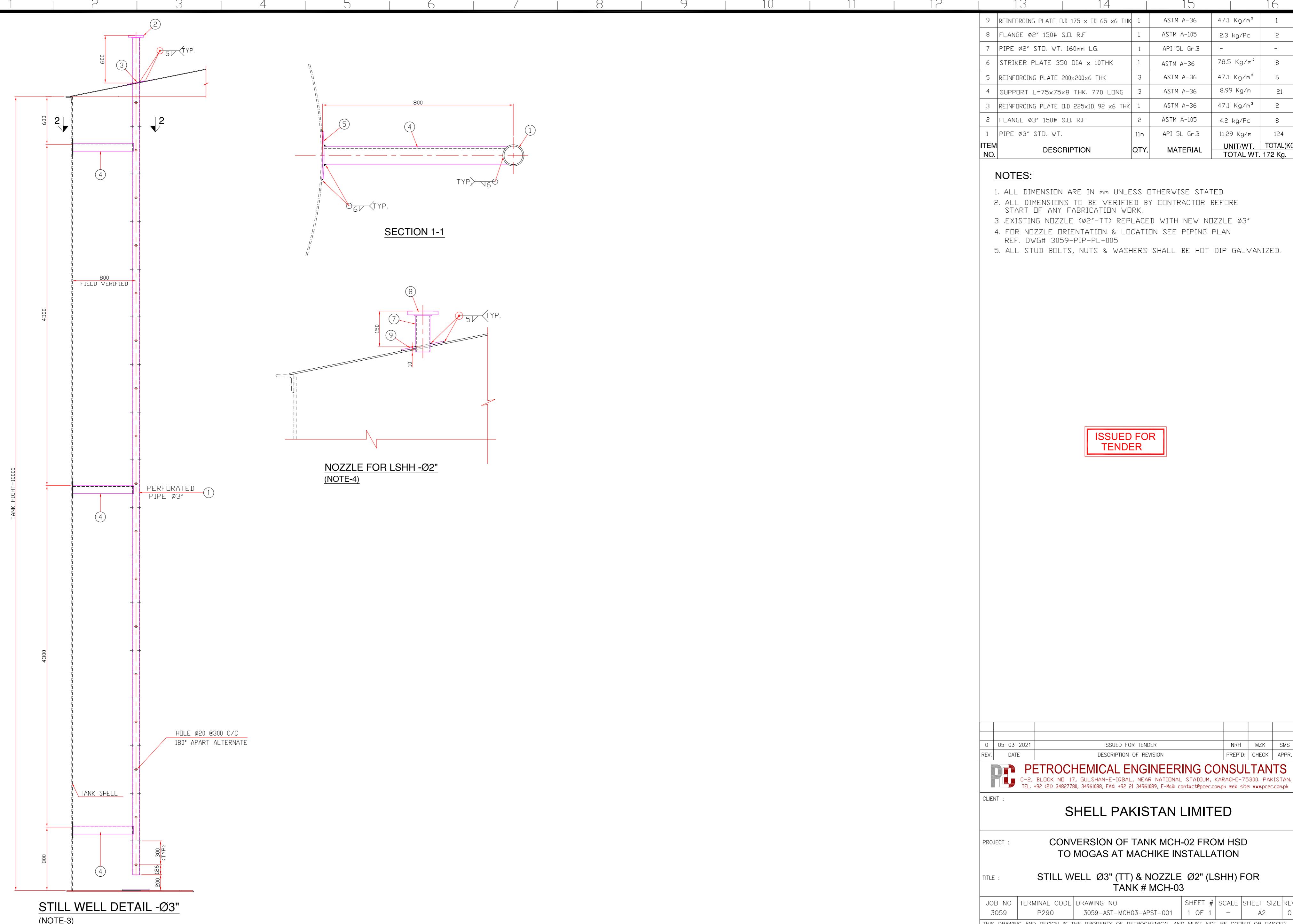
MCH-03

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

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Consultants



ITEM NO.	DESCRIPTION	QTY.	MATERIAL	UNIT/WT.	TOTAL WT.
9	REINFORCING PLATE Ø.D 175 x ID 65 x 6 THK	1	ASTM A-36	47.1 Kg/m ²	1
8	FLANGE Ø2" 150# S.O. R.F.	1	ASTM A-105	2.3 kg/Pc	2
7	PIPE Ø2" STD. WT. 160mm LG.	1	API 5L Gr.B	-	-
6	STRIKER PLATE 350 DIA x 10THK	1	ASTM A-36	78.5 Kg/m ²	8
5	REINFORCING PLATE 200x200x6 THK	3	ASTM A-36	47.1 Kg/m ²	6
4	SUPPORT L=75x75x8 THK. 770 LONG	3	ASTM A-36	8.99 Kg/m	21
3	REINFORCING PLATE Ø.D 225xID 92 x 6 THK	1	ASTM A-36	47.1 Kg/m ²	2
2	FLANGE Ø3" 150# S.O. R.F.	2	ASTM A-105	4.2 kg/Pc	8
1	PIPE Ø3" STD. WT.	11m	API 5L Gr.B	11.29 Kg/m	124
					TOTAL WT. 172 Kg.

REV.	DATE	ISSUED FOR TENDER	NRH	MZK	SMS
0	05-03-2021				

PETROCHEMICAL ENGINEERING CONSULTANTS
C-2, BLOCK NO. 17, GULSHAN-E-IQBAL, NEAR NATIONAL STADIUM, KARACHI-75300, PAKISTAN.
TEL: +92 (21) 34827780, 34961088, FAX: +92 21 34961089, E-Mail: contact@pceccom.pk web site: www.pceccom.pk

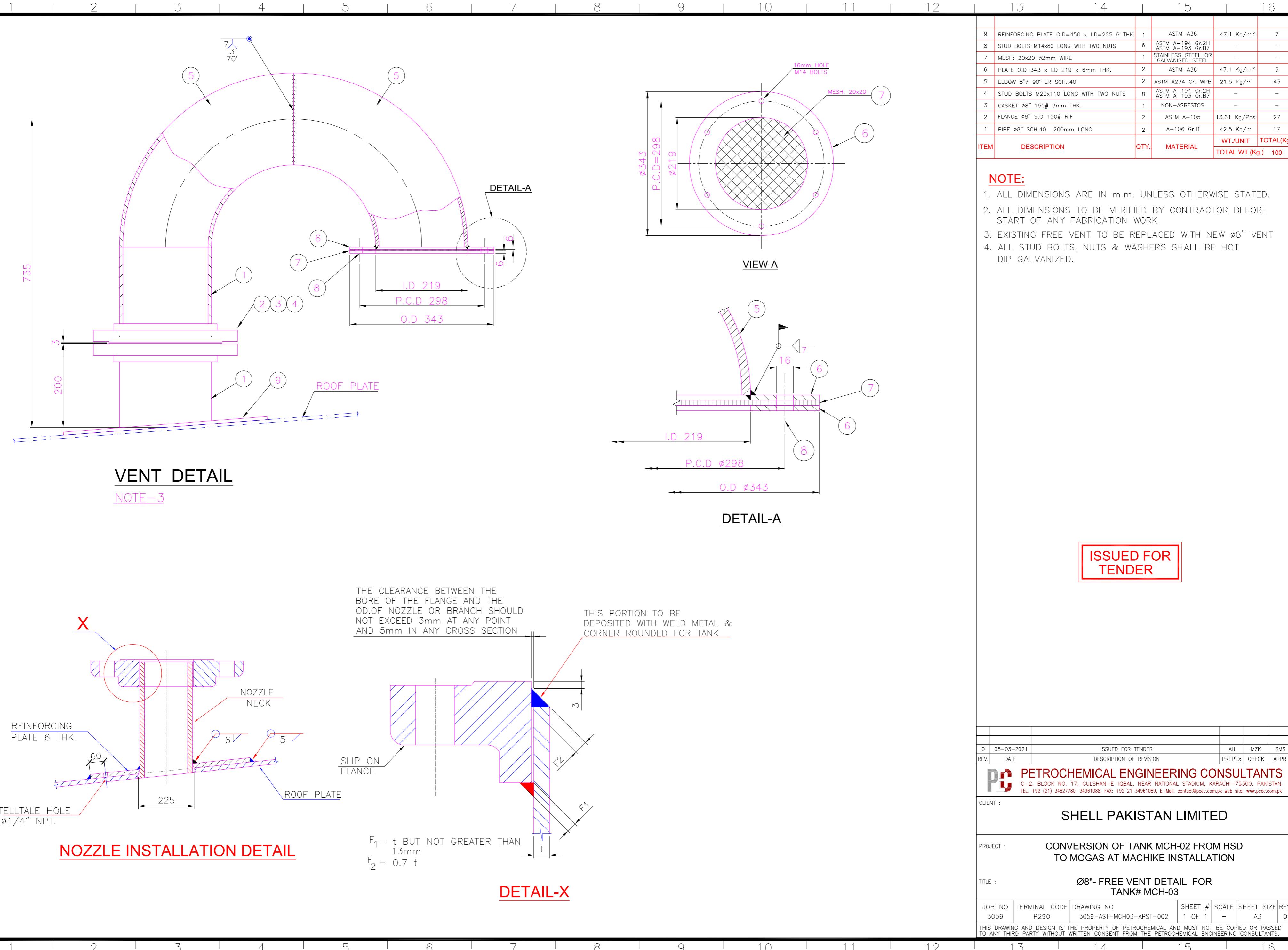
CLIENT : **SHELL PAKISTAN LIMITED**

PROJECT : **CONVERSION OF TANK MCH-02 FROM HSD
TO MOGAS AT MACHIKE INSTALLATION**

TITLE : **STILL WELL Ø3" (TT) & NOZZLE Ø2" (LSHH) FOR
TANK # MCH-03**

JOB NO	TERMINAL CODE	DRAWING NO	SCALE	SIZE	REV
3059	P290	3059-AST-MCH03-APST-001	1 OF 1	-	A2 0

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32					
31					
30					
29					
28					
27	LEVEL GAUGE (MECHANICAL TYPE) BY VENDOR	1	-	-	-
26	STUD & BOLT M14x70 LONG	24	ASTM A 193 Gr. BM ASTM A 194 Gr. 2H	0.5 Kg/4Pcs.	3
25	GASKET, Ø3/4"-150#	6	SPIRAL WOUND	-	-
24	FLANGE SW, Ø3/4"-150#	5	A-105	0.9 Kg/Pc.	5
23	GATE VALVE, Ø3/4"-150#	3	ASTM A216 Gr.B	7 Kg/Pc.	21
22	S.W EQUAL TEE Ø3/4"-3000#	1	A-105	-	-
21	PIPE Ø3/4" SCH. 80x 1000 LG.	1	ASTM A106 Gr.B	2.2 Kg/m	2
20	PIPE Ø2" SCH. 80x 550 LONG	1	ASTM A106 Gr.B	7 Kg/m	4
19	FINE MASH	1	-	-	-
18	PLATE 4mm THK.	1	ASTM A-36	-	-
17	BLIND FLANGE, Ø3/4"-150#	1	A-105	0.9 Kg/Pc.	1
16	Ø1" 180° BEND	1	A-105	-	1
15	HINGE PLATE 6 thk	3	ASTM A-36	47.1 Kg/m ²	1
14	CHEMICAL HILTI BOLT M20	4	-	-	-
13	FLANGE S.O Ø2"-150#	2	ASTM A-105	2.3 Kg/PC	5
12	PIPE Ø2" SCH.80 125 LONG	2	ASTM A106 Gr.B	7 Kg/m	2
11	PIPE Ø1" SCH.80 125mm LG.	1	ASTM A106 Gr.B	3 Kg/m	1
10	BOLT M10x40 WITH NUTS	6\SET	ASTM A-307	-	-
9	HINGE PLATE 6 thk.	3	ASTM A-36	47.1Kg/m ²	1
8	BASE PLATE 150x150x10 thk.	4	ASTM A-36	78.5Kg/m ²	7
7	HANDLE Ø15x400 LONG	1	ASTM A-36	1.4Kg/m	1
6	L 75x75x8 thk. 570 long	4	ASTM A-36	8.99 Kg/m	21
5	L 50x50x6 thk. 2827 long	1	ASTM A-36	4.47Kg/m	13
4	PLATE P-4 6 thk.	1	ASTM A-36	47.1Kg/m ²	23
3	PLATE P-3 6 thk.	1	ASTM A-36	47.1Kg/m ²	14
2	PLATE P-2 6 thk.	1	ASTM A-36	47.1Kg/m ²	33
1	PLATE P-1 2810x500x6thk.	1	ASTM A-36	47.1Kg/m ²	67
ITEM	DESCRIPTION	QTY.	MATERIAL	W.T/UNIT	TOTAL(Kg)
				TOTAL WT.	226 (Kg)

**ISSUED FOR
TENDER**

NOTES:

1. ALL DIMENSIONS AND ELEVATION ARE IN mm UNLESS OTHERWISE STATED.
 2. ALL DIMENSIONS, ELEVATIONS AND ORIENTATIONS TO BE VERIFIED BY THE CONTRACTOR BEFORE UNDERTAKING ANY KIND OF FABRICATION, CONSTRUCTION AND INSTALLATION WORK AT SITE.
 3. USE CHEMICAL HILTI RE-500 WITH HAS-E-F ROD AS PER APPROVED AND SPECIFICATIONS OF HILTI PAK.
 4. DIMENSION IS SUBJECT TO STORAGE TANK NOZZLE ELEVATION. HEIGHT SHALL BE SELECTED SO THAT INLET NOZZLE CENTRE LINE MATCH WITH STORAGE TANK NOZZLE CENTRE LINE.

EV.	DATE	DESCRIPTION OF REVISION	PREP'D:	CHECK	APPR.
1	07-04-2021	ISSUED FOR TENDER	MI	MZK	SMS
0	05-03-2021	ISSUED FOR TENDER	AH	MZK	SMS

SHELL PAKISTAN LIMITED

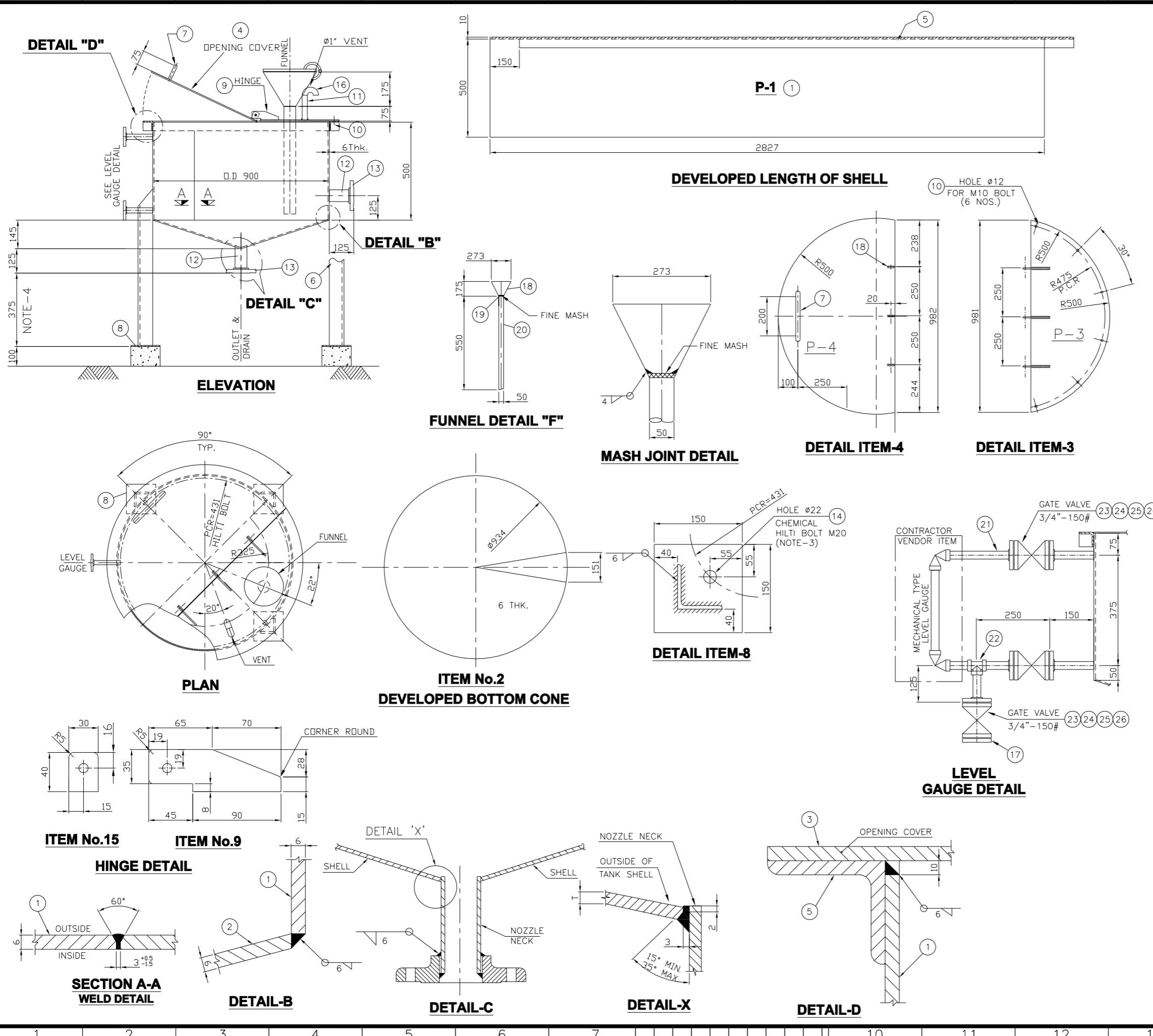
CONVERSION OF TANK MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION

**QUICK FLUSH TANK (QFT) DETAIL FOR
TANK# MCH-03**

CODE DRAWING NO SHEET # SCALE SHEET
0 3059-AST-MCH03-APST-003 1 OF 1 -

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14 15 16



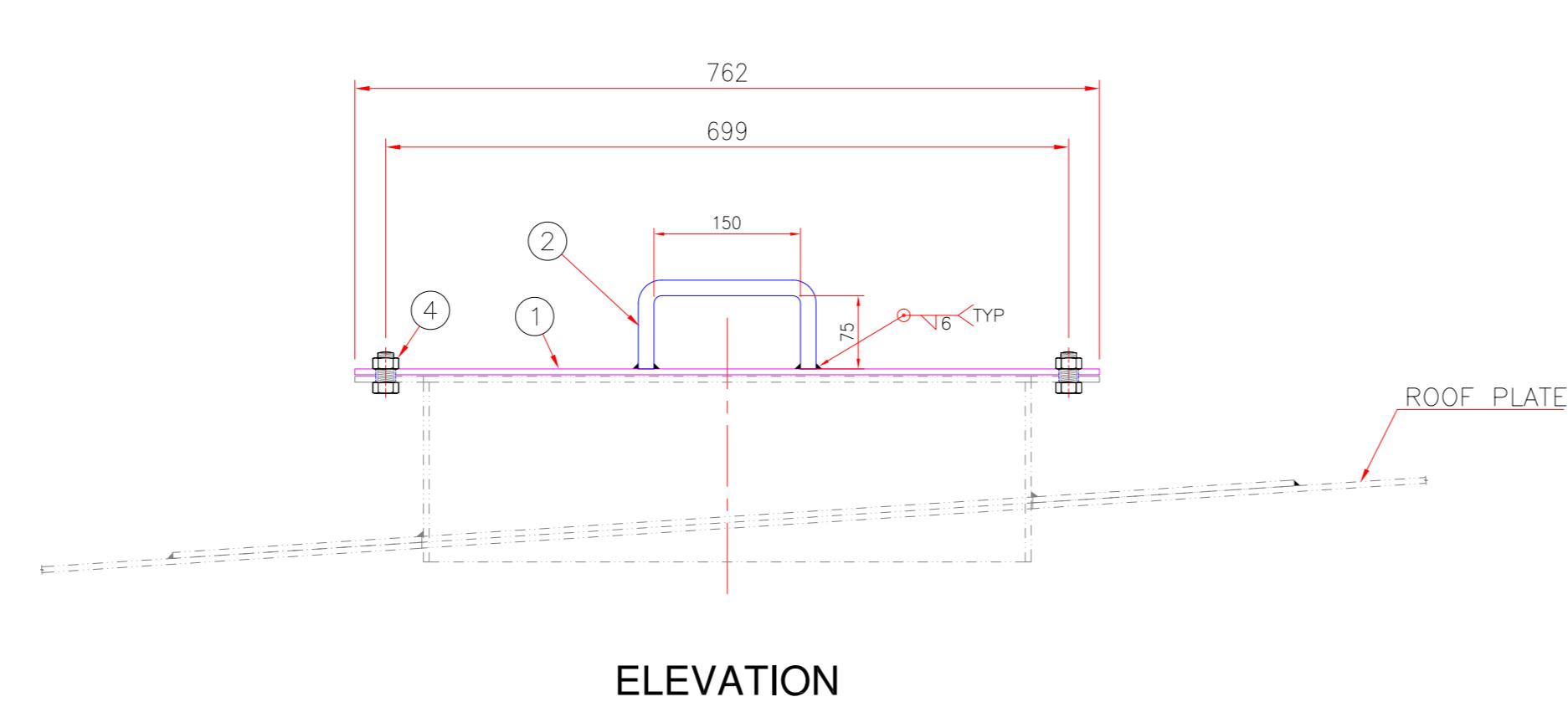
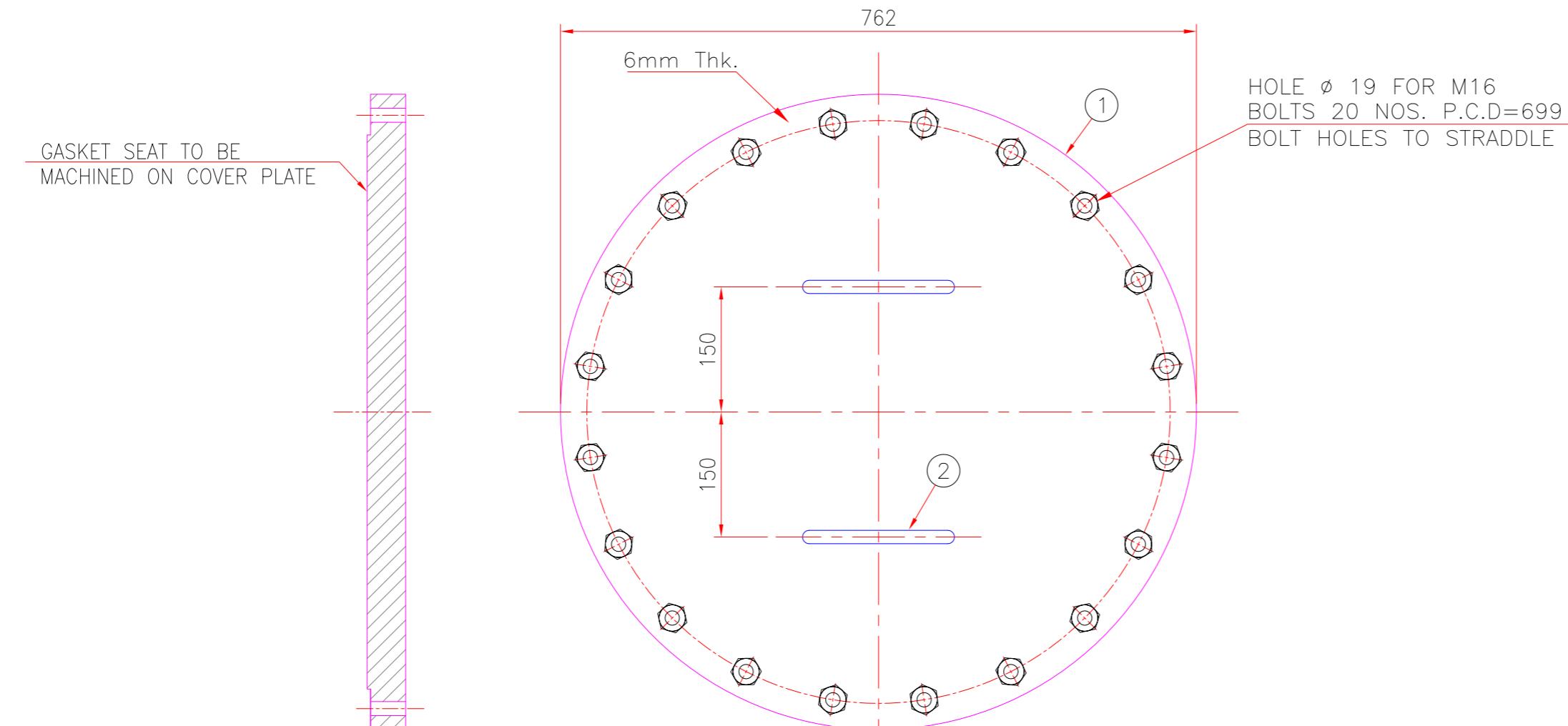
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

ITEM	DESCRIPTION	QTY.	MATERIAL	W.T/UNIT	TOTAL(Kg)
4	STUD BOLTS M16 WITH 2 NUTS (M16 x 60mm L.G)	20	ASTM A-193 B7 ASTM A-194 2H	0.16 Kg/Pc.	3
3	GASKET OD=762, ID=600, 1.5mm Thk.	1	NON ASBESTOS FILLED	-	-
2	LIFTING LUGS (ø16x340 LONG ROD)	2	ASTM A36	1.5 Kg/m	1
1	COVER PLATE ø762 6 Thk.	1	ASTM-A36	47.1 Kg/m ²	21
				TOTAL WT.(Kg)	25

BILL OF MATERIAL

NOTES:

- ALL DIMENSION ARE IN mm UNLESS OTHERWISE STATED.
- ALL STUD BOLTS, NUTS & WASHERS SHALL BE HOT DIP GALVANIZED.



ISSUED FOR
TENDER

0	04-03-2021	ISSUED FOR TENDER	AH	MZK	SMS
REV.	DATE	DESCRIPTION OF REVISION	PREP'D:	CHECK	APPR.

PETROCHEMICAL ENGINEERING CONSULTANTS
C-2, BLOCK NO. 17, GULSHAN-E-IQBAL, NEAR NATIONAL STADIUM, KARACHI-75300, PAKISTAN.
TEL: +92 (21) 34827780, 34961088, FAX: +92 21 34961089, E-Mail: contact@pcec.com.pk web site: www.pcec.com.pk

CLIENT :	SHELL PAKISTAN LIMITED				
PROJECT :	CONVERSION OF TANK MCH-02 FROM HSD TO MOGAS AT MACHIKE INSTALLATION				
TITLE :	ROOF MANHOLE COVER DETAIL -Ø24" FOR TANK# MCH-03				
JOB NO	TERMINAL CODE	DRAWING NO	SCALE	HEET SIZE	REV
3059	P290	3059-AST-MCH03-APST-004	1 OF 1	-	A3 0

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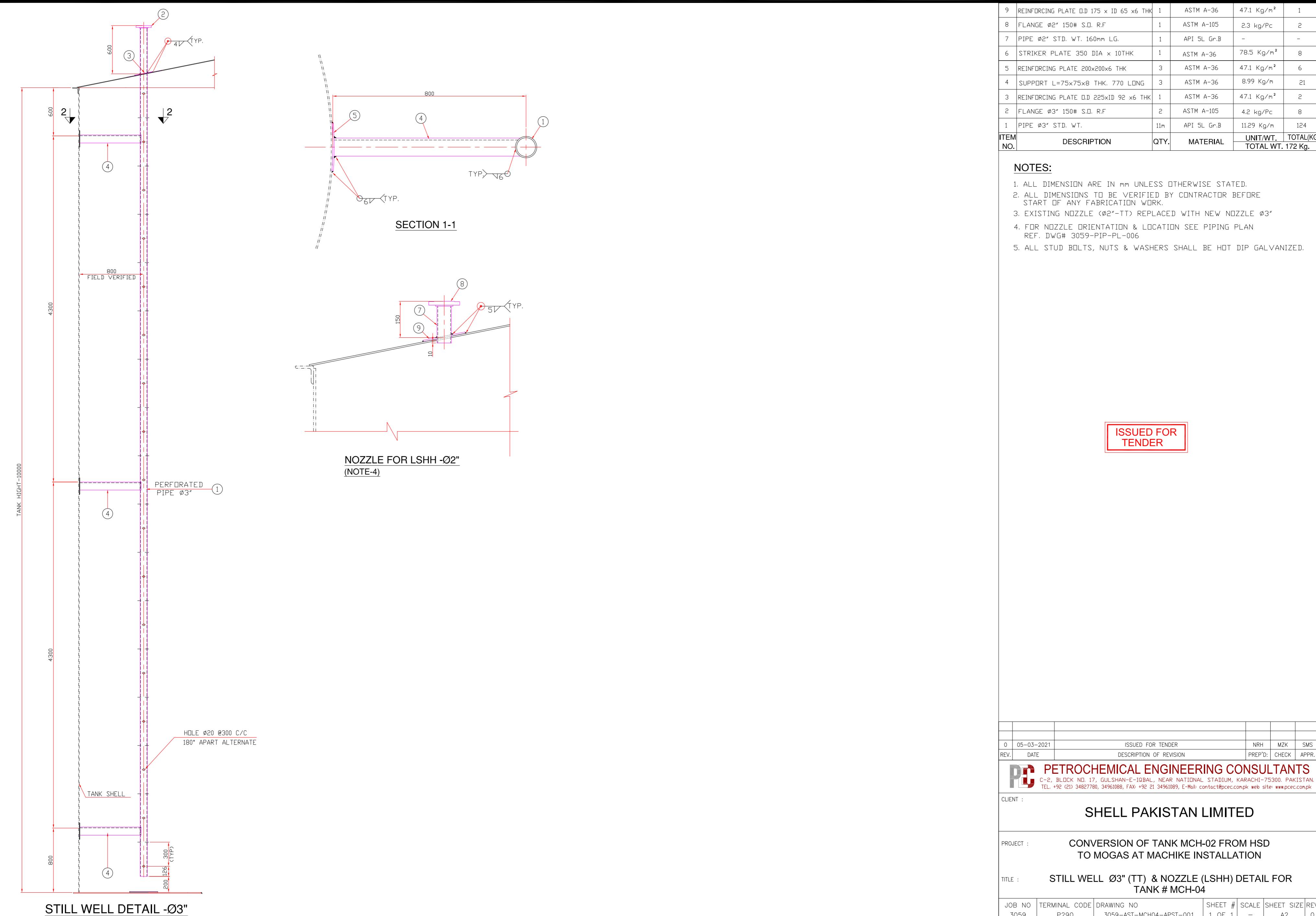
MCH-04

Consultant:



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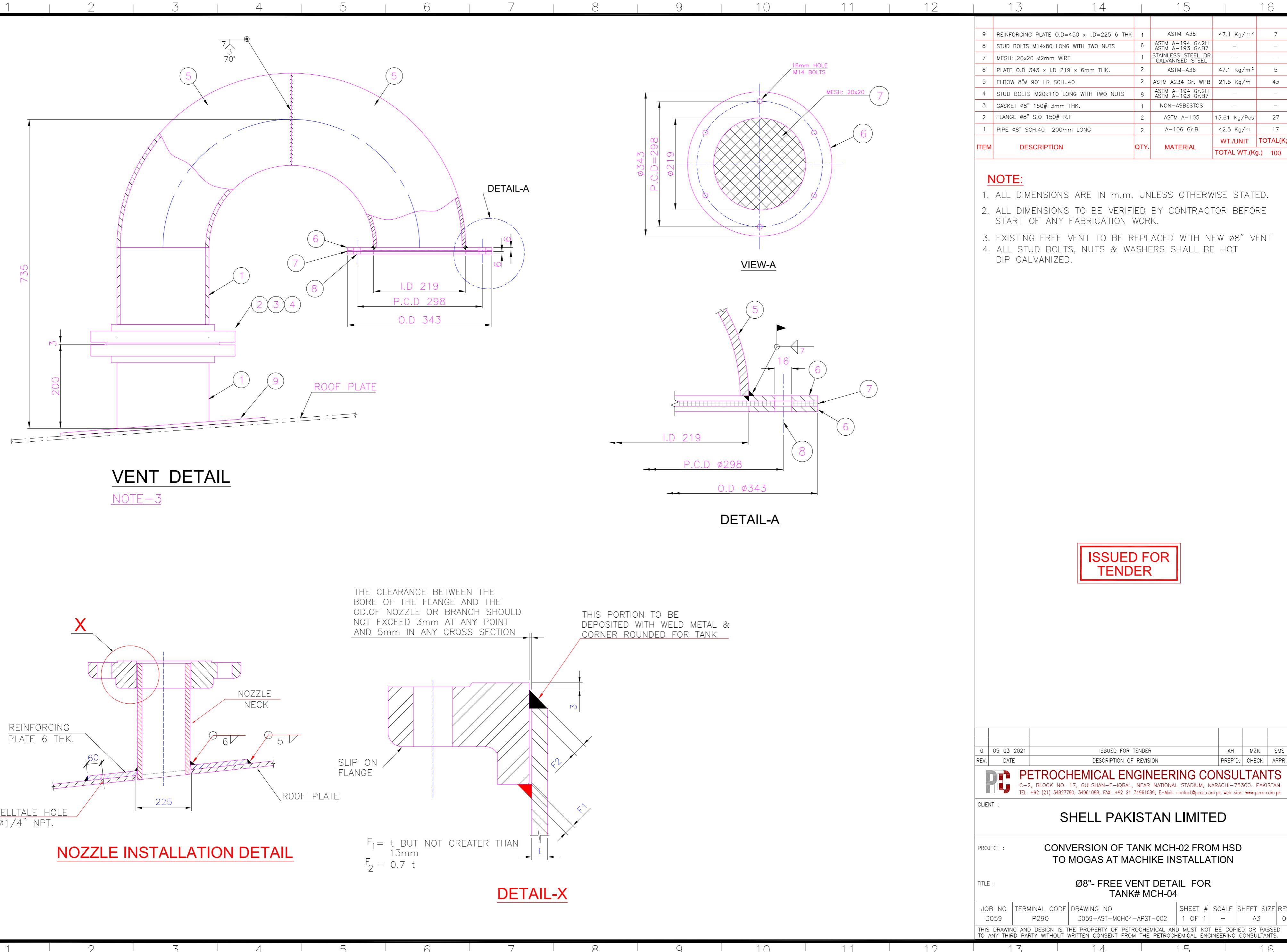
CLIENT : SHELL PAKISTAN LIMITED

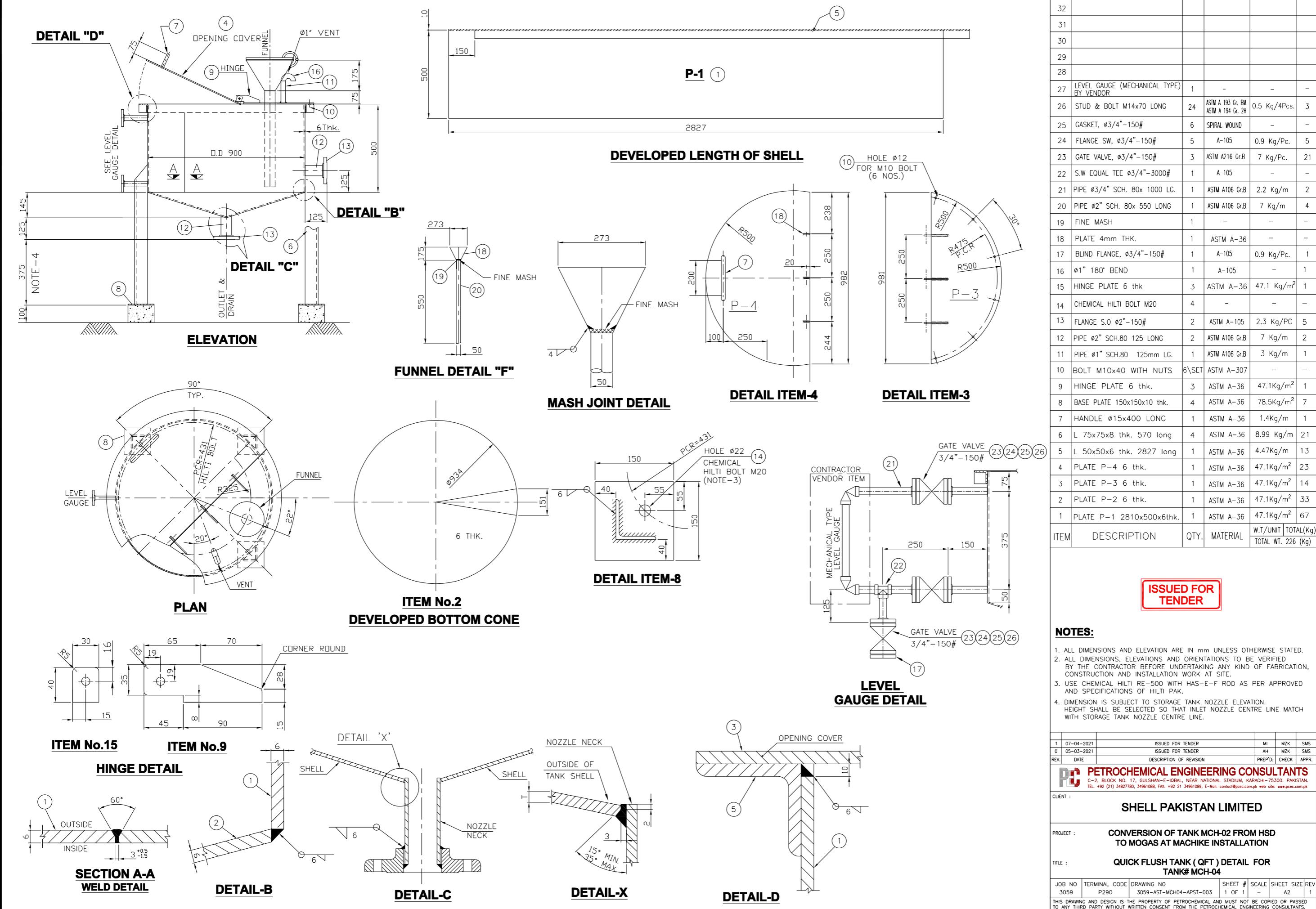
PROJECT : CONVERSION OF TANK MCH-02 FROM HSD
TO MOGAS AT MACHIKE INSTALLATION

TITLE : STILL WELL Ø3" (TT) & NOZZLE (LSHH) DETAIL FOR
TANK # MCH-04

JOB NO TERMINAL CODE DRAWING NO SHEET # SCALE SHEET SIZE REV
3059 P290 3059-AST-MCH04-APST-001 1 OF 1 - A2 0

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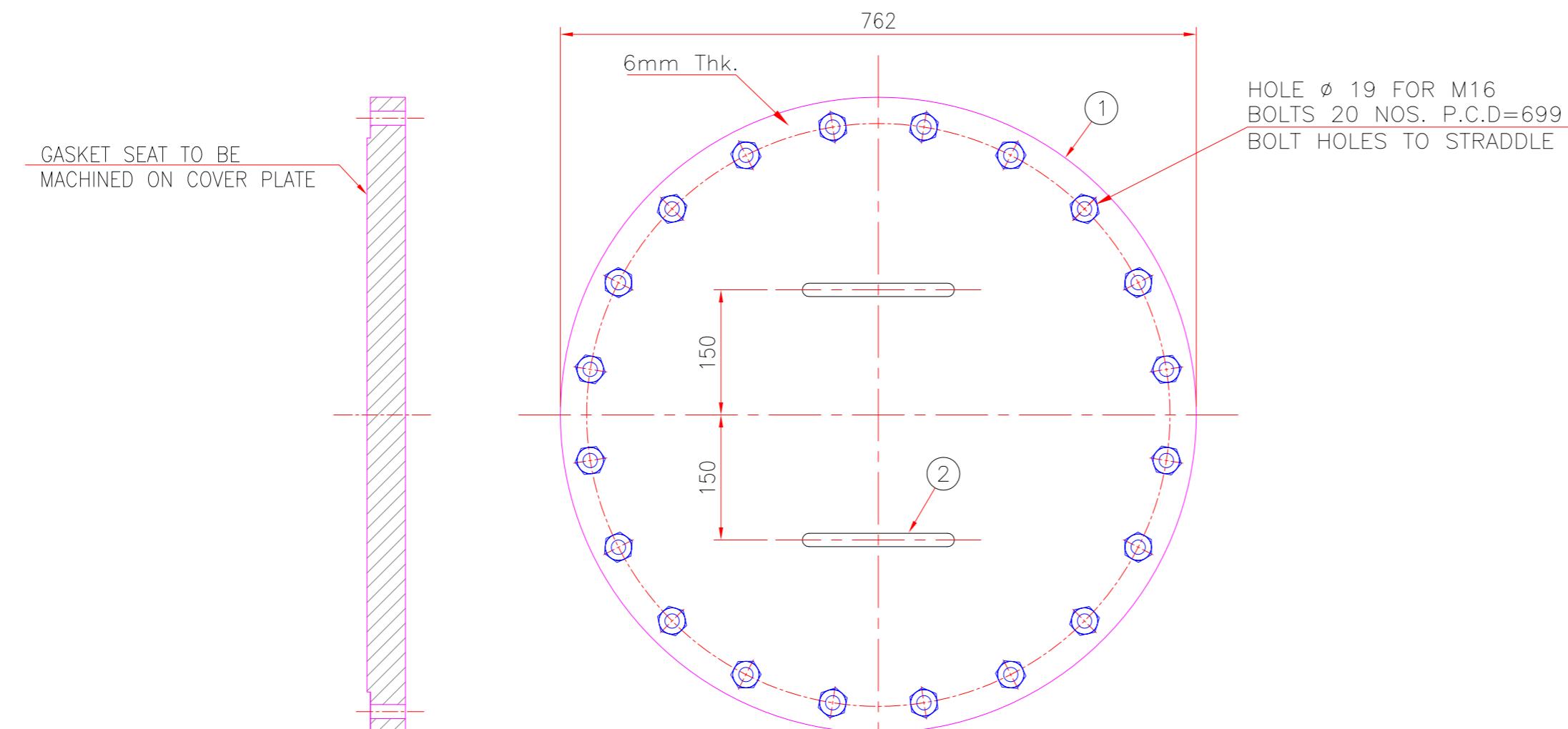
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

4	STUD BOLTS M16 WITH 2 NUTS (M16 x 60mm L.G)	20	ASTM A-193 B7 ASTM A-194 2H	0.16 Kg/Pc.	3
3	GASKET OD=762, ID=600, 1.5mm Thk.	1	NON ASBESTOS FILLED	-	-
2	LIFTING LUGS (ø16x340 LONG ROD)	2	ASTM A36	1.5 Kg/m	1
1	COVER PLATE ø762 6 Thk.	1	ASTM-A36	47.1 Kg/m ²	21
ITEM	DESCRIPTION	QTY.	MATERIAL	W.T/UNIT	TOTAL(Kg)
				TOTAL WT.(Kg)	25

BILL OF MATERIAL

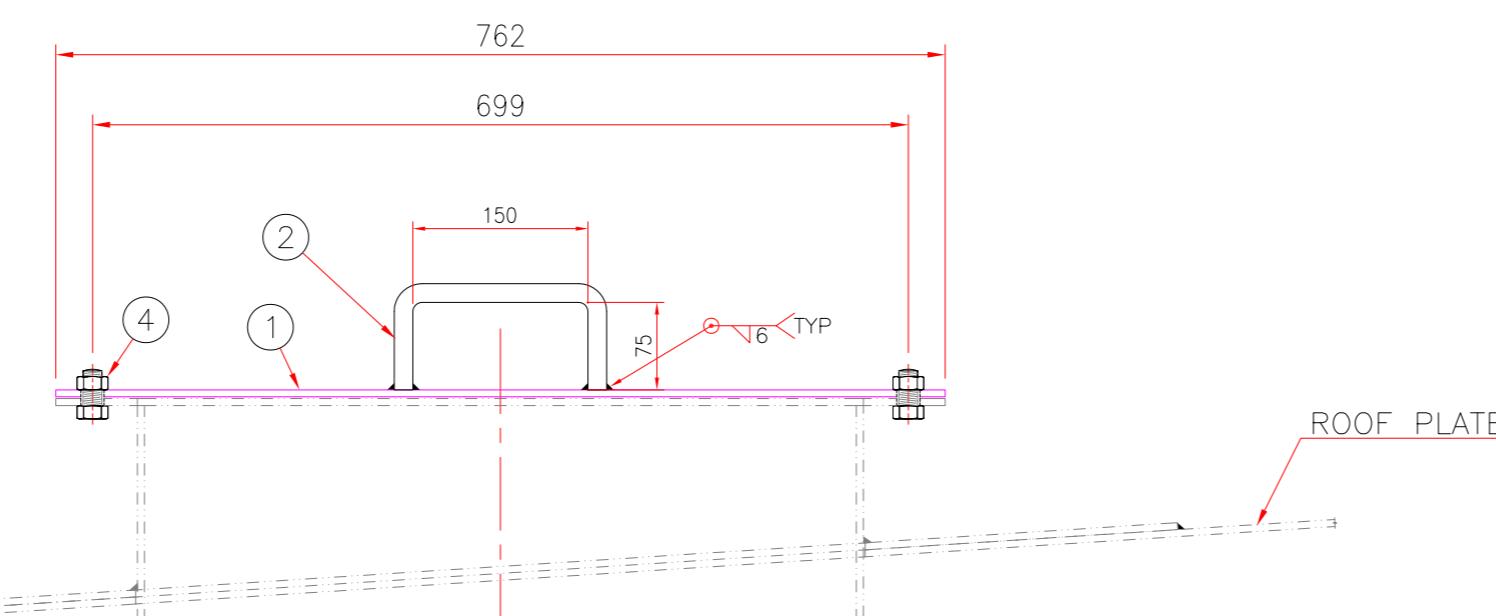
NOTES :

- ALL DIMENSION ARE IN mm UNLESS OTHERWISE STATED.
- ALL STUD BOLTS, NUTS & WASHERS SHALL BE HOT DIP GALVANIZED.



SECTION 3-3

PLAN



ELEVATION

ISSUED FOR
TENDER

0	05-03-2021	ISSUED FOR TENDER	AH	MZK	SMS
REV.	DATE	DESCRIPTION OF REVISION	PREP'D:	CHECK	APPR.

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CLIENT : SHELL PAKISTAN LIMITED

PROJECT : CONVERSION OF TANK MCH-02 FROM HSD
TO MOGAS AT MACHIKE INSTALLATION

TITLE : ROOF MANHOLE COVER DETAIL -Ø24" FOR
TANK# MCH-04

JOB NO	TERMINAL CODE	DRAWING NO	SCALE #	HEET SIZE	REV
3059	P290	3059-AST-MCH04-APST-004	1 OF 1	-	A3

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

SHELL PAKISTAN LIMITED

MCH-06

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

A

B

C

D

E

F

G

H

I

J

K

A

B

C

D

E

F

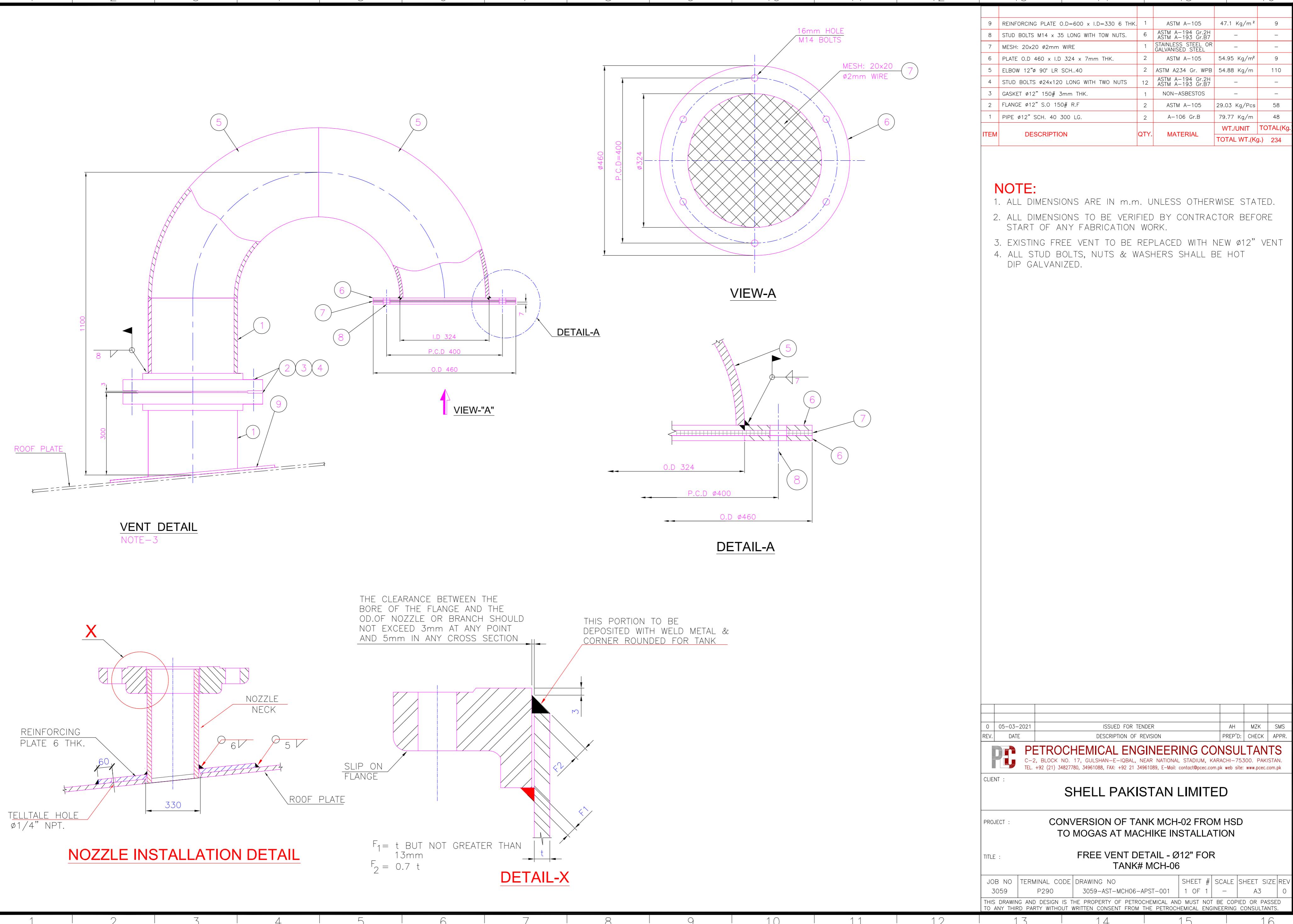
G

H

I

J

K

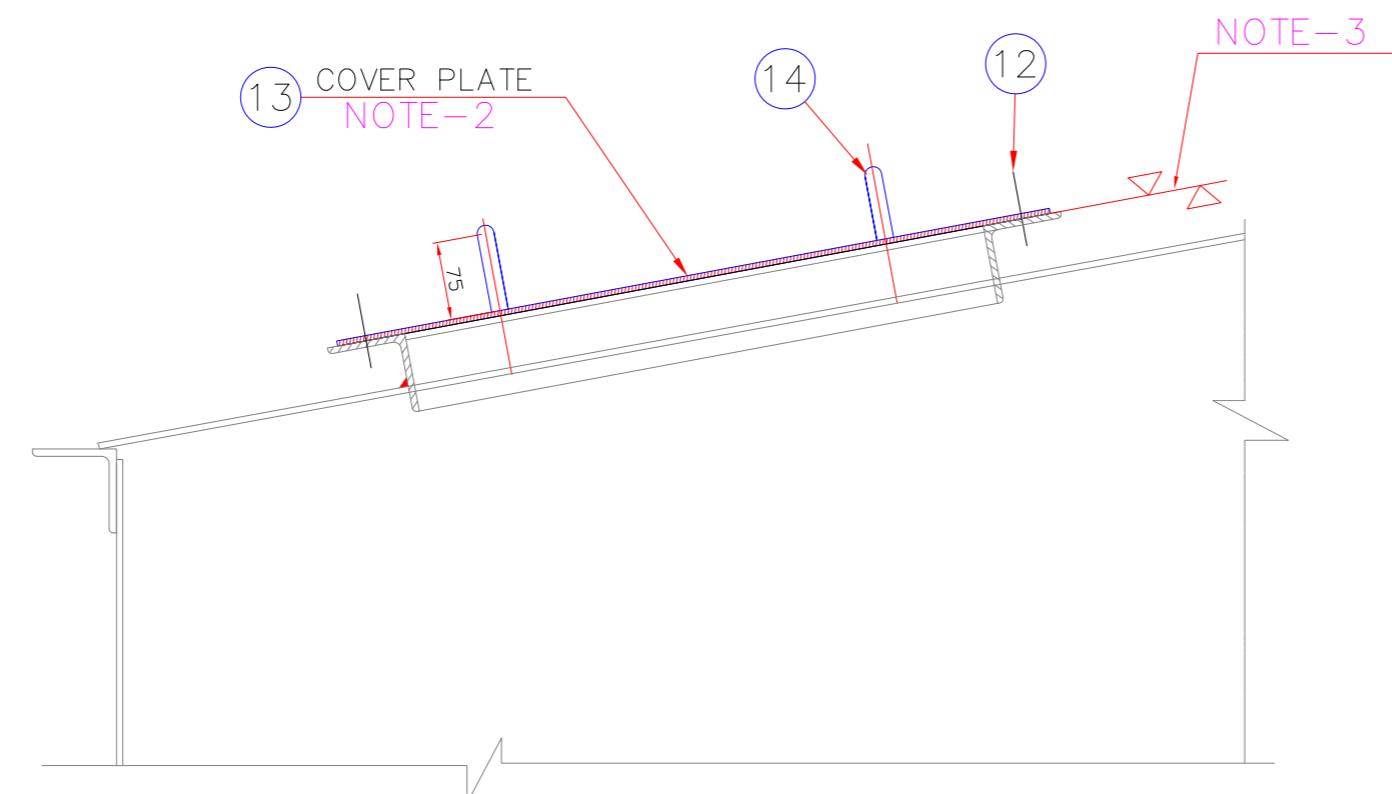


1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16

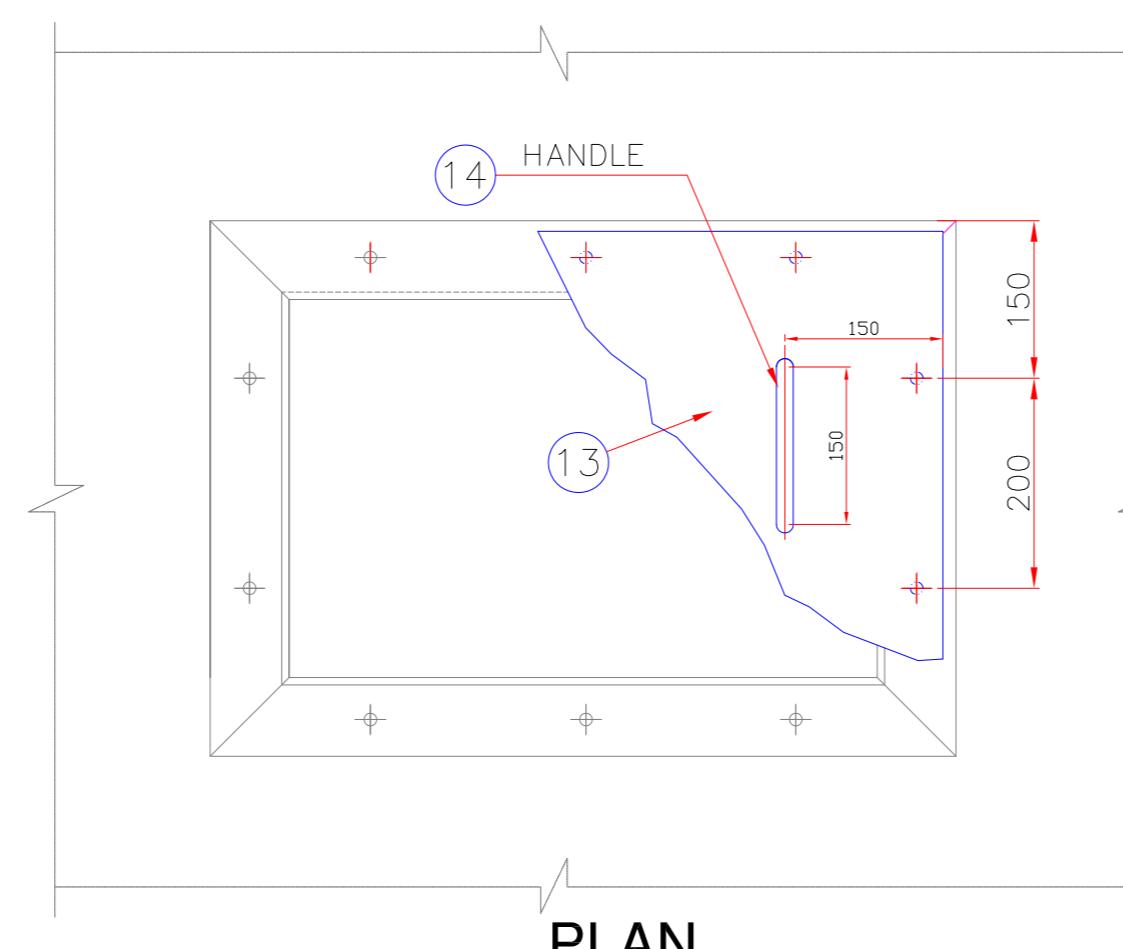
14	BOLT M10x40 LG. WITH NUTS	10	ASTM A-307	-	-
13	LIFTING LUGS, ROD Ø 16	2	ASTM A-36	-	1
12	COVER PLATE 690x490 10mm THK	1	A-36	78.5 Kg/m ²	27
ITEM	DESCRIPTION	QTY.	MATERIAL	UNIT WT.	TOTAL KG. 28

NOTES

- ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE STATED.
- CIRCULATION VENT OPENING SHALL BE COVERED WITH 8mm PLATE WHEN TANK DOES NOT HAVE INTERNAL FLOATING COVER.
- MACHINED FROM 10MM THK PLT.
- B.O.Q ONLY FOR ONE COVER
- ALL STUD BOLTS, NUTS & WASHERS SHALL BE HOT DIP GALVANIZED.



ELEVATION



PLAN

**ISSUED FOR
TENDER**

TANK NO.	TANK DIA	TANK HT.	NOS. OF CIRCULATION VENT
MCH-06	20.0m	15.0m	6

REV.	DATE	ISSUED FOR TENDER	AH	MZK	SMS
0	05-03-2021	DESCRIPTION OF REVISION	PREP'D:	CHECK	APPR.

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TEL: +92 (21) 34827780, 34961088, FAX: +92 21 34961089, E-Mail: contact@pcec.com.pk web site: www.pcec.com.pk

CLIENT : **SHELL PAKISTAN LIMITED**

PROJECT : **CONVERSION OF TANK MCH-02 FROM HSD
TO MOGAS AT MACHIKE INSTALLATION**

TITLE : **CIRCULATION VENT COVER DETAIL FOR
TANK# MCH-06**

JOB NO	TERMINAL CODE	DRAWING NO	SCALE	SIZE	REV
3059	P290	3059-AST-MCH06-APST-002	1 OF 1	-	A3

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SHELL PAKISTAN LIMITED

ANNEXURE - A

Consultant:



PETROCHEMICAL ENGINEERING CONSULTANTS

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	MCH-03

Client :	Shell Pakistan Limited
Location :	Machike Terminal
Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection
Job Number:	5010465
Inspection Date :	20 Jan 2021 To 25 Jan 2021
Job Executed By :	Bakhtiar Ahmed (Certified API 653 & MFL Inspector) Sajjad Hussain (NDT Level II) Ali Uzair (NDT Level II) Abdul Hanan (NDT Level II)

Prepared By :	Reviewed By :	Approved By :
Bakhtiar Ahmed Certificate #54112	Muhammad Danish Vohra Assistant Manager	Muhammad Asif Operation Manager




SGS Pakistan (Private) Limited
H-3/3, Sector 5,
Korangi Industrial Area,
Karachi-74900, Pakistan
Tel : 92-21351 21388-97
Fax : 92-21-351 21325/ 35121386

All orders are accepted and all report and certificates issued subject to the General Condition of Service
(Copies available upon request)

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

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SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

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SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

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SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :		Out of Service Inspection	

1. Introduction

Tank MCH-03 has been inspected at Machike Terminal for Shell Pakistan Limited .

Inspection Equipments used:

Equipment	Brand	Model	Serial Number	Calibration Due Date
Floor Map MFL	SILVERWING	3D	2480813	25/3/2021
UTG Meter	GE SENSING & INSPECTION TECHNOLOGIES	DMS GO	13016124	27-3-2021
UT A -Scanning Meter	GE SENSING & INSPECTION TECHNOLOGIES	USM 35	13863a	25 Apr 2021

1.1. General Tank information

Tank General Information							
Tank Number	MCH-03		Owner	Shell Pakistan Limited			
Tank Location	Machike Terminal		Manufacturer	CBI EASTERN ANSTALT			
Tank Diameter	15,000mm or 49.213ft		Product	HSD			
Tank Height	10,000mm or 32.808ft		Specific Gravity	0.870			
Maximum Filling Height	10,000mm or 32.808ft		Nominal Capacity (m³)	1,767.00			
Design Code	API 650	Heating System	No	Cathodic Protection	No		
Data Plate	Yes	Insulation	No	Leak Detection	Yes		
Tank Component Geometry Information							
Foundation	Cement Tank pad		Roof	Fixed Cone Roof			
Shell	Butt Weld		Bottom	Cone Down			
Tank Component Coating Availability							
Shell	Internal	Up to 1st course	Roof	Internal	None	Bottom	Coated
	External	Coated		External	Coated		
Tank Dates Information							
Year of Manufacture		1997	Year of Last Inspection		2014		
Year of Current Inspection		2021	Year of Last Bottom Plates Change		N/A		
Other Information							
Access To Roof		Spiral Stairway					

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

1.2. Summary of Findings

1.2.1. Engineering Evaluation

1.2.1.1. Differential Settlement

The Permissible Out-Of-Plane Settlement (mm)	Maximum Differential Settlement, S_i (mm)	Result
22.90	6.54	Within Tolerance

Please see page 55 for more information.

1.2.1.2. Roof Plate

Item	Previous Thickness (mm)	Minimum Measured Thickness (mm)	Minimum Required Thickness (mm)	Corrosion Rate (mm/Year)	Remaining Life (Years)
Roof Plates	5.82	5.27	2.29	0.07857	37.93

Note: Previous Thickness taken from Previous Inspection Report.2014

Please see page 61 for more information.

1.2.1.3. Shell Plate Evaluation

Course	Previous Thickness(mm)	Minimum Measured Thickness (mm)	Minimum Required Thickness (mm)	Remaining Life (year)	Next Inspection Interval
1	9.88	9.34	3.81	71.67	15.00
2	6.85	6.18	2.63	37.07	15.00
3	6.71	5.78	2.54	24.39	12.19
4	6.64	5.94	2.54	34.00	15.00

Note: Previous Thickness taken from Previous Inspection Report.2014

Please see page 66 for more information.

1.2.1.4. Plumbness (Tank Tilt)

Station ($^{\circ}$)	Maximum Out-of-Plumbness Value (mm)	Result
0.0	7	Within Tolerance
45.0	9	Within Tolerance
90.0	14	Within Tolerance
135.0	-9	Within Tolerance
180.0	-9	Within Tolerance
225.0	-8	Within Tolerance
270.0	10	Within Tolerance
315.0	3	Within Tolerance

Please see page 70 for more information.

1.2.1.5. Bottom plate (Before repair/ No repair needed)

Item	Year- In Service	Nominal Thickness (mm)	RT_{bc} (mm)	Rt_{ip} (mm)	S_tP_r (mm)	U_{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
Bottom Plates	24	8.00	7.50	8.00	0.0000	0.0208	1.27	299.04	20.00
Annular Plates	24	10.00	9.65	10.00	0.0000	0.0146	4.32	365.62	20.00
Critical Zone	24	10.00	9.55	10.00	0.0000	0.0188	4.32	279.04	20.00

MRT = minimum remaining thickness at the end of interval Or.

O_r = in-service interval of operation (years to next internal inspection) not to exceed that allowed by 6.4.2,

RT_{bc} = minimum remaining thickness from bottom side corrosion after repairs,

RT_{ip} = minimum remaining thickness from internal corrosion after repairs,

S_tP_r = maximum rate of corrosion not repaired on the top side. $S_tP_r = 0$ for coated areas of the bottom.

U_{pr} = maximum rate of corrosion on the bottom side.

Please see page 76 for more information.

SGS	Client :	Shell Pakistan Limited			
	Job Number :	5010465		Tank Number : MCH-03	
	Type Of Inspection :	Out of Service Inspection			

1.2.2. Visual Inspection

1.2.2.1. Foundation

Item	Findings	Recommendations	Repair Priority
1. Access Way	There are three access ways at west, east and north side, cracks observed on west side accessway	<ul style="list-style-type: none"> It is therefore recommended that cement plaster shall be restored by masonry work in order to avoid further deterioration. 	Online Or Offline
	One side handrail found missing.	<ul style="list-style-type: none"> Need to install the handrailing . 	Online Or Offline
2. Dyke wall	Reinforced Concrete ring wall observed around the tank, found minor cracks and cement plaster failure at different location	<ul style="list-style-type: none"> Need to repair the dyke wall with non shrikage grout 	Online Or Offline
3. Drainage System	Visually found in satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
4. Tank Area	Vegetation growth observed around the tank foundation.	<ul style="list-style-type: none"> Need to clean the existing vegetation and take measures to avoid future growth 	Online Or Offline
5. Cement Tank Pad	Visually found in satisfactory condition without spalling and cracks	<ul style="list-style-type: none"> Nil,just for info 	N/A
6. Bottom Projection Plate	Projection plate found beyond the out side toe of shell to bottom weld is not less than 3/8" , which is compliance the code API 653 requirement.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
7. Projection Plate	UTG carried out on bottom projection plate, No significant metal loss noted during testing.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
8. Bottom Projection Plate and Foundation	Vegetation growth observed b/w the projection and foundation at satirway side.	<ul style="list-style-type: none"> Need to clean the existing vegetation and take measures to avoid future growth 	Online Or Offline
	Atmospheric corrosion observed on projection plate due to painf failure.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
9. Tell-Tale Pipe - Leak Detection	Visually found satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
10. Piping	Paint failure observed at different locations	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
	Support of piping found	<ul style="list-style-type: none"> Nil,just for info. 	N/A

SGS	Client :	Shell Pakistan Limited			
	Job Number :	5010465		Tank Number : MCH-03	
	Type Of Inspection :	Out of Service Inspection			

	satisfactory without cracks		
	Paint flakes observed on Hydrant pipe line	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline

1.2.2.2. Shell

Item	Findings	Recommendations	Repair Priority
1. Name Plate	Name plate found on the tank shell as per API code	<ul style="list-style-type: none"> Nil,just for info. 	N/A
2. Shell Plate	Visually shell course plates found in satisfactory condition without paint failure and surface pitting.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
3. Horizontal joints	Visually found in satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
4. Vertical joints	Visually found in satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
5. Tank Earthing	The Earthing bosses have been observed on two locations on tank shell with values of electrical resistance up to date written on them, which is well within acceptable limit of 25 ohms	<ul style="list-style-type: none"> To monitor. 	To Monitor
6. Manway	Visually found in satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
7. Shell Nozzle	Atmospheric corrosion observed due to minor paint failure.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
	Internally shell nozzles were found satisfactory without pitting.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
8. Internal shell plate	Paint observed on first internal shell course plates with satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
	Except first shell course minor corrosion observed on internal shell plates.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
9. Shell course	UT crawler carreid out on shell course plates to record the thickness.No significant metal loss noted during testing.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
10. Stairway	Stairway is not properly supported with foundation due to which shell plates	<ul style="list-style-type: none"> It should be properly supported with foundation 	Online Or Offline



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

	bear more stresses		
11. Stairway	Support of stairway directly welded with shell plates.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
	Visually found in satisfactory condition without pitting and paint failure.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
12. Hydrant Line	As per view from ground level, paint blisters and paint flakes observed on hydrant line.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
	Support of hydrant line directly welded with shell plates	<ul style="list-style-type: none"> Nil,just for info. 	N/A

1.2.2.3. Fixed Roof

Item	Findings	Recommendations	Repair Priority
1. Roof Plates	Visually found in satisfactory condition without paint failure and surface pitting.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
	All roof lapped welded seams (short and long) was found satisfactory, no visual defect was observed.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
2. Roof Plates UTG	UTG carried out on roof plates to record the thickness , No significant metal loss noted during testing.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
3. Goose Neck	Atmospheric corrosion observed on nut bolts of goose neck.	<ul style="list-style-type: none"> Need to install Appropriate hot dip galvanized coated nut bolts. 	Offline
4. Mesh screen.	Corrosion observed on mesh screen.	<ul style="list-style-type: none"> Need to installed the new Corrosion-resistant coarse-mesh screen (13 mm [1/2 in.] openings) shall be provided to prevent the entrance of birds 	Offline
5. Blind Nozzle	Paint failure and atmospheric corrosion observed.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. Need to install Appropriate hot dip galvanized coated nut 	Offline



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

		bolts.	
6. Manway	Visually found in rusted condition.	<ul style="list-style-type: none">To made good surface preparation and recoat as per paint manufacturer' specification.	Offline
7. Sampling/ Gauging Hatch	Visually found in satisfactory condition.	<ul style="list-style-type: none">Nil,just for info.	N/A
8. ESV	ESV 24 " dia instelled with minor paint failure	<ul style="list-style-type: none">To made good surface preparation and recoat as per paint manufacturer' specification.	Offline
	Calibration tage found with expired date.	<ul style="list-style-type: none">Need to calibrate the ESV.	Offline/Online
9. Handrail	Paint failure and atmospheric corrosion observed.	<ul style="list-style-type: none">To made good surface preparation and recoat as per paint manufacturer' specification.	Offline
	Support of handrail welded on roof plates	<ul style="list-style-type: none">Nil,just for info.	N/A
10. Frangible joint (Joint between roof plate and shell top angle)	During visual inspection of Frangible joint found seal weld with satisfactory condition, without any significant discontinuities	<ul style="list-style-type: none">Nil,just for info.	N/A
11. Curb angle plate	Visually found in satisfactory condition without paint failure and surface pitting.	<ul style="list-style-type: none">Nil,just for info.	N/A
12. Hydrant Line	Paint deterioration & flakes scrutinized on hydrant line	<ul style="list-style-type: none">.To made good surface preparation and recoat as per paint manufacturer' specification.	Offline
	Support of hydrant line found in satisfactory condition without corrosion.	<ul style="list-style-type: none">Nil,just for info.	N/A
	Installed hydrant line on top shell course, paint failure observed.	<ul style="list-style-type: none">To made good surface preparation and recoat as per paint manufacturer' specification.	Offline
13. Roof structure	Visually found in satisfactory condition.	<ul style="list-style-type: none">Nil,just for info.	N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number : MCH-03
	Type Of Inspection :		Out of Service Inspection	

1.2.2.4. Bottom

Item	Findings	Recommendations	Repair Priority
1. Bottom Plate	Magnetic Flux Leakage 3D scanning carried out on the bottom plates. No significant thickness loss had observed on the bottom plates accessible areas.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
	Paint blisters and flakes observed on bottom plates at different locations which permanently marked.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
2. Bottom Plate weldment	Visually bottom lap joints found satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
	UTG Carried out on bottom plates to record the thickness, No significant metal loss noted during testing.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
3. Shell to Bottom Joint	Shell to bottom joint inspected visually and with NDT method of MPI, where found no surface defects.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
4. Sump	Tank bottom sump pit visually inspected and found satisfactory.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
5. Diping Plate/ Datum Plate	Visually found in satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
6. Pipeline	Support of pipeline found satisfactory condition.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
7. Pipeline	visually found in satisfactory condition without paint failure and pitting.	<ul style="list-style-type: none"> Nil,just for info. 	N/A
8. Annular Plate	Paint blisters and flakes observed on Annular plate number 02	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
9. Bottom plate coating	Paint blisters and flakes observed on bottom plates at different locations which permanently marked.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
10. Holiday test	Low voltage pin hole detector carried out on bottom plate and bottom weld seams, Paint blistering and flake observed on different locations	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
11. Bottom plates	UT A scanning carried out on annular plates and	<ul style="list-style-type: none"> Nil,just for info. 	N/A

SGS	Client :	Shell Pakistan Limited
	Job Number :	5010465
	Type Of Inspection : Out of Service Inspection	

	unscane area of MFL,No significant metal loss noted during testing		
12. DFT	DFT carried out on bottom plates Thickness of coating observed in the range of 150 to 200 microns	<ul style="list-style-type: none"> • Nil,just for info. 	N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

1.3. Visual Inspection Photos with Comment

1.3.1. General View of Tank

	General View of Tank MCH-03
	General View of Name plate

1.3.2. Foundation

	Access Way Finding: There are three access ways at west, east and north side, cracks observed on west side accessway Recommendation: It is therefore recommended that cement plaster shall be restored by masonry work in order to avoid further deterioration. Repair Priority: <i>Online Or Offline</i> Finding: One side handrail found missing. Recommendation: Need to installed the handrailing on missing location. Repair Priority: Offline
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Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Access Way****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Online Or Offline*

Dyke wall**Finding:**

Reinforced Concrete ring wall observed around the tank, found minor cracks and cement plaster failure at different location

Recommendation:

Need to repair the dyke wall with non shrikage grout

Repair Priority: *Online Or Offline*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Dyke wall****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Online Or Offline*

**Drainage System****Finding:**

Visually found in satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Tank Area****Finding:**

Vegetation growth observed around the tank foundation.

Recommendation:

Need to clean the existing vegetation and take measures to avoid future growth

Repair Priority: *Online Or Offline*

**Cement Tank Pad****Finding:**

Visually found in satisfactory condition without spalling and cracks

Recommendation:

Nil, just for info

Repair Priority: *None/ Not Applicable.*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Cement Tank Pad****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: N/A**Bottom Projection Plate****Finding:**

Projection plate found beyond the out side toe of shell to bottom weld is not less than 3/8", which is compliance the code API 653 requirement.

Recommendation:

Nil, just for info.

Repair Priority: N/A**Projection Plate****Finding:**

UTG carried out on bottom projection plate, No significant metal loss noted during testing.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Bottom Projection Plate and Foundation****Finding:**

Vegetation growth observed b/w the projection and foundation at satirway side.

Recommendation:

Need to clean the existing vegetation and take measures to avoid future growth

Repair Priority: *Online Or Offline*

**Bottom Projection Plate****Finding:**

Atmospheric corrosion observed on projection plate due to painf failure.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

**Tell-Tale Pipe - Leak Detection****Finding:**

Visually found satisfactory condition.

Recommendation:

Nil,just for info.

Repair Priority: *N/A*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Piping****Finding:**

Paint failure observed at different locations

Recommendation:

To make good surface preparation and recoat as per paint manufacturer's specification.

Repair Priority: *Offline***Piping****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Offline***Piping****Finding:**

Support of piping found satisfactory without cracks

Recommendation:

Nil, just for info.

Repair Priority: *N/A*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		



Piping

Finding:

Paint flakes observed on Hydrant pipe line

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority:

Offline

1.3.3. Shell



Name Plate

Finding:

Name plate found on the tank shell as per API code

Recommendation:

Nil,just for info.

Repair Priority:

N/A



Shell Plate

Finding:

Visually shell course plates found in satisfactory condition without paind failure and surface pitting.

Recommendation:

Nil,just for info.

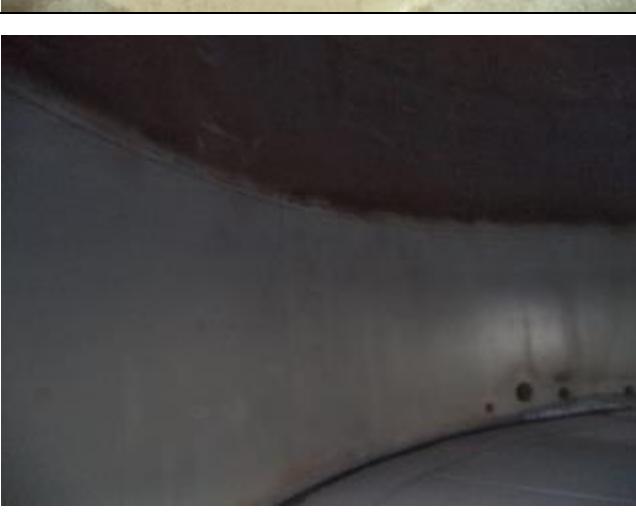
Repair Priority:

N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

	<p>Shell Plates</p> <p>Finding: Same as above</p> <p>Recommendation: Same as above</p> <p>Repair Priority: N/A</p>
	<p>Horizontal joint</p> <p>Finding: Visually found in satisfactory condition.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>
	<p>Vertical joints</p> <p>Finding: Visually found in satisfactory condition.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>
	<p>Tank Earthing</p> <p>Finding: The Earthing bosses have been observed on two locations on tank shell with values of electrical resistance up to date written on them, which is well within acceptable limit of 25 ohms</p> <p>Recommendation: To monitor.</p> <p>Repair Priority: To Monitor</p>

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

	<p>Manway</p> <p>Finding: Visually found in satisfactory condition.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>
	<p>Shell Nozzle</p> <p>Finding: Atmospheric corrosion observed due to minor paint failure.</p> <p>Recommendation: To make good surface preparation and recoat as per paint manufacturer's specification.</p> <p>Repair Priority: Offline</p>
	<p>Shell Nozzle</p> <p>Finding: Internally shell nozzles were found satisfactory without pitting.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>
	<p>Internal shell plate</p> <p>Finding: Paint observed on first internal shell course plates with satisfactory condition.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p> <p>Finding: Except first shell course minor corrosion observed on internal shell plates.</p> <p>Recommendation: Nil, just for info.</p>

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

	Repair Priority: N/A
	Shell course Finding: UT crawler carried out on shell course plates to record the thickness. No significant metal loss noted during testing. Recommendation: Nil, just for info. Repair Priority: N/A
	Stairway Finding: Stairway is not properly supported with foundation due to which shell plates bear more stresses Recommendation: It should be properly supported with foundation Repair Priority: Offline
	Stairway Finding: Support of stairway directly welded with shell plates. Recommendation: Nil, just for info. Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

	<p>Stairway</p> <p>Finding: Visually found in satisfactory condition without pitting and paint failure.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>
	<p>Hydrant Line</p> <p>Finding: As per view from ground level, paint blisters and paint flakes observed on hydrant line.</p> <p>Recommendation: To make good surface preparation and recoat as per paint manufacturer's specification.</p> <p>Repair Priority: Offline</p>
	<p>Hydrant Line</p> <p>Finding: Support of hydrant line directly welded with shell plates</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>

1.3.4. Fixed_Roof

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Roof Plates****Finding:**

Visually found in satisfactory condition without paint failure and surface pitting.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Roof Plates****Finding:**

All roof lapped welded seams (short and long) was found satisfactory, no visual defect was observed.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Roof Plates UTG****Finding:**

UTG carried out on roof plates to record the thickness , No significant metal loss noted during testing.

Recommendation:

Nil,just for info.

Repair Priority: N/A

**Goose Neck****Finding:**

Atmospheric corrosion observed on nut bolts of goose neck.

Recommendation:

Need to install Appropriate hot dip galvanized coated nut bolts.

Repair Priority: Offline

**Mesh screen.****Finding:**

Corrosion observed on mesh screen.

Recommendation:

Need to installed the new Corrosion-resistant coarse-mesh

screen (13 mm [1/2 in.] openings) shall be provided to prevent the entrance of birds

Repair Priority: Offline

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Blind Nozzle****Finding:**

Paint failure and atmospheric corrosion observed.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Need to install Appropriate hot dip galvanized coated nut bolts.

Repair Priority: *Offline*

**Manway****Finding:**

Visually found in rusted condition.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

**Sampling/ Gauging Hatch****Finding:**

Visually found in satisfactory condition.

Recommendation:

Nil,just for info.

Repair Priority: *N/A*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**ESV****Finding:**

ESV 24 " dia instelled with minor paint failure

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: Offline

**ESV****Finding:**

Calibration tage found with expired date.

Recommendation:

Need to calibrate the ESV.

Repair Priority: Offline

**Handrail****Finding:**

Paint failure and atmospheric corrosion observed.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: Offline

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Handrail****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Offline***Handrail****Finding:**

Support of handrail welded on roof plates

Recommendation:

Nil, just for info.

Repair Priority: *N/A***Frangible joint (Joint between roof plate and shell top angle)****Finding:**

During visual inspection of Frangible joint found seal weld with satisfactory condition, without any significant discontinuities

Recommendation:

Nil, just for info.

Repair Priority: *N/A*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Curb angle plate****Finding:**

Visually found in satisfactory condition without paint failure and surface pitting.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Hydrant Line****Finding:**

Paint deterioration & flakes scrutinized on hydrant line

Recommendation:

To make good surface preparation and recoat as per paint manufacturer's specification.

Repair Priority: Offline

**Hydrant Line****Finding:**

Support of hydrant line found in satisfactory condition without corrosion.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Hydrant Line****Finding:**

Installed hydrant line on top shell course, paint failure observed.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

**Roof structure****Finding:**

Visually found in satisfactory condition.

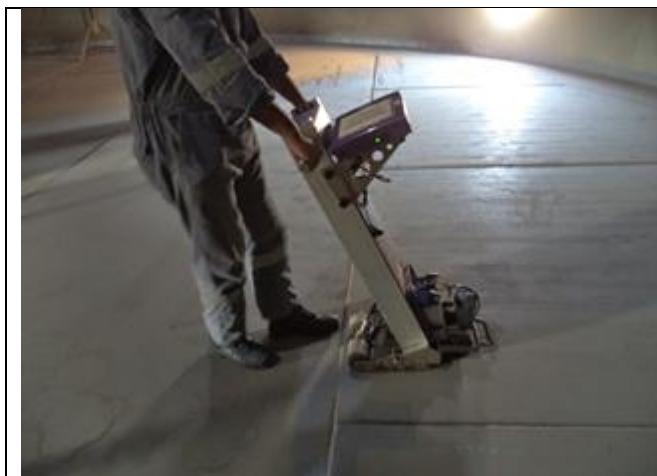
Recommendation:

Nil,just for info.

Repair Priority: *N/A*

**1.3.5. Bottom**

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Bottom Plate****Finding:**

Magnetic Flux Leakage 3D scanning carried out on the bottom plates. No significant thickness loss had observed on the bottom plates accessible areas.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Bottom Plate****Finding:**

Painted surface noted

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Bottom Plate weldment****Finding:**

Visually bottom lap joints found satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Shell to Bottom Joint****Finding:**

Shell to bottom joint inspected visually and with NDT method of MPI, where found no surface defects.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Shell to Bottom Joint****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: N/A**Sump****Finding:**

Tank bottom sump pit visually inspected and found satisfactory.

Recommendation:

Nil, just for info.

Repair Priority: N/A**Dipping Plate/ Datum Plate****Finding:**

Visually found in satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: N/A**Piping****Finding:**

Support of pipeline found satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Pipeline****Finding:**

visually found in satisfactory condition without paint failure and pitting.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Bottom Plate****Finding:**

UTG Carried out on bottom plates to record the thickness, No significant metal loss noted during testing.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Annular Plate****Finding:**

Paint blisters and flakes observed on Annular plate number 02

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: Offline

**Bottom plate coating****Finding:**

Paint blisters and flakes observed on bottom plates at different locations which permanently marked.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: Offline

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

**Bottom plate coating****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Offline***Bottom plate coating****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Offline***Bottom plate coating****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Offline***Holiday test****Finding:**

Low voltage pin hole detector carried out on bottom plate and bottom weld seams, Paint blistering and flake observed on different locations

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

**Holiday test****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Offline***Bottom plates****Finding:**

UT A scanning carried out on annular plates and unscane area of MFL, No significant metal loss noted during testing

Recommendation:

Nil, just for info.

Repair Priority: *N/A***Bottom plates****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *N/A***DFT****Finding:**

DFT carried out on bottom plates Thickness of coating observed in the range of 150 to 200 microns

Recommendation:

Nil, just for info.

Repair Priority: *N/A*



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		



DFT

Finding:

Same as above

Recommendation:

Same as above

Repair Priority: N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :		Out of Service Inspection	

1.4. Visual Inspection Checklist

- Out of Service Inspection Checklist

No.	Items	Completed	Comments
		√	
1	OVERVIEW		
1.1	Check that tank has been cleaned, is gas free, and safe for entry.	√	Satisfactory
1.2	Check that the tank is completely isolated from product lines, all electrical power, and steam lines.	√	Satisfactory
1.3	Check that roof is adequately supported, including fixed roof structure and floating roof legs.	√	Satisfactory
1.4	Check for presence of failing object hazards, such as corroded-through roof rafters, asphalt stalactites, and trapped hydrocarbons in unopened or plugged equipment or appurtenances, ledges, etc.	√	Satisfactory
1.5	Inspect for slipping hazards on the bottom and roof decks.	√	Satisfactory
1.6	Inspect structural welds on accessways and clips.	√	Satisfactory
1.7	Check surface needing inspection for a heavy-scale buildup and check weld seams and oily surfaces where welding is to be done. Note areas needing more cleaning, including blasting.	√	Satisfactory
2	TANK EXTERIOR		
2.1	Inspect appurtenances opened during cleaning such as lower floating swing sheave assemblies, nozzle interiors (after removal of valves).	√	Satisfactory
2.2	Hammer test or ultrasonically test the roof.	√	Satisfactory, UTG performed
2.3	Enter and inspect the floating roof pontoon compartments.	N/A	N/A
3	BOTTOM INTERIOR SURFACE		
3.1	Using a flashlight held close to and parallel to the bottom plates, and using the bottom plate layout as a guide, visually inspect and hammer test the entire bottom.	√	Satisfactory
3.2	Measure the depth of pitting and describe the pitting appearance (sharp edged, lake type, dense, scattered, etc).	√	Satisfactory
3.3	Mark areas requiring patching or further inspection.	N/A	N/A
3.4	Mark locations for turning coupons for inspection.	N/A	N/A
3.5	Inspect all welds for corrosion and leaks, particularly the shell-to-bottom weld.	√	Satisfactory
3.6	Inspect sketch plates for corrosion.	√	MFL performed . No significant metal loss noted
3.7	Check condition of internal sump, if applicable. Standing liquid should be removed from the sump to allow for complete inspection and vacuum testing of weld seams as appropriate. Sump bottom and sidewall plate and seams need to be evaluated for both product-side and soil-side corrosion.	√	Satisfactory
3.8	Locate and mark voids under the bottom.	N/A	N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :		Out of Service Inspection	
3.9	Record bottom data on a layout sketch using the existing bottom plates as a grid. List the number and sizes of patches required.		N/A	N/A
3.1	Vacuum test the bottom lap welds.		N/A	N/A
3.11	Hammer test or ultrasonically examine any slightly discolored spots or damp areas.		✓	Satisfactory
3.12	Check for reinforcing pads under all bottom attached clips, brackets, and supports.		✓	Satisfactory
3.13	Inspect floating roof leg pads for pitting or cutting, and excessive dimpling (indicating excessive loading).		N/A	N/A
3.14	Check the column bases of fixed roof supports for adequate pads and restraining clips.		N/A	N/A
3.15	In earthquake zones 3 and 4, check that roof supports are not welded down to the tank bottom, but are only restrained from horizontal movement.		N/A	N/A
3.16	Check area beneath swing line cable for indications of cable cutting or dragging.		N/A	N/A
3.17	Mark old oil and air test connection for removal and patching.		N/A	N/A
3.18	Identify and report low areas on the bottom that does not drain adequately.		✓	Satisfactory
3.19	Inspect coating for holes, disbonding, deterioration, and discoloration.		✓	deteriorated found at few location
4	SHELL SEAMS AND PLATE			
4.1	On cone up bottoms, closely inspect and gauge the depth of metal loss on the lower 2 in. to 4 in. of the shell (area of standing water).		✓	Satisfactory
4.2	Measure the depth of pitting on each course.		✓	Satisfactory
4.3	Inspect and estimate the amount of metal loss on the heads of rivets and bolts.		✓	Satisfactory
4.4	Inspect shell-to-bottom riveted lap joints.		N/A	N/A
4.5	Inspect for vertical grooving damage from seal assembly protrusions.		N/A	N/A
4.6	Inspect existing protective coatings for damage, deterioration, and disbonding.		✓	Satisfactory
4.7	Check for areas of rubbing (indicating too much pressure by the seal assembly shoes or inadequate annular space).		N/A	N/A
4.8	Visually inspect the shell plates and seams for indications of leakage.		✓	visually satisfactory
4.9	If the shell has riveted or bolted seams, record the leak locations by film or chart in case the locations are lost during surface preparation for painting.		N/A	N/A
4.1	Measure annular space at 40-ft intervals.		N/A	N/A
4.11	Survey the shell to check for roundness and plumb.		✓	See survey report
5	SHELL-MOUNTED OVERFLOWS			
5.1	Inspect overflow for corrosion and adequate screening.		N/A	N/A
5.2	Check location of overflow that it is not above any tank valves or equipment.		N/A	N/A

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

6	ROOF INTERIOR SURFACE		
6.1	General		
6.1.1	Visually inspect the underside surface of the roof plates for holes, scale buildup, and pitting.	✓	Satisfactory
6.1.2	Hammer test or ultrasonically examine to check for thin areas, particularly in the vapor space of floating roofs and at edge of roof on cone roof tank.	✓	Satisfactory
6.1.3	Check all clips, brackets, braces, etc., welded to the roof deck plate for welded reinforcing pads and see that they have not broken free.	✓	Satisfactory
6.1.4	If no pad is present, penetrant test for cracking of the weld or deck plate.	N/A	N/A
6.1.5	Inspect for protective coating for breaks, disbondment, and deterioration.	✓	Satisfactory
6.1.6	Spark test the interior surface coating if recoating is not planned.	N/A	N/A
6.2	Fixed Roof Support Structure		
6.2.1	Inspect the support columns for thinning in the upper 2 ft.	N/A	N/A
6.2.2	On API columns (two channels welded together) check for corrosion scale breaking the tack welds, unless the joint between the channels is completely seal welded.	N/A	N/A
6.2.3	Check that the reinforcing pad on the bottom is seal-welded to the tank bottom with horizontal movement restraining clips welded to the pad.	N/A	N/A
6.2.4	Determine if pipe column supports are concrete filled or open pipe. If open pipe, check for a drain opening in the bottom of the pipe.	N/A	N/A
6.2.5	Inspect and gauge rafters for thinning, particularly near the center of the roof. Report metal loss.	N/A	N/A
6.2.6	Check for loose or twisted rafters.	✓	Satisfactory
6.2.7	Inspect girders for thinning and check that they are attached securely to the top of the columns.	N/A	N/A
6.2.8	Report if the columns have cross bracing in the area between the low pump out of the top of the shell (for future internal floating roof installation).	N/A	N/A
6.2.9	Inspect and report presence of any roof-mounted swing line bumpers.	N/A	N/A
6.2.10	Photograph the roof structure if no rafter layout drawing exists.	✓	survey report
7	FIXED ROOF APPURTENANCES		
7.1	Inspection and Light Hatches		
7.1.1	Inspect the hatches for corrosion, paint and coating failures, holes, and cover sealing.	N/A	N/A
7.1.2	On loose covers, check for a safety chain in good condition.	N/A	N/A
7.1.3	On light hatches over 30 in. across, check for safety rods.	N/A	N/A
7.1.4	Inspect the condition of the gaskets on bold or latched down hatch covers.	N/A	N/A
7.2	Staging Support Connection		
7.2.1	Inspect the condition of the staging support for corrosion.	N/A	N/A

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7.3	Breathers and Vents					
7.3.1	Inspect and service the breather.	N/A				
7.3.2	Inspect screens on vents and breathers.	N/A				
7.4	Emergency P/V Hatches					
7.4.1	Inspect and service pressure/vacuum hatches. (Setting should be high enough to prevent chattering of breather during normal operation. See breather manufacturer's guide.)	N/A				
7.4.2	Inspect liquid seal hatches for corrosion and proper liquid level in the seal.	N/A				
7.5	Sample Hatches					
7.5.1	Inspect sample hatch for corrosion.	√				
7.5.2	Check that the cover operates properly.	√				
7.5.3	If the tank has no gauge well, check for a hold-off distance marker and check measurement.	√				
8	FLOATING ROOF					
8.1	Roof Deck					
8.1.1	Hammer test the area between roof rim and shell. (If access for hammer testing is inadequate, measure the distance from the bottom edge of the roof to the corroded area and then hammer test from inside the pontoon).	N/A				
8.1.2	In sour water service, clean and test all deck plate weld seams for cracking unless the lower laps have been seal-welded.	N/A				
8.1.3	Check that either the roof drain is open or the drain plug in the roof is open in case of unexpected rain.	N/A				
8.1.4	On flat bottomed and cone bottom roof decks, check for a vapor dam around the periphery of the roof. The dam should be continuous without break to prevent escape of vapors to the seal area from under the center of the roof.	N/A				
8.2	Floating Roof Pontoons					
8.2.1	Visually inspect each pontoon for liquid leakage.	N/A				
8.2.2	Run a light wire through the gooseneck vents on locked down inspection hatch covers to make sure they are open.	N/A				
8.2.3	Inspect lockdown latches on each cover.	N/A				
8.2.4	Check and report if each pontoon is : 1. Vapor tight (bulkhead seal welded on one side on bottom, sides, and top) 2. Liquid tight (seal-welded on bottom and sides only), or 3. Unacceptable (minimum acceptable conditions is liquid tight).	N/A N/A N/A N/A				
8.3	Floating Roof Cutouts					
8.3.1	Inspect underside of cutouts for mechanical damage.	N/A				
8.3.2	Inspect welds for cracks.	N/A				
8.3.3	Inspect plate thinning, pitting, and erosion.	N/A				
8.3.4	Measure mixer cutouts and record plate thickness for future mixer installation or replacement. Plate thickness _____.	N/A				
8.4	Floating Roof Supports					

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8.4.1	Inspect fixed low and removable high floating roof legs for thinning.	N/A	N/A
8.4.2	Inspect for notching at bottom of legs for drainage.	N/A	N/A
8.4.3	Inspect for leg buckling or felling at bottom.	N/A	N/A
8.4.4	Inspect pin hole in roof guide for tears.	N/A	N/A
8.4.5	Check plumb of all legs.	N/A	N/A
8.4.6	Inspect for adequate reinforcing gussets on all legs through a single portion of the roof.	N/A	N/A
8.4.7	Inspect the area around the roof legs for cracking if there is no internal reinforcing pad or if the topside pad is not welded to the deck plate on the underside.	N/A	N/A
8.4.8	Inspect the sealing system on the two-position legs and the vapor plugs in the fixed low leg for deterioration of the gaskets.	N/A	N/A
8.4.9	On shell-mounted roof supports, check for adequate clearance based on the maximum floating roof movement as determined by the position of the roof relative to the gauge well and/or counter-rotational device.	N/A	N/A
9	FLOATING ROOF SEAL ASSEMBLIES		
9.1	Primary Shoes Assembly		
9.1.1	Remove four sections of foam log (foam-filled seals) for inspection on 90° locations.	N/A	N/A
9.1.2	Inspect hanger attachment to roof rim for thinning, bending, broken welds, and wear of pin holes.	N/A	N/A
9.1.3	Inspect clips welded to roof rim for thinning.	N/A	N/A
9.1.4	Shoes-inspect for thinning and holes in shoes.	N/A	N/A
9.1.5	Inspect for bit-metal bolts, clips, and attachment.	N/A	N/A
9.1.6	Seal fabric-inspect for deterioration, stiffening, holes, and tears in fabric.	N/A	N/A
9.1.7	Measure length of fabric from top of shoe to roof rim, and check against maximum anticipated annular space as roof operates.	N/A	N/A
9.1.8	Inspect any modification of shoes over shell nozzles, mixers, etc., for clearance.	N/A	N/A
9.1.9	Inspect shoes for damage caused by striking shell nozzles, mixers, etc.	N/A	N/A
9.2	Primary Toroidal Assembly		
9.2.1	Inspect seal fabric for wear, deterioration, holes, and tears.	N/A	N/A
9.2.2	Inspect hold-down system for buckling or bending.	N/A	N/A
9.2.3	Inspect foam for liquid absorption and deterioration.	N/A	N/A
9.3	Rim-Mounted Secondaries		
9.3.1	Inspect the rim-mounted bolting bar for corrosion and broken welds.	N/A	N/A
9.3.2	Measure and chart seal-to-shell gaps.	N/A	N/A
9.3.3	Visually inspect seam from below, looking for holes as evidenced by light.	N/A	N/A
9.3.4	Inspect fabric for deterioration and stiffness.	N/A	N/A
9.3.5	Inspect for mechanical damage, corrosion, and wear on tip in contact with shell.	N/A	N/A

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9.3.6	Inspect for contact with obstructions above top of shell.	N/A	N/A	
10	FLOATING ROOF APPURTENANCES			
10.1	Roof Manways			
10.1.1	Inspect walls of manways for pitting and thinning.	N/A	N/A	
10.1.2	On tanks with interface autogauges, check seal around gauge tape cable and guide wires through manway cover.	N/A	N/A	
10.1.3	Inspect cover gasket and bolts.	N/A	N/A	
10.2	Rim Vent			
10.2.1	Check rim vent for fitting and holes.	N/A	N/A	
10.2.2	Check vent for condition of screen.	N/A	N/A	
10.2.3	On floating roof tanks where the environmental rules require closing off the vent, check the vent pipe for corrosion at the pipe-to-rim joint and check that the blinding is adequate.	N/A	N/A	
10.3	Vacuum Breaker, Breather Type			
10.3.1	Service and check operation of breather valve.	N/A	N/A	
10.3.2	Check that nozzle pipe projects no more than 1/2 in. below roof deck.	N/A	N/A	
10.4	Vacuum Breaker, Mechanical Type			
10.4.1	Inspect the stem for thinning. Measure how far the vacuum breaker cover is raised off the pipe when the roof is resting on high or low legs.	N/A	N/A	
	a. On high legs :	N/A	N/A	
	b. On low legs :	N/A	N/A	
10.5	Roof Drains : Open Systems, Including Emergency Drains.			
10.5.1	Check liquid level inside open roof drains for adequate freeboard. Report if there is insufficient distance between liquid level and top of drain.	N/A	N/A	
10.5.2	If tanks comes under Air Quality Monitoring District rules, inspect the roof drain vapor plug.	N/A	N/A	
10.5.3	If emergency is not at the center of the roof, check that there are at least three emergency drains.	N/A	N/A	
10.6	Closed Drain System : Drain Basins			
10.6.1	Inspect for thinning and pitting.	N/A	N/A	
10.6.2	Inspect protective coating (topside).	N/A	N/A	
10.6.3	Inspect basin cover or screen for corrosion.	N/A	N/A	
10.6.4	Test operation of check valve.	N/A	N/A	
10.6.5	Check for presence of check valve where bottom of basin is below product level.	N/A	N/A	
10.6.6	Inspect drain basin(s) to roof deck welds for cracking.	N/A	N/A	
10.6.7	Check drain basin(s) outlet pipe for adequate reinforcement to roof deck (including reinforcing pad).	N/A	N/A	
10.7	Closed Drain Systems : Fixed Drain Line on Tank Bottom			
10.7.1	Hammer test fixed drain line on tank bottom for thinning and scale/debris plugging.	N/A	N/A	
10.7.2	Inspect supports and reinforcing pads for weld failures and corrosion.	N/A	N/A	
10.7.3	Check that pipe is guided, not rigidly locked to support, to avoid tearing of tank bottom plate.	N/A	N/A	
10.8	Closed Drain Systems : Flexible Pipe Drain			

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10.8.1	Inspect for damage to exterior of pipe.	N/A	N/A	
10.8.2	Check for obstructions that pipe could catch on.	N/A	N/A	
10.8.3	Inspect shields to protect pipe from snagging.	N/A	N/A	
10.8.4	Inspect results of hydrostatic test on flexible roof drain system.	N/A	N/A	
10.9	Closed Drain System : Articulated Joint Drain			
10.9.1	Hammer test rigid pipe in flexible joint systems for thinning and scale/debris plugging.	N/A	N/A	
10.9.2	Inspect system for signs of bending or strain.	N/A	N/A	
10.9.3	Inspect results of system hydrostatic test.	N/A	N/A	
10.9.4	Inspect landing leg and pad.	N/A	N/A	
10.10	Autogauge System and Alarms			
10.10.1	Check freedom of movement of tape through autogauge tape guide.	N/A	N/A	
10.10.2	Inspect sheaves for freedom of movement.	N/A	N/A	
10.10.3	Test operation checker.	N/A	N/A	
10.10.4	Inspect tape and tape cable for twisting and fraying.	N/A	N/A	
10.10.5	Test the tape's freedom of movement through guide sheaves and tape guide pipe.	N/A	N/A	
10.10.6	On open-top tanks, check that gate tapes with cables have no more than one foot of tape exposed with float at lowest point.	N/A	N/A	
10.10.7	Check float for leakage.	N/A	N/A	
10.10.8	Test float guide wire anchors for spring action by pulling on wire and releasing.	N/A	N/A	
10.10.9	Inspect floatwells in floating roofs for thinning and pitting of walls just above the liquid level.	N/A	N/A	
10.10.10	Check that the autogauge tape is firmly attached to the float.	N/A	N/A	
10.10.11	Inspect the tape cable and float guide wire fabric seals through the float well cover.	N/A	N/A	
10.10.12	Inspect the bottom guide wire attachment clip : inspect for a temporary weighted bar instead of a permanent welded down clip.	N/A	N/A	
10.10.13	Inspect board-type autogauge indicators for legibility and freedom of movement of indicator.	N/A	N/A	
10.10.14	Measure and record these distances to determine if seal damage will occur if tank is run over from : 1. Shell top angle to underside of tape guide system. 2. Liquid level on floating top to top of secondary seal.	N/A N/A N/A	N/A N/A N/A	
10.10.15	Identify floating roofs where the tape is connected directly to the roof.	N/A	N/A	
10.10.16	Overfill alarm : Inspect tank overfill prevention alarm switches for proper operation.	N/A	N/A	
11	COMMON TANK APPURTENANCES			
11.1	Gauge Well			
11.1.1	Inspect gate well pipe for thinning at about two-thirds distance above the bottom: look for thinning at the edge of the slots.	✓	Satisfactory	
11.1.2	Check for corrosion on the pipe joint. Check that sample cords, weights, thermometers, etc., have been removed from the pipe.	✓	Satisfactory	

SGS	Client :	Shell Pakistan Limited		
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	Type Of Inspection :		Out of Service Inspection	
11.1.3	Check for cone at bottom end of pipe about one foot above the bottom.	N/A	N/A	
11.1.4	Check condition of well washer pipe and that its flared end is directed at the near side of the hold of pad.	N/A	N/A	
11.1.5	Check that supports for gauge well are welded to pad or to shell and no directly to bottom plate.	N/A	N/A	
11.1.6	Check operation of gauge well cover.	N/A	N/A	
11.1.7	Check presence of a hold-off distance marker in well pipe and record hold-off distance. Hold-off distance_____.	N/A	N/A	
11.1.8	Identify and report size and pipe schedule, and whether pipe is solid or slotted. Report slot size.	N/A	N/A	
11.1.9	Check that the hold-off distance plate is seal-welded to the bottom and that any gauge well supports are welded to the plate and not directly to the bottom.	N/A	N/A	
11.1.10	Inspect vapor control float and cable.	N/A	N/A	
11.1.11	Check for presence and condition of gauge well washer.	N/A	N/A	
11.1.12	Check for bull plug or plate blind on gauge well washer valve.	N/A	N/A	
11.1.13	Inspect gauge well guide in floating roof for pitting and thinning.	N/A	N/A	
11.1.14	Inspect the guide rollers and sliding plates for freedom of movement.	N/A	N/A	
11.1.15	Inspect condition of gauge well pipe seal system.	N/A	N/A	
11.1.16	On black oil and diesel services: if gauge well is also used for sampling, check for presence of a thief-and gauge-type hatch to avoid spillage.	N/A	N/A	
11.1.17	Visually inspect inside of pipe for pipe weld protrusions which could catch or damage vapor control float.	N/A	N/A	
11.2	Sampling Systems : Roof Sample Hatches			
11.2.1	Inspect roof-mounted sample hatches for reinforcing pads and cracking.	N/A	N/A	
11.2.2	Inspect cover for operation.	N/A	N/A	
11.2.3	For tanks complying with Air Quality Monitoring District rules, inspect sample hatch covers for adequate sealing.	N/A	N/A	
11.2.4	Check horizontal alignment of internal floating roof sample hatches under fixed roof hatches.	N/A	N/A	
11.2.5	Inspect the sealing system on the internal floating roof sample hatch cover.	N/A	N/A	
11.2.6	Inspect floating roof sample hatch cover recoil reel and rope.	N/A	N/A	
11.3	Shell Nozzles			
11.3.1	Inspect shell nozzles for thinning and pitting.	✓	Satisfactory	
11.3.2	Inspect hot tap nozzles for trimming of holes.	✓	Satisfactory	
11.3.3	Identify type of shell nozzles.	✓	see report	
11.3.4	Identify and describe internal piping, including elbow-up and elbow-down types.	N/A	N/A	
11.4	For Nozzles Extended Into the Tank			
11.4.1	Inspect pipe support pads welded to tank bottom.	N/A	N/A	
11.4.2	Inspect to see that pipe is free to move along support without strain or tearing action on bottom plate.	N/A	N/A	
11.4.3	Inspect nozzle valves for packing leaks and damaged flange faces.	N/A	N/A	

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :		Out of Service Inspection	
11.4.4	Inspect heater stream nozzle flanges and valves for wire cutting.	N/A	N/A	
11.4.5	Report which nozzles have thermal pressure relief bosses and valves.	N/A	N/A	
11.4.6	In internal elbow-down fill line nozzles, inspect the wear plate on the tank bottom.	N/A	N/A	
11.4.7	On elbow-up fill lines in floating roof tanks, check that opening is directed against underside of roof, not against vapor space. Inspect impact area for erosion.	N/A	N/A	
11.5	Diffusers and Air Rolling Systems			
11.5.1	Inspect diffuser pipe for erosion and thinning.	N/A	N/A	
11.5.2	Check holes in diffuser for excessive wear and enlargement.	N/A	N/A	
11.5.3	Inspect diffuser supports for damage and corrosion.	N/A	N/A	
11.5.4	Check that diffuser supports restrain, not anchor, longitudinal line movement.	N/A	N/A	
11.5.5	Inspect air spiders on bottom of lube oil tanks for plugging and damaged or broken threaded joints.	N/A	N/A	
11.6	Swing Lines			
11.6.1	Inspect flexible joint for cracks and leaks.	N/A	N/A	
11.6.2	Scribe the flexible joint across the two moving faces and raise end of swing line to check the joint's freedom of movement, indicated by separation of scribe marks.	N/A	N/A	
11.6.3	Check that flexible joints over 6 in. are supported.	N/A	N/A	
11.6.4	Inspect the swing pipe for deep pitting and weld corrosion.	N/A	N/A	
11.6.5	Loosen the vent plugs in the pontoons and listen for a vacuum. Lack of a vacuum indicates a leaking pontoon.	N/A	N/A	
11.6.6	Check the results of air test on pontoons during repairs.	N/A	N/A	
11.6.7	Inspect the pontoons for pitting.	N/A	N/A	
11.6.8	Inspect the pull-down cable connections to the swing.	N/A	N/A	
11.6.9	Inspect the condition of the bottom-mounted support, fixed roof limiting bumper, or shell-mounted limiting bumper for wood condition, weld and bolt corrosion, and seal welding to bottom or shell.	N/A	N/A	
11.6.10	Inspect safety hold-down chain for corrosion and weak links.	N/A	N/A	
11.6.11	Check that there is a welded reinforcing pad where the chain connects to the bottom.	N/A	N/A	
11.6.12	If the floating swing in a floating or internal floating roof tank does not have a limiting device preventing the swing from exceeding 60 degrees, measure and calculate the maximum angle possible with the roof on overflow. Max. angle on Overflow :(If the calculated angle exceeds 65 degrees, recommended installation of a limiting bracket.):	N/A	N/A	
11.6.13	Inspect pull-down cable for fraying.	N/A	N/A	
11.6.14	Inspect for three cable clamps where cable attaches to end of swing line (single-reeved) or to roof assembly (double-reeved). Inspect sheaves for freedom of movement.	N/A	N/A	
11.6.15	Inspect winch operation and check the height indicator for legibility and accuracy.	N/A	N/A	
11.6.16	Inspect bottom-mounted sheave assembly at end of pontoon for freedom of rotation of sheave.	N/A	N/A	

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11.6.17	Inspect shell-mounted lower sheave assembly for freedom of rotation of sheave, corrosion thinning, and pitting of sheave housing.	N/A	N/A	
11.6.18	Inspect upper sheave assembly for freedom of movement of sheave.	N/A	N/A	
11.6.19	Inspect the cable counterbalance assembly for corrosion and freedom of operation.	N/A	N/A	
11.7	Manway Heater Racks			
11.7.1	Inspect the manway heater racks for broken welds and bending of the sliding rails.	N/A	N/A	
11.7.2	Measure and record the length of the heater and length of the track.	N/A	N/A	
11.8	Mixer Wear Plates and Deflector Stands			
11.8.1	Inspect bottom and shell plates and deflector stands.	N/A	N/A	
11.8.2	Inspect for erosion and corrosion on the wear plates. Inspect for rigidity, structural soundness, corrosion, and erosion of deck plates and reinforcing pads that are seal-welded to the bottom under the deflector stand legs.	N/A	N/A	
11.8.3	Measure for propeller clearance between the bottom of deflector stand and roof when the roof is on low legs.	N/A	N/A	
12	ACCESS STRUCTURES			
12.1	Handrails			
12.1.1	Identify and report type (steel pipe, galvanized pipe, square tube, angle) and size of handrails.	✓	Satisfactory	
12.1.2	Inspect for pitting and holes, paint failure.	✓	Satisfactory	
12.1.3	Inspect attachment welds.	✓	Satisfactory	
12.1.4	Identify cold joints and sharp edges. Inspect the handrails and midrails.	✓	Satisfactory	
12.1.5	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	✓	Satisfactory	
12.1.6	Inspect the handrail between the rolling ladder and the gauging platform for the hazardous opening when the floating roof is at its lowest level.	N/A	N/A	
12.2	Platform Frame			
12.2.2	Inspect frame for corrosion and paint failure.	✓	Satisfactory	
12.2.3	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	✓	Satisfactory	
12.2.4	Check reinforcing pads where supports are attached to shell or roof.	✓	Satisfactory	
12.2.5	Inspect the surface that deck plate or grating rests on, for thinning and holes.	✓	Satisfactory	
12.2.6	Check that flat-surface-to-flat-surface junctures are seal-welded.	✓	Satisfactory	
12.3	Deck Plate and Grating			
12.3.1	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	N/A	N/A	
12.3.2	Inspect plate-to-frame weld for rust scale buildup.	N/A	N/A	
12.3.3	Inspect grating for corrosion-caused thinning of bars and failure of welds.	N/A	N/A	

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection : Out of Service Inspection		
12.3.4	Check grating tie down clips. Where grating has been retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.	N/A	N/A
12.4	Stairway Stringers		
12.4.1	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	✓	Satisfactory
12.4.2	Inspect stairway supports to shell welds and reinforcing pads.	✓	directly welded with shell plates
12.4.3	Inspect steel support attachment to concrete base for corrosion.	✓	Satisfactory
12.5	Rolling Ladder		
12.5.1	Inspect rolling ladder stringers for corrosion.	N/A	N/A
12.5.2	Identify and inspect ladder fixed rungs (square bar, round bar, angles) for weld attachment to stringers and corrosion, particularly where angle rungs are welded to stringers.	N/A	N/A
12.5.3	Check for wear and corrosion where rolling ladder attaches to gauging platform.	N/A	N/A
12.5.4	Inspect pivot bar for wear and secureness.	N/A	N/A
12.5.5	Inspect operation of self-leveling stairway treads.	N/A	N/A
12.5.6	Inspect for corrosion and wear on moving parts.	N/A	N/A
12.5.7	Inspect rolling ladder wheels for freedom of movement, flat spots, and wear on axle.	N/A	N/A
12.5.8	Inspect alignment of rolling ladder with roof rack.	N/A	N/A
12.5.9	Inspect top surface of rolling ladder track for wear by wheels to assure at least 18 in. Of unworn track (track long enough).	N/A	N/A
12.5.10	Inspect rolling ladder track welds for corrosion.	N/A	N/A
12.5.11	Inspect track supports on roof for reinforcing pads seal-welded to deck plate.	N/A	N/A
12.5.12	Check by dimensioning, the maximum angle of the rolling ladder when the roof is on low legs. Max.angle _____ .	N/A	N/A
12.5.13	If rolling ladder tracks extends to within 5ft of the edge of the roof on the far side, check for a handrail on the top of the shell on that side.	N/A	N/A

1.5. Visual Inspection Checklist

In- Service Inspection Checklist



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

No.	Item	Completed	Comments
		√	
1	FOUNDATION		
1.0.1	Measure foundation levelness and bottom elevations.	√	Satisfactory
1.1	Concrete Ring		
1.1.1	Inspect for broken concrete, spalling and cracks, particularly under backup bars used in welding Butt-welded annular rings under the shell.	√	Satisfactory
1.1.2	Inspect drain openings in ring, back of water draw basins and top surface of ring for indications of bottom leakage.	√	Satisfactory
1.1.3	Inspect for cavities under foundation and vegetation against bottom of tank.	√	Vegetation observed . need to be removed
1.1.4	Check that runoff rainwater from the shell drains away from tank.	√	Satisfactory
1.1.5	Check for settlement around perimeter of tank.	√	See survey report
1.2	Cement/ asphalt		
1.2.1	Check for settling of tank into cement/asphalt base which would direct runoff rain water under the tank instead of away from it.	√	Satisfactory
1.2.2	Look for areas where leaching of oil has left rock filler exposed, which indicates hydrocarbon leakage.	√	Satisfactory
1.3	Oiled Dirt or Sand		
1.3.1	Check for settlement into the base which would direct runoff rain water under the tank rather than away from it.	√	Satisfactory
1.4	Rock		
1.4.1	Presence of crushed rock under the steel bottom usually results in severe underside corrosion. Make a note to do additional bottom plate examination (ultrasonic, hammer testing or turning of coupons) when the tank is out of service.	√	Satisfactory
1.5	Site Drainage		
1.5.1	Check site for drainage away from the tank and associated piping and manifolds.	√	Satisfactory
1.5.2	Check operating condition of the dike drains.	√	Minor cracks
1.6	Housekeeping		
1.6.1	Inspect the area for buildup of trash, vegetation and other inflammables buildup.	√	Satisfactory
2	SHELLS		
2.1	External Visual Inspection		
2.1.1	Visually inspect for paint failures, pitting and corrosion.	√	Satisfactory
2.1.2	Clean off the bottom angle area and inspect for corrosion and thinning on plate and weld.	√	Satisfactory
2.1.3	Inspect the bottom-to-foundation seal, if any.	√	Satisfactory
2.2	Internal (Floating Roof Tank)		
2.2.2	Visually inspect for grooving, corrosion, pitting and coating failures.	N/A	N/A
2.3	Riveted Shell Inspection		



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

2.3.1	Inspect external surface for rivet and seam leaks.	N/A	N/A
2.3.2	Locate leaks by sketch or photo (location will be lost when shell is abrasive cleaned for painting)	N/A	N/A
2.3.3	Inspect rivets for corrosion loss and wear.	N/A	N/A
2.3.4	Inspect vertical seams to see if they have been full fillet lap-welded to increase joint efficiency.	N/A	N/A
2.3.5	If no record exists of vertical riveted seams, dimension and sketch (or photograph) the rivet pattern : number of rows, rivet size, pitch length and note whether the joint is butt-riveted or lap-riveted.	N/A	N/A
2.4	Wind Girder (Floating Roof Tanks)		
2.4.1	Inspect wind girder and handrail for corrosion damage (paint failure, pitting, corrosion product buildup), especially where it occurs at tack-welded junction and for broken welds.	N/A	N/A
2.4.2	Check support welds to shell for pitting, especially on shell plates.	N/A	N/A
2.4.3	Note whether supports have reinforcing pads welded to shell.	N/A	N/A
3	SHELL APPURTENANCES		
3.1	Manways and Nozzles		
3.1.1	Inspect for cracks or signs of leakage on weld joint at nozzles, manways and reinforcing plates.	✓	Satisfactory
3.1.2	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.	✓	Satisfactory
3.1.3	Inspect for flange leaks and leaks around bolting.	✓	Satisfactory
3.1.4	Inspect sealing of insulation around manways and nozzles.	N/A	N/A
3.1.5	Check for inadequate manway flange and cover thickness on mixer manways.	N/A	N/A
3.2	Tank Piping Manifolds		
3.2.1	Inspect manifold piping, flanges and valves for leaks.	✓	Satisfactory
3.2.2	Inspect fire fighting system components.	✓	Satisfactory
3.2.3	Check for anchored piping which would be hazardous to the tank shell or bottom connections during earth movement.	✓	Satisfactory
3.2.4	Check for adequate thermal pressure relief of piping to the tank.	✓	Satisfactory
3.2.5	Check operation of regulators for tanks with purge gas systems.	✓	Satisfactory
3.2.6	Check sample connections for leaks and for proper valve operation.	✓	Satisfactory
3.2.7	Check for damage and test the accuracy of temperature indicators.	✓	Satisfactory
3.2.8	Check welds on shell-mounted davit clips above valves 6 in. and larger.	✓	Satisfactory
3.3	Autogauge System		
3.3.1	Inspect autogauge tape guide and lower sheave housing (floating swings) for leaks.	N/A	N/A
3.3.2	Inspect autogauge head for damage.	N/A	N/A
3.3.3	Bump the checker on autogauge head for proper movement of tape.	N/A	N/A
3.3.4	Identify size and construction material of autogauge tape guide (floating roof tanks).	N/A	N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :		Out of Service Inspection	
3.3.5	Ask operator if tape tends to hang up during tank roof movement (floating roof tanks).	N/A	N/A	
3.3.6	Compare actual product level to the reading on the autogauge (maximum variation is 2 in.)	N/A	N/A	
3.3.7	On floating roof tanks, when the roof is in the lowest position, check that no more than two ft. of tape are exposed at the end of the tape guide.	N/A	N/A	
3.3.8	Inspect condition of board and legibility of board-type autogauges.	N/A	N/A	
3.3.9	Test freedom of movement of marker and float.	N/A	N/A	
3.4	Shell-Mounted Sample Station			
3.4.1	Inspect sample lines for function of valves and plugging of lines, including drain or return-to-tank line.	N/A	N/A	
3.4.2	Check circulation pump for leaks and operating problems.	N/A	N/A	
3.4.3	Test bracing and supports for sample lines and equipment.	N/A	N/A	
3.5	Heater (Shell Manway Mounted)			
3.5.1	Inspect condensate drain for presence of oil indicating leakage.	N/A	N/A	
3.6	Mixer			
3.6.1	Inspect for proper mounting flange and support.	N/A	N/A	
3.6.2	Inspect for leakage.	N/A	N/A	
3.6.3	Inspect condition of power lines and connections to mixer.	N/A	N/A	
3.7	Swing Lines : Winch Operation			
3.7.1	Nonfloating. Raise, then lower the swing line with the winch and check for cable tightness to confirm that swing line lowered properly.	N/A	N/A	
3.7.2	Floating. With tank half full or more, lower the swing line, then let out cable and check if swing has pulled cable tight, indicating that the winch is operating properly.	N/A	N/A	
3.7.3	Indicator. Check that the indicator moves in the proper direction. Floating swing line indicators show a lower level as cable is wound up on the winch. Non-floating swing line indicators show the opposite.	N/A	N/A	
3.8	Swing Lines : External Guide System			
3.8.1	Check for leaks at threaded and flanged joints.	N/A	N/A	
3.9	Swing Lines : Identify Ballast Varying Need			
3.9.1	Check for significant difference in stock specific gravity.	N/A	N/A	
3.10	Swing Lines : Cable Material and Condition			
3.10.1	For nonstainless steel cable, check for corrosion over entire length.	N/A	N/A	
3.10.2	All cable: Check for wear of fraying.	N/A	N/A	
3.11	Swing Lines : Product Sample Comparison			
3.11.1	Check for water or gravity differences that would indicate a leaking swing joint.	N/A	N/A	
3.12	Swing Lines : Target			
3.12.1	Target should indicate direction of swing opening (up or down) and height above bottom where suction will be lost with swing on bottom support.	N/A	N/A	
4	ROOFS			
4.1	Deck Plate Internal Corrosion			



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

4.1.1	For safety, before accessing the roof, check with ultrasonic instrument or lightly use a ball pen hammer to test the deck plate near the edge of the roof for thinning. Note that: Corrosion normally attacks the deck plate at the edge of a fixed roof and at the rafters in the center of the roof first.	N/A	N/A
4.2	Deck Plate External Corrosion		
4.2.1	Visually inspect for paint failure, holes, pitting and corrosion product on the roof deck.	N/A	N/A
4.3	Roof Deck Drainage		
4.3.1	Look for indication of standing water. Significant sagging of fixed roof deck indicates potential rafter failure. Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a nonlevel roof with possible leaking pontoons.	N/A	N/A
4.4	Level of Floating Roof		
4.4.1	At several locations, measure distance from roof rim to a horizontal weld seam above the roof. A variance in the readings indicates a nonlevel roof with possible shell out-of-round, out-of-plumb, leaking pontoons or hang-up. On small diameter tanks, an unlevel condition can indicate unequal loading at that level.	N/A	N/A
4.5	Gas Test Internal Floating Roof		
4.5.1	Test for explosive gas on top of the internal floating roof. Readings could indicate a leaking roof, leaking seal system or inadequate ventilation of the area above the internal floating roof.	N/A	N/A
4.6	Roof Insulation		
4.6.1	Visually inspect for cracks or leaks in the insulation weather coat where runoff rain water could penetrate the insulation.	N/A	N/A
4.6.2	Inspect for wet insulation under the weather coat.	N/A	N/A
4.6.3	Remove small test sections of insulation and check roof deck for corrosion and holes near the edge of the insulated area.	N/A	N/A
4.7	Floating Roof Seal Systems		
4.7.1	Measure and record maximum seal-to-shell gaps at : 1. Low pump out 2. Mid-shell 3. High liquid level	N/A N/A N/A N/A	N/A N/A N/A N/A
4.7.2	Measure and record annular space at 30-ft. spacing (minimum of four quadrants) around roof and record. Measurements should be taken in directly opposite pairs. 1 Opposite pair 1 2 Opposite pair 2	N/A N/A N/A	N/A N/A N/A
4.7.3	Check if seal fabric on primary shoe seals is pulling shoes away from shell fabric not wide enough)	N/A	N/A
4.7.4	Inspect fabric for deterioration, holes, tears and cracks.	N/A	N/A
4.7.5	Inspect visible metallic parts for corrosion and wear.	N/A	N/A
4.7.6	Inspect for openings in seals that would permit vapor emissions.	N/A	N/A
4.7.7	Inspect for protruding bolt or rivet heads against the shell.	N/A	N/A
4.7.8	Pull both primary and secondary seal systems back all around the shell to check their operation.	N/A	N/A
4.7.9	Inspect secondary seals for signs of buckling or indications that their angle with the shell is too shallow.	N/A	N/A

SGS	Client :	Shell Pakistan Limited			
	Job Number :	5010465		Tank Number : MCH-03	
	Type Of Inspection :	Out of Service Inspection			
4.7.10	Inspect wedge-type wiper seals for flexibility, resilience, cracks and tears.		N/A	N/A	
5	ROOF APPURTENANCES				
5.1	Sample Hatch				
5.1.1	Inspect condition and functioning of sample of sample hatch cover.	√	Satisfactory		
5.1.2	On tanks governed by Air Quality Monitoring District rules, check for the condition of seal inside hatch cover.	√	Satisfactory		
5.1.3	Check for corrosion and plugging on thief and gauge hatch cover.	√	Satisfactory		
5.1.4	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	√	Satisfactory		
5.1.5	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	√	Satisfactory		
5.1.6	On floating roof sample hatch and recoil systems, inspect operation of recoil reel and condition of rope.	N/A	N/A		
5.1.7	Test operation of system.	N/A	N/A		
5.1.8	On ultra clean stocks such as JP4, check for presence and condition of protective coating or liner inside sample hatch (preventing rust from pipe getting into sample).	N/A	N/A		
5.2	Gauge Well				
5.2.1	Inspect visible portion of the gauge well for thinning, size of slots and cover condition.	N/A	N/A		
5.2.2	Check for a hold-off distance marker and tab with hold-off distance (legible).	N/A	N/A		
5.2.3	On floating roofs, inspect condition of roof guide for gauge well, particularly the condition of the rollers for grooving.	N/A	N/A		
5.2.4	If accessible, check the distance from the gauge well pipe to the tank shell at different levels.	N/A	N/A		
5.2.5	If tank has a gauge well washer, check valve for leakage and for presence of a bull plug or blind flange.	N/A	N/A		
5.3	Fixed Roof Scaffold Support				
5.3.1	Inspect scaffold support for corrosion, wear and structural soundness.	N/A	N/A		
5.4	Autogauge : Inspection Hatch and Guides (Fixed Roof)				
5.4.1	Check the hatch for corrosion and missing bolts.	√	N/A		
5.4.2	Look for corrosion on the tape guide's and float guide's wire anchors.	N/A	N/A		
5.5	Autogauge : Float Well Cover				
5.5.1	Inspect for corrosion.	N/A	N/A		
5.5.2	Check tape cable for wear or fraying caused by rubbing on the cover.	N/A	N/A		
5.6	Sample Hatch (Internal Floating Roof)				
5.6.1	Check overall conditions.	N/A	N/A		
5.6.2	When equipped with a fabric seal, check for automatic sealing after sampling.	N/A	N/A		
5.6.3	When equipped with a recoil reel opening device, check for proper operations.	N/A	N/A		
5.7	Roof-Mounted Vents (Internal Floating Roof)				

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number : MCH-03
	Type Of Inspection :		Out of Service Inspection	
5.7.1	Check condition of screens, locking and pivot pins.	N/A	N/A	
5.8	Gauging Platform Drip Ring			
5.8.1	On fixed roof tanks with drip rings under the gauging platform or sampling area, inspect for plugged drain return to the tank.	√	N/A	
5.9	Emergency Roof Drains			
5.9.1	Inspect vapor plugs for emergency drain: that seal fabric discs are slightly smaller than the pipe ID and that fabric seal is above the liquid level.	N/A	N/A	
5.10	Removable Roof Leg Racks			
5.10.1	Check for leg racks on roof.	N/A	N/A	
5.11	Vacuum Breakers			
5.11.1	Report size, number and type of vacuum breakers. Inspect vacuum breakers. If high legs are set, check for setting of mechanical breaker in high leg position.	N/A	N/A	
5.12	Rim Vents			
5.12.1	Check condition of the screen on the rim vent cover.	N/A	N/A	
5.12.2	Check for plating off or removal of rim vents where jurisdictional rules do not permit removal.	N/A	N/A	
5.13	Pontoon Inspection Hatches			
5.13.1	Open pontoon inspection hatch covers and visually check inside for pontoon leakage.	N/A	N/A	
5.13.2	Test for explosive gas (an indicator of vapor space leaks).	N/A	N/A	
5.13.3	If pontoon hatches are equipped with locked down coves, check for vent tubes. Check that vent tubes are not plugged up. Inspect lock-down devices for condition and operation.	N/A	N/A	
5.13.4	Test for explosive gas (an indicator of vapor space leaks).	N/A	N/A	
6	ACCESS STRUCTURES			
6.1	Handrails			
6.1.1	Identify and report type (steel pipe, galvanized pipe, square tube, angle) and size of handrails.	√	Satisfactory	
6.1.2	Inspect for pitting and holes, paint failure.	√	Satisfactory	
6.1.3	Inspect attachment welds.	√	Satisfactory	
6.1.4	Identify cold joints and sharp edges. Inspect the handrails and midrails.	√	Satisfactory	
6.1.5	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	√	Satisfactory	
6.1.6	Inspect the handrail between the rolling ladder and the gaging platform for the hazardous opening when the floating roof is at its lowest level.	√	Satisfactory	
6.2	Platform Frame			
6.2.1	Inspect frame for corrosion and paint failure.	√	Satisfactory	
6.2.2	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	√	Satisfactory	
6.2.3	Check reinforcing pads where supports are attached to shell or roof.	√	Satisfactory	
6.2.4	Inspect the surface that deck plate or grating rests on, for thinning and holes.	√	Satisfactory	
6.2.5	Check that flat-surface-to-flat-surface junctures are seal-welded.	√	Satisfactory	

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :		Out of Service Inspection	

6.3	Deck Plate and Grating			
6.3.1	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	N/A		
6.3.2	Inspect plate-to-frame weld for rust scale buildup.	N/A		
6.3.3	Inspect grating for corrosion-caused thinning of bars and failure of welds.	N/A		
6.3.4	Check grating tie down clips. Where grating has been retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.	N/A	N/A	
6.4	Stairway Stringers			
6.4.1	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	✓	Satisfactory	
6.4.2	Inspect stairway supports to shell welds and reinforcing pads.	N/A	directly welded with shell plates	
6.4.3	Inspect steel support attachment to concrete base for corrosion.	✓	Satisfactory	
6.5	Rolling Ladder			
6.5.1	Inspect rolling ladder stringers for corrosion.	N/A	N/A	
6.5.2	Identify and inspect ladder fixed rungs (square bar, round bar, angles) for weld attachment to stringers and corrosion, particularly where angle rungs are welded to stringers.	N/A	N/A	
6.5.3	Check for wear and corrosion where rolling ladder attaches to gaging platform.	N/A	N/A	
6.5.4	Inspect pivot bar for wear and secureness.	N/A	N/A	
6.5.5	Inspect operation of self-leveling stairway treads.	N/A	N/A	
6.5.6	Inspect for corrosion and wear on moving parts.	N/A	N/A	
6.5.7	Inspect rolling ladder wheels for freedom of movement, flat spots, and wear on axle.	N/A	N/A	
6.5.8	Inspect alignment of rolling ladder with roof rack.	N/A	N/A	
6.5.9	Inspect top surface of rolling ladder track for wear by wheels to assure at least 18 in. of unworn track (track long enough).	N/A	N/A	
6.5.10	Inspect rolling ladder track welds for corrosion.	N/A	N/A	
6.5.11	Inspect track supports on roof for reinforcing pads seal-welded to deck plate.	N/A	N/A	
6.5.12	Check by dimensioning, the maximum angle of the rolling ladder when the roof is on low legs. Max.angle :	N/A	N/A	
6.5.13	If rolling ladder tracks extends to within 5ft of the edge of the roof on the far side, check for a handrail on the top of the shell on that side.	N/A	N/A	

2 Foundation

2.1. Tank Settlement

Tank Settlement survey was carried out to determine the effects of soil settlement on storage tanks.

The minimum number of elevation points shall be as indicated by the following equation:

$$N = D/10$$

Where,

N = the minimum required number of settlement measurement points, but no less than eight. All values shall be rounded to the next higher whole number. The maximum spacing between settlement measurement points shall be 32 ft;

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

D = the tank diameter, in feet (ft).

The survey data was then be calculated to form a best fit cosine curve.

The permissible out of Plane Settlement is given by the following equation:-

$$S_{max} = (L^2 \times Y \times 11) / 2[(E \times H)]$$

Where,

S = Deflection, in ft (out of plane distortion),

L = Arc length between measurement points, in ft,

Y = Yield strength, in lbf/in²,

E = Young's modulus, in lbf/in²,

H = tank height, in ft.

The survey data is recorded on Table 2-1 : General Detail for Settlement Evaluation, Table 2-2 : Optimum Cosine Curve Base On Survey Data and Figure 2-1 : Graphical Representation of Shell Settlement.

Table 2-1 : General Detail for Settlement Evaluation

Tank Number	MCH-03
Tank Diameter	15,000 mm or 49.213 ft
Tank Shell height	10,000 mm or 32.808 ft
Minimum Number of Settlement Points Required	8
Actual Settlement Point, N	8
Settlement spacing, L	5,890.5 mm or 19.33 ft
Yield stress, Y	36,000 psi
Young's modulus, E	30 MSI
Readings Average ,ao	6.88 mm or 0.27 in.
a1, (2 x Ui x Cos(θ)/N)	-1.57 mm or -0.06 in
b1 , (2 x Ui x Sin(θ)/N)	-1.99 mm or -0.08 in
Si	6.54 mm or 0.26 in.
S _{max}	22.90 mm or 0.90 in.

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :	Out of Service Inspection		

Table 2-2 : Optimum Cosine Curve Base On Survey Data

Station, ($^{\circ}$)	Measured Reading, U_i (mm)	Reading, U_i (inch)	Perfect Tilt (mm)	Differential Settlement, S_i (mm)	Absolute Finite Difference, S_{max} (mm)	Top Shell Radial Move (mm)
0	0	0.000	5.3	-5.3	6.5	28.3
45	6	0.236	4.4	1.6	2.2	9.7
90	9	0.354	4.9	4.1	4.6	19.8
135	4	0.157	6.6	-2.6	3.9	16.9
180	7	0.276	8.4	-1.4	0.0	0.2
225	9	0.354	9.4	-0.4	1.2	5.3
270	12	0.472	8.9	3.1	2.9	12.6
315	8	0.315	7.2	0.8	1.9	8.3

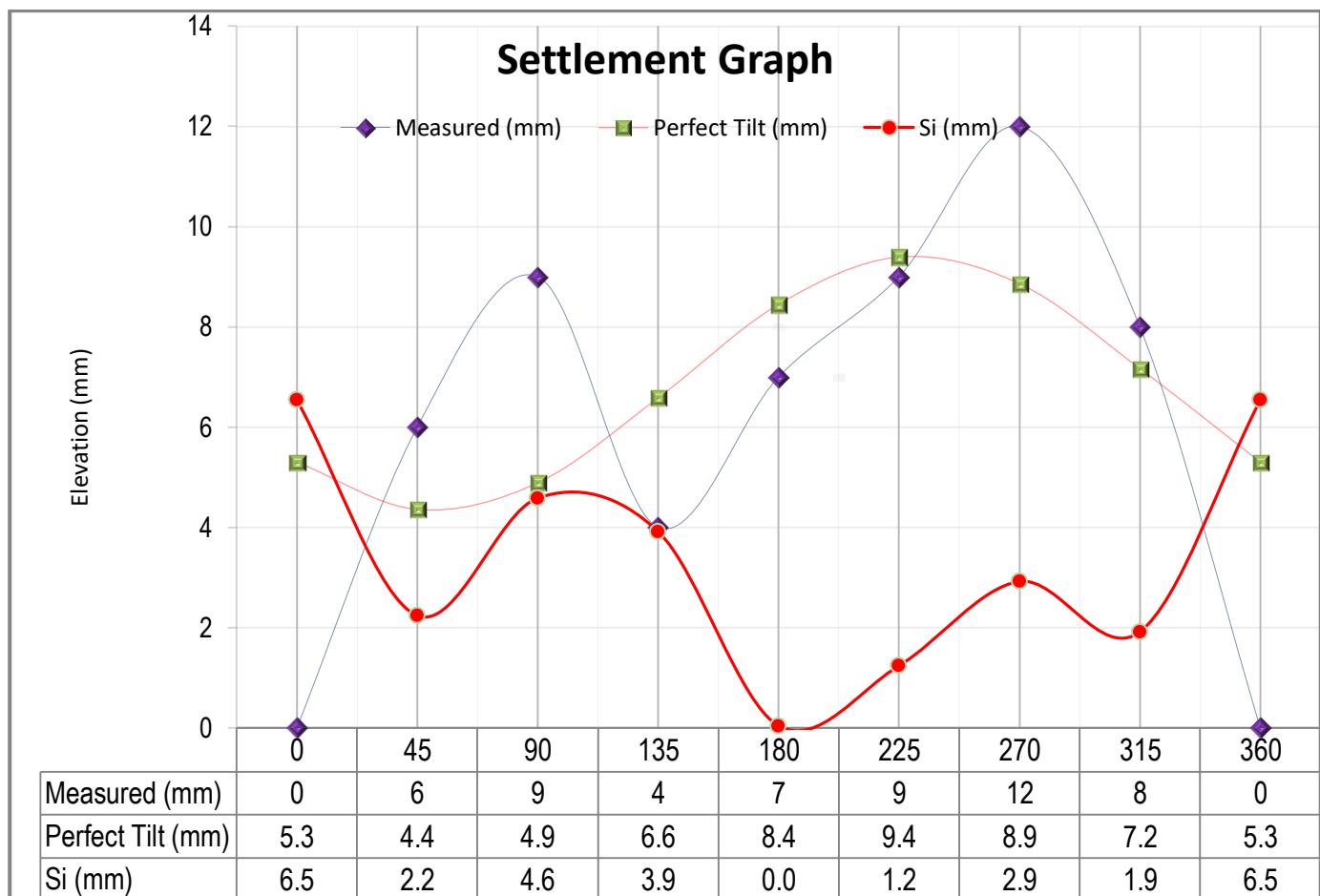


Figure 2-1 : Graphical Representation of Shell Settlement

Conclusion:

The settlement survey is acceptable, the API allowed is 22.9mm(0.9 inch), and the S_{max} is 6.54mm (0.26inch).

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :	Out of Service Inspection		

2.2. Bottom Plate Settlement

These settlements readings were recorded by taking elevation measurements around the tank circumference and across the tank diameter to create an idea of bottom plate elevation profile.

The survey is only to give an idea of the bottom plate settlement profile. Unless there is severe bulging or depression of the bottom plate noted on the bottom plate during visual inspection, then more inspection/evaluation using API 653 Appendix B should be performed.

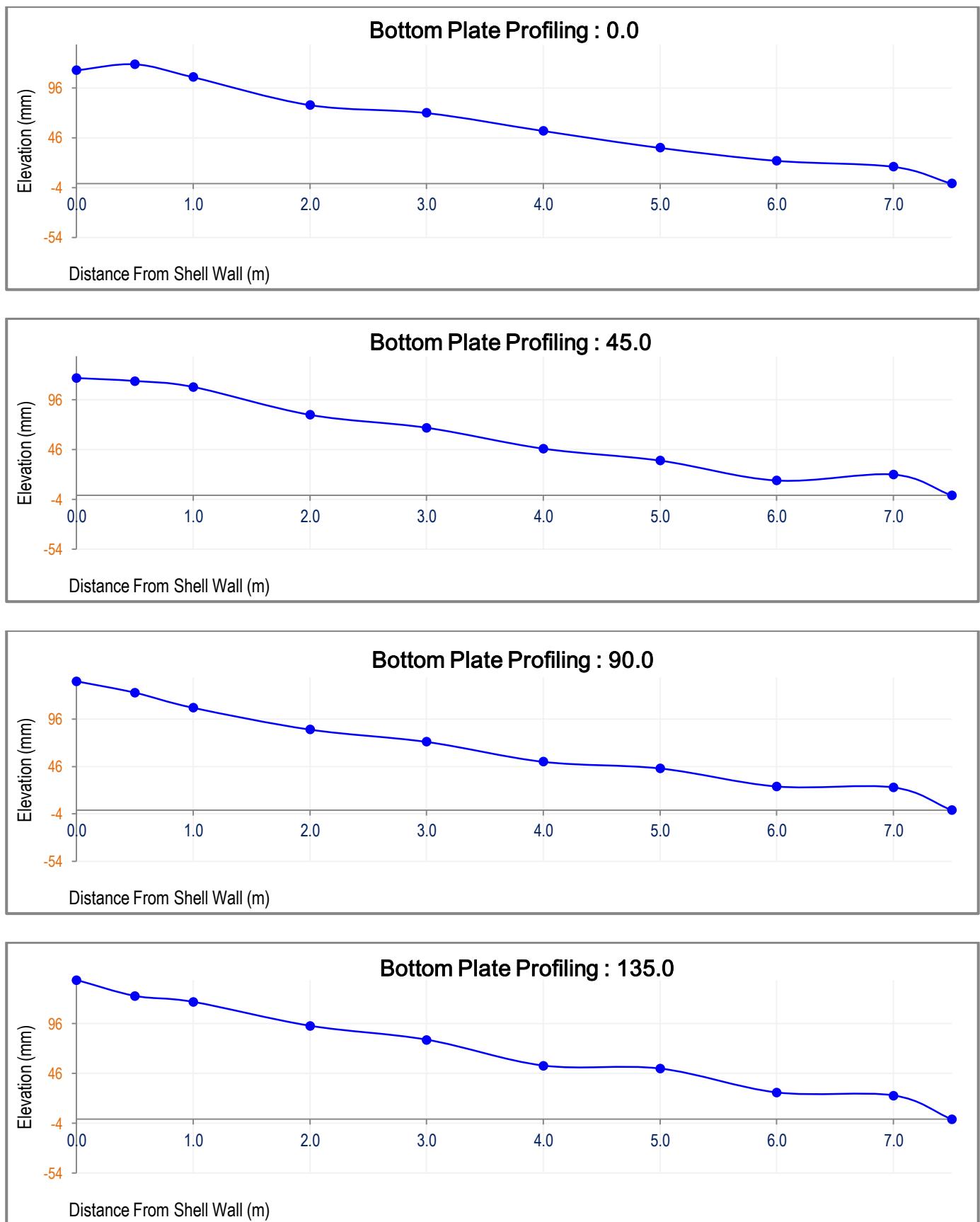
Results of Bottom Plate settlement was recorded on Table 2-3 : Bottom Plate Settlement/Elevation Readings.

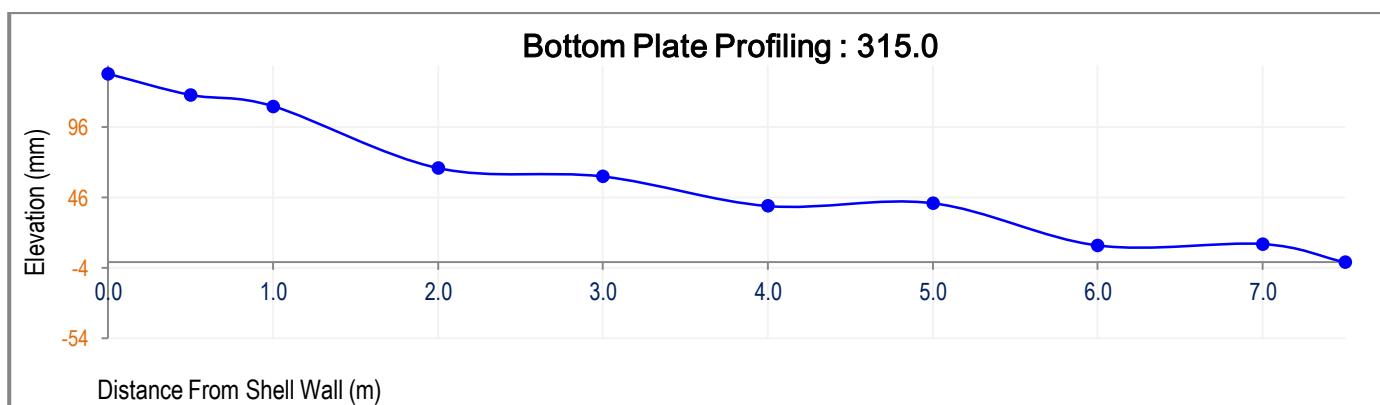
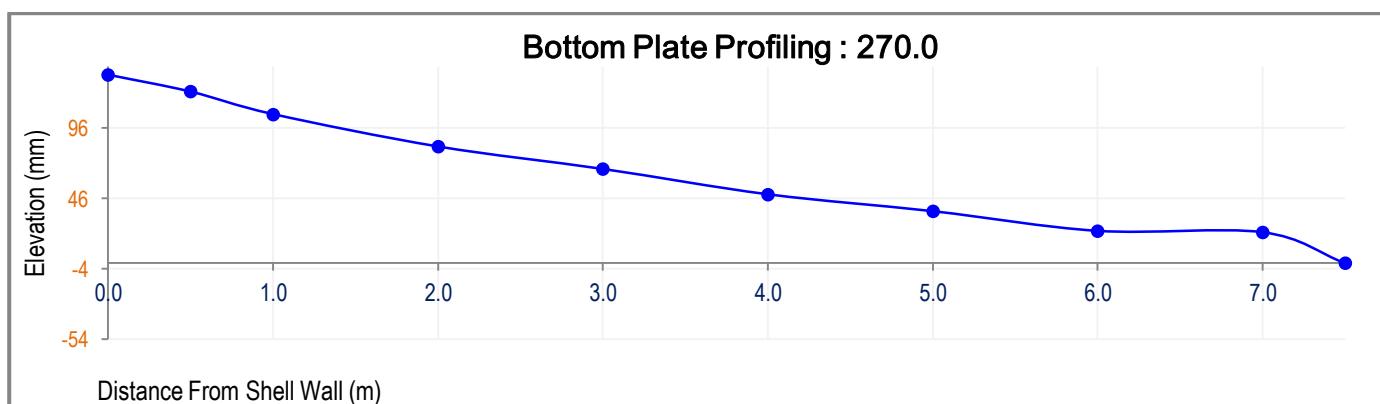
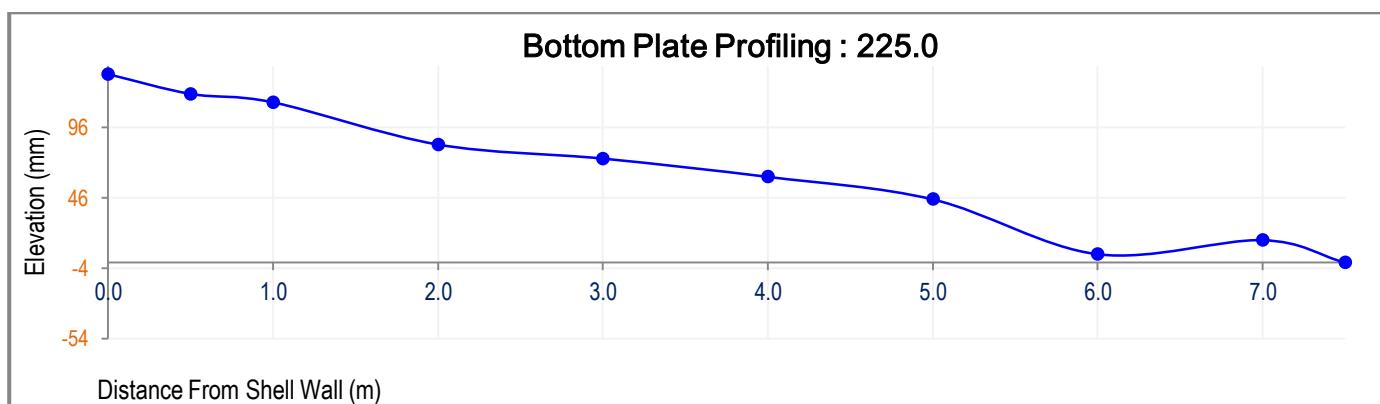
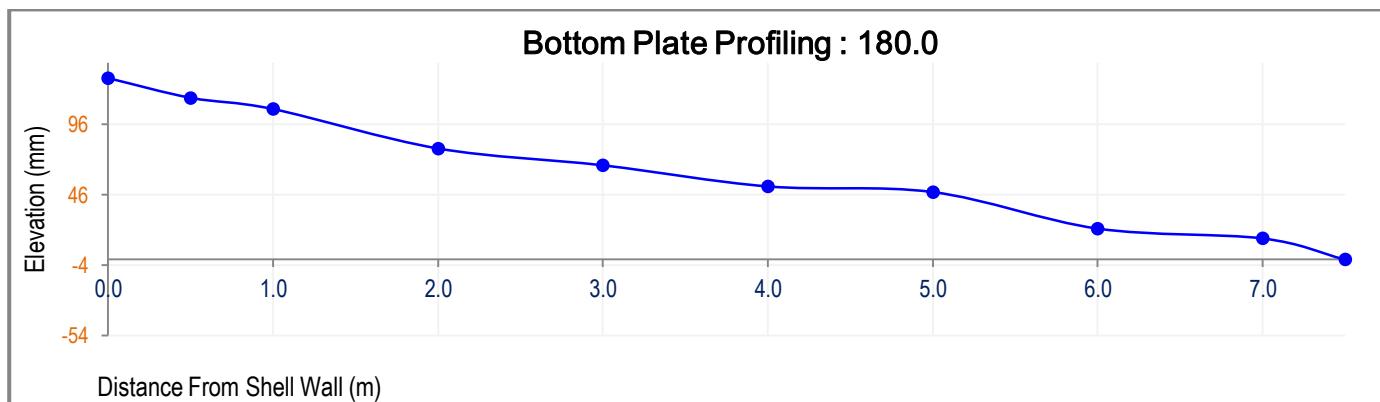
Table 2-3 : Bottom Plate Settlement/Elevation Readings

Distance From Shell (m)	Station (°) - Elevation Readings (mm)							
	0	45	90	135	180	225	270	315
0.00	114	118	136	140	129	134	134	134
0.50	120	115	124	124	115	120	122	119
1.00	107	109	108	118	107	114	106	111
2.00	79	81	85	94	79	84	83	67
3.00	71	68	72	80	67	74	67	61
4.00	53	47	51	54	52	61	49	40
5.00	36	35	44	51	48	45	37	42
6.00	23	15	25	27	22	6	23	12
7.00	17	21	24	24	15	16	22	13
7.50	0	0	0	0	0	0	0	0

SGS	Client :	Shell Pakistan Limited
	Job Number :	5010465
	Type Of Inspection :	Out of Service Inspection

Figure 2-2 : Illustration of Bottom Plate Settlement Profiling







Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

3 Ultrasonic Thickness Measurements Report

4 Roof

4.1. Thickness Measurements on Roof Plate

The ultrasonic thickness measurement of roof plates can be carried out using hand held digital instruments.

Thickness measurement is taken on each individual roof plate with a minimum of 5 readings.

For plates which are welded to tank shell or girder, the thickness measurements shall be taken as near as close to frangible joint.

The result of the thickness readings are recorded in Table 4-1 : Thickness Measurements on Roof Plate (mm).

Code Reference

API 653 Paragraph 4.2.1.2 Roof plates corroded to an average thickness of less than 0.09 in. in any 100 in.² area or roof plates with any holes through the roof plate shall be repaired or replaced.

Table 4-1 : Thickness Measurements on Roof Plate (mm)

Plate Number	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1-1	5.95	5.98	6.03	6.10	6.06	5.95
1-2	5.98	5.99	5.97	6.00	5.94	5.94
1-3	6.05	5.99	6.01	6.09	6.06	5.99
2-1	6.06	6.08	6.05	6.08	6.11	6.05
2-2	5.94	5.96	5.93	5.92	6.00	5.92
3-1	5.93	6.00	5.95	5.90	5.94	5.90
3-2	6.06	6.04	6.11	6.05	6.03	6.03
3-3	5.95	6.00	6.00	5.96	5.98	5.95
4-1	5.98	5.98	5.97	5.98	5.96	5.96
4-2	6.02	6.03	6.07	6.02	6.09	6.02
5-1	6.03	6.03	5.27	6.04	5.96	5.27
5-2	5.94	5.98	5.97	5.90	5.95	5.90
5-3	6.01	5.96	6.04	5.99	6.04	5.96
6-1	6.00	6.02	6.01	6.11	6.08	6.00
6-2	6.04	6.08	6.09	6.09	6.00	6.00
7-1	6.22	6.12	6.12	6.18	6.15	6.12
7-2	6.06	6.13	6.13	6.13	6.23	6.06
7-3	6.19	6.12	6.02	6.13	6.13	6.02
C-1	6.33	6.77	6.28	6.32	6.23	6.23
C-2	6.36	6.47	6.47	6.44	6.41	6.36

Table 4-2 : Roof Plate Life Span Calculation

Item	Previous Thickness (mm)	Minimum Measured Thickness (mm)	Minimum Required Thickness (mm)	Corrosion Rate (mm/Year)	Remaining Life (Years)
Roof Plates	5.82	5.27	2.29	0.07857	37.93

Previous thickness taken from previous inspection report 2014



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

4.2. Thickness Measurements on Roof Nozzles and Reinforcement Plates.

Ultrasonic thickness measurements were taken at quadrants of nozzle neck and reinforcement plate.

Table 4-3 : Thickness Measurements Readings On Roof Nozzle Necks and Reinforcement Plates (mm)

No	Item ID	Item	Nozzle				Reinforcement Plate			
			0 °	90 °	180 °	270 °	0 °	90 °	180 °	270 °
1	N1	8" Sampling Hatch 1	8.28	8.35	8.29	8.33	5.76	6.49	5.81	5.80
2	N2	8" Blind Nozzle	8.38	8.12	7.97	8.38	6.07	6.17	5.98	6.02
3	N3	1.5" Tank radar	4.10	3.72	3.80	3.77	5.90	5.90	5.85	5.88
4	N4	6" Goose Neck	6.51	7.21	6.68	6.66	6.14	6.08	6.15	6.11
5	MW-1	24" Manhole 1	6.50	6.33	6.48	6.43	5.12	6.10	4.94	4.95
6	MW-2	24" Manhole 2	5.93	5.93	6.03	6.07	11.90	11.82	11.87	12.01

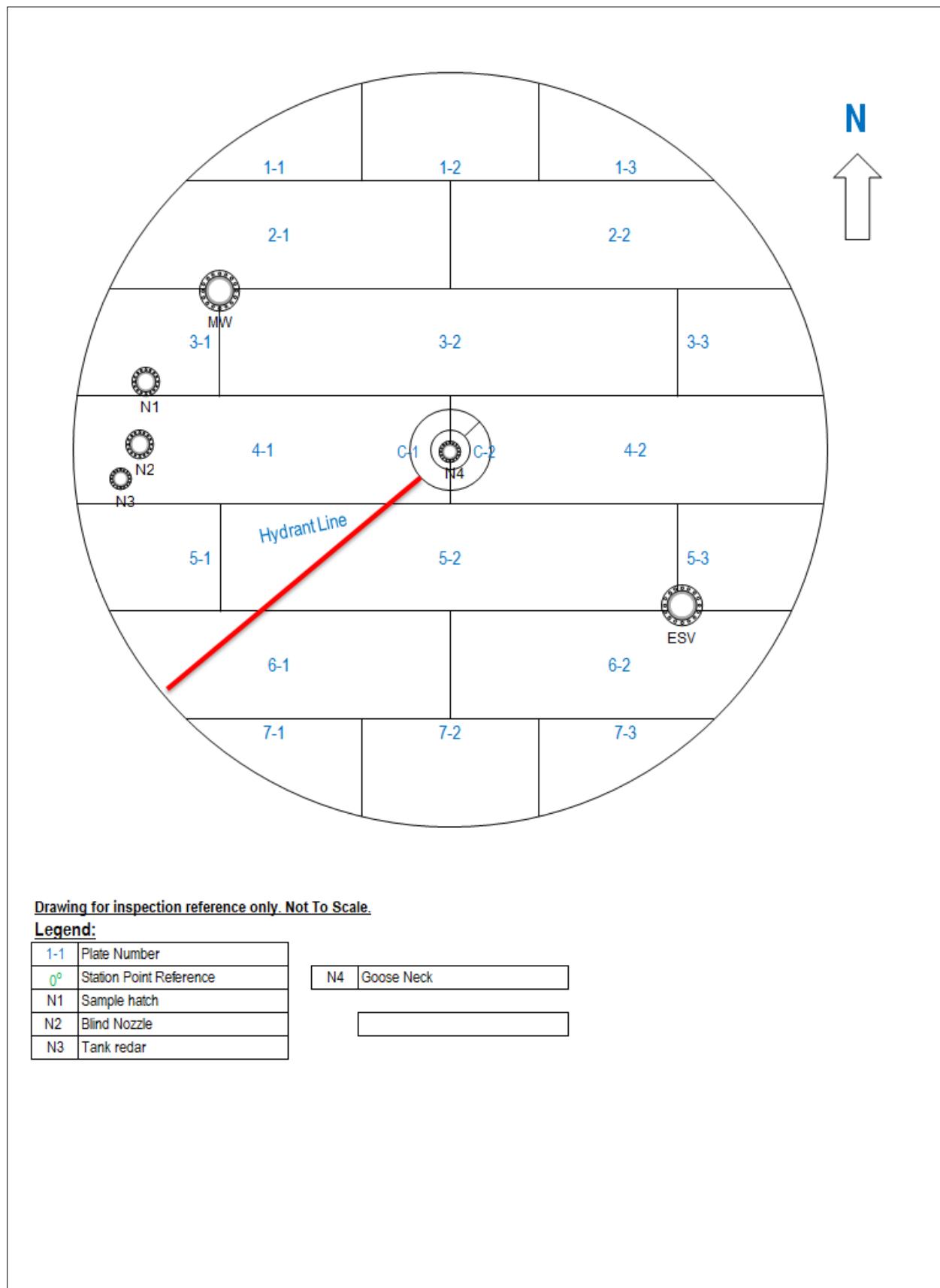


Figure 4-1 : Tank Roof Layout



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

5 Shell

5.1. Thickness Measurements on Shell Plates

Ultrasonic thickness measurements were carried out on the shell plate .

The thickness reading are recorded in Table 5-1 : Thickness Readings at Shell Plate (mm).

Table 5-1 : Thickness Readings at Shell Plate (mm).

Vertical Scan Location/ Station (Degree): 0.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.35	9.44	9.62	9.76	9.78	9.35
2	6.18	6.26	6.29	6.37	6.44	6.18
3	6.05	6.23	6.18	6.01	6.11	6.01
4	6.14	6.21	6.02	6.15	6.06	6.02

Vertical Scan Location/ Station (Degree): 30.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.69	9.90	9.98	9.92	10.04	9.69
2	6.32	6.40	6.25	6.38	6.31	6.25
3	5.78	5.89	5.97	6.08	6.10	5.78
4	6.07	6.03	6.09	6.01	5.94	5.94

Vertical Scan Location/ Station (Degree): 60.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.48	9.37	9.51	9.85	9.92	9.37
2	6.56	6.60	6.43	6.39	6.33	6.33
3	5.97	5.99	6.04	6.13	5.95	5.95
4	6.14	6.05	6.10	6.20	6.06	6.05

Vertical Scan Location/ Station (Degree): 90.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.37	9.52	9.77	9.89	9.78	9.37
2	6.30	6.39	6.28	6.43	6.49	6.28
3	6.09	6.15	6.18	6.11	6.10	6.09
4	6.00	6.13	6.22	6.06	6.18	6.00

Vertical Scan Location/ Station (Degree): 120.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.67	9.92	10.10	9.96	10.09	9.67
2	6.25	6.31	6.40	6.35	6.47	6.25
3	6.05	6.12	6.19	6.08	6.17	6.05
4	6.13	6.24	6.21	6.18	6.19	6.13

Vertical Scan Location/ Station (Degree): 150.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.34	9.61	9.82	9.84	9.82	9.34
2	6.42	6.61	6.55	6.41	6.51	6.41
3	6.20	6.17	6.21	6.19	6.15	6.15
4	6.18	6.05	6.00	6.11	6.21	6.00

Vertical Scan Location/ Station (Degree): 180.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.36	9.54	9.68	9.83	9.72	9.36

SGS	Client :	Shell Pakistan Limited				
	Job Number :	5010465			Tank Number :	MCH-03
	Type Of Inspection :	Out of Service Inspection				

2	6.24	6.21	6.36	6.30	6.33	6.21
3	6.20	6.13	6.02	6.24	6.17	6.02
4	6.08	6.16	6.23	6.12	6.08	6.08

Vertical Scan Location/ Station (Degree): 210.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.68	9.94	10.00	10.07	9.97	9.68
2	6.31	6.42	6.55	6.39	6.48	6.31
3	6.41	6.51	6.50	6.43	6.47	6.41
4	6.25	6.33	6.29	6.20	6.18	6.18

Vertical Scan Location/ Station (Degree): 240.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.43	9.74	9.78	9.85	9.89	9.43
2	6.35	6.28	6.42	6.48	6.36	6.28
3	6.16	6.20	6.11	6.06	6.18	6.06
4	6.02	6.14	6.22	6.32	6.26	6.02

Vertical Scan Location/ Station (Degree): 270.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.62	9.45	9.74	9.88	9.86	9.45
2	6.28	6.33	6.32	6.45	6.41	6.28
3	6.09	6.16	6.29	6.21	6.13	6.09
4	6.11	6.09	6.26	6.26	6.03	6.03

Vertical Scan Location/ Station (Degree): 300.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.63	10.01	10.10	9.97	9.84	9.63
2	6.34	6.43	6.42	6.32	6.39	6.32
3	6.12	6.03	5.98	6.13	6.00	5.98
4	6.14	6.19	6.13	6.22	6.16	6.13

Vertical Scan Location/ Station (Degree): 330.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.98	9.68	9.77	9.97	9.96	9.68
2	6.26	6.18	6.46	6.25	6.20	6.18
3	6.08	6.19	6.16	6.07	6.11	6.07
4	6.12	6.10	6.09	6.15	6.03	6.03

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :	Out of Service Inspection		

5.2. Shell Plate Acceptable Thickness Calculation

The minimum acceptable thickness for entire shell course, t_{min} is calculated as follows:-

$$t_{min} = \frac{2.6(H-1)DG}{SE}$$

where

- t_{min} is the minimum acceptable thickness, in inches for each course as calculated from the above equation; however, t_{min} shall not be less than 0.1 in. for any tank course;
- D is the nominal diameter of tank, in feet (ft);
- H is the height from the bottom of the shell course under consideration to the maximum liquid level when evaluating an entire shell course, in feet (ft); or is the height from the bottom of the length L (see 4.3.2.1) from the lowest point of the bottom of L of the locally thinned area to the maximum liquid level, in feet (ft); or is the height from the lowest point within any location of interest to the maximum liquid level, in feet (ft);
- G is the highest specific gravity of the contents;

The information and calculation of minimum thickness required is recorded in Table 5-2 : Information For Shell Plates Minimum Acceptable Thickness Calculation and Table 5-3 : Shell Plate Minimum Acceptable Thickness.

Table 5-2 : Information For Shell Plates Minimum Acceptable Thickness Calculation

Tank Number	MCH-03
Tank Diameter	15,000 mm or 49.213 ft
Tank Height	10,000 mm or 32.808 ft
Maximum Filling Height	10,000 mm or 32.808 ft
Product	HSD
Specific Gravity, G	0.87
Year of Commission	1997
Year of Last Inspection	2014
Year of Current Inspection	2021
Type of Shell Weld	Butt weld
Corrosion Allowance	0.00
Joint Efficiency, E	1.00

Table 5-3 : Shell Plate Minimum Acceptable Thickness Calculation.

Course No	Height Per Course (mm)	Material	Allowable Product Stress, S (lbf/in ²)	*Previous Thickness (mm)	Minimum Measured Thickness (mm)	Minimum Acceptable Thickness, T _{min} (mm)	Corrosion Rate (mm/year)	Remaining Life (year)	Inspection Interval (year)
1	3,000	Unknown	23,600	9.88	9.34	3.81	0.077	71.67	15.00
2	2,380	Unknown	23,600	6.85	6.18	2.63	0.096	37.07	15.00
3	2,380	Unknown	26,000	6.71	5.78	2.54	0.133	24.39	12.19
4	2,240	Unknown	26,000	6.64	5.94	2.54	0.100	34.00	15.00

*Previous Thickness taken from : Previous Inspection Report 2104

Note: API653 section 6.3.3.3: Internal inspection of the tank shell, when the tank is out of service, can be substituted for a program of external ultrasonic thickness measurement if the internal inspection interval is equal to or less than the interval required in 6.3.3.2 b).

Conclusion:

The minimum remaining life calculated as per API 653 on tank shell is 24.39 years, therefore the next inspection is 12.19 years



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

5.3. Thickness Measurement on Shell Nozzles and Reinforcement Plates

Ultrasonic thickness measurements were taken at quadrants of the nozzles neck and reinforcement plates.

Table 5-4 : Thickness Measurement Readings on Shell Nozzle Necks and Reinforcement Plate (mm)

No	Item ID	Item	Nozzle				Reinforcement Plate			
			0 °	90 °	180 °	270 °	0 °	90 °	180 °	270 °
1	MW-1	24" Manhole 1	14.67	14.57	13.90	13.84	10.01	9.84	9.75	9.89
2	MW-2	24" Manhole 2	13.66	14.38	13.66	13.73	9.77	9.61	9.98	9.90
3	N2	2" Nozzle	5.74	5.69	5.33	5.48	N/A	N/A	N/A	N/A
4	N3	6" Nozzle	11.01	10.58	11.01	10.92	9.80	9.91	9.83	9.74
5	N4	12" Nozzle	13.37	12.59	12.65	13.26	9.72	9.63	9.78	9.96
6	N5	8" Nozzle	13.14	13.23	13.50	12.82	10.00	10.12	10.11	10.11
7	N6	4" Nozzle	8.68	8.85	8.77	8.39	10.25	10.22	10.17	10.18
8	N7	6" Nozzle	10.77	10.62	10.98	10.83	9.77	9.76	9.85	9.77

SGS

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

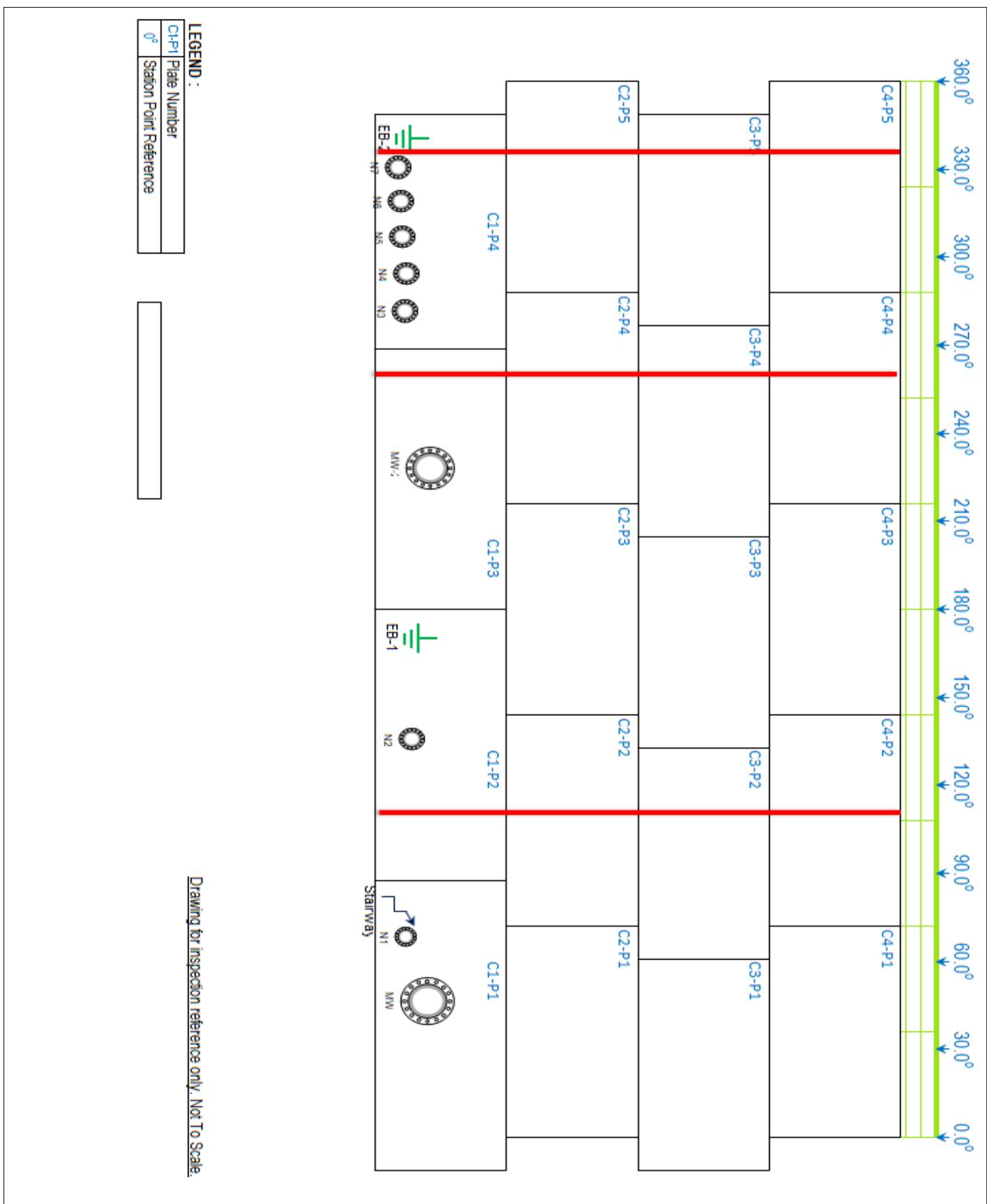


Figure 5-1 : Tank Shell Plate and Nozzle Layout

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-03
	Type Of Inspection :	Out of Service Inspection		

5.4. Tank Plumbness- Tank Verticality check

A Plumbness Survey was carried out to determine the verticality of tank.

The required numbers of survey stations is not mentioned in API 653. However as guidance, the number of survey station determined will be the same for tank settlement as mentioned below:

$$N = D/10$$

Where,

N is the minimum required number of settlement measurement points, but no less than eight. All values shall be rounded to the next higher whole number. The maximum spacing between settlement measurement points shall be 32 ft;

D is the tank diameter, in feet (ft).

The required information and result of plumbness is shown in Table 5-5 : Information for Plumbness Survey, Table 5-5 : Information for Plumbness Survey and Table 5-6 : Plumbness Readings (mm).

Simplified Acceptance Criteria for Plumbness as per API 653 is shown as below:-

Type of Tank	Tolerance
Fixed Roof Tank	1/100 of tank Height with a maximum of 5 inch
Tank with Floating Roof (Internally or Externally)	1/200 of tank height with a maximum of 5 inch

Code Reference

API 653 Paragraph 10.5.2.1

The maximum out-of-plumbness of the top of the shell relative to the bottom of the shell shall not exceed 1/100 of the total tank height, with a maximum of 5 in. The 1/100 criteria, with a maximum of 5 in., shall also apply to fixed roof columns. For tanks with internal floating roofs, apply the criteria of this section or API 650, Appendix H, whichever is more stringent.

API 650 Annex H.6.1

..... Any defects, projections, obstructions or tank tolerance limits (exceeding those defined in 7.5 of this Standard), which would inhibit proper internal floating roof and seal operation, that are identified by the internal floating roof erector shall be reported to the Purchaser.

API 650 Paragraph 7.5.2 a

The maximum out-of-plumbness of the top of the shell relative to the bottom of the shell shall not exceed 1/200 of the total tank height.

Table 5-5 : Information for Plumbness Survey

Tank Number	MCH-03
Tank Diameter	15000 mm or 49.213 ft.
Tank Height	10000 mm or 32.808 ft.
Minimum Plumbness Survey Station Required	8.00
Actual Plumbness Station (°)	8
Plumbness Circumference Spacing:	5890 mm or 19.326 ft.
Plumbness Survey Carried Out From:	Internal
Number of Shell Course :	4
Floating Roof on Tank:	No
Acceptance Value	100 mm or 3.937 in.

Table 5-6 : Plumbness Readings (mm)

Station (°)	Course - Distance Readings (mm) Relative To Shell To Bottom Weld				
	0	1	2	3	4
0.0	0	4	-1	10	7
45.0	0	8	-1	-3	9
90.0	0	5	4	10	14



Client :	Shell Pakistan Limited			
Job Number :	5010465		Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection			

Station (°)	Course - Distance Readings (mm) Relative To Shell To Bottom Weld				
	0	1	2	3	4
135.0	0	1	-12	-7	-9
180.0	0	-6	-7	-1	-9
225.0	0	1	-1	5	-8
270.0	0	3	3	1	10
315.0	0	12	8	9	3

Note : Course 0 is area near to shell to bottom weld

Table 5-7 : Plumbness Survey Results

Station (°)	Out-of-plumbness of the top of the shell relative to the bottom of the shell (mm)	Result
0.0	7	Within Tolerance
45.0	9	Within Tolerance
90.0	14	Within Tolerance
135.0	-9	Within Tolerance
180.0	-9	Within Tolerance
225.0	-8	Within Tolerance
270.0	10	Within Tolerance
315.0	3	Within Tolerance

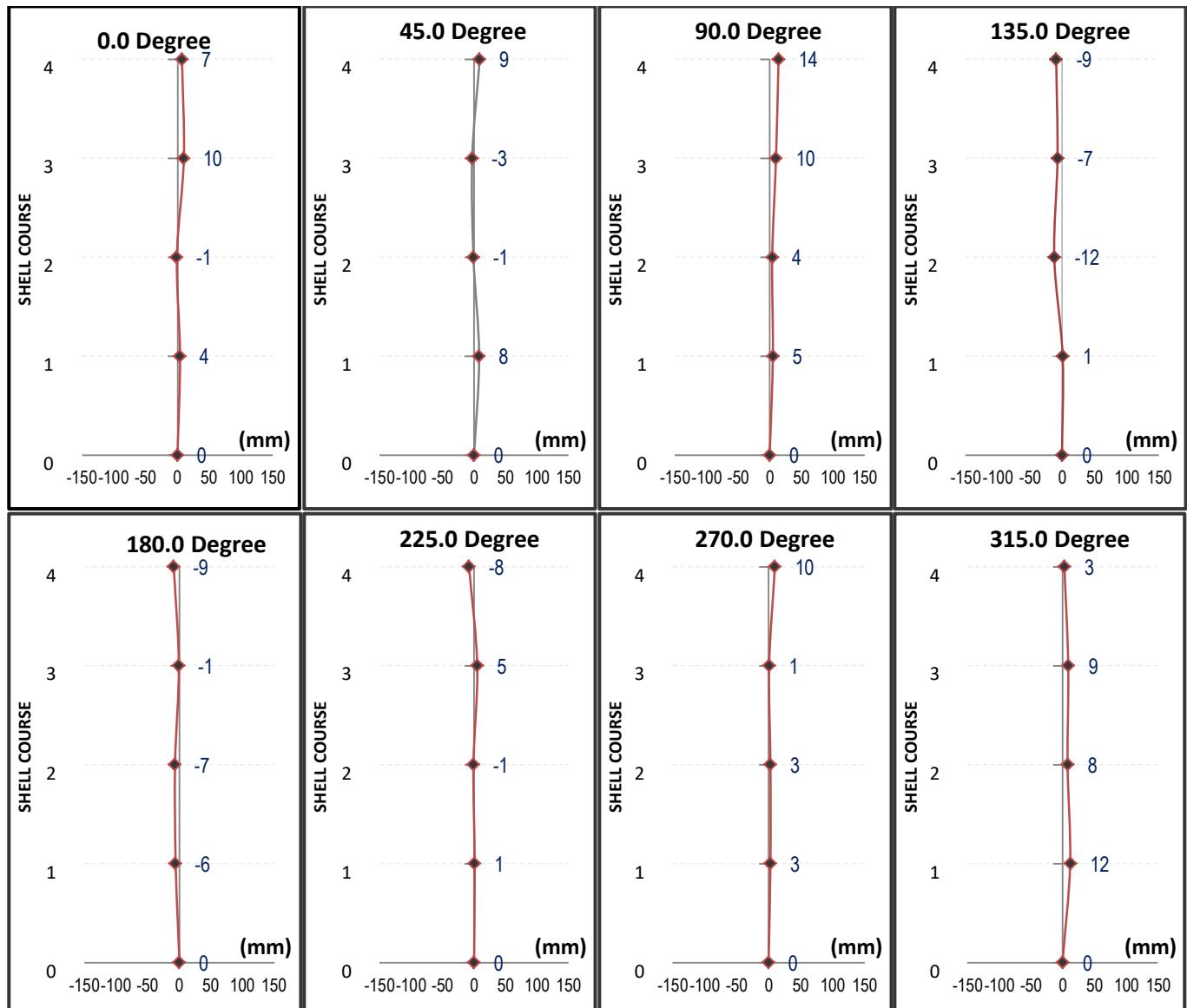


Figure 5-2 : Plumbness Plot

SGS	Client :	Shell Pakistan Limited			
	Job Number :	5010465		Tank Number :	MCH-03
	Type Of Inspection :	Out of Service Inspection			

6 Bottom

6.1. Thickness Measurements on Bottom Plate

Ultrasonic thickness measurements are taken at each plate with 5 readings.

For bottom plates that are welded to the tank shell, ultrasonic thickness readings are taken as near and as possible to tank shell.

The results of Ultrasonic thickness readings are show in Table 6-1 : Thickness Measurements on Bottom Plates (mm)

Table 6-1 : Thickness Measurements on Bottom Plates (mm)

Plate No.	Point 1	Point 2	Point 3	Point 4	Point 5	Min. Reading
A-1	10.23	10.17	10.13	10.19	10.26	10.13
A-2	9.85	9.71	9.96	10.03	10.28	9.71
A-3	9.94	10.06	10.11	10.06	9.93	9.93
A-4	10.12	10.12	10.17	10.05	10.19	10.05
A-5	9.65	9.86	10.04	10.19	10.70	9.65
A-6	10.06	10.00	10.07	9.94	10.14	9.94
A-7	9.72	9.92	10.20	10.09	10.02	9.72
A-8	10.01	10.08	10.19	10.22	10.14	10.01
A-9	9.89	10.04	10.06	10.12	9.92	9.89
A-10	9.69	9.91	10.04	10.07	10.04	9.69
1-1	7.89	7.75	7.63	7.80	7.85	7.63
1-2	8.06	8.26	8.09	7.95	8.10	7.95
1-3	7.56	7.61	7.72	7.50	7.68	7.50
1-4	7.64	7.70	7.68	7.67	7.86	7.64
1-5	7.81	8.01	7.97	7.97	8.01	7.81
2-1	8.00	7.85	8.17	7.90	7.83	7.83
2-2	7.75	7.81	7.72	7.67	7.71	7.67
2-3	7.74	7.74	7.67	7.50	7.48	7.48
3-1	7.63	7.78	7.60	7.65	7.65	7.60
3-2	7.72	7.78	8.01	7.82	7.78	7.72
3-3	7.72	7.66	7.80	7.75	7.74	7.66
4-1	7.59	7.64	7.82	7.72	7.67	7.59
4-2	7.62	7.67	7.72	7.73	7.72	7.62
4-3	7.89	7.88	7.92	7.88	7.78	7.78
5-1	7.55	7.87	7.86	7.76	7.62	7.55
5-2	7.68	7.68	7.72	7.77	7.74	7.68
5-3	7.47	7.59	7.75	7.74	7.74	7.47
5-4	8.10	7.91	8.09	7.97	7.84	7.84
5-5	7.84	8.02	8.01	8.01	7.89	7.84

Ultrasonic Thickness Measurements on Cylinder Shape Drain Sump (mm)

Drain Sump	Side1	Side 2	Side 3	Side 4	Bottom 1	Bottom 2	Bottom 3	Bottom 4	Center	Minimum Reading
S-1	12.35	13.73	12.29	12.29	11.75	11.79	11.77	11.70	11.75	11.70

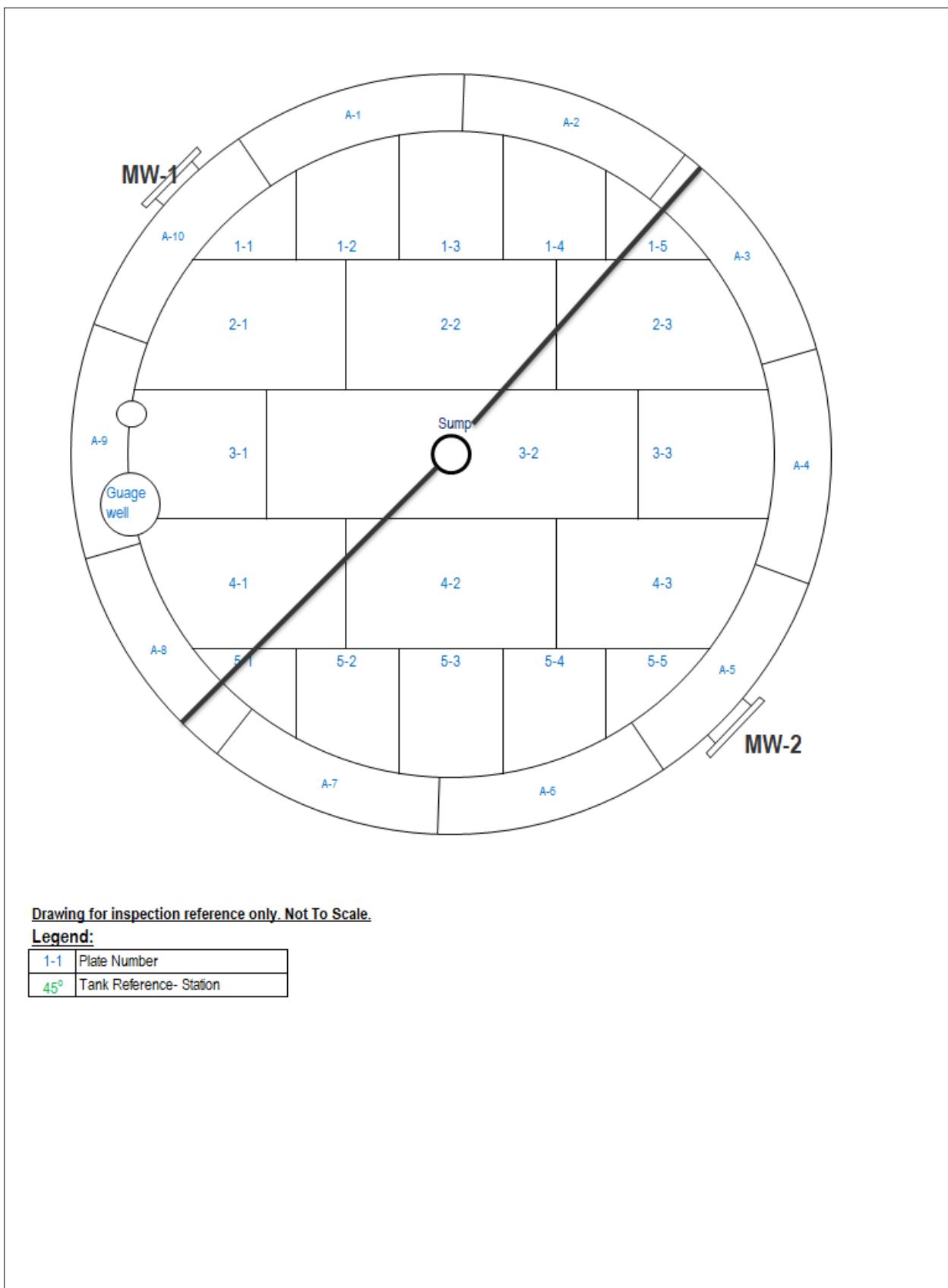


Figure 6-1 : Tank Bottom Layout

SGS	Client :	Shell Pakistan Limited			
	Job Number :	5010465		Tank Number :	
	Type Of Inspection :	Out of Service Inspection			

6.2. Bottom Plates Life Span Calculation

Magnetic Flux Leakage (MFL) scanning is carried out on tank bottom.

MFL method is used for screening to detect underside and topside corrosion.

All areas inaccessible by the MFL scanner will be scanned using the UT A scanning (if accessible).

Code and Reference:

API 653 Section 4.4.5.1:- Minimum Thickness for Tank Bottom Plate

An acceptable method for calculating the minimum acceptable bottom thickness for the entire bottom or portions thereof is as follows:

$$MRT = (\text{Minimum of } RT_{bc} \text{ or } RT_{ip}) - Or (S_t P_r + U P_r)$$

Where,

MRT = minimum remaining thickness at the end of interval Or.

O_r = in-service interval of operation (years to next internal inspection) not to exceed that allowed by 6.4.2.

RT_{bc} = minimum remaining thickness from bottom side corrosion after repairs,

RT_{ip} = minimum remaining thickness from internal corrosion after repairs,

$S_t P_r$ = maximum rate of corrosion not repaired on the top side. $S_t P_r = 0$ for coated areas of the bottom.

$U P_r$ = maximum rate of corrosion on the bottom side.

Bottom Plate Life Span Calculation:

API 653 Section 4.4.5.3 If the minimum bottom thicknesses, at the end of the in-service period of operation, is calculated to be less than the minimum bottom renewal thicknesses given in API 653 Table 4.4.

API 653, Table 4.4 – Bottom Plate Minimum Thickness

Minimum Bottom Plate Thickness at Next Inspection	Tank bottom / Foundation Design
0.10 in. (2.54 mm)	Tank bottom/foundation with no means for detection and containment of a bottom leak.
0.05 in (1.27 mm)	Tank bottom/foundation design with means to provide detection and containment of a bottom leak.
0.05 in (1.27 mm)	Applied tank bottom reinforced lining > 0.05 in. thick, in accordance with API 652

Annular Plate Life Span Calculation:

API 653 Section 4.4.6.2 For tanks in service with a product specific gravity less than 1.0, which require annular plates for other than seismic loading considerations, the thickness of the annular plates shall be not less than the thicknesses given in API 653, Table 4.5, plus any specified corrosion allowance. Interpolation is allowed within Table 4.5 based on shell stress determined per Note b of Table 4.5.

API 653 Table 4.5 -Annular Bottom Plate Thicknesses (in.) (Specific Gravity < 1.0)

Plate Thickness ^a of First Shell Course	Stress ^b in First Shell Course (lbf/in. ²)			
	< 24,300	< 27,000	< 29,700	< 32,400
$t \leq 0.75\text{in} (19.05\text{mm})$	0.17	0.2	0.23	0.3
$0.75 < t \leq 1.00\text{in} (25.4\text{mm})$	0.17	0.22	0.31	0.38
$1.00 < t \leq 1.25\text{in} (31.75\text{mm})$	0.17	0.26	0.38	0.48
$1.25 < t \leq 1.50\text{in} (38.1\text{mm})$	0.22	0.34	0.47	0.59

a. Plate thickness refers to the tank shell as constructed.

b. Stresses are calculated from $[2.34D(H-1)]/t$.

API 653, Section 4.4.6.3: For tanks in service with a product specific gravity of 1.0 or greater, which require annular plates for other than seismic loading considerations, the thickness of the annular plates shall be in accordance with API 650, Table 5-1, plus any specified corrosion allowance.



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

API 650, Table 5-1b - (USC) Annular Bottom Plate Thickness (t_b)				
Plate Thickness ^a of First Shell Course	Stress ^b in First Shell Course (lbf/in. ²)			
	$\leq 27,000$	$\leq 30,000$	$\leq 32,000$	$\leq 36,000$
$t \leq 0.75\text{in} (19.05\text{mm})$	0.236	0.236	9/32	11/32
$0.75 < t \leq 1.00\text{in} (25.4\text{mm})$	0.236	9/32	3/8	7/16
$1.00 < t \leq 1.25\text{in} (31.75\text{mm})$	0.236	11/32	15/32	9/16
$1.25 < t \leq 1.50\text{in} (38.1\text{mm})$	5/16	7/16	9/16	11/16
$1.50 < t \leq 1.75\text{in}$	11/32	1/2	5/8	3/4
Product Stress = $((t_d - CA)/corroded\ t) (S_d)$				
Hydrostatic Test Stress = $(t_t /nominal\ t) (S_t)$				

Lifespan Calculation of Plate at Critical Zone:

API 653 Section 4.4.5.4 Unless a stress analysis is performed, the minimum bottom plate thickness in the critical zone of the tank bottom defined in 9.10.1.2 shall be the smaller of one-half the original bottom plate thickness (not including the original corrosion allowance) or 50 % of t_{min} of the lower shell course per 4.3.3.1 but not less than 0.1 in. Isolated pitting will not appreciably affect the strength of the plate.

Bottom Plate Lifespan Calculation:

The required information and calculation result is shown in Table 6-2 : General Information for Tank Bottom Lifespan Calculation and Table 6-3 : Lifespan Calculation

Table 6-2 : General Information for Tank Bottom Lifespan Calculation

Tank Number	MCH-03
Tank Diameter	15,000 mm or 49.213 ft
Tank Height	10,000 mm or 32.808 ft
Maximum Filling Height	10,000 mm or 32.808 ft
Year of Commission	1997
Year of Last Inspection	2014
Year of Current Inspection	2021
Year of Last Bottom Plates Change	N/A
Tank bottom have coating?	YES
The expected life of the coating must equal or exceed, O_r	
Tank bottom Have effective cathodic protection?	NO
Tank bottom have reinforced lining > 0.05 in. (1.27mm)?	NO
Tank have detection and containment of bottom leak?	YES
Does the tank bottom require repair?	NO

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

Table 6-3 : Lifespan Calculation of Tank Bottom (Before repair or no repair required)

Lifespan Calculation for Bottom Plates

Bottom Plate Thickness		8.00						
Year In Service (Years)	Nominal Thickness (mm)	RT _{bc} (mm)	Rt _{ip} (mm)	StP _r (mm)	U _{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
24	8.00	7.50	8.00	0.0000	0.0208	1.27	299.04	20.00

Lifespan Calculation for Annular Plates

Annular Plate Thickness	10.00 mm or 0.394 in.
Annular Plate Corrosion Allowance	0.00 mm or 0.000 in.
As Built First Shell Course Thickness, t	10.00 mm or 0.394 in.
Shell Plate Corrosion Allowance	0.00 mm or 0.000 in.
Product Specific Gravity, G	0.870
Material of First Shell Course	Unknown
If G<1, Stress in First Shell Course,[2.34D(H - 1)]/t	9,304 lbf/in. ²

Year-In Service (Years)	Nominal Thickness (mm)	RT _{bc} (mm)	Rt _{ip} (mm)	StP _r (mm)	U _{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
24	10.00	9.65	10.00	0.0000	0.0146	4.32	365.62	20.00

Lifespan calculation for plates at Critical Zone

Nominal Thickness of plate under critical zone.	10.00 mm or 0.394
One-half of original Plate Thickness under critical zone	5.00 mm or 0.197
Material of Lower Shell Course	Unknown
Shell Plate Joint Efficiency, E	1.00
Product Specific Gravity, G	0.87
Product Stress, S	23600 lbf/in. ²
Tmin of the Lower Shell Course per API 653,4.3.3.1	3.81 mm or 0.150
50% of Tmin of the Lower Shell Course per API 653,4.3.3.1	1.91 mm or 0.075

Year-In Service (Years)	Nominal Thickness (mm)	RT _{bc} (mm)	Rt _{ip} (mm)	StP _r (mm)	U _{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
24	10.00	9.55	10.00	0.0000	0.0188	4.32	279.04	20.00

Conclusion :

- a) Life span of bottom plates is calculated to be 299.04 years, recommend to perform tank bottom inspection before next inspection interval which is 20 years from current inspection year.
- b) Life span of annular plates is calculated to be 365.62 years, recommend to perform tank bottom inspection before next inspection interval which is 20 years from current inspection year.
- c) Life span of plate in critical zone is calculated to be 279.04 years, recommend to perform tank bottom inspection before next inspection interval which is 20 years from current inspection year.

	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

6.3. Bottom Projection Plate

Ultrasonic Thickness Measurements are taken at a maximum 1.309 meters interval apart around tank circumference.

API 653 Sections 4.4.5.7

The thickness of the projection of the bottom plate beyond the shell as measured at the toe of the outside bottom-to-shell fillet weld shall not be less than 0.1 in (2.54mm). The projection of the bottom plate beyond the outside toe of the shell-to-bottom weld shell shall be at least 3/8 in (9.53mm).

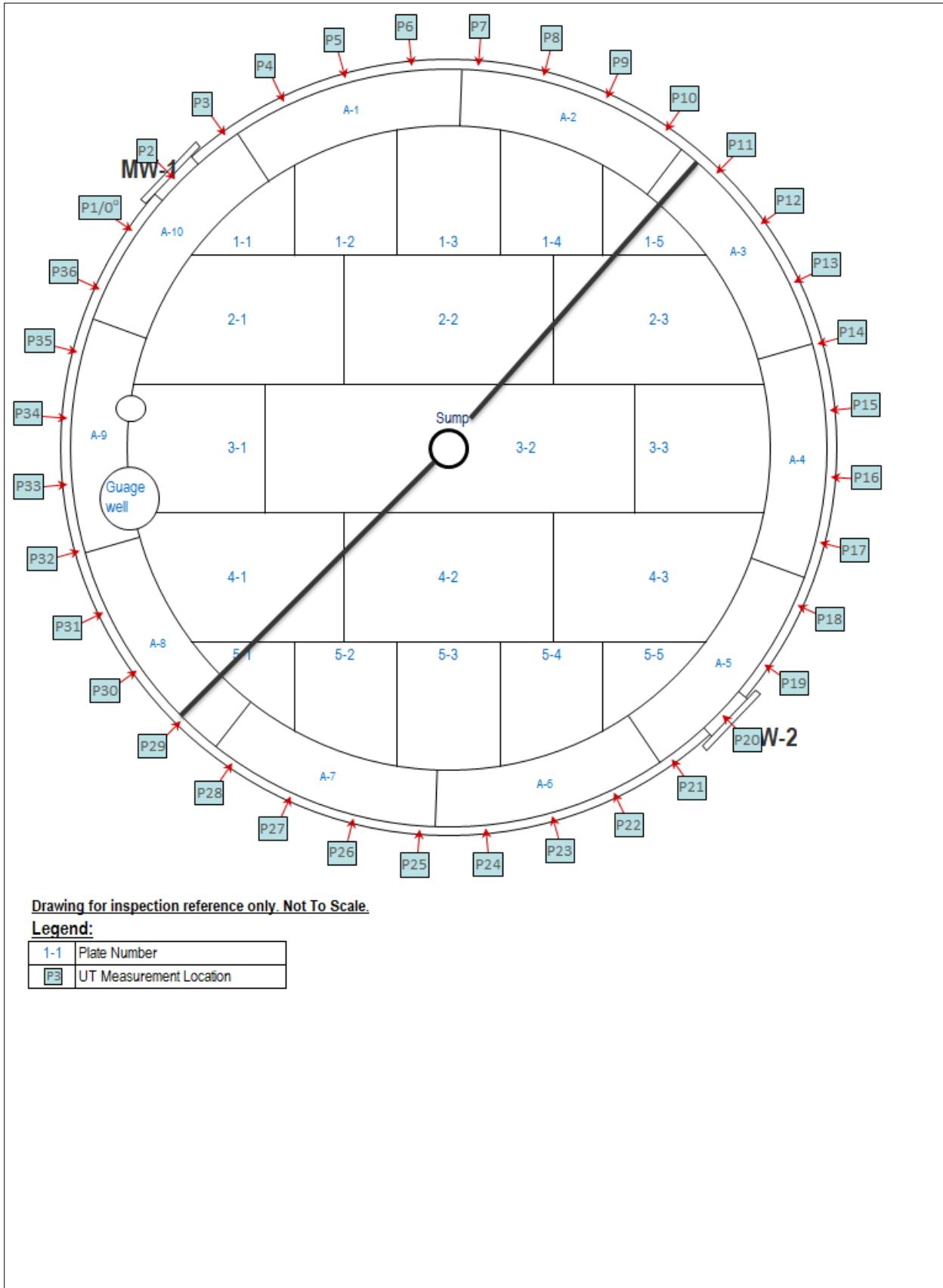
Table 6-4 : Thickness Measurement on Bottom Projection Plates (mm)

UT Location	1	2	3	4	5	6	7	8	9	10
Readings(mm)	10.12	10.16	10.10	10.01	10.78	9.99	9.97	9.93	9.94	10.14
UT Location	11	12	13	14	15	16	17	18	19	20
Readings(mm)	10.23	10.25	10.05	10.10	10.13	10.18	10.20	10.22	9.83	9.86
UT Location	21	22	23	24	25	26	27	28	29	30
Readings(mm)	10.17	10.17	9.72	9.76	9.81	9.79	9.81	9.90	9.89	9.86
UT Location	31	32	33	34	35	36	-	-	-	-
Readings(mm)	10.29	10.28	10.32	10.32	10.36	10.34	-	-	-	-

Note: First Ultrasonic Thickness location is at 0° degree of the tank reference

Conclusion:

The Lowest reading found on bottom projection plate is 9.72 mm, therefore, the thickness on bottom projection plate is within API 653 tolerance.



6-2 : Bottom Projection Plate Layout

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

6.4. Magnetic Particle Inspection Report

Attached MPI Report

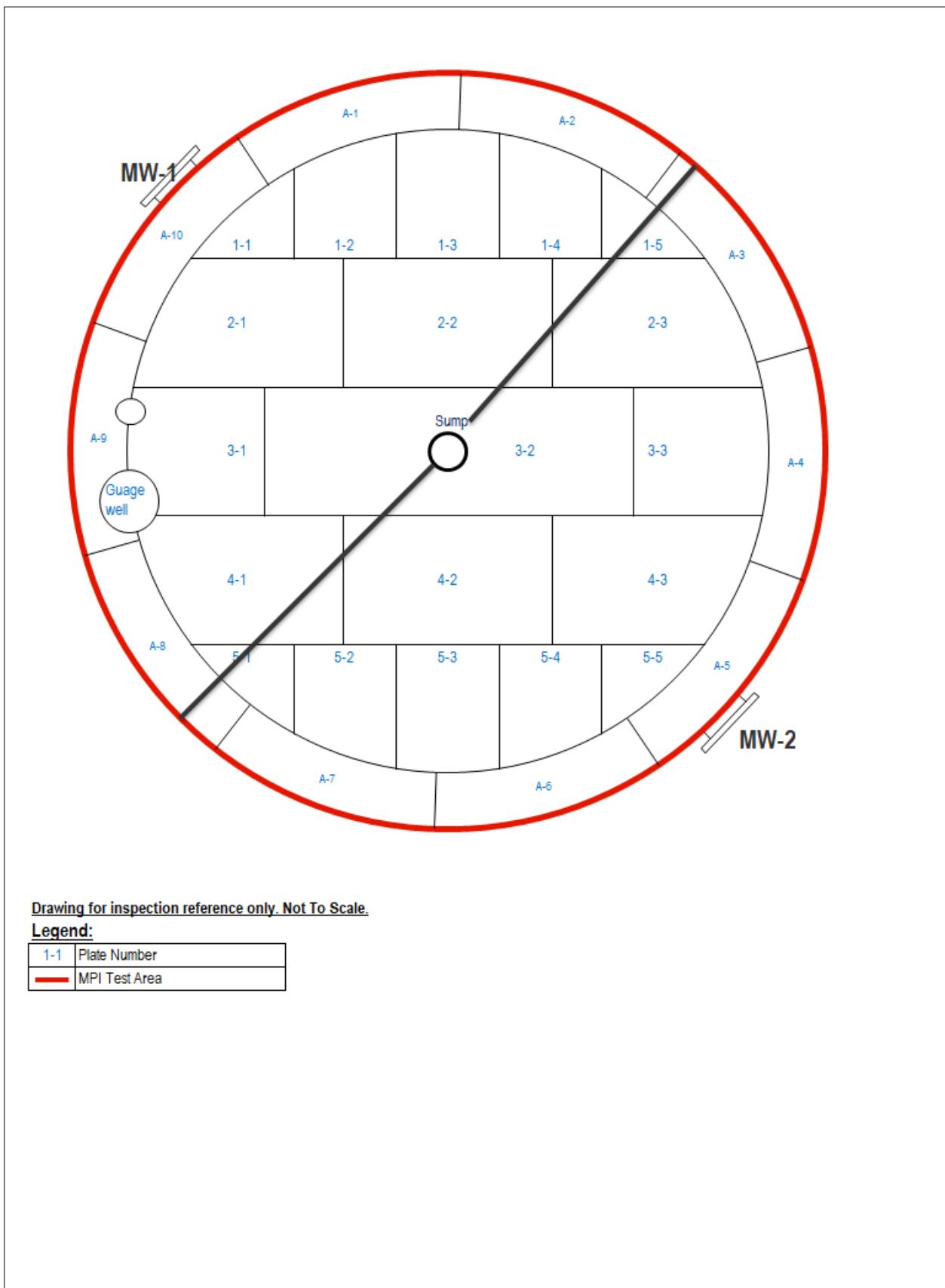


Figure 6-3 : Magnetic Particle Inspection Area Layout



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-03
Type Of Inspection :	Out of Service Inspection		

6.5. UT A scanning Report (Bottom Scanning on Area not scan by MFL)

PART/JOB DETAIL DESCRIPTION					
SGS Job No.	5010465	Part / Object	MCH-03	Calibration Block	Step Wedge
Client	Shell Pakistan Limited	Material	Carbon Steel	Reference Block	-----
Project	Out of Service Inspection of MCH-03	Drawing No.	N/A	Wall Thickness	10mm
Location	Machike Terminal	Scanning Technique	Pulse Echo	Couplant	Water
Examination Code	ASME Sec V	Over Lap	10%	Surface Condition	Painted
Acceptance Code	API 653	Procedure No	IND-QMS-TP-34	Scanning Surface	Surface
EQUIPMENT & ACCESSORIES DESCRIPTION					
Equipment Make / Model	USM 35	Equipment S/N	13863a	Cable Type	MPKLL2
SENSITIVITY LEVEL					
Probe Sr #	Frequency	Wave Type	Wave Angle	Sensitivity Reference	PRE (dB)
MSEB4(57462)	4 MHz	Longitudinal	0°	Backwall Echo	53
					58
EXAMINATION RESULTS					
S#	Location ID (Grid #)	Thickness (mm)	A-scan Ref No.	Echo amplitude w.r.t. reference level (dB)	Remarks
1	Annular Plate-01	10.09	--	--	No significant metal loss observed
2	Annular Plate-02	9.75	--	--	No significant metal loss observed
3	Annular Plate-03	9.90	--	--	No significant metal loss observed
4	Annular Plate-04	10.01	--	--	No significant metal loss observed
5	Annular Plate-05	9.62	--	--	No significant metal loss observed
EXAMINATION RESULTS					
S#	Location ID (Grid #)	Thickness (mm)	A-scan Ref No.	Echo amplitude w.r.t. reference level (dB)	Remarks
6	Annular Plate-06	9.96	--	--	No significant metal loss observed
7	Annular Plate-07	9.65	--	--	No significant metal loss observed

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :		Out of Service Inspection	

8	Annular Plate-08	9.98	--	--	No significant metal loss observed
9	Annular Plate-09	9.89	--	--	No significant metal loss observed
10	Annular Plate-10	9.69	--	--	No significant metal loss observed
11	Piping area	7.80	--	--	No significant metal loss observed

Remarks : (If any)

Particulars	Inspected By	Reviewed By
Name	Ali Uzair	Sajjad Hussain
Qualification/Designation	UT Level II / Inspection Engineer	UT Level II / Sr.Inspection Engineer
Signature		
Date:	21-01-2021	21-01-2021

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :		Out of Service Inspection	

Attachment 1 : Tank Floor Scanning, Magnetic Flux Leakage Report



(MFL)MAGNETIC FLUX LEAKGE

REPORT



Tank Inspection Report

Client: Shell Pakistan Limited

Location: Machike Terminal

Tank ID: MCH-03

Inspection Date: 1/21/2021



Tank Floor Layout Showing Top and Bottom Discontinuities

Tank MCH-03

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15002 mm

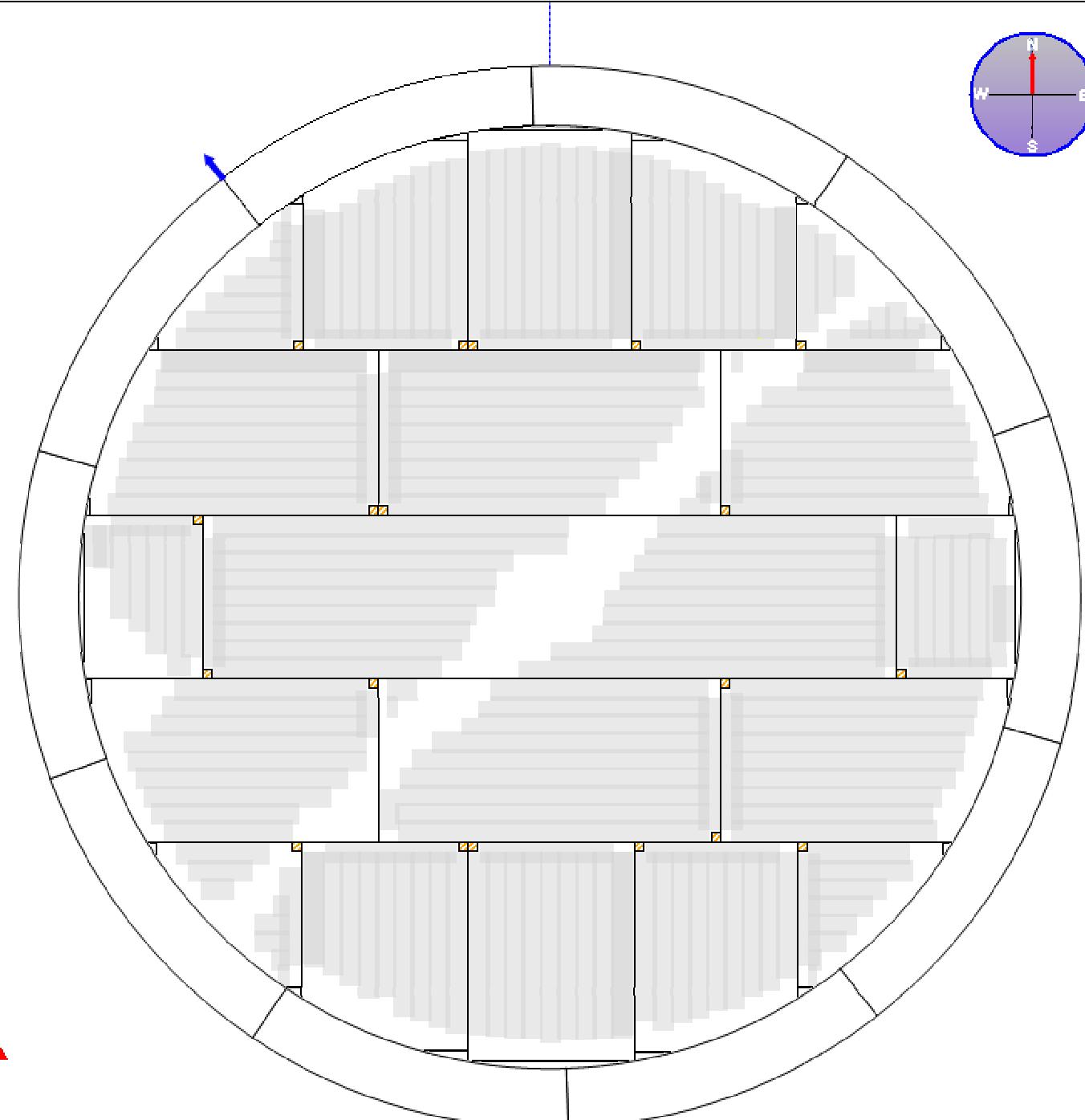
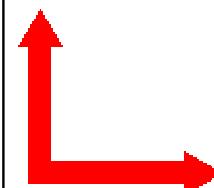
Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting

Discontinuity Colour Scheme

20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	





Maximum Discontinuity Per Track

Tank MCH-03

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15002 mm

Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting

Discontinuity Colour Scheme

20% - 29%



30% - 39%



40% - 49%



50% - 59%



60% - 69%



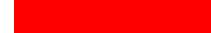
70% - 79%



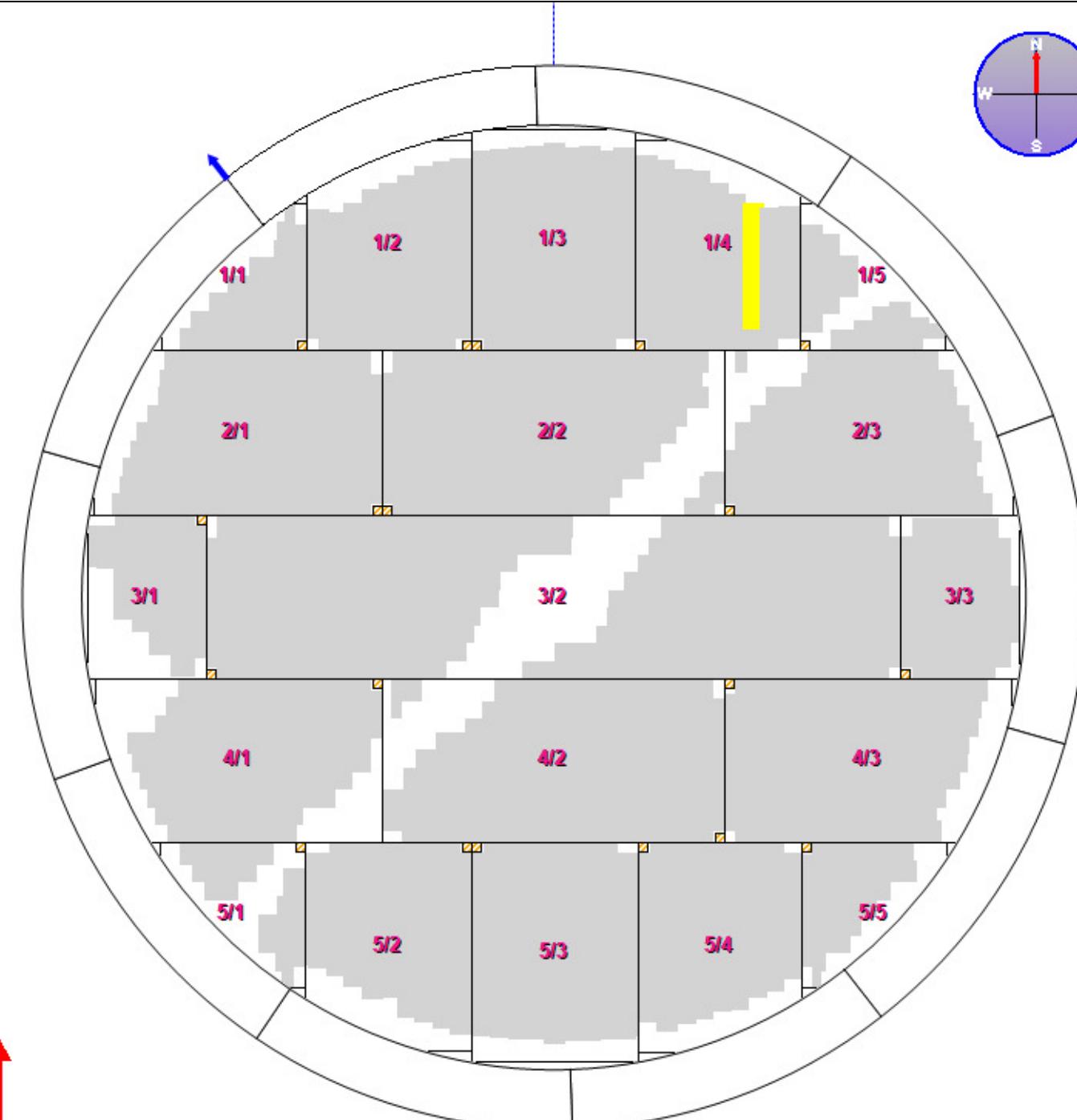
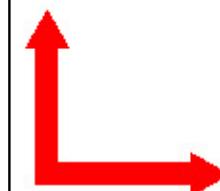
80% - 89%



90% - 100%



Weld Discontinuity





Tank Floor Numbering System

Tank MCH-03

Location Machike Terminal

Client Shell Pakistan Limited

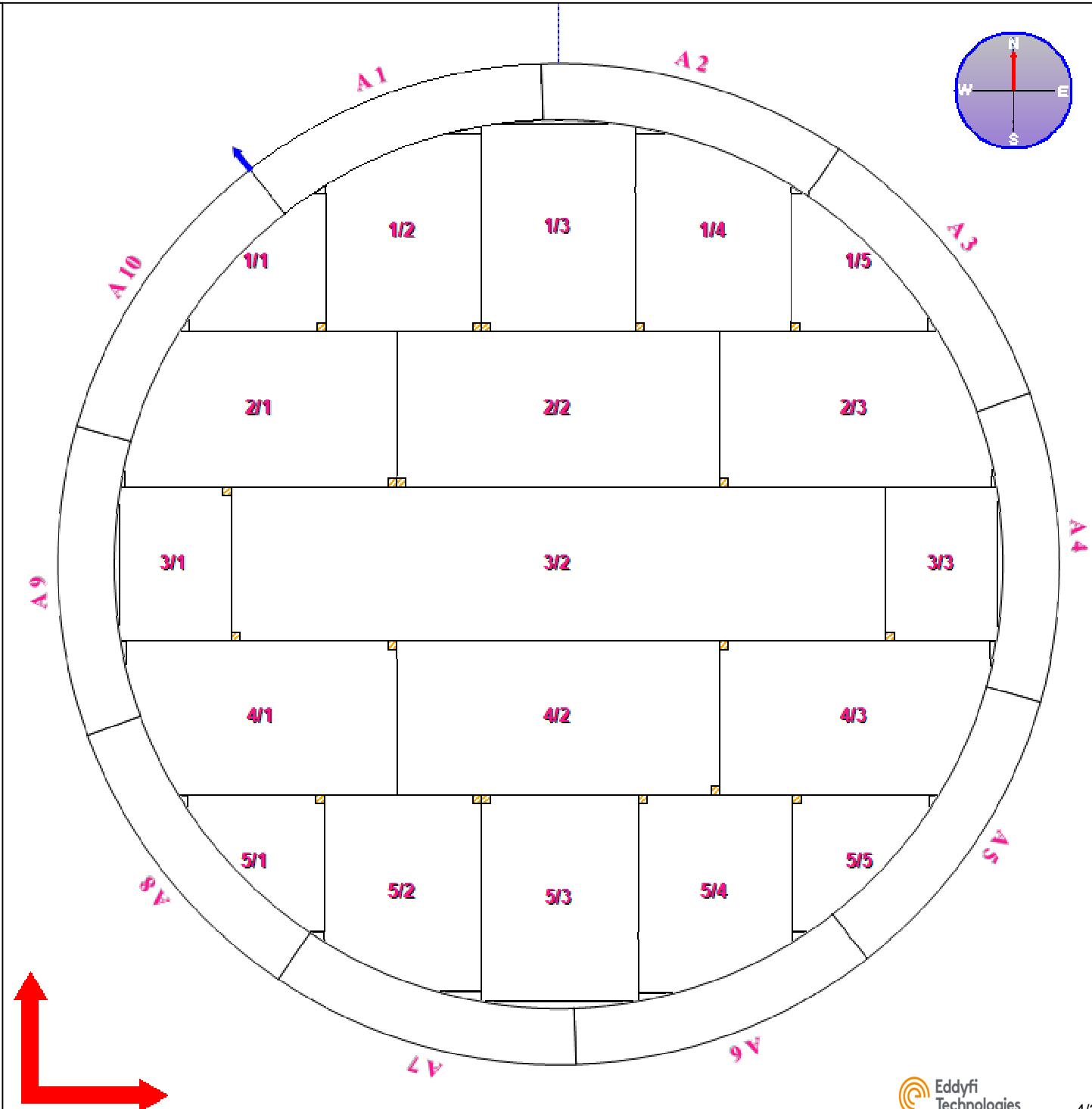
Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15002 mm

Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting





Tank Floor Layout With Symbols

Tank MCH-03

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

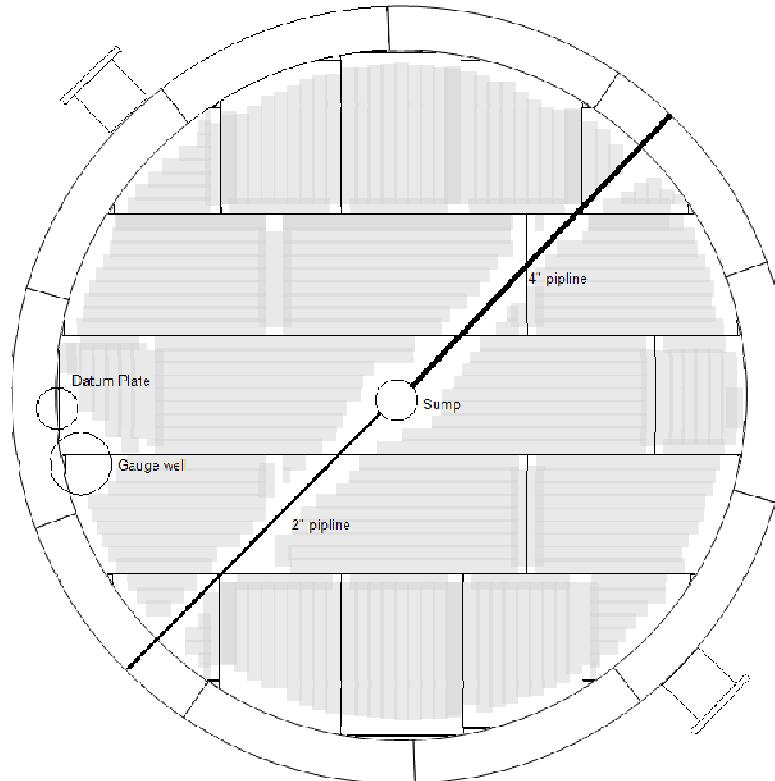
Outer Tank Diameter 15002 mm

Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement Setting 10

UT A scanning performed on entire Annular plates due to Limitation of MFL 3D scanner





Identify Top and Bottom Discontinuities

Tank MCH-03

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15002 mm

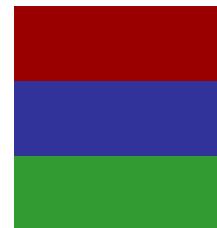
Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting

Identify Top/Bottom Colour Scheme

Top



Bottom

Both

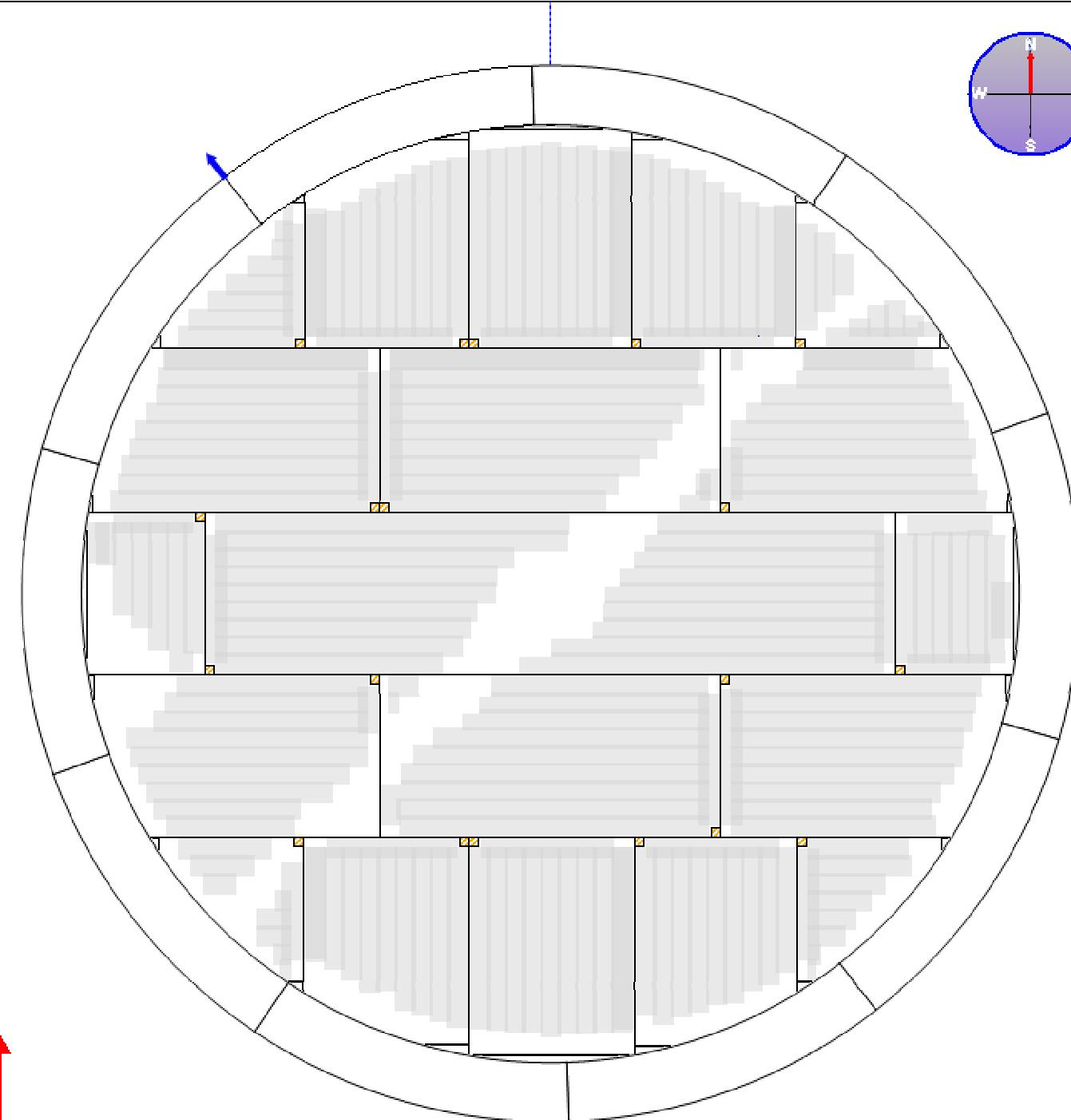
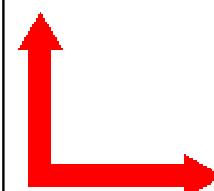
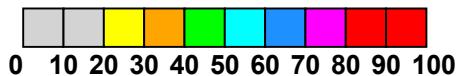


Plate summary

Tank: MCH-03

Date: 1/21/2021



Discontinuities found on all plates (ignoring thresholds)

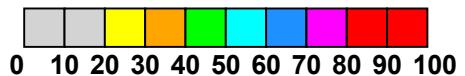
Row	Plate	Minimum discontinuity %	Maximum discontinuity %	Severity
1	1	N/A	N/A	
1	2	N/A	N/A	
1	3	N/A	N/A	
1	4	20	20	
1	5	N/A	N/A	
2	1	N/A	N/A	
2	2	N/A	N/A	
2	3	N/A	N/A	
3	1	N/A	N/A	
3	2	N/A	N/A	
3	3	N/A	N/A	
4	1	N/A	N/A	
4	2	N/A	N/A	
4	3	N/A	N/A	
5	1	N/A	N/A	
5	2	N/A	N/A	
5	3	N/A	N/A	
5	4	N/A	N/A	
5	5	N/A	N/A	

Total number Of plates for Tank MCH-03 = 19

Annular plate summary

Tank: MCH-03

Date: 1/21/2021



Discontinuities found on all annular plates (ignoring thresholds)

Annular number	Minimum discontinuity %	Maximum discontinuity %	Severity
----------------	-------------------------	-------------------------	----------

Patch plate summary

Tank: MCH-03

Date: 1/21/2021



All X and Y coordinates are taken perpendicular from the TOP-LEFT corner of the patch plate concerned. See each plate illustration for further details

METRIC (mm), Height and Width are rounded up to nearest 10 mm

Row	Plate	Plate Ref.	Patch ID	X	Y	Height	Width	Rot (deg)	Radius	Type
-----	-------	------------	----------	---	---	--------	-------	-----------	--------	------

Patch plate summary

Tank: MCH-03

Date: 1/21/2021



All X and Y coordinates are taken perpendicular from the TOP-LEFT corner of the patch plate concerned. See each plate illustration for further details

METRIC (mm), Height and Width are rounded up to nearest 10 mm

Annular	Plate Ref.	Patch ID	X	Y	Height	Width	Rot (deg)	Radius	Type
---------	------------	----------	---	---	--------	-------	-----------	--------	------

Total No Of Patches for Tank MCH-03 = 0

Total area of patch material required for Tank MCH-03 = 0 meters squared

Annular 1

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

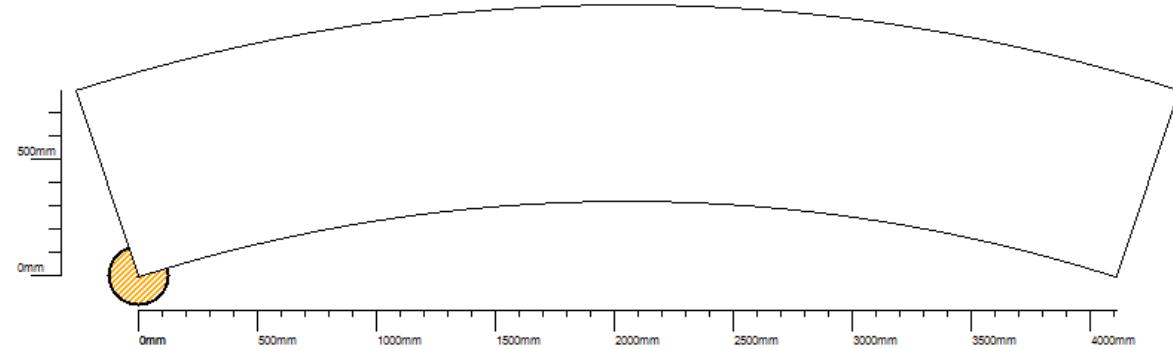
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

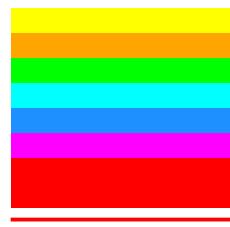
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 2

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

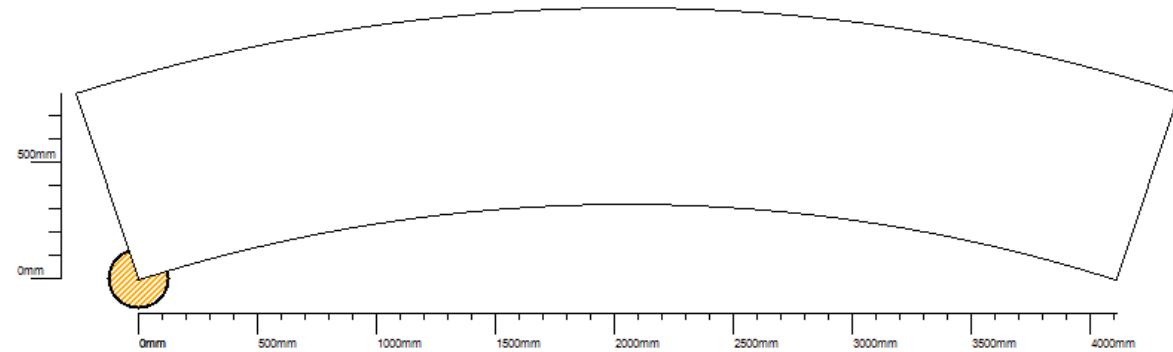
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

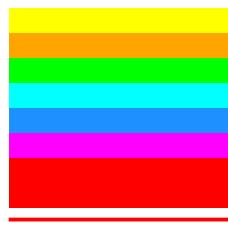
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 3

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

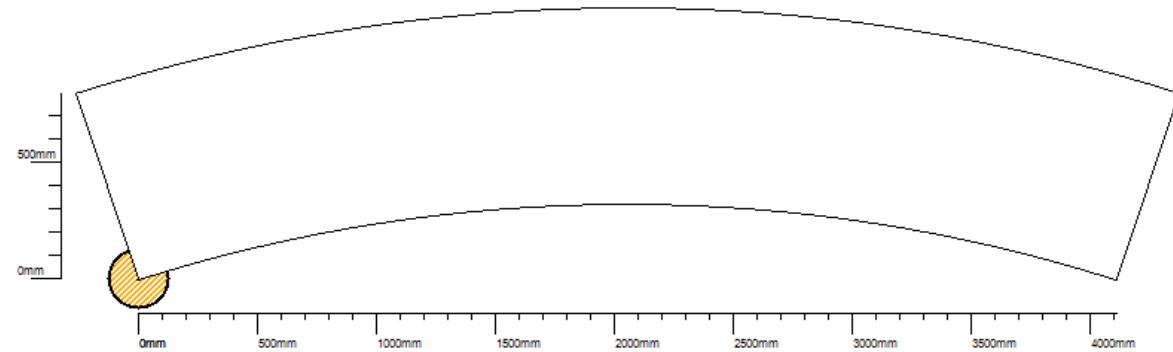
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	



Annular 4

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

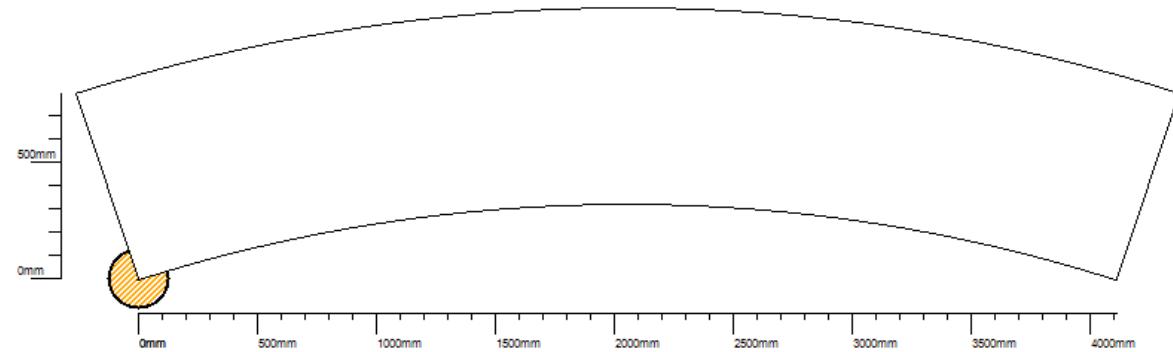
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

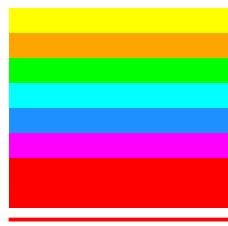
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 5

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

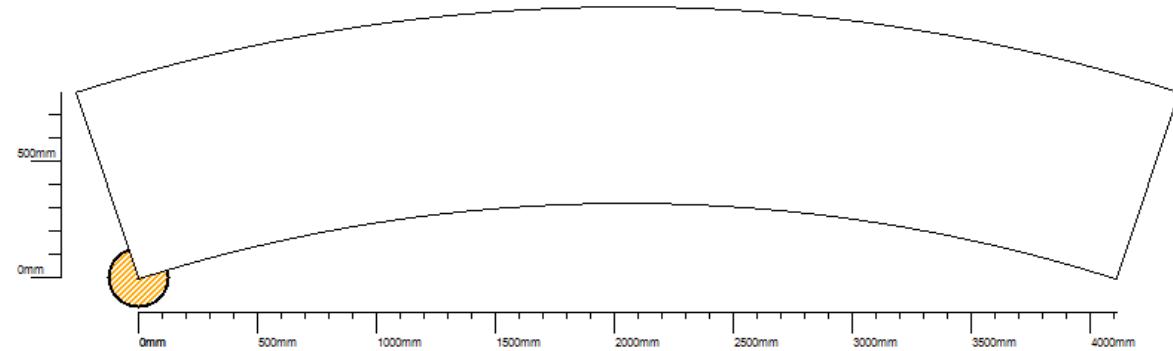
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

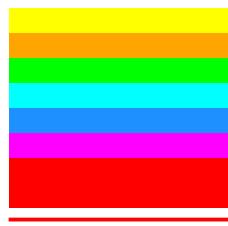
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 6

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

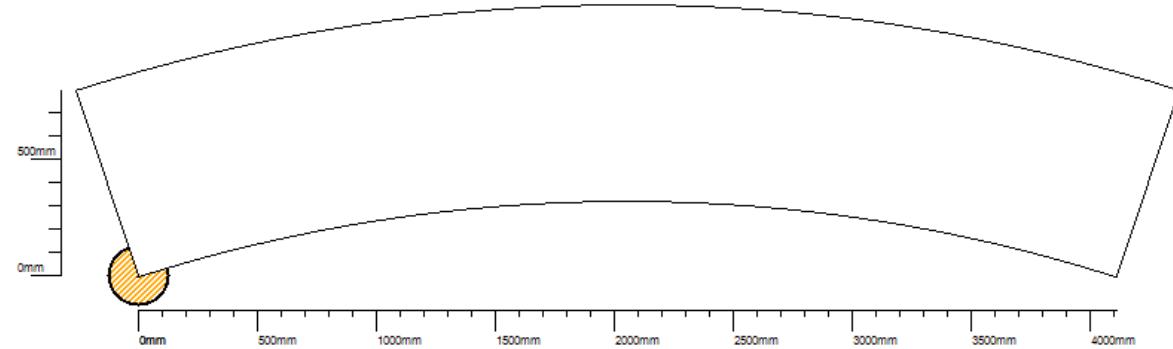
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

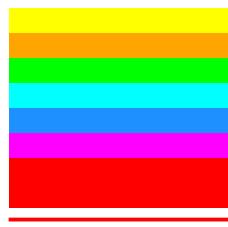
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity



Annular 7

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

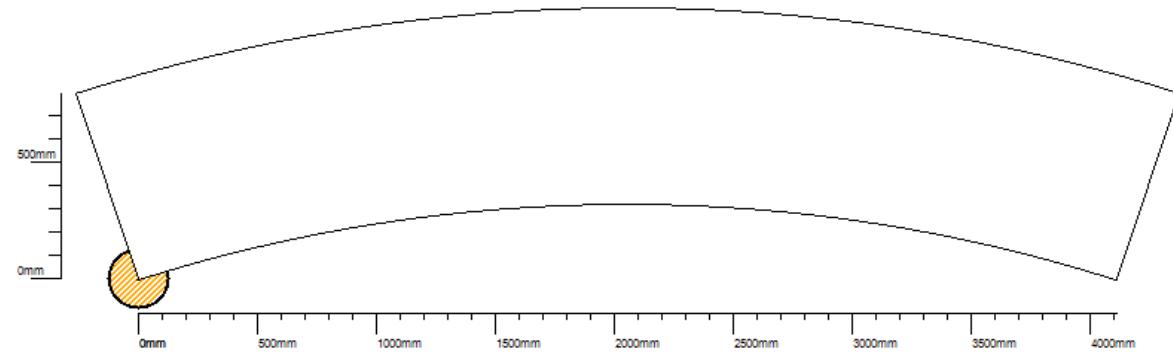
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

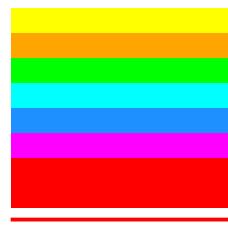
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 8

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

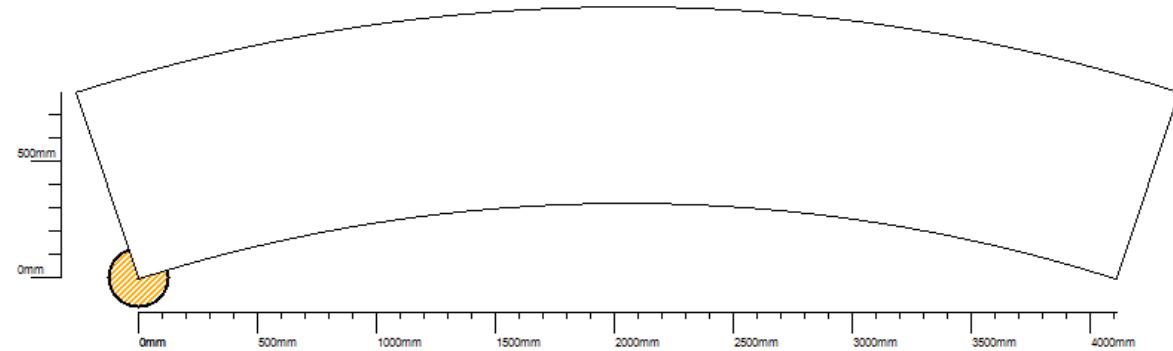
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

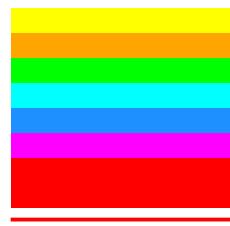
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity



Annular 9

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

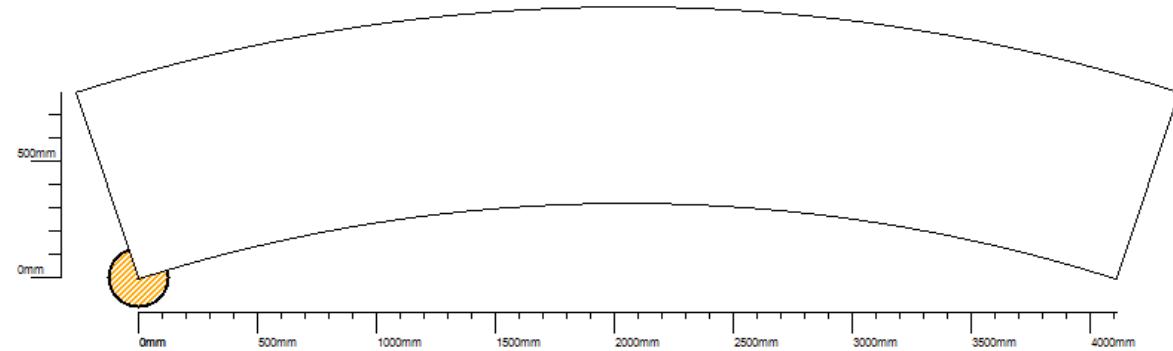
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

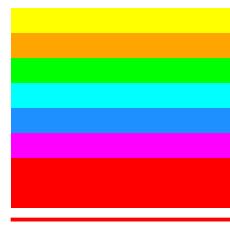
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity



Annular 10

Tank MCH-03

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

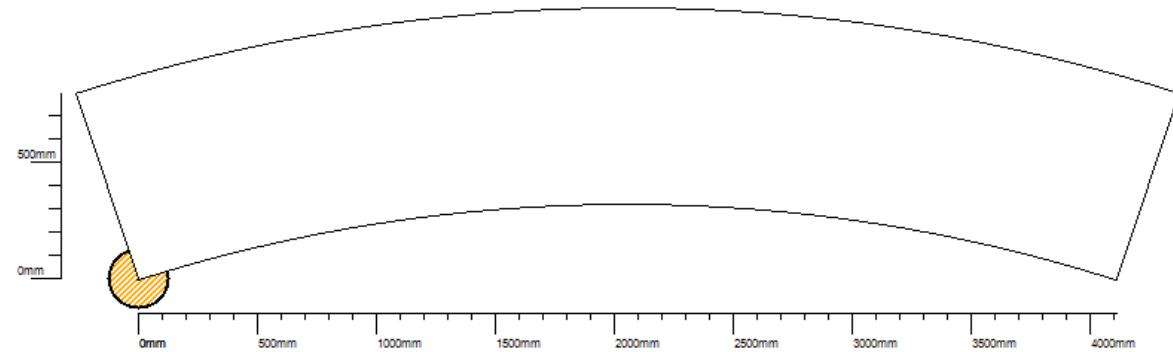
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

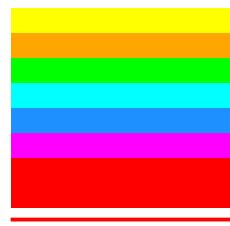
Upper Threshold: 100%

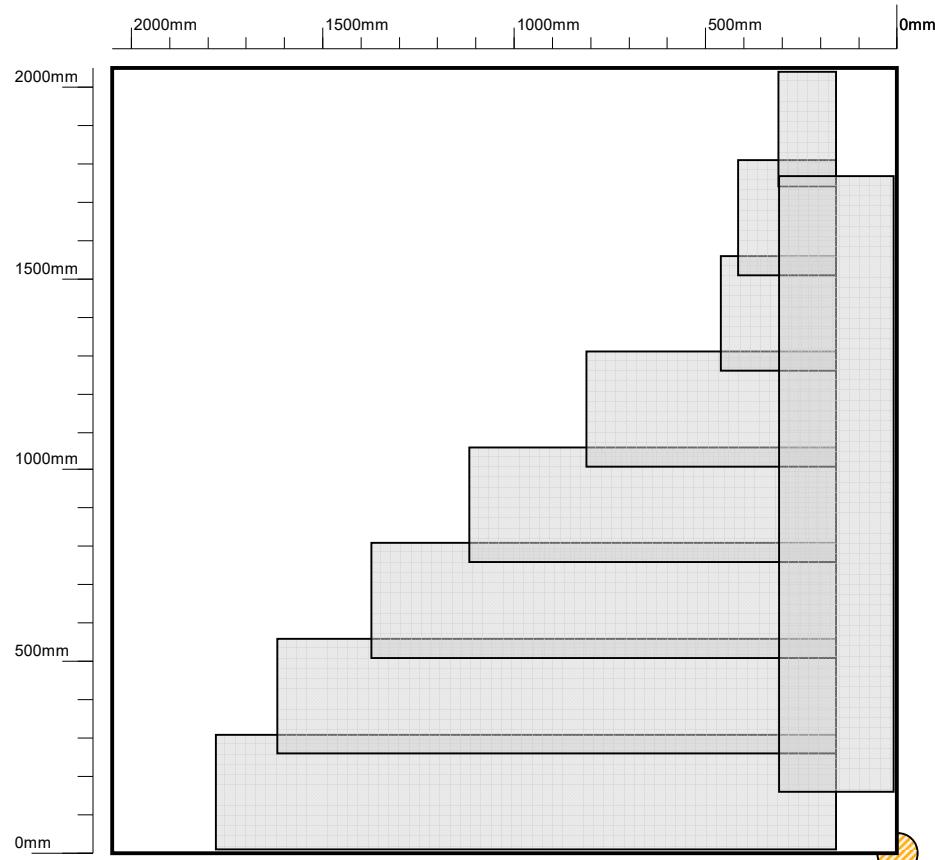
Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





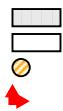
Y-axis
X-axis

 Eddyfi
Technologies

SGS

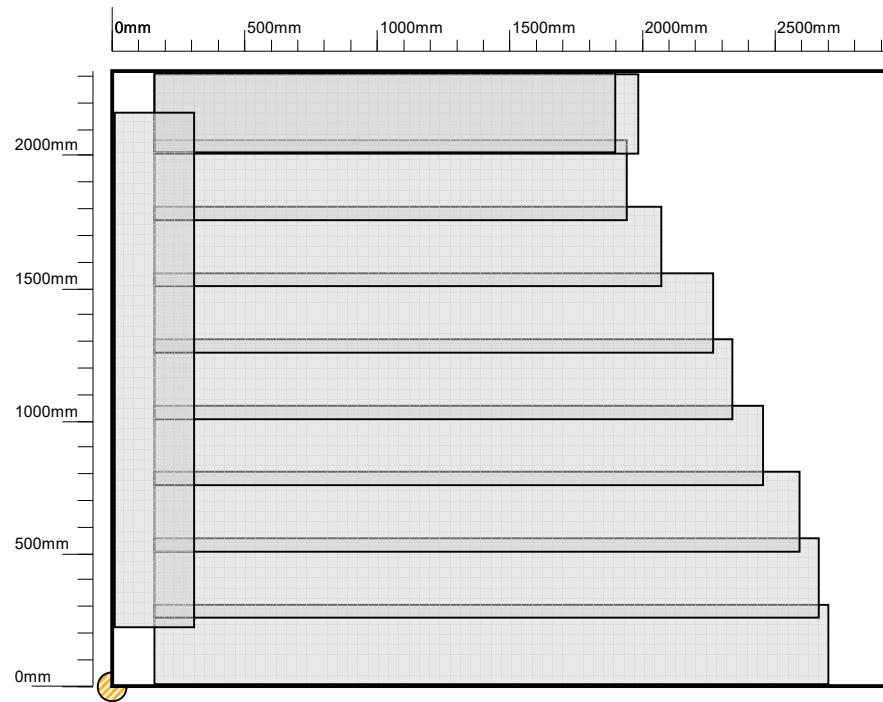
Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



Row:	1	Plate:	1
Plate Length (mm):	2050	Plate Width (mm):	2050
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

Y-axis
 X-axis



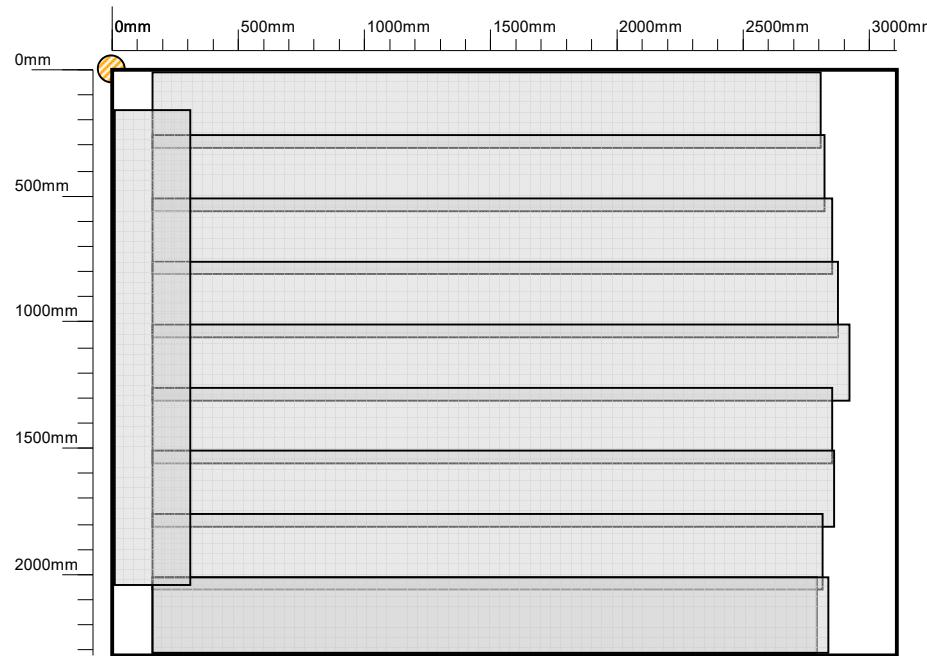
Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

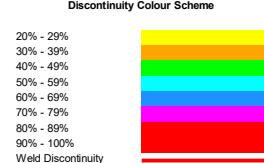
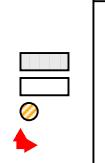
Symbols

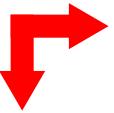


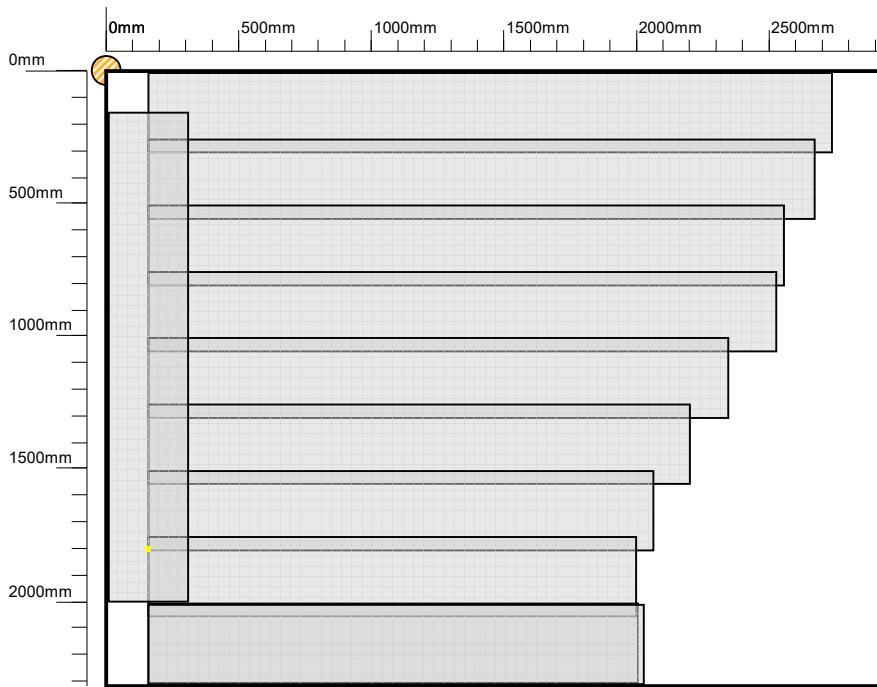
Row:	1	Plate:	2
Plate Length (mm):	2960	Plate Width (mm):	2320
Orientation:	Vertical	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

 Y-axis
 X-axis



		Row: 1 Plate: 3 Plate Length (mm): 3110 Plate Width (mm): 2320 Orientation: Vertical Scan Method: Parallel Max discontinuity: 0 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used	
Discontinuity Colour Scheme 	Symbols 	Tank: MCH-03 Operator: Bakhtiar Date: 1/21/2021 Equipment Serial: 7C00000031C51722 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited	23/39

 Y-axis
 X-axis



SGS

Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

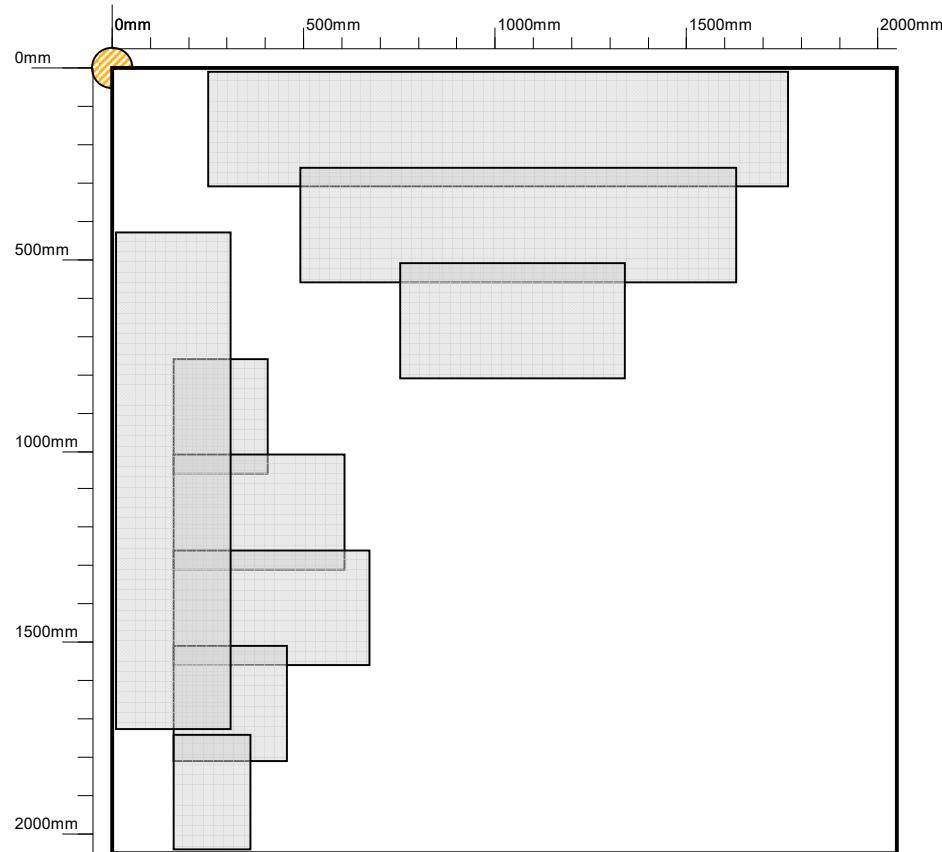
Symbols



Row: 1 **Plate:** 4
Plate Length (mm): 2960 **Plate Width (mm):** 2320
Orientation: Vertical **Scan Method:** Parallel
Max discontinuity: 20 **Showing defects from:** TOP & BOTTOM
Lower Threshold: 20% **Upper Threshold:** 100% (Import Threshold: 20%)
Defect enhancement setting: Not used

Tank: MCH-03 **Operator:** Bakhtiar
Date: 1/21/2021 **Equipment Serial:** 7C00000031C51722
Location: Machike Terminal
Company: SGS Pakistan Pvt Limited
Client: Shell Pakistan Limited

Y-axis
 X-axis

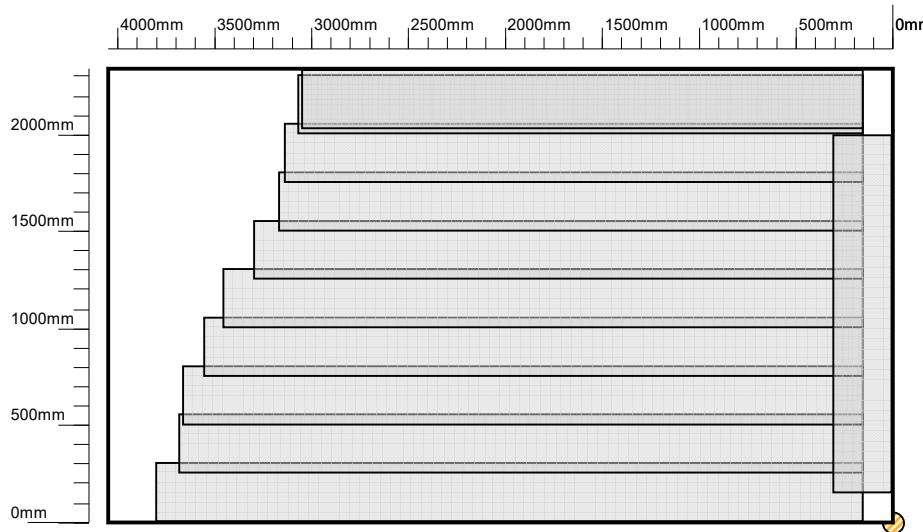


Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



Row:	1	Plate:	5
Plate Length (mm):	2050	Plate Width (mm):	2050
Orientation:	Vertical	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



X-axis
Y-axis

Eddyfi
Technologies

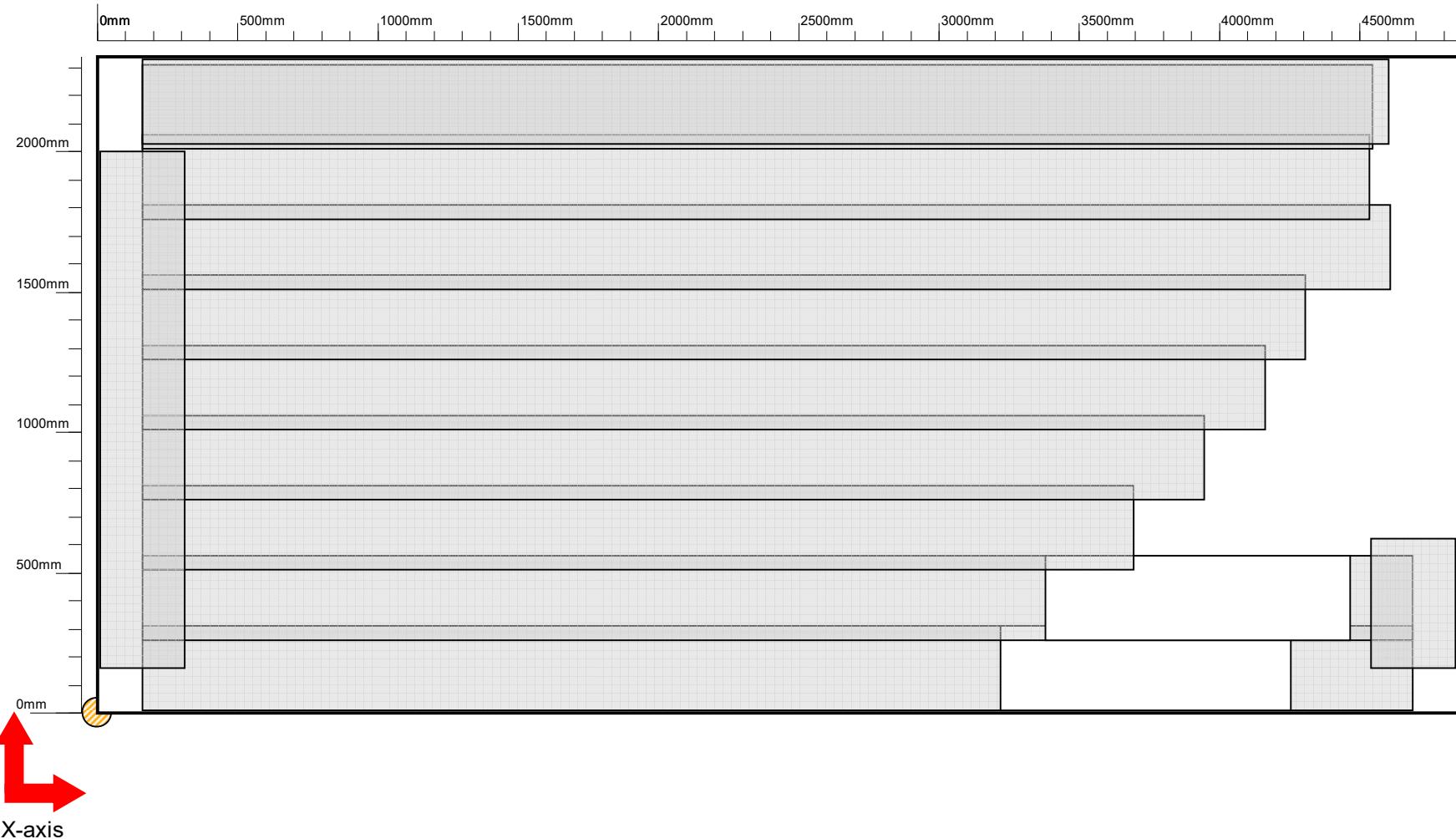


Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



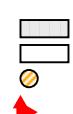
Row:	2	Plate:	1
Plate Length (mm):	4050	Plate Width (mm):	2340
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



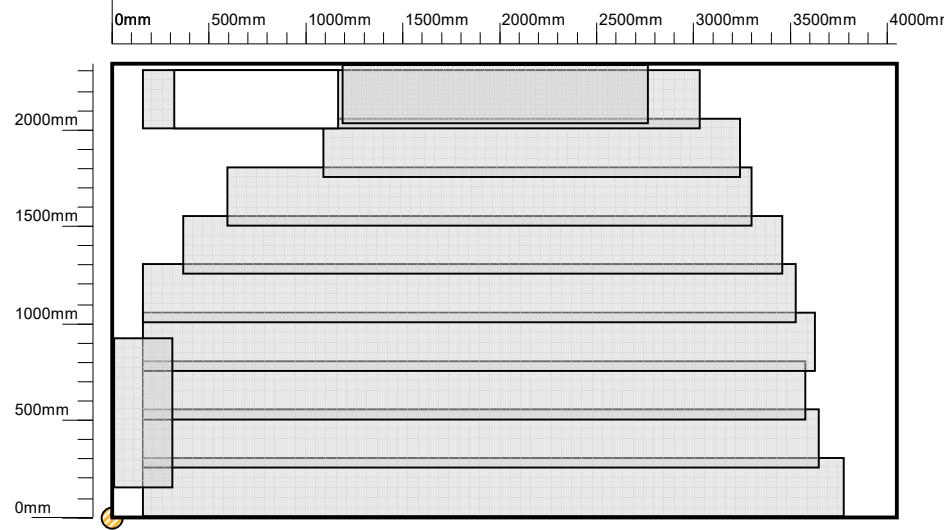
SGS

Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



Row:	2	Plate:	2
Plate Length (mm):	4850	Plate Width (mm):	2340
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



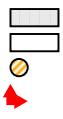
Y-axis
X-axis

 Eddyfi Technologies

SGS

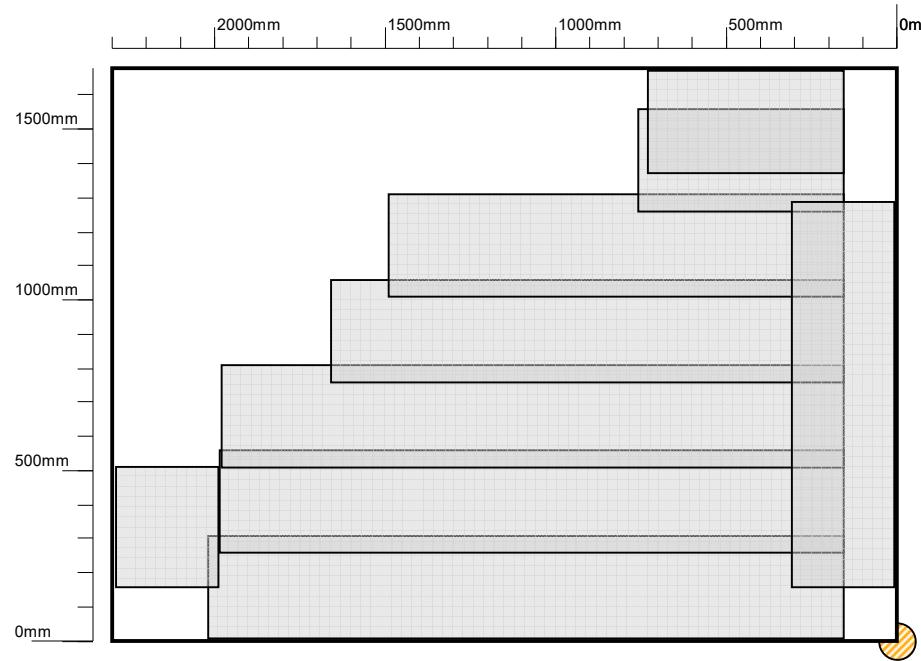
Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



Row:	2	Plate:	3
Plate Length (mm):	4050	Plate Width (mm):	2340
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

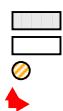
Y-axis
 X-axis



SGS

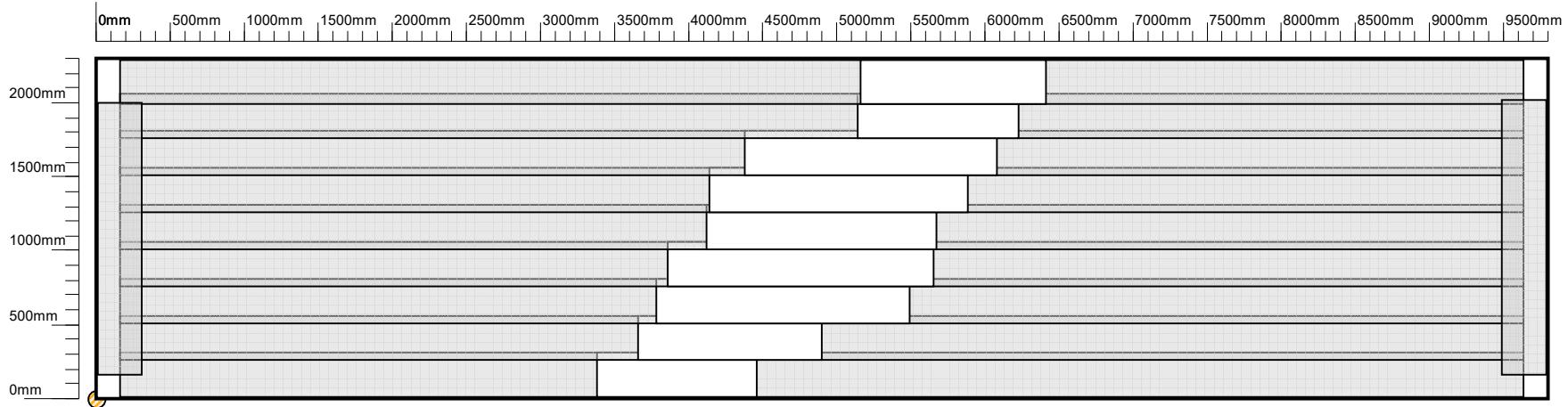
Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



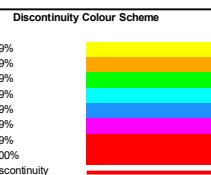
Row: 3 **Plate:** 1
Plate Length (mm): 2300 **Plate Width (mm):** 1680
Orientation: Vertical **Scan Method:** Parallel
Max discontinuity: 0 **Showing defects from:** TOP & BOTTOM
Lower Threshold: 20% **Upper Threshold:** 100% (Import Threshold: 20%)
Defect enhancement setting: Not used

Tank: MCH-03 **Operator:** Bakhtiar
Date: 1/21/2021 **Equipment Serial:** 7C00000031C51722
Location: Machike Terminal
Company: SGS Pakistan Pvt Limited
Client: Shell Pakistan Limited



Y-axis
X-axis

Eddyfi
Technologies



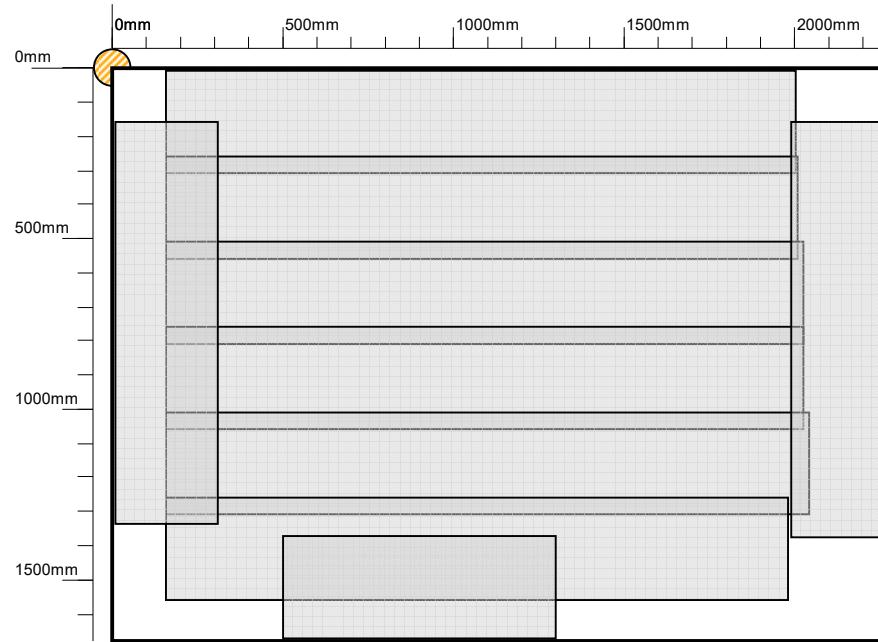
Symbols

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

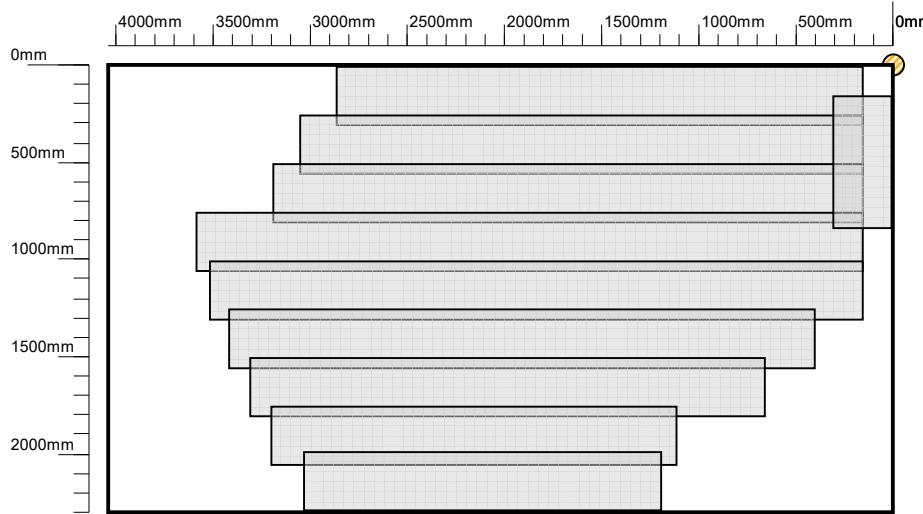


Row:	3	Plate:	2
Plate Length (mm):	9800	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

Y-axis
 X-axis



		Row: 3 Plate: 3 Plate Length (mm): 2300 Plate Width (mm): 1680 Orientation: Vertical Scan Method: Parallel Max discontinuity: 0 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used			
Discontinuity Colour Scheme 	Symbols Track Non-Scanned Area Plate Reference Tank Reference	Tank: MCH-03 Operator: Bakhtiar Date: 1/21/2021 Equipment Serial: 7C00000031C51722 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited			
					31/39



X-axis
Y-axis

Eddyfi Technologies

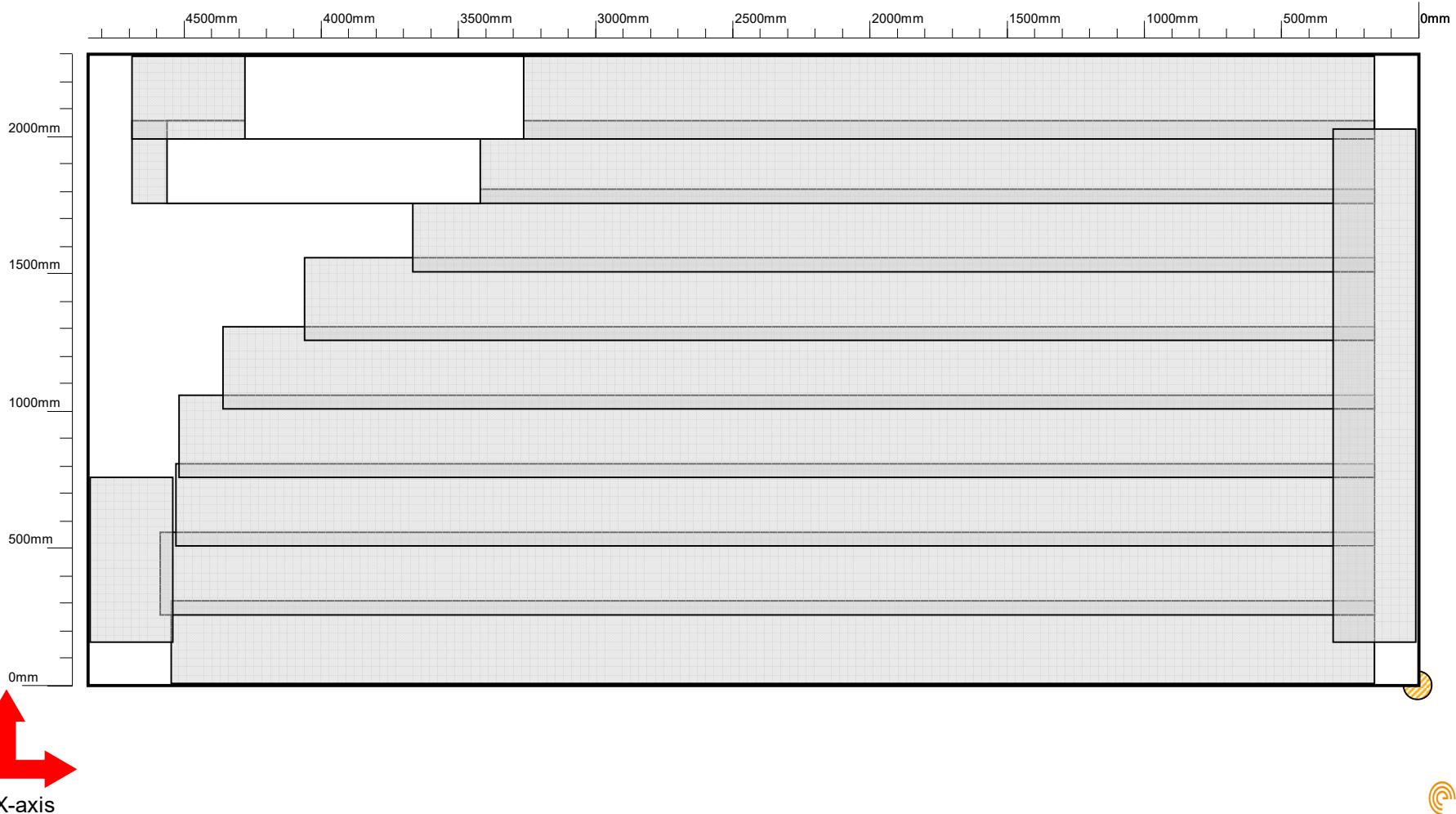


Discontinuity Colour Scheme	
20% - 29%	Yellow
30% - 39%	Orange
40% - 49%	Red
50% - 59%	Green
60% - 69%	Cyan
70% - 79%	Magenta
80% - 89%	Blue
90% - 100%	Black
Weld Discontinuity	White

Symbols



Row:	4	Plate:	1
Plate Length (mm):	4040	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



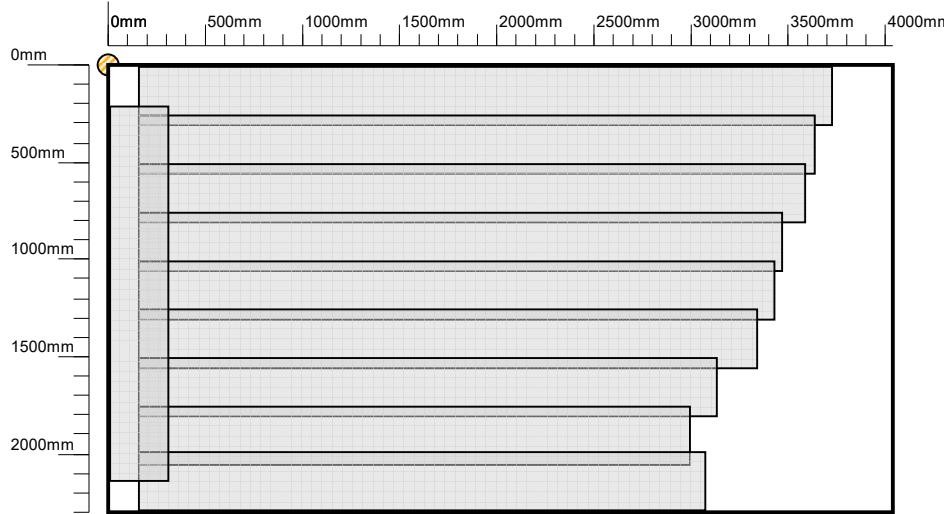
 Eddyfi
Technologies



Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols	
Track	
Non-Scanned Area	
Plate Reference	
Tank Reference	

Row:	4	Plate:	2
Plate Length (mm):	4850	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



X-axis
Y-axis

Eddyfi
Technologies

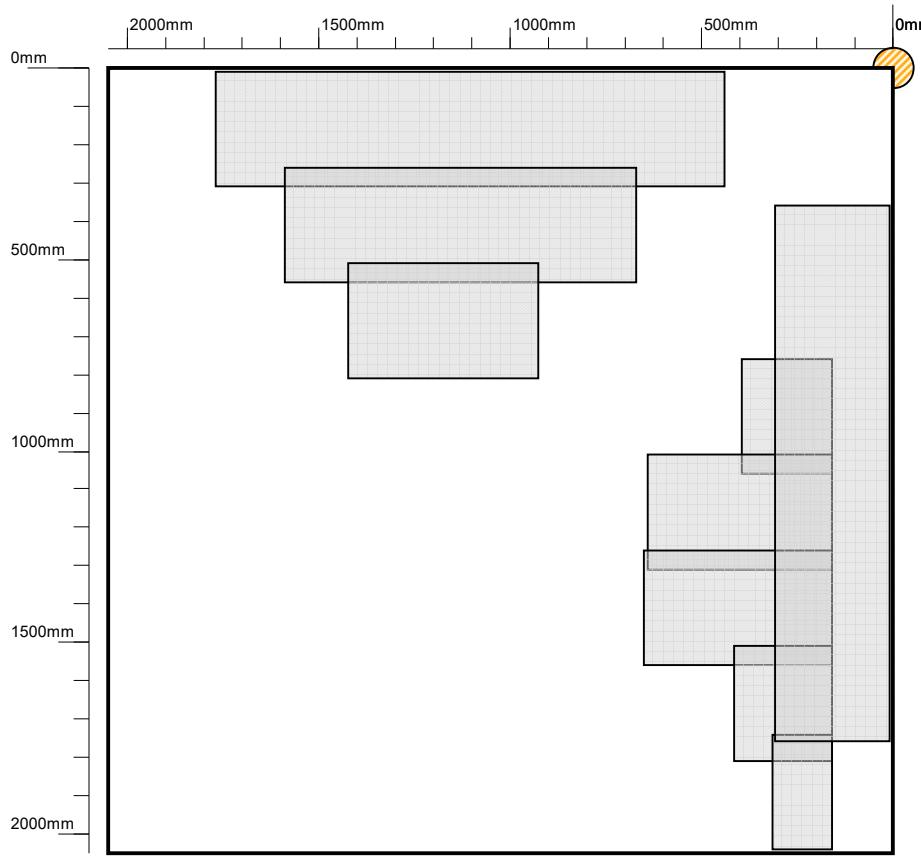


Discontinuity Colour Scheme	
20% - 29%	Yellow
30% - 39%	Orange
40% - 49%	Red
50% - 59%	Green
60% - 69%	Cyan
70% - 79%	Magenta
80% - 89%	Blue
90% - 100%	Black
Weld Discontinuity	

Symbols



Row:	4	Plate:	3
Plate Length (mm):	4040	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



Y-axis
X-axis

Eddyfi
Technologies



Discontinuity Colour Scheme	
20% - 29%	Yellow
30% - 39%	Orange
40% - 49%	Red
50% - 59%	Green
60% - 69%	Cyan
70% - 79%	Magenta
80% - 89%	Blue
90% - 100%	Black
Weld Discontinuity	Red

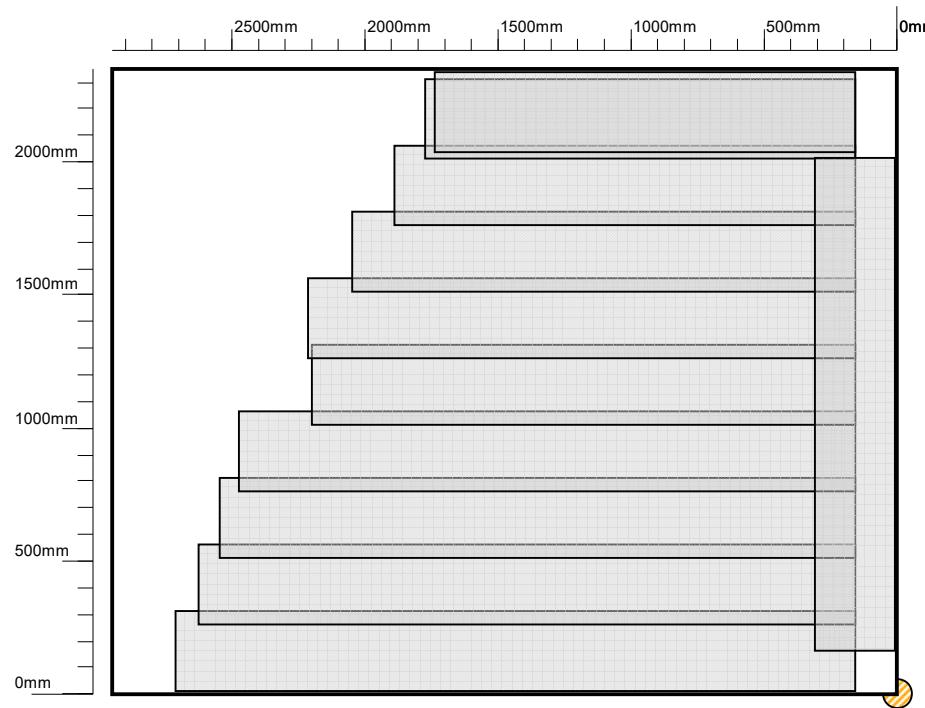
Symbols

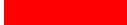


Row: 5 **Plate:** 1
Plate Length (mm): 2050 **Plate Width (mm):** 2050
Orientation: Horizontal **Scan Method:** Parallel
Max discontinuity: 0 **Showing defects from:** TOP & BOTTOM
Lower Threshold: 20% **Upper Threshold:** 100% (Import Threshold: 20%)
Defect enhancement setting: Not used

Tank: MCH-03 **Operator:** Bakhtiar
Date: 1/21/2021 **Equipment Serial:** 7C00000031C51722
Location: Machike Terminal
Company: SGS Pakistan Pvt Limited
Client: Shell Pakistan Limited

 Y-axis
 X-axis



Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

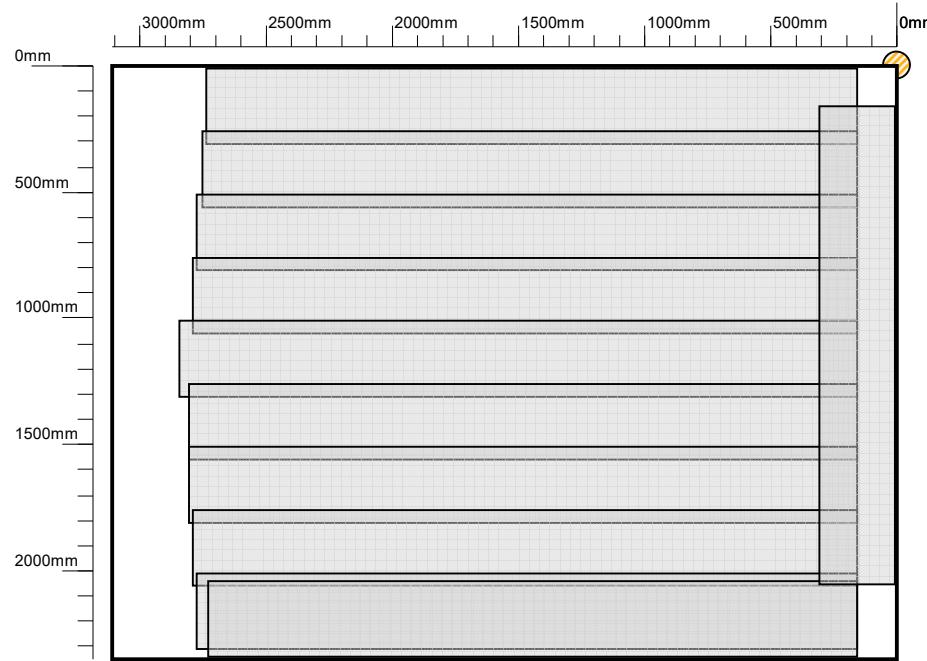
Symbols

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

Row: 5 **Plate:** 2
Plate Length (mm): 2950 **Plate Width (mm):** 2350
Orientation: Vertical **Scan Method:** Parallel
Max discontinuity: 0 **Showing defects from:** TOP & BOTTOM
Lower Threshold: 20% **Upper Threshold:** 100% (Import Threshold: 20%)
Defect enhancement setting: Not used

Tank: MCH-03 **Operator:** Bakhtiar
Date: 1/21/2021 **Equipment Serial:** 7C00000031C51722
Location: Machike Terminal
Company: SGS Pakistan Pvt Limited
Client: Shell Pakistan Limited

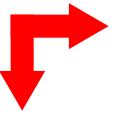
Y-axis
 X-axis

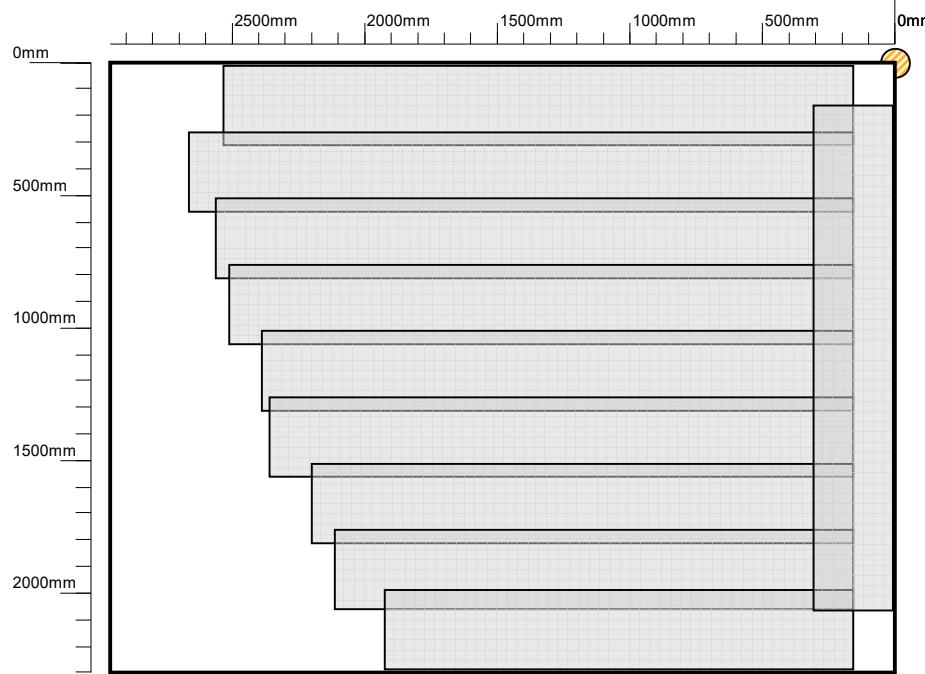


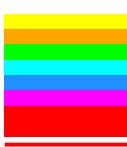
Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

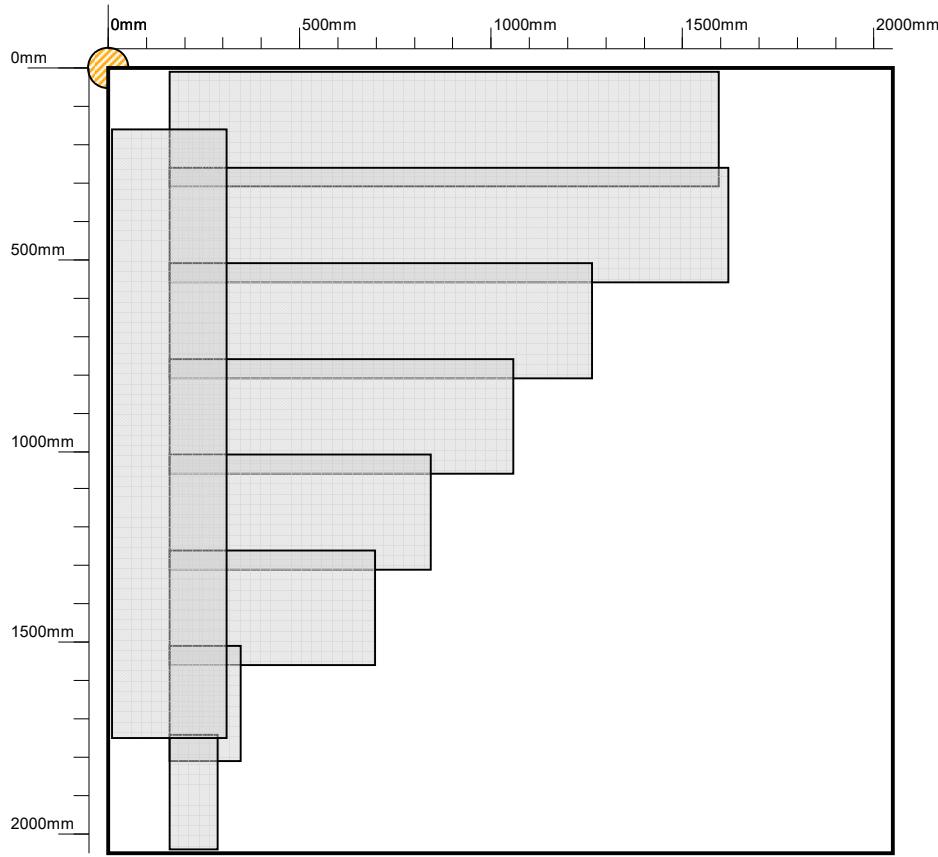
Symbols	
Track	
Non-Scanned Area	
Plate Reference	
Tank Reference	

Row:	5	Plate:	3
Plate Length (mm):	3110	Plate Width (mm):	2350
Orientation:	Vertical	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-03	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

 Y-axis
 X-axis



		Row: 5 Plate: 4 Plate Length (mm): 2960 Plate Width (mm): 2300 Orientation: Vertical Scan Method: Parallel Max discontinuity: 0 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used			
Discontinuity Colour Scheme 	Symbols Track Non-Scanned Area Plate Reference Tank Reference	   	Tank: MCH-03 Date: 1/21/2021 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited	Operator: Bakhtiar Equipment Serial: 7C00000031C51722	38/39



X-axis
Y-axis

Eddyfi
Technologies



Discontinuity Colour Scheme	
20% - 29%	Yellow
30% - 39%	Orange
40% - 49%	Red
50% - 59%	Green
60% - 69%	Cyan
70% - 79%	Magenta
80% - 89%	Blue
90% - 100%	Black
Weld Discontinuity	White

Symbols



Row:	5	Plate:	5
Plate Length (mm):	2050	Plate Width (mm):	2050
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from:	TOP & BOTTOM
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			

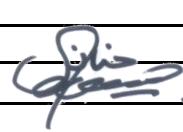
Tank:	MCH-03
Date:	1/21/2021
Location:	Machike Terminal
Company:	SGS Pakistan Pvt Limited
Client:	Shell Pakistan Limited

Operator:	Bakhtiar
Equipment Serial:	7C00000031C51722



(MPI) Magnetic Particle Inspection

REPORT

SGS	OUT OF SERVICE INSPECTION OF MCH-03			Report No:	5010465/MPI/MCH3/01		
	MAGNETIC PARTICLE EXAMINATION REPORT			Rev.	0		
			Page:	1 of 1			
			Date:	21/01/2021			
SGS Ref. No: 5010465		Examination Date: 21-10-2020			Thickness: 10 mm		
Client: Shell Pakistan Limited		Object / Part Desc: MCH-03			Illumination level : 1000 LUX		
Project:OOSI of MCH-03		Material: CS			Surface Temperature: Ambiant		
Location: Machicke Terminal		Magnetizing Technique: Permenant Yoke			Calibration Refernce : Pie Gauge		
Examination Code: ASME SEC V		Surface Condition: Painted			Yoke Sr No : 2964		
Acceptance Code: API 653		Examination Medium: Dry <input type="checkbox"/> Wet <input checked="" type="checkbox"/>			Coil Sr No (If Used) : --		
Procedure No: IND-QMS-TP-31		Method of Examination:Continuous <input checked="" type="checkbox"/> Residual <input type="checkbox"/>			Contrast Consumable Used : WCP-2		
Method : Visible <input checked="" type="checkbox"/> Fluorescent <input type="checkbox"/>		MPI Consumable Brand Name: Magnaflux			MPI Consumable Used : 7HF		
Examination Results							
S. No.	Item Desc.	Dimension / Diameter (mm)	Inspected Area	Nature of Indication			Status
				Type	Loc from 0 point	Length	
1	Shell to Bottom Annular Plate-01	15000	Weld+Haz	-	-	-	Satisfactory
2	Shell to Bottom Annular Plate-02	15000	Weld+Haz	-	-	-	Satisfactory
3	Shell to Bottom Annular Plate-03	15000	Weld+Haz	-	-	-	Satisfactory
4	Shell to Bottom Annular Plate-04	15000	Weld+Haz	-	-	-	Satisfactory
5	Shell to Bottom Annular Plate-05	15000	Weld+Haz	-	-	-	Satisfactory
6	Shell to Bottom Annular Plate-06	15000	Weld+Haz	-	-	-	Satisfactory
7	Shell to Bottom Annular Plate-07	15000	Weld+Haz	-	-	-	Satisfactory
8	Shell to Bottom Annular Plate-08	15000	Weld+Haz	-	-	-	Satisfactory
9	Shell to Bottom Annular Plate-09	15000	Weld+Haz	-	-	-	Satisfactory
10	Shell to Bottom Annular Plate-10	15000	Weld+Haz	-	-	-	Satisfactory
Remarks (If Any) : Note-							
Particulars	Inspected By			Reviewed by			
Name	Sajjad Hussain			Abdul Hanan			
Qualification / Designation	MT Level II			Inspection Engineer			
Signature:							
Date	21/01/2021			21/01/2021			

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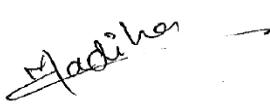
	INDUSTRIAL SERVICES Vent Calculation Report	Order #:5010465 Rev: 0 Page: 1 of 4 Date: 28-01-2021
---	--	---

<h1 style="color: blue;">VENTING REPORT OF TANK MCH-03</h1>	SGS Pakistan (Pvt.) Ltd. H-3/3, Sector - 5 Korangi Industrial Area, Karachi - PAKISTAN. Tel: +92 21 35121388 Fax: +92 21 35121325 / 35121386
<b style="color: blue;">Venting Calculation Report	

SCOPE:

- NORMAL VENTING
- EMERGENCY VENTING
- FRANGIBILITY ASSESSMENT

CLIENT:	SHELL PAKISTAN LIMITED
TANK NO:	MCH-03
DATE:	28-1-2021

Particulars	Prepared By	Reviewed By
Name	Madiha Gulfam	Danish Vohra
Signature		
Date:	28-1-2021	28-1-2021

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Title: Venting Report, Ref: IND-QMS-FOR-073, Revision: 00, Page 1 of 4 Dated: 01-10-2014

SGS	INDUSTRIAL SERVICES	Order #:5010465 Rev: 0 Page: 2 of 4 Date: 28-01-2021
Vent Calculation Report		

TANK DETAILS:

Tank:	Above Ground Storage Tank
Tank no:	MCH-03
Op. Pressure:	Atmospheric Pressure
Type:	Vertical Tank
Product:	HSD

GIVEN DATA:

Diameter (D)=	15	m
Height (H)=	10	m
Inlet Flow rate=	1100	m^3/hr
Outlet Flow rate=	144	m^3/hr
Capacity=	1,767.14	m^3
Leg Length=	4	mm

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Title: Venting Report, Ref: IND-QMS-FOR-073, Revision: 00, Page 2 of 4 Dated: 01-10-2014



INDUSTRIAL SERVICES

Vent Calculation Report

Order #:5010465

Rev: 0

Page: 3 of 4

Date: 28-01-2021

CALCULATIONS

- **NORMAL VENTING**

1. **Required Vent Capacity (SCMH)**

Required Vent Capacity	
Maximum In breathing rate (vacuum) (SCMH)	
Displacement	1100
Thermal inbreathing	185.07
Total	1285.07
Maximum Out breathing rate (pressure) (SCMH)	
Displacement	144
Thermal out breathing	267.7
Total	411.7

2. **Normal Vent Size (inch)**

Vent size (inches)	
For pressure hazard	4"
For vacuum hazard	8"

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INDUSTRIAL SERVICES

Vent Calculation Report

Order #:5010465

Rev: 0

Page: 4 of 4

Date: 28-01-2021

- **EMERGENCY VENTING**

Calculations	
Wetted Area	417.23 m ²
Heat Input	7,149,38.57 watt
Venting capacity	38,454.94 m ³ /hr

CONCLUSION:

NORMAL VENTING: Normal venting Requirement of Tank Mmch-3 calculated for pressure and vacuum hazard is 4" and 8".

EMERGENCY VENTING: For emergency condition, calculated venting requirement is 38,454.94 m³/hr for wetted area of 417.23 m². If the tank would be taken in service without IFC, weak roof to shell attachment or emergency vent with excess ventilation must be provided to the tank according to the above calculated venting requirements. At present weak roof to shell joint is available with leg length 4mm which satisfies the condition of emergency venting.

FRANGIBILITY ASSESSMENT: The Average leg length of weak roof to shell joint is 4.00 mm when measured from toe to toe, which is in compliance with weak roof-to-shell attachment.

NOTE 1: Above calculations & results are based on standard API 2000.

NOTE 2: If extra emergency vent size would be installed to save the lifting of manhole cover in case of abnormal internal pressure, it should be in accordance with the specifications confirmed by the vendor for above calculated venting requirements.



Tank Cleaning Certificate

We here by certify that tank cleaning has been checked at
Shell Machike Terminal
for the tank described as follows:

MCH-03

Tank No

Height 10.00 meters

Diameter 15.00 meters

Dimensions

1767 M³

Capacity

Self-Supported fixed roof

Floating or Fixed roof

This is to certify that above out of service tank has been inspected and checked in all respect for safe tank entry and found fully cleaned, appropriate and in ready state for tank internal inspection

Authorized Representative



Bakhtiar Ahmed

(API – 653 Authorized Inspector - 54112)

Date: 20-01-2021



AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP™

API Individual Certification Programs

verifies that

Bakhtiar Ahmed

has met the requirements for API certification

*API-653 Aboveground Storage Tank
Inspector*

Certification Number *54112*

Original Certification Date *September 30, 2014*

Current Certification Date *September 30, 2020*

Expiration Date *September 30, 2023*


Manager, Individual Certification Programs



SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	MCH-04

Client :	Shell Pakistan Limited
Location :	Machike Terminal
Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection
Job Number:	5010465
Inspection Date :	20 Jan 2021 To 25 Jan 2021
Job Executed By :	Bakhtiar Ahmed (Certified API 653 & MFL Inspector) Sajjad Hussain (NDT Level II) Ali Uzair (NDT Level II) Abdul Hanan (NDT Level II)

Prepared By :	Reviewed By :	Approved By :
Bakhtiar Ahmed Certificate #54112	Muhammad Danish Vohra Assistant Manager	Muhammad Asif Operation Manager



SGS Pakistan (Private) Limited
H-3/3, Sector 5,
Korangi Industrial Area,
Karachi-74900, Pakistan
Tel : 92-21351 21388-97
Fax : 92-21-351 21325/ 35121386

All orders are accepted and all report and certificates issued subject to the General Condition of Service
(Copies available upon request)

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

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Any holder of this document is advised that the information contained hereon is limited to visual examination of the safely and readily accessible portions of the consignment only

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

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Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

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Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

1. Introduction

Tank MCH-04 has been inspected at Machike Terminal for Shell Pakistan Limited .

Inspection Equipments used:

Equipment	Brand	Model	Serial Number	Calibration Due Date
Floor Map MFL	SILVERWING	3D	2480813	25/3/2021
UTG Meter	GE SENSING & INSPECTION TECHNOLOGIES	DMS GO	13016124	27-3-2021
UT A -Scanning Meter	GE SENSING & INSPECTION TECHNOLOGIES	USM 35	13863a	25 Apr 2021

1.1. General Tank information

Tank General Information							
Tank Number	MCH-04		Owner	Shell Pakistan Limited			
Tank Location	Machike Terminal		Manufacturer	CBI EASTERN ANSTALT			
Tank Diameter	15,000mm or 49.213ft		Product	HSD			
Tank Height	10,000mm or 32.808ft		Specific Gravity	0.870			
Maximum Filling Height	10,000mm or 32.808ft		Nominal Capacity (m³)	1,767.00			
Design Code	API 650	Heating System	No	Cathodic Protection	No		
Data Plate	Yes	Insulation	No	Leak Detection	Yes		
Tank Component Geometry Information							
Foundation	Cement Tank pad		Roof	Fixed Cone Roof			
Shell	Butt Weld		Bottom	Cone Down			
Tank Component Coating Availability							
Shell	Internal	Up to 1st course	Roof	Internal	None	Bottom	Coated
	External	Coated		External	Coated		
Tank Dates Information							
Year of Manufacture	1997		Year of Last Inspection		N/A		
Year of Current Inspection	2021		Year of Last Bottom Plates Change		N/A		
Other Information							
Access To Roof	Spiral Stairway						

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

1.2. Summary of Findings

1.2.1. Engineering Evaluation

1.2.1.1. Differential Settlement

The Permissible Out-Of-Plane Settlement (mm)	Maximum Differential Settlement, Si (mm)	Result
22.90	4.77	Within Tolerance

Please see page 49 for more information.

1.2.1.2. Roof Plate

Item	Nominal Thickness (mm)	Minimum Measured Thickness (mm)	Minimum Required Thickness (mm)	Corrosion Rate (mm/Year)	Remaining Life (Years)
Roof Plates	Data Not available	5.84	2.29	0.07857 Taken from MCH-03	45.18

Please see page 54 for more information. **Corrosion rate taken from Tank MCH-03**

1.2.1.3. Shell Plate Evaluation

Course	Previous Thickness(mm)	Minimum Measured Thickness (mm)	Minimum Required Thickness (mm)	Remaining Life (year)	Next Inspection Interval
1	Data Not available	9.38	3.81	72.34	5
2		5.95	2.63	34.58	5
3		5.25	2.54	20.37	5
4		5.88	2.54	33.40	5

Note: For calculation of remaining life corrosion rate taken from Tank MCH-03

Please see page 59 for more information.

1.2.1.4. Plumbness (Tank Tilt)

Station (°)	Maximum Out-of-Plumbness Value (mm)	Result
0.0	10	Within Tolerance
45.0	-9	Within Tolerance
90.0	3	Within Tolerance
135.0	4	Within Tolerance
180.0	3	Within Tolerance
225.0	11	Within Tolerance
270.0	15	Within Tolerance
315.0	17	Within Tolerance

Please see page 63 for more information.

1.2.1.5. Bottom plate (corrosion rate taken from MCH-03 for calculated life span.)

Item	Year- In Service	Nominal Thickness (mm)	RT _{bc} (mm)	Rt _{tp} (mm)	S _t P _r (mm)	U _{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
Bottom Plates	24	Data Not Available	7.57	7.50	0.0000	0.0208	1.27	299.52	20.00
Annular Plates	24	Data Not Available	9.72	9.00	0.0000	0.0146	4.32	320.55	20.00
Critical Zone	24	Data Not Available	9.45	9.00	0.0000	0.0188	4.32	248.94	20.00



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

MRT = minimum remaining thickness at the end of interval Or
 O_r = in-service interval of operation (years to next internal inspection) not to exceed that allowed by 6.4.2,
 RT_{bc} = minimum remaining thickness from bottom side corrosion after repairs,
 RT_{ip} = minimum remaining thickness from internal corrosion after repairs,
 SiP_r = maximum rate of corrosion not repaired on the top side. $SiP_r = 0$ for coated areas of the bottom.
 UP_r = maximum rate of corrosion on the bottom side.

Please see page 69 for more information.

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :		Out of Service Inspection	

1.2.2. Visual Inspection

1.2.2.1. Foundation

Item	Findings	Recommendations	Repair Priority
1. Access Way	One side handrailing missing	<ul style="list-style-type: none"> Need to installed the handrailing on missing side 	Offline
2. Dyke wall	Reinforced Concrete ring wall observed around the tank, found minor cracks and cement plaster failure at different location	<ul style="list-style-type: none"> It is therefore recommended that cement plaster shall be restored by masonry work in order to avoid further deterioration. 	Online Or Offline
3. Tank Area	Vegetation growth observed around the tank foundation.	<ul style="list-style-type: none"> Need to clean the existing vegetation and take measures to avoid future growth 	Online Or Offline
4. Drainage System	Drain channel observed around the tank, Visually found in satisfactory condition	<ul style="list-style-type: none"> Nil,just for info. 	N/A
5. Cement Tank Pad	Spalling, broken Asphalt observed on tank foundation pad	<ul style="list-style-type: none"> Need to repair the foundation pad with non shrikage grout 	Online Or Offline
6. Tank Foundation	Tank foundation level is higher than bottom projection plate, causing runoff rainwater from the shell, remain stagnant on projection plate. Water can damage the paint and cause corrosion of projection plate	<ul style="list-style-type: none"> To trim tank foundation to allow proper water drainage. 	Offline
7. Bottom Projection Plate and Foundation	Gap noted between bottom Projection Plate and tank foundation, which may allow water to seep in under the tank.	<ul style="list-style-type: none"> It should be filled with water proof sealant to avoid the moisture ingress beneath the bottom 	Offline
	Vegetation growth observed in b/w the projection plate and foundation.	<ul style="list-style-type: none"> Need to clean the existing vegetation and take measures to avoid future growth 	Online Or Offline
8. Bottom Projection Plate	Paint failure observed on projection plates	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
9. Piping	Paint failure observed on piping at different locations	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :		Out of Service Inspection	

1.2.2.2. Shell

Item	Findings	Recommendations	Repair Priority
1. Tank Earthing	Tank Earthing cable observed disconnect from shell plate.	<ul style="list-style-type: none"> Need to properly connect the earthing cable with tank shell plate 	Offline
2. Shell Plate	Signs of paint failure observed on first shell course.	<ul style="list-style-type: none"> To make good surface preparation and recoat as per paint manufacturer's specification. 	Offline
	Paint deterioration scrutinized on different location of shell plates from stairway side.	<ul style="list-style-type: none"> To make good surface preparation and recoat as per paint manufacturer's specification. 	Offline
3. Internal Shell Plate	At one location paint failure observed on internal shell plate number -1 at nozzle side	<ul style="list-style-type: none"> To make good surface preparation and recoat as per paint manufacturer's specification. 	Offline
	Atmospheric corrosion observed on internal shell plates except first shell course plates.	<ul style="list-style-type: none"> Nil, just for info. 	N/A
4. Shell Nozzle	No pitting observed on internal shell nozzle.	<ul style="list-style-type: none"> Nil, just for info. 	N/A
	Visually found in satisfactory condition without paint failure and pitting.	<ul style="list-style-type: none"> Nil, just for info. 	N/A
	UT Crawler carried out on shell plates to record the thickness, No significant metal loss noted during testing.	<ul style="list-style-type: none"> Nil, just for info. 	N/A
5. Manway	Atmospheric corrosion observed on shell manway flange surface.	<ul style="list-style-type: none"> Need to properly clean it. 	Offline
6. Stairway	Stairway is not properly supported with foundation due to which shell plates bear more stresses	<ul style="list-style-type: none"> It should be properly supported with foundation 	Online Or Offline
	Guest plate of stair case found directly welded with shell plates.	<ul style="list-style-type: none"> Nil, just for info. 	To Monitor
7. Weld Seam	Visually horizontal and vertical weld seams found in satisfactory condition.	<ul style="list-style-type: none"> Nil, just for info. 	N/A
8. Hydrant Line	As per view from ground level, hydrant line paint found paint blisters & paint	<ul style="list-style-type: none"> To make good surface preparation and recoat as per paint 	N/A



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

	flakes.	manufacturer' specification.	
	Guest plates of hydrant line directly welded with shell plate.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	N/A
9. Tank Survey	Tank Survey carried out to check the settlement and plumbness. No abnormality observed. See survey report.	<ul style="list-style-type: none"> Nil,just for info. 	N/A

1.2.2.3. Fixed Roof

Item	Findings	Recommendations	Repair Priority
1. Roof Plate	Paint deterioration & flakes scrutinized on roof plates number 2/1, 3/2, 4/1 and 5/2.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
2. Crown plate	Paint deterioration & flakes scrutinized on roof plates including weld seams and crown plate	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
3. Manway	Visually manyway found in rusted condition.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
4. Sampling/ Gauging Hatch	Atmospheric corrosion observed on nut bolts of sample hatch.	<ul style="list-style-type: none"> Need to install Appropriate hot dip galvanized coated nut bolts. 	Offline
5. Roof Nozzle	Atmospheric corrosion observed on roof nozzle due to paint failure.	<ul style="list-style-type: none"> To made good surface preparation and recoat as per paint manufacturer' specification. 	Offline
6. Mesh screen	Corrosion noted	<ul style="list-style-type: none"> Need to installed the new Corrosion-resistant coarse-mesh screen (13 mm [1/2 in.] openings) shall be provided to prevent the entrance of birds 	Offline
7. Handrailing	Structural integrity of hand rail was found satisfactory. No visual defect was observed.	<ul style="list-style-type: none"> Nil,just for info. 	N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number : MCH-04
	Type Of Inspection :		Out of Service Inspection	

	Vertical support of handrailing welded on roof plates.	• Nil,just for info.	N/A
8. Frangible joint (Joint between roof plate and shell top angle)	During visual inspection of Frangible joint found seal weld with satisfactory condition, without any significant discontinuities	• Nil,just for info.	N/A
9. Roof Structure	Visually found in satisfactory condition.	• Nil,just for info.	N/A

1.2.2.4. Bottom

Item	Findings	Recommendations	Repair Priority
1. Bottom Plate	Magnetic Flux Leakage 3D scanning carried out on the bottom plates. No significant thickness loss had observed on the bottom plates accessible areas.	• Nil,just for info.	N/A
	UT A scanning performed on unscane area of MFL, No significant metal loss noted during scanning.	• Nil,just for info.	N/A
	Minor pitting observed on bottom plates at different locations.	• Nil,just for info.	N/A
	Paint failure noted on bottom plate number 4/3	• Need to repaint after proper surface preparation.	Offline
2. Pipeline	Visually found in satisfactory condition.	• Nil,just for info.	N/A
3. Sump	UT A scanning performed on supm. No significant metal loss noted during scanning.	• Nil,just for info.	N/A
	Visually found in satisfactory condition.	• Nil,just for info.	N/A
4. Shell to Bottom Joint	Shell to bottom joint inspected visually and with NDT method of MPI, where found no surface defects.	• Nil,just for info.	N/A
5. Annular Plate	UT A scanning performed on annular plates, No significant metal loss noted during scanning.	• Nil,just for info.	N/A
6. Datum Plate	Visually found in satisfactory condition.	• Nil,just for info.	N/A
7. Weld joints	Weld remnants noted on bottom weld joints at plate number 1/4.	• Need to grinf flush and repaint after proper surface preparation.	Offline
8. DFT	DFT carried out on bottom	• Nil,just for info.	N/A

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	
	plates. Thickness recorded in the range of 160 to 200 microns		

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

1.3. Visual Inspection Photos with Comment

1.3.1. General View of Tank

	General View of Tank MCH-04
	General View of Name plate

1.3.2. Foundation

	Access Way Finding: One side handrailing missing Recommendation: Need to installed the handrailing on missing side Repair Priority: Offline
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Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Dyke wall****Finding:**

Reinforced Concrete ring wall observed around the tank, found minor cracks and cement plaster failure at different location

Recommendation:

It is therefore recommended that cement plaster shall be restored by masonry work in order to avoid further deterioration.

Repair Priority: *Online Or Offline*

**Tank Area****Finding:**

Vegetation growth observed around the tank foundation.

Recommendation:

Need to clean the existing vegetation and take measures to avoid future growth

Repair Priority: *Online Or Offline*

**Drainage System****Finding:**

Drain channel observed around the tank, Visually found in satisfactory condition

Recommendation:

Nil, just for info.

Repair Priority: *N/A*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Cement Tank Pad****Finding:**

Spalling, broken Asphalt observed on tank foundation pad

Recommendation:

Need to repair the foundation pad with non shrinkage grout

Repair Priority: *Online Or Offline*

**Cement Tank Pad****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Online Or Offline*

**Tank Foundation****Finding:**

Tank foundation level is higher than bottom projection plate, causing runoff rainwater from the shell, remain stagnant on projection plate. Water can damage the paint and cause corrosion of projection plate

Recommendation:

To trim tank foundation to allow proper water drainage.

Repair Priority: *Offline*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Bottom Projection Plate and Foundation****Finding:**

Gap noted between bottom Projection Plate and tank foundation, which may allow water to seep in under the tank.

Recommendation:

It should be filled with water proof sealant to avoid the moisture ingress beneath the bottom

Repair Priority: *Offline*

**Bottom Projection Plate and Foundation****Finding:**

Vegetation growth observed in b/w the projection plate and foundation.

Recommendation:

Need to clean the existing vegetation and take measures to avoid future growth

Repair Priority: *Online Or Offline*

**Bottom Projection Plate****Finding:**

Paint failure observed on projection plates

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Bottom Projection Plate****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Online Or Offline*

**Piping****Finding:**

Paint failure observed on piping at different locations

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

**Piping****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: *Offline*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

1.3.3. Shell

	<p>Tank Earthing</p> <p>Finding: Tank Earthing cable observed disconnect from shell plate.</p> <p>Recommendation: Need to properly connect the earthing cable with tank shell plate</p> <p>Repair Priority: Offline</p>
	<p>Shell Plate</p> <p>Finding: Signs of paint failure observed on first shell course.</p> <p>Recommendation: To make good surface preparation and recoat as per paint manufacturer's specification.</p> <p>Repair Priority: Offline</p>
	<p>Shell Plate</p> <p>Finding: Paint deterioration scrutinized on different location of shell plates from stairway side.</p> <p>Recommendation: To make good surface preparation and recoat as per paint manufacturer's specification.</p> <p>Repair Priority: Offline</p>

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Internal Shell Plate****Finding:**

At one location paint failure observed on internal shell plate number -1 at nozzle side

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: Offline

**Internal Shell Plate****Finding:**

Atmospheric corrosion observed on internal shell plates except first shell course plates.

Recommendation:

Nil,just for info.

Repair Priority: N/A

**Shell Nozzle****Finding:**

No pitting observed on internal shell nozzle.

Recommendation:

Nil,just for info.

Repair Priority: N/A

**Shell Nozzle****Finding:**

Visually found in satisfactory condition without paint failure and pitting.

Recommendation:

Nil,just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Manway****Finding:**

Atmospheric corrosion observed on shell manway flange surface.

Recommendation:

Need to properly clean it.

Repair Priority: *Offline*

**Stairway****Finding:**

Stairway is not properly supported with foundation due to which shell plates bear more stresses

Recommendation:

It should be properly supported with foundation

Repair Priority: *Online Or Offline*

**Stairway****Finding:**

Guest plate of stair case found directly welded with shell plates.

Recommendation:

Nil, just for info.

Repair Priority: *To Monitor*

**Weld Seam****Finding:**

Visually horizontal and vertical weld seams found in satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: *N/A*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

	<p>Hydrant Line</p> <p>Finding: As per view from ground level, hydrant line paint found paint blisters & paint flakes.</p> <p>Recommendation: To made good surface preparation and recoat as per paint manufacturer' specification.</p> <p>Repair Priority: N/A</p> <p>Finding: Guest plates of hydrant line directly welded with shell plate.</p> <p>Recommendation: Nil,just for info.</p> <p>Repair Priority: N/A</p>
	<p>Shell Plate</p> <p>Finding: UT Crawler carreid out on shell plates to record the thickness, No significant metal loss noted during testing.</p> <p>Recommendation: Nil,just for info.</p> <p>Repair Priority: N/A</p>
	<p>Tank Survey</p> <p>Finding: Tank Survey carried out to check the settlement and plumbness. No abnormality observed. See survey report.</p> <p>Recommendation: Nil,just for info.</p> <p>Repair Priority: N/A</p>

1.3.4. Fix Roof

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Roof Plate****Finding:**

Paint deterioration & flakes scrutinized on roof plates number 2/1, 3/2, 4/1 and 5/2.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: Offline

**Roof Plate****Finding:**

same as above

Recommendation:

Same as above

Repair Priority: Offline

**Roof Plate****Finding:**

same as above

Recommendation:

Same as above

Repair Priority: Offline

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Crown plate****Finding:**

Paint deterioration & flakes scrutinized on roof plates including weld seams and crown plate

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

**Manway****Finding:**

Visually manyway found in rusted condition.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: *Offline*

**Manway****Finding:**

same as above

Recommendation:

Same as above

Repair Priority: *Offline*

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		



Sampling/ Gauging Hatch

Finding:

Atmospheric corrosion observed on nut bolts of sample hatch.

Recommendation:

Need to install Appropriate hot dip galvanized coated nut bolts.

Repair Priority: Offline



Roof Nozzle

Finding:

Atmospheric corrosion observed on roof nozzle due to paint failure.

Recommendation:

To made good surface preparation and recoat as per paint manufacturer' specification.

Repair Priority: Offline



Roof Nozzle

Finding:

same as above

Recommendation:

Same as above

Repair Priority: Offline

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

	<p>Mesh screen</p> <p>Finding: Corrosion noted</p> <p>Recommendation: Need to installed the new Corrosion-resistant coarse-mesh screen (13 mm [1/2 in.] openings) shall be provided to prevent the entrance of birds</p> <p>Repair Priority: <i>Offline</i></p>
	<p>Handrailing</p> <p>Finding: Structural integrity of hand rail was found satisfactory. No visual defect was observed.</p> <p>Recommendation: Nil,just for info.</p> <p>Repair Priority: <i>N/A</i></p>
	<p>Handrailing</p> <p>Finding: Vertical support of handrailing welded on roof plates.</p> <p>Recommendation: Nil,just for info.</p> <p>Repair Priority: <i>N/A</i></p>

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		



Frangible joint (Joint between roof plate and shell top angle)

Finding:

During visual inspection of Frangible joint found seal weld with satisfactory condition, without any significant discontinuities

Recommendation:

Nil, just for info.

Repair Priority: N/A



Roof Structure

Finding:

Visually found in satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

1.3.5. Bottom Plate

	<p>Bottom Plate</p> <p>Finding: Magnetic Flux Leakage 3D scanning carried out on the bottom plates. No significant thickness loss had observed on the bottom plates accessible areas.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>
	<p>Bottom Plate</p> <p>Finding: Coating observed on bottom plates</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>
	<p>Pipline</p> <p>Finding: Visually found in satisfactory condition.</p> <p>Recommendation: Nil, just for info.</p> <p>Repair Priority: N/A</p>

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Sump****Finding:**

UT A scanning performed on supm. No significant metal loss noted during scanning.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Sump****Finding:**

Visually found in satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Shell to Bottom Joint****Finding:**

Shell to bottom joint inspected visually and with NDT method of MPI, where found no surface defects.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Shell to Bottom Joint****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Annular Plate****Finding:**

UT A scanning performed on annular plates, No significant metal loss noted during scanning.

Recommendation:

Nil, just for info.

Repair Priority: N/A

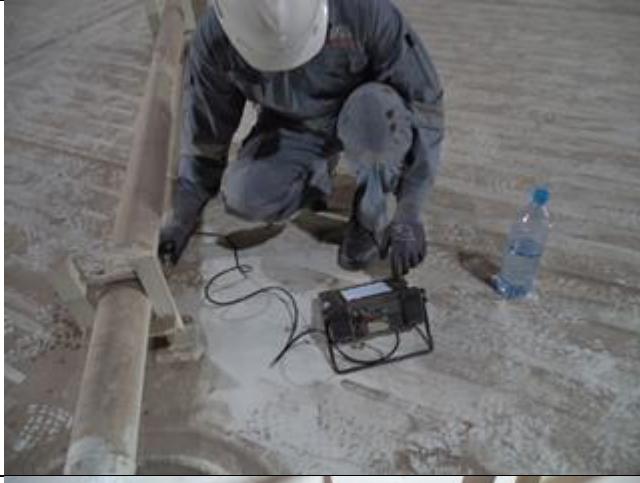
**Annular Plate****Finding:**

Same as above

Recommendation:

Same as above

Repair Priority: N/A

**Bottom Plate****Finding:**

UT A scanning performed on unscanned area of MFL, No significant metal loss noted during scanning.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Datum Plate****Finding:**

Visually found in satisfactory condition.

Recommendation:

Nil, just for info.

Repair Priority: N/A

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

**Bottom Plate****Finding:**

Minor pitting noted on bottom plates at different location.

Recommendation:

Nil, just for info.

Repair Priority: N/A

**Weld joints****Finding:**

Weld remnants noted on bottom weld joints at plate number 1/4.

Recommendation:

Need to grind flush and repaint after proper surface preparation.

Repair Priority: Offline

**Bottom Plate****Finding:**

Paint failure noted on bottom plate number 4/3

Recommendation:

Need to repaint after proper surface preparation.

Repair Priority: Offline

**DFT****Finding:**

DFT carried out on bottom plates. Thickness recorded in the range of 160 to 200 microns

Recommendation:

Nil, just for info.

Repair Priority: N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :		Out of Service Inspection	

1.4. Visual Inspection Checklist

- Out of Service Inspection Checklist

No.	Items	Complete d	Comments
		✓	
1	OVERVIEW		
1.1	Check that tank has been cleaned, is gas free, and safe for entry.	✓	Satisfactory
1.2	Check that the tank is completely isolated from product lines, all electrical power, and steam lines.	✓	Satisfactory
1.3	Check that roof is adequately supported, including fixed roof structure and floating roof legs.	✓	Satisfactory
1.4	Check for presence of failing object hazards, such as corroded-through roof rafters, asphalt stalactites, and trapped hydrocarbons in unopened or plugged equipment or appurtenances, ledges, etc.	✓	Satisfactory
1.5	Inspect for slipping hazards on the bottom and roof decks.	✓	Satisfactory
1.6	Inspect structural welds on accessways and clips.	✓	Satisfactory
1.7	Check surface needing inspection for a heavy-scale buildup and check weld seams and oily surfaces where welding is to be done. Note areas needing more cleaning, including blasting.	✓	Satisfactory
2	TANK EXTERIOR		
2.1	Inspect appurtenances opened during cleaning such as lower floating swing sheave assemblies, nozzle interiors (after removal of valves).	N/A	N/A
2.2	Hammer test or ultrasonically test the roof.	N/A	yes, UTG Perfomed, found satisfactory
2.3	Enter and inspect the floating roof pontoon compartments.	N/A	N/A
3	BOTTOM INTERIOR SURFACE		
3.1	Using a flashlight held close to and parallel to the bottom plates, and using the bottom plate layout as a guide, visually inspect and hammer test the entire bottom.	✓	Satisfactory
3.2	Measure the depth of pitting and describe the pitting appearance (sharp edged, lake type, dense, scattered, etc).	✓	0.5 mm pitting observed on few plates
3.3	Mark areas requiring patching or further inspection.	N/A	N/A
3.4	Mark locations for turning coupons for inspection.	N/A	N/A
3.5	Inspect all welds for corrosion and leaks, particularly the shell-to-bottom weld.	✓	MPI performed . Found satisfactory
3.6	Inspect sketch plates for corrosion.	✓	Satisfactory
3.7	Check condition of internal sump, if applicable. Standing liquid should be removed from the sump to allow for complete inspection and vacuum testing of weld seams as appropriate. Sump bottom and sidewall plate and seams need to be evaluated for both product-side and soil-side corrosion.	✓	Satisfactory

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :		Out of Service Inspection	
3.8	Locate and mark voids under the bottom.	√	Satisfactory	
3.9	Record bottom data on a layout sketch using the existing bottom plates as a grid. List the number and sizes of patches required.	N/A	N/A	
3.1	Vacuum test the bottom lap welds.	N/A	N/A	
3.11	Hammer test or ultrasonically examine any slightly discolored spots or damp areas.	√	Satisfactory	
3.12	Check for reinforcing pads under all bottom attached clips, brackets, and supports.	√	Satisfactory	
3.13	Inspect floating roof leg pads for pitting or cutting, and excessive dimpling (indicating excessive loading).	N/A	N/A	
3.14	Check the column bases of fixed roof supports for adequate pads and restraining clips.	√	Satisfactory	
3.15	In earthquake zones 3 and 4, check that roof supports are not welded down to the tank bottom, but are only restrained from horizontal movement.	N/A	N/A	
3.16	Check area beneath swing line cable for indications of cable cutting or dragging.	N/A	N/A	
3.17	Mark old oil and air test connection for removal and patching.	N/A	N/A	
3.18	Identify and report low areas on the bottom that does not drain adequately.	N/A	N/A	
3.19	Inspect coating for holes, disbonding, deterioration, and discoloration.	√	see report	
4 SHELL SEAMS AND PLATE				
4.1	On cone up bottoms, closely inspect and gauge the depth of metal loss on the lower 2 in. to 4 in. of the shell (area of standing water).	√	Satisfactory	
4.2	Measure the depth of pitting on each course.	√	Satisfactory	
4.3	Inspect and estimate the amount of metal loss on the heads of rivets and bolts.	N/A	N/A	
4.4	Inspect shell-to-bottom riveted lap joints.	N/A	N/A	
4.5	Inspect for vertical grooving damage from seal assembly protrusions.	N/A	N/A	
4.6	Inspect existing protective coatings for damage, deterioration, and disbonding.	√	see report	
4.7	Check for areas of rubbing (indicating too much pressure by the seal assembly shoes or inadequate annular space).	N/A	N/A	
4.8	Visually inspect the shell plates and seams for indications of leakage.	√	visually found satisfactory	
4.9	If the shell has riveted or bolted seams, record the leak locations by film or chart in case the locations are lost during surface preparation for painting.	N/A	N/A	
4.11	Survey the shell to check for roundness and plumb.	√	see survey report	
5 SHELL-MOUNTED OVERFLOWS				
5.1	Inspect overflow for corrosion and adequate screening.	N/A	N/A	
5.2	Check location of overflow that it is not above any tank valves or equipment.	N/A	N/A	

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :		Out of Service Inspection	

6	ROOF INTERIOR SURFACE			
6.1	General			
6.1.1	Visually inspect the underside surface of the roof plates for holes, scale buildup, and pitting.		✓	Satisfactory
6.1.2	Hammer test or ultrasonically examine to check for thin areas, particularly in the vapor space of floating roofs and at edge of roof on cone roof tank.		N/A	N/A
6.1.3	Check all clips, brackets, braces, etc., welded to the roof deck plate for welded reinforcing pads and see that they have not broken free.		✓	Satisfactory
6.1.4	If no pad is present, penetrant test for cracking of the weld or deck plate.		N/A	N/A
6.1.5	Inspect for protective coating for breaks, disbondment, and deterioration.		✓	deteriorated found
6.1.6	Spark test the interior surface coating if recoating is not planned.		N/A	N/A
6.2	Fixed Roof Support Structure			
6.2.1	Inspect the support columns for thinning in the upper 2 ft.		N/A	N/A
6.2.2	On API columns (two channels welded together) check for corrosion scale breaking the tack welds, unless the joint between the channels is completely seal welded.		N/A	N/A
6.2.3	Check that the reinforcing pad on the bottom is seal-welded to the tank bottom with horizontal movement restraining clips welded to the pad.		N/A	N/A
6.2.4	Determine if pipe column supports are concrete filled or open pipe. If open pipe, check for a drain opening in the bottom of the pipe.		N/A	N/A
6.2.5	Inspect and gauge rafters for thinning, particularly near the center of the roof. Report metal loss.		N/A	N/A
6.2.6	Check for loose or twisted rafters.		N/A	N/A
6.2.7	Inspect girders for thinning and check that they are attached securely to the top of the columns.		N/A	N/A
6.2.8	Report if the columns have cross bracing in the area between the low pump out of the top of the shell (for future internal floating roof installation).		N/A	N/A
6.2.9	Inspect and report presence of any roof-mounted swing line bumpers.		N/A	N/A
6.2.10	Photograph the roof structure if no rafter layout drawing exists.		N/A	N/A
7	FIXED ROOF APPURTENANCES			
7.1	Inspection and Light Hatches			
7.1.1	Inspect the hatches for corrosion, paint and coating failures, holes, and cover sealing.		N/A	N/A
7.1.2	On loose covers, check for a safety chain in good condition.		N/A	N/A
7.1.3	On light hatches over 30 in. across, check for safety rods.		N/A	N/A
7.1.4	Inspect the condition of the gaskets on bold or latched down hatch covers.		N/A	N/A
7.2	Staging Support Connection			
7.2.1	Inspect the condition of the staging support for corrosion.		N/A	N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :	Out of Service Inspection		

7.3	Breathers and Vents			
7.3.1	Inspect and service the breather.	√	unsatisfactory	
7.3.2	Inspect screens on vents and breathers.	√	corrosion noted	
7.4	Emergency P/V Hatches			
7.4.1	Inspect and service pressure/vacuum hatches. (Setting should be high enough to prevent chattering of breather during normal operation. See breather manufacturer's guide.)	N/A	N/A	
7.4.2	Inspect liquid seal hatches for corrosion and proper liquid level in the seal.	N/A	N/A	
7.5	Sample Hatches			
7.5.1	Inspect sample hatch for corrosion.	√	Satisfactory	
7.5.2	Check that the cover operates properly.	√	Satisfactory	
7.5.3	If the tank has no gauge well, check for a hold-off distance marker and check measurement.	√	Satisfactory	
8	FLOATING ROOF			
8.1	Roof Deck			
8.1.1	Hammer test the area between roof rim and shell. (If access for hammer testing is inadequate, measure the distance from the bottom edge of the roof to the corroded area and then hammer test from inside the pontoon).	N/A	N/A	
8.1.2	In sour water service, clean and test all deck plate weld seams for cracking unless the lower laps have been seal-welded.	N/A	N/A	
8.1.3	Check that either the roof drain is open or the drain plug in the roof is open in case of unexpected rain.	N/A	N/A	
8.1.4	On flat bottomed and cone bottom roof decks, check for a vapor dam around the periphery of the roof. The dam should be continuous without break to prevent escape of vapors to the seal area from under the center of the roof.	N/A	N/A	
8.2	Floating Roof Pontoons			
8.2.1	Visually inspect each pontoon for liquid leakage.	N/A	N/A	
8.2.2	Run a light wire through the gooseneck vents on locked down inspection hatch covers to make sure they are open.	N/A	N/A	
8.2.3	Inspect lockdown latches on each cover.	N/A	N/A	
8.2.4	Check and report if each pontoon is :	N/A	N/A	
	1. Vapor tight (bulkhead seal welded on one side on bottom, sides, and top)	N/A	N/A	
	2. Liquid tight (seal-welded on bottom and sides only), or	N/A	N/A	
	3. Unacceptable (minimum acceptable conditions is liquid tight).	N/A	N/A	
			N/A	
8.3	Floating Roof Cutouts			
8.3.1	Inspect underside of cutouts for mechanical damage.	N/A	N/A	
8.3.2	Inspect welds for cracks.	N/A	N/A	
8.3.3	Inspect plate thinning, pitting, and erosion.	N/A	N/A	
8.3.4	Measure mixer cutouts and record plate thickness for future mixer installation or replacement. Plate thickness _____.	N/A	N/A	
8.4	Floating Roof Supports			

SGS	Client :	Shell Pakistan Limited		
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	Type Of Inspection :		Out of Service Inspection	

8.4.1	Inspect fixed low and removable high floating roof legs for thinning.	N/A	N/A
8.4.2	Inspect for notching at bottom of legs for drainage.	N/A	N/A
8.4.3	Inspect for leg buckling or felling at bottom.	N/A	N/A
8.4.4	Inspect pin hole in roof guide for tears.	N/A	N/A
8.4.5	Check plumb of all legs.	N/A	N/A
8.4.6	Inspect for adequate reinforcing gussets on all legs through a single portion of the roof.	N/A	N/A
8.4.7	Inspect the area around the roof legs for cracking if there is no internal reinforcing pad or if the topside pad is not welded to the deck plate on the underside.	N/A	N/A
8.4.8	Inspect the sealing system on the two-position legs and the vapor plugs in the fixed low leg for deterioration of the gaskets.	N/A	N/A
8.4.9	On shell-mounted roof supports, check for adequate clearance based on the maximum floating roof movement as determined by the position of the roof relative to the gauge well and/or counter-rotational device.	N/A	N/A
9	FLOATING ROOF SEAL ASSEMBLIES		
9.1	Primary Shoes Assembly		
9.1.1	Remove four sections of foam log (foam-filled seals) for inspection on 90° locations.	N/A	N/A
9.1.2	Inspect hanger attachment to roof rim for thinning, bending, broken welds, and wear of pin holes.	N/A	N/A
9.1.3	Inspect clips welded to roof rim for thinning.	N/A	N/A
9.1.4	Shoes-inspect for thinning and holes in shoes.	N/A	N/A
9.1.5	Inspect for bit-metal bolts, clips, and attachment.	N/A	N/A
9.1.6	Seal fabric-inspect for deterioration, stiffening, holes, and tears in fabric.	N/A	N/A
9.1.7	Measure length of fabric from top of shoe to roof rim, and check against maximum anticipated annular space as roof operates.	N/A	N/A
9.1.8	Inspect any modification of shoes over shell nozzles, mixers, etc., for clearance.	N/A	N/A
9.1.9	Inspect shoes for damage caused by striking shell nozzles, mixers, etc.	N/A	N/A
9.2	Primary Toroidal Assembly		
9.2.1	Inspect seal fabric for wear, deterioration, holes, and tears.	N/A	N/A
9.2.2	Inspect hold-down system for buckling or bending.	N/A	N/A
9.2.3	Inspect foam for liquid absorption and deterioration.	N/A	N/A
9.3	Rim-Mounted Secondaries		
9.3.1	Inspect the rim-mounted bolting bar for corrosion and broken welds.	N/A	N/A
9.3.2	Measure and chart seal-to-shell gaps.	N/A	N/A
9.3.3	Visually inspect seam from below, looking for holes as evidenced by light.	N/A	N/A
9.3.4	Inspect fabric for deterioration and stiffness.	N/A	N/A
9.3.5	Inspect for mechanical damage, corrosion, and wear on tip in contact with shell.	N/A	N/A

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	Type Of Inspection :					
9.3.6	Inspect for contact with obstructions above top of shell.	N/A	N/A			
10	FLOATING ROOF APPURTENANCES					
10.1	Roof Manways					
10.1.1	Inspect walls of manways for pitting and thinning.	N/A	N/A			
10.1.2	On tanks with interface autogauges, check seal around gauge tape cable and guide wires through manway cover.	N/A	N/A			
10.1.3	Inspect cover gasket and bolts.	N/A	N/A			
10.2	Rim Vent					
10.2.1	Check rim vent for fitting and holes.	N/A	N/A			
10.2.2	Check vent for condition of screen.	N/A	N/A			
10.2.3	On floating roof tanks where the environmental rules require closing off the vent, check the vent pipe for corrosion at the pipe-to-rim joint and check that the blinding is adequate.	N/A	N/A			
10.3	Vacuum Breaker, Breather Type					
10.3.1	Service and check operation of breather valve.	N/A	N/A			
10.3.2	Check that nozzle pipe projects no more than 1/2 in. below roof deck.	N/A	N/A			
10.4	Vacuum Breaker, Mechanical Type					
10.4.1	Inspect the stem for thinning. Measure how far the vacuum breaker cover is raised off the pipe when the roof is resting on high or low legs.	N/A	N/A			
a.	On high legs :	N/A	N/A			
b.	On low legs :	N/A	N/A			
10.5	Roof Drains : Open Systems, Including Emergency Drains.					
10.5.1	Check liquid level inside open roof drains for adequate freeboard. Report if there is insufficient distance between liquid level and top of drain.	N/A	N/A			
10.5.2	If tanks comes under Air Quality Monitoring District rules, inspect the roof drain vapor plug.	N/A	N/A			
10.5.3	If emergency is not at the center of the roof, check that there are at least three emergency drains.	N/A	N/A			
10.6	Closed Drain System : Drain Basins					
10.6.1	Inspect for thinning and pitting.	N/A	N/A			
10.6.2	Inspect protective coating (topside).	N/A	N/A			
10.6.3	Inspect basin cover or screen for corrosion.	N/A	N/A			
10.6.4	Test operation of check valve.	N/A	N/A			
10.6.5	Check for presence of check valve where bottom of basin is below product level.	N/A	N/A			
10.6.6	Inspect drain basin(s) to roof deck welds for cracking.	N/A	N/A			
10.6.7	Check drain basin(s) outlet pipe for adequate reinforcement to roof deck (including reinforcing pad).	N/A	N/A			
10.7	Closed Drain Systems : Fixed Drain Line on Tank Bottom					
10.7.1	Hammer test fixed drain line on tank bottom for thinning and scale/debris plugging.	N/A	N/A			
10.7.2	Inspect supports and reinforcing pads for weld failures and corrosion.	N/A	N/A			
10.7.3	Check that pipe is guided, not rigidly locked to support, to avoid tearing of tank bottom plate.	N/A	N/A			

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10.8	Closed Drain Systems : Flexible Pipe Drain		
10.8.1	Inspect for damage to exterior of pipe.	N/A	N/A
10.8.2	Check for obstructions that pipe could catch on.	N/A	N/A
10.8.3	Inspect shields to protect pipe from snagging.	N/A	N/A
10.8.4	Inspect results of hydrostatic test on flexible roof drain system.	N/A	N/A
10.9	Closed Drain System : Articulated Joint Drain		
10.9.1	Hammer test rigid pipe in flexible joint systems for thinning and scale/debris plugging.	N/A	N/A
10.9.2	Inspect system for signs of bending or strain.	N/A	N/A
10.9.3	Inspect results of system hydrostatic test.	N/A	N/A
10.9.4	Inspect landing leg and pad.	N/A	N/A
10.10	Autogauge System and Alarms		
10.10.1	Check freedom of movement of tape through autogauge tape guide.	N/A	N/A
10.10.2	Inspect sheaves for freedom of movement.	N/A	N/A
10.10.3	Test operation checker.	N/A	N/A
10.10.4	Inspect tape and tape cable for twisting and fraying.	N/A	N/A
10.10.5	Test the tape's freedom of movement through guide sheaves and tape guide pipe.	N/A	N/A
10.10.6	On open-top tanks, check that gate tapes with cables have no more than one foot of tape exposed with float at lowest point.	N/A	N/A
10.10.7	Check float for leakage.	N/A	N/A
10.10.8	Test float guide wire anchors for spring action by pulling on wire and releasing.	N/A	N/A
10.10.9	Inspect floatwells in floating roofs for thinning and pitting of walls just above the liquid level.	N/A	N/A
10.10.10	Check that the autogauge tape is firmly attached to the float.	N/A	N/A
10.10.11	Inspect the tape cable and float guide wire fabric seals through the float well cover.	N/A	N/A
10.10.12	Inspect the bottom guide wire attachment clip : inspect for a temporary weighted bar instead of a permanent welded down clip.	N/A	N/A
10.10.13	Inspect board-type autogauge indicators for legibility and freedom of movement of indicator.	N/A	N/A
10.10.14	Measure and record these distances to determine if seal damage will occur if tank is run over from :	N/A	N/A
	1. Shell top angle to underside of tape guide system.	N/A	N/A
	2. Liquid level on floating top to top of secondary seal.	N/A	N/A
10.10.15	Identify floating roofs where the tape is connected directly to the roof.	N/A	N/A
10.10.16	Overfill alarm : Inspect tank overfill prevention alarm switches for proper operation.	N/A	N/A
11	COMMON TANK APPURTENANCES		
11.1	Gauge Well		
11.1.1	Inspect gate well pipe for thinning at about two-thirds distance above the bottom: look for thinning at the edge of the slots.	N/A	N/A

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11.1.2	Check for corrosion on the pipe joint. Check that sample cords, weights, thermometers, etc., have been removed from the pipe.		N/A	N/A
11.1.3	Check for cone at bottom end of pipe about one foot above the bottom.		N/A	N/A
11.1.4	Check condition of well washer pipe and that its flared end is directed at the near side of the hold of pad.		N/A	N/A
11.1.5	Check that supports for gauge well are welded to pad or to shell and no directly to bottom plate.		N/A	N/A
11.1.6	Check operation of gauge well cover.		N/A	N/A
11.1.7	Check presence of a hold-off distance marker in well pipe and record hold-off distance. Hold-off distance _____.		N/A	N/A
11.1.8	Identify and report size and pipe schedule, and whether pipe is solid or slotted. Report slot size.		N/A	N/A
11.1.9	Check that the hold-off distance plate is seal-welded to the bottom and that any gauge well supports are welded to the plate and not directly to the bottom.		N/A	N/A
11.1.10	Inspect vapor control float and cable.		N/A	N/A
11.1.11	Check for presence and condition of gauge well washer.		N/A	N/A
11.1.12	Check for bull plug or plate blind on gauge well washer valve.		N/A	N/A
11.1.13	Inspect gauge well guide in floating roof for pitting and thinning.		N/A	N/A
11.1.14	Inspect the guide rollers and sliding plates for freedom of movement.		N/A	N/A
11.1.15	Inspect condition of gauge well pipe seal system.		N/A	N/A
11.1.16	On black oil and diesel services: if gauge well is also used for sampling, check for presence of a thief-and gauge-type hatch to avoid spillage.		N/A	N/A
11.1.17	Visually inspect inside of pipe for pipe weld protrusions which could catch or damage vapor control float.		N/A	N/A
11.2	Sampling Systems : Roof Sample Hatches			
11.2.1	Inspect roof-mounted sample hatches for reinforcing pads and cracking.		✓	Satisfactory
11.2.2	Inspect cover for operation.		✓	Satisfactory
11.2.3	For tanks complying with Air Quality Monitoring District rules, inspect sample hatch covers for adequate sealing.		✓	Satisfactory
11.2.4	Check horizontal alignment of internal floating roof sample hatches under fixed roof hatches.		N/A	N/A
11.2.5	Inspect the sealing system on the internal floating roof sample hatch cover.		N/A	N/A
11.2.6	Inspect floating roof sample hatch cover recoil reel and rope.		N/A	N/A
11.3	Shell Nozzles			
11.3.1	Inspect shell nozzles for thinning and pitting.		✓	Satisfactory
11.3.2	Inspect hot tap nozzles for trimming of holes.		✓	Satisfactory
11.3.3	Identify type of shell nozzles.		✓	See report
11.3.4	Identify and describe internal piping, including elbow-up and elbow-down types.		N/A	N/A
11.4	For Nozzles Extended Into the Tank			

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11.4.1	Inspect pipe support pads welded to tank bottom.	✓	Satisfactory	
11.4.2	Inspect to see that pipe is free to move along support without strain or tearing action on bottom plate.	✓	Satisfactory	
11.4.3	Inspect nozzle valves for packing leaks and damaged flange faces.	✓	Satisfactory	
11.4.4	Inspect heater stream nozzle flanges and valves for wire cutting.	N/A	N/A	
11.4.5	Report which nozzles have thermal pressure relief bosses and valves.	N/A	N/A	
11.4.6	In internal elbow-down fill line nozzles, inspect the wear plate on the tank bottom.	N/A	N/A	
11.4.7	On elbow-up fill lines in floating roof tanks, check that opening is directed against underside of roof, not against vapor space. Inspect impact area for erosion.	N/A	N/A	
11.5	Diffusers and Air Rolling Systems			
11.5.1	Inspect diffuser pipe for erosion and thinning.	N/A	N/A	
11.5.2	Check holes in diffuser for excessive wear and enlargement.	N/A	N/A	
11.5.3	Inspect diffuser supports for damage and corrosion.	N/A	N/A	
11.5.4	Check that diffuser supports restrain, not anchor, longitudinal line movement.	N/A	N/A	
11.5.5	Inspect air spiders on bottom of lube oil tanks for plugging and damaged or broken threaded joints.	N/A	N/A	
11.6	Swing Lines			
11.6.1	Inspect flexible joint for cracks and leaks.	N/A	N/A	
11.6.2	Scribe the flexible joint across the two moving faces and raise end of swing line to check the joint's freedom of movement, indicated by separation of scribe marks.	N/A	N/A	
11.6.3	Check that flexible joints over 6 in. are supported.	N/A	N/A	
11.6.4	Inspect the swing pipe for deep pitting and weld corrosion.	N/A	N/A	
11.6.5	Loosen the vent plugs in the pontoons and listen for a vacuum. Lack of a vacuum indicates a leaking pontoon.	N/A	N/A	
11.6.6	Check the results of air test on pontoons during repairs.	N/A	N/A	
11.6.7	Inspect the pontoons for pitting.	N/A	N/A	
11.6.8	Inspect the pull-down cable connections to the swing.	N/A	N/A	
11.6.9	Inspect the condition of the bottom-mounted support, fixed roof limiting bumper, or shell-mounted limiting bumper for wood condition, weld and bolt corrosion, and seal welding to bottom or shell.	N/A	N/A	
11.6.10	Inspect safety hold-down chain for corrosion and weak links.	N/A	N/A	
11.6.11	Check that there is a welded reinforcing pad where the chain connects to the bottom.	N/A	N/A	
11.6.12	If the floating swing in a floating or internal floating roof tank does not have a limiting device preventing the swing from exceeding 60 degrees, measure and calculate the maximum angle possible with the roof on overflow. Max. angle on Overflow : (If the calculated angle exceeds 65 degrees, recommended installation of a limiting bracket.):	N/A	N/A	
11.6.13	Inspect pull-down cable for fraying.	N/A	N/A	

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11.6.14	Inspect for three cable clamps where cable attaches to end of swing line (single-reeved) or to roof assembly (double-reeved). Inspect sheaves for freedom of movement.	N/A	N/A
11.6.15	Inspect winch operation and check the height indicator for legibility and accuracy.	N/A	N/A
11.6.16	Inspect bottom-mounted sheave assembly at end of pontoon for freedom of rotation of sheave.	N/A	N/A
11.6.17	Inspect shell-mounted lower sheave assembly for freedom of rotation of sheave, corrosion thinning, and pitting of sheave housing.	N/A	N/A
11.6.18	Inspect upper sheave assembly for freedom of movement of sheave.	N/A	N/A
11.6.19	Inspect the cable counterbalance assembly for corrosion and freedom of operation.	N/A	N/A
11.7	Manway Heater Racks		
11.7.1	Inspect the manway heater racks for broken welds and bending of the sliding rails.	N/A	N/A
11.7.2	Measure and record the length of the heater and length of the track.	N/A	N/A
11.8	Mixer Wear Plates and Deflector Stands		
11.8.1	Inspect bottom and shell plates and deflector stands.	N/A	N/A
11.8.2	Inspect for erosion and corrosion on the wear plates. Inspect for rigidity, structural soundness, corrosion, and erosion of deck plates and reinforcing pads that are seal-welded to the bottom under the deflector stand legs.	N/A	N/A
11.8.3	Measure for propeller clearance between the bottom of deflector stand and roof when the roof is on low legs.	N/A	N/A
12	ACCESS STRUCTURES		
12.1	Handrails		
12.1.1	Identify and report type (steel pipe, galvanized pipe, square tube, angle) and size of handrails.	✓	Satisfactory
12.1.2	Inspect for pitting and holes, paint failure.	✓	paint failure
12.1.3	Inspect attachment welds.	✓	Satisfactory
12.1.4	Identify cold joints and sharp edges. Inspect the handrails and midrails.	✓	Satisfactory
12.1.5	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	N/A	N/A
12.1.6	Inspect the handrail between the rolling ladder and the gauging platform for the hazardous opening when the floating roof is at its lowest level.	N/A	N/A
12.2	Platform Frame		
12.2.2	Inspect frame for corrosion and paint failure.	✓	Satisfactory
12.2.3	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	✓	Satisfactory
12.2.4	Check reinforcing pads where supports are attached to shell or roof.	✓	Directly welded
12.2.5	Inspect the surface that deck plate or grating rests on, for thinning and holes.	N/A	N/A

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12.2.6	Check that flat-surface-to-flat-surface junctures are seal-welded.	N/A	N/A	
12.3	Deck Plate and Grating			
12.3.1	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	N/A	N/A	
12.3.2	Inspect plate-to-frame weld for rust scale buildup.	N/A	N/A	
12.3.3	Inspect grating for corrosion-caused thinning of bars and failure of welds.	N/A	N/A	
12.3.4	Check grating tie down clips. Where grating has been retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.	N/A	N/A	
12.4	Stairway Stringers			
12.4.1	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	✓	Satisfactory	
12.4.2	Inspect stairway supports to shell welds and reinforcing pads.	✓	directly welded	
12.4.3	Inspect steel support attachment to concrete base for corrosion.	N/A	N/A	
12.5	Rolling Ladder			
12.5.1	Inspect rolling ladder stringers for corrosion.	N/A	N/A	
12.5.2	Identify and inspect ladder fixed rungs (square bar, round bar, angles) for weld attachment to stringers and corrosion, particularly where angle rungs are welded to stringers.	N/A	N/A	
12.5.3	Check for wear and corrosion where rolling ladder attaches to gauging platform.	N/A	N/A	
12.5.4	Inspect pivot bar for wear and secureness.	N/A	N/A	
12.5.5	Inspect operation of self-leveling stairway treads.	N/A	N/A	
12.5.6	Inspect for corrosion and wear on moving parts.	N/A	N/A	
12.5.7	Inspect rolling ladder wheels for freedom of movement, flat spots, and wear on axle.	N/A	N/A	
12.5.8	Inspect alignment of rolling ladder with roof rack.	N/A	N/A	
12.5.9	Inspect top surface of rolling ladder track for wear by wheels to assure at least 18 in. Of unworn track (track long enough).	N/A	N/A	
12.5.10	Inspect rolling ladder track welds for corrosion.	N/A	N/A	
12.5.11	Inspect track supports on roof for reinforcing pads seal-welded to deck plate.	N/A	N/A	
12.5.12	Check by dimensioning, the maximum angle of the rolling ladder when the roof is on low legs. Max.angle _____.	N/A	N/A	
12.5.13	If rolling ladder tracks extends to within 5ft of the edge of the roof on the far side, check for a handrail on the top of the shell on that side.	N/A	N/A	

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1.5. Visual Inspection Checklist

In-service inspection check list

No.	Item	Completed	Comments
		√	
1	FOUNDATION		
1.0.1	Measure foundation levelness and bottom elevations.	√	Satisfactory
1.1	Concrete Ring		
1.1.1	Inspect for broken concrete, spalling and cracks, particularly under backup bars used in welding Butt-welded annular rings under the shell.	√	See report
1.1.2	Inspect drain openings in ring, back of water draw basins and top surface of ring for indications of bottom leakage.	√	Satisfactory
1.1.3	Inspect for cavities under foundation and vegetation against bottom of tank.	√	Vegetation observed . need to be removed
1.1.4	Check that runoff rainwater from the shell drains away from tank.	√	Satisfactory
1.1.5	Check for settlement around perimeter of tank.	√	See survey report
1.2	Cement/ asphalt		
1.2.1	Check for settling of tank into cement/asphalt base which would direct runoff rain water under the tank instead of away from it.	√	See report
1.2.2	Look for areas where leaching of oil has left rock filler exposed, which indicates hydrocarbon leakage.	√	Satisfactory
1.3	Oiled Dirt or Sand		
1.3.1	Check for settlement into the base which would direct runoff rain water under the tank rather than away from it.	√	Satisfactory
1.4	Rock		
1.4.1	Presence of crushed rock under the steel bottom usually results in severe underside corrosion. Make a note to do additional bottom plate examination (ultrasonic, hammer testing or turning of coupons) when the tank is out of service.	√	Satisfactory
1.5	Site Drainage		
1.5.1	Check site for drainage away from the tank and associated piping and manifolds.	√	Satisfactory
1.5.2	Check operating condition of the dike drains.	√	Minor cracks
1.6	Housekeeping		
1.6.1	Inspect the area for buildup of trash, vegetation and other inflammables buildup.	√	Satisfactory
2	SHELLS		
2.1	External Visual Inspection		
2.1.1	Visually inspect for paint failures, pitting and corrosion.	√	Minor paint failure external side
2.1.2	Clean off the bottom angle area and inspect for corrosion and thinning on plate and weld.	√	Satisfactory
2.1.3	Inspect the bottom-to-foundation seal, if any.	√	Satisfactory
2.2	Internal (Floating Roof Tank)		



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2.2.2	Visually inspect for grooving, corrosion, pitting and coating failures.	N/A	N/A
2.3 Riveted Shell Inspection			
2.3.1	Inspect external surface for rivet and seam leaks.	N/A	N/A
2.3.2	Locate leaks by sketch or photo (location will be lost when shell is abrasive cleaned for painting)	N/A	N/A
2.3.3	Inspect rivets for corrosion loss and wear.	N/A	N/A
2.3.4	Inspect vertical seams to see if they have been full fillet lap-welded to increase joint efficiency.	N/A	N/A
2.3.5	If no record exists of vertical riveted seams, dimension and sketch (or photograph) the rivet pattern : number of rows, rivet size, pitch length and note whether the joint is butt-riveted or lap-riveted.	N/A	N/A
2.4 Wind Girder (Floating Roof Tanks)			
2.4.1	Inspect wind girder and handrail for corrosion damage (paint failure, pitting, corrosion product buildup), especially where it occurs at tack-welded junction and for broken welds.	N/A	N/A
2.4.2	Check support welds to shell for pitting, especially on shell plates.	N/A	N/A
2.4.3	Note whether supports have reinforcing pads welded to shell.	N/A	N/A
3 SHELL APPURTENANCES			
3.1 Manways and Nozzles			
3.1.1	Inspect for cracks or signs of leakage on weld joint at nozzles, manways and reinforcing plates.	✓	Satisfactory
3.1.2	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.	✓	Satisfactory
3.1.3	Inspect for flange leaks and leaks around bolting.	✓	Satisfactory
3.1.4	Inspect sealing of insulation around manways and nozzles.	N/A	N/A
3.1.5	Check for inadequate manway flange and cover thickness on mixer manways.	N/A	N/A
3.2 Tank Piping Manifolds			
3.2.1	Inspect manifold piping, flanges and valves for leaks.	✓	Satisfactory
3.2.2	Inspect fire fighting system components.	✓	Satisfactory
3.2.3	Check for anchored piping which would be hazardous to the tank shell or bottom connections during earth movement.	✓	Satisfactory
3.2.4	Check for adequate thermal pressure relief of piping to the tank.	✓	Satisfactory
3.2.5	Check operation of regulators for tanks with purge gas systems.	✓	Satisfactory
3.2.6	Check sample connections for leaks and for proper valve operation.	✓	Satisfactory
3.2.7	Check for damage and test the accuracy of temperature indicators.	✓	Satisfactory
3.2.8	Check welds on shell-mounted davit clips above valves 6 in. and larger.	✓	Satisfactory
3.3 Autogauge System			
3.3.1	Inspect autogauge tape guide and lower sheave housing (floating swings) for leaks.	N/A	N/A
3.3.2	Inspect autogauge head for damage.	N/A	N/A
3.3.3	Bump the checker on autogauge head for proper movement of tape.	N/A	N/A

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	Type Of Inspection :		Out of Service Inspection	
3.3.4	Identify size and construction material of autogauge tape guide (floating roof tanks).			N/A
3.3.5	Ask operator if tape tends to hang up during tank roof movement (floating roof tanks).			N/A
3.3.6	Compare actual product level to the reading on the autogauge (maximum variation is 2 in.)			N/A
3.3.7	On floating roof tanks, when the roof is in the lowest position, check that no more than two ft. of tape are exposed at the end of the tape guide.			N/A
3.3.8	Inspect condition of board and legibility of board-type autogauges.			N/A
3.3.9	Test freedom of movement of marker and float.			N/A
3.4 Shell-Mounted Sample Station				N/A
3.4.1	Inspect sample lines for function of valves and plugging of lines, including drain or return-to-tank line.			N/A
3.4.2	Check circulation pump for leaks and operating problems.			N/A
3.4.3	Test bracing and supports for sample lines and equipment.			N/A
3.5 Heater (Shell Manway Mounted)				N/A
3.5.1	Inspect condensate drain for presence of oil indicating leakage.			N/A
3.6 Mixer				
3.6.1	Inspect for proper mounting flange and support.			N/A
3.6.2	Inspect for leakage.			N/A
3.6.3	Inspect condition of power lines and connections to mixer.			N/A
3.7 Swing Lines : Winch Operation				
3.7.1	Nonfloating. Raise, then lower the swing line with the winch and check for cable tightness to confirm that swing line lowered properly.			N/A
3.7.2	Floating. With tank half full or more, lower the swing line, then let out cable and check if swing has pulled cable tight, indicating that the winch is operating properly.			N/A
3.7.3	Indicator. Check that the indicator moves in the proper direction. Floating swing line indicators show a lower level as cable is wound up on the winch. Non-floating swing line indicators show the opposite.			N/A
3.8 Swing Lines : External Guide System				
3.8.1	Check for leaks at threaded and flanged joints.			N/A
3.9 Swing Lines : Identify Ballast Varying Need				
3.9.1	Check for significant difference in stock specific gravity.			N/A
3.10 Swing Lines : Cable Material and Condition				
3.10.1	For nonstainless steel cable, check for corrosion over entire length.			N/A
3.10.2	All cable: Check for wear of fraying.			N/A
3.11 Swing Lines : Product Sample Comparison				
3.11.1	Check for water or gravity differences that would indicate a leaking swing joint.			N/A
3.12 Swing Lines : Target				
3.12.1	Target should indicate direction of swing opening (up or down) and height above bottom where suction will be lost with swing on bottom support.			N/A
4 ROOFS				

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :		Out of Service Inspection	

4.1	Deck Plate Internal Corrosion			
4.1.1	For safety, before accessing the roof, check with ultrasonic instrument or lightly use a ball pen hammer to test the deck plate near the edge of the roof for thinning. Note that: Corrosion normally attacks the deck plate at the edge of a fixed roof and at the rafters in the center of the roof first.	N/A	N/A	N/A
4.2	Deck Plate External Corrosion			
4.2.1	Visually inspect for paint failure, holes, pitting and corrosion product on the roof deck.	N/A	N/A	N/A
4.3	Roof Deck Drainage			
4.3.1	Look for indication of standing water. Significant sagging of fixed roof deck indicates potential rafter failure. Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a nonlevel roof with possible leaking pontoons.	N/A	N/A	N/A
4.4	Level of Floating Roof			
4.4.1	At several locations, measure distance from roof rim to a horizontal weld seam above the roof. A variance in the readings indicates a nonlevel roof with possible shell out-of-round, out-of-plumb, leaking pontoons or hang-up. On small diameter tanks, an unlevel condition can indicate unequal loading at that level.	N/A	N/A	N/A
4.5	Gas Test Internal Floating Roof			
4.5.1	Test for explosive gas on top of the internal floating roof. Readings could indicate a leaking roof, leaking seal system or inadequate ventilation of the area above the internal floating roof.	N/A	N/A	N/A
4.6	Roof Insulation			
4.6.1	Visually inspect for cracks or leaks in the insulation weather coat where runoff rain water could penetrate the insulation.	N/A	N/A	N/A
4.6.2	Inspect for wet insulation under the weather coat.	N/A	N/A	N/A
4.6.3	Remove small test sections of insulation and check roof deck for corrosion and holes near the edge of the insulated area.	N/A	N/A	N/A
4.7	Floating Roof Seal Systems			
4.7.1	Measure and record maximum seal-to-shell gaps at : 1. Low pump out 2. Mid-shell 3. High liquid level	N/A	N/A	N/A
		N/A	N/A	N/A
		N/A	N/A	N/A
		N/A	N/A	N/A
4.7.2	Measure and record annular space at 30-ft. spacing (minimum of four quadrants) around roof and record. Measurements should be taken in directly opposite pairs. 1 Opposite pair 1 2 Opposite pair 2	N/A	N/A	N/A
		N/A	N/A	N/A
		N/A	N/A	N/A
4.7.3	Check if seal fabric on primary shoe seals is pulling shoes away from shell fabric not wide enough)	N/A	N/A	N/A
4.7.4	Inspect fabric for deterioration, holes, tears and cracks.	N/A	N/A	N/A
4.7.5	Inspect visible metallic parts for corrosion and wear.	N/A	N/A	N/A
4.7.6	Inspect for openings in seals that would permit vapor emissions.	N/A	N/A	N/A
4.7.7	Inspect for protruding bolt or rivet heads against the shell.	N/A	N/A	N/A
4.7.8	Pull both primary and secondary seal systems back all around the shell to check their operation.	N/A	N/A	N/A

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number : MCH-04
	Type Of Inspection :		Out of Service Inspection	
4.7.9	Inspect secondary seals for signs of buckling or indications that their angle with the shell is too shallow.	N/A	N/A	
4.7.10	Inspect wedge-type wiper seals for flexibility, resilience, cracks and tears.	N/A	N/A	
5	ROOF APPURTENANCES			
5.1	Sample Hatch			
5.1.1	Inspect condition and functioning of sample of sample hatch cover.	√	Satisfactory	
5.1.2	On tanks governed by Air Quality Monitoring District rules, check for the condition of seal inside hatch cover.	√	Satisfactory	
5.1.3	Check for corrosion and plugging on thief and gauge hatch cover.	√	Satisfactory	
5.1.4	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	√	Satisfactory	
5.1.5	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	√	Satisfactory	
5.1.6	On floating roof sample hatch and recoil systems, inspect operation of recoil reel and condition of rope.	N/A	N/A	
5.1.7	Test operation of system.	N/A	N/A	
5.1.8	On ultra clean stocks such as JP4, check for presence and condition of protective coating or liner inside sample hatch (preventing rust from pipe getting into sample).	N/A	N/A	
5.2	Gauge Well			
5.2.1	Inspect visible portion of the gauge well for thinning, size of slots and cover condition.	N/A	N/A	
5.2.2	Check for a hold-off distance marker and tab with hold-off distance (legible).	N/A	N/A	
5.2.3	On floating roofs, inspect condition of roof guide for gauge well, particularly the condition of the rollers for grooving.	N/A	N/A	
5.2.4	If accessible, check the distance from the gauge well pipe to the tank shell at different levels.	N/A	N/A	
5.2.5	If tank has a gauge well washer, check valve for leakage and for presence of a bull plug or blind flange.	N/A	N/A	
5.3	Fixed Roof Scaffold Support			
5.3.1	Inspect scaffold support for corrosion, wear and structural soundness.	N/A	N/A	
5.4	Autogauge : Inspection Hatch and Guides (Fixed Roof)			
5.4.1	Check the hatch for corrosion and missing bolts.	√	N/A	
5.4.2	Look for corrosion on the tape guide's and float guide's wire anchors.	N/A	N/A	
5.5	Autogauge : Float Well Cover			
5.5.1	Inspect for corrosion.	N/A	N/A	
5.5.2	Check tape cable for wear or fraying caused by rubbing on the cover.	N/A	N/A	
5.6	Sample Hatch (Internal Floating Roof)			
5.6.1	Check overall conditions.	N/A	N/A	
5.6.2	When equipped with a fabric seal, check for automatic sealing after sampling.	N/A	N/A	

SGS	Client : Job Number :	Shell Pakistan Limited 5010465	Tank Number : MCH-04
	Type Of Inspection : Out of Service Inspection		
5.6.3	When equipped with a recoil reel opening device, check for proper operations.	N/A	N/A
5.7	Roof-Mounted Vents (Internal Floating Roof)		
5.7.1	Check condition of screens, locking and pivot pins.	N/A	N/A
5.8	Gauging Platform Drip Ring		
5.8.1	On fixed roof tanks with drip rings under the gauging platform or sampling area, inspect for plugged drain return to the tank.	√	N/A
5.9	Emergency Roof Drains		
5.9.1	Inspect vapor plugs for emergency drain: that seal fabric discs are slightly smaller than the pipe ID and that fabric seal is above the liquid level.	N/A	N/A
5.10	Removable Roof Leg Racks		
5.10.1	Check for leg racks on roof.	N/A	N/A
5.11	Vacuum Breakers		
5.11.1	Report size, number and type of vacuum breakers. Inspect vacuum breakers. If high legs are set, check for setting of mechanical breaker in high leg position.	N/A	N/A
5.12	Rim Vents		
5.12.1	Check condition of the screen on the rim vent cover.	N/A	N/A
5.12.2	Check for plating off or removal of rim vents where jurisdictional rules do not permit removal.	N/A	N/A
5.13	Pontoon Inspection Hatches		
5.13.1	Open pontoon inspection hatch covers and visually check inside for pontoon leakage.	N/A	N/A
5.13.2	Test for explosive gas (an indicator of vapor space leaks).	N/A	N/A
5.13.3	If pontoon hatches are equipped with locked down coves, check for vent tubes. Check that vent tubes are not plugged up. Inspect lock-down devices for condition and operation.	N/A	N/A
5.13.4	Test for explosive gas (an indicator of vapor space leaks).	N/A	N/A
6	ACCESS STRUCTURES		
6.1	Handrails		
6.1.1	Identify and report type (steel pipe, galvanized pipe, square tube, angle) and size of handrails.	√	Satisfactory
6.1.2	Inspect for pitting and holes, paint failure.	√	Paint failure observed on roof plates
6.1.3	Inspect attachment welds.	√	Satisfactory
6.1.4	Identify cold joints and sharp edges. Inspect the handrails and midrails.	√	Satisfactory
6.1.5	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	√	Satisfactory
6.1.6	Inspect the handrail between the rolling ladder and the gaging platform for the hazardous opening when the floating roof is at its lowest level.	√	Satisfactory
6.2	Platform Frame		
6.2.1	Inspect frame for corrosion and paint failure.	√	Satisfactory
6.2.2	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	√	Satisfactory
6.2.3	Check reinforcing pads where supports are attached to shell or roof.	√	Satisfactory

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number : MCH-04
	Type Of Inspection :		Out of Service Inspection	
6.2.4	Inspect the surface that deck plate or grating rests on, for thinning and holes.		✓	Satisfactory
6.2.5	Check that flat-surface-to-flat-surface junctures are seal-welded.		✓	Satisfactory
6.3	Deck Plate and Grating			
6.3.1	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.		N/A	
6.3.2	Inspect plate-to-frame weld for rust scale buildup.		N/A	
6.3.3	Inspect grating for corrosion-caused thinning of bars and failure of welds.		N/A	N/A
6.3.4	Check grating tie down clips. Where grating has been retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.		N/A	N/A
6.4	Stairway Stringers			
6.4.1	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.		✓	Satisfactory
6.4.2	Inspect stairway supports to shell welds and reinforcing pads.		N/A	directly welded with shell plates
6.4.3	Inspect steel support attachment to concrete base for corrosion.		✓	Satisfactory
6.5	Rolling Ladder			
6.5.1	Inspect rolling ladder stringers for corrosion.		N/A	N/A
6.5.2	Identify and inspect ladder fixed rungs (square bar, round bar, angles) for weld attachment to stringers and corrosion, particularly where angle rungs are welded to stringers.		N/A	N/A
6.5.3	Check for wear and corrosion where rolling ladder attaches to gaging platform.		N/A	N/A
6.5.4	Inspect pivot bar for wear and secureness.		N/A	N/A
6.5.5	Inspect operation of self-leveling stairway treads.		N/A	N/A
6.5.6	Inspect for corrosion and wear on moving parts.		N/A	N/A
6.5.7	Inspect rolling ladder wheels for freedom of movement, flat spots, and wear on axle.		N/A	N/A
6.5.8	Inspect alignment of rolling ladder with roof rack.		N/A	N/A
6.5.9	Inspect top surface of rolling ladder track for wear by wheels to assure at least 18 in. of unworn track (track long enough).		N/A	N/A
6.5.10	Inspect rolling ladder track welds for corrosion.		N/A	N/A
6.5.11	Inspect track supports on roof for reinforcing pads seal-welded to deck plate.		N/A	N/A
6.5.12	Check by dimensioning, the maximum angle of the rolling ladder when the roof is on low legs. Max.angle :		N/A	N/A
6.5.13	If rolling ladder tracks extends to within 5ft of the edge of the roof on the far side, check for a handrail on the top of the shell on that side.		N/A	N/A

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

2 Foundation

2.1. Tank Settlement

Tank Settlement survey was carried out to determine the effects of soil settlement on storage tanks.

The minimum number of elevation points shall be as indicated by the following equation:

$$N = D/10$$

Where,

N = the minimum required number of settlement measurement points, but no less than eight. All values shall be rounded to the next higher whole number. The maximum spacing between settlement measurement points shall be 32 ft;

D = the tank diameter, in feet (ft).

The survey data was then be calculated to form a best fit cosine curve.

The permissible out of Plane Settlement is given by the following equation:-

$$S_{max} = (L^2 \times Y \times 11) / 2[(E \times H)]$$

Where,

S = Deflection, in ft (out of plane distortion),

L = Arc length between measurement points, in ft,

Y = Yield strength, in lbf/in²,

E = Young's modulus, in lbf/in²,

H = tank height, in ft.

The survey data is recorded on Table 2-1 : General Detail for Settlement Evaluation, Table 2-2 : Optimum Cosine Curve Base On Survey Data and Figure 2-1 : Graphical Representation of Shell Settlement.

Table 2-1 : General Detail for Settlement Evaluation

Tank Number	MCH-04
Tank Diameter	15,000 mm or 49.213 ft
Tank Shell height	10,000 mm or 32.808 ft
Minimum Number of Settlement Points Required	8
Actual Settlement Point, N	8
Settlement spacing, L	5,890.5 mm or 19.33 ft
Yield stress, Y	36,000 psi
Young's modulus, E	30 MSI
Readings Average ,ao	2.75 mm or 0.11 in.
a1, (2 x Ui x Cos(θ)/N)	-4.27 mm or -0.17 in
b1 , (2 x Ui x Sin(θ)/N)	-0.91 mm or -0.04 in
Si	4.77 mm or 0.19 in.
Smax	22.90 mm or 0.90 in.

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

Table 2-2 : Optimum Cosine Curve Base On Survey Data

Station, ($^{\circ}$)	Measured Reading, U_i (mm)	Reading, U_i (inch)	Perfect Tilt (mm)	Differential Settlement, S_i (mm)	Absolute Finite Difference, S_{max} (mm)	Top Shell Radial Move (mm)
0	0	0.000	-1.5	1.5	1.3	5.4
45	-4	-0.157	-0.9	-3.1	3.9	17.0
90	2	0.079	1.8	0.2	1.8	7.6
135	5	0.197	5.1	-0.1	1.7	7.3
180	10	0.394	7.0	3.0	3.8	16.2
225	5	0.197	6.4	-1.4	1.1	4.6
270	0	0.000	3.7	-3.7	4.8	20.6
315	4	0.157	0.4	3.6	4.7	20.3

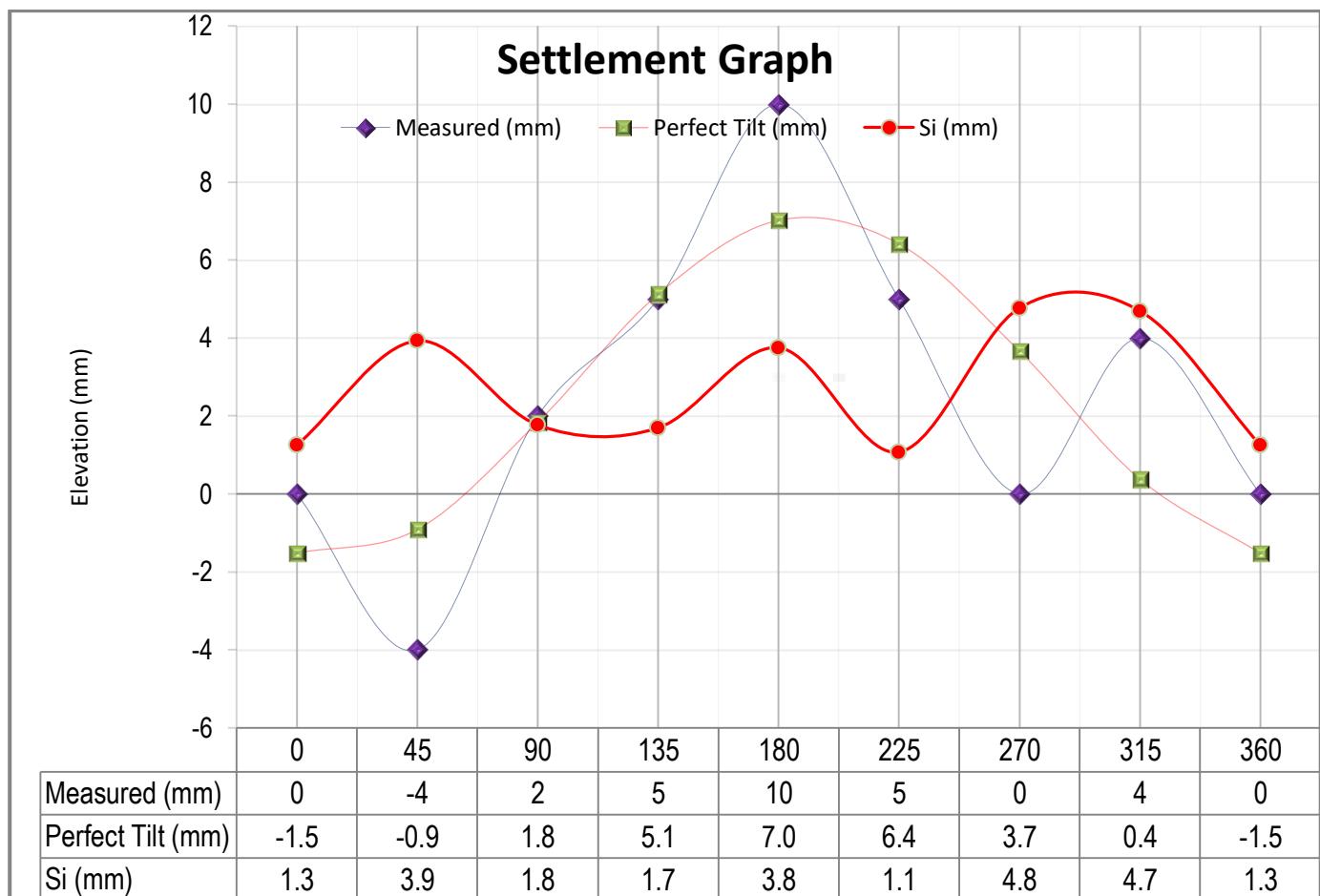


Figure 2-1 : Graphical Representation of Shell Settlement

Conclusion:

The settlement survey is acceptable, the API allowed is 22.9 mm(0.9 inch), and the S_{max} is 4.77mm (0.19inch).

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :	Out of Service Inspection		

2.2. Bottom Plate Settlement

These settlements readings were recorded by taking elevation measurements around the tank circumference and across the tank diameter to create an idea of bottom plate elevation profile.

The survey is only to give an idea of the bottom plate settlement profile. Unless there is severe bulging or depression of the bottom plate noted on the bottom plate during visual inspection, then more inspection/evaluation using API 653 Appendix B should be performed.

Results of Bottom Plate settlement was recorded on Table 2-3 : Bottom Plate Settlement/Elevation Readings.

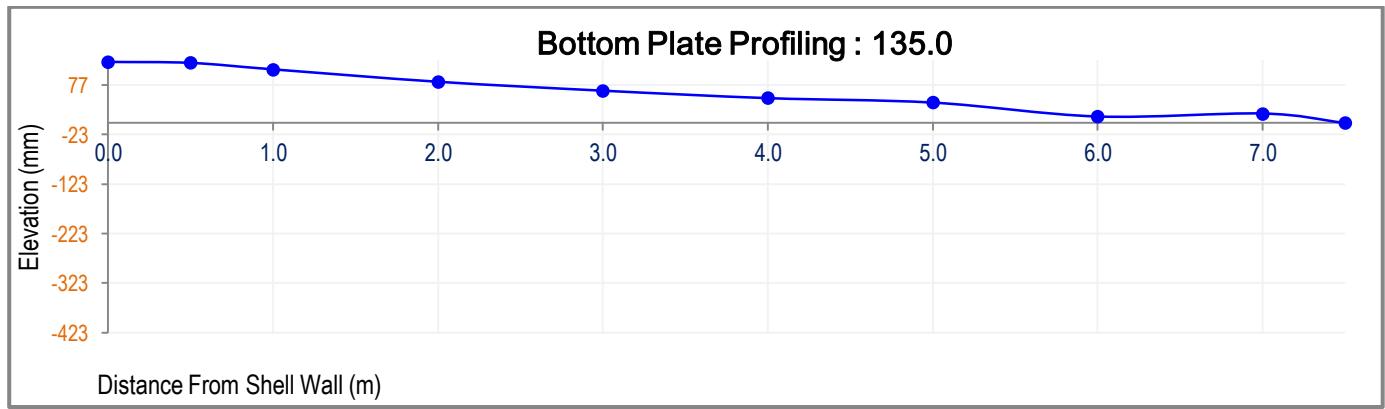
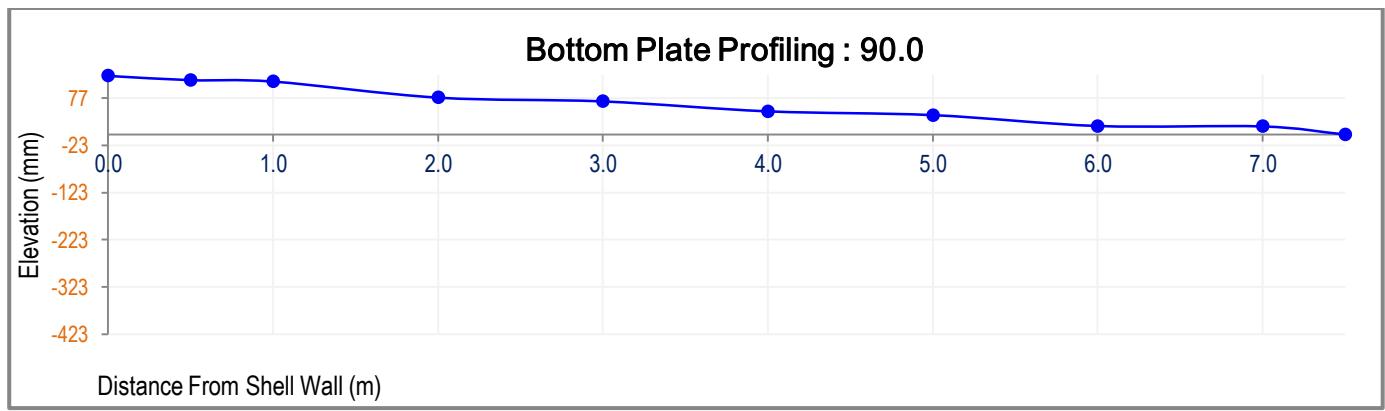
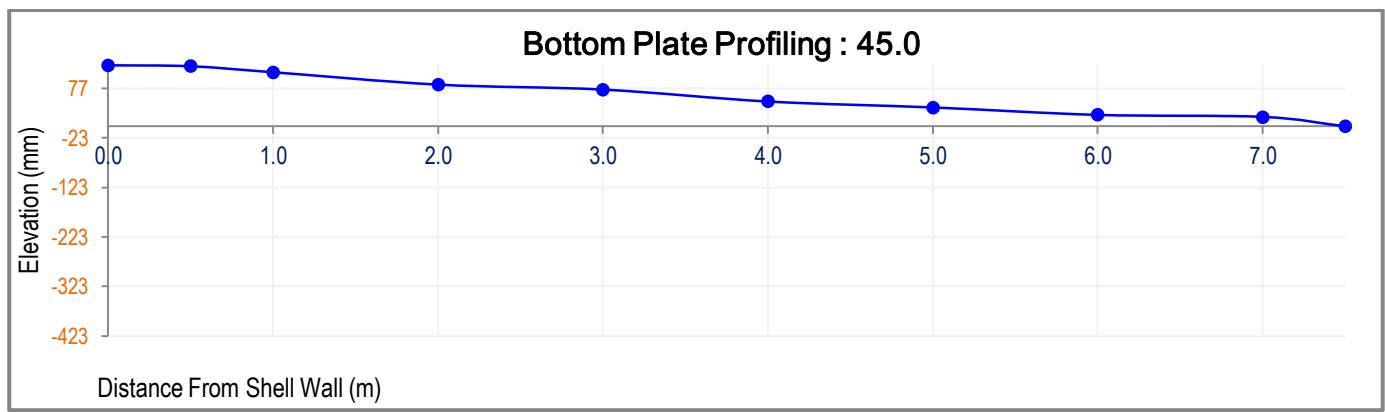
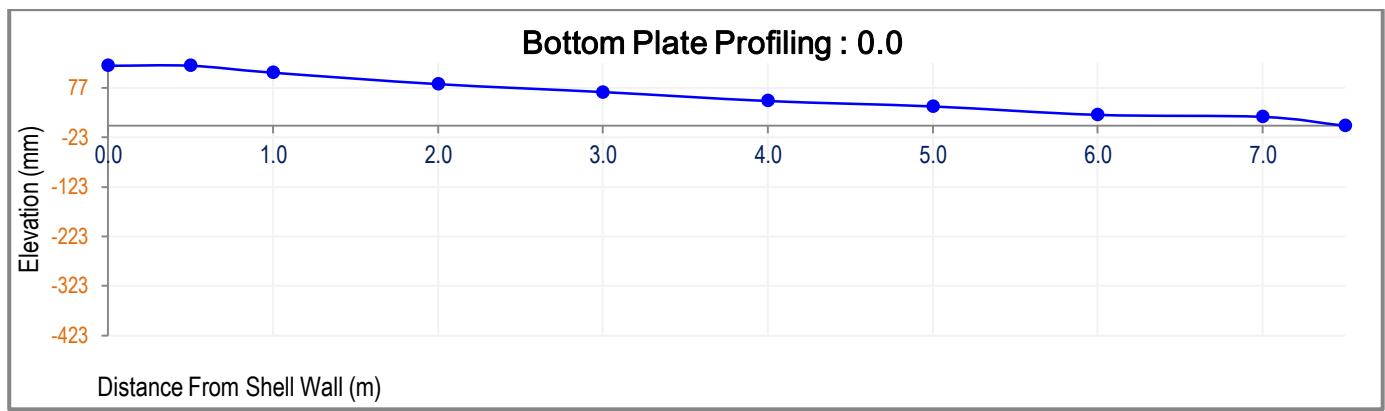
Table 2-3 : Bottom Plate Settlement/Elevation Readings

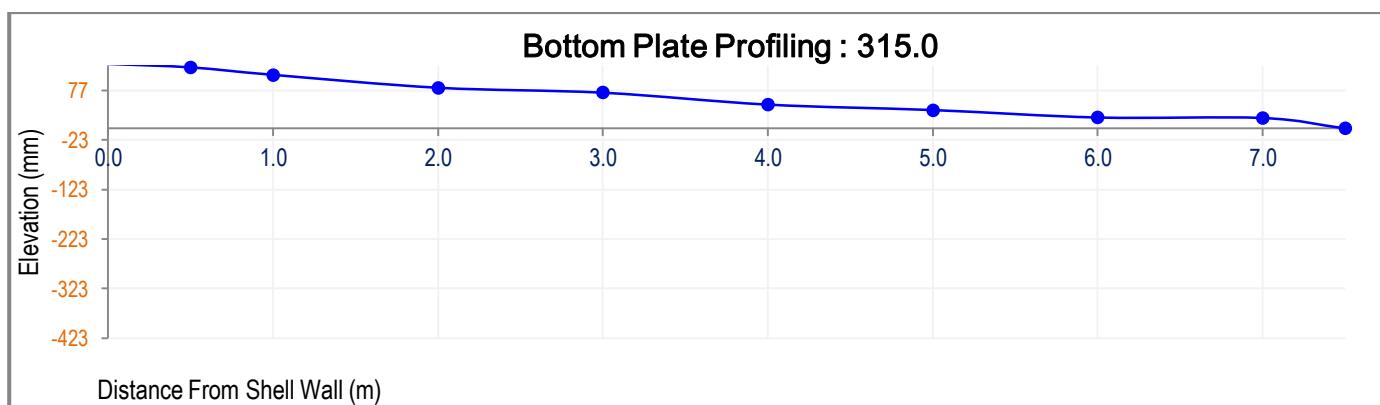
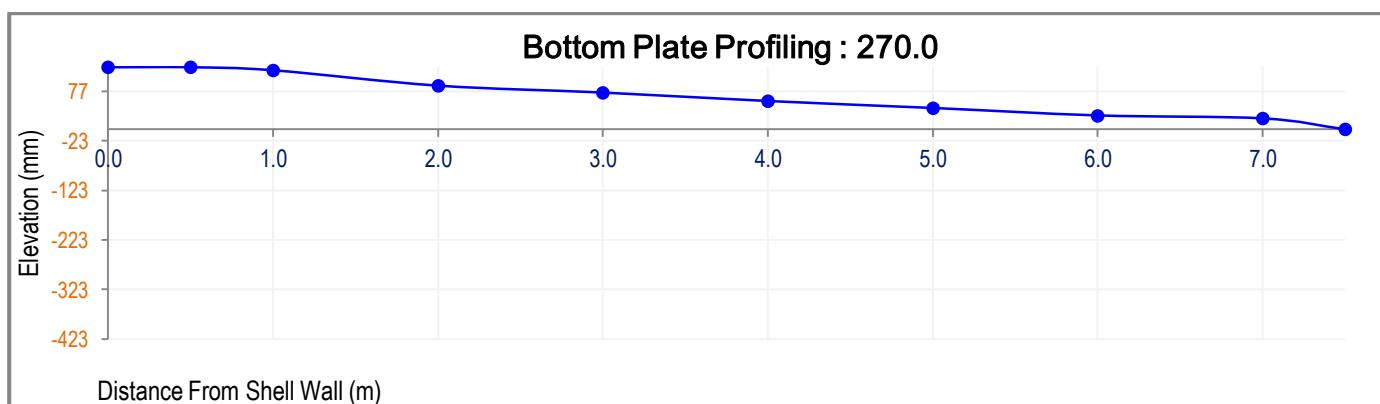
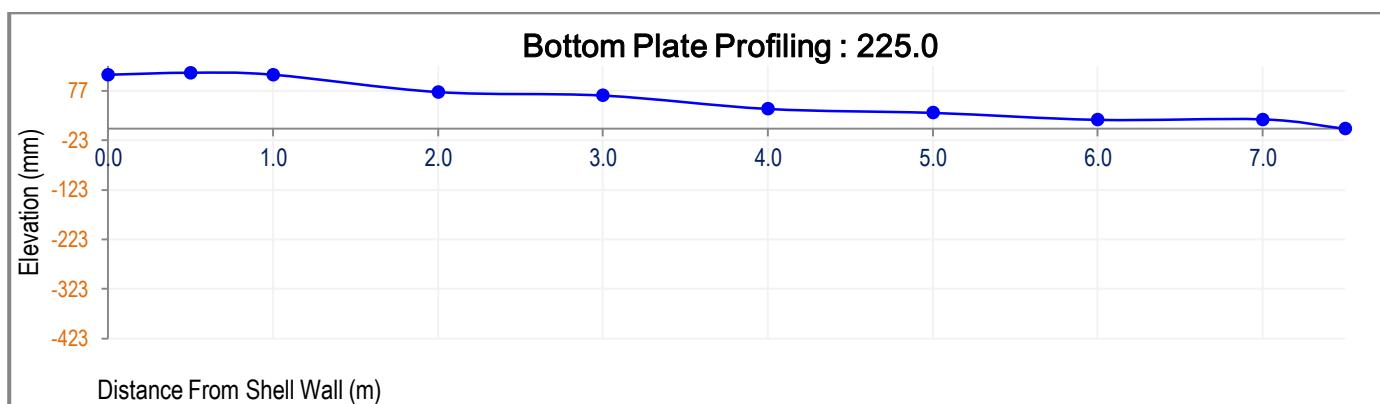
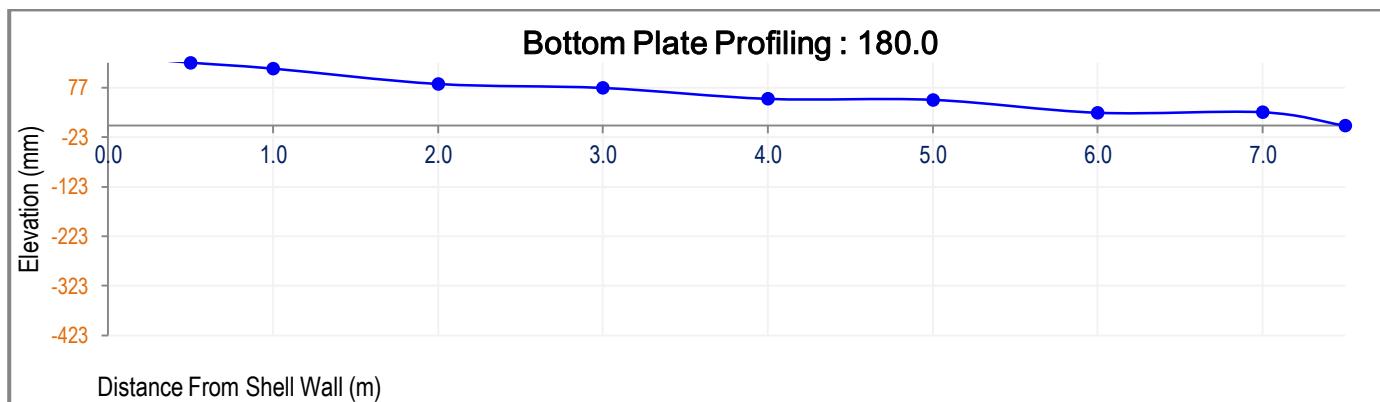
Distance From Shell (m)	Station (°) - Elevation Readings (mm)							
	0	45	90	135	180	225	270	315
0.00	121	123	124	123	141	109	125	130
0.50	121	121	115	121	127	113	125	123
1.00	107	109	112	108	115	109	119	108
2.00	84	84	78	83	84	74	88	82
3.00	68	74	70	65	76	67	74	72
4.00	50	50	49	50	54	40	57	48
5.00	39	38	41	41	52	32	43	37
6.00	22	23	18	13	26	18	28	22
7.00	18	19	17	19	27	19	22	21
7.50	0	0	0	0	0	0	0	0

SGS	Client :	Shell Pakistan Limited
	Job Number :	5010465
	Tank Number :	MCH-04

Type Of Inspection : Out of Service Inspection

Figure 2-2 : Illustration of Bottom Plate Settlement Profiling







Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

3 Ultrasonic Thickness Measurements Report

4 Roof

4.1. Thickness Measurements on Roof Plate

The ultrasonic thickness measurement of roof plates can be carried out using hand held digital instruments.

Thickness measurement is taken on each individual roof plate with a minimum of 5 readings.

For plates which are welded to tank shell or girder, the thickness measurements shall be taken as near as close to frangible joint.

The result of the thickness readings are recorded in Table 4-1 : Thickness Measurements on Roof Plate (mm).

Code Reference

API 653 Paragraph 4.2.1.2 Roof plates corroded to an average thickness of less than 0.09 in. in any 100 in.² area or roof plates with any holes through the roof plate shall be repaired or replaced.

Table 4-1 : Thickness Measurements on Roof Plate (mm)

Plate Number	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1-1	6.17	6.12	6.07	6.15	6.08	6.07
1-2	6.58	5.97	6.04	5.97	6.00	5.97
1-3	5.94	5.94	5.89	5.84	5.96	5.84
2-1	6.04	6.07	6.69	6.09	6.10	6.04
2-2	6.09	5.93	6.02	6.00	5.99	5.93
3-1	5.99	5.91	5.92	5.89	5.92	5.89
3-2	6.14	6.13	6.79	6.09	6.10	6.09
3-3	5.87	6.53	5.88	5.94	5.93	5.87
4-1	6.63	5.92	5.95	5.93	5.94	5.92
4-2	5.98	6.01	6.01	5.98	6.01	5.98
5-1	6.02	5.89	5.92	6.32	6.08	5.89
5-2	6.13	6.23	6.23	6.22	5.90	5.90
5-3	5.86	5.94	5.89	5.94	5.92	5.86
6-1	5.90	6.40	6.17	6.10	6.12	5.90
6-2	6.00	6.00	5.89	5.98	6.06	5.89
7-1	6.57	5.91	6.01	5.95	6.01	5.91
7-2	5.94	6.02	6.01	6.63	6.64	5.94
7-3	6.00	6.01	6.66	6.01	6.01	6.00
C-1	6.05	6.26	6.15	6.06	6.10	6.05
C-2	6.25	6.30	6.34	6.23	6.17	6.17

Table 4-2 : Roof Plate Life Span Calculation

Item	Nominal Thickness (mm)	Minimum Measured Thickness (mm)	Minimum Required Thickness (mm)	Corrosion Rate (mm/Year)	Remaining Life (Years)
Roof Plates	Data Not available	5.84	2.29	0.07857 Taken from MCH-03	45.18

Corrosion rate taken from Tank MCH-03



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

4.2. Thickness Measurements on Roof Nozzles and Reinforcement Plates.

Ultrasonic thickness measurements were taken at quadrants of nozzle neck and reinforcement plate.

Table 4-3 : Thickness Measurements Readings On Roof Nozzle Necks and Reinforcement Plates (mm)

No	Item ID	Item	Nozzle				Reinforcement Plate			
			0 °	90 °	180 °	270 °	0 °	90 °	180 °	270 °
1	N1	8" Sampling Hatch 1	8.34	8.32	8.87	8.18	5.93	5.85	5.90	6.63
2	N2	1.5" Blind Nozzle	3.89	3.90	3.96	3.88	7.56	8.29	8.17	8.29
3	N3	8" Tank Radar	8.20	8.95	8.31	8.42	5.66	5.85	5.96	6.54
4	N4	6" Goose Neck	6.75	6.81	6.75	6.69	5.63	5.81	5.71	5.72
5	MW-1	24" Manhole 1	6.85	6.75	6.80	6.76	7.18	7.32	7.09	7.32
6	MW-2	24" Manhole	6.59	6.63	6.58	6.51	7.22	7.17	7.20	7.23

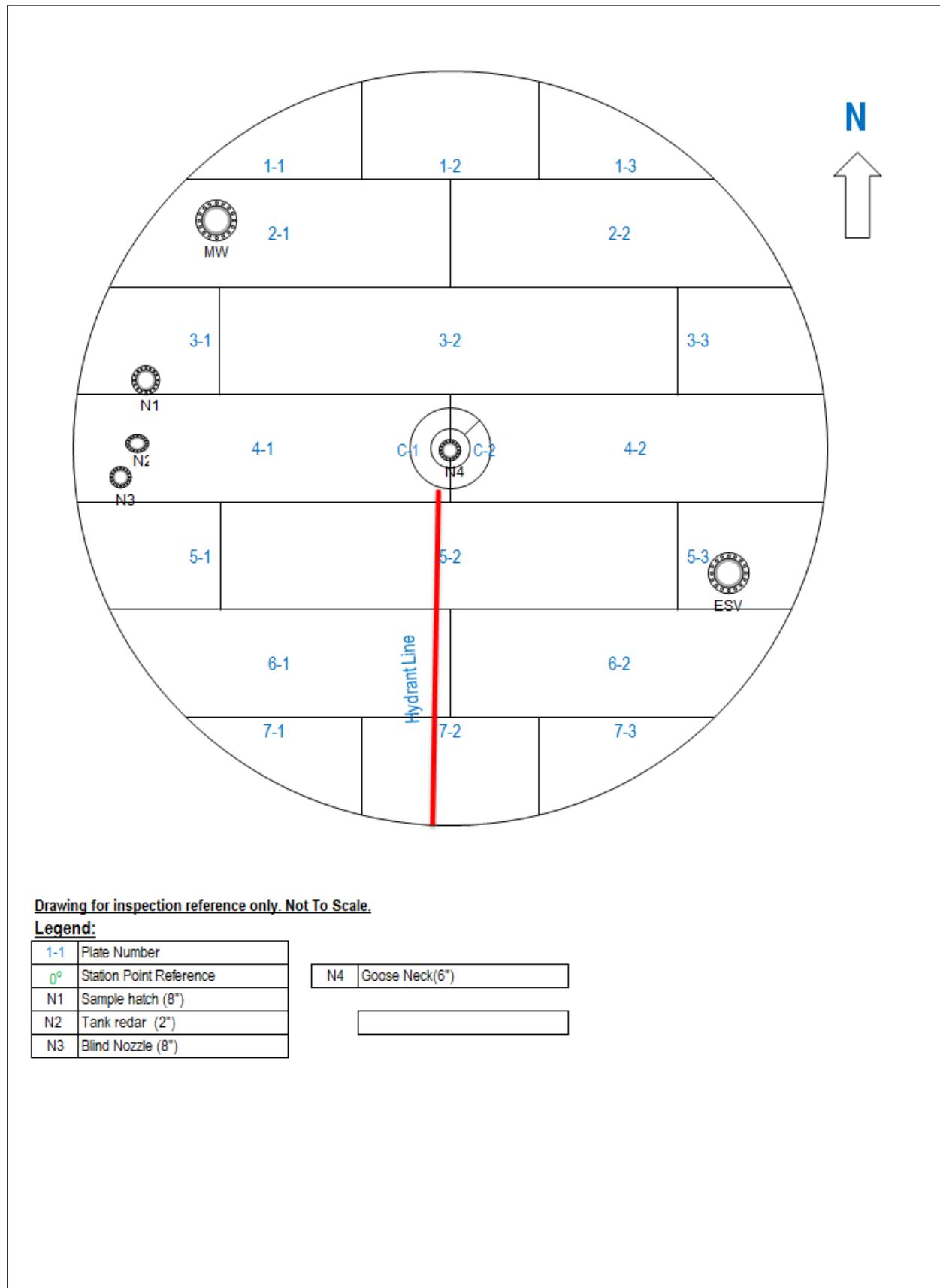


Figure 4-1 : Tank Roof Layout



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

5 Shell

5.1. Thickness Measurements on Shell Plates

Ultrasonic thickness measurements were carried out on the shell plate .

The thickness reading are recorded in Table 5-1 : Thickness Readings at Shell Plate (mm).

Table 5-1 : Thickness Readings at Shell Plate (mm).

Vertical Scan Location/ Station (Degree): 0.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.45	9.93	9.84	9.91	9.88	9.45
2	6.29	6.33	6.33	6.40	6.48	6.29
3	6.17	6.08	6.08	6.20	6.06	6.06
4	6.00	6.12	6.12	6.07	6.11	6.00

Vertical Scan Location/ Station (Degree): 30.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.42	9.70	9.90	9.76	9.83	9.42
2	6.28	6.35	6.30	6.20	6.39	6.20
3	6.31	6.34	6.42	6.40	6.26	6.26
4	6.03	5.88	6.01	5.96	6.90	5.88

Vertical Scan Location/ Station (Degree): 60.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.68	9.75	10.06	9.99	9.84	9.68
2	6.33	6.62	6.57	6.68	6.44	6.33
3	6.05	6.18	6.27	6.24	6.09	6.05
4	6.01	5.97	6.04	5.99	6.04	5.97

Vertical Scan Location/ Station (Degree): 90.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.87	9.83	9.75	9.63	9.89	9.63
2	6.90	6.43	6.40	6.53	6.30	6.30
3	6.03	6.11	5.25	6.19	6.05	5.25
4	6.10	6.03	5.98	6.00	6.09	5.98

Vertical Scan Location/ Station (Degree): 120.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.70	9.95	9.86	9.85	9.91	9.70
2	6.40	6.56	6.44	6.38	6.49	6.38
3	6.12	6.04	5.96	6.10	6.18	5.96
4	6.00	5.92	6.14	6.05	6.11	5.92

Vertical Scan Location/ Station (Degree): 150.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.56	9.76	9.86	9.83	9.89	9.56
2	6.31	6.53	6.20	6.50	6.45	6.20
3	6.13	6.07	6.13	6.21	6.01	6.01
4	6.93	6.00	6.19	5.98	6.07	5.98

Vertical Scan Location/ Station (Degree): 180.0

Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.48	9.61	9.86	9.76	9.80	9.48

SGS	Client :	Shell Pakistan Limited				
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	Type Of Inspection :	Out of Service Inspection				

2	6.15	6.63	6.45	6.60	6.38	6.15
3	6.56	6.21	6.08	6.19	6.20	6.08
4	5.99	6.01	6.13	6.15	6.11	5.99

Vertical Scan Location/ Station (Degree): 210.0						
Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.59	9.80	9.78	9.38	9.76	9.38
2	6.50	6.66	6.38	6.27	6.29	6.27
3	6.18	6.22	6.31	6.15	6.30	6.15
4	6.01	6.02	5.98	5.94	6.00	5.94

Vertical Scan Location/ Station (Degree): 240.0						
Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.43	9.70	9.84	9.77	9.82	9.43
2	6.63	6.59	6.43	6.66	6.31	6.31
3	6.53	6.19	6.27	6.19	6.30	6.19
4	6.10	6.08	5.91	6.11	6.09	5.91

Vertical Scan Location/ Station (Degree): 270.0						
Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.55	9.53	9.71	9.68	9.79	9.53
2	6.13	6.01	5.96	6.46	6.13	5.96
3	6.39	6.11	6.01	6.31	6.29	6.01
4	6.40	6.19	6.36	6.11	6.03	6.03

Vertical Scan Location/ Station (Degree): 300.0						
Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.58	9.86	9.96	10.01	9.95	9.58
2	6.11	6.33	6.15	6.11	5.95	5.95
3	6.09	6.19	6.11	6.09	6.00	6.00
4	5.99	6.01	6.39	6.19	6.09	5.99

Vertical Scan Location/ Station (Degree): 330.0						
Course No.	Point 1	Point 2	Point 3	Point 4	Point 5	Minimum Reading
1	9.47	9.98	10.03	10.00	9.89	9.47
2	6.11	6.19	5.96	6.19	6.31	5.96
3	6.05	6.03	6.30	6.13	6.09	6.03
4	6.45	5.99	6.27	6.24	6.11	5.99

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

5.2. Shell Plate Acceptable Thickness Calculation

The minimum acceptable thickness for entire shell course, t_{min} is calculated as follows:-

$$t_{min} = \frac{2.6(H-1)DG}{SE}$$

where

- t_{min} is the minimum acceptable thickness, in inches for each course as calculated from the above equation; however, t_{min} shall not be less than 0.1 in. for any tank course;
- D is the nominal diameter of tank, in feet (ft);
- H is the height from the bottom of the shell course under consideration to the maximum liquid level when evaluating an entire shell course, in feet (ft); or is the height from the bottom of the length L (see 4.3.2.1) from the lowest point of the bottom of L of the locally thinned area to the maximum liquid level, in feet (ft); or is the height from the lowest point within any location of interest to the maximum liquid level, in feet (ft);
- G is the highest specific gravity of the contents;

The information and calculation of minimum thickness required is recorded in Table 5-2 : Information For Shell Plates Minimum Acceptable Thickness Calculation and Table 5-3 : Shell Plate Minimum Acceptable Thickness.

Table 5-2 : Information For Shell Plates Minimum Acceptable Thickness Calculation

Tank Number	MCH-04
Tank Diameter	15,000 mm or 49.213 ft
Tank Height	10,000 mm or 32.808 ft
Maximum Filling Height	10,000 mm or 32.808 ft
Product	HSD
Specific Gravity, G	0.87
Year of Commission	1997
Year of Last Inspection	2014
Year of Current Inspection	2021
Type of Shell Weld	Butt weld
Corrosion Allowance	0.00
Joint Efficiency, E	1.00

Table 5-3 : Shell Plate Minimum Acceptable Thickness Calculation.

Course No	Height Per Course (mm)	Material	Allowable Product Stress, S (lbf/in ²)	*Previous Thickness (mm)	Minimum Measured Thickness (mm)	Minimum Acceptable Thickness, T _{min} (mm)	Corrosion Rate (mm/year)	Remaining Life (year)	Inspection Interval (year)
1	3,000	Unknown	23,600	Data Not available	9.38	3.81	0.077	72.34	5
2	2,380	Unknown	23,600		5.95	2.63	0.096	34.58	5
3	2,380	Unknown	26,000		5.25	2.54	0.133	20.37	5
4	2,240	Unknown	26,000		5.88	2.54	0.100	33.40	5

* For calculation of remaining life corrosion rate taken from Tank MCH-03

Note: API653 section 6.3.3.3: Internal inspection of the tank shell, when the tank is out of service, can be substituted for a program of external ultrasonic thickness measurement if the internal inspection interval is equal to or less than the interval required in 6.3.3.2 b).



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

5.3. Thickness Measurement on Shell Nozzles and Reinforcement Plates

Ultrasonic thickness measurements were taken at quadrants of the nozzles neck and reinforcement plates.

Table 5-4 : Thickness Measurement Readings on Shell Nozzle Necks and Reinforcement Plate (mm)

No	Item ID	Item	Nozzle				Reinforcement Plate			
			0 °	90 °	180 °	270 °	0 °	90 °	180 °	270 °
1	MW-1	24" Manhole 1	12.73	13.62	13.57	13.68	9.60	9.84	9.91	9.61
2	MW-2	24" Manhole 2	13.78	13.82	13.73	13.75	10.10	9.91	9.81	9.75
3	N1	6" Nozzle	10.23	10.65	10.49	10.29	9.17	9.46	9.39	9.27
4	N2	12" Nozzle	13.03	12.74	12.80	12.97	9.94	10.16	10.12	10.14
5	N3	6" Nozzle	11.06	10.99	10.64	10.78	9.50	9.49	9.67	9.62
6	N4	8" Nozzle	13.18	12.58	12.65	13.02	9.58	9.75	9.62	9.78
7	N5	4" Nozzle	8.89	8.92	8.76	8.35	10.17	10.15	10.11	10.21
8	N7	2" Nozzle	5.71	5.81	5.33	5.52	N/A	N/A	N/A	N/A

SGS

Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

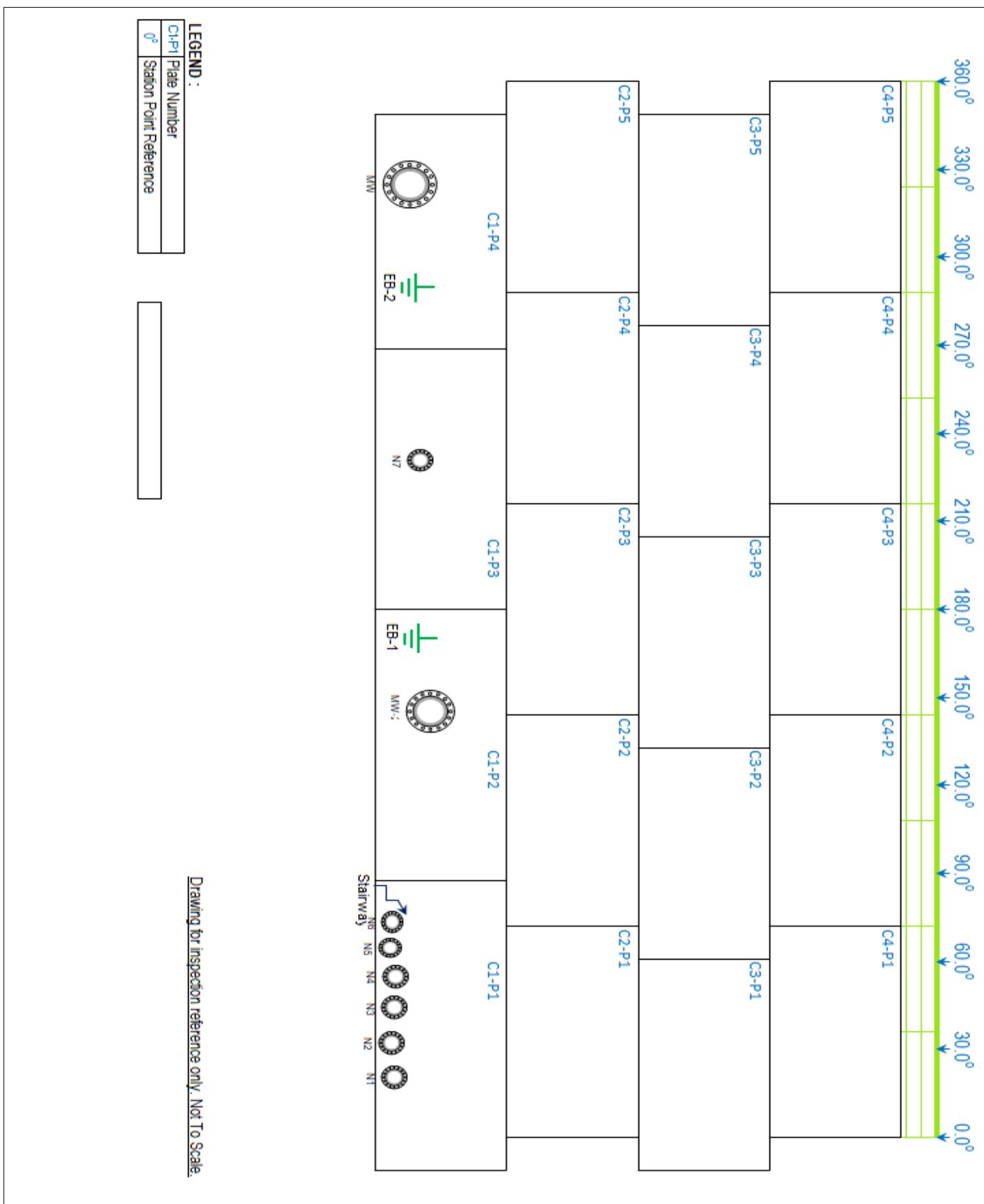


Figure 5-1 : Tank Shell Plate and Nozzle Layout

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :	Out of Service Inspection		

5.4. Tank Plumbness- Tank Verticality check

A Plumbness Survey was carried out to determine the verticality of tank.

The required numbers of survey stations is not mentioned in API 653. However as guidance, the number of survey station determined will be the same for tank settlement as mentioned below:

$$N = D/10$$

Where,

N is the minimum required number of settlement measurement points, but no less than eight. All values shall be rounded to the next higher whole number. The maximum spacing between settlement measurement points shall be 32 ft;

D is the tank diameter, in feet (ft).

The required information and result of plumbness is shown in Table 5-5 : Information for Plumbness Survey, Table 5-5 : Information for Plumbness Survey and Table 5-6 : Plumbness Readings (mm).

Simplified Acceptance Criteria for Plumbness as per API 653 is shown as below:-

Type of Tank	Tolerance
Fixed Roof Tank	1/100 of tank Height with a maximum of 5 inch
Tank with Floating Roof (Internally or Externally)	1/200 of tank height with a maximum of 5 inch

Code Reference

API 653 Paragraph 10.5.2.1

The maximum out-of-plumbness of the top of the shell relative to the bottom of the shell shall not exceed 1/100 of the total tank height, with a maximum of 5 in. The 1/100 criteria, with a maximum of 5 in., shall also apply to fixed roof columns. For tanks with internal floating roofs, apply the criteria of this section or API 650, Appendix H, whichever is more stringent.

API 650 Annex H.6.1

..... Any defects, projections, obstructions or tank tolerance limits (exceeding those defined in 7.5 of this Standard), which would inhibit proper internal floating roof and seal operation, that are identified by the internal floating roof erector shall be reported to the Purchaser.

API 650 Paragraph 7.5.2 a

The maximum out-of-plumbness of the top of the shell relative to the bottom of the shell shall not exceed 1/200 of the total tank height.

Table 5-5 : Information for Plumbness Survey

Tank Number	MCH-04
Tank Diameter	15000 mm or 49.213 ft.
Tank Height	10000 mm or 32.808 ft.
Minimum Plumbness Survey Station Required	8.00
Actual Plumbness Station (°)	8
Plumbness Circumference Spacing:	5890 mm or 19.326 ft.
Plumbness Survey Carried Out From:	Internal
Number of Shell Course :	4
Floating Roof on Tank:	No
Acceptance Value	100 mm or 3.937 in.

Table 5-6 : Plumbness Readings (mm)

Station (°)	Course - Distance Readings (mm) Relative To Shell To Bottom Weld				
	0	1	2	3	4
0.0	0	-2	-2	-7	10
45.0	0	-12	-6	-4	-9
90.0	0	-3	-10	2	3



Client :	Shell Pakistan Limited			
Job Number :	5010465		Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection			

Station (°)	Course - Distance Readings (mm) Relative To Shell To Bottom Weld				
	0	1	2	3	4
135.0	0	-6	6	3	4
180.0	0	-2	2	11	3
225.0	0	7	12	-1	11
270.0	0	8	6	10	15
315.0	0	5	-3	10	17

Note : Course 0 is area near to shell to bottom weld

Table 5-7 : Plumbness Survey Results

Station (°)	Out-of-plumbness of the top of the shell relative to the bottom of the shell (mm)	Result
0.0	10	Within Tolerance
45.0	-9	Within Tolerance
90.0	3	Within Tolerance
135.0	4	Within Tolerance
180.0	3	Within Tolerance
225.0	11	Within Tolerance
270.0	15	Within Tolerance
315.0	17	Within Tolerance

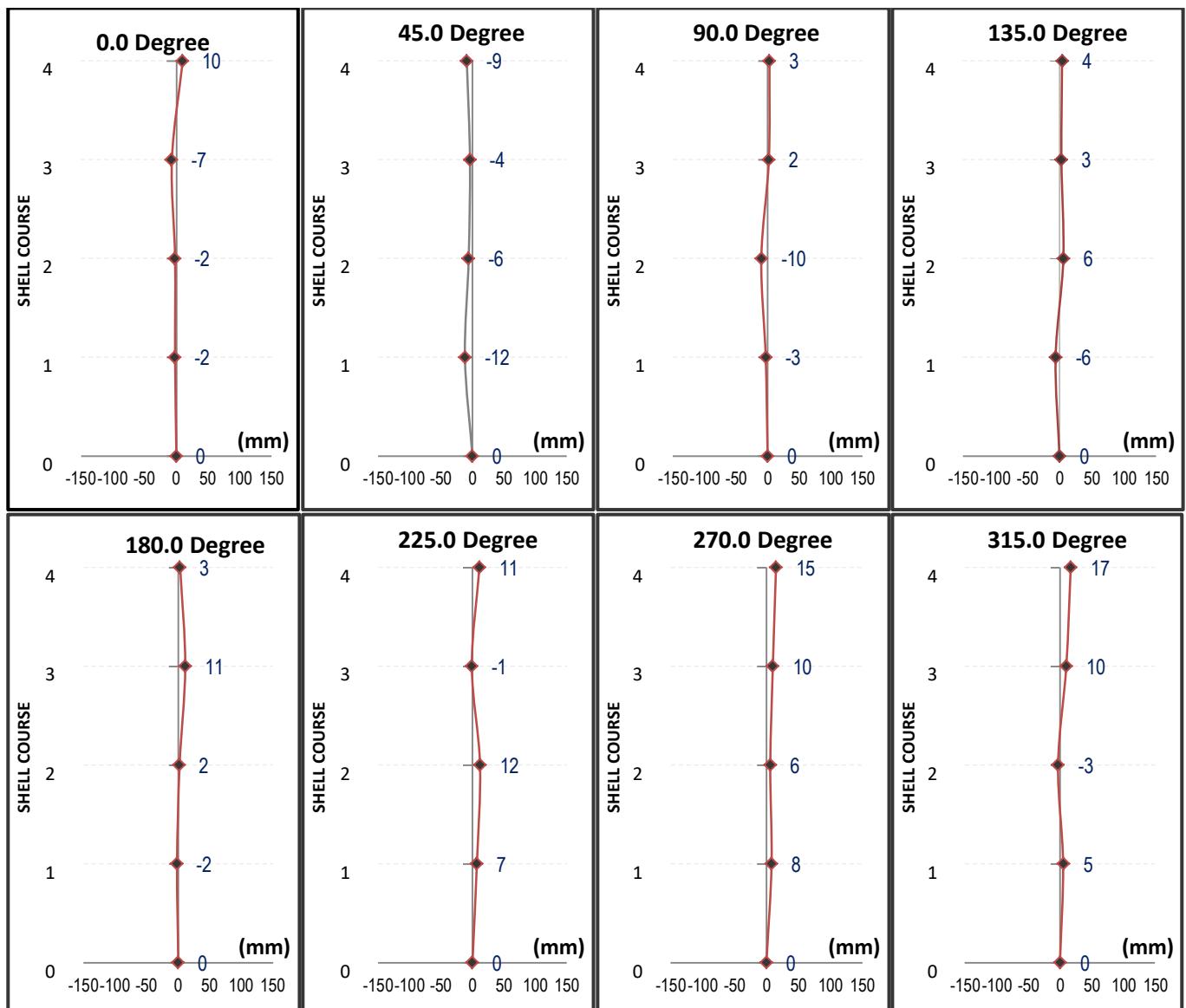


Figure 5-2 : Plumbness Plot

SGS	Client :	Shell Pakistan Limited			
	Job Number :	5010465		Tank Number :	MCH-04
	Type Of Inspection :	Out of Service Inspection			

6 Bottom

6.1. Thickness Measurements on Bottom Plate

Ultrasonic thickness measurements are taken at each plate with 5 readings.

For bottom plates that are welded to the tank shell, ultrasonic thickness readings are taken as near and as possible to tank shell.

The results of Ultrasonic thickness readings are show in Table 6-1 : Thickness Measurements on Bottom Plates (mm)

Table 6-1 : Thickness Measurements on Bottom Plates (mm)

Plate No.	Point 1	Point 2	Point 3	Point 4	Point 5	Min. Reading
A-1	10.13	10.05	10.19	10.45	9.97	9.97
A-2	10.26	10.24	10.12	9.86	9.72	9.72
A-3	10.17	10.29	10.21	10.17	10.12	10.12
A-4	10.28	10.07	10.16	10.16	10.08	10.07
A-5	10.28	10.07	10.14	10.11	10.17	10.07
A-6	10.31	10.22	10.09	9.85	10.02	9.85
A-7	10.71	10.13	9.91	9.76	9.83	9.76
A-8	9.93	10.19	10.25	9.86	10.01	9.86
A-9	9.86	10.09	10.29	9.96	10.41	9.86
A-10	10.09	10.26	10.19	10.05	9.94	9.94
1-1	7.93	7.99	7.90	7.87	7.68	7.68
1-2	7.59	7.66	7.75	7.64	7.67	7.59
1-3	7.69	7.58	7.66	7.86	7.68	7.58
1-4	7.75	7.78	7.83	7.78	7.81	7.75
1-5	7.71	7.64	7.88	7.86	7.80	7.64
2-1	7.65	7.68	7.89	7.79	7.65	7.65
2-2	7.86	7.77	7.85	7.61	7.82	7.61
2-3	7.67	7.81	7.68	7.82	7.57	7.57
3-1	7.82	7.87	7.89	7.61	7.69	7.61
3-2	7.58	7.81	7.86	7.71	7.76	7.58
3-3	8.01	7.91	8.04	7.86	7.79	7.79
4-1	7.79	7.63	7.90	7.78	7.82	7.63
4-2	7.66	7.63	7.81	7.65	7.58	7.58
4-3	7.81	7.92	7.96	7.83	7.80	7.80
5-1	7.99	8.08	8.04	7.77	7.65	7.65
5-2	7.95	7.82	7.93	7.84	7.90	7.82
5-3	7.90	8.01	7.92	8.31	7.95	7.90
5-4	7.63	7.90	7.70	7.77	7.71	7.63
5-5	7.86	8.05	8.01	7.81	7.72	7.72

Ultrasonic Thickness Measurements on Cylinder Shape Drain Sump (mm)

Drain Sump	Side1	Side 2	Side 3	Side 4	Bottom 1	Bottom 2	Bottom 3	Bottom 4	Center	Minimum Reading
S-1	12.04	12.64	12.58	13.18	11.79	11.82	11.77	11.81	11.76	11.76

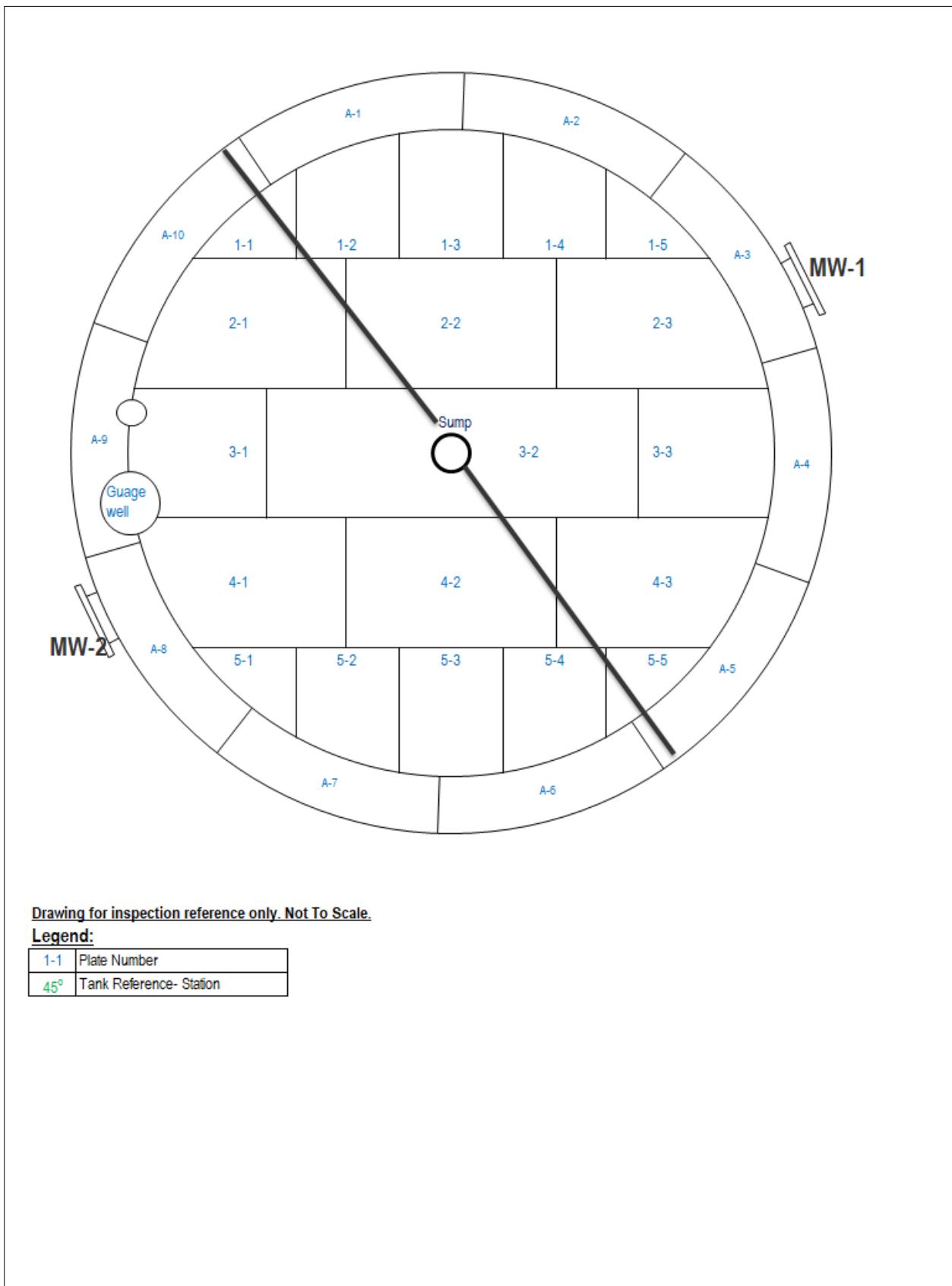


Figure 6-1 : Tank Bottom Layout

SGS	Client :	Shell Pakistan Limited			
	Job Number :	5010465		Tank Number :	
	Type Of Inspection :	Out of Service Inspection			

6.2. Bottom Plates Life Span Calculation

Magnetic Flux Leakage (MFL) scanning is carried out on tank bottom.

MFL method is used for screening to detect underside and topside corrosion.

All areas inaccessible by the MFL scanner will be scanned using the UT A scanning (if accessible).

Code and Reference:

API 653 Section 4.4.5.1:- Minimum Thickness for Tank Bottom Plate

An acceptable method for calculating the minimum acceptable bottom thickness for the entire bottom or portions thereof is as follows:

$$MRT = (\text{Minimum of } RT_{bc} \text{ or } RT_{ip}) - Or (S_t P_r + U P_r)$$

Where,

MRT = minimum remaining thickness at the end of interval Or.

O_r = in-service interval of operation (years to next internal inspection) not to exceed that allowed by 6.4.2.

RT_{bc} = minimum remaining thickness from bottom side corrosion after repairs,

RT_{ip} = minimum remaining thickness from internal corrosion after repairs,

$S_t P_r$ = maximum rate of corrosion not repaired on the top side. $S_t P_r = 0$ for coated areas of the bottom.

$U P_r$ = maximum rate of corrosion on the bottom side.

Bottom Plate Life Span Calculation:

API 653 Section 4.4.5.3 If the minimum bottom thicknesses, at the end of the in-service period of operation, is calculated to be less than the minimum bottom renewal thicknesses given in API 653 Table 4.4.

API 653, Table 4.4 – Bottom Plate Minimum Thickness

Minimum Bottom Plate Thickness at Next Inspection	Tank bottom / Foundation Design
0.10 in. (2.54 mm)	Tank bottom/foundation with no means for detection and containment of a bottom leak.
0.05 in (1.27 mm)	Tank bottom/foundation design with means to provide detection and containment of a bottom leak.
0.05 in (1.27 mm)	Applied tank bottom reinforced lining > 0.05 in. thick, in accordance with API 652

Annular Plate Life Span Calculation:

API 653 Section 4.4.6.2 For tanks in service with a product specific gravity less than 1.0, which require annular plates for other than seismic loading considerations, the thickness of the annular plates shall be not less than the thicknesses given in API 653, Table 4.5, plus any specified corrosion allowance. Interpolation is allowed within Table 4.5 based on shell stress determined per Note b of Table 4.5.

API 653 Table 4.5 -Annular Bottom Plate Thicknesses (in.) (Specific Gravity < 1.0)

Plate Thickness ^a of First Shell Course	Stress ^b in First Shell Course (lbf/in. ²)			
	< 24,300	< 27,000	< 29,700	< 32,400
$t \leq 0.75\text{in} (19.05\text{mm})$	0.17	0.2	0.23	0.3
$0.75 < t \leq 1.00\text{in} (25.4\text{mm})$	0.17	0.22	0.31	0.38
$1.00 < t \leq 1.25\text{in} (31.75\text{mm})$	0.17	0.26	0.38	0.48
$1.25 < t \leq 1.50\text{in} (38.1\text{mm})$	0.22	0.34	0.47	0.59

a. Plate thickness refers to the tank shell as constructed.

b. Stresses are calculated from $[2.34D(H-1)]/t$.

API 653, Section 4.4.6.3: For tanks in service with a product specific gravity of 1.0 or greater, which require annular plates for other than seismic loading considerations, the thickness of the annular plates shall be in accordance with API 650, Table 5-1, plus any specified corrosion allowance.



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

API 650, Table 5-1b - (USC) Annular Bottom Plate Thickness (t_b)

Plate Thickness ^a of First Shell Course	Stress ^b in First Shell Course (lbf/in. ²)			
	$\leq 27,000$	$\leq 30,000$	$\leq 32,000$	$\leq 36,000$
$t \leq 0.75\text{in} (19.05\text{mm})$	0.236	0.236	9/32	11/32
$0.75 < t \leq 1.00\text{in} (25.4\text{mm})$	0.236	9/32	3/8	7/16
$1.00 < t \leq 1.25\text{in} (31.75\text{mm})$	0.236	11/32	15/32	9/16
$1.25 < t \leq 1.50\text{in} (38.1\text{mm})$	5/16	7/16	9/16	11/16
$1.50 < t \leq 1.75\text{in}$	11/32	1/2	5/8	3/4

Product Stress = $((td - CA)/corroded t) (Sd)$
Hydrostatic Test Stress = $(tt /nominal t) (St)$

Lifespan Calculation of Plate at Critical Zone:

API 653 Section 4.4.5.4 Unless a stress analysis is performed, the minimum bottom plate thickness in the critical zone of the tank bottom defined in 9.10.1.2 shall be the smaller of one-half the original bottom plate thickness (not including the original corrosion allowance) or 50 % of t_{min} of the lower shell course per 4.3.3.1 but not less than 0.1 in. Isolated pitting will not appreciably affect the strength of the plate.

Bottom Plate Lifespan Calculation:

The required information and calculation result is shown in Table 6-2 : General Information for Tank Bottom Lifespan Calculation and Table 6-3 : Lifespan Calculation

Table 6-2 : General Information for Tank Bottom Lifespan Calculation

Tank Number	MCH-04
Tank Diameter	15,000 mm or 49.213 ft
Tank Height	10,000 mm or 32.808 ft
Maximum Filling Height	10,000 mm or 32.808 ft
Year of Commission	1997
Year of Last Inspection	2014
Year of Current Inspection	2021
Year of Last Bottom Plates Change	N/A
Tank bottom have coating?	YES
The expected life of the coating must equal or exceed, O_r	
Tank bottom Have effective cathodic protection?	NO
Tank bottom have reinforced lining > 0.05 in. (1.27mm)?	NO
Tank have detection and containment of bottom leak?	YES
Does the tank bottom require repair?	NO

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

Table 6-3 : Lifespan Calculation of Tank Bottom (Before repair or no repair required)

Lifespan Calculation for Bottom Plates

Bottom Plate Thickness					Data not available			
Year In Service (Years)	Nominal Thickness (mm)	RT _{bc} (mm)	Rt _{ip} (mm)	StP _r (mm)	U _{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
24	-	7.57	7.50	0.0000	0.0208	1.27	299.52	20.00

Lifespan Calculation for Annular Plates

Year-In Service (Years)	Nominal Thickness (mm)	RT _{bc} (mm)	Rt _{ip} (mm)	StP _r (mm)	U _{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
24	Data Not available	9.72	9.00	0.0000	0.0146	4.32	320.55	20.00

Lifespan calculation for plates at Critical Zone

Year-In Service (Years)	Nominal Thickness (mm)	RT _{bc} (mm)	Rt _{ip} (mm)	StP _r (mm)	U _{pr} (mm)	MRT (mm)	Calculated Life Span (Year)	Next Inspection Interval, Or
24	Not available	9.45	9.00	0.0000	0.0188	4.32	248.94	20.00

Conclusion :

- a) Life span of bottom plates is calculated to be 299.52 years, recommend to perform tank bottom inspection before next inspection interval which is 20 years from current inspection year.
- b) Life span of annular plates is calculated to be 320.55 years, recommend to perform tank bottom inspection before next inspection interval which is 20 years from current inspection year.
- c) Life span of plate in critical zone is calculated to be 248.94 years, recommend to perform tank bottom inspection before next inspection interval which is 20 years from current inspection year.



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

6.3. Bottom Projection Plate

Ultrasonic Thickness Measurements are taken at a maximum 1.309 meters interval apart around tank circumference.

API 653 Sections 4.4.5.7

The thickness of the projection of the bottom plate beyond the shell as measured at the toe of the outside bottom-to-shell fillet weld shall not be less than 0.1 in (2.54mm). The projection of the bottom plate beyond the outside toe of the shell-to-bottom weld shell shall be at least 3/8 in (9.53mm).

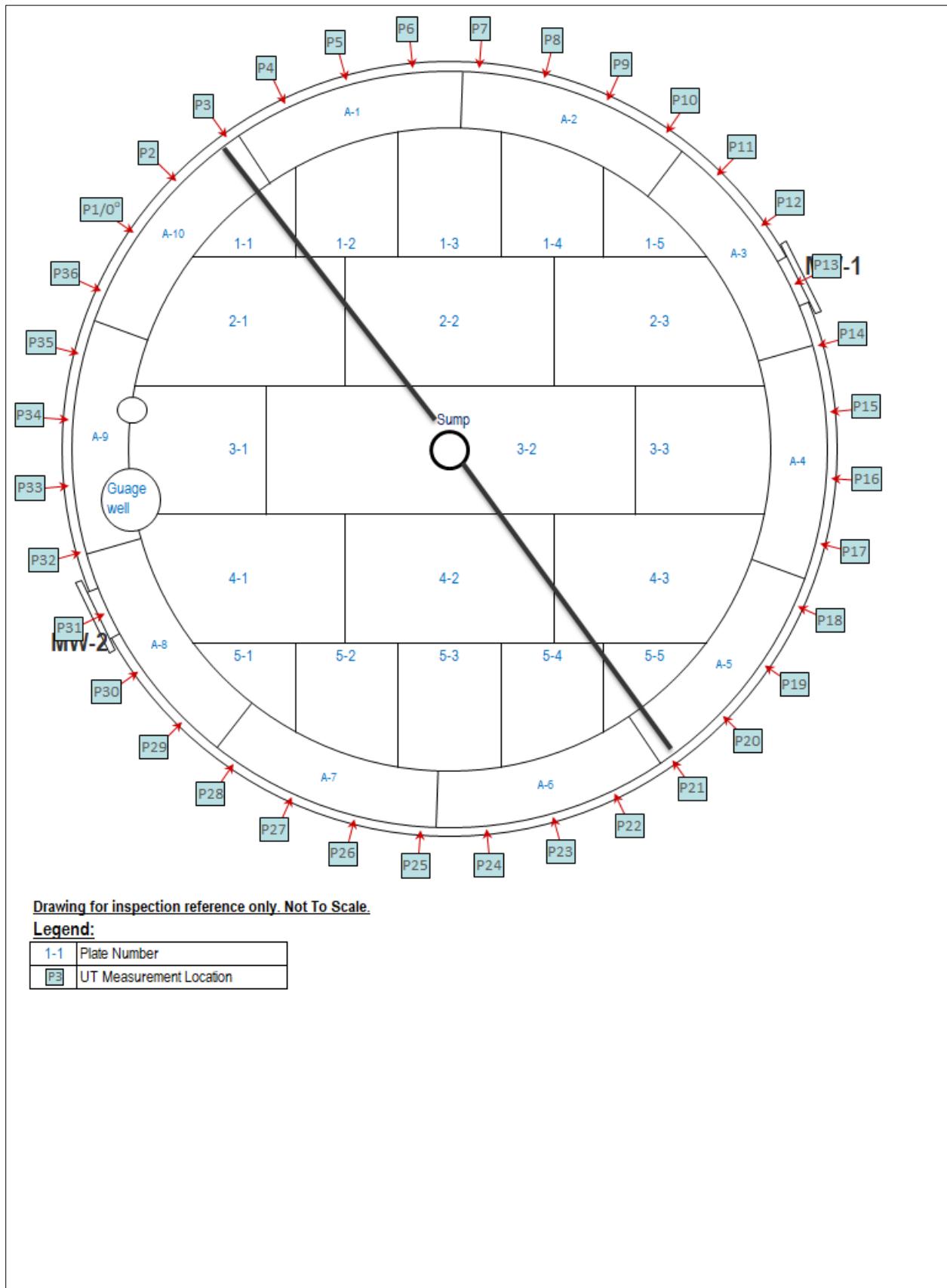
Table 6-4 : Thickness Measurement on Bottom Projection Plates (mm)

UT Location	1	2	3	4	5	6	7	8	9	10
Readings(mm)	9.86	9.99	9.93	10.31	10.29	10.25	9.66	9.72	9.71	9.53
UT Location	11	12	13	14	15	16	17	18	19	20
Readings(mm)	9.62	9.58	10.06	10.07	10.05	10.16	10.35	9.96	10.24	10.26
UT Location	21	22	23	24	25	26	27	28	29	30
Readings(mm)	10.23	10.36	10.33	10.34	9.93	9.83	9.89	9.99	10.02	10.01
UT Location	31	32	33	34	35	36				
Readings(mm)	10.26	10.13	10.28	10.06	9.99	10.04				

Note: First Ultrasonic Thickness location is at 0° degree of the tank reference

Conclusion:

The Lowest reading found on bottom projection plate is 9.53 mm, therefore, the thickness on bottom projection plate is within API 653 tolerance.



6-2 : Bottom Projection Plate Layout

SGS	Client :	Shell Pakistan Limited	
	Job Number :	5010465	Tank Number :
	Type Of Inspection :	Out of Service Inspection	

6.4. Magnetic Particle Inspection Report

Attached MPI Report

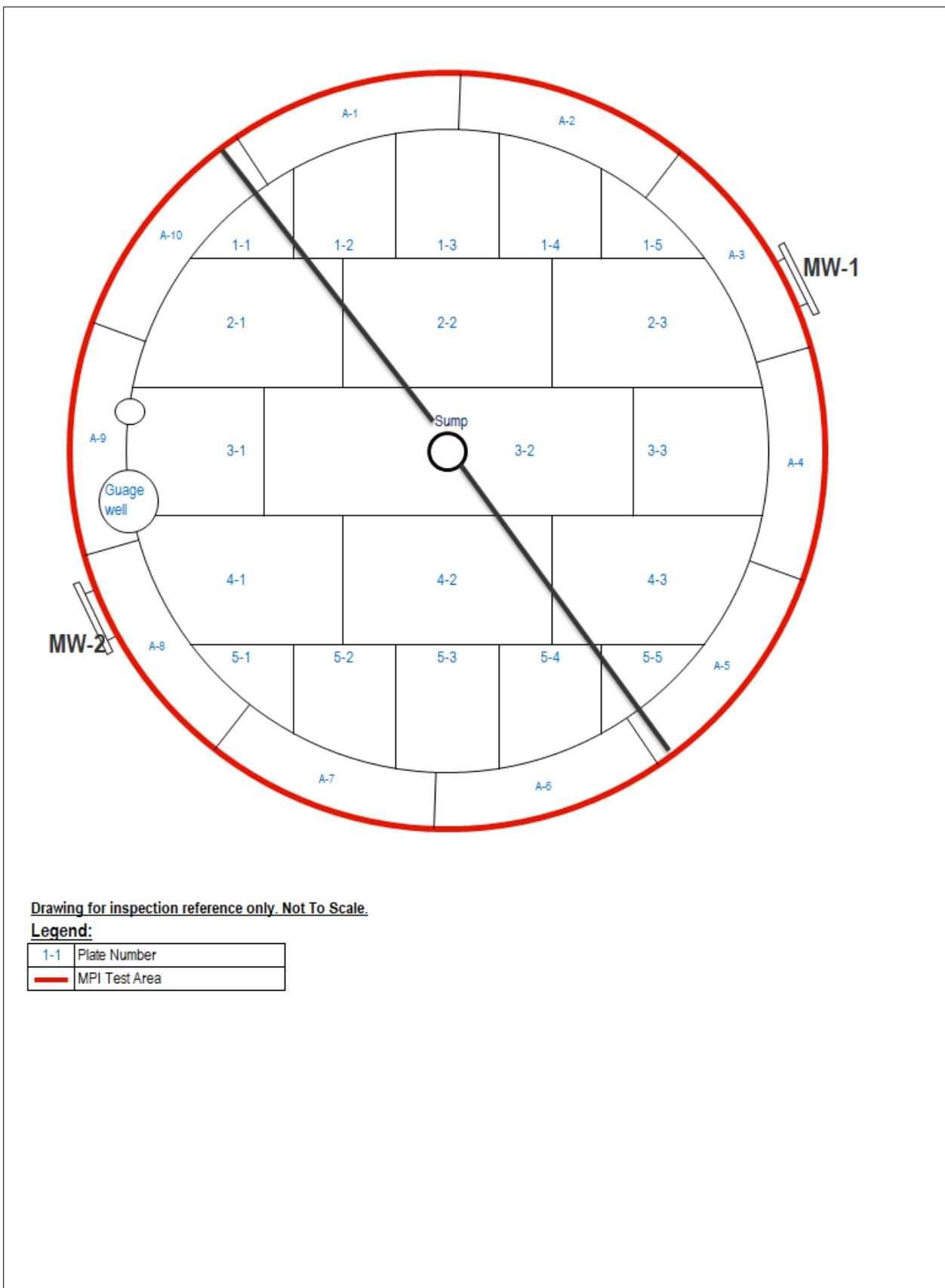


Figure 6-3 : Magnetic Particle Inspection Area Layout

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465	Tank Number :	MCH-04
	Type Of Inspection :	Out of Service Inspection		

6.5. UT A scanning (Bottom Scanning on Area not scan by MFL)

PART/JOB DETAIL DESCRIPTION					
SGS Job No.	5010465	Part / Object	MCH-03	Calibration Block	Step Wedge
Client	Shell Pakistan Limited	Material	Carbon Steel	Reference Block	-----
Project	Out of Service Inspection of MCH- 04	Drawing No.	N/A	Wall Thickness	10mm
Location	Machike Terminal	Scanning Technique	Pulse Echo	Couplant	Water
Examination Code	ASME Sec V	Over Lap	10%	Surface Condition	Painted
Acceptance Code	API 653	Procedure No	IND-QMS-TP-34	Scanning Surface	Surface
EQUIPMENT & ACCESSORIES DESCRIPTION					
Equipment Make / Model	USM 35	Equipment S/N	13863a	Cable Type	MPKLL2
SENSITIVITY LEVEL					
Probe Sr #	Frequency	Wave Type	Wave Angle	Sensitivity Reference	PRE (dB)
MSEB4(57462)	4 MHz	Longitudinal	0°	Backwall Echo	53
					58
EXAMINATION RESULTS					
S#	Location ID (Grid #)	Thickness (mm)	A-scan Ref No.	Echo amplitude w.r.t. reference level (dB)	Remarks
1	Annular Plate-01	10.09	--	--	No significant metal loss observed
2	Annular Plate-02	9.80	--	--	No significant metal loss observed
3	Annular Plate-03	9.90	--	--	No significant metal loss observed
4	Annular Plate-04	10.01	--	--	No significant metal loss observed
5	Annular Plate-05	9.72	--	--	No significant metal loss observed
EXAMINATION RESULTS					
S#	Location ID (Grid #)	Thickness (mm)	A-scan Ref No.	Echo amplitude w.r.t. reference level (dB)	Remarks
6	Annular Plate-06	9.96	--	--	No significant metal loss observed
7	Annular Plate-07	9.72	--	--	No significant metal loss observed

SGS	Client :	Shell Pakistan Limited		
	Job Number :	5010465		Tank Number :
	Type Of Inspection :	Out of Service Inspection		

8	Annular Plate-08	9.98	--	--	No significant metal loss observed
9	Annular Plate-09	9.89	--	--	No significant metal loss observed
10	Annular Plate-10	9.80	--	--	No significant metal loss observed
11	Piping area	7.60	--	--	No significant metal loss observed

Remarks : (If any)

Particulars	Inspected By	Reviewed By
Name	Ali Uzair	Sajjad Hussain
Qualification/Designation	UT Level II / Inspection Engineer	UT Level II / Sr.Inspection Engineer
Signature		
Date:	21-01-2021	21-01-2021



Client :	Shell Pakistan Limited		
Job Number :	5010465	Tank Number :	MCH-04
Type Of Inspection :	Out of Service Inspection		

Attachment 1 : Tank Floor Scanning, Magnetic Flux Leakage Report



Tank Inspection Report

Client: Shell Pakistan Limited

Location: Machike Terminal

Tank ID: MCH-04

Inspection Date: 1/21/2021



Tank Floor Layout Showing Top and Bottom Discontinuities

Tank MCH-04

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15000 mm

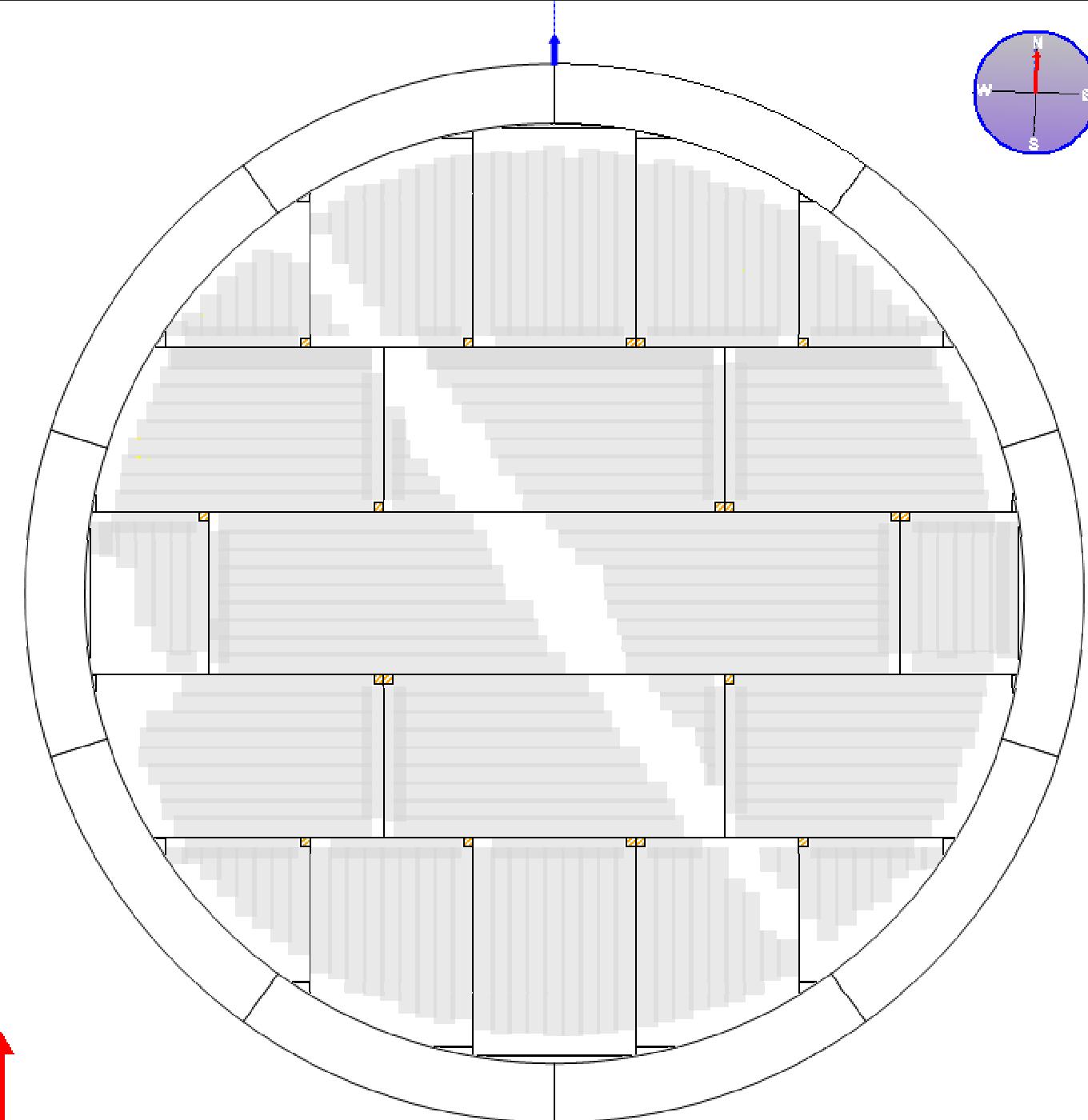
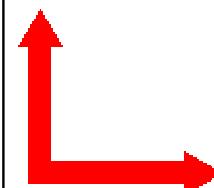
Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting

Discontinuity Colour Scheme

20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	





Maximum Discontinuity Per Track

Tank MCH-04

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15000 mm

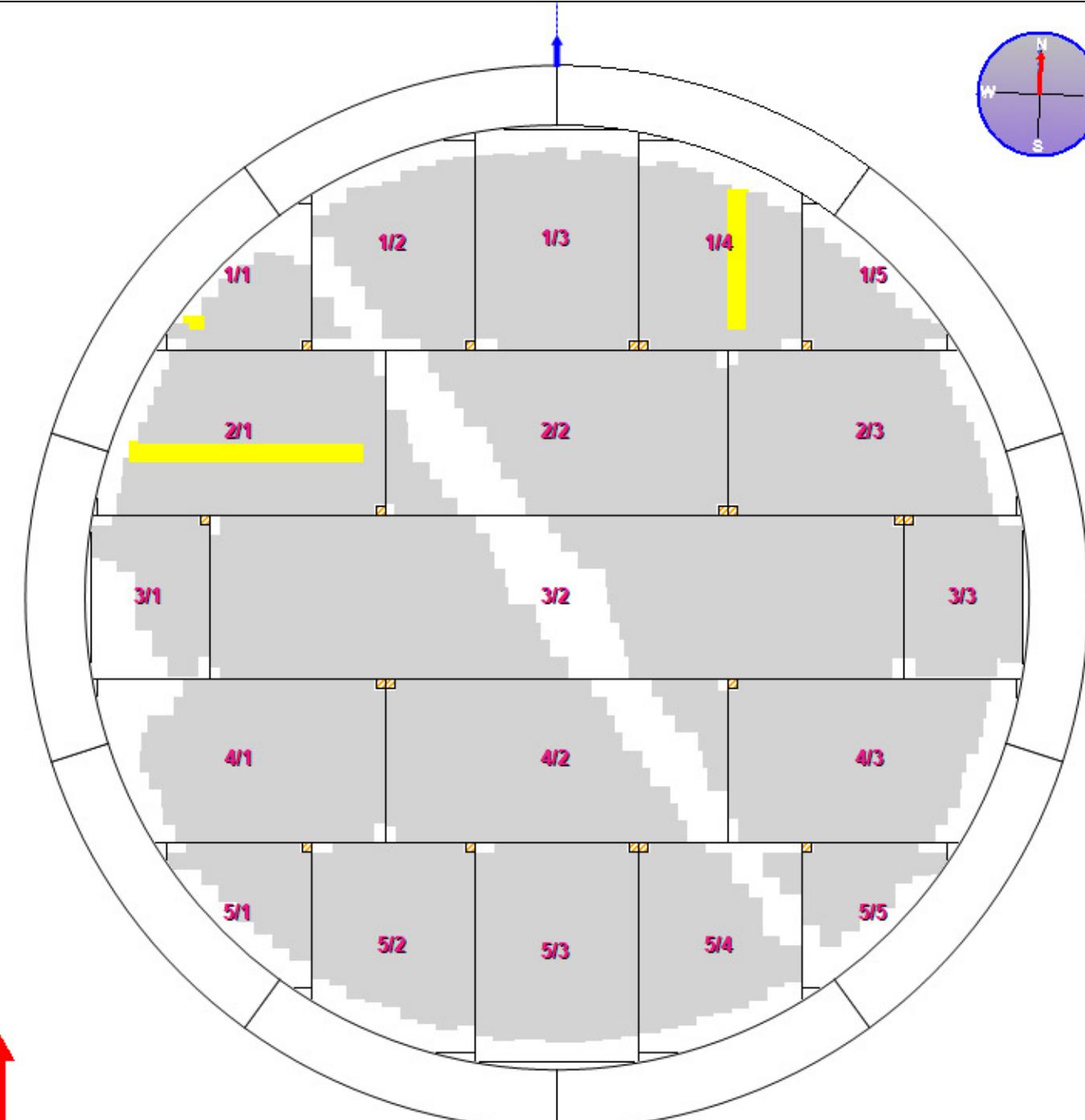
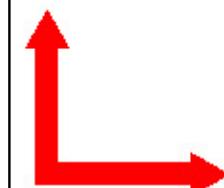
Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting

Discontinuity Colour Scheme

20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	





Tank Floor Numbering System

Tank MCH-04

Location Machike Terminal

Client Shell Pakistan Limited

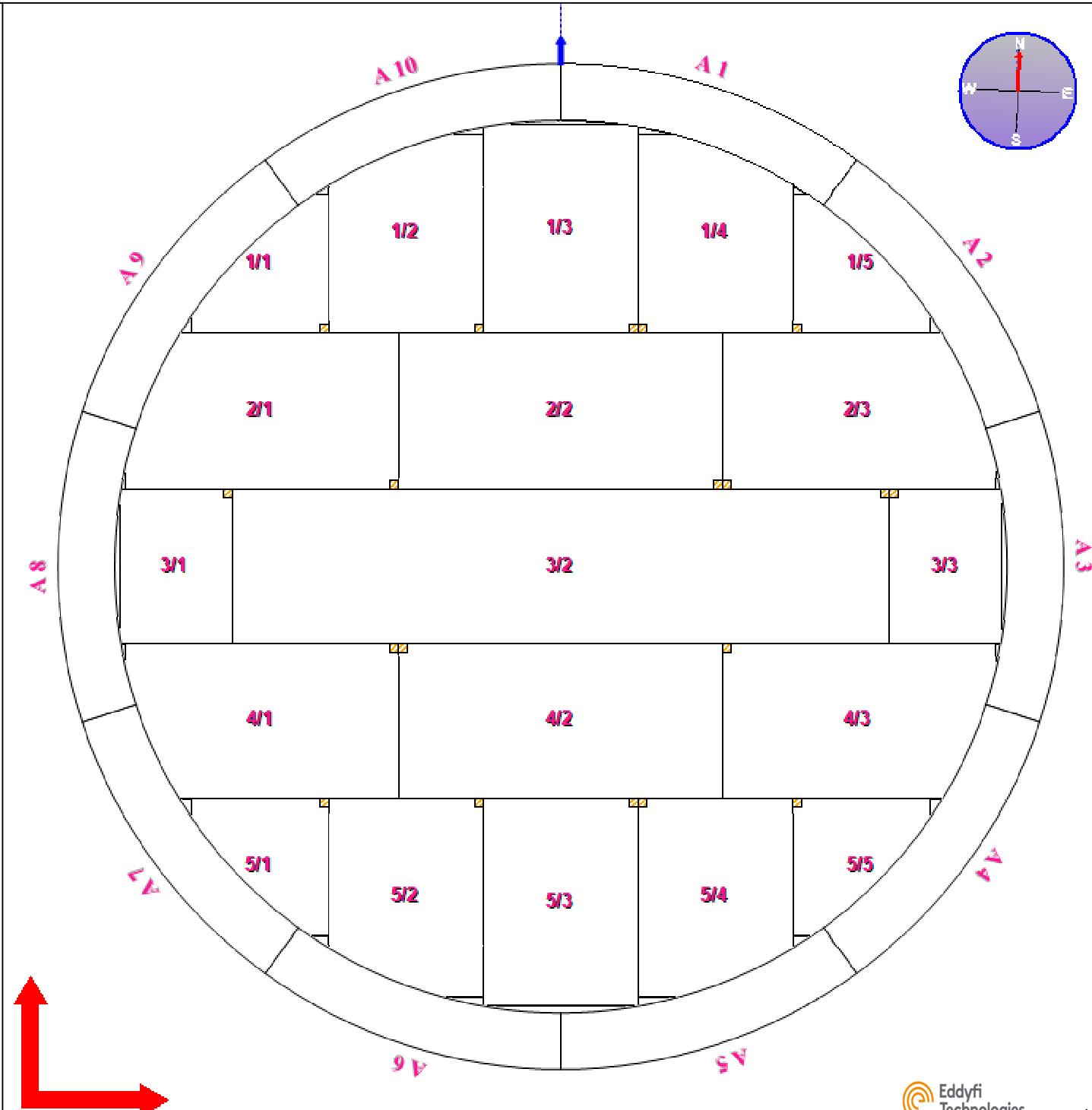
Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15000 mm

Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting





Tank Floor Layout With Symbols

Tank MCH-04

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

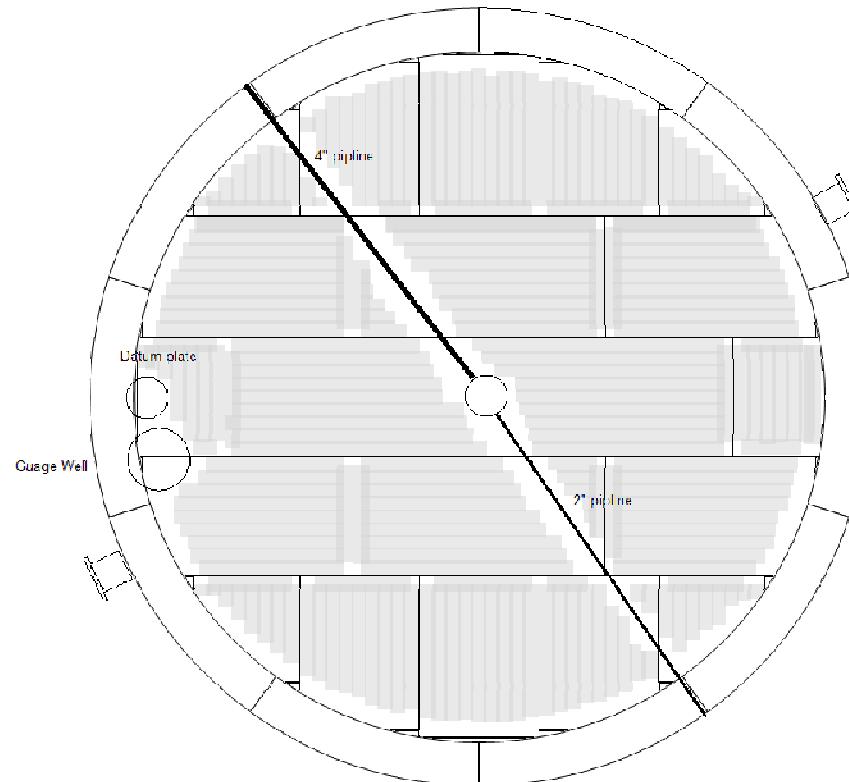
Outer Tank Diameter 15000 mm

Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting

UT A scanning performed on entire Annular plates due to limitation of MFL 3D Scanner





Identify Top and Bottom Discontinuities

Tank MCH-04

Location Machike Terminal

Client Shell Pakistan Limited

Operator Company SGS Pakistan Pvt Limited

Outer Tank Diameter 15000 mm

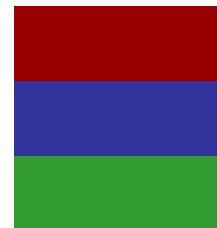
Lower Threshold 20%

Upper Threshold 100%

Defect Enhancement 10
Setting

Identify Top/Bottom Colour Scheme

Top



Bottom

Both

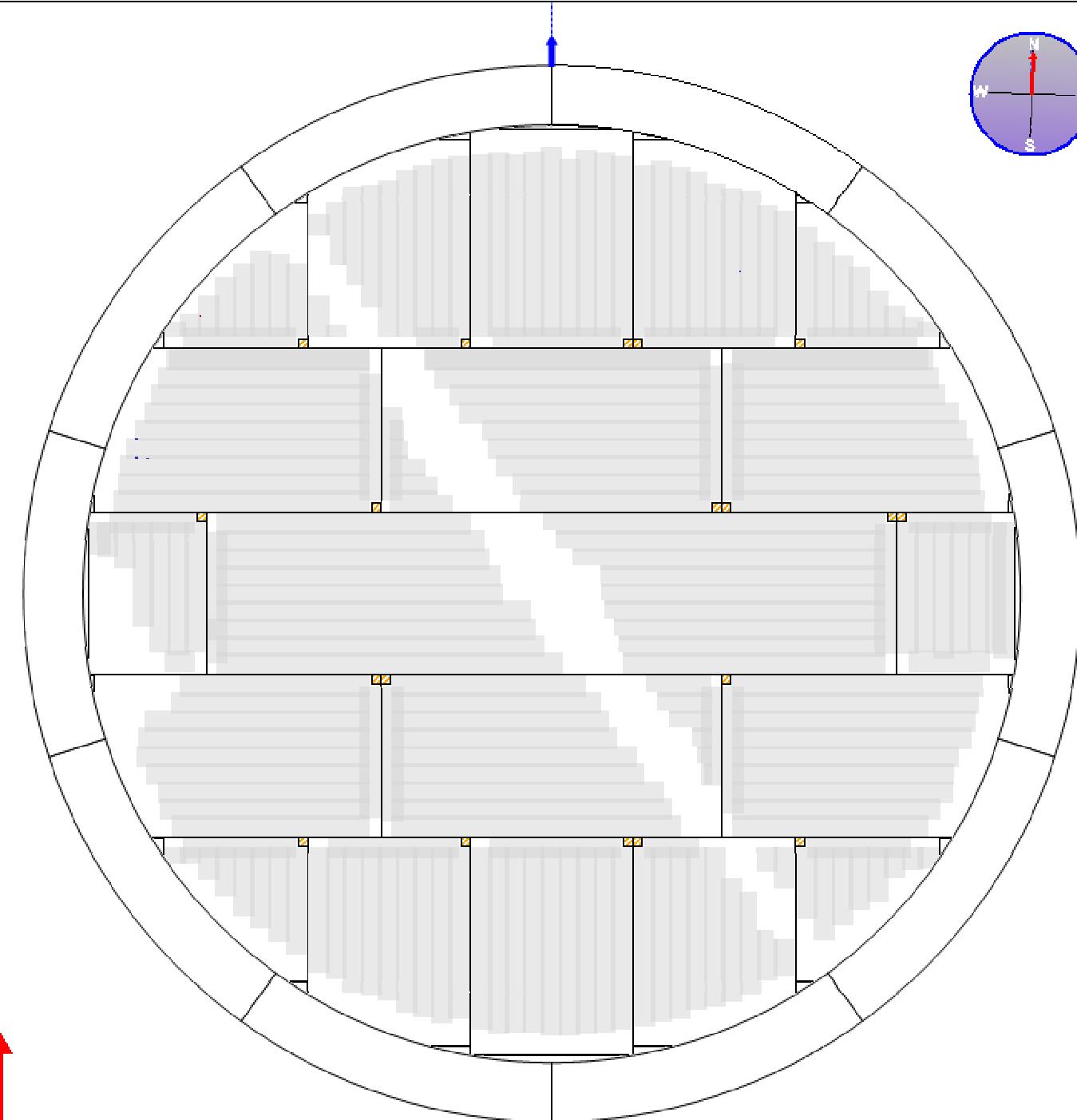
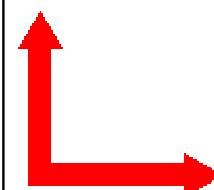
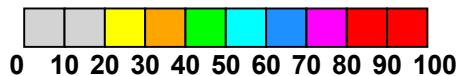


Plate summary

Tank: MCH-04

Date: 1/21/2021



Discontinuities found on all plates (ignoring thresholds)

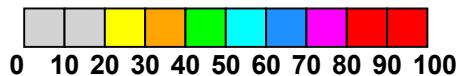
Row	Plate	Minimum discontinuity %	Maximum discontinuity %	Severity
1	1	20	23	
1	2	N/A	N/A	
1	3	N/A	N/A	
1	4	20	20	
1	5	N/A	N/A	
2	1	20	21	
2	2	N/A	N/A	
2	3	N/A	N/A	
3	1	N/A	N/A	
3	2	N/A	N/A	
3	3	N/A	N/A	
4	1	N/A	N/A	
4	2	N/A	N/A	
4	3	N/A	N/A	
5	1	N/A	N/A	
5	2	N/A	N/A	
5	3	N/A	N/A	
5	4	N/A	N/A	
5	5	N/A	N/A	

Total number Of plates for Tank MCH-04 = 19

Annular plate summary

Tank: MCH-04

Date: 1/21/2021



Discontinuities found on all annular plates (ignoring thresholds)

Annular number	Minimum discontinuity %	Maximum discontinuity %	Severity
----------------	-------------------------	-------------------------	----------

Patch plate summary

Tank: MCH-04

Date: 1/21/2021



All X and Y coordinates are taken perpendicular from the TOP-LEFT corner of the patch plate concerned. See each plate illustration for further details

METRIC (mm), Height and Width are rounded up to nearest 10 mm

Row	Plate	Plate Ref.	Patch ID	X	Y	Height	Width	Rot (deg)	Radius	Type
-----	-------	------------	----------	---	---	--------	-------	-----------	--------	------

Patch plate summary

Tank: MCH-04

Date: 1/21/2021



All X and Y coordinates are taken perpendicular from the TOP-LEFT corner of the patch plate concerned. See each plate illustration for further details

METRIC (mm), Height and Width are rounded up to nearest 10 mm

Annular	Plate Ref.	Patch ID	X	Y	Height	Width	Rot (deg)	Radius	Type
---------	------------	----------	---	---	--------	-------	-----------	--------	------

Total No Of Patches for Tank MCH-04 = 0

Total area of patch material required for Tank MCH-04 = 0 meters squared



Annular 1

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

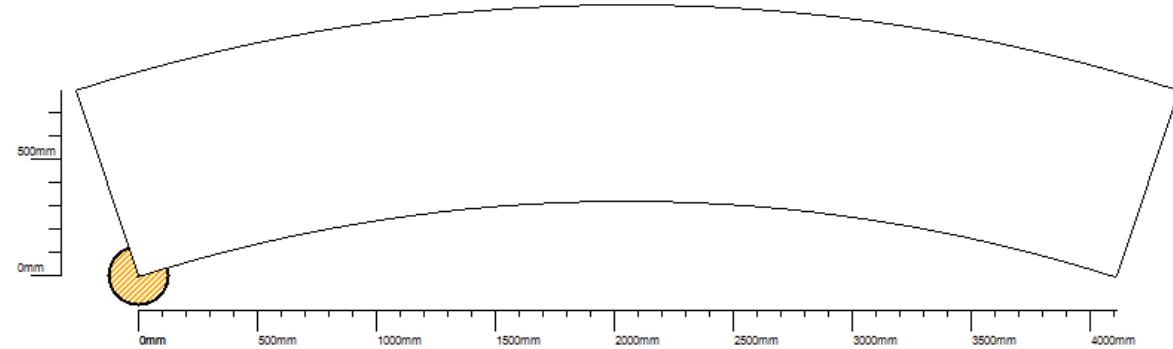
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

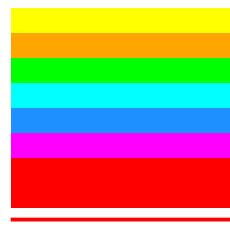
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 2

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

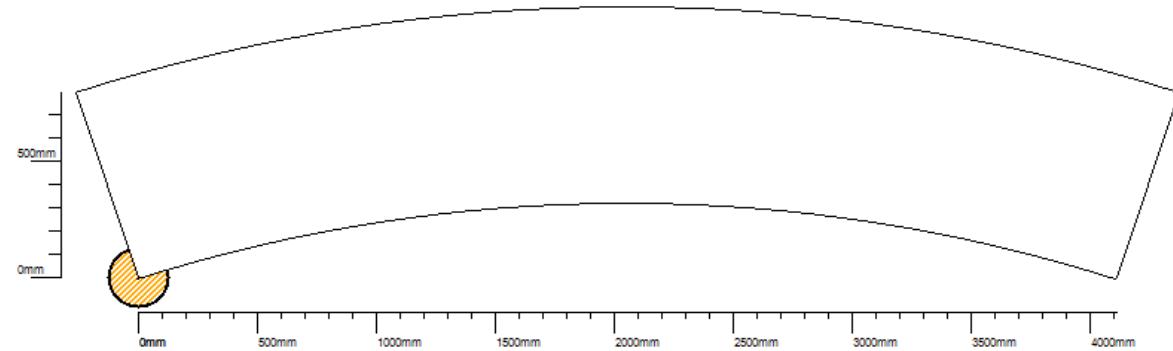
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

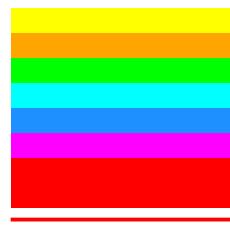
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 3

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

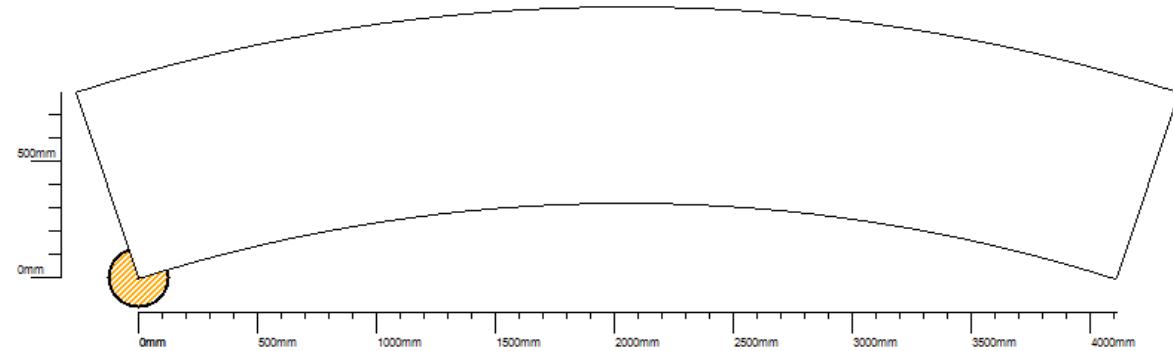
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

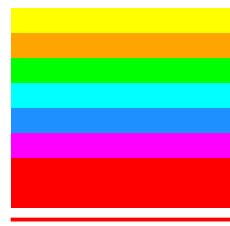
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 4

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

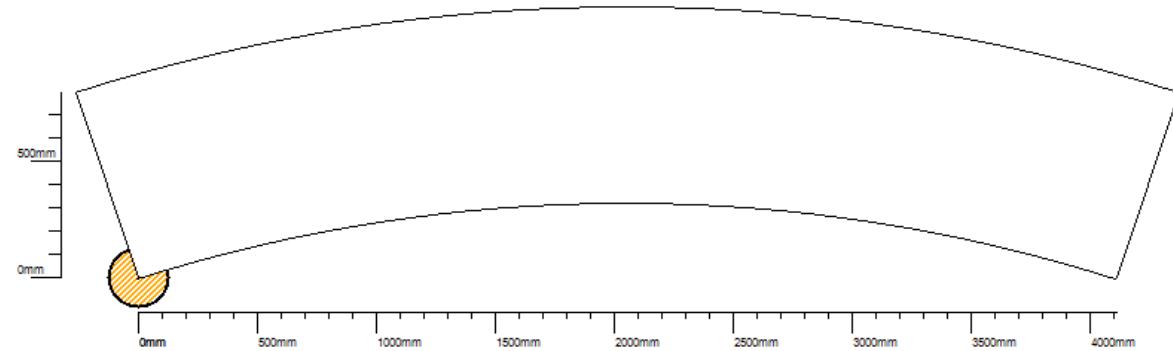
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

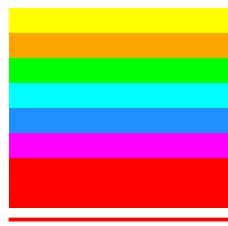
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 5

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

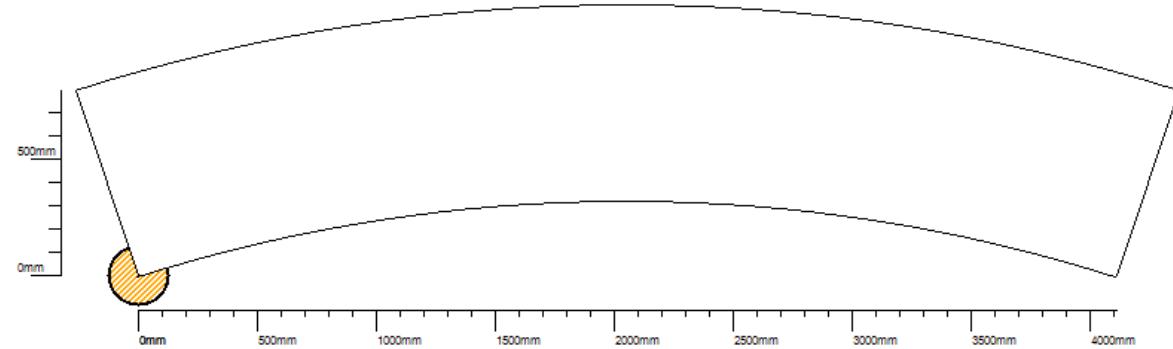
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

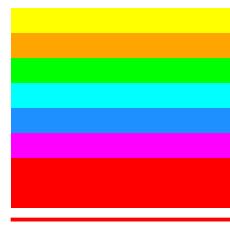
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 6

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

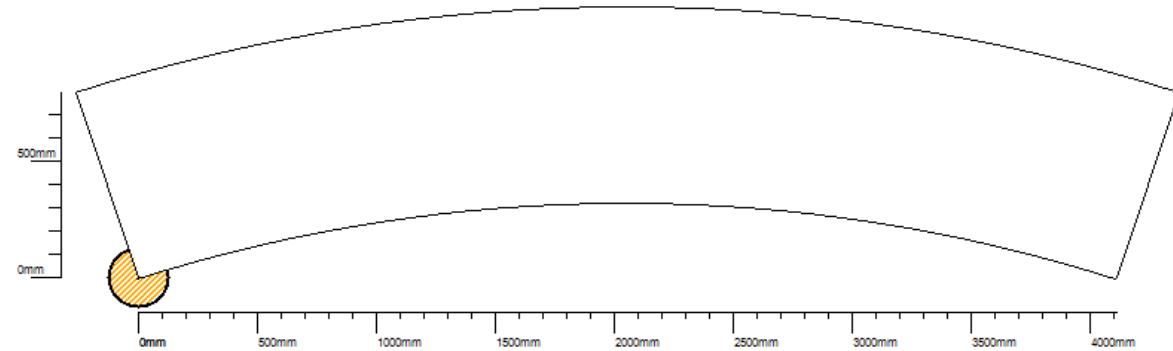
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

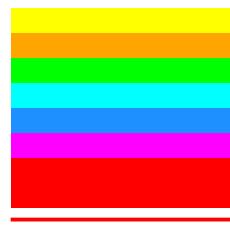
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity



Annular 7

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

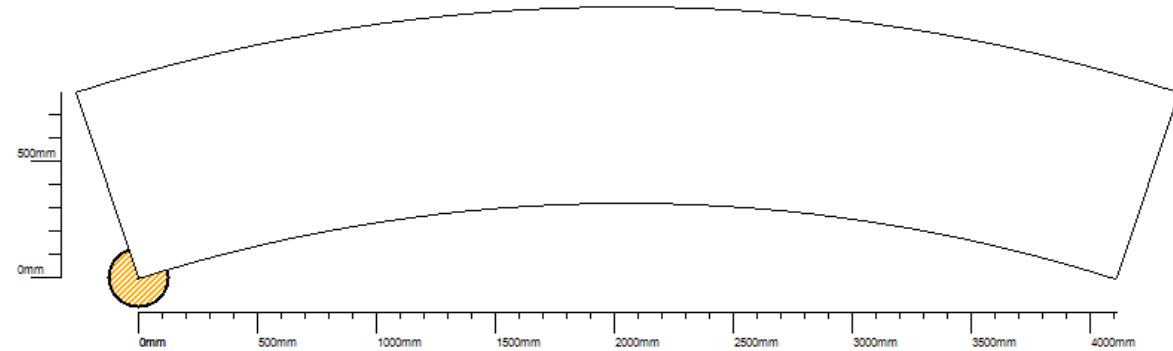
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

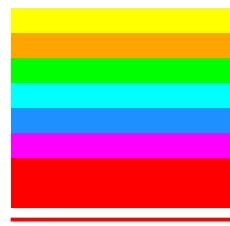
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity



Annular 8

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

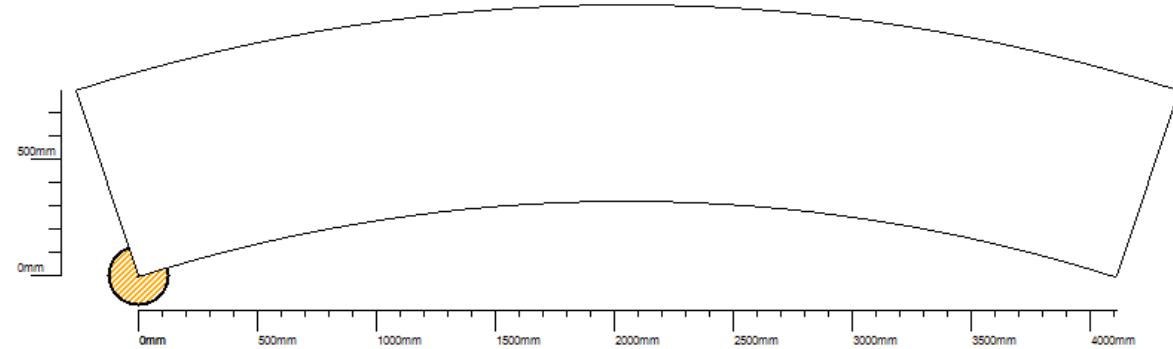
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

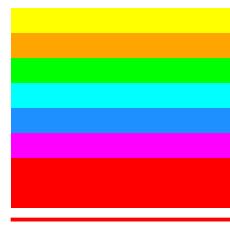
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity





Annular 9

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

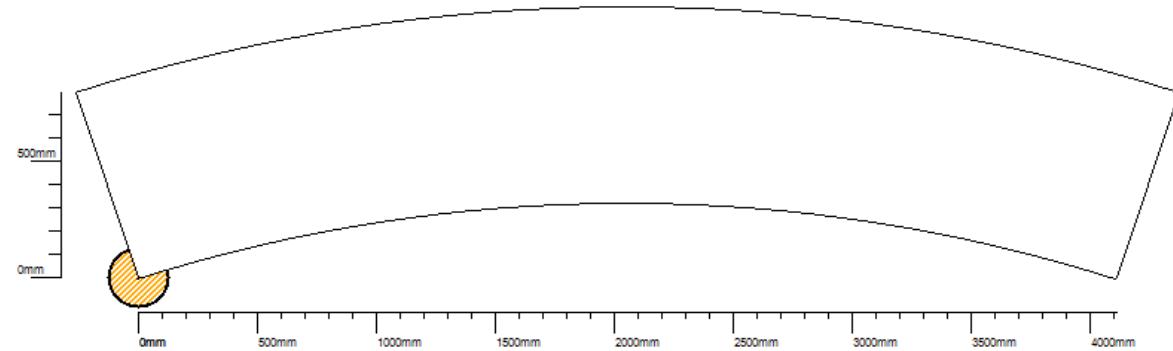
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

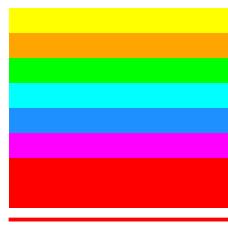
Upper Threshold: 100%

Import Threshold: 20%



Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity



Annular 10

Tank MCH-04

Date 1/21/2021

Location Machike Terminal

Client Shell Pakistan Limited

Operator Bakhtiar

Equipment Serial 7C00000031C51722

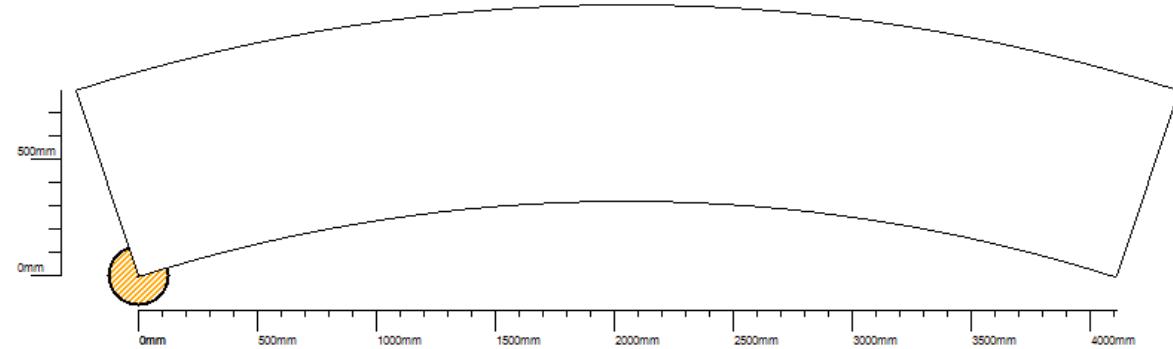
Showing defects from TOP & BOTTOM

No tracks scanned

Lower Threshold: 20%

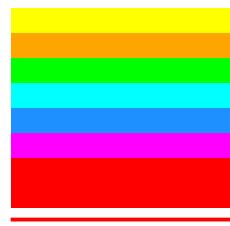
Upper Threshold: 100%

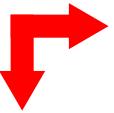
Import Threshold: 20%

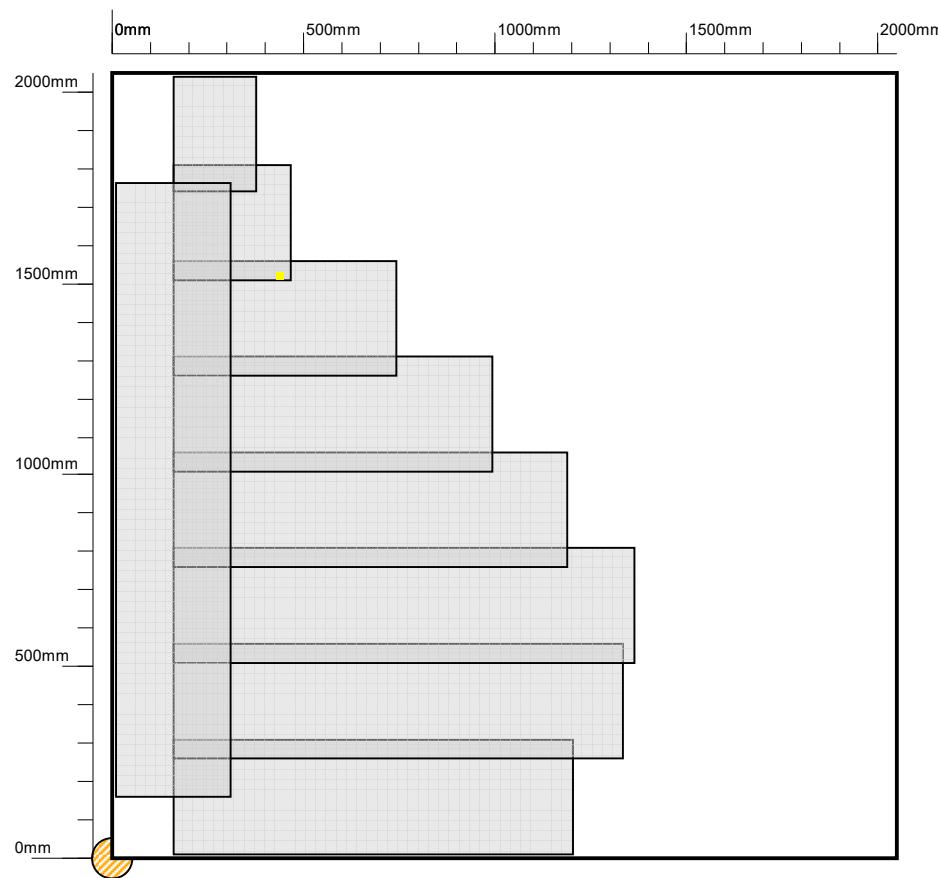


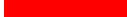
Discontinuity Colour Scheme

20% - 29%
30% - 39%
40% - 49%
50% - 59%
60% - 69%
70% - 79%
80% - 89%
90% - 100%
Weld Discontinuity

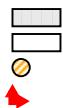


 Y-axis
 X-axis



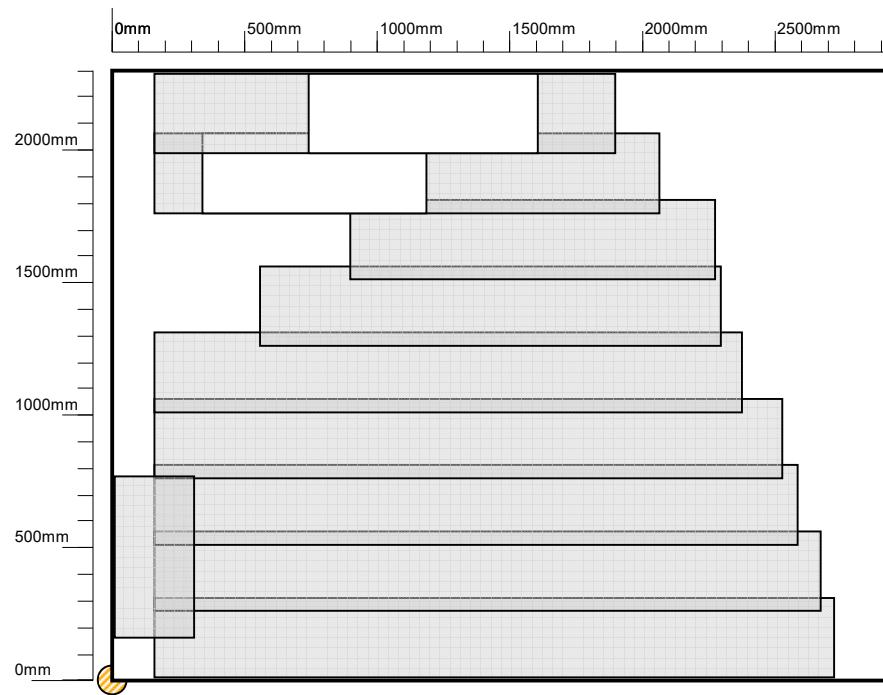
Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



Row:	1	Plate:	1
Plate Length (mm):	2050	Plate Width (mm):	2050
Orientation:	Vertical	Scan Method:	Parallel
Max discontinuity:	23	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

 Y-axis
 X-axis



Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

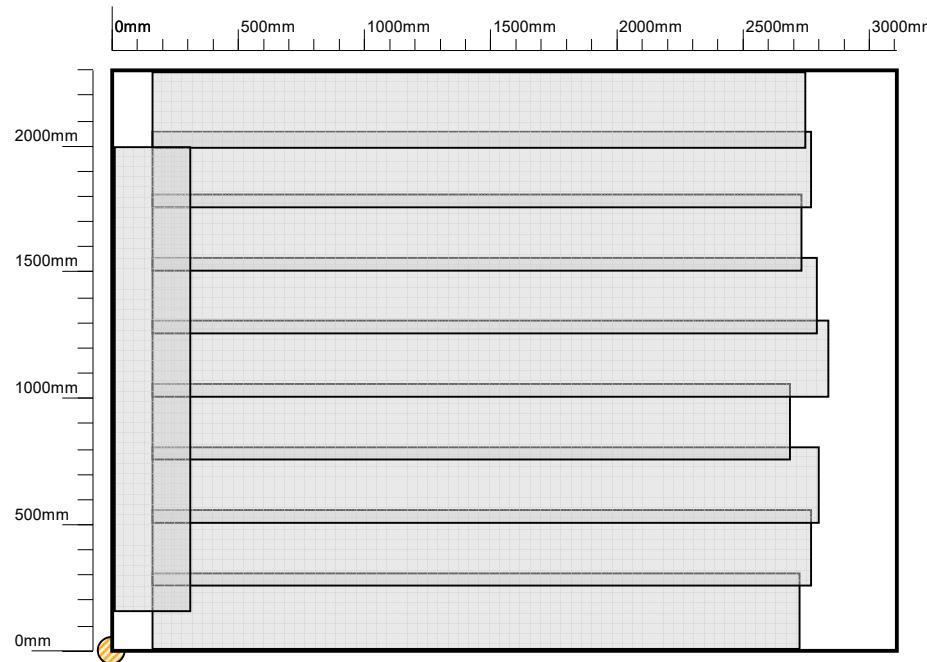
Symbols



Row: 1 **Plate:** 2
Plate Length (mm): 2960 **Plate Width (mm):** 2300
Orientation: Vertical **Scan Method:** Parallel
Max discontinuity: 0 **Showing defects from:** TOP & BOTTOM
Lower Threshold: 20% **Upper Threshold:** 100% (Import Threshold: 20%)
Defect enhancement setting: Not used

Tank: MCH-04 **Operator:** Bakhtiar
Date: 1/21/2021 **Equipment Serial:** 7C00000031C51722
Location: Machike Terminal
Company: SGS Pakistan Pvt Limited
Client: Shell Pakistan Limited

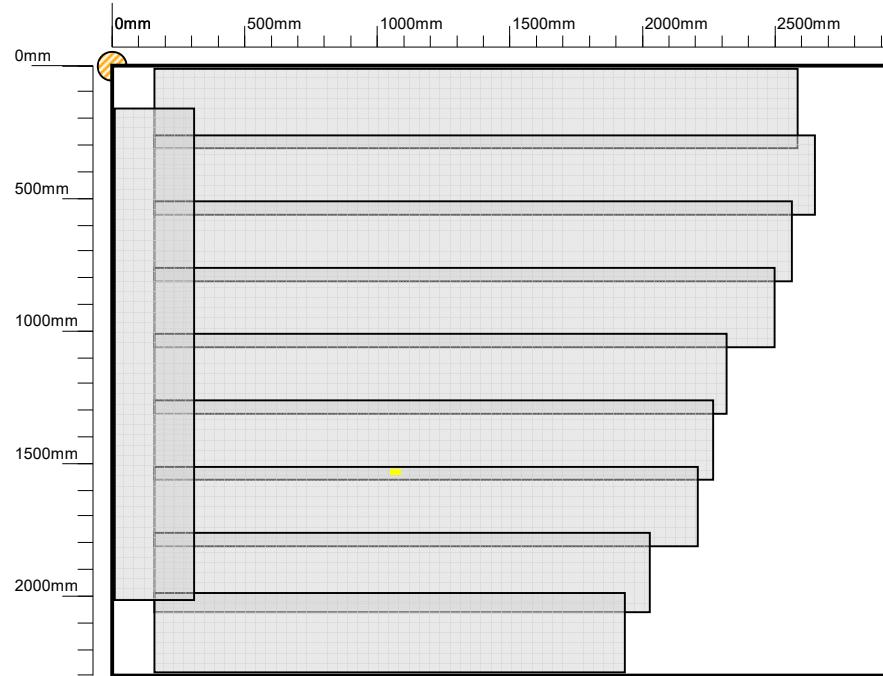
 Y-axis
 X-axis



 Eddyfi
Technologies

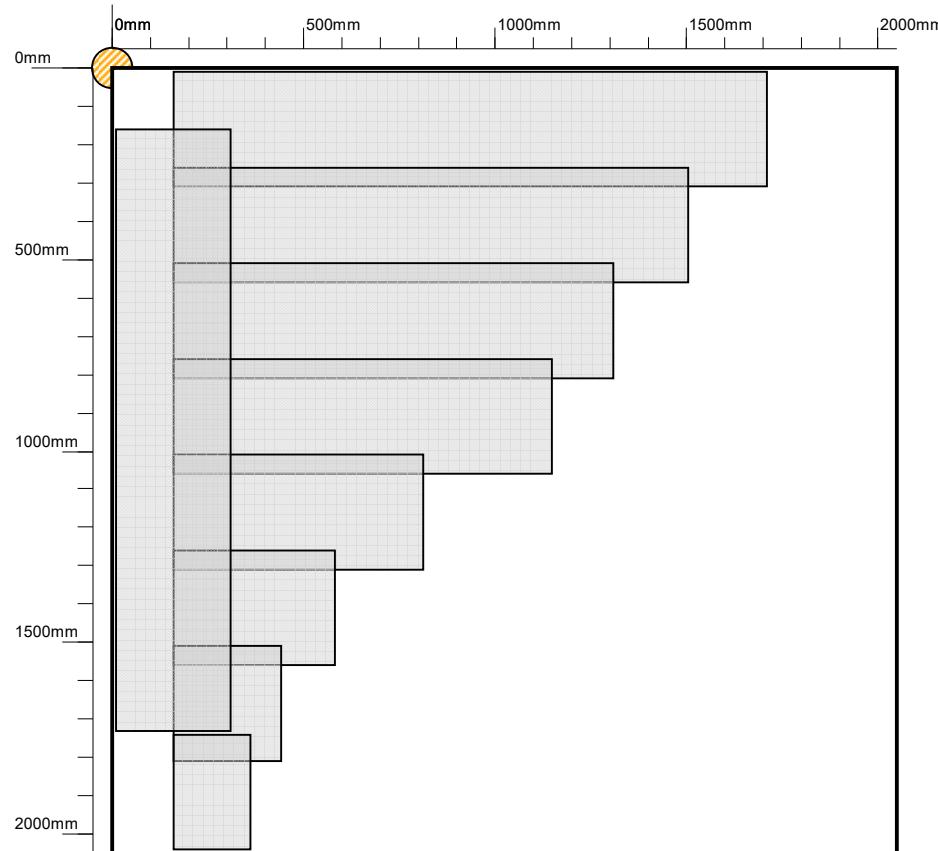
		Row: 1 Plate: 3 Plate Length (mm): 3110 Plate Width (mm): 2300 Orientation: Vertical Scan Method: Parallel Max discontinuity: 0 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used			
Discontinuity Colour Scheme	Symbols	Tank: MCH-04 Operator: Bakhtiar Date: 1/21/2021 Equipment Serial: 7C00000031C51722 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited			
20% - 29% 30% - 39% 40% - 49% 50% - 59% 60% - 69% 70% - 79% 80% - 89% 90% - 100% Weld Discontinuity	Track Non-Scanned Area Plate Reference Tank Reference				23/39

Y-axis
 X-axis



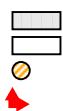
		Row: 1 Plate: 4 Plate Length (mm): 2960 Plate Width (mm): 2300 Orientation: Vertical Scan Method: Parallel Max discontinuity: 20 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used			
Discontinuity Colour Scheme 	Symbols Track Non-Scanned Area Plate Reference Tank Reference	Tank: MCH-04 Operator: Bakhtiar Date: 1/21/2021 Equipment Serial: 7C00000031C51722 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited			
					24/39

 Y-axis
 X-axis



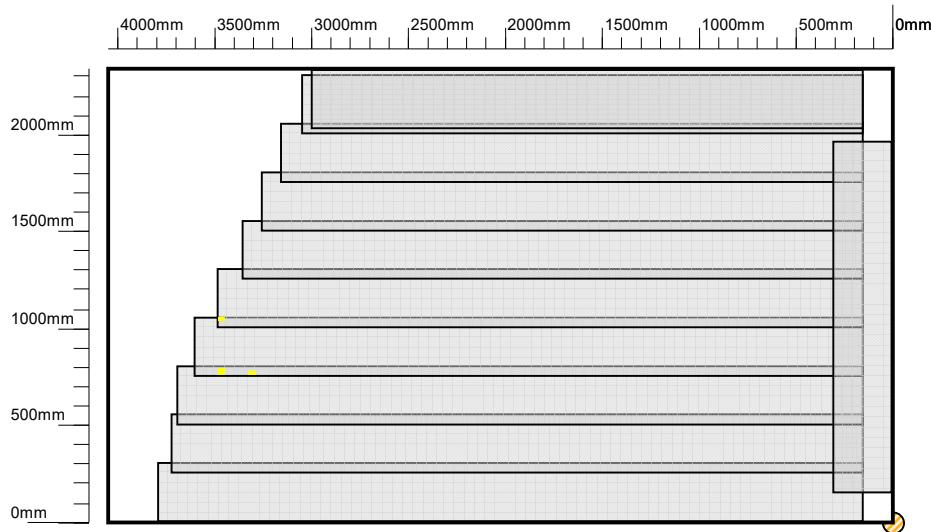
Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



Row: 1 **Plate:** 5
Plate Length (mm): 2050 **Plate Width (mm):** 2050
Orientation: Vertical **Scan Method:** Parallel
Max discontinuity: 0 **Showing defects from:** TOP & BOTTOM
Lower Threshold: 20% **Upper Threshold:** 100% (Import Threshold: 20%)
Defect enhancement setting: Not used

Tank: MCH-04 **Operator:** Bakhtiar
Date: 1/21/2021 **Equipment Serial:** 7C00000031C51722
Location: Machike Terminal
Company: SGS Pakistan Pvt Limited
Client: Shell Pakistan Limited



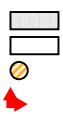
X-axis
Y-axis

Eddyfi
Technologies

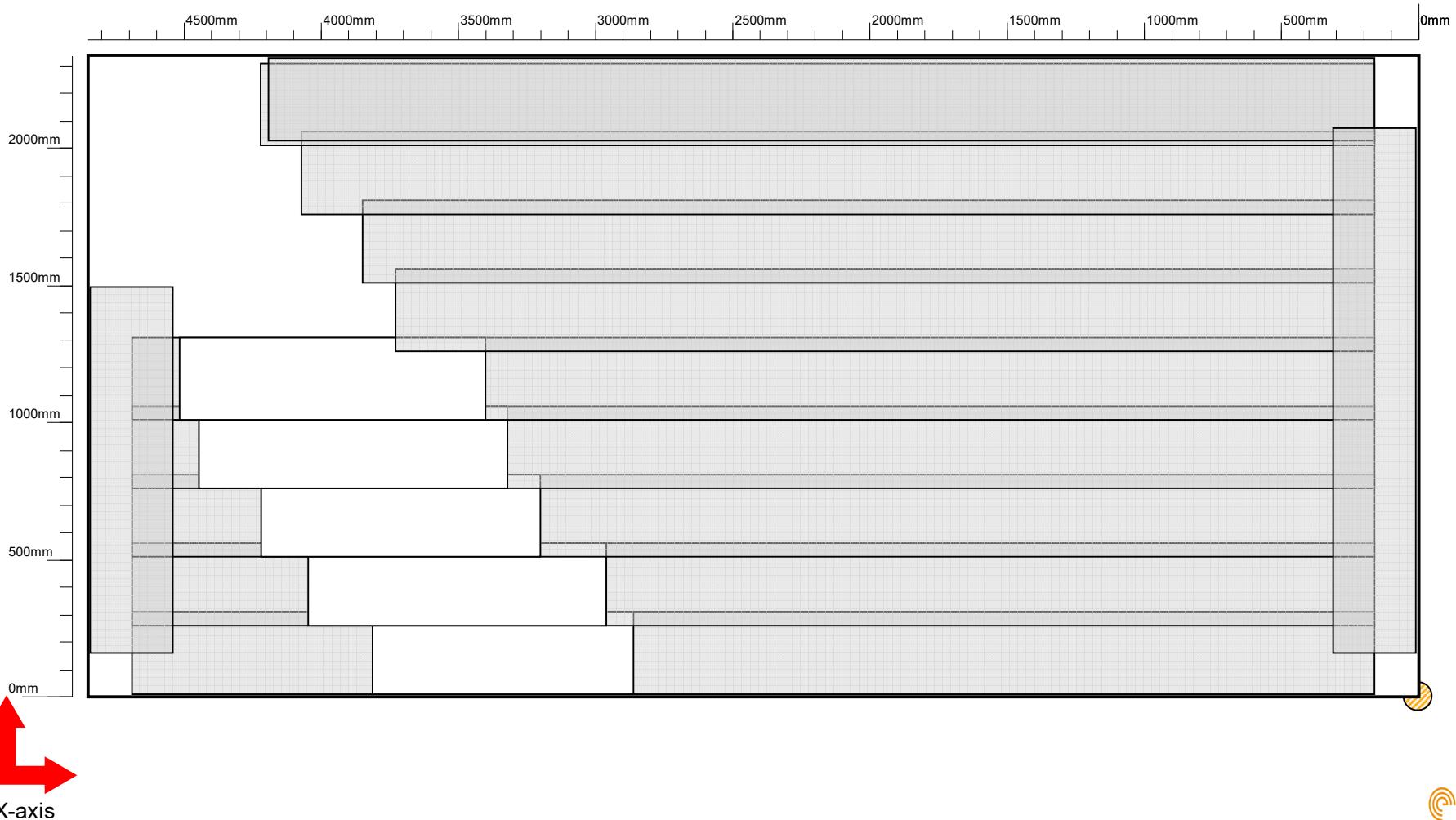


Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

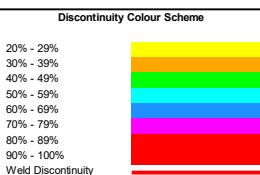
Symbols



Row:	2	Plate:	1
Plate Length (mm):	4050	Plate Width (mm):	2340
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	21	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



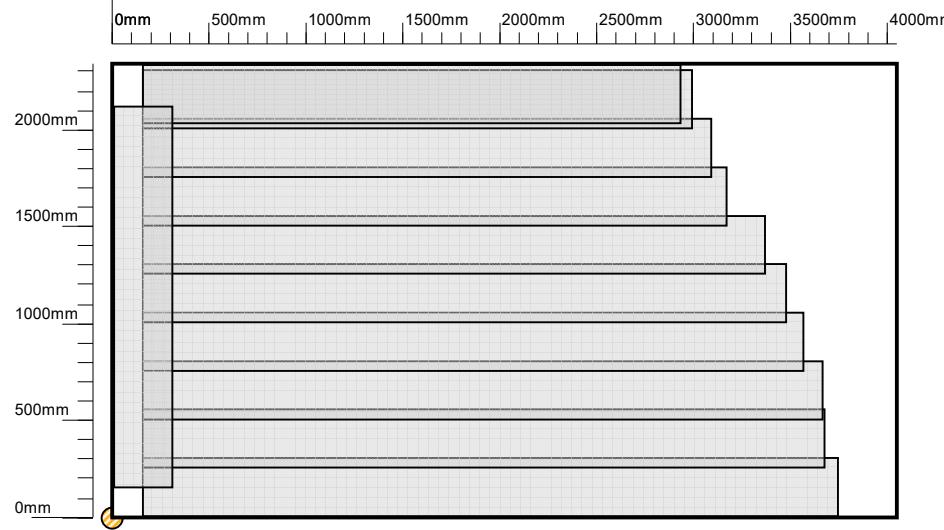
SGS



Symbols



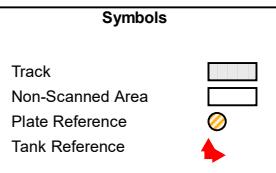
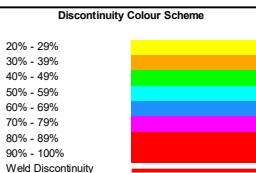
Row:	2	Plate:	2
Plate Length (mm):	4850	Plate Width (mm):	2340
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from:	TOP & BOTTOM
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



X-axis
Y-axis

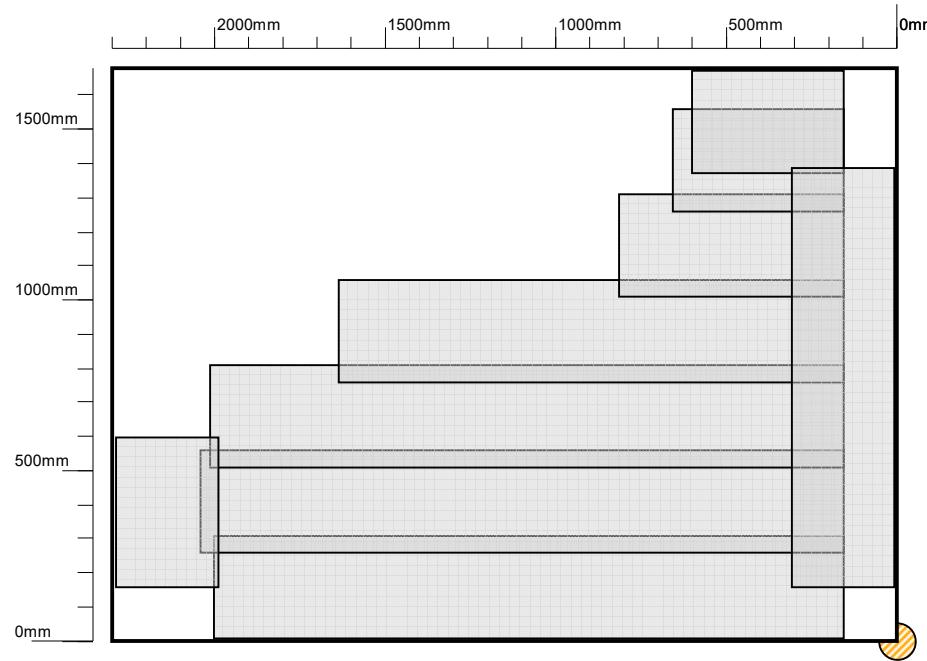
 Eddyfi Technologies

SGS

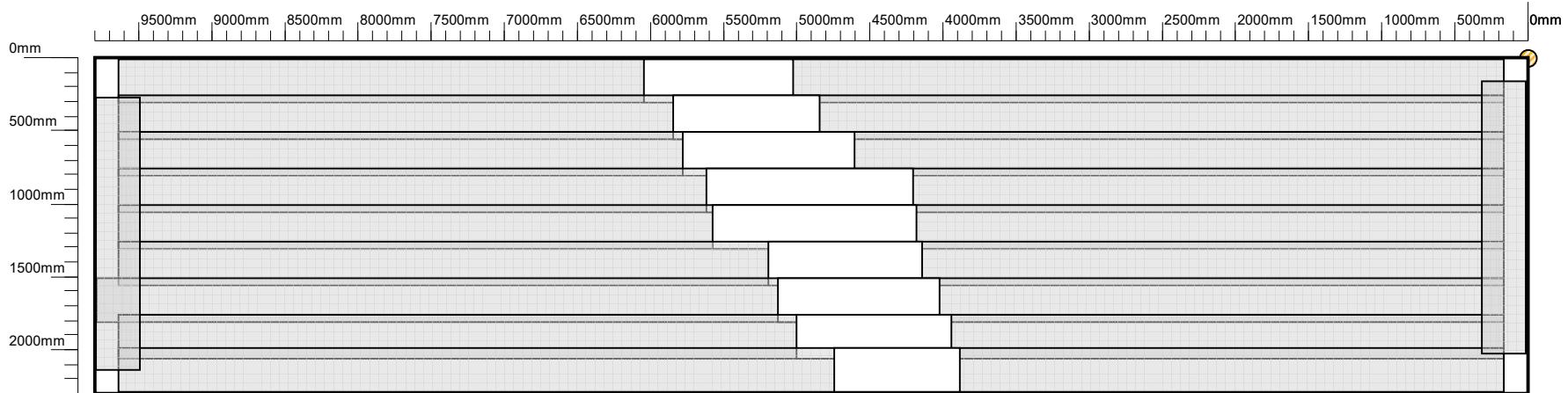


Row:	2	Plate:	3
Plate Length (mm):	4050	Plate Width (mm):	2340
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from:	TOP & BOTTOM
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

 Y-axis
 X-axis



		Row: 3 Plate: 1 Plate Length (mm): 2300 Plate Width (mm): 1680 Orientation: Vertical Scan Method: Parallel Max discontinuity: 0 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used			
Discontinuity Colour Scheme 20% - 29% 30% - 39% 40% - 49% 50% - 59% 60% - 69% 70% - 79% 80% - 89% 90% - 100% Weld Discontinuity	Symbols Track Non-Scanned Area Plate Reference Tank Reference	Tank: MCH-04 Date: 1/21/2021 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited	Operator: Bakhtiar Equipment Serial: 7C00000031C51722		
					29/39



X-axis
Y-axis

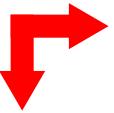
Eddyfi
Technologies

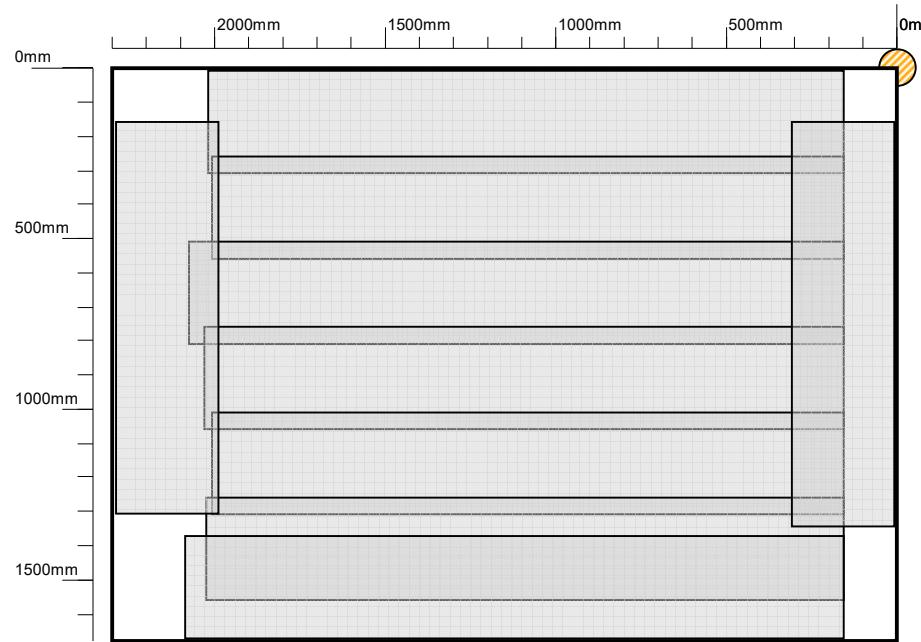


Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols	
Track	
Non-Scanned Area	
Plate Reference	
Tank Reference	

Row:	3	Plate:	2
Plate Length (mm):	9800	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

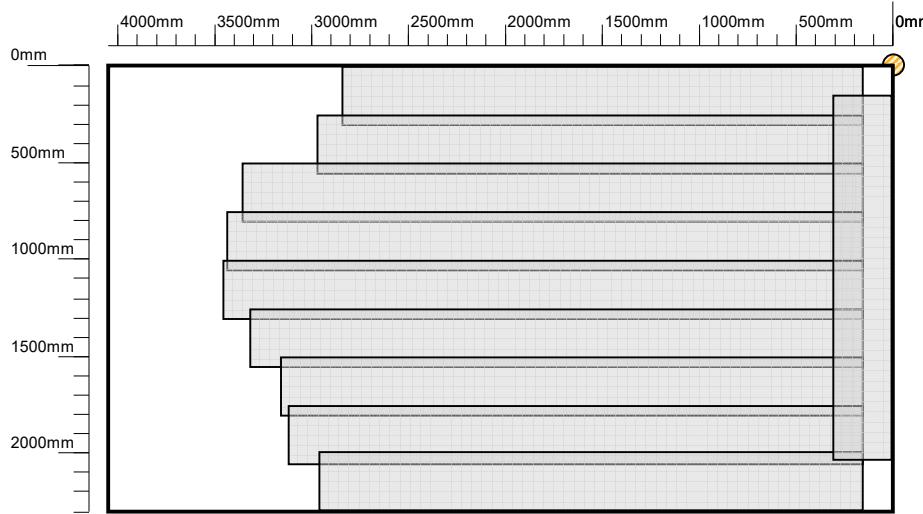
 Y-axis
 X-axis



Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols	
Track	
Non-Scanned Area	
Plate Reference	
Tank Reference	

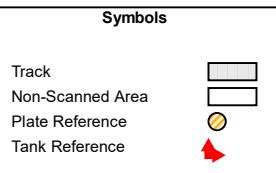
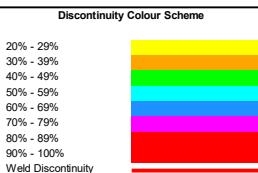
Row:	3	Plate:	3
Plate Length (mm):	2300	Plate Width (mm):	1680
Orientation:	Vertical	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



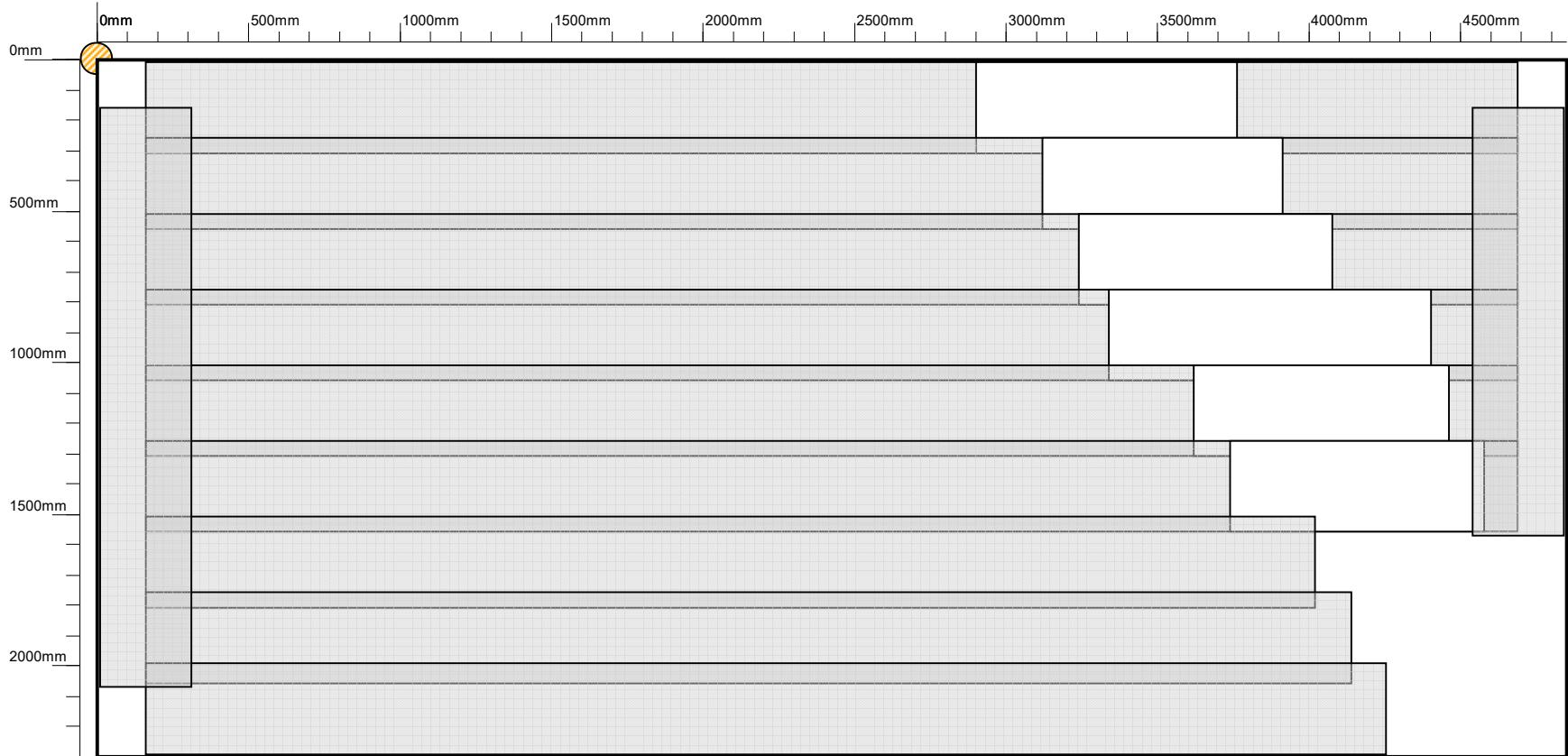
X-axis
Y-axis

 Eddyfi Technologies

SGS



Row:	4	Plate:	1
Plate Length (mm):	4050	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from:	TOP & BOTTOM
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



X-axis
Y-axis

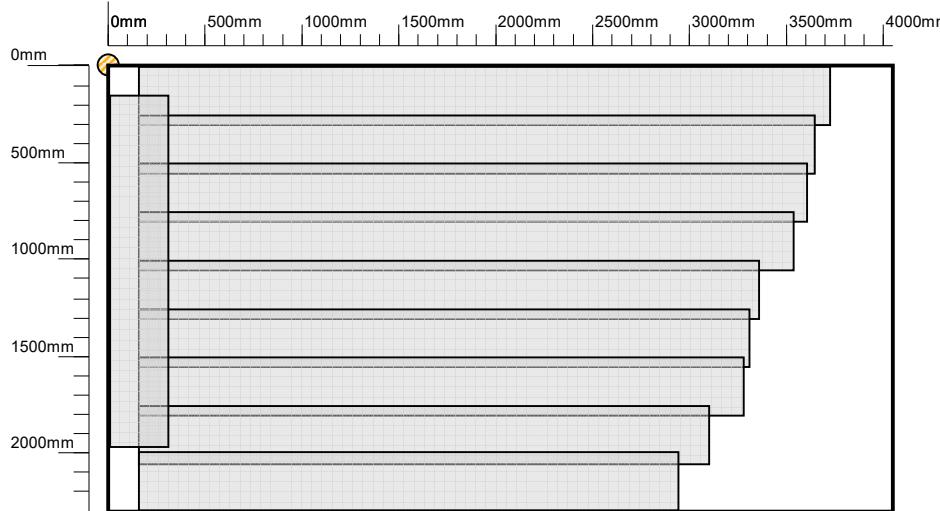
Eddyfi
Technologies



Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols	
Track	
Non-Scanned Area	
Plate Reference	
Tank Reference	

Row:	4	Plate:	2
Plate Length (mm):	4850	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



X-axis
Y-axis

Eddyfi
Technologies

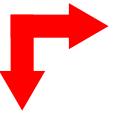


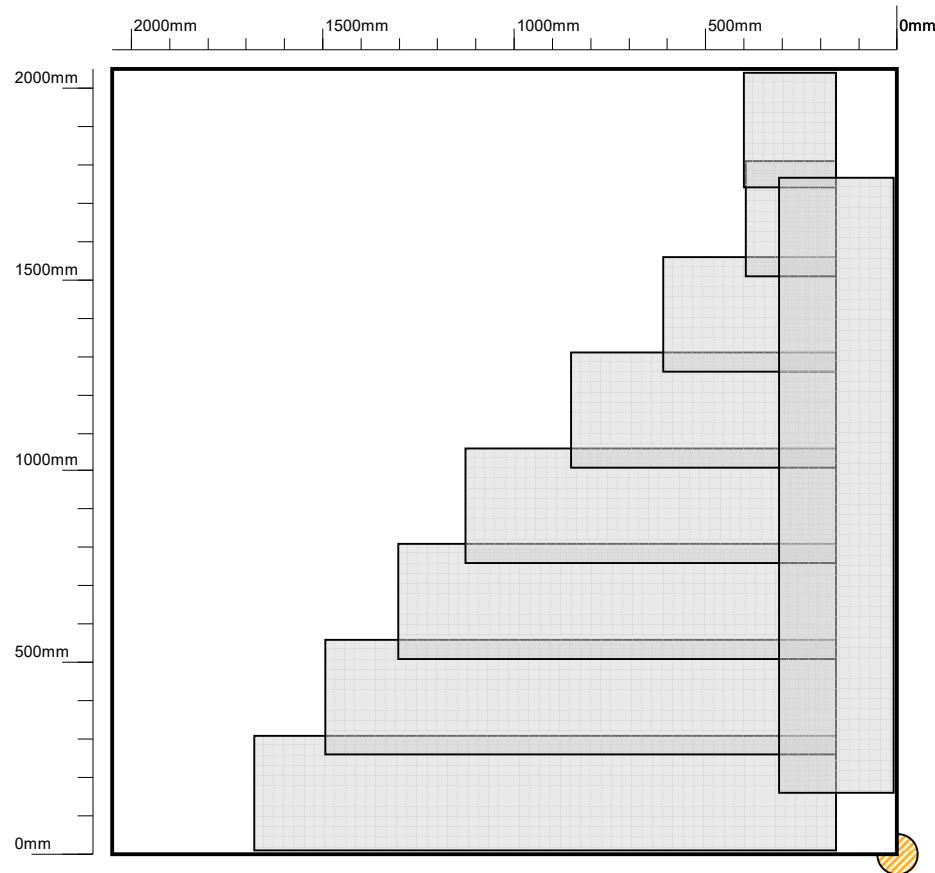
Discontinuity Colour Scheme	
20% - 29%	Yellow
30% - 39%	Orange
40% - 49%	Red
50% - 59%	Green
60% - 69%	Cyan
70% - 79%	Magenta
80% - 89%	Blue
90% - 100%	Black
Weld Discontinuity	White

Symbols



Row:	4	Plate:	3
Plate Length (mm):	4050	Plate Width (mm):	2300
Orientation:	Horizontal	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

 Y-axis
 X-axis

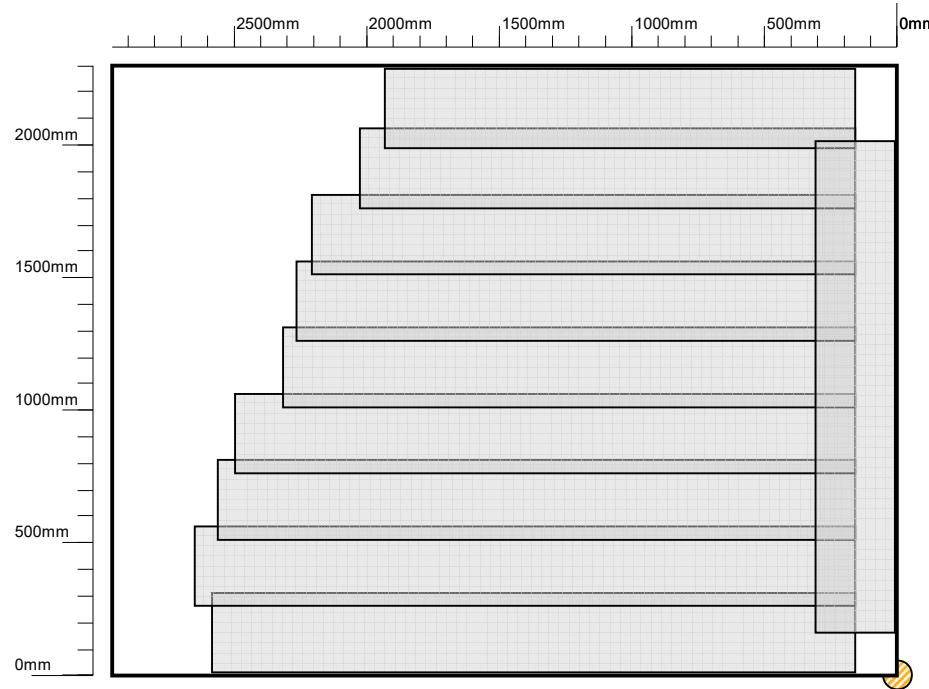


Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols	
Track	
Non-Scanned Area	
Plate Reference	
Tank Reference	

Row:	5	Plate:	1
Plate Length (mm):	2050	Plate Width (mm):	2050
Orientation:	Vertical	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		

Y-axis
 X-axis



SGS

Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

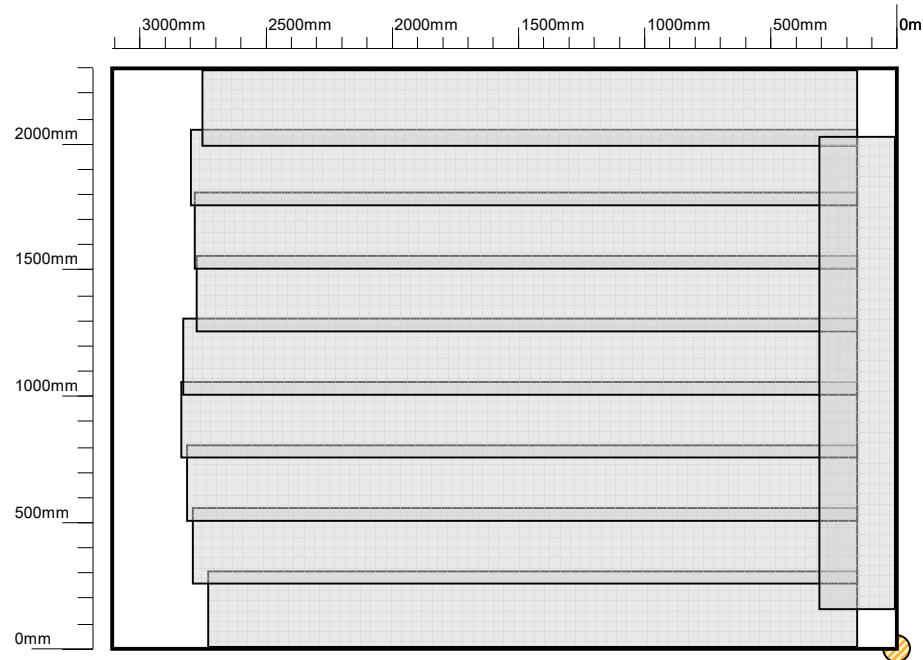
Symbols

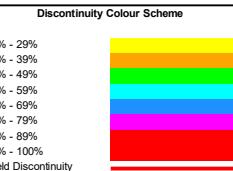
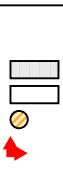


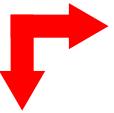
Row: 5 **Plate:** 2
Plate Length (mm): 2960 **Plate Width (mm):** 2300
Orientation: Vertical **Scan Method:** Parallel
Max discontinuity: 0 **Showing defects from:** TOP & BOTTOM
Lower Threshold: 20% **Upper Threshold:** 100% (Import Threshold: 20%)
Defect enhancement setting: Not used

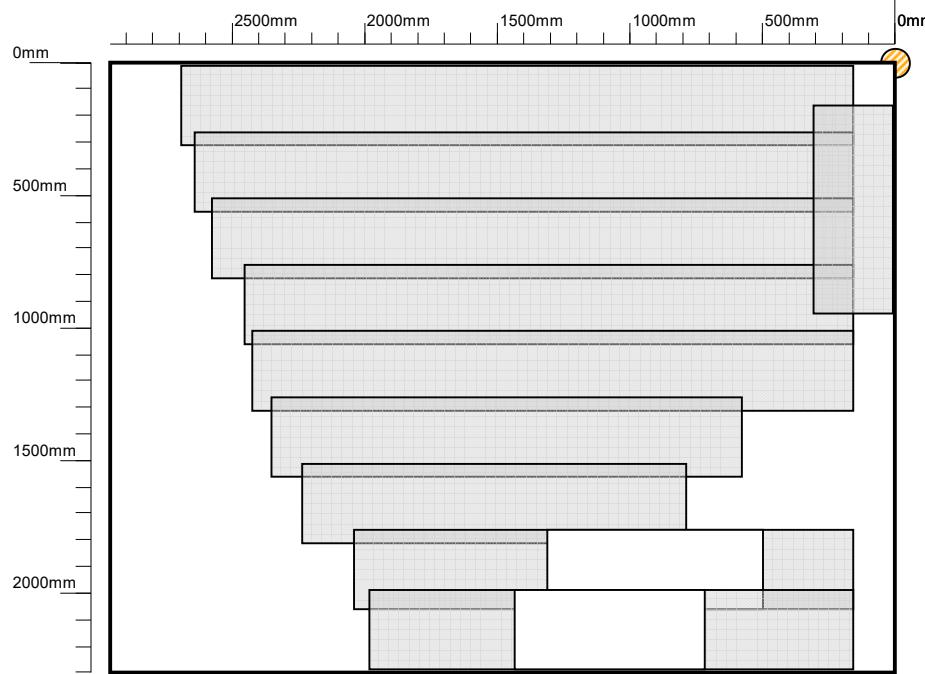
Tank: MCH-04 **Operator:** Bakhtiar
Date: 1/21/2021 **Equipment Serial:** 7C00000031C51722
Location: Machike Terminal
Company: SGS Pakistan Pvt Limited
Client: Shell Pakistan Limited

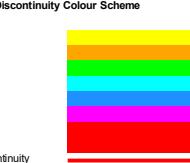
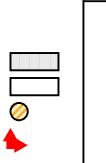
 Y-axis
 X-axis



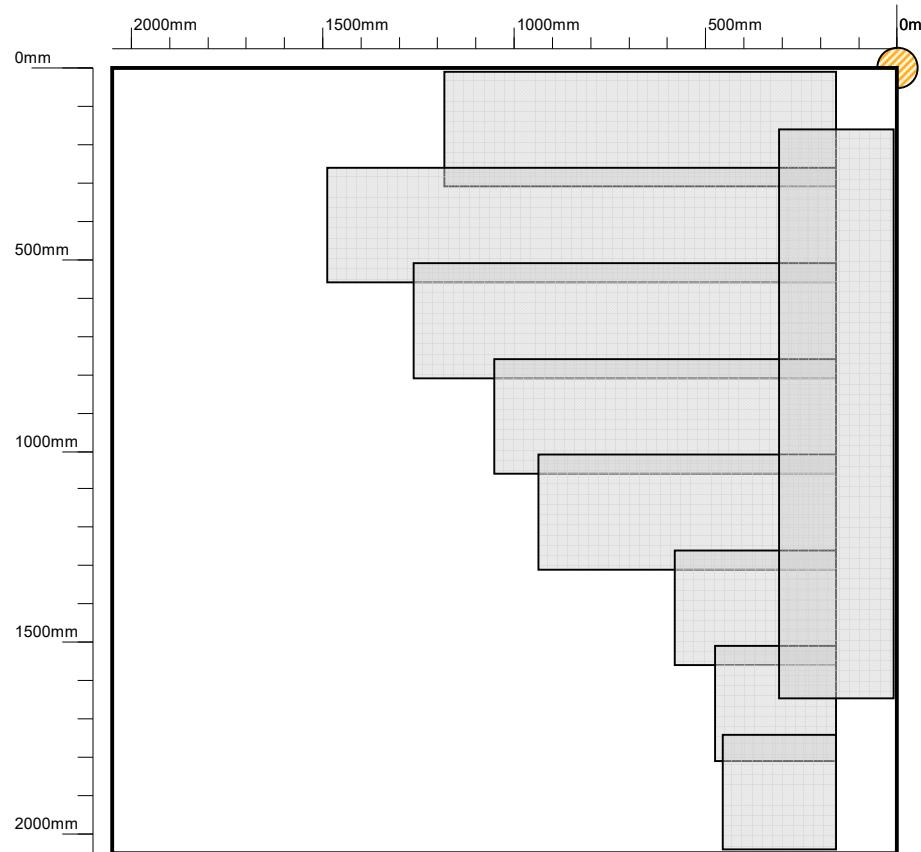
		Row: 5 Plate: 3 Plate Length (mm): 3110 Plate Width (mm): 2300 Orientation: Vertical Scan Method: Parallel Max discontinuity: 0 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used	
Discontinuity Colour Scheme	Symbols	Tank: MCH-04 Operator: Bakhtiar Date: 1/21/2021 Equipment Serial: 7C00000031C51722 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited	 
20% - 29%	Track	Tank:	MCH-04
30% - 39%	Non-Scanned Area	Date:	1/21/2021
40% - 49%	Plate Reference	Location:	Machike Terminal
50% - 59%	Tank Reference	Company:	SGS Pakistan Pvt Limited
60% - 69%		Client:	Shell Pakistan Limited
70% - 79%			
80% - 89%			
90% - 100%			
Weld Discontinuity			

 Y-axis
 X-axis



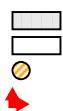
		Row: 5 Plate: 4 Plate Length (mm): 2960 Plate Width (mm): 2300 Orientation: Vertical Scan Method: Parallel Max discontinuity: 0 Showing defects from: TOP & BOTTOM Lower Threshold: 20% Upper Threshold: 100% (Import Threshold: 20%) Defect enhancement setting: Not used	
Discontinuity Colour Scheme 	Symbols 	Tank: MCH-04 Operator: Bakhtiar Date: 1/21/2021 Equipment Serial: 7C00000031C51722 Location: Machike Terminal Company: SGS Pakistan Pvt Limited Client: Shell Pakistan Limited	38/39

Y-axis
 X-axis



Discontinuity Colour Scheme	
20% - 29%	
30% - 39%	
40% - 49%	
50% - 59%	
60% - 69%	
70% - 79%	
80% - 89%	
90% - 100%	
Weld Discontinuity	

Symbols



Row:	5	Plate:	5
Plate Length (mm):	2050	Plate Width (mm):	2050
Orientation:	Vertical	Scan Method:	Parallel
Max discontinuity:	0	Showing defects from: TOP & BOTTOM	
Lower Threshold:	20%	Upper Threshold:	100% (Import Threshold: 20%)
Defect enhancement setting: Not used			
Tank:	MCH-04	Operator:	Bakhtiar
Date:	1/21/2021	Equipment Serial:	7C00000031C51722
Location:	Machike Terminal		
Company:	SGS Pakistan Pvt Limited		
Client:	Shell Pakistan Limited		



(MPI) Magnetic Particle Inspection

REPORT



OUT OF SERVICE INSPECTION OF MCH-04

MAGNETIC PARTICLE EXAMINATION REPORT

Report No:	5010465/MPI/MCH4/01
Rev.	0
Page:	1 of 1
Date:	22/01/2021

SGS Ref. No: 5010465	Examination Date: 22-10-2020	Thickness: 10 mm
Client: Shell Pakistan Limited	Object / Part Desc: MCH-04	Illumination level : 1000 LUX
Project:OOSI of MCH- 04	Material: CS	Surface Temperature: Ambiant
Location: Machicke Terminal	Magnetizing Technique: Permenant Yoke	Calibration Refernce : Pie Gauge
Examination Code: ASME SEC V	Surface Condition: Painted	Yoke Sr No : 2964
Acceptance Code: API 653	Examination Medium: Dry <input type="checkbox"/> Wet <input checked="" type="checkbox"/>	Coil Sr No (If Used) : --
Procedure No: IND-QMS-TP-31	Method of Examination:Continuous <input checked="" type="checkbox"/> Residual <input type="checkbox"/>	Contrast Consumable Used : WCP-2
Method : Visible <input checked="" type="checkbox"/> Fluorescent <input type="checkbox"/>	MPI Consumable Brand Name: Magnaflux	MPI Consumable Used : 7HF

Examination Results

Remarks (If Any) : Note-

Particulars	Inspected By	Reviewed by
Name	Sajjad Hussain	Abdul Hanan
Qualification / Designation	MT Level II	Inspection Engineer
Signature:		
Date	21/01/2021	21/01/2021

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SGS Pakistan Private Limited -H 3/3,Sector 5,Korangi Industrial Area ,Karachi-74900 ,Pakistan. UAN: 92 (21) 111 222 747 Tel :92-21-35121388-97 Fax: 92 (21) 3 5121386-87 Web :www.sgs.com

	INDUSTRIAL SERVICES Vent Calculation Report	Order #:5010465 Rev: 0 Page: 1 of 4 Date:
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<h1 style="color: blue;">VENTING REPORT OF TANK MCH-04</h1>	SGS Pakistan (Pvt.) Ltd. H-3/3, Sector - 5 Korangi Industrial Area, Karachi - PAKISTAN. Tel: +92 21 35121388 Fax: +92 21 35121325 / 35121386
<b style="color: blue;">Venting Calculation Report	

SCOPE:

- NORMAL VENTING
- EMERGENCY VENTING
- FRANGIBILITY ASSESSMENT

CLIENT:	SHELL PAKISTAN LIMITED
TANK NO:	MCH-04
DATE:	28-1-2021

Particulars	Prepared By	Reviewed By
Name	Madiha Gulfam	
Signature		
Date:	28-1-2021	28-1-2021

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SGS Pakistan Private Limited -H 3/3, Sector 5, Korangi Industrial Area ,Karachi-74900 ,Pakistan. UAN: 92 (21) 111 222 747 Tel :92-21-35121388-97 Fax: 92 (21) 3 5121386-87 Web :www.sgs.com

Title: Venting Report, Ref: IND-QMS-FOR-073, Revision: 00, Page 1 of 4 Dated: 01-10-2014

	INDUSTRIAL SERVICES Vent Calculation Report	Order #:5010465 Rev: 0 Page: 2 of 4 Date:
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TANK DETAILS:

Tank:	Above Ground Storage Tank
Tank no:	MCH-04
Op. Pressure:	Atmospheric Pressure
Type:	Vertical Tank
Product:	HSD

GIVEN DATA:

Diameter (D)=	15	m
Height (H)=	10	m
Inlet Flow rate=	1100	m^3/hr
Outlet Flow rate=	144	m^3/hr
Capacity=	1,767.14	m^3
Leg Length=	4	mm

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Title: Venting Report, Ref: IND-QMS-FOR-073, Revision: 00, Page 2 of 4 Dated: 01-10-2014



INDUSTRIAL SERVICES

Vent Calculation Report

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CALCULATIONS

- **NORMAL VENTING**

1. **Required Vent Capacity (SCMH)**

Required Vent Capacity	
Maximum In breathing rate (vacuum) (SCMH)	
Displacement	1100
Thermal inbreathing	185.07
Total	1285.07
Maximum Out breathing rate (pressure) (SCMH)	
Displacement	144
Thermal out breathing	267.7
Total	411.7

2. **Normal Vent Size (inch)**

Vent size (inches)	
For pressure hazard	4"
For vacuum hazard	8"

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- **EMERGENCY VENTING**

Calculations	
Wetted Area	417.23 m ²
Heat Input	7,149,38.57 watt
Venting capacity	38,454.94 m ³ /hr

CONCLUSION:

NORMAL VENTING: Normal venting Requirement of Tank Mch-4 calculated for pressure and vacuum hazard is 4" and 8".

EMERGENCY VENTING: For emergency condition, calculated venting requirement is 38,454.94 m³/hr for wetted area of 417.23 m². If the tank would be taken in service without IFC, weak roof to shell attachment or emergency vent with excess ventilation must be provided to the tank according to the above calculated venting requirements. At present weak roof to shell joint is available with leg length 4mm which satisfies the condition of emergency venting.

FRANGIBILITY ASSESSMENT: The Average leg length of weak roof to shell joint is 4.00 mm when measured from toe to toe, which is in compliance with weak roof-to-shell attachment.

NOTE 1: Above calculations & results are based on standard API 2000.

NOTE 2: If extra emergency vent size would be installed to save the lifting of manhole cover in case of abnormal internal pressure, it should be in accordance with the specifications confirmed by the vendor for above calculated venting requirements.

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Tank Cleaning Certificate

We here by certify that tank cleaning has been checked at
Shell Machike Terminal
for the tank described as follows:

MCH-04

Tank No

Height 10.00 meters

Diameter 15.00 meters

Dimensions

1767 M³

Capacity

Self-Supported fixed roof

Floating or Fixed roof

This is to certify that above out of service tank has been inspected and checked in all respect for safe tank entry and found fully cleaned, appropriate and in ready state for tank internal inspection

Authorized Representative



Bakhtiar Ahmed

(API – 653 Authorized Inspector - 54112)

Date: 20-01-2021



AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP™

API Individual Certification Programs

verifies that

Bakhtiar Ahmed

has met the requirements for API certification

*API-653 Aboveground Storage Tank
Inspector*

Certification Number *54112*

Original Certification Date *September 30, 2014*

Current Certification Date *September 30, 2020*

Expiration Date *September 30, 2023*


Manager, Individual Certification Programs

