

**20000m3 FUEL OIL STEEL STORAGE TANK****Hydrotest Procedure****Vendor Doc No: VD-ST-PR-006****Client Doc No. :-**-----

Rev.: 01

Vendor:**ITEM NO. : Hydrotest Procedure****TOTAL Sheets : 15 (Excluding Attachments)**

- ☐ **NO COMMENT:** Documents/ Drawings Were Checked By Purchaser And Further Steps Can Be Followed.
- ☐ **COMMENTS AS MARKED:** Documents/Drawings Were Checked By Purchaser And Marked Comments Must Be Considered By Vendor. Vendor Shall Revise Documents/ Drawings As Per Comments And The New Revision Of Documents/ Drawings Must Be Reissued Prior To Fabrication.
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Name :

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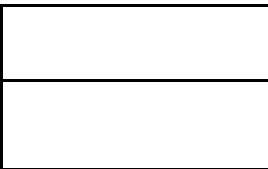
Date:

Req. No.:

Seq. No.:

Purchaser review & comments does not absolve the vendor of the responsibility for the correct design, manufacturing and operation of the equipment

D01	Issue for Approval	M.B	E.SHAKOURI	M.TAVSOLI FAR	M.Ghaleie	06.Jan.2026
D00	Issue for Comment	M.B	M.GH	M.A.SH	-	20.Aug.2025
Rev.	DESCRIPTION	Pre.	Checked	Approved	AUTHD	Date



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1) SCOPE:

This procedure covers the general requirement for hydrostatic test of fix roof storage tanks.

2) APPLICATION:

This procedure is based on the API 650 and specification to assess leak test for covered welding seam and settlement foundation of storage tanks.

3) REFERENCE:



API 650 standard, 14th. Ed. AUG.2025

4) WATER QUALITY:

4-1) - For carbon steel tanks, the water for hydrostatic test use should be free from salt and have sufficient anti corrosive agent. The temperature of the test water shall not lower than 15° c.

4-2) - The materials used in the construction of stainless steel tanks may be subject to severe pitting, cracking .or rusting if they are exposed to contaminated test water for extended periods of time. The purchaser shall specify a minimum quality of test water that conforms to the following equipment:

4-2-1) Unless otherwise specified by the purchaser, water used for hydrostatic testing of tanks shall be potable, containing at least 0.2 parts per million free chlorine.

4-2-2) Water shall be substantially clean and clear.

4-2-3) Water shall have no objectionable odor (that is, no hydrogen sulfide).

4-2-4) Water pH shall be between 6.5 and 8.


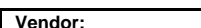


4-2-5) Water temperature shall be below 50 ° C (120 ° F).

4-2-6) The chloride content of the water shall be below 30 ppm for equipment made from stainless steels and less than 150 ppm for equipment fabricated from carbon steels.



4-2-7) For carbon steel equipment where water contact exceeds 14 days,including filling and draining (e.g. consider adding an oxygen scavenger and a biocide, and raise the pH by the addition of caustic).

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- 4-3) Upon completion of the hydrostatic test, water shall be completely drained. Wetted surface shall be washed with potable water when non potable water is used for the test and completely dried. Particular attention shall be given to low spots, crevices, and similar areas. Hot air drying is not permitted.


5) MARKER:



Sufficient points on the wall shell plates (400 mm above the bottom) should be marked. The marked points must be in such a way that distance and level between indicators is same with the bench mark. Quantity of points shall be determined by fabrication standard and tank diameter.

6) BENCH MARK:

At least 4 points (for tanks up to 25m diameter) or 8 points (for tank with diameter more than 25m) must be set as the bench marks. These points must have the same elevation and in such a way that settlement of the foundation has no effect on them. Meanwhile two other points should be visible from each one as a minimum requirement. Distance of these bench marks from the tank shall be determined by civil engineer.

7) PREPARATION PRIOR TO HYDROSTATIC TEST:

- Check points before water filling test.
- All welding work shall be finished.
- All NDT shall be completed.
- Temporary piping for water test shall be completed and tools are completed.
- Cleaning inside and outside of the tank and removal of the temporary jigs and tools are completed.
- All shell opening shall closed by appropriate cover plate.
- Level of foundation on under shell plate shall be measured at specified point.
- All inspection including, dimensional check, visual examination shall be completed.
- The hydrostatic test shall be completed before the application of the insulation and final painting.
- The bottom plates shall be tested in any case before water is let into the tank for testing.
- All nozzles including emergency vent and manholes shall be blinded before starting the Hydro Test.
- Deleted 
- Before hydrotest, provisions for settlement measurement on bottom and shell shall be made. Markers on the shell shall be provided 500 mm from bottom to check shell settlement. Size shall be 50x50x5 angle and 100 mm length. Number and location of measuring points shall be determined according to API653. Initial readings shall be taken before filling the tank. During the hydrotest, regular settlement readings shall be taken every day and reported to the purchaser. Evaluation and acceptance of settlement shall be as per API-650 and API-653.

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8) FILLING WATER RATE:

8-1) While is normal practice to test all tanks by filling with water before commission. This filling should be done under controlled condition to ensure that foundation failure does not occur during filling.

8-2) The water test (hydro loading) makes the tank subsoil to settle and detects the points which may have the differential settlements and may be fixed before the service loading, so it is an essential test.

Initial elevations should be obtained prior to any loading, and settlement records are referenced to a permanent, fixed benchmark. Movements should begin shortly after application of load and should increase for a short period of time and then begin to decrease, Additional loads should not be applied until movement has begun to decelerate under the previous load.

The water test program requirements would be dependent upon the tank size, storage product, final site grade, subsurface condition and tank spacing, however the following 4staged procedure may be carried out for water loading

Stage 1: The tank shall be filled to 0.25H at a maximum filling rate of 2.5 meters per day. At the end of stage 1, there shall be a further equilibration and monitoring period of 24 hours before the commencement of stage 2.

Stage 2: The tank shall be filled from 0.25H to 0.5H at a maximum filling rate of 1.25 meters per day. At the end of stage 2, there shall be a further equilibration and monitoring period of 36 hours before the commencement of stage 3.



Stage 3: The tank shall be filled from 0.5H to 0.67H at a maximum filling rate of 0.75meter per day. At the end of stage 3 there shall be a further equilibration and monitoring period of 48 hours before the commencement of stage 4.

Stage 4: The tank shall be filled from 0.67H the 0.83H at a maximum filling rate of 0.75meter per day. At the end of stage 4 the tank shall be monitored for at least 4 more days.

Stage 5: The tank shall be filled from 0.83H the 1.00H at a maximum filling rate of 0.75meter per day. At the end of stage 4 the tank shall be monitored for at least 4 more days.

In all above stages the filling period in any one day shall not be less than 3hours and shall not be more than 16 hours. At the end of each filling period, for the remaining hours in the day's total of 24 the foundation shall be allowed to equilibrate, consolidate and be monitored.

It is recommended to perform water test under supervision of a qualified soil technician.

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8-3) Roof manhole or bleeder vent and deck manhole should be open while filling or emptying a fixed roof tank for test purposes, so that the tank is not damaged by excessive vacuum or pressure loading.

9) INSPECTION DURING THE WATER FILLING:

9-1) Settlement of the tank foundation must be monitored in case of extraordinary settlement will subcontractor shall report it to inspector as soon as possible.

9-2) Checking leakage of weld seam.

9-3) Checking of function of level gauge and other.

10) TO ASSESS SETTLEMENT OF TANK:

10-1) Before filling the tank, All marker and bench mark elevation should be check and recorded. When water level reached 1/4 height of the tank, the above mentioned checking must be repeat again. This measuring should be carried out in each step of test until the tank filled completely.

10-2) Minimum interval between each step of filling and measuring the height difference of marker and bench mark is 24 hour.

10-3) Number of point for measuring settlement.

10-3-1) Tank settlement shall initially be surveyed with the tank empty using the number of bottom plate projection elevation measurement point. N, uniformly distributed around the circumference, as indicated by the following formula:



$$N = D/10$$

N= Minimum required number of settlement measurement points, but no less than eight. All fractional value shall be rounded to the next higher whole number. The maximum spacing between settlement measurement points shall be 30 feet.

D= Tank diameter, in feet.

10-4) Determination of acceptable settlement

10-4-1) If settlement measurement are specified by the purchaser, any differential settlement greater than 13 mm per 10 m (1/2 inch Per 32 ft) of circumference or a uniform settlement over 50 mm (2in). Shall be reported to the purchaser for evaluation refer to API 650. Filling of the tank shall be stopped until cleared by the purchaser.

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11) TO ASSESS TESTING:

11-1) SHELL TESTING

11-1-1) The shell of fixed & floating roof tanks shall be tested after completion of the roof.

11-1-2) Test liquid level is equal to height from the bottom to the top of shell including the top angle.

11-1-3) Continuous inspection shall be maintained for the whole filling period. All leakages found shall be repaired. To do this, the water level should be at least 300 mm below the point being repaired.

11-1-4) All leakage seam after repair shall be tested according to the above mentioned procedure.



11-1-5) Any tank showing evidence of leakage from the bottom during water test should be emptied immediately. The source of such leaks should be determined and rectified. Where there is risk that the leakage may have caused washout of the foundation material. The foundations are to be inspected. The repair of the foundation should be subject to special consideration and approval by the company.

11-1-6) Air pressure as the following shall be applied to the each tank filled with water to the design liquid height . .The air pressure shall be reduced to the design pressure and the tank shall be checked for tightness.

ABYEK 20,000^{m3} : Free Vent (Not Pressure)

11-1-7) If sufficient water to fill the tank is not available, the tank may be tested by:

- Painting all of the joints on the inside with highly penetrating oil, such as automobile spring oil, and carefully examining the outside of the joints for leakage.
- Applying vacuum to either side of the joints or applying internal air pressure as specified for the roof test in below or carefully examining the joints for leakage.
- Using any combination of the methods stipulated in a & b above.

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11-2) FIXED ROOF TESTING

11-2-1) Upon completion, the roof of a tank designed to be gas-tight (except for roofs designed under 7.3.7.2) shall be tested by one of the following methods:


- a. Applying internal air pressure not exceeding the weight of the roof plates and applying to the weld joints a bubble solution or other material suitable for the detection of leaks.
- b. Vacuum testing the weld joints in accordance with 8.6 to detect any leaks.



11-2-2) After past 15 min reduce the pressure to half. Then apply soap solution or other suitable agent to detect any leakage.

11-2-3) Pay attention to the need for careful control and monitoring of pressures during this testing. Climatic change may cause sharp fluctuations in test pressure and so that provision should be made for the safe relief of pressure or vacuum in the event of such fluctuation. Vacuum test is an alternative method instead of soap(bubble) test.



11-2-4) Pressure and vacuum relief vents shall normally be installed after completion of the tank water test or alternatively shall be blank end-off during the testing of the roof, after installation or immediately following the roof pressure test all vent's shall be carefully examined to ensure that all packing and blanks have been removed and that all moving parts function normally.



11-2-5) Tank inside, shall be thoroughly dried after hydrostatic test.



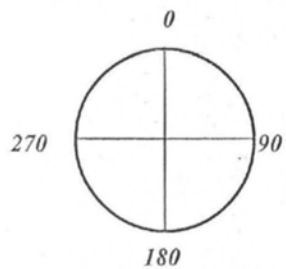
	Pressure Table	
	Design Pressure	ATM
	Hydrotest Pressure	ATM

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12) TEST RECORD

	<h1>Inspection Report before Hydro test</h1>		
Date:	Project:		
Client :	Diameter:		
Contractor :	Height :		
Tag No. :	Drawing No.		
Inspection Stage before Hydro Test			
1- Does all Attachment fabricated? Yes <input type="checkbox"/> No <input type="checkbox"/>			
2- Does all Welding NDT Finish? Yes <input type="checkbox"/> No <input type="checkbox"/>			
3- Does all Weld Repair Proceed? Yes <input type="checkbox"/> No <input type="checkbox"/>			
4- Are all Nozzles in Correct Position? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Inspection Result : <input type="checkbox"/> OK <input type="checkbox"/> Not OK			
Remark :			
Contractor Inspector :	Client Inspector :	Third Party Inspector :	


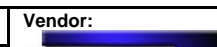
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		<h1>Hydro test Report</h1>												
Date:		Project:												
Client :		Diameter:												
Contractor :		Height :												
Tag No. :		Drawing No.												
Inspection Result :														
1- Plumbness														
2- Settlement														
	Inspection Stage	Inspection Type	0 °	30 °	60 °	90 °	120 °	150 °	180 °	210 °	240 °	270 °	300 °	330 °
	Empty Tank	Plumbness												
		Settlement												
	1/4 Height	Plumbness												
		Settlement												
	1/2 Height	Plumbness												
		Settlement												
	3/4 Height	Plumbness												
		Settlement												
	Full Tank	Plumbness												
		Settlement												
	Empty Tank	Plumbness												
		Settlement												

Hydro test Report :

Leakage Report :

Contractor Inspector :	Client Inspector :	Third Party Inspector :

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13) AIR LEAK TEST:

13-1) Scope:

This procedure is to be used for testing reinforcing plates installed on a Storage Tank to detect any possible leakage in the weld between the reinforcement pad and the shell surface.

13-2) Reference Code and standard: ASME SECTION VIII DIV. 1

13-3) Necessary equipment:

- Air compressor capable of inducing a minimum pressure of 20 Psig)
- Suitable regulator capable of adjustment at downstream to 20 psig
- Calibrated gage (0-40/50 Psig)
- Suitable house piping, or steel piping and connectors.

13-4) Test Conduct

Reinforcing plates of saddles & nozzles attached to the outside of a tank shall be provided with at least one telltale hole (maximum size N.P.S. ¼” tap) for applying compressed air.



After tightly connecting the air nozzle to reinforcing plate, apply the air pressure until the pressure gauge reaches 20 psig (max pressure).

Apply soap foam to the weld line so that it covers the entire weld surface.

During the holding time (As long as 5 minutes) the foam and pressure gauge should be regarded.

If no reduction in pressure gage or no bubbling outwards the soap foam is noticed the result is acceptable.

Reduce the pressure and disconnect the test facilities from the pad.

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13-5) Witnessing:



Air leak test shall be witnessed by the quality control representative of the manufacturer and authorized contractor and company inspector and the relevant form should be completed after conducting the test and signed by the aforementioned supervisors.



13-6) Sequence of air leak test for reinforcement pad:

- Clean tank reinforcement with water.
- Install pressurizing globe valve
- Open the valve for air in come.
- Pressurizing up to 0.5 bar (g)
- Recording

ACTION:

- Holding time: 5 Min
- All of re welded m/h and nozzle pad shall be tested.
- Soapy water shall be putted to welds of nozzle or m/h during air purging.
- The pressure gauge in middle of the shell shall be installed also.

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	Air Test (Pneumatic Test) Report for Reinforced Nozzle		
Date:	Consulter :	(Proj. Name) :	
Form No:	Inspector :	Page No. :	
Description :	Client :		
Test Detail	Test Condition Value	Note	
Nozzle Mark :			
No. of Reinforce			
Temperature :			
Air test Pressure :			
Maximum Gage Pressure			
Soap Test Report			
Final Inspection Result :			
Contractor Inspector	Client Inspector	(Client Rep) :	



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