



Title: Circulation Loop Qualification for Purified Water System

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1.0 OBJECTIVE:

To lay down a procedure for circulation loop qualification for purified water system.

2.0 SCOPE:

This SOP is applicable for circulation loop qualification for purified water system.

3.0 RESPONSIBILITY:

Officer/Executive – Engineering

4.0 ACCOUNTABILITY:

Head – Engineering

5.0 ABBREVIATIONS:

ER Engineering
HNO₃ Nitric Acid
QC Quality Control
SOP Standard Operating Procedure

6.0 PROCEDURE:

6.1 Circulation loop qualification procedure:

6.1.1 Orbital welding.

6.1.2 Boroscopy Examination

6.1.3 Slope verification

6.1.4 Dead leg verification

6.1.5 Hydro test for loop piping.

6.2 PROCEDURE FOR ORBITAL WELDING:

6.2.1 Ensure the welder is qualified before starting of welding.

6.2.2 Clamp the welding head at position of welding joint.

6.2.3 Centre the tungsten tip over the weld joint contact surface.

6.2.4 Attach purge gas source to open end of system being welded preferably at point that is the lowest point & Purge gas Vent point at the opposite to gas source point.



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- 6.2.5 Set the weld parameters in the orbital welding machine as per the component.
- 6.2.6 Isolate the inner surface of the components being welded properly by providing non oxidising gas as surrounding environment.
- 6.2.7 Ensure the ends of the components being welded are properly aligned and carry out the welding activity.
- 6.2.8 Collect two weld samples with same set parameters and verify that they meet acceptance criteria.
- 6.2.9 Continue till samples meet the acceptance criteria. Set parameters of the acceptable samples shall be recorded and the same shall be followed to carryout welding regularly.
- 6.2.10 Use the equipment setting and other supplies (Purging gas, Electrode etc.), which were approved at the beginning of the day.
- 6.2.11 The test weld samples inspected should be permanently marked to identify the weld. Recording of the set parameters / observations shall be done in this form.
- 6.2.12 Attach the orbital welding report printout with this form.
- 6.2.13 After finish welding allow to cool joint slowly at room temp.
- 6.2.14 Clean OD only with fine K-2 paste / scotch brite.
- 6.2.15 Observation should be filled in Orbital Observation Sheet.
- 6.2.16 Record the details in orbital welding log as per **Annexure I**.

6.3 PROCEDURE FOR BOROSCOPY EXAMINATION:

- 6.3.1 To take the photographs of pipe weld joints made by fusion of base material without the addition of filler and recorded in the attached compact disc and should meeting the required specifications mentioned below:
 - Uniformity in weld joint
 - Should have proper penetration
 - Should not have any foreign object or pit holes
- 6.3.2 The weld joints to be examined, shall be made accessible for entry and movement of the fiber optic cable.
- 6.3.3 **Synchronies the visual display with the camera tips vision for clarity.**



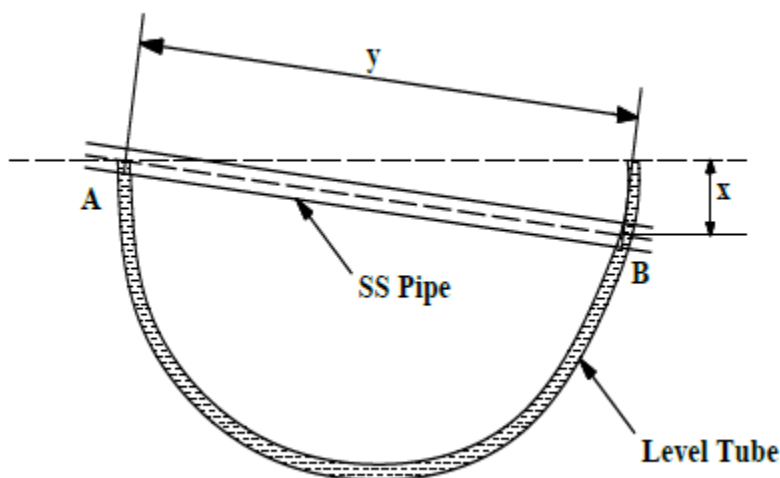
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- 6.3.4 Articulate the camera tip all around the seam and interrelate the joints quality.
- 6.3.5 The image shall be saved with the identification of the weld joints No. in appropriate folder memory card.
- 6.3.6 In case of rejection, the weld joint shall be marked with a specified procedure of rejection.
- 6.3.7 The rejection joint shall be carried for the rectification and re-offered.
- 6.3.8 Record the boroscopy details in details as per **Annexure - II** and all weld joints are photographed and recorded in compact disc, and all welds should meet the required specifications.

6.4 PROCEDURE FOR SLOPE VERIFICATION

- 6.4.1 To ensure that the distribution lines are sloped towards the point of use and slope of the lines is approximately 1mm in 100 mm.



- 6.4.2 Collect the as built Piping loop Isometric Drawing of the Purified Water Distribution System
- 6.4.3 Consider each straight section of pipe test piece for the slope.
- 6.4.4 Fill the level tube with water.
- 6.4.5 Remove air bubbles, balance both the ends and allow the water column to stabilize.
- 6.4.6 Measure the length Y of the pipeline from the starting point A to end point B (towards the point of use) as shown in the figure.
- 6.4.7 Place one end of the water column at the starting point A (Water level at this point should be corresponding to the center of the pipeline) and the other end of the water column at the ending point B.



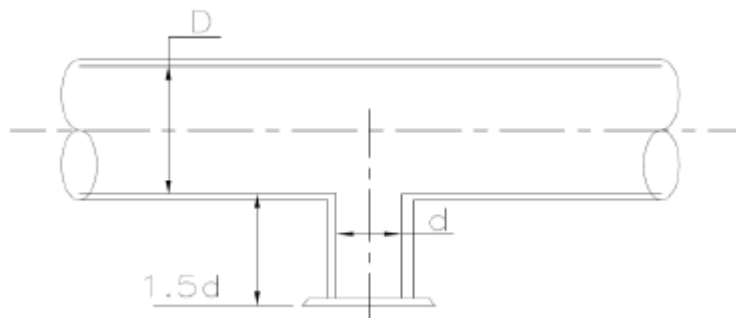
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- 6.4.8 If slope of the pipeline AB is toward point B then water level in the tube will rise above the center of the pipeline AB at point B. Now hold the tube vertically straight and measure the distance X, between the center of the pipeline AB at point B and the water level.
- 6.4.9 If slope of the pipeline AB is not observed toward the point of use i.e. B, then adjust the slope of the pipeline and again repeat step no 1-5.
- 6.4.10 Calculate the ratio of X: Y and record the observation at the respective point on the isometric drawing of the water distribution system.
- 6.4.11 Repeat step 1 to 7 for each segment of the pipeline
- 6.4.12 Record the slope verification details as per **Annexure III**.

6.5 PROCEDURE FOR DEAD LEG VERIFICATION:

- 6.5.1 To Check that the dead-leg in Sampling lines / Instrument Connection are not greater than 1.5 pipe diameters in length.



- 6.5.2 Collect the as built isometric drawing of the Purified Water Distribution System
- 6.5.3 Identify the dead legs in the sampling line, instruments, etc. and allot Dead leg ID Nos.
- 6.5.4 Now note down, diameter of each dead leg branch pipeline
- 6.5.5 Measure the length of dead leg pipe from inner surface of main line to end of branch line
- 6.5.6 Now calculate the length of dead leg by multiplying by 1.5 with diameter of branch line
- 6.5.7 Repeat step 3 to 5 for each segment of the pipeline and note the data in report.
- 6.5.8 **Acceptance Criteria:** Length of Dead-Leg shall not be greater than 1.5 times pipe diameter in length



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6.5.9 Record the details in dead leg verification log as per **Annexure IV**

6.6 PROCEDURE FOR HYDRO TEST FOR LOOP PIPING:

6.6.1 Fill the Purified Water Distribution piping loop completely with Purified Water from the Supply line up to last end of Return line.

6.6.2 Close all the Sampling Valves & Zero Dead Leg Valves tightly.

6.6.3 Close the Last end point of Return line with TC Blind.

6.6.4 With the help of hand pump from supply line create a pressure of around 7.5 kg/cm² and maintain it for 1 hour.

6.6.5 During this 1 hour, check if any leakages found

6.6.6 After this, open tank drain valve and release the pressure

6.6.7 Acceptance Criteria: No leakages or pressure drop found during test.

6.6.8 Record the hydro test details for loop piping as per **Annexure V**.

7.0 ANNEXURES:

ANNEXURES No.	TITLE OF ANNEXURE	FORMAT No.
Annexure-I	Orbital welding log	
Annexure-II	Boroscopy examination log	
Annexure-III	Slope verification log	
Annexure-IV	Dead Leg verification log	
Annexure-V	Hydro test verification for loop piping	

ENCLOSURES: SOP Training Record

8.0 DISTRIBUTION:

- Controlled Copy No. 01 Quality Assurance
- Controlled Copy No. 02 Engineering
- Master Copy Quality Assurance

9.0 REFERENCES:

Not Applicable.



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10.0 REVISION HISTORY:

CHANGE HISTORY LOG

Revision No.	Change Control No.	Details of Changes	Reason for Change	Effective Date	Updated By



PHARMA DEVILS

ENGINEERING DEPARTMENT

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ANNEXURE – I ORBITAL WELDING LOG

S.No	Date	Name of welder	Weld No	Time	Done by	Checked by	Remark



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ANNEXURE – II BOROSCOPY EXAMINATION LOG

S.No	Weld no	Date	Visual inspection			Remark
			Uniformity	Lack of penetration	Foreign inclusion	

Checked by:
Date:

Verified by:
Date:



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ANNEXURE – III SLOPE VERIFICATION LOG

S.No.	Slope No.	Node to Node Location	Length of section pipe in mm (Y)	Slope measured in mm. (X)	Slope of Pipe section(X: Y)	Pass/Fail

Checked by:
Date:

Verified by:
Date:



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ANNEXURE – IV
DEAD LEG VERIFICATION LOG

S.No.	Dead leg ID	Location	Diameter of Branch pipe in (mm)	Length of Dead leg pipe (mm)	Dead-Leg (mm)	Pass/ Fail

Checked by:
Date:

Verified by:
Date:



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ANNEXURE – V HYDRO TEST VERIFICATION FOR LOOP PIPING

Area	Purified Water Distribution loop piping
Length	
Hydro test Pressure	
Duration	
Test Date /Time	
Pressure Gauge details:	
Range	
Serial No.	
Make	
Calibration report	
Length	

Checked by:

Date:

Verified by:

Date: