

1 HYDROSTATIC TESTING OF PE PRESSURE PIPELINES

1.1 General

Upon substantial completion of the pipeline or major sections, the line shall be cleaned and hydrostatically tested to prove integrity of the pipeline section and to detect any leakage prior to commissioning. Testing shall be performed in accordance with the procedure described below. The Contractor shall supply all necessary fittings, equipment and facilities required to undertake the testing. It should be noted that any hydrostatic test is an assessment of the current state of the system, not a guarantee of good workmanship.

1.2 Outline Test Procedure

Seal the pipeline. Fix all blank flanges. Remove air valves. Remove all on line equipment that may be damaged by high pressure.

Only test against blank flanges or end caps, do not attempt to test against closed valves.

Cover the pipe with sufficient backfill to protect it from direct sunlight, leaving joints exposed where practical.

If backfilling is not practicable schedule the tests for early morning or evening.

Fill the pipeline from the lowest point. Bleed the air from all high points and flange points where it is possible and tighten once water begins to spill.

When the line is full, close off the filling valve and check all flanges and the small diameter test pipework for leaks.

1.3 Notes on Test Equipment

The pressure gauge shall be calibrated, certified and accurate to 10kPa. It shall be connected to the feed pipework. It is good practice to include a second gauge for comparison.

The small diameter test pipework shall include a bleed valve at upper end of the pipeline and at all high points together with feed pipework and valve at the lower end of the pipeline. The feed pipework shall include a means of draining off the water in to a measuring cylinder that shall have a capacity of at least 2 litres capacity, graduated to 100ml.

The Contractor shall also have a thermometer for air and water temperature measurement.

1.4 Differences in elevation

Care should be taken not to over pressure the lower end of the system during testing. Gauges should always be placed at the lower end of the length under test. As far as possible the difference between the lower and upper end should be kept to one bar. It is recognized that this may not always be possible when longer lengths are being tested, or where the slope of the pipeline makes it impractical.

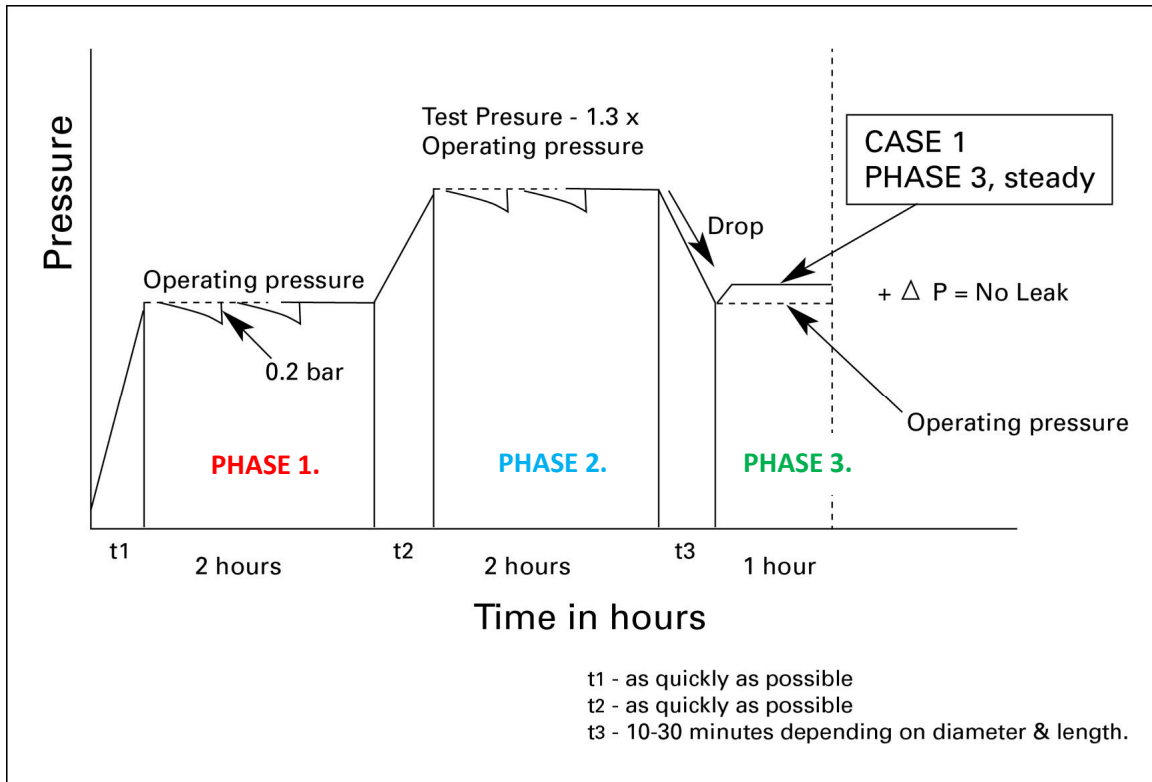
1.5 Test pressures at elevated temperature

Where the phase II pressure is within the pressure rating of the pipe and test temperatures are 30°C or less no adjustment of test pressure is necessary.

When ambient temperatures at the time of test are over 30°C and test pressures are over the pressure rating of the pipe then it may be necessary to modify the test pressure according to the table below or as agreed with the pipe manufacturer.

Test Temp. (°C)	32	38	43	49	54	60
Multiplier	0.9	0.8	0.75	0.65	0.6	0.5

Figure 1 Graphical Representation of the Hydrostatic Test Process
Case 1 – Pipeline passes test without adding any make up water



Contractor Name: _____ **Project:** _____ **Date:** _____

Phase 1.

Commence raising the pressure at the filling point to the operating pressure or a pressure of 500kPa, whichever is higher. Hold this pressure for a period of 2 hours and add water whenever the pressure drops by 20kPa in order to maintain a steady pressure.

Visually inspect the pipe length for leakage.

Your Phase 1 Test Pressure = _____ kPa

Phase 2.

After two hours raise the pressure to 1.3 times the operating pressure or 650 kPa, whichever is higher, as quickly as is practical. Again maintain this pressure for two hours by adding water whenever the pressure drops by 20kPa.

Visually inspect the pipe length for leakage.

Your Phase 2 Test Pressure = _____ kPa

Phase 3.

At the end of the second two hours release the pressure back down to the phase 1 level i.e. the operating pressure or 500 kPa, within a period of no more than 30 minutes and as quickly as is practical, in a controlled manner.

If after one hour the pressure in the pipelines remains at or above the operational pressure, the test is considered to be completed with the pipeline passing the hydrostatic test.

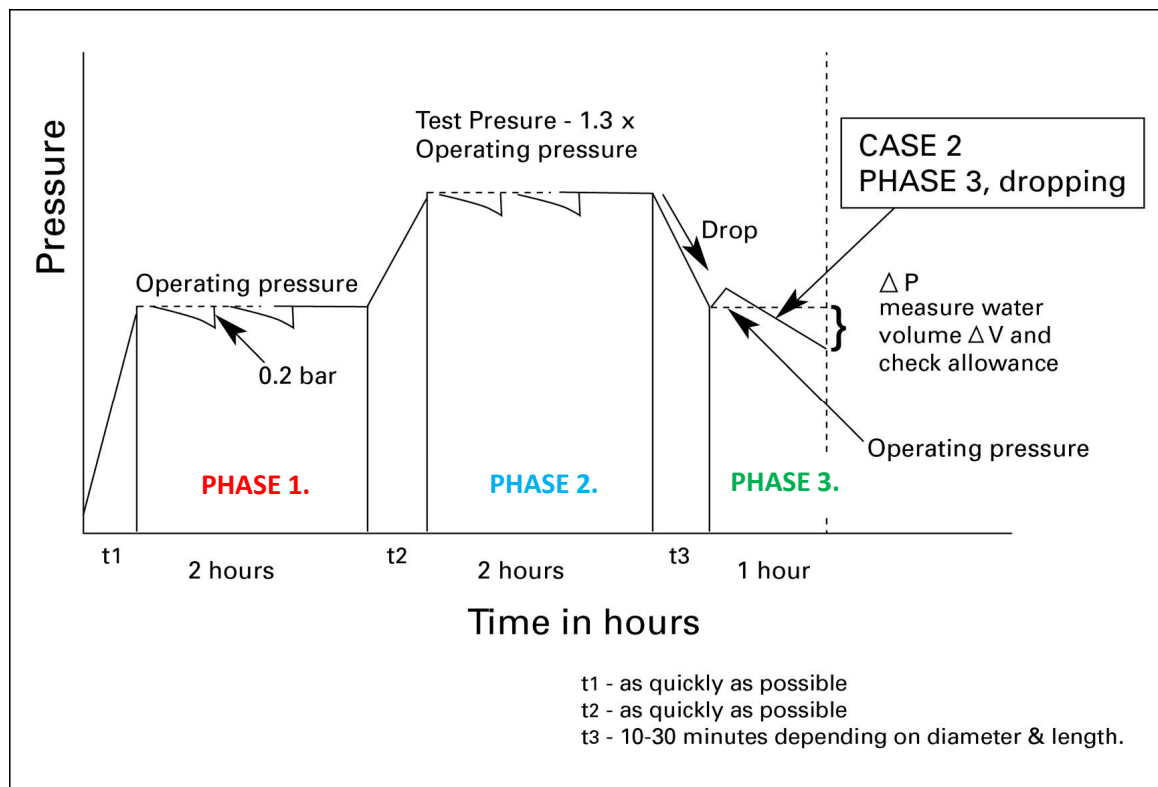
**IF AFTER ONE HOUR, THE PRESSURE FALLS BELOW YOUR PHASE 1 TEST PRESSURE
 – GO TO NEXT PAGE**

Phase 3 – Case 2 – See Figure 2

If after one hour the pressure in the pipeline has fallen below your Phase 1 test pressure, water shall be added to raise the pressure back to the Phase 1 test pressure level, having first noted the low pressure before adding any water.

Measure the added water by draining it off into a measuring cylinder. (i.e. reduce pressure to the previously recorded low value and save the water bled off). The measured quantity is then compared against the allowable quantity to determine if the pipeline passes the hydrostatic pressure test.

Figure 2 Graphical Representation of the Hydrostatic Test Process Case 2 – Water to be added to determine if the pipeline passes or fails



1.6 Test Result

If during Phase 3 the pressure within the pipeline remains at or above the Phase 1 test pressure of the pipeline for a period of at least one hour, the pipeline is considered to have passed the hydrostatic test.

If water needs to be added the pipeline is considered to have passed the hydrostatic test if the quantity of water added in terms of litres of water per km of pipeline length per hour of the phase 3 period is less than that given in the following expression and in Figure 3.

$$Q \leq \frac{Di}{50} - 1 \text{ (litres / km/ hour)}$$

Q = _____ added water in litres.

Di = _____ internal diameter for the pipeline in mm.

Km = _____

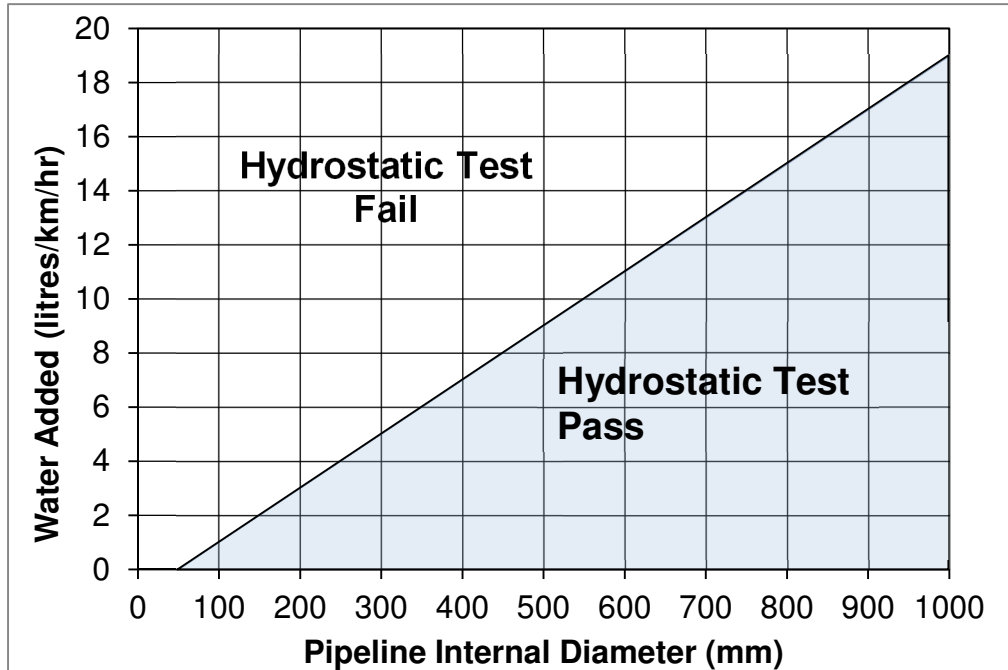
Workings:

$$\frac{Di}{50} - 1 \times km \times 1 \text{ (hour)}$$

Added water (Q) should be less than or equal to this answer

(i.e. Internal Diameter divided by 50, minus 1, equals litres/ km)

Figure 3. Hydrostatic Test – Allowable Quantities of ‘Make Up’ Water



1.7 Additional Notes

Care should be taken that any mechanical elements on the system are protected from elevated pressure or completely removed from the pipeline.

Do not subject the line to prolonged over-pressure. Always aim to complete the procedure within one working day.

During the summer make sure that the pipe is not subject to direct sunlight during testing.

During pressure testing pay full attention to the HSE aspects of the procedure. In particular keep the general public away from high pressure test areas.

The test equipment must be capable of pressurizing the test length within a reasonable time. If the procedure becomes protracted (beyond one working day) the test length may be modified or reviewed. Extremely long test lengths may be subject to special procedures.