

## SECTION 5100 - TESTING

5101 GENERAL. This section covers hydrostatic pressure testing and leakage testing of the pipelines. All pipelines installed under this contract shall be tested as specified herein.

All testing work shall be done in the presence of the engineer or city representative. The contractor shall notify the engineer at least 24 hours in advance of the times and places at which testing work is to be done.

Temporary discharge piping shall be provided for wasting test water at a suitable remote location where such water will drain away from the work. Discharge of test water into sanitary sewers will not be permitted.

5102 TESTING EQUIPMENT AND FACILITIES. The contractor shall provide all necessary piping and piping connections between the pipeline to be tested and the nearest available source of water supply, together with test pumping equipment, pressure gauge, and other equipment, materials, and facilities required for the specified tests.

Test pressures shall be applied by means of a force pump of such design and capacity that the required pressure can be applied and maintained without interruption for the duration of each test.

The pressure gauge used shall be tested, accurately calibrated, and acceptable to the engineer.

All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed immediately and replaced with new and acceptable material, by and at the expense of the contractor.

Materials shall be replaced as necessary and the test shall then be repeated until the line and all parts thereof withstand the test pressure in a satisfactory manner.

5103 PRESSURE AND LEAKAGE TEST. The hydrostatic pressure during testing shall be at least 150 psi or 1.5 times the maximum static pressure at the lowest point of the line, whichever is greater. Maximum static pressure, in PSI, shall be calculated by subtracting the lowest USGS elevation of the waterline from the maximum hydraulic grade line (1200' for most areas of Gardner) and then dividing by 2.31 to convert to PSI.

$$\text{Maximum Static Pressure, PSI} = \frac{1200 \text{ ft} - \text{lowest elevation}}{2.31 \text{ ft/PSI}}$$

The selected pressure shall be maintained constant within a maximum variation of plus or minus **5 PSI** during the entire time that line leakage measurements are being made.

Leakage measurements shall not be started until a constant test pressure is established; compression of air trapped in un-vented pipes or fittings will give false leakage readings under

changing pressure conditions. After the selected test pressure is stabilized, the line leakage shall be measured by means of a suitable water meter installed in the pressure supply piping on the line side of the force pump. The water meter shall be furnished and installed by the contractor.

Line leakage shall be the total amount of water introduced into the line as measured by the meter during the leakage test.

Each leakage test shall have a duration of two (2) hours plus whatever additional period is necessary to accurately determine leaking in the opinion of the engineer.

No pipeline or section thereof, will be acceptable if the leakage indicated by the test meter is in excess of that determined by the following formula or as indicated on Standard Detail 51-1.

where  $Q = 0.0075 \text{ DLN}$   
Q = Allowable leakage in gallons per hour  
D = Nominal diameter of pipe in inches  
L = Length of section tested in thousand feet  
N = Square root of average test pressure in psi

In the event that the line under test contains pipe of more than one size, the allowable leakage shall be calculated separately for each size and corresponding length of line and then added to obtain the total allowable leakage from the entire line. **Pressure and leak testing shall meet the requirements set forth in the latest edition of KDHE'S Policies, General Considerations and Design Requirements for Public Water Supply Systems in Kansas.**

5104 **DEFECTS.** It is the intent of these specifications and the contract based thereon that (a) all joints in piping shall be watertight and free from visible leaks during the prescribed leakage test and (b) each and every leak which may be discovered at any time prior to the expiration of two years from and after the date of final acceptance of the work by the owner shall be located and repaired by and at the expense of the contractor, regardless of any amount that the total line leakage rate during the specified leakage test may be below the specified maximum rate.

If the specified leakage test is made after the pipeline has been backfilled and the joints covered, and such test shows a leakage rate in excess of the permissible maximum, the contractor shall make all necessary surveys in connection with the location and repair of leaking joints to the extent required to reduce the total leakage to an acceptable amount. Where evidence of leaking joints does not appear on the ground surface above or near the leaks, the contractor shall prospect the line by sinking a hole, with an auger or otherwise, at the location of each joint and determine any undue saturation of the soil which would indicate a leak at such joint; such prospecting shall be done after pressure has been maintained in the line a sufficient time to provide adequate soil saturation for locating leaks by this method.

Leaks in mechanical joints shall be repaired by dismantling, cleaning, realigning gland and gasket, and re-bolting. Under no circumstances shall gland bolts be tightened beyond the

specified and allowable torque limits in an attempt to reduce or stop leakage from a defective joint or for any other purpose.

5105 TAPPING SLEEVES AND VALVES. The tapping sleeve and valve will be tested in place with water for 30 minutes. Test pressure must not exceed rated working pressure (150 psig on 16", 200 psig on 4" through 12"). No leaks will be permitted.