5. Total Internal and Transient Pressures.

a. Total Internal Pressure.

1) Determine total internal pressure for water mains from the following equation:
Total Pressure = Working Pressure + Surge Pressure

2) Working Pressure is based on ductile iron pipe and surge pressure used by WSSC for ductile iron pipe.

a) PVC AWWA C900 and C905 pipe. The working pressures as shown in Part One, Section 4 (Selection of Pipe Material) are based on a derating factor for a water temperature of eighty-three (83°) degrees and a surge allowance of approximately of forty-five (45) to fifty (50) psi. The surge allowance is based on normal surge pressure allowances used by WSSC for DIP but converted to the equivalent surge in PVC pipe in consideration of its much lower modulus of elasticity.

b. Working Pressure.

1) The working pressure (also referred to as the operating pressure) of buried water pipelines is a function of the pipe elevation. Therefore, the working pressure (and total pressure) varies at different elevations along the pipeline.

a) Calculate the working pressure using the following equation:

$$(\text{HHG in feet} - \text{pipe invert elevation in feet}) \times 0.433 = \text{Working Pressure in lbs/in}^2$$

2) To determine the applicable HHG, the following is required:

a) New Pipeline Designs, obtain the HHG and LHG from WSSC.

b) Existing Water Pipelines, the HHG used for the original design of the existing pipeline can be obtained typically from the lower left-hand corner or in the General Notes on the record (as-built) drawings. If the HHG is not indicated on the record drawings, then it may be obtained from WSSC. Prior to performing any new investigations or evaluations of existing water mains, verify with the WSSC if the HHG shown on the record drawings is applicable.

c. Surge (Transient) Pressures.

1) Use Table "1", standard surge pressures for the design of water pipelines:

TABLE "1"
Surge Pressures

Pipeline Diameter in inches	Surge Pressure in lb/in^2	Pipeline Diameter in inches	Surge Pressure in lb/in^2
4 to 10	120	30	80
12 to 14	110	36	75
16 to 18	100	42 to 60	70
20	90	Greater than 60	65
24	85	--	--

2) Assure that the design does not create conditions which will result in surge pressures greater than the values shown in Table "1", and no greater than the surge pressure allowances used for the design of adjacent pipelines.

3) Exercise sound judgement in determining whether a detailed surge analysis is necessary. Some conditions that may warrant the consideration of a surge analysis include the following:

a) Impact of power failure, pump start up or quick closure of discharge valves at water pumping station or an in-line booster pumping station.

b) Possible impact due to water column separation.

c) Rapid closure of remotely controlled in-line valves.

d) Inadvertent, rapid closure of altitude valves at water storage tanks.

4) A detailed surge analysis may be performed using a computer model and is subject to approval. Consider the effects of line friction in the analysis. Consult with WSSC regarding any available surge studies and analysis that may have been performed for the study area.