6. Buckling Design.

a. Criteria.

1) Check for buckling, steel pipe of all diameters and DIP greater than 24-inch in diameter and also, all sizes of DIP under some extreme conditions such as evacuation of pipe installed under water. Use the appropriate factor of safety from the referenced publication and the following criteria for buckling check.

a) Assume vacuum pressure equal to 14.7 psi.

b) E' [Modulus of soil reaction] for soil shall be four hundred (400) psi, unless a higher value can be justified.

c) Ground water level as indicated by soil borings and modified for expected fluctuation or may conservatively be taken at the ground surface unless the pipe is installed under water or in the flood plain (Use one hundred (100) year flood level).

d) Live load for AASHTO HS-20 truck and the numerical value as shown in the Table 1 of AWWA C150.

e) Deduct service allowance of 0.08 inch for DIP without cathodic protection and deduct the casting tolerance for all DIP as recommended by the pipe manufacturer for calculating the net thickness for buckling check.

f) See References below for method of computation.

b. References.

1) Ductile Iron Pipe: "Critical Buckling Pressure for Ductile Iron Pipe". Ductile Iron Pipe Research Association, Technical Report, Richard W. Bonds, July 1, 1992.

2) Steel Pipe: "Steel Pipe - A Guide for Design and Installation", American Water Works Association, AWWA M-11.