

CHAPTER 4

PRESSURES IN DISTRIBUTION SYSTEMS

4-1. General. Water distribution systems should be designed to maintain operating pressures within the system in accordance with EM 1110-3-160. Pressures at critical points in the system must be checked for anticipated periods of high draft (peak demand, fire fighting, etc.) to insure that required residual pressures are maintained. Critical points include usage points on high ground or points remote from elevated storage or pumping facilities. These pressures are calculated based on the lowest allowable water level in elevated storage or on the head produced (at high flowrates) by pumps employed in the system. Areas of potential high pressures must be checked to insure that maximum permissible pressures are not exceeded. These pressures include residual as well as static pressures and are calculated based on the highest possible water level in elevated storage or on the head produced (at low flow rates) by pumps employed in the system. Areas of excessively high or low pressures require that the system be divided into multiple pressure levels.

4-2. Multiple levels. Where multiple-level systems are required, it is desirable to establish the lines of separation so that the pressures in each system will approach the optimum range outlined in EM 1110-3-160. Three or more levels will not be used unless distribution pressures in a large area of the two-level system fall below 30 psi or exceed 100 psi. In all circumstances, fire flows must be adequate.

4-3. Pressure-reducing valves. Pressure-reducing valves will be required in areas of the distribution system that have pressures in excess of 100 psi. The pressure-reducing valves may be installed on the mains serving these areas or on the individual building services lines in high-pressure areas. If pressure-reducing valves are to be installed on individual service lines, the preferred location is adjacent to, and upstream from, the water meter for each building or immediately inside the building being served. In some cases, it may be necessary to install pressure-reducing valves only on lines to certain plumbing or heating units which are adversely affected by excessive pressures.

4-4. Pressure-relief valves. Pressure-relief valves should be installed in all systems which might be subjected to greater than allowable pressures. In systems with 100 psi pumps, the pressure-relief valves should be set to discharge at 120 psi; pressures greater than 120 psi may be experienced for brief periods during testing or operation of these pumps. All pumps driven by variable speed motors or engines will be provided with relief valves, and if the shutoff pressure of any pump exceeds 120 psi, the pressure-relief valves should be installed and set at approximately 120 psi.

9 Apr 84

4-5. Water hammer. Consideration of water hammer must be given to the system especially in low-lying areas subject to high flow rates and surge pressures. The occurrence and severity of water hammer can be reduced through the use of slow-closing valves, pressure-release valves, surge tanks, and air chambers.