Chapter 4
Criteria for Design

4-1. Water Supply

a. Fire pumps. The fire pumps should be in accordance with NFPA 20. The shut-off head shall not exceed 120 percent of the total rated head for horizontal pumps or 140 percent of the total rated head for vertical pumps. The pumps should have a pressure rating of not less than 6.89×10^5 Pa [100 psi] with a capacity of 1.6×10^{-2} m^3/s [250 gpm] and have sufficient capability to provide a flow of 3.15×10^{-3} m^3/s [50 gpm] to five hoses simultaneously with an effective pressure at the nozzle of not less than 4.14×10^5 Pa [60 psi]. The fire pumps may be combined with service water or deck wash systems for economies. If a fixed miter gate sprinkler system is used, a separate water supply system should be provided that supplies at least 1.58×10^{-5} m^3/s [0.25 gpm] coverage per 9.29×10^{-2} m^2 [1 ft^2] of gate. Sprinkler pumps should be sized to accommodate the sprinkler head capacities required. A back-up pump should be provided for either system for redundancy. Water supplies for fire protection should be in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, and NFPA 14, Standard for the Installation of Standpipe and Hose Systems. Adequate supplies of spare hose and nozzles should be readily available.

b. Piping. Aboveground and embedded pipe should be corrosion resistant and conform to American Society for Testing and Materials (ASTM) A795 or ASTM A312, Schedule 40. All fittings should have a minimum rated working pressure of 1.2×10^6 Pa [175 psi]. Underground piping should be ductile-iron with a 1.03×10^6 Pa [150 psi] working pressure and should conform to American Water Works Association (AWWA) C151 with a cement-mortar lining conforming to AWWA C104 and polyethylene encasement conforming to AWWA C105. All aspects of the fire water piping systems should comply with appropriate NFPA and AWWA standards and all state and local fire codes.

c. Zebra mussels. In areas contaminated by zebra mussels, water supplies for fire pumps should not be drawn from the river unless suitable zebra mussel control strategies are implemented. For control strategies, refer to "Zebra Mussel Research Technical Notes" as compiled by the Zebra Mussel Research Program at the U.S. Army Engineer Waterways Experiment Station. Other possible water supplies include city or well waters.

4-2. Hose Stations and Hydrants

Hose stations should be provided on all new locks and all existing locks as funding becomes available. Hydrants should be provided, in addition to hose stations, where a local fire department can respond to a fire. Location of the hydrants and connections must be compatible with the fire department's equipment. Hose should be synthetic lined and conform to NFPA 1961. Hose should be 1-1/2 in. with 1.5-9 NH. Hydrants should be the base valve (dry barrel) type with the valve and feed piping protected from freezing. A dry pipe system should be used when this is impractical. Hose stations should consist of 45.72 m [150 ft] of hose in permanent hose cabinets or on wheeled hose carts with hose reels. The stations should be spaced at no more than 91.44-m [300-ft] intervals along the walls on both sides of the lock chamber and no more than 45.72 m [150 ft] from a dead-end area.

4-3. Sprinkler Systems

Sprinkler systems should be considered at locks with lifts over 4.57 m [15 ft]. Tall gates are more susceptible to fire damage, when compared with shorter gates, in that it is possible to expose a higher percentage of gate area at low pool. Piping for fixed sprinkler systems should conform to NFPA 13 and NFPA 15. Sprinkler systems shall be designed in accordance with NFPA 13. Spray nozzles should be the open type with a flat spray pattern for uniform distribution and should operate at 3.1×10^5 Pa [45 psi]. Minimum spray angle should be 50 deg. The nozzles should be constructed of brass or stainless steel and should be sized and spaced to provide complete coverage. The sprinkler piping should be connected to the supply piping with a galvanized steel swivel joint with stainless steel ball bearings and grease fitting for lubrication. The piping should be designed so the water can be easily purged from the nozzles and piping to avoid freezing problems. Sprinkler systems, including bracing, shall be corrosion resistant and shall be properly protected against damage.

4-4. Access for Fire Trucks

Suitable access for fire trucks and other emergency vehicles should be provided where physically possible.

4-5. Alarm Systems

A fire alarm system should be provided, in addition to existing air whistle systems, to alert personnel quickly to

a lock chamber fire. The system should consist of an outside electric gong with alarm switches located strategically throughout the project. Electric power for the alarm should be taken from the house-current supply line on the line side of the main switch through an independent switch and circuit breaker. Automatic dialers should be considered, where the capability exists, to facilitate a quick emergency response.

4-6. Fire Extinguishers

Fire extinguishers should be the industrial usage type, rated for Class A, B, and C fires. Fire extinguishers shall be labeled to identify the listing and labeling organization and the fire test and performance standard that the fire extinguisher meets. They shall be marked with class of fire and numeric classification for relative extinguishing effectiveness. Placement of the fire extinguishers shall be in accordance with Chapter 3, NFPA 10, Standard for Portable Fire Extinguishers. Possible vandalism of fire extinguishers should also be considered. Cabinets should be provided at control shelters and near potential sources of ignition. The glass door cabinets should be weather-resistant, recessed or flush type, for either wall or pedestal mounting.