U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: WATER SUPPLY SYSTEM FOR AIRCRAFT FIRE AND RESCUE PROTECTION
Date: 12/11/85
Initiated by: AAS-120
AC No: 150/5220-4A
Change:

1. PURPOSE. This advisory circular (AC) provides guidance for the water source selection and standards for a water distribution system designed to support aircraft rescue and firefighting (ARF) service operations on airports.

2. CANCELLATION. Advisory Circular 150/5220-4, Water Supply for Aircraft Fire and Rescue Protection, dated December 7, 1967, is cancelled.

3. APPLICATION. Compliance with the standards contained in this AC is a prerequisite for projects involving federal funding. These standards are also recommended for developing non-federally funded water supply systems for aircraft rescue and fire protection. This AC makes a distinction between the water supply system intended to support the ARF service operation and that needed to support an airport structural fire protection function. Guidance for airport structural fire protection facilities and operations, such as airport terminal buildings, aircraft hangars, air cargo terminals, fuel farms, etc., can be found in National Fire Protection Association (NFPA) publication, Airport Water Supply Systems, NFPA 419.

4. DEFINITIONS.

a. Airport Water Distribution System. A system of water mains, piping, valves, hydrants, pumps, etc., under airport authority for the distribution of pressurized water to support aircraft firefighting and rescue service operations on airports.

b. Multi-distribution System. A system consisting of the main potable distribution system and a secondary or backup nonpotable distribution system.

c. Potable Water. Water certified by a department of health or other agencies having jurisdiction which has met certain minimum specifications and declared suitable for human consumption.

5. WATER SOURCE IDENTIFICATION. Water can be acquired from a public municipal water system, man-made reservoirs, or natural sources. A public municipal water system is generally a reliable primary supply source for ARF service operations. Man-made reservoirs include gravity tanks, pressure tanks, wells, and at or above ground level water reservoirs. Natural water sources that may be accessible to the airport, are nearby lakes, rivers, and springs. Whichever water supply source chosen, the Airport Master Plan should identify the source as being able to support the present and forecasted ARF service, including the domestic service demands of the airport in a cost-effective manner. When selecting the source for establishing an overall airport fire protection program, the following guidelines need to be considered.

a. A Public Municipal Water System. This is generally a reliable primary water supply source. The disadvantages of this source include lack of control over water sharing, physical condition of the system, and system component make-up, such as pressure reducing valves or water meters. In addition, boosters pump are often required to overcome restricted flows or pressures during fire service operations.

b. Man-made Reservoirs.

(1) Elevated gravity tanks provide a dependable delivery of water. However, high pressure and volume delivery rates may restrict their use because of the extra cost and other practical considerations. If employed, their height and location should be such as not to constitute an airport hazard (see AC 150/5300-4B). In addition, to be fully effective, the tanks need a refill capability appropriate for anticipated emergency service.

(2) At or above ground level water reservoirs for airport fire protection purposes can be located on or off the airport. In either case, a reservoir should be divided into approximately equal sections to allow continuous service during routine maintenance, repairs, or expansions to the reservoir. As an additional safeguard, automatic supervision of the reservoir's water level is encouraged.

(3) Wells are subject to recedence and, in some areas, salt water intrusion. This not only presents corrosion problems, it also affects the usefullness of the water, except for AFFF production which is compatible with either a freshwater or saltwater source. Before placing reliance on well suppplies, local water table trends should be analyzed for potential recedence, contaminates, and saltwater.

c. Natural Supply Sources. These are usually beyond the airport authority's control. Additional disadvantages include the ever-present affects of seasonal weather factors on natural sources, new land developments which cause increased water demands, and possible alterations of the source. Industrial pollutants and other surfectant contaminations, may affect the usefulness of the water for foam production and cause damage to firefighting vehicles, pumping equipment, and the associated distribution piping network.

6. WATER SOURCE EVALUATION. A viable water source is one that supports the airport water distribution system. To determine the best water source, analyze the alternatives on the basis of cost-effectiveness and operational requirements. The selected water source should accommodate airport growth and expansions, thereby avoiding costly future expansions and corrective measures. This analysis should at least examine the following in selecting a water source:

a. Control. The airport authority's capability to maintain control over the potential water source;

b. Capacity. The capacity of the potential water source to maintain the appropriate flow rate and pressure to support normal domestic and industrial obligations during airport emergency fire service demands;

c. Seasonal Weather Conditions. The affects of drought, flood, and freezing conditions in eliminating or reducing the reliability of some potential water sources;

d. Future Requirements. Allowances need to be made for the potable water requirement of any population centers that may share the source. Consider the increases in populations which expand significantly over time;

e. Water Quality. Identify present and potential water source contamination, such as detrimental chemicals or particulates, and assess how they may affect fire protection equipment and operations;

f. Dedicated Source. It may be feasible and cost-effective to provide a separate, nonpotable water distribution system for ARF services; and

g. Backup Source. Judge the feasibility of providing for a secondary water source to be used in the event of an impairment to the main water supply source.

7. DISTRIBUTION SYSTEM COMPONENTS.

a. Piping Layout. A gridded or looped water distribution system is preferred over a single water main. The emergency service capacity of the system is based on the fire protection water requirements in paragraph 8 and any domestic or industrial service that will have concurrent demand. Avoid installing water lines under airport buildings, aircraft maintenance facilities, embankments, or zones of heavy traffic areas, such as, airport runways. Install anti-surge components to protect piping from surge and water hammer damage. When feasible, the airport water distribution system should be fed with water at two or more widely separated points.

b. Valves. Valves should be located to facilitate water control and to limit the size of the inoperative area during system checks, repairs, modifications, or expansions.

c. Hydrants.

(1) The availability of water from a hydrant source in proximity to aprons is operationally desirable. Where hydrants are located in close proximity to hangars, terminal buildings, and passenger gates, identify their location with a reflective sign at least 15 feet above their position. Hydrants should be strategicly located on loops or grids and readily accessible to firefighting vehicles for emergency replenishment. Fire hydrants should be spaced 300 to 500 feet apart along the periphery of aprons which are used for aircraft parking and passenger loading/unloading. Spacing should not be greater than 500 feet.

(2) Accessible hydrant stations should be located so as not to constitute a hazard to aircraft or vehicle movements (see AC 150/5300-4B). This placement should also safeguard hydrants against mechanical or ground service vehicular damage and vandalism.

(3) Hydrants installed along runway shoulders to provide resupply points are not intended to replace self-propelled ARF equipment. Reliance should not be placed on the use of hydrants for ARF on the movement areas, particularly runways. Runway hydrant systems should be conspicuously marked, and be of recessed or flush type so not to become a hazard in the runway safety area. Additionally, such systems will need special winter maintenance to insure identification of their positions for emergency use and maintenance.

d. Fire Service Pumps. Fire service pump installations are often needed to boost the normal municipal water system to higher operating levels for aircraft emergencies as well as for multi-story airport structures and aircraft hangar ceilings. An effective pumping program for emergency operations normally has the following:

(1) Adequate number of pumps capable of supplying the total water demand at the required pressure with the largest individual pump inoperative;

(2) A highly reliable pump power source. Each pump should be individually driven. Avoid the dependence of all pumps driven by a common source, such as an electric public utility. In case of failure of electrically driven pumps, provide for a backup engine generator with an automatic transfer device;

(3) A pump arrangement that allows either manual or automatic operations using either pressure or flow actuated controls;

(4) Protective pressure reducing components to protect domestic piping from water surge or water hammer damage;

(5) A regular preventive maintenance and inspection schedule;

(6) Continuous water service during single or group pump maintenance provided by strategically arranged and valved discharge headers;

(7) Suction lines to all fire pumps from reservoirs sized to achieve full water flow requirements;

(8) Detached pump house buildings of non-combustible or fire resistive construction. Site location should not constitute a hazard. If housed within another structure, a pump room is sectored off by an enclosure having a minimum of four-hour fire resistance; and

(9) Operational spare pumps on-line during emergencies.

8. VEHICLE FILL CAPABILITY.

a. Vehicle Capacity. The payload of ARF vehicles is primarily water. The vehicle capacity for a given airport vehicle is a function of the total water requirements for that airport index and the number of vehicles that the airport provides to transport and apply that quantity of water. Airport indices (based on aircraft length) are used to quantify the recommended amount of fire extinguishing agent(s) together with the minimum number of vehicles needed to transport the agent(s). At a given airport there are a number of combinations of vehicles that could be provided to carry the recommended ARF water supply. Typical recommended water quantities range from 60 gallons to 9700 gallons, depending on the type of foam concentrate selected.

b. Vehicle Tank Fill Connections. The performance standard for modern ARF vehicles specifies that the tank fill connections be sized to permit the filling of the water tank in two minutes when a pressure of 80 psi (5.5 bar) is provided at the tank intake connection. Wherever practical, water system connections designated as tank fill points for the ARF service should meet this standard.

c. Fill Supply Flow Rate. Minimum flow capacity needed to efficiently fill vehicles of a given payload is presented in appendix 1. As an illustration, a 2000 gallon capacity vehicle requires a minimum system flow rate of 1000 gallons/minute. Intercepts above the delineation line indicate that the water system has the capacity to service the vehicle's need and provide other fire-station operational needs. Intercepts below the delineation line indicate a water system that has an inadequate capacity to fully use the given vehicle's fill performance standard. With the individual vehicle fill requirements found from appendix 1, a cost-effective system capacity can be designed for any unique ARF fleet.

Leonard E. Mudd
LEONARD E. MUDD
Director, Office of Airport Standards

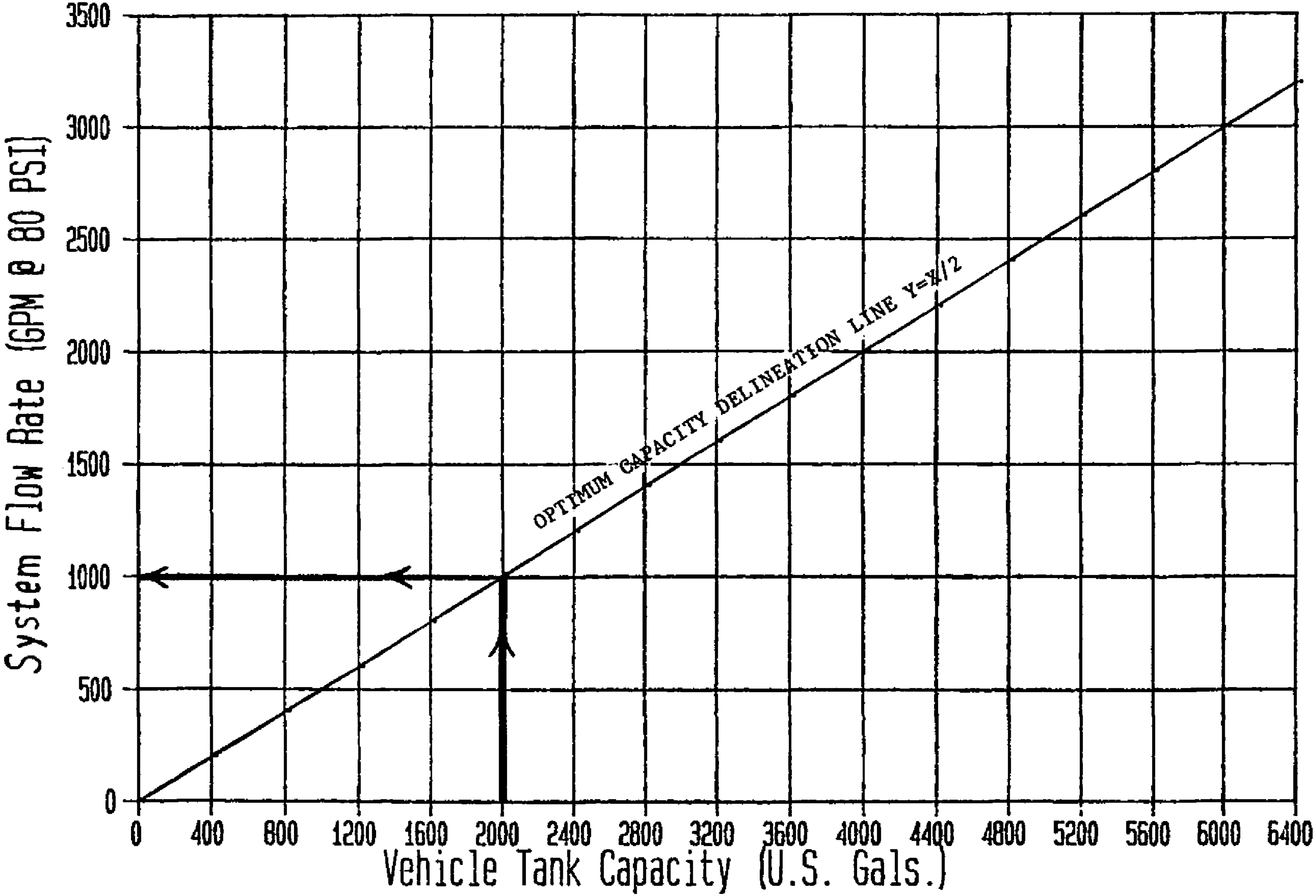

Figure 1. Vehicle tank capacity versus system flow rate.