Water Supply Operations: 3.11

Water supply operations are an important part of firefighting operations. If water supply operations are not conducted properly then fireground operations and firefighter safety will be affected. Water supply operations will be necessary anytime the needed fire flow exceeds the water available on the scene. This is generally an issue in rural firefighting operations but can also become necessary in urban settings when fire flows exceed the capability of the municipal water system, or there is a failure of the system.

Water Supply Officer:

When an incident commander initiates a water supply operation he/she should designate a water supply officer. It is the responsibility of the Water supply officer to coordinate the water supply operations according to the goals established by the incident commander. Both the Incident Commander and the Water Supply Officer should determine the total water supply needed to accomplish all the goals of the incident. They should provide for the "Needed Fire Flow"[1] to accomplish, offensive, defensive, exposure protection, and rapid intervention operations. There will also be a need for water for any overhaul and other mop up tasks.

NFA formula for computing needed water supplies for fire suppression:
TFF = (bff + eef + ief) x percentage of involvement.
TFF = theoretical fire flow.
bff = base fire flow.
eef = exterior exposure flow.
ief = interior exposure flow.
Base fire flow calculation; *bff = (length x width) /3.*
Exterior exposure protection calculation:
eef = exterior exposure charge x bff.
exterior exposure charge = number of sides with exposures x 0.25.
Interior exposure protection calculation:
ief = interior exposure charge x bff.
interior exposure charge = number of exposed floors x 0.25.
* Note: For multi-story buildings that are fire-resistive construction, the interior exposure charge is always considered to be 0.25, regardless of the number of floors.

When setting up the water supply operation several factors play into how the operation is going to proceed. A smooth water supply operation begins with the first arriving company and their size up. The first arriving officer needs to quickly determine whether or not to lay a line going in to the scene and what size line to lay. Once this decision is made the first in officer should relay appropriate instructions to the responding companies. When deciding which supply lines to lay crews need to consider the length of the lay and the volume of water needed. For example a single 500' lay of 3" hose will adequately supply 500 gpm at 150 lbs Pump Pressure on level ground. This will give a 50 lbs residual

[1] NFA "Testing and Evaluation of Water Supplies for Fire Protection, United States Fire Administration,.

pressure at the receiving pump. If the flow rate or length of lay increases other lines or larger lines may need to be laid. By doubling the number of hoses you can divide the friction loss. However for example 3 x 100 foot sections of 3" hose requires more water to fill than 1 x 100 foot section of 5" hose. With this example in mind it may be advisable to lay a 5" line in situations that involve long hose lays or high flow rates.

Safe Vehicle Movement:

During tanker shuttle operations tankers are required to operate on roadways and in close proximity to pedestrians and civilian traffic. Tanker operators should use caution when approaching and departing fill & dump sites, using slow speeds that will allow them to stop suddenly if necessary.

While traveling on roadways there is a risk of the Right side wheels leaving the roadway and riding on the shoulder. If this occurs the operator should slow down gradually, 20 mph or less is nationally recommended, and slowly remount onto the paved surface. If the driver reacts too quickly and / or applies the brakes there is a good chance they will loose control of the vehicle and could cause a rollover.

During water shuttle operations tankers should not pass each other, except on rare occasions when the road is wide enough to permit the passing without either vehicle leaving the paved roadway, the road is unobstructed, and both operators are in radio communication with each other and they have communicated the desire to pass and that it is safe.

Any time a vehicle is required to back up dismounted personnel are at a greater risk of being injured. If tankers are required to back up then a spotter shall be used. The spotter shall be well marked (reflective traffic vest), and should have a reliable flashlight or strobe light when operating at night. In addition any persons are operating in the area where vehicles will be required to back up frequently must wear reflective clothing. Any unnecessary personnel and bystanders should be excluded from the area.

When tankers are traveling too and from the fill and dump sites they should be either completely full or completely empty. Tankers should use caution when approaching unguarded railroad crossings and should come to a stop prior to crossing. All cautionary speeds should be treated as maximum speeds for tankers. Operators should be familiar with all load limits for bridges they will be crossing and the weight of their vehicles.

During nighttime operations while filling and off loading vehicle operators should turn off their headlights to avoid blinding approaching vehicles. Vehicle operators should then turn on their headlights and emergency warning lights when moving. When preparing to operate in reverse vehicle operators should blow the vehicle horn twice in quick succession to alert bystanders that the vehicle is about to move

backwards, regardless of whether the vehicle is equipped with a back up alarm.

Tanker Shuttle:

The water supply officer should decide if dump tanks are going to be deployed and if so careful consideration should be given to their placement. Dump tanks need to be placed so the drafting engine has adequate access as well as giving access to offloading tankers and engines. The water supply officer needs to decide whether to supply water through a "nursing" operation or to use a tanker shuttle with portable dump tanks. While a "nursing operation" is quicker to set up it has several disadvantages in respect to flow rates and safety. Nursing operations generally require more manpower due to having to couple and un-couple hoses and position apparatus to supply water. In addition most pumpers are not designed for efficient supply operations. If the needed water supply is less than or equal too the amount of water on hand, a nursing operation should be able to supply sufficient amounts of water. Anytime the amount of water on site does not meet the amount of water needed to accomplish suppression operations then a tanker shuttle with dump tanks should be used.

Dump Site:

When choosing a site to position the dump tanks it should be level, have smooth surface, and be unobstructed for both the tankers and the drafting pumper. The location of the dump site should be as close to the fire scene as possible but should not interfere with other firefighting crews and apparatus arriving to the scene. The dump site should be positioned to allow easy approach and departure of tankers. In the event a tanker needs to back up there should be spotters on both sides of the tanker to ensure safe baking.

The dumpsite should also provide for a safe approach and departure of tankers. If multiple dump tanks are being used some special equipment may be necessary to transfer the water from tank to tank (i.e. jet siphon.). Any area that would require a tanker to operate in reverse should be avoided.

Fill Site:

When choosing a fill sight ordinarily the closer to the fire scene the better. Points to consider when choosing a fill site are:

a) Proximity to the scene.
b) Obstacles between the scene and the fill point.
(Railroad tracks, heavily traveled intersecting roads)
c) Presence of a dry hydrant or municipal hydrant.

d) Ability to gain access to the water source.
e) Seasonal considerations, a pond that is iced over.
    i) If it is necessary to establish a water source at a pond that is iced over the engine company assigned to the fill site should take sufficient equipment to cut a hole safely. For example, a chain saw to cut the hole, pike poles to open the hole, ground ladders, rope throw bags, & cold water suits for crew safety.
    ii) The hole should be cut large enough to allow equipment to be properly placed in the water. If a floating pump is to be used be sure to allow enough room to allow the hose to exit the pump without tipping it over.

Approach and departure routes should be designated to avoid congestion and to provide for the safest operation possible. When practical a one-way traffic flow is best where tankers drive in, dump, and exit the dumping area without backing up or changing directions. If possible travel routes too and from staging areas should not cross tanker travel routes. If transit across tanker routes is necessary then use some form of traffic control and mark the crossing area clearly.

Vacuum Tankers:

When vacuum tankers are to be used a slightly different approach to water shuttle operations may be used. Vacuum tankers have some operational differences over conventional tankers. Vacuum tankers utilize a vacuum pump to create a negative or positive pressure in the water tank. The vacuum pump is more efficient than a priming pump and can overcome minor leaks in the "drafting circuit". When the vacuum tanker goes to off load the water at the dump site the tank can be pressurized to increase the off loading rate. Drafting and dumping rates of around 2000 gallons a minute are routinely possible with vacuum tankers (depending on how the tanker is designed). An additional advantage of vacuum tankers is they don't require a supply pumper at the fill site. In fact a fill pumper may actually slow down the tankers efficiency. The vacuum tanker does not have any higher lift than a conventional pumper but it can successfully draft quicker from a longer linier distance. It may be of a greater advantage to send vacuum tankers to an alternate fill site to take advantage of their quicker fill rates.