

## **Attack Engine – Attack Lines Tank Water & External Water Supply**

**Purpose:** To establish a procedure to supply an attack line from tank water, transition to an external water supply, increase flow to multiple attack lines, and set pressure control devices.

**Tactical Objective:** To supply an attack line from tank water, transition to an external water supply, increase flow to multiple attack lines, and set pressure control devices.

**Background:** It is recommended by MFRI Pump Operators course not to run more than one attack line off tank water. One exception to this rule would be in the event of a Life Safety incident. Advise incoming crews if only one line is used. This water is needed for the 1st attack line. Additional lines can be pulled of the Engine but should not be charged until an external water supply is achieved. Rapid Intervention Company (RIC) attack line can be charged but do not flow water unless this line is used in RIC duties to rescue crews inside a fire.

**Procedure:** One attack line transition to external water supply

- ❑ Lay a line from a hydrant to the fire ground.
- ❑ Place pump in gear and open tank-to-pump valve.
- ❑ Pull Attack line and charge off tank water.
- ❑ Place supply line into an intake and call for water.
- ❑ Open intake, close tank-to-pump valve, and monitor pump panel gauges for increases in pressure.
- ❑ Place additional lines in service and set pressure control device.
- ❑ Fill tank water back up.
- ❑ Monitor pump panel, pump and engine compartment gauges.

## **Key Operational Considerations**

- ❑ Never charge more than one line off tank water to use for fire attack. Crews inside have will have an idea how much sustained water flow they have off the tank water for one line. One exception to this rule would be in the event of a Life Safety incident.
- ❑ MFRI Pump Operators Manual recommends to set relief valves after all lines are in place flowing water.
- ❑ Fill tank water back up immediately after transitioning to an external water supply. Tank water may be needed again if supply line fails.
- ❑ Use intakes on pump operators side first if Engine does not have a master intake valve to control increases in discharge pressure while transitioning to external supply.

## Foam Attack Lines

**Purpose:** To establish a procedure for pumping foam attack lines used for fuel spill fires.

**Tactical Objective:** Place in service a foam attack line from an in-line eductor to attack a fuel spill fire. Select appropriate type of foam concentrate and rate of flow for the type of fuel spill.

### Procedure:

- ❑ Park Engine in a safe location away from the spill or fire.
- ❑ Identify the type of fuel spill or fire and select the type of foam concentrate required.
- ❑ Place eductor on or near pump panel.
- ❑ Place 200' of 1 3/4" from the eductor with a foam nozzle.
- ❑ Select the proper foam concentrate percentage and on selector knob on the foam eductor.
- ❑ Place eductor tube in the foam concentrate.
- ❑ Open discharge and flow attack line at 200psi to the eductor.
- ❑ After use, remove pick up tube from foam concentrate in place in fresh water for one minute. Reduce pressure to 100psi and rotate the selector knob through all the positions.

### Key Operational Considerations:

- ❑ Methods of applying foam streams: Roll-on, Bank-down, and rain-down.
- ❑ Hydrocarbon fuel spill fires on the ground require AFFF foam typically flowing a 3 % foam solution at .10/gpm/square foot.
- ❑ Polar solvents fuel spill fires on the ground require alcohol resistant foam typically flowing a 6 % foam solution at .20gpm/square foot.
- ❑ Place apparatus in a safe location to protect crew and apparatus from running fuel fires.
- ❑ Clean all foam equipment and hose after foam usage. Foam concentrate is slightly corrosive.

- Refer to Manufacturer's recommendations for each type foam eductor and foam nozzle.
  - Note the proper pressures and flow from each. The nozzle must be compatible with the eductor for effective fire stream. Ensure nozzles are open completely.
  - Note the recommendations for hose diameter and length for each eductor.

## **Master Streams & Elevated Master Streams**

**Purpose:** To establish a procedure to supply water to a portable master stream device and an elevated master stream device on an Aerial Ladder Truck or Ladder Tower.

**Background:** Master streams are defined by IFSTA as large volume fire streams flowing more than 350gpm fed by multiple 2 ½” or 3” supply lines. There are several portable master stream devices used in Montgomery County. Manufacturer’s recommendations should always be followed for proper pressures and maximum flow rates.

There are several types of elevated master stream devices in Montgomery County. Aerial Towers Platforms, Ladder Trucks with pre piped water ways, and Ladder Trucks supplied by a hose line running to the ladder pipe. Each apparatus is unique and the manufacturer’s recommendations should always be followed for proper pressures and maximum flow rates for each aerial master stream device. When supplying elevated master stream devices, higher pressures and flow require apparatus to be parked as close as possible to the aerial apparatus they are supplying to eliminate having to compensate for elevation and friction loss in hose lines. This is usually within 200ft.

**Tactical Objective:** To provide water to an elevated master stream device on an Aerial Ladder Truck.

### **Procedure: Ladder Pipe**

- ❑ Establish a water supply from a source.
- ❑ Park the Engine within 200ft of the Ladder Truck.
- ❑ Place 3” supply lines from discharged at pump panel to the clapped Siamese of the Ladder Truck.
- ❑ Obtain tip size and elevation and calculate the flow required to flow the ladder pipe.
- ❑ Open discharges and fill hose lines with water when Ladder Truck is ready. Once supply lines are filled, charge to the proper discharge pressure.
- ❑ Prepare to expand upon water supply if necessary.

### **Key Operational Considerations**

- ❑ Hose lays from the Engine to the Ladder Truck’s Siamese over 200ft, may prevent the Engine from supplying adequate water flow and pressure required to overcome head pressure and friction loss in hose lines supplying the siamese.

- ❑ MFRI Pump Operators Course recommends counting the ladder pipe and the siamese both as devices. +10psi for each for a total of 20psi for devices.
- ❑ For longer distances consider using additional lines to supply any additional 2 ½” connections on the siamese intake for the aerial device.



**Tactical Objective:** To provide water to an elevated master stream device on an Aerial Ladder Tower.

**Procedure:** Ladder Towers

- ❑ Establish a water supply from a source.
- ❑ Park the Engine with in 200ft of the Ladder Tower.
- ❑ Place 3”supply lines from discharged at pump panel to the intake (Siamese) of the Ladder Tower.
- ❑ Open discharges and fill supply lines with water. Once supply lines are filled, throttle up to the proper discharge pressure recommended by the manufacturer. Account for any additional devices or elevations required by the manufacturer.
- ❑ Prepare to expand upon water supply if necessary.

**Key Operational Considerations:**

- ❑ Follow recommendations of the manufacturer for maximum flow and required pressure to the Ladder Tower or pre pre-piped Aerial Ladders Trucks. Ask Aerial Tower operator for required flow and pressures required to the intake device.

**Tactical Objective:** To provide water to a portable master stream device.

**Procedure:** Portable Master Streams Devices

- ❑ Establish a water supply from a source.
- ❑ Set up portable master stream device.
- ❑ Attach 3” supply lines from a discharge at pump panel to the intake (Siamese) on the portable master stream device.
- ❑ Secure the device for safety as required by the manufacturer.
- ❑ Obtain tip size/flow.
- ❑ Open discharges and fill supply lines when crew is ready. Once supply lines are filled, throttle up to the proper discharge pressure.
- ❑ Prepare to expand upon water supply if necessary.

**Key Operational Considerations**

- ❑ Monitor portable master stream devices incase operators lose control of them. Prepare to shut down valves to any out of control flowing of portable master stream devices. Some devices have shut offs if they over-turn.
- ❑ Ensure parts are secure and tight prior to charging portable master stream devices or deck guns. Ensure pins are in place and stack tips are tight.
- ❑ For portable master stream devices that have safety stops, ensure manufacturer’s recommendations are followed. Many recommend not to depress the tip below the safety stop unless it is mounted to the Engine as a deck gun.



*Unmanned portable master stream device*



*Portable master stream device aimed at ceiling*



*Apparatus mounted deck gun*

## Supply Engine Using a Four-way Hydrant Valve-Humat Valve

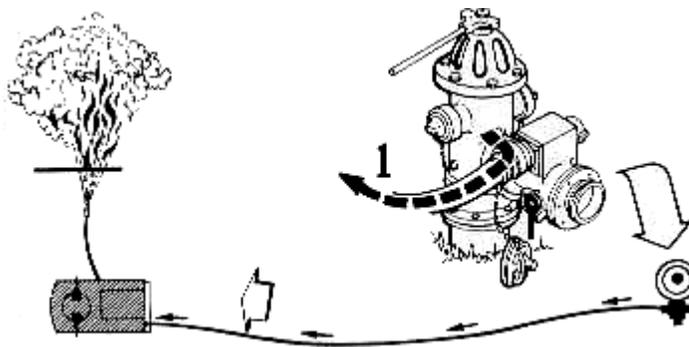
**Purpose:** To establish a procedure to provide a rapid, expandable, efficient, and uninterrupted supply of water from a municipal hydrant to an Attack Engine.

**Tactical Objective:** As a Supply Engine, provide an uninterrupted water supply to an Attack Engine from a municipal hydrant using a four-way hydrant valve (Humat).

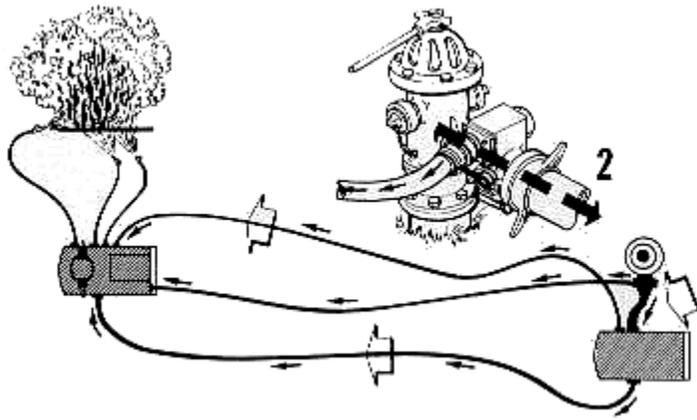
**Background:** The practice of using a four-way hydrant valve is to provide initial water supply from a hydrant prior to the Supply Engine's arrival. The four-way hydrant valve used in Montgomery County is the Humat Valve. The Humat Valve is placed on the hydrant immediately and charged after the Attack Engine lays a supply line from the hydrant to the fire scene. The Supply Engine will connect supply lines to the Humat Valve and expand upon the water supply of the Attack Engine without interrupting the water supply.

**Procedure:** For Supply Engines

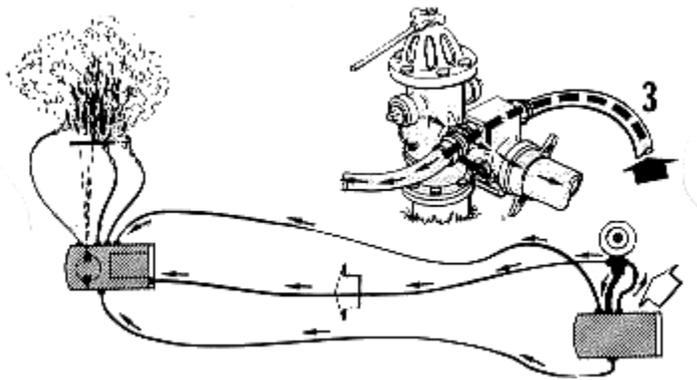
- Attach Humat Valve and hydrant gate valve(s) to the 2 ½" outlet(s) on the hydrant, if this is not done by the 1<sup>st</sup> Engine, and charge the hydrant once the pump operator of the Attack Engine hooks the supply to an intake. This will ensure some water initially for the Attack Engine.



- Place soft sleeve on the 4 ½" male connection on the front of the Humat Valve.
- Place a 3" or 4" supply line from a discharge at the Engine's pump panel to the intake side of the Humat Valve.
- Obtain length of supply line to the Attack Engine and the flow required.



- ❑ Open the butterfly valve on the Humat Valve and fill the soft sleeve.
- ❑ Open the front intake on the Engine.
- ❑ Open the discharge to the supply line attached to the intake side of the Humat Valve.
- ❑ Once discharge pressure from pump overcomes hydrant pressure the clapper valve will close and the supply line will be supplied directly from the pump of the Supply Engine and not directly from the hydrant.



### Key Operational Considerations

- ❑ Charge the Humat Valve first incase hydrant is out of service and fails to provide water. The Humat Valve can be left hooked up to the hydrant and the Attack Engine's supply line attached to the discharge side of the Humat Valve. A supply line from the Supply Engine can be hooked to the intake side of the Humat Valve. The Supply Engine can drive to another hydrant. Flow water through their supply line into the Humat Valve than into the supply line of the Attack Engine.

- ❑ Communicate via radio or face to face with the Attack Engine and ensure they are ready for water with supply line(s) coupled to an intake prior to charging attack line. This is an important consideration since, the use of the hose clamps are prohibited in Directive 04-01.
- ❑ The use of hydrant gate valves on the 2 ½” connections on a hydrant can be used incase the soft sleeve fails. An additional supply line can be hooked up to the hydrant gate valve and the other end to an intake on the Supply Engine to provide water supply without shutting the hydrant down. The use of hydrant gate can be beneficial in providing additional water from the hydrant if more water is available from the water main. This is also known as the “heavy water hook-up”.



*Heavy water hook-up using all outlets on hydrant*

- ❑ Laying-out may prove to be an advantage for Attack Engines rather than having your own water supply off a hydrant. The Supply Engine would serve as a back up if the Attack Engine’s pump fails. When Attack Engines have their own water supply, Supply Engines should ensure and expand upon the water supply of the Attack Engine by reverse laying from the Attack Engine to another hydrant. Having your own water supply from a hydrant in front of a structure may also limit where the Engine can park if using a soft sleeve for hook-up and block other apparatus from taking their position on the scene. Consider laying out where it is practical.

## Relay Operations

**Purpose:** To provide a procedure to for Engines to create and maintain water supply at a rate of 500gpm in a constant Engine relay.

**Tactical Objective:** To establish and maintain a constant relay to a fire ground at a minimum rate of 500gpm.

**Background:** FRC Interim Directive; *Water Supply SOP in Areas Without Available Water* suggests that pumping relays not be established for distances using more than a three Pumper relay at intervals of 1,000ft between Engines. A Three Pumper relay includes 3 Relay Pumpers, 1 Supply Engine at source, and 1 Attack Engine. The minimum desired flow in a relay identified in this SOP is a minimum of 500gpm. For distances over 4500ft, a water shuttle should be considered.

### Procedure

- ❑ The Unit Officer or Water Supply Officer on the Attack Engine will identify and announce layout instructions via radio per the non-hydrant SOP.
- ❑ All Engines will lay supply line(s) in intervals not to exceed 1,000ft between the source and the fire scene. Layouts can be initiated from the source first or the fire scene depending on operational considerations and access to the scene.
- ❑ Supply line in the relay should be one 4" or two 3" lines.
- ❑ Connect all lines to the appropriate intake and discharge points, create dump line, and notify the water supply group officer that your unit is ready for water.
- ❑ Fill the supply line(s) slowly starting at source, to the Relay Engines, then to the Attack Engine.
- ❑ Once water from source discharges from the dump line and all air is evacuated, gate dump line down to maintain residual intake pressure of 50psi and engage pump.
- ❑ Variations in intake pressures between 10psi and 100psi caused by attack lines opening and closing should not be adjusted.
- ❑ Adjust the pressure relief valves accordingly.
- ❑ Shut a relay down begin with Attack Engine, Relay Engine, and then Supply Engine at source.

## Pumping Considerations

There are design limitations inherent in any relay operation. Engines can only discharge rated capacity when the *net pump pressure* does not exceed 150-psi. Higher discharge pressures will reduce the capacity of the pump accordingly. Since most MCFRS Engines are rated at 1250-gpm, fire flows greater than 1,000-gpm should not be expected. Substantially smaller capacity engines should never be placed in a relay. Therefore, the three front mount Navistar Engines (750-gpm capacity) should not be utilized in this manner. They are better suited as a fill site drafting Engine.

The *maximum working pressure of the fire hose* used in a relay will also limit the amount of water that can be moved. The MCFRS recommends that pump pressures be limited to 250psi in high flow 3-inch supply line, and 200-psi for 4-inch supply line. These hoses are typically tested at 300-psi and 200-psi respectively. Some existing 4-inch supply hose is still in service that tests to 200-psi. The maximum working pressure for this hose should be 185-psi. This meets the NFPA requirements that recommend working pressures do not exceed the service test pressure minus 10%. The difference between the service test pressures and the recommended working pressures is intended to compensate for any deterioration of the hose do to age and use. In addition, some manufacturer's couplings are compromised at pressures exceeding 200psi. Higher pressure rated hose is available at extra expense.

To initiate a relay with three or more pumpers, the following information is needed:

- ❑ Needed fire flow (500-gpm unless otherwise directed)
- ❑ Distance to the fire from the water source
- ❑ Difference in ground elevation
- ❑ Pump capacity of the responding Engines
- ❑ Diameter of the supply hose line(s)

## Key Operational Considerations

- ❑ Layout instructions are announced via radio to initiate the relay:

*“Engine 141 to Montgomery”. “ I will be laying out from the driveway on Marble Mountain Rd”. “Have the remaining units pick up my line and take it to the pond at 24300 Quarry Rd”.*

- ❑ Establish a water supply group officer
- ❑ The maximum available flow is limited by the capacity of the smallest Engine in the relay and by the flow characteristics of the hose line in the most restrictive section(s). If a smaller capacity pump must be used in a relay, then the distance between pumps must be smaller.

- ❑ All water will move through the entire relay. Any change in any Engines discharge pressure will cause changes throughout the relay. Do not make throttle changes for residual intake pressures between pressures of 10psi and 100psi.
- ❑ The intent of this guide is to limit the length between Engines to 1,000-feet or less. By doing so, calculations for pressure and flow requirements can be pre-planned and available for all but elevation requirements.
- ❑ Moving large quantities of water over great distances through several pumps is a complicated evolution that must be understood and practiced.
- ❑ Always put the relay in operation from the source to the Attack Engine. Reverse the process to shut down.
- ❑ When the relay is operating, keep pressure adjustments to a minimum.
- ❑ Always monitor intake pressure. Make sure intake pressures do not drop low enough to cause the line to shake and or collapse.
- ❑ Each pump operator should keep a dump outlet uncapped or dump line to use as a manual pressure relief valve for any dangerously high pressures.
- ❑ Water moves through a 1,000ft of a fire hose in about a minute.

#### Appendix B: Multi-Pumper Relay Operations

