Principles of Relay Pump Operations
Relay Pumping Principles

- **Relay**
  - ✗ 2+ pumpers move water from distances that would require excessive pressures if only one pumper is employed

- **Relay operation**
  - ✗ 2+ pumpers move water over a long distance by operating them in series
Relay Pumping Principles

- Water discharged from one pumper flows through hoses to the inlet of the next pumper, and so on
- Purpose
  - To boost inadequate water pressure over an extensive distance from source to incident
Apparatus Relay Principles

- **Source pumper**
  - Apparatus connected to the actual water source

- **Relay pumper (in-line pumper)**
  - Pumper(s) connected within a relay
  - Receives water from the source pumper
  - Boosts the water pressure and supplies water to the next in-line pumper or attack pumper
Apparatus Relay Principles

- **Attack pumper**
  - Pumper located at the incident scene
  - Receives water from the in-line pumpers
  - Supplies water to the appliances necessary for suppression

- **Determining maximum relay capacity**
  - Limited to the capacity of the smallest pump
  - Limited to smallest hoseline used within the relay
Relay Pumping Operations

- Maximum distance relay
  - Involves flowing predetermined volume of water for the maximum distance
Chart

- Used to determine maximum pumping distance through a particular hose lay
- Based upon
  - 20 psi residual pressure available at next, in-line pumper
  - Discharge pressure of 200 psi for 2½" and 3" hose
  - Discharge pressure of 185 psi for 4" and 5" hose
Relay Pumping Operations

- Minimum pump capacities based on maximum distance relay charting
- Flows needed: Pump capacity required
  - 250/500 gpm flows: 750 gpm rated
  - 750 gpm flow: 1,250 gpm rated
  - 1,000 gpm flow: 1,500 gpm rated
  - 1,250 gpm flow: 1,750 gpm rated
Equation U

- **Relay distance** + 1 = Total pumpers
  - MDR

- **Example**
  - \( \underline{2,000} \)
  - \( 1,600 = 1.25 + 1 = 2.25 \) or 3 pumpers

- Round up to nearest whole number
Constant Pressure Relay

- Establishes maximum flow available from a particular relay setup
  - By using a constant pressure in the system
Constant Pressure Relay

- Advantages
  - Speeds relay activation
  - Requires no complicated calculations
  - Reduces radio traffic
  - Can govern hoselines with greater ease
  - Can guide and adjust pressure to one constant figure
Constant Pressure Relay Formation

- Attack pumper at the fire
- Largest capacity pumper at the source
- Pump 175 psi from the water source
Constant Pressure Relay Formation

- Relay pumper pumps 175 psi to next pumper in line
- Each successive driver/operator follows the same procedure
- Attack pumper driver/operator adjusts the discharge pressure(s) to supply the attack line(s)
Constant Pressure Relay Formation

- Maintain the flow from the attack pumper during temporary shutdowns
- For a ruptured hoseline, open a discharge gate on the relay pumper before the rupture to dump water until line is replaced
Constant Pressure Relay Formation

- PDP at 175 psi until
  - Intake pressure drops below 20 psi
- Constant pressure of 175 psi may be modified
  - Increase for greater spacing
  - Decrease for lesser spacing
  - Severe elevation differences
  - Increase fire flow
  - Large diameter hose
Relay Pressure Adjustment

- **Increase**
  - Adjust source pumper until desired pressure is reached
  - Adjust successive pumper similarly

- **Decrease relay pressure**
  - Attack pumper throttles down
  - Open dump line
  - Relay pumpers toward the water source, in decreasing succession
Operational Considerations

- Basis for relay operation
  - Amount of water required at scene
  - Distance from scene to water source
- Methods to increase flow
  - Size of hoselines
  - Number of hoselines
  - PDP of the pumpers
  - Number of pumpers
General Rules

- Operation always begins with the source pumper
- Largest diameter hose should be used at the beginning of the relay
General Rules

- Once water has been established, source pumper opens uncapped discharge or allows water to waste through dump line until first relay pumper is ready for water
- Relay pressure not to exceed maximum operating pressure rating for the hose
- Elevation pressures
Placing a Relay Into Operation

- Largest capacity pumper at the source
- Source and relay pumper ready for water
- Discharge supply hoseline on source pumper is opened
  - Valve on dump line is closed in conjunction
- Maintain intake pressure of 20 psi
Placing a Relay Into Operation

- Receiving water at the attack pumper
  - Bleed out air from the supply line
  - Open bleed valve on intake being used
  - Open discharge
  - Close dump line

- Once water is flowing
  - Set automatic pressure control
Placing a Relay Into Operation

- Relay operation shutdown
  - Shutdown from the fire scene first
  - Driver/operators should shut down in succession
  - Slowly decrease the throttle
  - Open the dump line
  - Take pump out of gear