

# PUMP OPERATIONS

January 2010

FIREFIGHTER TRAINING

Firefighter Daily Quick Drills - Easy Access to Training Topics

## Relay Calculations

### References:

**Delmar Handbook 3rd edition**, pages 310-312  
**J&B Fundamentals 2<sup>nd</sup> edition**, pages 487-491  
**IFSTA Essentials 5th edition**, pages 664-671, 695-696

**NFPA 1001, 2008 JPR**  
5.3.15

### @ 500 gpm – 1 Engine

- No relay: one attack engine with 1000 ft. forward lay from the hydrant to the fire
- FL is 5 psi per 100 ft.
- $5 \times 10 = 50$  psi TFL
- Residual pressure on the compound gauge should read only **10 psi (±)** depending on hydrant pressure

### @ 750 gpm – 2 Engines

- One relay: engine at the hydrant relays 1000 ft. to the attack engine at the fire
- FL is 11 psi per 100 ft.
- $11 \times 10 = 110$  psi TFL
- Relay:  $110$  psi +  $50$  psi = 160 psi EP

### @ 1000 gpm – 3 Engines

- Two relays: engine at the hydrant relays 500 ft. to the intermediate engine and the intermediate relays 500 ft. to the attack engine at the fire
- FL is 20 psi per 100 ft.
- $20 \times 5 = 100$  psi in TFL per relay
- Relay:  $100$  psi +  $50$  psi = 150 psi EP

### @ 1250 gpm – 3 Engines

- Two relays: engine at the hydrant relays 500 ft. to the intermediate engine and the intermediate relays 500 ft. to the attack engine at the fire
- FL is 31 psi per 100 ft.
- $31 \times 5 = 155$  psi in TFL per relay
- Relay:  $155$  psi +  $50$  psi = 205 psi EP

### @ 1500 gpm – 3 Engines and dual 4 in. supply lines

- Two relays: engine at the hydrant relays dual 500 ft. lines to the intermediate engine and the intermediate relays dual 500 ft. lines to the attack engine at the fire
- Pump 750 gpm through each supply line for a total of 1500 gpm
- Figure TFL for only one of the two supply lines since the same pressure and volume will be delivered to both lines with the discharge gates fully open
- FL for 750 gpm is 11 psi per 100 ft.
- $11 \times 5 = 55$  psi in TFL per relay
- Relay:  $55$  psi +  $50$  psi = 105 psi EP