#### Reference Material:.

NFPA 1900: Standard for Aircraft Rescue and Firefighting Vehicles, Automotive Fire Apparatus, Wildland Fire Apparatus, and Automotive Ambulances (NFPA 1901 Chapters) 2024 edition www.nfpa.org or call (800) 344-3555

Pumping Apparatus DRIVER/OPERATOR Handbook, 3rd edition. International Fire Service Training Association (IFSTA) Chapters 2,9,10, Glossary To order, call (800) 654-4055 or www.ifsta.org

#### **LEARNING OBJECTIVES**

1. **Definitions**: The technician shall define the terms and phrases commonly used in connection with fire apparatus to include the following:

- a. Acceptance/ acceptance tests
- b. Angle of approach
- c. Angle of departure
- d. Authority having jurisdiction
- e. Automatic electrical load management
- f. Auxiliary braking system
- g. Bonding
- h. Cascade system
- i. Cavitation
- Certification test j.
- k. Combination fire apparatus
- I. Compound gauge
- m. Continuous electrical load
  - (1) Minimum
  - (2) Total
- n. Contractor

- o. Drafting operation
- p. Eductor
- q. Fire apparatus
  - (1) Command/Communication
- r. Fire pump
- s. FMVSS
- t. Grade
- Gross axle weight (GAWR) u.
- Gross combination weight (GCWR) ٧.
- Gross vehicle weight rating (GVWR)
- Ground clearance X.
- Hard suction (intake) hose у.
- Initial attack fire apparatus 7.
- aa. Intake relief valve
- bb. Interlock
- cc. Line voltage circuits
- dd. Manufacture's tests

- ee. Net pump discharge pressure
- ff. Override
- gg. Pre-service test
- hh. Pressure governor
- ii. Pressure relief device
- ij. Pump and roll
- kk. Pumper
- II. Ramp breakover angle
- mm. Relay pumping
- nn. Responsibility of purchaser
- oo. Shall
- pp. Slow operating valve
- qq. Split shaft PTO
- Static water source rr.
- ss. Vehicle carrying capacity

vv. Diesel Particulate Filter (DPF)

uu. Curb Weight

platform

ww. Hydrodynamic

tt. Anti-Electrocution

- xx. Hydrostatic
- yy. Load management
- zz. Pump discharge classification
- aaa. Optical Source
- bbb. Yield Strength
- ccc. Utility Air
- ddd. Suction Hose
- eee. Ground Fault Interrupter (GFCI)
- fff. Compressed Air Foam System (CAFS)

2. General: The Technician shall understand the design & performance requirements for Aerial, Pumper, and Initial Attack Fire Apparatus such as:

# a. General Design requirements

- (1) Responsibility
  - (a) Contractor Responsibility
  - (b) Purchaser Responsibility
  - (2) Controls & Instructions
  - (3) Mounting height of gauges
  - (4) Vehicle Data Recorder
  - (a) Storage capacity
  - (b) data recorded
  - (5) Vehicle Stability
    - (a) Center of Gravity
    - (b) Control System sensor
    - (c) Side to side load variation
    - (d) Load Distribution
  - (6) Roadability
    - (a) performance loaded
    - (b) top speed
  - (7) Serviceability
    - (a) routine maintenance
    - (b) special tool requirement
- (8) Road Tests
  - (a) Stopping Distance
- (9) Load distribution
  - (a) tire pressure

#### b. Apparatus

- (1) Pumper
  - (a) Minimum rated capacity
  - (b) Misc Equipment
    - (i) number of traffic vests
    - (ii) AED
- (2) Initial Attack Fire Apparatus
  - (a) Pump Minimum rated capacity
  - (b) Water Tank minimum rated cap.
- (3) Mobile Water Supply Fire Apparatus
  - (a) Water Tank/Rated Flow Min. cap. (b) Tank fill rate
- (4) Quint Fire Apparatus
  - (a) Minimum Tank Capacity
- (b) Minimum ladders and sizes (5) Special Service Fire Apparatus
  - (a) Ground Ladder NFPA 1931 requirements
  - (b) Minimum size of suction and
  - supply hoses (c) Suction strainer
- (6) Mobile Foam Fire Apparatus
  - (a) Min. rated capacity for fire pump
- c. Chassis and Vehicle Components
  - (1) Labeling for size and GVWR
  - (2) Engine

- (a) Cooling System
- (b) Air intake system (i) separate water and embers
- (c) Engine Shutdowns
- (d) Engine Derate
- (e) Hour meter
- (f) Tow hooks
- (3) Fuel Systems
  - (a) Diesel Engines
    - (i) Fuel supply lines and fuel filters (ii) filters and strainers accessability
  - (b) Electric Fuel Priming Systems op.
  - (c) Diesel Particulate Filter
  - (i) HEST icon for regen
- (4) Vehicle Components
  - (a) Braking Systems (i) pressure protection valve ,pressure

    - (ii) quick build-up time
  - (iii) parking brake inter-locks (iv) Auxiliary Brake
  - (b) Parking Brakes
  - (i) GVWR & auxiliary braking system (c) Suspension & Wheels
    - (i) Axle housing road clearance
    - (ii) Angle of Approach and Departure
  - (d) Steering (i) radius of axles

    - (ii) power steering provision
  - (e) Fuel Tank
  - (i) labeling
  - (ii) capacity and time (iii) maintenance
- (5) Exhaust Systems
- (6) Diesel particulate filter (a) Exhaust Tip Outlet Temp
- d. Low Voltage Systems
  - (1) Voltage Drops
  - (2) Minimum Continuous Electrical Load
  - (3) alarm monitoring
    - (a) Batteries
    - (b) reserve capacity
    - (c) Who sets Minimum CCA (d) alternator wiring through ammeter shunts
  - (4) Optical Warning Device
    - (a) Flash Rate
    - (b) Permissible/Non Permissible Colors
    - (c) Upper-level Location

- (d) Lower-Level Location
- (e) Midship Location
- (f) conform with SAE J845 criteria
- (5) Audible Warning Equipment mounting
  - (a) Back Up Alarm dBa
  - (b) Stop, Tail, & Directional Light
  - mounting (c) Low Voltage Alarm after voltage
- drop
- (6) Wiring (7) Grounding & Bonding

# e. Driver and Crew area

- (1) Seat belt color
- (2) Signage for occupants in Motion (3) Seat belt warning activation
- (4) Noise levels
- (5) Equipment & SCBA Mounting
- requirements (6) # of Means of escape and size
- (7) Cab Tilt Systems and parking brake (8) Driving Compartment seating capacity
- (9) Instrumentation and Controls visible to driver
- (10) Seat Height (11) Helmet Storage
- **Body, Compartments & Equipment** Mounting
  - (1) Powered Equipment Racks (a) locking requirements
  - (2) SCBA cylinder mounting
  - (3) Pump Plumbing Access size (4) Stepping, Walking Surface minimum
  - load (5) Access Handrails size and clearance
  - (6) Reflective Striping coverage and size
  - (7) External Compartment Ventilation (8) Receivers and anchors for rope and
- g. Fire Pumps and Associated Equipment (1) pumps < 1500 gpm suction discharge

(2) Pumping Engine drain for heat

exchanger

removable winches

time

- (a) Heat exchanger (3) Intake Strainers requirements
  - (a) minimum valve & piping size
  - (b) bleeder valve minimum size
  - (c) pressure relief for >3" valve

- (4) Pump discharge Outlets
  - (a) minimum # outlets
  - (b) Connections size
  - (c) Slow Operation Valve size
  - (d) Location
- (5) Pump Drains access
- (6) Pump Controls
  - (a) Engine brake disengagement
  - (b) Speedometer operation during pump
- (7) Pressure Control System
  - (a) rise in water pressure
- (8) Pump Operator Panel
  - (a)required Instrumentation
  - (b) Minimum Numeral Size Master Gauges
  - (c) Test Gauges
    - (i) Discharge pressure gauge range
  - (d) Gauge and visual display location
- (9) Ultra High Pressure Pumps
  - (a) engine governor system
  - (b) engine control throttle
  - (c) gauges & instruments
  - (d) pump body integrity test

### h. Auxiliary Pumps & Associated Equipment

- (1) Pump Drive Systems
  - (a) Pump Engine Running Light
- (2) Engine Control
  - (a) Throttle control location

#### i. Water Tanks

- (1) baffles and swash partitions
  - (a) distance between walls and/or baffles
  - (b) partition arrangement
- (2) Tank-to-Pump rate
  - (a)<500 gal (2000L)
  - (b) >500 gal (2000L)
- (3) Tank Fill Line
  - (a) <1000 gal (4000L)
  - (b) > 1000 gal (4000L)

### j. Aerial Devices

- (1) Obstructions Below Ladder
  - (a) Folding step load
  - (b) ladder rotation
    - (i) rated height&seconds of rotation
- (2) Aerial Ladder Rated Capacity
- (3) Aerial Ladder Water Delivery flow
- (4) Hydraulics System bursting strength
- k. Foam Proportioning Systems
  - (1) Water Backflow prevention
  - (2) Swash Partitions
    - (a) pressure vacuum vent
  - (3) Test Points

flow capacity at minimum pressure

# I. Line Voltage Electrical systems

- (1) AC current Hz
- (2) Max voltage to portable equipment
- (3) Instrumentation on Operator's Panel
- (4) Power Supply Assembly
  - (a) Overcurrent protection
  - (b) Branch Circuit Overcurrent Protection
- (5) Cord reels
  - (a) Distribution Box
- (6) Power-Operated Light Masts
- (a) Sustained wind requirement(7) Line Bonding & Grounding

- m. Command and Communications
  - (1) Location
  - (2) Climate Control
  - (3) Noise Levels
  - (4) Lighting
- n. Air Systems
  - (1) General Piping & Installation
    - (a) threads
  - (2) Compressor Drive System, Controls,
  - Àir Monitoring
  - (3) Audible and Visual Alarms
  - (4) SCBA/SCUBA Fill Station protection
  - (5) Piping Systems low air warning %(6) Breathing Air Quality Std. NFPA 1989
  - (a) charging requirements of delivery
- o. Winches
  - (1) Winch Wire length
  - (2) Load rating/line pull capacity

## p. Trailers

- (1) Classification
  - (a)Type I, II & III
- (2) Wheel Chocks (a) grade %
  - (b) requirements
- (3) Power Supply
  - (a) Combined electrical load for Type II
  - & III trailer
- (4) Wheel chocks mounting

- 3. Test requirements: The Technician shall understand the test and delivery data requirements for a Pumper Fire Apparatus
  - a. Fire Pumps and Associated Equipment
    - (1) Pumping System Capacity
      - (a) Pumps 3000 gpm or less
        - (i) 100% rated capacity at 150 psi
      - (b) Pumps < 1500 gpm
      - (i) suction hose length and lift for 1250 gpm
  - (2) Vacuum loss %
  - b. Construction Requirements
    - (1) Hydrostatic Test gauge pressure & time
  - c. Discharge Outlet Connections
    - (1) Hydrostatic gauge pressure reading
  - d. Required Testing
    - (1) Apparatus Pump System Certification (a) > 750 gpm
    - (b) Third Party Certification
    - (2) Pump Test Conditions for Test
      - (a) depth of water(b) Water temperature
      - (c) engine-driven accessories
    - (3) Test Gauges for certification test
      - (a) calibration time requirement
    - (4) Engine Speed Check
      - (a) % change allowed of Manufacturer no-load governed speed
    - (5) Pumps rated at <750 gpm, 750 to <3000 gpm, & >3000 gpm,
      - (a) total time of pump test
        - (b) time & % at rated capacity of 150psi, 200 psi and 250 psi
    - (6) Ultra high pressure pumps
      - (a) Water tank capacity test
      - (b) Gauge & Flowmeter test accuracy
      - (c) Priming system test
      - (d) Conditions for test

- e. Pumping Engine Overload Test
  - (1) Pump Rated Capacity of 750 or greater but <3000
    - (a) test for net pump pressure at 165 psi for 10 min
- f. Pressure Control System Test
  - (1) Pumps rated at 3000 gpm or less
    - (a) gauge pressure at 90 psi, 150 psi, 250 psi
    - (b) time allowance to prime pump
    - (c) additional time for 4+" intake pipe
- g. Vacuum Test
  - (1) vacuum
  - (2) vacuum drop
- h. Volume Discharge Calculation
  - (1) Rated Tank-to-flow till what % of discharge
- i. Gauge and Flowmeter Test
  - (1) Test capacity
  - (2) re-calibration requirement
- j. Manufacturer's Pre-delivery Test
  (1) Hydrostatic test requirements