Reference Material:.
NFPA 1901, *Standard for Automotive Fire Apparatus*,Chapters 1-26 ***www.nfpa.org*** ***or call*** (800) 344-3555
Pumping Apparatus DRIVER/OPERATOR Handbook, 3nd edition. International Fire Service Training Association (IFSTA) Chapters 2,9,10, Glossary
To order, call (800) 654-4055 or www.ifsta.org

LEARNING OBJECTIVES FOR THE F-2 EXAM

1. **Definitions**: The technician shall define the terms and phrases commonly used in connection with fire apparatus to include the following:
   a. 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
   j. Certification test
   k. Combination fire apparatus
   l. Compound gauge
   m. Continuous electrical load
      (1) Minimum
      (2) Total
   n. Contractor
   o. Drafting operation
   p. Eductor
   q. Fire apparatus
   r. Fire pump
   s. FMVSS
   t. Grade
   u. Gross axle weight (GAWR)
   v. Gross combination weight (GCWR)
   w. Gross vehicle weight rating (GVWR)
   x. Ground clearance
   y. Hard suction (intake) hose
   z. Initial attack fire apparatus
   aa. Intake relief valve
   bb. Interlock
   cc. Line voltage circuits
   dd. Lugging
   ee. Manufacture's tests
   ff. Net pump discharge pressure
   gg. Override
   hh. Pre-service test
   ii. Pressure governor
   jj. Pressure relief device
   kk. Pump and roll
   ll. Pumper
   mm. Ramp breakover angle
   nn. Relay pumping
   oo. Responsibility of purchaser
   pp. Shall
   qq. Slow operating valve
   rr. Split shaft PTO
   ss. Static water source
   tt. Vehicle carrying capacity
   uu. Anti-Electrocution platform

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
   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 capacity
      (3) Mobile Water Supply Fire Apparatus
         (a) Water Tank/Rated Flow Minimum capacity
         (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) Minimum 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
      (3) Fuel Systems
         (a) Diesel Engines
            (i) Fuel supply lines and fuel filters
            (ii) filters and strainers accessability
         (b) Electric Fuel Priming Systems operation
         (c) Diesel Particulate Filter
            (i) HEST icon for regen
      (4) Vehicle Components
         (a) Braking Systems
            (i) pressure protection valve ,pressure drop
            (ii) quick build-up time
            (iii) parking brake inter-locks
         (b) Parking Brakes
            (i) GVWR & auxiliary braking system
            (ii) parking brake-20% grade requirement
         (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
      (6) Diesel particulate filter
   d. Low Voltage Systems
      (1) Voltage Drops
      (2) Minimum Continuous Electrical Load
         (a) alarm monitoring
      (3) Batteries
         (a) reserve capacity
         (b) Who sets Minimum CCA
         (c) 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
         (d) Wiring
   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

f. 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 tope and removable winches
g. Fire Pumps and Associated Equipment
  (1) pumps < 1500 gpm suction discharge time
  (2) Pumping Engine drain for heat exchanger
    (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
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 (400L)
    (b) > 1000 gal (400L)
j. Aerial Devices
  (1) Obstructions Below Ladder
    (a) Folding step load
    (b) ladder rotation
      (i) rated height and 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
    (a) flow capacity at minimum pressure
l. Line Voltage Electrical systems
  (1) AC current Hz
  (2) Maximum 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
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, Air Monitoring
  (3) Audible and Visual Alarms
  (4) SCBA/SCUBA Fill Station protection
  (5) Piping Systems low air warning system %
  (6) Breathing Air Quality standard NFPA 1989
    (a) charging requirements of delivery
o. Winches
  (1) Winch Wire length
  (2) Load rating/line pull capacity
p. Trailers
  (1) Classification
  (2) Wheel Chocks grade %
  (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 or greater but <3000 gpm
    (a) total time of pump test
    (b) time & % at rated capacity of 150psi
    (c) time & % at rated capacity of 200 psi
    (d) time & % at rated capacity of 250 psi
  (6) Pumps rated at >3000 gpm
    (a) total time of pump test
    (b) time & % at capacity of 100 psi
    (c) time & % at capacity of 150 psi
    (d) time & % at capacity of 200 psi
    (e) time allowed to stop for cleaning of suction strainer
  (7) Pumps rated at <750 gpm
    (a) total time of pump test
    (b) time & % at capacity of 150 psi
    (c) time & % at capacity of 200 psi
    (d) time & % at capacity of 250 psi
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 of 150 psi
    (b) gauge pressure at 90 psi
    (c) gauge pressure at 250 psi
    (d) time allowance to prime pump
    (e) 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