

Reference Material: Note: Exam may contain "accepted practice" type questions not found in the reference material listed below.

Pumping Apparatus DRIVER/OPERATOR Handbook, International Fire Service Training Association (IFSTA) Chapters 3,4,6,10,11,16, Glossary & Appendix A. To order, call (800) 654-4055 or www.ifsta.org

NFPA 1901, **Standard for Automotive Fire Apparatus**, Chapters 1-25 & appendix.

NFPA 1911, **Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus**, National Fire Protection Association, Quincy, MA 800-344-3555. Or order online at www.nfpa.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	t. Net pump pressure	nn. Eductor
b. Fire pump	u. No load governed speed	oo. Intake relief valve
c. Fire apparatus	v. Pressure relief device	pp. Ground clearance
d. Angle of approach	w. Relay pumping	qq. Combination Fire Apparatus
e. Angle of departure	x. Static water source	rr. Preventive Maintenance
f. Authority having jurisdiction	y. Cavitation	ss. Ironing
g. Heat exchanger	z. Initial attack fire apparatus	tt. Minimum continuous electrical load
h. Auxiliary braking systems	aa. Class "A" foam	uu. Severe service
i. Ramp breaker angle	bb. Split Shaft PTO	vv. Bonding
j. Contractor	cc. Pump and roll	ww. Interlock
k. Certification test	dd. Pressure Governor	xx. Override
l. Drafting operation	ee. Responsibility of purchaser	yy. Anti electrocution platform
m. Grade	ff. Automatic electrical load management	zz. Leakage
n. Vehicle carrying capacity	gg. Triple-combination pumper	
o. Hard suction(intake) hose	hh. Compound gauge	
p. Line voltage circuits	ii. Pre-service tests	
q. Intake hose	jj. Gross vehicle weight rating (GVWR)	
r. Lugging	kk. Net pump discharge pressure	
s. Manufacturer's tests	ll. Gross axle weight (GAWR)	
	mm. Gross combination weight (GCWR)	

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

<ol style="list-style-type: none"> a. General design requirements <ol style="list-style-type: none"> (1) seating capacity (2) steps and platforms (3) minimum pump sizes (4) DBA levels cab (5) stability and weight distributions (6) minimum angle of approach & departure (7) DBA back up alarm decibels (8) contractor requirements (9) DBA command area (10) Audible warning devices (11) Pump Panel Controls & Instructions & gauge height (12) Ground ladder standard NFPA 1931 (13) Reflective stripping-size and area (14) Ground clearance (15) Optical warning lights (FMVSS) (16) Driving and crew areas/seat belts <ol style="list-style-type: none"> (a) color and type (17) Power Equipment Rack (18) Access Hand Rails (19) Compartmentation (20) Warning Sytems, Instruction Plates, & Signage (21) Serviceability (22) Safety monitoring devices (23) Trailers <ol style="list-style-type: none"> (a) type I,II,III (b) wheel chucks (24) Vehicle cover under NFPA (25) Scene lighting <ol style="list-style-type: none"> (a) light masts b. Chassis & vehicle components <ol style="list-style-type: none"> (1) Engine cooling system (2) Minimum top speed (3) Fuel tank size (4) Air filter restriction gauge (5) Cab tilt interlock (6) Power Steering (7) Fuel system (8) Mobile foam (9) Quint <ol style="list-style-type: none"> (a) ladder length (10) Diesel Engine <ol style="list-style-type: none"> (a) Electric Fuel Priming System (b) emission temperature c. Fire pump and equipment <ol style="list-style-type: none"> (1) Heat exchanger <ol style="list-style-type: none"> (a) pump drive engine 	<ol style="list-style-type: none"> (2) Pressure relief valve (3) Auxiliary cooler (4) Initial Attack <ol style="list-style-type: none"> (a) minimum water tank size (b) minimum fire pump capacity (5) Preconnect plumbing size <ol style="list-style-type: none"> (a) strainers (6) Suction hose <ol style="list-style-type: none"> (a) minium amount of hard suction (b) minimum amount of soft suction (7) suction strainer (8) Bleeder valves and drains (9) Minimum discharge outlets and size (10) Minimum intake outlets and size (11) Pressure control system (12) Slow operating valve <ol style="list-style-type: none"> (a) size (b) speed (13) Priming pump <ol style="list-style-type: none"> (a) pumping system capability <ol style="list-style-type: none"> (i) at 3,000 gpm (ii) over 3,000 gpm (iii) discharge rate (14) Interlocks <ol style="list-style-type: none"> (a) Fan (b) Exhaust Brake (c) Engine Brake (15) Pump and roll (16) Pump indicator light (17) Pump & Plumbing access (18) minimum Fire Pump rated capacity (19) Pressure control systems (20) Engine Throttle controls position <ol style="list-style-type: none"> d. Water tanks <ol style="list-style-type: none"> (1) Minimum Pumper tank sizes (2) Minimum Mobile Water Supply Apparatus tank size (3) Fill valve sizes (4) Delivery rate (4) Baffles e. Performance requirements <ol style="list-style-type: none"> (1) Roadability f. Breathing air systems & purification <ol style="list-style-type: none"> (1) Compressor shut downs (2) Grade E air (3) Audible warning air volume (4) SCBA Fill Station g. Foam systems
---	---

- (1) Air pressure for compressed air foam systems, CAFS
- (2) Water and foam check valves
- (3) Minimum pump rated capacity
- (4) Tank pressure and vacuum vents function
- h. Aerial Apparatus
 - (1) hydraulic tubing and fittings minimum burst pressure
 - (2) ladder minimum rated capacity
 - (3) ladder rated height, speed, & rotation
 - (4) aerial waterway requirements
- i. Brakes & Suspensions
 - (1) Hydraulic-activated service brake
 - (2) Service brakes
 - (3) Parking brakes
 - (4) Steering Mechanism
 - (a) radius of non driving front axle
 - (b) radius of driving front axle
 - (5) Stopping distance
 - (6) Air brake quick buildup time
 - (7) Auxiliary brake systems
 - (a) GVWR required
 - (8) Anti-lock brakes
 - (9) Pressure protection valve system

- j. Electrical
 - (1) Lower level optical warning
 - (2) Line voltage electrical systems
 - (a) instrumentation on operators panel
 - (b) power distribution box
 - (3) Upper level optical warning
 - (4) Midship Optical warning device mounting
 - (5) Low voltage electrical systems
 - (a) warning systems
 - (6) Batteries
 - (a) Minimum continuous load for starting
 - (b) Minimum continuous load discharge
 - (7) Minimum flash rate of optical light source
- k. Pump Operators Panel
 - (1) Required instrumentation
 - (2) Control throttle
 - (3) Discharge pressure gauge range
- l. Winches
 - (1) Minimum pull rating
 - (2) Minimum wire rope length
- m. NFPA required equipment
 - (a) automatic external defibrillator (AED)

3. Test requirements: The Technician shall understand the test and delivery data requirements for a Pumper Fire Apparatus

- a. Certification test
 - (1) Pumps less than 750 gpm (initial attack)
 - (2) Pumps greater than 750 gpm (pumper)
 - (3) Certification of pump test gauges
 - (4) Water temperature conditions
 - (5) Tank to pump flow test
 - (6) 50% rated capacity and time
 - (7) 70% rated capacity and time
 - (8) 100% rated capacity and time
 - (9) Hard suction hose
 - (10) Overload test
 - (11) Pump engine driven auxiliary systems
- b. Data required of the contractor
- c. Hydrostatic test
 - (1) of discharge outlets
 - (2) of pump and time
- d. Manufacturer pre-delivery tests
- e. Pressure control tests
 - (1) Tested at pressures
 - (2) Maximum rise in pressure
- f. Priming tests
 - (1) Maximum times
 - (2) Auxiliary intakes
- g. Pump tests
- h. Road tests
 - (1) Acceleration time & distance
 - (2) Stopping time & distance
 - (3) Top speed and time
- i. Overload test
- j. Tests on delivery
- k. Vacuum test
 - (1) Check for leaks
- l. Water tank to pump flow test
 - (1) Flow rate
- m. Electrical test
- n. Gauges and instruments
- o. Intake Relief System Valve Test

4. Principles of servicing and maintenance: The Fire Apparatus Technician shall understand the principles of proper servicing and preventive maintenance programs for fire apparatus.

- 4.1 Identify the elements of servicing and preventive maintenance as listed in IFSTA's Pumping Apparatus Driver/Operator Handbook, to include the following:
 - a. Daily inspections
 - b. Weekly inspections
 - c. Monthly inspections
 - d. Periodic inspections
 - (1) Lubrication
 - (2) Air filters
 - (3) Power steering
 - e. Documentation
 - (1) Pump test
 - (2) Major and minor repairs
 - (3) Preventive maintenance records
 - (4) Repair records
 - (5) Testing records
 - (6) Data recorded
- 4.2 Identify fire apparatus maintenance problems, according to IFSTA's Pumping Apparatus Driver/Operator Handbook, including:
 - a. Electrical components
 - (1) Voltage drop test
 - (2) Master battery disconnect
 - (3) Precautions (battery charging)
 - (4) Testing open circuits
 - b. Engine maintenance
 - (1) Recommended extended idle rpm
 - (2) Unnecessary short durations
 - (3) Oil change intervals
 - (4) Long idling periods
 - c. Hydraulic components
 - (1) Filter change intervals
 - (2) Cylinder leaks
 - d. Pump maintenance
 - (1) Pump packing leakage rate
 - (2) Relief valve intake
 - (3) Trouble shooting
 - (4) Transfer case seals
 - (5) Leakage checks
 - (6) Pump packing
 - (7) Primer valve
 - (8) Primer vent
 - e. Pump valves
 - (1) Linkage
 - (2) Seals
 - f. Transmission
 - (1) Interlocks
 - (2) Fluid color inspection
 - (3) Checking fluid leaks
 - g. Air systems
 - (1) Pressure protection valves
 - h. Test equipment
 - (1) Using a test light
 - (2) Using a volt meter
 - i. Power train components
 - (1) Drive line vibration
 - (2) Poor braking response
 - (3) Drive line seals
 - j. Priming system components
 - (1) Primer valves and lines
- 4.3 Identify Out of Service Criteria as listed in NFPA 1911.