

Reference Materials Note: This exam may contain some "accepted practice" type questions not found in the reference material listed below.

NFPA reference listed below - National Fire Protection Association, Quincy, MA, (800) 344-3555 or www.nfpa.org

NFPA 1900: Standard for Aircraft Rescue and Firefighting Vehicles, Automotive Fire Apparatus, Wildland Fire Apparatus, and Automotive Ambulances (**NFPA 1901 section**) 2024 edition Chapters 3,7,9,11,20,21,23

NFPA 1910: Standard for the Inspection, Maintenance, Refurbishment, Testing and Retirement of In-Service Emergency Vehicles and Marine Firefighting Vessels (**NFPA 1911 section**) 2024 edition Chapters 3,4,5,6,11,20 & 23

Elementary Hydraulics Student Guide. \$34 Can be ordered online from
<https://hydraulicsliteraturestore.com/elementary-hydraulics-student-guide/>

Any hydraulic reference material with symbols such as Fluid Power Designer Lightning Reference Handbook, 8th edition. Available online or call 856-489-8983

LEARNING OBJECTIVES

1. Define the terms and phrases commonly used with aerial fire apparatus, operations, and/or testing.

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|--------------------------|----------------------------|--|
| a. NFPA 1900 Definitions | b. NFPA 1910 Definitions | c. General Knowledge |
| (1) rated capacity | (1) operator | (1) cantilever |
| (2) continuous egress | (2) acoustical testing | (2) races/base rail |
| (3) burst pressure | (3) twist | d. Lightning Reference Glossary of Terms |
| (4) live load | (4) leak | (1) double acting cylinder |
| (5) dead load | (5) ultrasonic testing | (2) micron (micro-meter) |
| | (6) magnetic particle test | (3) pilot valve |
| | (7) operator alert device | (4) shuttle valve |
| | | (5) cracking pressure |
| | | (6) Pascal's law |
| | | (7) motor |

2. Identify the design requirements for aerial fire apparatus:

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|--------------------------------------|-----------------------------------|--------------------------------------|
| a. Aerial ladder requirements | h. Stabilizing systems | q. Signs |
| (1) rated capacity | (1) Deployment | r. Low voltage electrical systems |
| b. Elevating platform requirements | (2) Sloping surface | s. Driving and crew area |
| c. Water delivery systems on aerials | i. Operational time requirements | t. Aerial ladder operating positions |
| d. Safety systems used on aerials | j. Vehicle components | u. Communication systems |
| e. Operating controls | k. Aerial ladder rated capacity | v. Fold down step requirement |
| f. Hydraulic systems and components | l. Aerial platform rated capacity | w. Aerial platform water curtain |
| (1) Hose, Tubing, and Fittings | m. Tractor drawn vehicles | |
| g. Structural components | n. Aerial ladder mechanisms | |
| (1) Safety factor | o. Aerial platform mechanisms | |
| | p. Remote breathing air systems | |
| | Breathing air tank capacity | |

3. Understand the testing, inspection, and documentation requirements of all aerial fire apparatus.

- a. Identify the "Test and Delivery Data Requirements" for aerial fire apparatus as stated in NFPA 1900
 - (1) Road test
 - (2) Delivery data requirement
 - (3) Quality control test
- b. Identify the types of inspections and tests for aerials as stated in NFPA 1910
 - (1) Requirements for inspection and testing
 - (a) Water gauge test
 - (b) Water flow meter test
 - (c) System pressure test
 - (2) Extension cylinder
 - (a) Drift test
 - (3) Annual testing
 - (4) N.D.T. testing
 - (a) Liquid Penetrant Inspection
 - (5) Horizontal load test
 - (6) Weld testing
 - (a) Aluminum ladder weld crack testing
 - (7) Rotation gear inspection
 - (8) Hardness test
 - (9) Operational test
 - (10) Articulating boom test
 - (11) Max elevation load test
 - (12) Hydraulic oil testing
 - (13) Extension motor brake test
 - (14) Turntable inspection and test
 - (15) Stabilizer test
 - (16) Visual inspection
 - (17) Engine speed interlock
 - (18) Winch holding capacity
 - (19) Qualifications of third-party testing
- c. General requirements and which standard contains the requirement for:
 - (1) Out of service requirements
 - (2) Test frequency
 - (3) Inspections personnel
 - (4) Retired Vehicle
- d. Required documentation as per NFPA 1910
- e. Understand accepted procedures for aerial apparatus testing:
 - (1) Tool usage
 - (2) Extension cable
 - (3) Pressure tests
 - (4) Stabilizing system

4. Understand and identify hydraulic systems of an aerial apparatus:

- a. Identify and understand hydraulic components
 - (1) Relief valve
 - (2) Filter assemblies and indicators
 - (3) Hydraulic actuators
 - (4) Counterbalance/holding valves
 - (5) Pumps
 - (6) Hoses and fittings
- b. Identify and understand hydraulic schematics
- c. Identify hydraulic symbols
 - (1) Relief valve
 - (2) Hydraulic cooler
 - (3) Fixed displacement hydraulic pump
 - (4) Filter strainers
 - (5) Hydraulic check valves
 - (6) Metering valve
 - (7) Pressure reducing valve
 - (8) Flow Control Valve
- d. Understand principles of hydraulics
 - (1) Resistance to flow
 - (2) Causes of aerated hydraulic fluid
 - (3) Hose sizing and configuration
 - (4) Effect of hose size on fluid velocity
- e. Understanding and trouble shooting hydraulic systems
 - (1) Platform system
 - (2) Abnormal noises
 - (3) Oil conditions
 - (4) Valves
 - (5) Actuator
 - (6) Stabilizer systems
 - (7) Pressure compensated hydraulic pump
 - (8) Engine speed control

5. Understand and identify electrical systems of an aerial apparatus

- a. Identify electrical components
 - (1) Electrical monitors
 - (2) Electrical cable reel
- b. Identify and understand electrical schematics
- c. Identify electrical schematic symbols
 - (1) Motor
 - (2) Ground
 - (3) SPDT Switch
 - (4) Diode
- d. Understand and troubleshoot electrical systems
 - (1) Controllers
 - (2) Voltage drops
 - (3) Digital controllers
 - (4) Commutator/collector rings
 - (5) Line voltage systems
 - (6) GFCI circuits
 - (7) Water monitor electronic controls

6. Describe activities considered to be accepted practice in service and repair of aerial apparatus

- a. Maintenance
 - (1) Lubrication
 - (2) Cable adjustments
 - (3) Hydraulic hose replacement criteria
 - (4) Filtration
 - (5) Parts Criteria
 - (6) Intervals
- b. Repair procedures
 - (1) Identify hydraulic fluid leakage
 - (2) Identify fastening devices and requirements
 - (3) Line voltage repair procedures

7. Understand the principles of operating aerial apparatus

- a. Stabilizing the apparatus
 - (1) Emergency procedures
 - (2) Stability requirements
 - (3) Stabilizer pads
 - (4) Short jacking
- b. Operating aerial devices from lower controls
- c. Operating aerial devices from upper controls
- d. Proper cab tilting procedures as per manufacturer's recommendations
- e. Safety
- f. Interlocks