



FIRE APPARATUS ENGINEER

INITIAL CERTIFICATION PRACTICAL TASK BOOK

NFPA 1010 (2024 EDITION)



Fire Apparatus Engineer



INTRODUCTION

This task book provides the evaluation tools used during the State Practical Examinations for the skills required to complete the Fire Apparatus Engineer certification program. The National Fire Protection Agency (NFPA) 1010: *Standard on Professional Qualifications for Firefighters* (2024 Edition) standard has specified Job Performance Requirements (JPRs) required by individuals to comply with Chapter 12. JPRs provide an individual completing a task with the necessary data to determine when the task is finished and indicate how well the individual performed.

The Proficiency Log sheets and JPR Skill Sheets contained in this Task Book are to be utilized to document the successful completion of State Practical Examinations related to this certification level. Approved training facilities that already have documentation methods in place that are referenced to the currently approved reference material may incorporate these skill sheets into their program or continue to utilize their own. Approved training facilities may also elect to modify the skill sheets found here to more closely reflect the AHJs current operational practices.

INITIAL STATE CERTIFICATION PREREQUISITES

All rules relating to the Fire Apparatus Engineer certification can be found in the Joint Committee on Administrative Rules (JCAR) Section 141.306.

1. Engagement as Illinois fire protection personnel, as attested by the employing fire chief of the candidate seeking certification.
2. Current certification as Fire Service Vehicle Operator.
3. Successful completion of a Fire Apparatus Engineer course consisting of a minimum of 40 instructional hours.
4. Passage of the State Written and State Practical Examinations.
5. Additional information related to the module delivery and course requirements can be found in the JCAR rule.

REFERENCE LIST

Below is the list of the approved reference material.

- Pumping and Aerial Apparatus Driver/Operator Handbook, 4th Edition. IFSTA.
- Fire Apparatus Driver/Operator, 4th Edition. Jones & Bartlett.



Fire Apparatus Engineer



HOW TO USE THIS TASK BOOK

1. The Proficiency Log Sheets list the mandatory JPR skill examinations on which a Fire Apparatus Engineer candidate shall be tested.
2. Proficiency Log Sheets are utilized to track successful passage of JPR examinations throughout the delivery of an approved Fire Service Apparatus Engineer course (in addition to the individual JPR examination pages).
3. Fire Apparatus Engineer candidates are permitted two attempts to pass each JPR examination. If the candidate does not pass after the second attempt:
 - a. The candidate shall receive additional training in that topic area.
 - b. The candidate shall be retested on a later date.
 - c. Documentation of all attempts and re-education shall be maintained.



Fire Apparatus Engineer

PROFICIENCY LOG SHEET (1 of 2)



12.4	Operations				Officer Initials
12.4.3-1	Date		Comments		
12.4.3-2	Date		Comments		
12.4.3-3	Date		Comments		
12.4.3-4	Date		Comments		
12.4.4-1	Date		Comments		
12.4.4-2	Date		Comments		
12.4.4-3	Date		Comments		
12.4.4-4	Date		Comments		
12.4.4-5	Date		Comments		
12.4.4-6	Date		Comments		
12.4.4-7	Date		Comments		
12.4.4-8	Date		Comments		
12.4.4-9	Date		Comments		
12.4.4-10	Date		Comments		
12.4.4-11	Date		Comments		
12.4.4-12	Date		Comments		
12.4.4-13	Date		Comments		
12.4.4-14	Date		Comments		
12.4.4-15	Date		Comments		
12.4.4-16	Date		Comments		
12.4.4-17	Date		Comments		
12.4.4-18	Date		Comments		
12.4.4-19	Date		Comments		
12.4.4-20	Date		Comments		
12.4.4-21	Date		Comments		
12.4.4-22	Date		Comments		



Fire Apparatus Engineer

ROFICIENCY LOG SHEET (2 of 2)



12.4	Operations				Officer Initials
12.4.4-23	Date		Comments		
12.4.4-24	Date		Comments		
12.4.4-25	Date		Comments		
12.4.5	Date		Comments		
12.4.6-1	Date		Comments		
12.4.6-2	Date		Comments		
12.4.6-3	Date		Comments		
12.4.7	Date		Comments		

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.3-1

TASK: Hand lay a supply line.

PERFORMANCE OUTCOME: The candidate shall establish and operate in work areas at emergency and nonemergency scenes, so that procedures are followed, safety equipment is utilized, protected work areas are established as directed using traffic and scene control devices, and the driver/operator performs assigned tasks only in established, protected work areas.

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given safety equipment, traffic and scene control devices, emergency and nonemergency scenes, traffic and other hazards, an assignment, and SOPs.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate positions the apparatus for the intake to be used.				
2	The candidate rolls out or pulls the supply hose to the hydrant.				
3	The candidate flushes the hydrant.				
4	The candidate connects the supply hose to the hydrant utilizing the required adapters.				
5	The candidate connects the supply hose to the pump's intake.				
6	The candidate checks for any kinks in the supply line.				
7	The candidate opens the hydrant and charges the supply line.				
Comments:					

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.3-2

TASK: Attach a soft sleeve hose to a fire hydrant.

PERFORMANCE OUTCOME: The candidate shall establish and operate in work areas at emergency and nonemergency scenes, so that procedures are followed, safety equipment is utilized, protected work areas are established as directed using traffic and scene control devices, and the driver/operator performs assigned tasks only in established, protected work areas.

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given safety equipment, traffic and scene control devices, emergency and nonemergency scenes, traffic and other hazards, an assignment, and SOPs.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate positions the apparatus so that its inlet is the correct distance from the fire hydrant.				
2	The candidate removes the hose from the hose bed and obtains any needed adaptors and the hydrant wrench.				
3	The candidate attaches the soft sleeve hose to the intake of the pump if it is not already attached to an intake.				
4	The candidate stretches out the hose.				
5	The candidate removes the large hydrant cap.				
6	The candidate checks the fire hydrant for proper operation and flushes the hydrant.				
7	The candidate attaches the soft sleeve hose to the hydrant and a gate valve to an additional port.				
8	The candidate ensures that the hose does not have any kinks or sharp bends that might restrict the flow of water.				
9	The candidate opens the fire hydrant valve slowly when indicated by the driver/operator.				
10	The candidate checks all connections for leaks.				
11	The candidate tightens the couplings if necessary.				

Comments:

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.3-3

TASK: Attach a hard suction hose to a fire hydrant.

PERFORMANCE OUTCOME: The candidate shall connect a pumper to a water supply as a member of a team, so that connections are tight, and water flow is unobstructed.

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given supply or intake hose, hose tools, and a fire hydrant or static water source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate positions the apparatus so that the intake on the apparatus is located the correct distance from the fire hydrant.				
2	The candidate removes the pump inlet cap.				
3	The candidate removes the hydrant steamer outlet cap.				
4	The candidate places an adaptor on the hydrant if needed.				
5	With a partner's help, the candidate removes a section of hard suction hose from the engine.				
6	The candidate connects the hard suction hose to the large intake on the pump panel.				
7	The candidate connects the opposite end to the fire hydrant.				
8	The candidate slowly opens the fire hydrant valve when instructed to do so by the pump driver/operator.				
Comments:					

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.3-4

TASK: Prepare the fire apparatus for drafting operations.

PERFORMANCE OUTCOME: The candidate shall connect a pumper to a water supply as a member of a team, so that connections are tight, and water flow is unobstructed.

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given supply or intake hose, hose tools, and a fire hydrant or static water source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate inspects the gasket in the female coupling of each piece of suction hose, and the adapters for damage or debris.				
2	If multiple sections are necessary, the candidate connects the sections of suction hose together.				
3	The candidate installs the strainer on the end that is placed in the water.				
4	The candidate tightens the couplings as much as possible by hand and then tightens them slightly more by striking the tightening lugs two or three times with a rubber hammer.				
5	The candidate connects the suction hose to the fire pump.				
6	The candidate advances the suction hose assembly while moving the fire apparatus into position.				
7	The candidate sets the parking brake and chocks the wheels.				
8	The candidate ensures the barrel strainer assembly or floating strainer does not touch the bottom of the water source. If a low-level strainer is used, the candidate ensures that it will sit on the bottom with sufficient water covering the strainer.				

Comments:

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.4-1		TASK: Calculate the nozzle reaction from a smooth-bore nozzle.			
PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate demonstrates the ability to calculate the nozzle reaction for a $\frac{7}{8}$ -inch tip operating at 50 psi nozzle pressure.				
Calculation solution: NR = $1.57 \times d^2 \times NP$ NR = $1.57 \times 0.875^2 \times 50$ NR = $1.57 \times 0.766 \times 50$ NR = 60.1 lbs.					
Comments:					

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-2

TASK: Calculate the nozzle reaction from a fog nozzle.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate demonstrates the ability to calculate the nozzle reaction for a fog nozzle flowing 160 gpm operating at 50 psi nozzle pressure.				

Calculation solution:

Nozzle Reaction (NR); Square Root ($\sqrt{NP}$); Nozzle Pressure (NP)

$$NR = 0.0505 \times \text{gpm} \times \sqrt{NP}$$

$$NR = 0.0505 \times 160 \times \sqrt{50}$$

$$NR = 0.0505 \times 160 \times 7.071$$

$$NR = 57.1 \text{ lbs.}$$

Comments:

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-3

TASK: Calculate the flow of a smooth-bore nozzle on a 2½-in. handline.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	Calculate the flow rate for a 1-3/16-inch tip.				
2	Calculate the flow rate for a 1½-inch smooth-bore master stream nozzle at 80 psi.				
Calculation solutions: 1) $\text{gpm} = 29.7 \times d^2 \times \text{VNP}$ $\text{gpm} = 29.7 (1-3/16)^2 \times \sqrt{50}$ $\text{gpm} = 29.7 (1.1875)^2 \times \sqrt{50}$ $\text{gpm} = 29.7 \times 1.410 \times 7.071$ $\text{gpm} = 296.1$ 2) $\text{gpm} = 29.7 \times d^2 \times \text{VNP}$ $\text{gpm} = 29.7 (1.5)^2 \times \sqrt{80}$ $\text{gpm} = 29.7 \times 2.25 \times 8.94$ $\text{gpm} = 597.415$					
Comments:					

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.4-4		TASK: Calculate friction loss and determine pump discharge pressure in a single hose line.			
PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.					
NOTE: Candidates will utilize the modern FL formula: $FL = C Q^2 L$					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	What is the pump discharge pressure (PDP) for 300 ft. of 1¾-inch hose (actual ID of 1.88) with a 7/8-in. smooth-bore nozzle?				
2	Calculate the FL in 200 ft of 1¾-in. hose (ID of 1.81) with a 1-15/16-inch smooth-bore nozzle.				
Calculation solutions: 1) $FL = 8.75 \times (161/100)^2 \times 300/100$ $FL = 8.75 \times (1.61)^2 \times 3$ $FL = 8.75 \times 2.592 \times 3$ $FL = 68.0$ psi $PDP = 50 + 68 = 118$ psi 2) $FL = 11.5 \times (185/100)^2 \times 2$ $FL = 11.5 \times 3.423 \times 2$ $FL = 78.729$ (round to 78.7 psi) $PDP = 50 + 78.7 = 128.7$ psi					
Comments:					

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-5

TASK: Calculate pump discharge pressure in multiple hose lines of different sizes and lengths.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

NOTE: Candidates will utilize the modern FL formula: $FL = C Q^2 L$

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	A pumper is supplying two attack lines. The first consists of 150 ft of 1¾-inch hose (ID of 1.85) flowing 150 gpm with a fog nozzle. The second consists of 200 ft of 2½-inch hose (ID of 2.8) flowing 265 gpm with a 1-3/16-inch smooth-bore nozzle at 40 psi. What is the PDP?				
2	A pumper is supplying three hose lines. The first attack line is 300 ft of 2½-inch hose (ID of 2.8) flowing 296 gpm with a smooth-bore nozzle at 50 psi. The second attack line is 200 ft of 1¾-inch hose (ID of 1.8) flowing 150 gpm with a 75-psi fog nozzle. The third attack line is 200 ft of 1¾-inch hose (ID of 1.8) flowing 161 gpm with a 7/8-in. smooth-bore tip at 50 psi. What is the PDP?				

Calculation solutions:

1) $L1-FL = 10 (1.5)^2 \times 1.5$
 $L1-FL = 10 \times 2.25 \times 1.5 = 33.8 \text{ psi}$
 $L1-PDP = 75 + 33.8 \text{ FL} = 108.8 \text{ psi}$
 $L2-FL = 1.24 (2.5)^2 \times 2$
 $L2-FL = 1.24 \times 6.25 \times 2 = 15.5 \text{ psi}$
 $L2-PDP = 40 + 15.5 = 55.5 \text{ psi}$

2) $L1-FL = 1.24 (2.96)^2 \times 3 = 32.59 \text{ psi}$
 $L1-PDP = 50 + 32.6 = 82.6 \text{ psi}$
 $L2-FL = 11.5 (1.5)^2 \times 2$
 $L2-FL = 15.5 \times 2.25 \times 2 = 51.75$
 $L2-PDP = 75 + 51.75 = 126.75 \text{ psi}$
 $L3-FL = 11.5 (1.61)^2 \times 2$
 $L3-FL = 11.5 \times 2.59 \times 2 = 59.62$
 $L3-PDP = 50 + 59.62 = 109.6 \text{ psi}$
ANSWER = 126.75 psi

Comments:

Instructor Signature

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-6

TASK: Calculate the elevation pressure and estimate elevation pressure (loss and gain).

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	Calculate the EP when the nozzle is on the 11 th floor of a building and the total height of the nozzle is 125 ft above the ground (12.5 ft per floor).				
2	Estimate the EP when the nozzle is operating approximately 30 ft below the pump.				

Calculation solutions:

1) $EP = 0.434 \text{ psi} \times [(11 - 1) \times 12.5]$
 $EP = 0.434 \text{ psi} \times 125 \text{ ft}$
 $EP = 54.3 \text{ psi}$

2) $EP = 30 \times 0.5$
 $EP = 15 \text{ psi}$

Comments:

Instructor Signature

Date

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Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.4-7	TASK: Calculate the pump discharge pressure in a wye scenario with equal length and discharge hose lines.				
PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	A pumper is supplying 200 ft of 2½-inch hose (ID of 2.75) to a wye that has two 1¾-inch hose lines (ID of 1.8) 200 ft long flowing 161 gpm each through 7/8-inch smooth-bore nozzles. What is the PDP?				
2	A pumper is supplying 200-ft of 2½-inch hose (ID of 2.75) to a wye that has two 1 ¾ inch (ID of 1.8) hose lines 200 ft long, but only one of the two handlines is flowing. What is the PDP?				
Calculation solutions: 1) $FL-2\frac{1}{2} = 1.35 (3.22)^2 \times 2$ $FL-2\frac{1}{2} = 1.35 \times 10.37 \times 2$ $FL-2\frac{1}{2} = 28 \text{ psi}$ $FL-1\frac{3}{4} = 1.5 (1.61)^2 \times 2 = 36 \text{ psi}$ $FL-1\frac{3}{4} = 1.5 \times 2.592 \times 2 = 36 \text{ psi}$ $FL-1\frac{3}{4} = 59.6 \text{ psi}$ $PDP = 50 + 28 + 59.6$ $PDP = 137.6 \text{ psi}$ 2) $FL-2\frac{1}{2} = 1.35 (1.61)^2 \times 2$ $FL-2\frac{1}{2} = 1.35 \times 2.592 \times 2$ $FL-2\frac{1}{2} = 7 \text{ psi}$ $FL-1\frac{3}{4} = 11.5 (1.61)^2 \times 2$ $FL-1\frac{3}{4} = 11.5 \times 2.592 \times 2$ $FL-1\frac{3}{4} = 59.6 \text{ psi}$ $PDP = 50 + 7 + 59.6$ $PDP = 116.6 \text{ psi}$					
Comments:					

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-8

TASK: Calculate the pump discharge pressure in a wye scenario with unequal hose lines.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	A pumper is supplying 100 ft of 3-inch hose (with 2½-inch couplings) to a wye. The first attack line from the wye is 200 ft of 2½-inch hose (ID of 2.5) with a 1¼-inch smooth-bore nozzle flowing 328 gpm. The second attack line is 150 ft of 2½-inch hose (ID of 2.5) with a 1-inch smooth-bore nozzle flowing 210 gpm. What is the PDP?				
2	A pumper is supplying 100-ft of 3-inch hose to a wye. From the wye, the first attack line is 200 ft of 1¾-inch hose (ID of 1.75) flowing 150 gpm with a 100-psi fog nozzle. The second attack line is 200 ft of 2½-inch (ID of 2.5) hose flowing 300 gpm with a 100-psi fog nozzle. What is the PDP?				

Calculation solutions:

1) $FL-3 = 0.8 (5.38)^2 1$

$FL-3 = 0.8 \times 28.944 \times 1$

$FL-3 = 23.2 \text{ psi}$

$FL-2\frac{1}{2}\text{-}\#1 = 2.15 (3.28)^2 2 = 26.26 \text{ psi}$

$PDP-2\frac{1}{2}\text{-}\#1 = 50 + 23.2 + 46.3 + 10 = 129.5 \text{ psi}$

$FL-2\frac{1}{2}\text{-}\#2 = 2.15 (2.1)^2 1.5 = 14.2 \text{ psi}$

$PDP = 50 + 23.3 + 14.2 + 10 = 97.4 \text{ psi}$

$PDP = 130 \text{ psi}$

2) $FL-3 = 0.67 (4.5)^2 1$

$FL-3 = 0.67 \times 20.25 \times 1 = 13.6 \text{ psi}$

$FL-1\frac{3}{4} = 13.2 (1.5)^2 2$

$FL-1\frac{3}{4} = 13.2 \times 2.25 \times 2 = 59.4 \text{ psi}$

$PDP-1\frac{3}{4} = 100 + 13.6 + 59.4 + 10 = 183.0 \text{ psi}$

$FL-2\frac{1}{2} = 2.15 (3)^2 2$

$FL-2\frac{1}{2} = 2.15 \times 9 \times 2 = 38.7 \text{ psi}$

$PDP = 100 + 13.6 + 38.7 + 10 = 162.3 \text{ psi}$

Comments:

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-9

TASK: Calculate the friction loss in Siamese lines by the split flow method.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate demonstrates the ability to calculate the friction loss to the Siamese connection using the split flow method for a pumper supplying 1200 gpm through three 2½-inch lines that are 300 ft long to a Siamese connection.				
Calculation solution: 1200 gpm/3 hose lines = 400 gpm each $FL = C = 2$ $FL = Q = 400/100 = 4$ $L = 300 \text{ ft}/100 = 3$ $FL = 2 \times 4^2 \times 3$ $FL = 96 \text{ psi}$					
Comments:					

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.4-10		TASK: Calculate friction loss in Siamese lines by the coefficient method.			
PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate demonstrates the ability to calculate the friction loss in Siamese lines using the coefficient method for a pumper that is supplying 1200 gpm through three 2½-inch lines that are 300 ft long to a Siamese line.				
Calculation solution: FL = C = 0.22 FL = Q = 1200/100 = 12 FL = L = 300 ft/100 = 3 FL = 0.22 x 12 ² x 3 FL = 95 psi					
Comments:					

Instructor Signature

Date

Candidate Signature

Date



Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-11

TASK: Calculate friction loss in Siamese lines by the percentage method.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	A fire pumper is supplying 1200 gpm through three 2½-inch lines that are 300 ft long to a Siamese connection. What is the friction loss to the Siamese connection as calculated using the percentage method?				
2	A pumper is supplying 1000 gpm through two 2½-inch lines that are 200 ft long to a Siamese connection. What is the friction loss to the Siamese connection?				

Calculation solutions:

1) $FL = C = 2$
 $FL = L = 300 \text{ ft}/100 = 3$
 $FL = Q^2 = (1200/100)^2 = 12^2 = 144$
 $FL = 2 \times 144 \times 3 = 864$
 $FL = 10\% \text{ of } 864 = 86.4 \text{ psi}$

2) $FL = C = 2$
 $FL = L = 200 \text{ ft}/100 = 2$
 $FL = Q^2 = (1000/100)^2 = 10^2 = 100$
 $FL = 2 \times 100 \times 2 = 400$
 $FL = 25\% \text{ of } 400 = 100 \text{ psi}$

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.4-12	TASK: Calculate the pump discharge pressure for a pre-piped elevated master stream device.				
PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	A pumper supplying an elevated master stream is on the hydrant. This apparatus is supplying one 5-inch line that is 200 ft long to the inlet of the ladder truck, which the ladder has extended 80 ft vertically; it is equipped with a 1½-inch smooth-bore master stream tip (598 gpm). What is the PDP?				
2	Determine the PDP for supplying a pre-piped elevated master stream through 200 ft of 4-inch hose, where the aerial device is raised to 100 ft vertically and has a 2-inch tip rated at 80 psi.				
Calculation solutions: 1) $PDP = 80 + FL$ $FL = (0.08 \times 5.98^2 \times 2) + 25 + (0.434 \times 80)$ $FL = 5.7 + 25 + 34.7$ $FL = 65.4 \text{ psi}$ $PDP = 80 + 65.4$ $PDP = 145.4 \text{ psi}$ 2) $PDP = 80 + FL$ $FL = (0.2 \times 1063/100^2 \times 200 \text{ ft}/100) + AL \pm EP$ $FL = (0.2 \times 10.63^2 \times 2) + AL \pm EP$ $FL = (0.2 \times 113 \times 2) + 25 + (0.434 \times 100)$ $FL = 45.2 \text{ psi} + 25 + 43.4$ $FL = 113.6 \text{ psi}$ $PDP = 80 + 113.6$ $PDP = 193.6 \text{ psi}$					
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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-13

TASK: Calculate the pump discharge pressure for an elevated master stream.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	Determine the PDP for supplying a non-pre-piped elevated master stream that is raised to 60 ft and is flowing 750 gpm from a 100-psi fog nozzle through 300 ft of 3-inch hose with 2½-inch couplings. The aerial master stream has 25 psi of FL.				

Calculation solution:

$$\text{PDP} = 100 + \text{FL}$$

$$\text{FL} = 0.8 \times (598/100)^2 \times 300 \text{ ft}/100 + (\text{AL} \pm \text{EP})$$

$$\text{FL} = 0.8 \times (5.98)^2 \times 3 + (\text{AL} \pm \text{EP})$$

$$\text{FL} = 0.8 \times 35.76 \times 3 + (\text{AL} \pm \text{EP})$$

$$\text{AL} = 25 \text{ psi}$$

$$\text{EP} = 60 \text{ ft} \times 0.434 = 26.0 \text{ psi}$$

$$\text{FL} = 85.8 + 25 + 26.0$$

$$\text{PDP} = 100 + 85.8 + 25 + 26$$

$$\text{PDP} = 216.8 \text{ psi}$$

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-14

TASK: Calculate the discharge pressure for a standpipe during preplanning.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	You have been assigned to develop a preincident plan for the use of a standpipe system for fire attack on the top floor of a 17-story building (192 ft). Each attack hose will consist of 200 ft of 2½-inch hose (ID of 2.5) with a smooth-bore 1-3/16-inch nozzle at 40 psi. The FDC is supplied with two 100-ft lengths of 2½-inch hose (ID of 2.5). Each length is connected to one of the two ports of the FDC. The building is equipped with a 5-inch riser. What is the standpipe outlet pressure to operate the attack line on the 17 th floor (using modern coefficients)?				
Calculation solution: Q = 265 gpm (student must calculate this themselves) Attack line FL = $2.15 \times (2.65)^2 \times 2 = 30.2$ (round to 30 psi) EP loss connecting floor below = $10 \text{ ft} \times 0.433 = 4.33$ (round to 5 psi) Outlet pressure = $40 + 30 + 5 = 75$ psi					
Comments:					

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.4-15		TASK: Calculate pump discharge pressure for a standpipe.			
PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	You are supplying three 200-ft attack lines consisting of 2½-inch hose (ID of 2.75) with 1½-inch tips rated at 50 psi. The highest attack line is operating on the 15 th floor (180 ft). The other two attack lines are operating on the 14 th floor. The building's risers are made of 6-inch pipe. Using the split flow method for the two 2½-inch supply lines (ID of 2.75) that are 200 ft long to the FDC, what is the PDP?				
Calculation solution: FL-Supply = $266 \text{ gpm} \times 3 = 798 \text{ gpm}$ FL-Supply = $798 \text{ gpm} / 2 \text{ lines} = 399 \text{ gpm each}$ FL-Supply = $1.35 \times (3.99)^2 \times 2 = 42.98 \text{ (43 psi)}$ FL-Riser = $0.052 \times (798/100)^2 \times 180 \text{ ft}/100$ FL-Riser = $0.052 \times (7.98)^2 \times 1.8$ FL-Riser = 5.96 (6 psi) FDC = 10 psi AL (FDC & standpipe) = 16 psi Elevation = $(15-1) \times 5 = 14 \times 5$ Elevation = 70 psi FL-Attack line = $1.35 \times (266/100)^2 \times 200 \text{ ft}/100$ FL-Attack line = $1.35 \times (2.66)^2 \times 2$ FL-Attack line = $1.35 \times 7.076 \times 2$ FL-Attack line = 19.1 psi NP = 50 psi PDP = $43 + 16 + 78.1 + 50 + 19.1$ PDP = 206.2 psi					
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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-16

TASK: Use the subtract 10 method to calculate pump discharge pressure.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	Calculate the PDP for 300 ft of 2½-inch hose (ID of 2.75) with a 13/16-in. smooth-bore tip. The 13/16-inch tip flows 265 gpm when it has an NP of 40 psi.				
2	Do the same problem using the modern Q formula ($C Q^2 L$).				

Calculation solutions:

1) $256 \text{ gpm} = 26 - 10 = 16 \text{ psi FL/100 ft}$
 $300 \text{ ft} \times 16 \text{ psi} = 48 \text{ psi FL}$
 $\text{PDP} = 40 + 48 = 88 \text{ psi}$

2) $\text{FL} = 1.35 (2.65)^2 \times 3$
 $\text{FL} = 1.35 \times 7.023 \times 3$
 $\text{FL} = 28.4 \text{ psi}$
 $\text{PDP} = 40 + 28.4 = 68.4 \text{ psi}$

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-17

TASK: Calculate friction loss using the condensed Q method.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	Calculate friction loss in 3½-inch hose flowing 300 gpm.				
2	Calculate friction loss in 4-inch hose flowing 500 gpm.				
3	Calculate friction loss in 5-inch hose flowing 500 gpm.				

Calculation solutions:

1) $FL = Q^2/3 = 3^2/3$
 $FL = 9/3$
 $FL = 3 \text{ psi}/100 \text{ ft}$

2) $FL = Q^2/5 = 5^2/5$
 $FL = 25/5$
 $FL = 5 \text{ psi}/100 \text{ ft}$

3) $FL = Q^2/15 = 5^2/15$
 $FL = 25/15$
 $FL = 1.7 \text{ or } 2 \text{ psi}/100 \text{ ft}$

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-18

TASK: Determine available flow using the OK method.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	Scenario As Pumper 18 (P18) pulls up to the house on fire, Pumper 11 (P11) lays a 4-in. LDH and charges the hydrant. In the chaos, the driver/operator did not see the initial static pressure before charging the first handline because they were already flowing from the tank. For a brief period, the firefighter shut down their handline to advance, and the driver/operator was able to see that the static pressure on the hydrant was 85 psi. When the hose line opened back up, it dropped to 80 psi. P18's small attack lines are all 1¼-inch hose with flow rates of 160 gpm. A second attack line is quickly stretched, and the crews call for water. Before charging this attack line, you know you need to determine if you have enough to supply it.				
Solution steps: 1) $FL = 85 \text{ (static pressure)} - 80 \text{ (residual pressure)} = 5 \text{ psi}$ 2) $FL = 2^{\text{nd}} \text{ line of same flow} = 5 \times 4 = 20 \text{ psi}$ 3) $FL = \text{If a } 3^{\text{rd}} \text{ line of same flow is pulled} = 5 \times 9 = 45 \text{ psi}$ 4) $FL = \text{If } 4^{\text{th}} \text{ line of same flow is pulled} - 5 \times 16 = 80 \text{ psi}$ 5) The 4th line is the last line before the residual pressure is gone. 6) If the candidate continues to draw from pressure that does not exist in the above scenario, they must be marked as failed for that attempt and start over.					
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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-19

TASK: Calculate the water available from a hydrant using the first-digit method.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The static pressure is 80 psi from the hydrant, and the driver/operator flows the first attack line, a 2½-inch hose with a flow of 300 gpm. The residual pressure is now 70 psi. Calculate the water available from the hydrant.				

Solution steps:

- 1) $80 \text{ (static pressure)} - 70 \text{ (residual pressure)} = 10$
- 2) $8 \times 1 = 8$ (less than 10)
- 3) $8 \times 2 = 16$ (greater than 10)
- 4) The hydrant can safely flow one additional handline, or two times the amount of water it is currently flowing, for a total of 600 gpm.
- 5) If the candidate continues to add lines or attempts to flow water that the hydrant in the above scenario will not accommodate, they must be marked as failed for that attempt and start over.

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-20

TASK: Determine available water using the percentage method.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	Scenario As Pumper 18 (P18) pulls up to the house on fire, Pumper 11 (P11) lays a 4-inch LDH and charges the hydrant. In the chaos, the driver/operator did not see the initial static pressure before charging the first handline because they were already flowing from the tank. For a brief period, the firefighter shut down their handline to advance, and the driver/operator was able to see that the static pressure on the hydrant was 85 psi. When the handline opened back up, the static pressure dropped to 80 psi. P18's small attack lines are all 1¾-inch handlines with flow rates of 160 gpm. A second attack line is quickly stretched, and the crews call for water. Before charging this attack line, you need to determine if you have enough to supply it.				

Solution steps:

- 1) $85 \text{ (residual pressure)} - 80 \text{ (static pressure)} = 5 \text{ psi}$
- 2) $(5 \div 85) \times 100 = 5.88\%$
- 3) The candidate may use the following chart to determine if the supply will support four total handlines of this flow rate.

% of Static Pressure Loss	# of Attack Lines the Supply Can Support
1% - 6%	4 total lines of equal flow
7% - 11%	3 total lines of equal flow
12% - 25%	2 total lines of equal flow
>25%	Only the line currently flowing, but there may be enough for a line of lower flow.

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-21

TASK: Engage a fire pump with an automatic transmission.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate shifts the transmission into neutral.				
2	The candidate sets the parking brake.				
3	The candidate operates the pump shift control switch and ensures the "Pump engaged" light is illuminated.				
4	The candidate shifts the transmission into the drive position or other appropriate gear as specified by the manufacturer.				
5	The candidate identifies indicators of pump engagement inside the cab.				
6	The candidate exits the cab and chocks the wheels of the apparatus.				
7	The candidate opens the tank-to-pump valve.				
8	The candidate operates the priming pump if necessary.				
9	The candidate opens the tank fill valve until attack lines are ready to be supplied.				
10	The candidate charges the attack lines.				

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-22

TASK: Perform a changeover operation.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate calculates and flows an attack line from a discharge using the onboard water tank.				
2	The candidate slowly opens the intake valve.				
3	The candidate keeps the pressure fluctuation from exceeding 10 psi.				
4	After opening the intake valve fully, the candidate closes the tank-to-pump valve if necessary.				
5	The candidate adjusts the pump settings as needed.				

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-23

TASK: Operate an auxiliary cooling system.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate ensures the pump is operating and has a water supply.				
2	The candidate switches the auxiliary cooling valve open.				
3	The candidate returns the auxiliary coolant valve to the closed position at the conclusion of pumping operations.				

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-24

TASK: Disengage a fire pump with an automatic transmission.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate reduces the throttle to idle speed.				
2	The candidate closes the discharge valves.				
3	The candidate steps into the cab of the apparatus.				
4	The candidate places their foot on the brake pedal and move the transmission selector into neutral.				
5	The candidate ensures the speedometer no longer has a reading of 10–15 mi/h (16–24 km/h).				
6	The candidate moves the pump's shift control switch into the "road" position, momentarily stopping at the midpoint position before moving the switch all the way into "road" position.				
7	The candidate confirms the indicator lights ("Pump engaged" and "Okay to pump") are no longer illuminated.				
8	The candidate exits the cab.				
9	The candidate closes and drains all valves as necessary.				

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.4-25

TASK: Provide water flow for handlines and master streams.

PERFORMANCE OUTCOME: The candidate shall produce effective hand or master streams, so that the pump is engaged, all pressure control and vehicle safety devices are set, the rated flow of the nozzle is achieved and maintained, and the apparatus is monitored for potential problems:

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given the following water sources: (1) Internal tank; (2) Pressurized source; (3) Static source; (4) Transfer from internal tank to external source.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate ensures that firefighters with attack lines or additional pumpers are ready to receive water.				
2	The candidate opens the corresponding discharge valve for the hose line and begins flowing water.				
3	The candidate increases the engine's speed (rpm) and provides an adequate discharge pressure.				
4	The candidate opens the discharge valve and increases the throttle simultaneously if necessary until they reach the desired discharge pressure.				
5	The candidate sets the pressure-regulating mechanism after achieving the desired flow.				

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JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.5	TASK: Drafting from a static water source utilizing a primer.				
PERFORMANCE OUTCOME: The candidate shall pump a supply line of 2 ½ in. (65 mm) or larger, so that the correct pressure and flow are provided to the next pumper in the relay.					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given a relay pumping evolution the length and size of the line and the desired flow and intake pressure.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate closes all discharge valves and cap any suction fittings not being used.				
2	The candidate closes all drain valves and tank valves.				
3	The candidate closes the auxiliary cooler line.				
4	For a two-stage pump, the candidate moves the transfer valve to the “volume,” “parallel,” or “capacity” position.				
5	The candidate ensures that appropriate hard suction hose and adapters are attached and airtight, and the strainer is submerged.				
6	The candidate establishes a dump line.				
7	The candidate places the pump in gear.				
8	The candidate primes the pump until a draft is achieved.				
9	The candidate opens the discharge valve for the dump line to flow water back into the water source or tank.				
10	The candidate begins the water delivery.				
Comments:					

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JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.6-1		TASK: Batch mixing water additive.			
PERFORMANCE OUTCOME: The candidate shall produce a foam fire stream, so that proportioned foam is provided.					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given foam-producing equipment.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate determines the amount of water inside the water tank of the fire apparatus or drop tank.				
2	The candidate determines the correct percentage of water additive in solution.				
3	The candidate adds the correct amount of foam concentrate directly into the top of the water tank's fill port, or directly into the drop tank.				
4	The candidate recirculates the onboard water tank or discharges a bit of water into the drop tank from their waste line, to mix the solution in the tank.				
5	The candidate discharges the product through the attack lines so it may be applied onto the fuel to prevent or extinguish fire.				
Comments:					

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Fire Apparatus Engineer



JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.6-2

TASK: Operating an in-line eductor.

PERFORMANCE OUTCOME: The candidate shall produce a foam fire stream, so that proportioned foam is provided.

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given foam-producing equipment.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate ensures all necessary equipment is available, including the appropriate flow-matched nozzle, concentrate, and an in-line foam eductor.				
2	The candidate ensures there is enough concentrate to suppress the fire and that it is the correct type of agent for the job.				
3	The candidate stretches an attack line, removes the nozzle, and replaces it with the appropriate nozzle for the eductor (if necessary) and agent to be delivered.				
4	The candidate places the in-line eductor in the hose stream close to the apparatus but no more than 150 ft (45 m) from the nozzle.				
5	The candidate places the concentrate container(s) next to the eductor.				
6	The candidate checks the percentage at which the foam concentrate should be used.				
7	The candidate sets the metering device on the eductor accordingly.				
8	The candidate places the pick-up tube from the eductor into the foam concentrate, keeping both items at similar elevations.				
9	The candidate charges the hose line with water, ensuring there is a minimum pressure capable of supplying the nozzle with its recommended pressure (50–100 psi [350– 700 kPa]), and accounting for the friction losses caused by the eductor (100 psi [700 kPa]) and by the attack line.				
10	The candidate				
11	The candidate flows water through the hose line until solution starts to come out of the nozzle.				
12	The candidate applies the agent using an appropriate application method.				

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JOB PERFORMANCE REQUIREMENT					
NFPA 1010 2024 Edition 12.4.6-3		TASK: Apply Class A water additive on a fire.			
PERFORMANCE OUTCOME: The candidate shall produce a foam fire stream, so that proportioned foam is provided.					
CONDITIONS: The applicant will complete all elements.					
EQUIPMENT REQUIRED: Given foam-producing equipment.					
Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate opens the nozzle, and tests it to ensure the appropriate flow from the nozzle is achieved.				
2	The candidate moves within a safe range of the target and opens the nozzle.				
3	The candidate directs the stream from the nozzle onto the burning surface or the exposure they are protecting.				
Comments:					

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JOB PERFORMANCE REQUIREMENT

NFPA 1010
2024 Edition
12.4.7

TASK: Connecting hose to a fire department connection (FDC).

PERFORMANCE OUTCOME: The candidate shall supply water to fire sprinkler and standpipe systems, so that water is supplied to the system at the correct volume and pressure.

CONDITIONS: The applicant will complete all elements.

EQUIPMENT REQUIRED: Given specific system information and a pumper.

Step	Skill	Attempt 1		Attempt 2	
		Pass	Fail	Pass	Fail
1	The candidate secures a water supply using LDH.				
2	The candidate ensures the apparatus is in a safe and effective position for the given situation.				
3	The candidate engages the pump.				
4	The candidate pulls enough of the appropriate hose that matches the couplings on the FDC to reach from the pump discharge to the FDC.				
5	The candidate removes the protective cover from the FDC, if applicable.				
6	The candidate visually inspects the FDC for debris inside and any signs of damage.				
7	The candidate connects the hose to the FDC.				
8	The candidate connects the hose to the pump discharge if it is not already connected to the apparatus.				
9	The candidate verifies with the instructor if they should charge the hose line.				
10	Once the line is charged, the candidate connects to the remaining FDC connection.				

Comments:

Instructor Signature

Date

Candidate Signature

Date