New Hampshire Department of Safety
Division of Fire Standards and Training & Emergency Medical Services

DRIVER / OPERATOR – ALL VEHICLES

2017 EDITION

CURRICULUM GUIDE

MODULE 2
MAINTAINING EMERGENCY VEHICLES

Fall 2021 Revision

	Driver / Operator – All Vehicles **Module 2: Maintaining Emergency Vehicles** **Summary & Outline**	

Goal	To provide emergency vehicle driver/operators with an understanding of how to maintain modern emergency vehicles.
Objectives	At the conclusion of Module 2, students will be able to: 1. Describe the components and importance of a preventative maintenance program. 2. List and explain the steps to conduct an in-service check of an emergency vehicle. 3. Recognize deficiencies that would place an emergency vehicle out of service.
Prerequisite	Completion of Module 1
Instructor / Student Ratio	• 1 Lead Instructor • 2 Instructors • 16 Students
Time Required for Delivery	4 Hours

Outline

Activity 2-1: What is Maintenance?

1) Definition of Maintenance
2) Types of Maintenance
   a. Cleaning
   b. Fueling
   c. Routine Checks
   d. Preventative Servicing
   e. Performance Testing
   f. Documentation

Discussion 2-2: Introduction to Emergency Vehicle Checks

1) Apparatus Types
a. Staff / Command Vehicles (Cars, SUVs, Pick-Up Trucks, etc.)
b. Ambulances (Type I, II, & III)
c. Pumper Fire Apparatus
d. Initial Attack Fire Apparatus (Mini-Pumper, Midi-Pumper)
e. Mobile Water Supply Fire Apparatus
f. Aerial Fire Apparatus (Aerial Ladder, TDA, Elevating Platform)

Activity 2-3: Emergency Vehicle Checks

a. Engine Compartment Checks
b. Cab Checks
c. Brake System Checks
d. Exterior Checks

References	
IFSTA Pumping & Aerial Apparatus Driver/Operator Handbook, 3rd edition	Chapter 2: Apparatus Inspection and Maintenance • Page 29 to Page 68
NH CDL Driver's Guide	Section 2: Driving Safely • Section 2.1 - Vehicle Inspection Section 5: Air Brakes • Section 5.3 - Inspecting Air Brake Systems Section 8: Tank Vehicles • Section 8.1 - Inspecting Tank Vehicles Section 11: Vehicle Inspection Test
2021 Commercial Driver License Manual - Supplement	Section 11: Vehicle Inspection Test

	Driver / Operator – All Vehicles **Activity 2-1** **What is Maintenance?**	

Objective	At the conclusion of Activity 2-1, students will be able to: 1. Describe the components and importance of a preventative maintenance program.
Delivery Format	Group Activity
Resources Required	• Activity 2-1 Slides (PowerPoint or Poster Board)
Instructor / Student Ratio	• 1 Lead Instructor • 1 Instructor • 16 Students

Set-Up

Arrange the classroom or activity space with tables and chairs to provide for four separate small group work areas. The PowerPoint slides or easel stand & poster boards and the dry erase board should be within view of all participants.

Delivery

Divide the class into four groups of four students.

Each group will work together to answer the questions on the Activity 2-1 slide. The groups should be directed to make a written list of their answers. All groups will be given 10 minutes to answer the questions and complete their lists.

At the conclusion of the 10-minute work period, the instructional staff will facilitate a group discussion to review the answers compiled by the students.

An instructor should:

- Ask each group to provide their answer to Question 1. Facilitate a group discussion of the answers.
- Next, ask the first group to list an answer to Question 2.
- Write the answer on the dry erase board.
- Facilitate a group discussion of the answer.

The second group will then follow the same format, followed by the third, and then the fourth. The groups will continue to provide answers to Question 2 until each group's list has been exhausted.

The instructional staff must ensure that each component on the Activity 2-1 Reference Charts have been listed and explained.

DOAV Activity 2-1 Reference Chart

What is Maintenance?

Student Questions

DRIVER / OPERATOR – ALL VEHICLES

ACTIVITY 2-1

1. **What is Maintenance?**
2. **What are the components of an emergency vehicle Preventative Maintenance Program?**

DOAV Activity 2-1 Reference Chart

Maintenance

Discussion Points

Question 1
What is Maintenance?

Maintenance (IFSTA)
Keeping equipment or apparatus in a state of usefulness or readiness.

Preventative Maintenance (NFPA 1911)
The act or work of keeping something in proper condition by performing necessary preventative actions in a routine manner to prevent failure or breakdown.

DOAV Activity 2-1 Reference Chart

Maintenance

Discussion Points

Question 2
What are the components of an emergency vehicle preventative maintenance program?

Cleaning
Fueling
Routine Checks
PM Services Fluids & Filters Replaced Lubrication Alignment Torquing Fasteners Replacing Windshield Wipers, Tires, Belts & Hoses, Batteries, etc.
Performance Testing Pump Tests Foam Systems Tests Aerial Tests Electrical System Tests Breathing Air Systems Tests Annual Weight Verification
Documentation

	Driver / Operator – All Vehicles **Discussion 2-2** **Introduction to Emergency Vehicle Checks**	

Objective	At the conclusion of Discussion 2-2, students will be able to: 2. List and explain the steps to conduct an in-service check of an emergency vehicle. 3. Recognize deficiencies that would place an emergency vehicle out of service.
Delivery Format	Group Activity
Resources Required	• Discussion 2-2 PowerPoint slides or Poster Boards
Instructor / Student Ratio	• 1 Lead Instructor • 1 Instructor • 16 Students

Set-Up

Arrange the classroom or activity space with tables and chairs to place the activity slides within view of all participants. The same arrangement used for Activity 2-1 may be used.

When the Poster Boards are used in place of the PowerPoint slides, the Poster Boards should be placed in a location that facilitates easily changing from one Poster Board to another.

Delivery

The Discussion 2-2 Slides should be presented in a standard lecture or facilitated group discussion format.

Instructors should ensure that all discussion points applicable for each slide are discussed.

When the Poster Boards are used in place of the PowerPoint slides, instructors will need to remember to manually change the Poster Boards when moving from slide to slide.

DOAV Discussion 2-2 Reference Chart

Introduction to Emergency Vehicle Checks

Summary & Flow Chart

Slide 1: Introduction

Slide 2: Guiding Documents

Slide 3: When to Check?

Slide 4: How to Check

Slide 5: Out of Service

Slide 6: Repair

Slide 7: Documentation

DOAV Discussion 2-2 Reference Chart

Slide 1: Introduction

DOAV Discussion 2-2

Case Study: Boston, MA, January 9, 2009

Boston Fire Department photo; courtesy NIOSH FF Fatality & Prevention Program

Discussion Points
Review Boston Ladder 26 NIOSH report points pertinent to vehicle checks, maintenance, & repair.

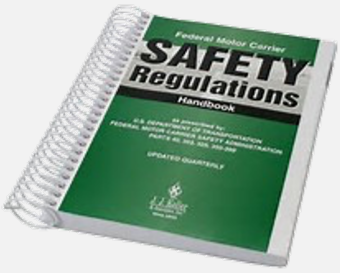
DOAV Discussion 2-2 Reference Chart

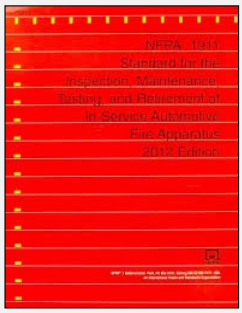
Slide 2: Guiding Documents

DOAV Discussion 2-2

Guiding Documents

Federal Motor Carrier Safety Regulations

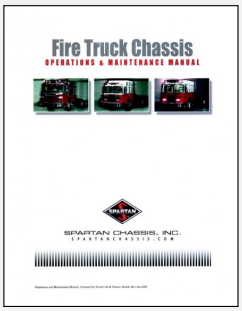


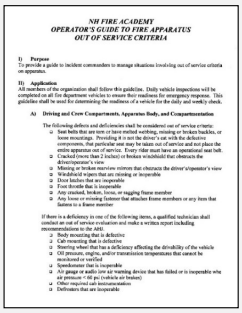


Industry Standards

NFPA 1911

Manufacturers Recommendations





Department Policies & Procedures

Discussion Points

What Guides Emergency Vehicle Maintenance & Repair?

- NFPA Standards (1911)
- Federal Motor Carrier Safety Regulations
- Manufacturer's Recommendations
- Department Policies & Procedures

DOAV Discussion 2-2 Reference Chart

Slide 3: When to Check?

DOAV Discussion 2-2

When to Check?

Pre-Use In-Use After-Use

How Often Should We Check?

Discussion Points
When to Check ● Pre-Use ● In-Use ● After-Use Apparatus should be checked weekly at a minimum.

DOAV Discussion 2-2 Reference Chart

Slide 4: How to Check

DOAV Discussion 2-2

How to Check

Use a System!

CDL Pre-Trip 7 Step Process

1. Vehicle Overview
2. Check Engine Compartment
3. Start Engine / Check Cab
4. Stop Engine/ Check Lights
5. Walkaround Check
6. Check Lights
7. Start Engine

NHFA 8 Step
Emergency Vehicle Check

1. Vehicle Overview
2. Engine Compartment
3. Cab
4. Exterior
5. Brake Check
6. Drive Vehicle
7. Systems
8. Inventory

Discussion Points

CDL Pre-Trip 7 Step Method

- Vehicle Overview
- Check Engine Compartment
- Start Engine / Check Cab
- Stop Engine / Check Lights
- Walkaround Check
- Check Lights
- Start Engine

NHFA 8 Step Emergency Vehicle Check

1) Vehicle Overview
2) Engine Compartment Check
3) Cab Check
4) Exterior Check
5) Brake Check
6) Drive Vehicle
7) Fixed Systems Check
8) Inventory Check

DOAV Discussion 2-2 Reference Chart

Slide 5: OOS

DOAV Discussion 2-2

Out of Service

How do we know what to place a vehicle Out of Service?

Who can place a vehicle Out of Service?

How do we notify our members that a vehicle is Out of Service?

Discussion Points
Out of Service Criteria / Policies & Procedures for Taking a Vehicle Out of Service

DOAV Discussion 2-2 Reference Chart

Slide 6: Repair

DOAV Discussion 2-2

Repair

To restore or put together something that has become inoperative or out of place.

Are there Repairs the D/O can complete?

What Repairs should be completed by a Technician?

What Qualifications should someone have to work on our vehicles?

Discussion Points
Discuss policies and procedures of the departments represented in the class.

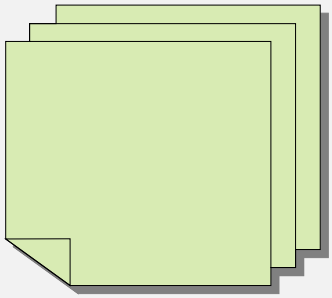
DOAV Discussion 2-2 Reference Chart

Slide 7: Documentation

DOAV Discussion 2-2

Documentation

- Daily Check Records
- Weekly Check Records
- Maintenance Requests
- Completion of Maintenance
- Repair Requests
- Completion of Repairs



Discussion Points
Review NHFA Vehicle Check Record Forms.

	Driver / Operator – All Vehicles **Activity 2-3** **Emergency Vehicle Checks Breakout Stations**	

Objective	At the conclusion of Activity 2-3, students will be able to: 2. List and explain the steps to conduct an in-service check of an emergency vehicle. 3. Recognize deficiencies that would place an emergency vehicle out of service.
Delivery Format	Group Activity
Resources Required	● Activity 2-3 Poster Boards ● Activity 2-3 Delivery Kits ● 2 Emergency Vehicles
Instructor / Student Ratio	1 Lead Instructor Station 1: Engine Compartment (Instructor Led) ● 1 Instructor ● 4 Students Station 2: Cab (Student Led) ● 4 Students Station 3: Brakes (Instructor Led) ● 1 Instructor ● 4 Students Station 2: Exterior (Student Led) ● 4 Students

Set-Up

Activity 2-3 utilizes four separate stations. Stations should be set-up in close proximity to allow for ease of student rotation from station to station, but with enough space to allow each station to function independently without a station creating a distraction for another.

Stations 1 and 3 utilize emergency vehicles to allow instructors to demonstrate vehicle check practices. Station 1 can be conducted without starting the vehicle. Station 3 should be set-up on the ramp as the vehicle must be running while conducting the station.

Stations 2 and 4 utilize props to supplement a list of questions that students work together to answer. The props can be set-up on tabletops. These stations can be set-up in a classroom or conference room in close proximity to the apparatus floor. If necessary, a table can be set-up on the apparatus floor provided there is adequate separation from any other station.

Specific set-up requirements and procedures are described in the reference information sections for each station.

Delivery

Divide the class into four groups of four students.

To start the Activity, a group is assigned to each of the four stations.

Station 1 and Station 3 are Instructor-Led stations. The instructor assigned to each station will present the station material four times, once for each group.

Station 2 and Station 4 are Student-Led stations. A list of questions is placed at each station; each group works together to answer the questions when they rotate through the station.

The Lead Instructor should float among the four stations to monitor time and student progress. Particular attention should be paid to the two student-led stations to provide guidance as needed.

Each station/rotation typically takes between 20-30 minutes. Students should be directed to not rotate to the next station until told to do so by the Lead Instructor. Any extra time at the conclusion of a station while waiting to rotate to the next station may be utilized for break time.

At the conclusion of each of the four rotations, the rotation should be:

- Station 1 to Station 2
- Station 2 to Station 3
- Station 3 to Station 4
- Station 4 to Station 1

This order ensure that all groups uniformly rotate from Instructor-Led stations to Student-Led stations.

At the conclusion of the four rotations, the Instructional Staff should review the answers to Student-Led station questions. The Instructional Staff can gather all students at each of the two stations and review each station once or can choose to split the class into two groups to reduce the number of students at each station. If this method is selected each station will need to be reviewed twice.

DOAV Activity 2-3 Reference Chart

Station 1: Engine Compartment

Demonstration Points

(1) Vehicle Overview
Review Records ***Engine Off - Parking Brake Set - Chocks Set - Remove Key (If Possible)***

(2) Engine Compartment
Verify Adequate Clearance **Open Hood / Tilt Cab** ***Verify Safety Support is in Place***
Check for Obvious Fluid Leaks
Check Engine Oil Level / Condition (Cold)
Check Radiator
Check Coolant Level / Condition (Cold)
Check Condition of Hoses
Check Condition of Belts *Alternator / Water Pump / Power Steering*
Check Batteries *Condition / Connections / Mounting / Water Level or Charge Status Indicator*
Check Electrical Wiring
Check Exhaust System Components
Check Frame Rails & Cross Members
Check Front Suspension Components *Springs / Hangers / U-Bolts / Shackles*
Check Front Axle
Check Steering Components *Steering Column / Steering Box / Pitman Arm / Drag Link / Knuckles / Steering Arm / Tie Rods*
Check Power Steering Fluid

Check Front Tires *Tread / Sidewalls / Pressure* ***Note: Do Not Discuss Tire Pressure here; it is covered in Station 4***
Check Front Wheels / Lug Nuts / Hubs
Check Front Brakes *Air Lines / Air Chambers / Drum, Shoes, & Slack Adjustors or Rotors, Calipers, & Pads* ***Note: Only Check Components Here; the In-Cab Brake Check is covered in Station 3***
Check Air Drier (May be located on the frame behind the engine compartment)
Check Windshield Washer Fluid
Start Engine **– Check Transmission Fluid Level / Condition (Hot) –** ***Shut Off Engine***
Close Hood / Lower Cab

State of New Hampshire Department of Safety
Division of Fire Standards & Training and Emergency Medical Services

Driver / Operator – All Vehicles Certification Exam (2017 edition)

Skill Sheet DOAV-1EC
Emergency Vehicle Check - Engine Compartment
NFPA 1002-2017: 4.2.1 & 4.2.2

Candidate Number: _____ Date: _____

1st Attempt / Retest Pass / Fail

Vehicle Used: _____

Evaluator: _____

	Points Possible	Points Earned
Vehicle Overview: • Review Vehicle Records (As applicable)	1	
Engine Compartment Check: • Checks Engine & Transmission - Obvious Leaks - Engine Oil Level & Condition - Belts - Transmission Fluid Level & Condition • Checks Coolant System - Radiator & Hoses - Coolant Level & Condition • Checks Exhaust System • Checks Electrical System • Checks Axles & Suspension • Checks Wheels & Tires • Checks Steering Components • Checks Front Brake Components	1	
Documentation: • Completes Vehicle Check Form • Completes Vehicle Maintenance / Repair Form if Deficiencies are Found	1	
	3	

Critical Criteria:

____ Fails to correctly complete 3 steps

Document all reasons for not awarding points in the space below:

DOAV Activity 2-3 Reference Chart

Station 2: Cab

Questions 1 & 2

ACTIVITY 2-3: STATION 2

Using the simulated dashboard:

1. **What is the function or purpose and normal reading of each gauge?**

2. **What is the function or purpose of each indicator?**

DOAV Activity 2-3 Reference Chart

Station 2: Cab

Questions 3, 4, & 5

DRIVER / OPERATOR – ALL VEHICLES

ACTIVITY 2-3: STATION 2

3. **When the ignition is first turned on, which indicator light should illuminate momentarily and then turn off?**

4. **How should the driver/operator adjust the following:**
   - **Seat**
   - **Steering Wheel**
   - **Mirrors**

5. **What should the driver/operator be looking for when checking the steering?**

6. **What other cab controls should be checked?**

DOAV Activity 2-3 Reference Chart

Station 2: Cab

Questions 1 & 2 Discussion Points

Dashboard Prop Labeling	
Label Number	**Description**
1	Coolant Temperature: 180° to 220° F
2	Oil Pressure: 25 to 80 PSI
3	Transmission Fluid Temperature: 180° to 200° F
4	Air Pressure: 110 to 130 PSI
5	Turbo Pressure
6	Voltmeter: 12 to 14 volts
7	Air Filter Minder
8	Fuel Level
9	DEF Level
10	ATC Indicator Light
11	Low Air Pressure Indicator Light
12	Low Voltage Indicator Light
13	Multi-Plex Error Indicator Light
14	Check Engine Indicator Light
15	Stop Engine Indicator Light
16	Service Required Indicator Light
17	Emissions Malfunction Indicator Light
18	Traction Control System Indicator Light
19	Tire Pressure Monitoring System Indicator Light
20	High Idle Indicator Light
21	Low Coolant Indicator Light
22	High Coolant Temperature Indicator Light
23	Low Oil Pressure Indicator Light
24	Cab Door Open Indicator Light
25	Wait to Start Indicator Light
26	High Transmission Temperature Indicator Light
27	Check Transmission Indicator Light
28	ABS Indicator Light
29	Water in Fuel Indicator Light
30	Low DEF Indicator Light
31	SRS Indicator Light
32	DPF Indicator Light
33	High Exhaust Temperature Indicator Light

DOAV Activity 2-3 Reference Chart

Station 2: Cab

Questions 3, 4, & 5 Discussion Points

State of New Hampshire Department of Safety
Division of Fire Standards & Training and Emergency Medical Services

Driver / Operator – All Vehicles Certification Exam (2017 edition)

Skill Sheet DOAV-1C
Emergency Vehicle Check - Cab
NFPA 1002-2017: 4.2.1 & 4.2.2

Candidate Number: _____ Date: _____

1st Attempt / Retest Pass / Fail

Vehicle Used: _____

Evaluator: _____

	Points Possible	Points Earned
Vehicle Overview: • Review Vehicle Records (As applicable)	1	
Cab Check: • Checks Mirrors • Checks Safety Equipment / Paperwork • Checks Gauges / Instruments / Indicators • Checks Steering / Throttle / Transmission Selector / Brake Controls • Checks Horn(s) • Checks Lighting Controls	1	
Documentation: • Completes Vehicle Check Form • Completes Vehicle Maintenance / Repair Form if Deficiencies are Found	1	
	3	

Critical Criteria:

____ Fails to correctly complete 3 steps

Document all reasons for not awarding points in the space below:

DOAV Activity 2-3 Reference Chart

Station 3: Brakes

Demonstration Points - Hydraulic

(2) Engine Compartment
Engine Off – Parking Brake Set – Chocks Set
Check Brake Fluid Level / Condition
Check Brake Lines
Check Drums / Shoes or Rotors & Calipers / Pads

(5) Brake Check: Hydraulic
Engine Off – Parking Brake Set – Chocks Set
Pump Brake Pedal 3 Times
Press Brake Pedal & Hold for 5 Seconds *Pedal Should Not Move*

DOAV Activity 2-3 Reference Chart

Station 3: Brakes

Demonstration Points - Air

(5) Brake Check: Air
Engine Off – Parking Brake Set – Chocks Set
Start with Air System Fully Charged
Release Parking Brake
Test Air Leakage Rate – Static *Air Pressure should drop No More than 2 PSI in 1 minute*
Test Air Leakage Rate – Service Brakes Applied *Air Pressure should drop No More than 3 PSI in 1 minute*
Check Low Air Pressure Alarms *Visual & Audible – Both MUST Activate before air pressure drops below 60 PSI*
Verify that Parking Brake Applies
Start Engine
Verify Rate of Air Pressure Build-Up *Engine at Operating RPMs – Air Pressure MUST build from 85 PSI to 100 PSI within 45 seconds*
Verify Compressor Cut-In Pressure *Compressor should start at approximately 90 to 100 PSI*
Verify Compressor Cut-Out Pressure *Compressor should stop at approximately 120 to 130 PSI*
Check Service Brake Operation *FMCSR / NFPA: 10,000 lbs. +: Must stop within 35 ft at 20 mph*
Check Parking Brake Operation *Should hold vehicle on 20% grade / steepest in AHJ*

State of New Hampshire Department of Safety
Division of Fire Standards & Training and Emergency Medical Services

Driver / Operator – All Vehicles Certification Exam (2017 edition)

Skill Sheet DOAV-1B
Emergency Vehicle Check - Brakes
NFPA 1002-2017: 4.2.1 & 4.2.2

Candidate Number: _____ Date: _____

1st Attempt / Retest Pass / Fail

Vehicle Used: _____

Evaluator: _____

	Points Possible	Points Earned
Vehicle Overview: • Review Vehicle Records (As applicable)	1	
In-Cab: • Checks Air Leakage Rate - Static • Checks Air Leakage Rate - Brakes Applied • Checks Low Air Pressure Alarm • Verifies that Parking Brake Applies • Checks Air Pressure Build-Up Rate • Checks Compressor Cut-In Pressure • Checks Compressor Cut-Out Pressure • Checks Parking Brake Operation • Checks Service Brake Operation	1	
Documentation: • Completes Vehicle Check Form • Completes Vehicle Maintenance / Repair Form if Deficiencies are Found	1	
	3	

Critical Criteria:

____ Fails to correctly complete 3 steps

Document all reasons for not awarding points in the space below:

DOAV Activity 2-3 Reference Chart

Station 4: Exterior

Student Questions

Prompt 1
What should the driver/operator be looking for when checking the Frame?

Prompt 2
What should the driver/operator be looking for when checking the Fuel Tank and Fuel Fill?

Prompt 3
What should the driver/operator be looking for when checking Exhaust components?

Prompt 4
What should the driver/operator be looking for when checking the Driveshaft and Differential?

Prompt 5
What should the driver/operator be looking for when checking the Rear Suspension components?

Prompt 6
What should the driver/operator be looking for when checking Wheels & Tires? • **Hubs?** • **How is the correct tire pressure determined?** • **What is the minimum allowable tire tread depth?**

Prompt 7
What should the driver/operator be looking for when checking Lights?

Reasons for Checking Tire Pressures:

- Incorrect tire pressure can lead to:
    - Increased Braking Distance
    - Creates less responsive steering
    - Increased tire wear
    - Poor fuel economy
    - Underinflation causes the sidewalls to flex which increases heat; high heat can lead to blowout and tread separation

State of New Hampshire Department of Safety
Division of Fire Standards & Training and Emergency Medical Services

Driver / Operator – All Vehicles Certification Exam (2017 edition)

Skill Sheet DOAV-1EX
Emergency Vehicle Check - Exterior
NFPA 1002-2017: 4.2.1 & 4.2.2

Candidate Number: _____ Date: _____

1st Attempt / Retest Pass / Fail

Vehicle Used: _____

Evaluator: _____

	Points Possible	Points Earned
Vehicle Overview: • Review Vehicle Records (As applicable)	1	
Exterior Check: • Checks Lights • Checks Windshield / Windows / Mirrors • Checks Windshield Wipers / Washers • Checks Cab Doors & Latches • Checks Body / Doors & Latches / Exterior Equipment • Checks Fuel Tank & Cap / DEF Tank & Cap • Checks License Plate • Checks Electrical Wiring • Checks Exhaust System Components • Checks Frame Rails & Cross Members • Checks Driveshaft / Rear Axle(s) / Differential • Checks Rear Wheels & Tires • Checks Splash Guards	1	
Documentation: • Completes Vehicle Check Form • Completes Vehicle Maintenance / Repair Form if Deficiencies are Found	1	
	3	

Critical Criteria:

____ Fails to correctly complete 3 steps

Document all reasons for not awarding points in the space below: