

NSTSCCE

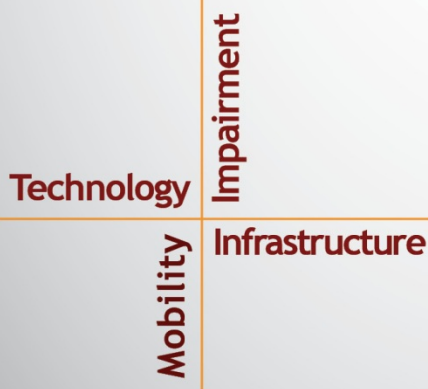
National Surface Transportation Safety Center for Excellence

Heavy-Vehicle Safety Outreach

Final Report

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LIST OF ABBREVIATIONS AND SYMBOLS

LV-HV	Light Vehicle–Heavy Vehicle
NSTSCE	National Surface Transportation Safety Center for Excellence
VTI	Virginia Tech Transportation Institute

CHAPTER 1. INTRODUCTION

The National Surface Transportation Safety Center for Excellence (NSTSCE) was formally awarded to the Virginia Tech Transportation Institute (VTTI) in 2006 through the Federal Highway Administration (FHWA). The mission of NSTSCE is to use “state-of-the-art facilities, including the Virginia Smart Road, to develop and test transportation devices and techniques that enhance driver performance.”⁽¹⁾ The purpose of the Heavy-Vehicle Safety Outreach project was to provide fleet safety managers with current safety-related research that they can share with their drivers to help improve safety.

BACKGROUND

The objective of the Heavy-Vehicle Safety Outreach project was to develop and implement a pragmatic curriculum to support the needs of safety managers. Safety managers for motor carrier fleets serve as the point of responsibility for heavy-vehicle safety. These individuals have a unique understanding of the safety challenges within their fleets. However, many of them operate without access to the latest research in heavy-vehicle safety. Providing a workshop that immerses fleet safety managers in the latest safety information could positively affect their approach to fleet safety. To be as effective as possible, this workshop should include both science- and practice-based presentations.

While there are many training programs available to disseminate information, the one used for this project was the ADDIE method. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation. The ADDIE method has become one of the most frequently used training methods in recent years. One reason it was chosen for this study is that it encourages the trainer to use an iterative process where feedback is obtained from each step and used to improve the next step.⁽²⁾ Each category listed above will be discussed in more detail in the Methods section.

PURPOSE OF THE STUDY

The purpose of this project was to develop under NSTSCE an effective education training program for safety managers that could be implemented by others. A comprehensive training program was developed that addresses these factors and others of interest. Details of each step that went into the development of the training program are described next in the Methods chapter.

CHAPTER 2. METHODS

The ADDIE training method was chosen for this project because it encourages the trainer to use an iterative process where feedback is obtained from each step and used to improve the next step.

ANALYSIS

During the first stage of the ADDIE method, the trainer sets the learning goals. For this project, a needs assessment was performed to determine the safety topics that would be of most interest to fleet safety managers. To do this, a survey (Appendix A) was distributed to fleet safety managers who were identified from a database at VTTI. These safety managers were either part of a fleet that had participated in a VTTI study in the past or had shown interest in participating in a future study. The survey was created as an online questionnaire and was sent via email to the safety managers.

DESIGN

During this stage, learning objectives for the workshop were identified. The needs assessment survey (Appendix A) noted above was distributed to over 60 fleet safety managers, and 18 responses were received. In order to determine the top six safety topics of interest, all responses for “very important” and “important” were grouped together, and all responses for “very unimportant” and “not at all important” were grouped together and then ordered by number of responses. The results can be seen below in Figure 1.

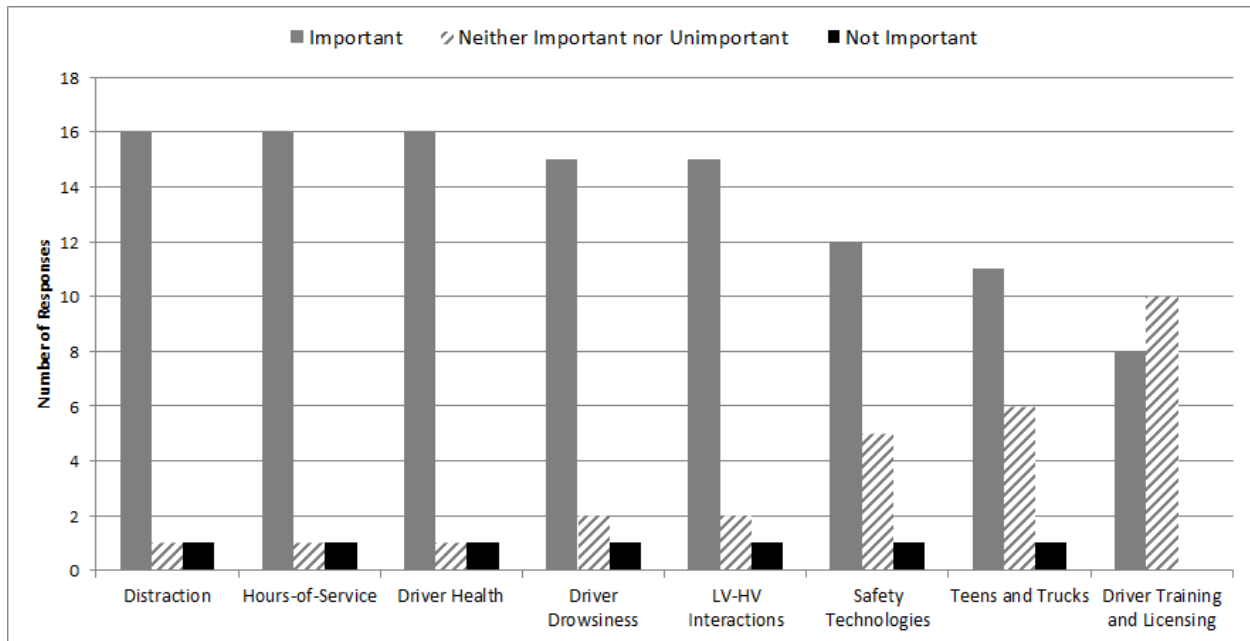


Figure 1. Graph. Results of needs assessment survey.

It can be seen from the above results that Distraction, Hours-of-Service, Driver Health, Driver Drowsiness, LV-HV (Light Vehicle–Heavy Vehicle) Interactions, and Safety Technologies were the six most popular topics among the safety managers surveyed. Due to the similarities between

topics, it was decided that LV-HV interactions and Teens and Trucks would be grouped together as a single topic.

It should also be noted that due to time restrictions for the planned workshop, only five safety topics were chosen to be presented. Since the workshop was hosted by Travelers Insurance and the workshop attendees were invited by the company, Travelers was asked to choose the top five safety topics that they thought would be most relevant to the audience. Therefore, the top five safety topics presented during the workshop were Distraction, Hours-of-Service, Driver Health, Driver Drowsiness, and Safety Technologies. However, a presentation was still developed for the Sharing the Road (Teens and Trucks/LV-HV Interactions) topic and included in Appendix G of this report.

The needs assessment survey also asked respondents how they would prefer to receive the information during the workshop. The results are shown below in Figure 2.

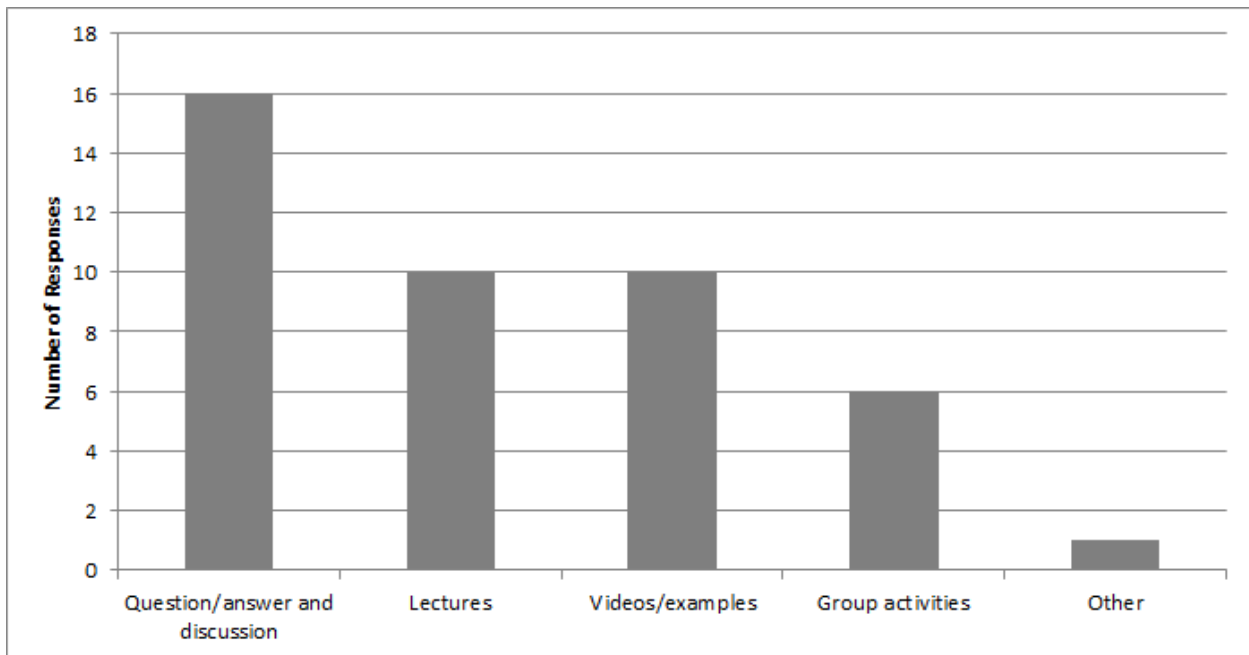


Figure 2. Graph. Preferred method of receiving information.

Figure 2 shows the preferred method of receiving information during the workshop based on the feedback received from the needs assessment survey. This information was used by the researchers when developing the workshop presentations.

DEVELOPMENT

During this stage, the learning content was developed. Researchers were asked to develop a presentation in a “train-the-trainer” format. That is, they were asked to provide materials to the safety managers in a format that the safety managers could then share with their drivers. Each presentation was “piloted” during an informal meeting at VTTI where other researchers attended the presentation and provided feedback and suggestions. That feedback was then used to develop the final version of the presentations to be used during the workshop.

IMPLEMENTATION AND EVALUATION

Implementation

The workshop was held on August 9, 2013, at Travelers' Claim University in Windsor, Connecticut. The workshop attendees were divided into five groups and rotated through the five safety topic presentations so that they were able to view all presentations by the end of the workshop. PowerPoint presentations of each safety topic can be found in Appendices B–F.

Evaluation

At the end of each presentation, the workshop attendees were asked to anonymously fill out a feedback questionnaire (Appendix H). The questionnaire asked participants to rank the presentation on a scale of 1 (poor) to 5 (excellent) in eight different categories. The results of this questionnaire are shown in Table 1 below.

Table 1. Results from the feedback questionnaire.

Evaluation Question	Driver Distraction	Driver Drowsiness	Driver Health	Hours-of- Service Regulations	Safety Systems
On-screen presentation	4.65	4.73	4.76	4.71	4.68
Speaker's knowledge about subject	4.92	4.68	4.89	4.98	4.71
Speaker's interaction with audience	4.68	4.76	4.84	4.71	4.67
Session length	4.54	4.71	4.72	4.64	4.69
Would you recommend this session?	4.67	4.68	4.84	4.74	4.71
Value of information presented	4.73	4.66	4.73	4.83	4.74
Did session content match description?	4.79	4.68	4.86	4.80	4.80
Overall session evaluation	4.66	4.63	4.89	4.76	4.73

It can be seen from Table 1 above that all the presentations were ranked very highly by the workshop attendees. Overall, Driver Health was the most popular topic and attendees were very engaged during these presentations.

CHAPTER 3. CONCLUSION

The workshop received great feedback and attendees looked forward to having a similar workshop in the future. Each of the five presentations given during the workshop, as well as a presentation on Sharing the Road, can be found in Appendices B–G at the end of this report. As part of the continuing outreach program with NSTSCE, all presentations can be found, and downloaded, at the following website: <http://cmvdrivingsafety.org/>.

APPENDIX A. NEEDS ASSESSMENT SURVEY FOR FLEET SAFETY MANAGERS

Thank you for taking a few minutes to complete this survey. The National Surface Transportation Safety Center for Excellence (NSTSCE) and the Virginia Tech Transportation Institute (VTTI) are developing an educational training program for safety managers and other professionals that may assist with commercial vehicle safety. The goal is to provide tools to disseminate the latest research findings that may impact the trucking industry. The purpose of this survey is to obtain information from safety professionals such as yourself as to what safety topics would be most beneficial as part of the curriculum for this program. All data will be kept strictly confidential and will not be shared with your employer or anyone else outside of this research project.

On the following pages you will find eight safety topics and two “Did you know?” facts for each topic. The “Did you know?” facts are meant to illustrate potential training areas within each safety topic. If you are not familiar with any of the “Did you know?” facts, this may be a topic that your organization could benefit from receiving additional information and training. After each safety topic, please tell us how important it is to you to include the topic in this training workshop.

You will also have the opportunity to add up to three additional topics that we may not have included but, based on your experience, will contribute to a well-rounded curriculum.

Safety Topic 1: Distraction

Did you know? A recent study found that 81% of safety-critical events had *at least* one potential distraction that occurred within the 5 seconds before, and 1 second after the initiation of the conflict.

Did you know? Drivers are 23 times more likely to be involved in a safety-critical event if they are texting and driving compared to if they are just driving.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Safety Topic 2: Hours-of-Service

Did you know? Drivers are more likely to be involved in a safety-critical event if their driving hours occur towards the end of their 14-hour shift rather than towards the beginning.

Did you know? Drivers are less likely to be involved in a safety-critical event in the *1-hour window following a break from driving*.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Safety Topic 3: Fatigue

Did you know? A recent study found that driver alertness was related to “time-of-day” more so than “time-on-task.” This is explained by the circadian rhythm which refers to the wake/sleep cycle that the human body goes through each day and night.

Did you know? Short naps are more effective at restoring energy levels than is coffee.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Safety Topic 4: Safety Technologies

Did you know? A Forward Collision Warning (FCW) system may reduce the number of rear-end conflicts by up to 21 percent.

Did you know? There are *many* safety technologies available, including forward collision warning systems, lane departure systems, automatic-braking systems, and camera/video imaging systems to assist with blind spot detection.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Safety Topic 5: Driver Health

Did you know? It is estimated that more than 1 in 4 CMV drivers in the U.S. has sleep apnea and the majority of sufferers are undiagnosed and untreated?

Did you know? CMV drivers have a 12 – 19 year reduced life expectancy compared to the general U.S. male population.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Safety Topic 6: Driver Training and Licensing

Did you know? If a driver tests for his CDL license with an automatic or auto shift transmission, then he is prohibited from driving a CMV with a manual transmission.

Did you know? When a driver receives his CDL Learner's Permit, he must wait *30 days* before he can take the skills and road test to obtain his CDL license.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Safety Topic 7: Teens and Trucks

Did you know? A recent survey of all 50 states found that students need more hands-on experience with large trucks in their driver's education coursework.

Did you know? Passenger vehicle crashes are the leading cause of death for teenagers aged 15 to 20 in the United States.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Safety Topic 8: Light Vehicle-Heavy Vehicle Interactions

Did you know? Seventy-eight percent of crashes and near-crashes involving light vehicles and large trucks are initiated by the light-vehicle driver.

Did you know? When considering safety-critical events involving an LV-HV interaction, where the large truck was considered to be at fault, the primary incident type for these interactions was *Lane Change without Sufficient Gap*.

How important is it to you to include this safety topic in a training workshop?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important

Please add up to three additional safety topics that you feel would contribute to this training workshop.

	Extremely Important	Very Important	Neither Important nor Unimportant	Very Unimportant	Not at all Important
Additional Topic #1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Additional Topic #2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Additional Topic #3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please use this space if you would like to elaborate on any of the safety topics that you have added above.

When thinking about attending a safety training workshop, which of the following would you find the most beneficial? Choose all that apply.

- Lectures
- Videos/examples
- Group activities
- Question/answer and discussion
- Other: _____

Finally, would you be willing to have a brief (approximately 10 minute) phone call with us to further discuss your company needs?

- Yes
- No

If yes, please provide us with a contact name, number and the best day and time to reach you:

First Name: _____
Last Name: _____
Phone Number: _____
Best day/time to reach you: _____

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Driver Distraction: Fundamentals,
Implications, and Strategies to Reduce
Distracted Driving

Learning Objectives

- By completing this module, you will be able to:
 - ▣ Know the extent of truck driver distraction
 - ▣ Assess the effectiveness of policy efforts to reduce driver distraction
 - ▣ Determine effective strategies, techniques, and technologies for minimizing distracted driving

Module 1: What is Driver Distraction?



Forms of Driver Distraction

- Visual distraction (e.g., looking away from the roadway)
- Auditory distraction (e.g., responding to a ringing cell phone)
- Biomechanical distraction (e.g., manually adjusting the radio volume)
- Cognitive distraction (e.g., being lost in thought)
- Can involve more than one of these (e.g., visually searching for a control to manipulate)

Construct of Driver Distraction

- What is distracted driving?
- “distracted driving” was designated as Webster’s New World College Dictionary “word of the year” in 2009
- Attention from public and research community
- No agreed upon construct of distracted driving
 - ▣ Poorly and inconsistently defined

Common Definition for Distracted Driving

- “the diversion of attention from activities critical for driving to a competing activity”
 - ▣ Implies almost anything that diverts attention is a distraction
 - ▣ Problematic for research
 - ▣ Doesn’t inform countermeasures
 - ▣ Critical safe driving activities?



Critical Aspects of Driving

- Primary driving tasks
 - ▣ Critical for safe driving
 - Steering, looking at forward road, brake, accelerator
- Secondary driving tasks
 - ▣ Not as important, but needed for safe driving
 - Mirrors, speedometer, turn signal
- Tertiary driving tasks
 - ▣ No relationship to the driving task
 - Cell phone, food, map

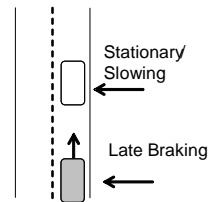
Definition of Driver Distraction

- Proposed by Pettit, Burnett, & Stevens (2005)
- Driver distraction occurs when 4 key components occur:
 - ▣ Agent: due to some activity/event/object/person within or outside of vehicle
 - ▣ Mechanism: shift attention away from the primary task
 - ▣ Type: auditory, biomechanical, cognitive, visual, or combination
 - ▣ Impact: delayed recognition of information necessary to safely operate vehicle

Applying the Definition

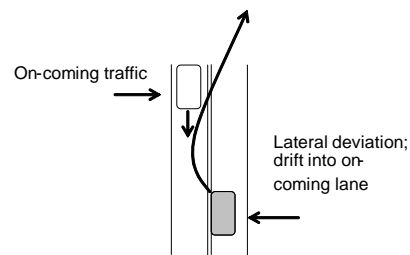
Driver looks down at phone. As he looks down at phone, lead vehicle brakes. Upon returning eyes to forward roadway, driver brakes hard to avoid collision with lead vehicle

- Agent
 - ▣ Phone
- Mechanism
 - ▣ Eyes off forward roadway
- Type
 - ▣ Visual
- Impact
 - ▣ Late braking, near crash



Applying the Definition Exercise

Driver looks in back seat and reaches for a sandwich. As he's reaching for the sandwich, he drifts over the solid center lane line. As he returns his eyes to the forward roadway, he swerves to avoid a head-on collision.



Quick Quiz

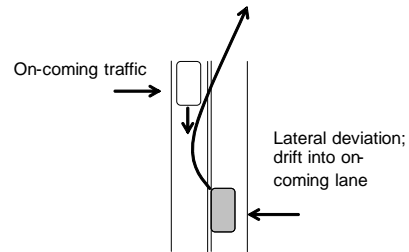
In the “sandwich” example, what is the “impact”?

- a. Reaches for a sandwich
- b. Swerves to avoid lead vehicle
- c. Crosses solid line, near head-on crash
- d. Returns eyes to forward roadway

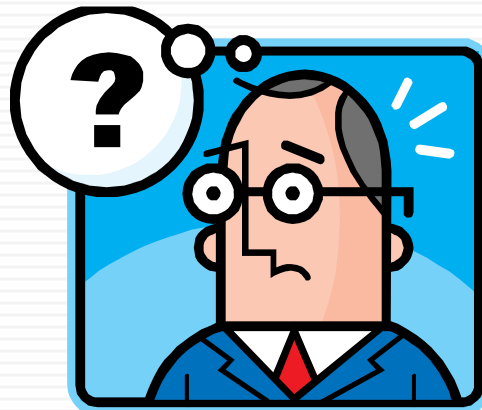
Applying the Definition Exercise

Driver looks in back seat and reaches for a sandwich. As he's reaching for the sandwich, he drifts over the solid center lane line. As he return his eyes to the forward roadway, he swerves to avoid a head-on collision.

- Agent
 - ▣ Reaching for a sandwich
- Mechanism
 - ▣ Eyes off forward roadway
- Type
 - ▣ Biomechanical and visual
- Impact
 - ▣ Near head-on crash



Module 2: Is Truck Driver Distraction a Problem?



Distraction in Truck Crashes

- Large Truck Crash Causation Study [Federal Motor Carrier Safety Administration (FMCSA) 2005]
 - ▣ 8% external distraction
 - ▣ 2% internal distraction
 - Primary reason
- Olson et al. (2009)
 - ▣ 71.4% crashes
 - ▣ 46.2% near-crashes



What is Naturalistic Driving Research?

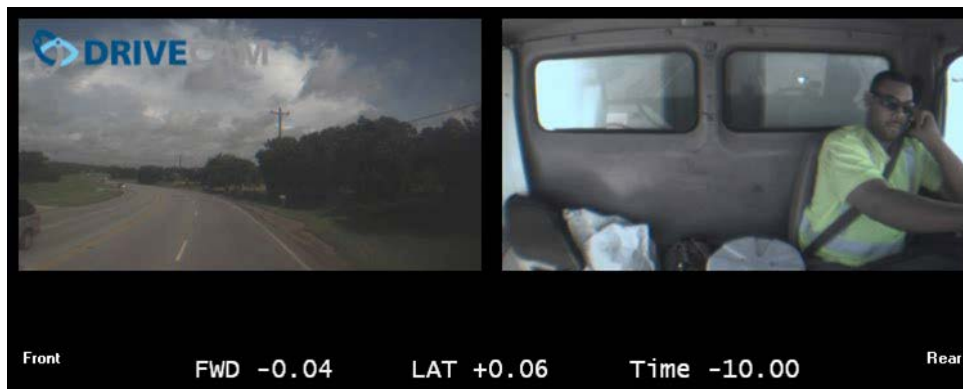
- Instrumented vehicles
 - ▣ Video, GPS, radar, onboard computer, machine vision, etc.
- Driver behavior in the natural environment
- Realistic
 - ▣ Real driving pressures
 - ▣ Driver choice
 - ▣ Self-regulation



Case Study

- Single vehicle off-road crash
 - ▣ Left road departure, rollover
- 2-lane highway, curve in road
- 55 mph
- Skid marks, steered left
- Witness: truck appeared to go out of control for no reason
- Driver: in hospital with injuries, limited recall of crash (was just driving down the road)

Naturalistic Driving Video

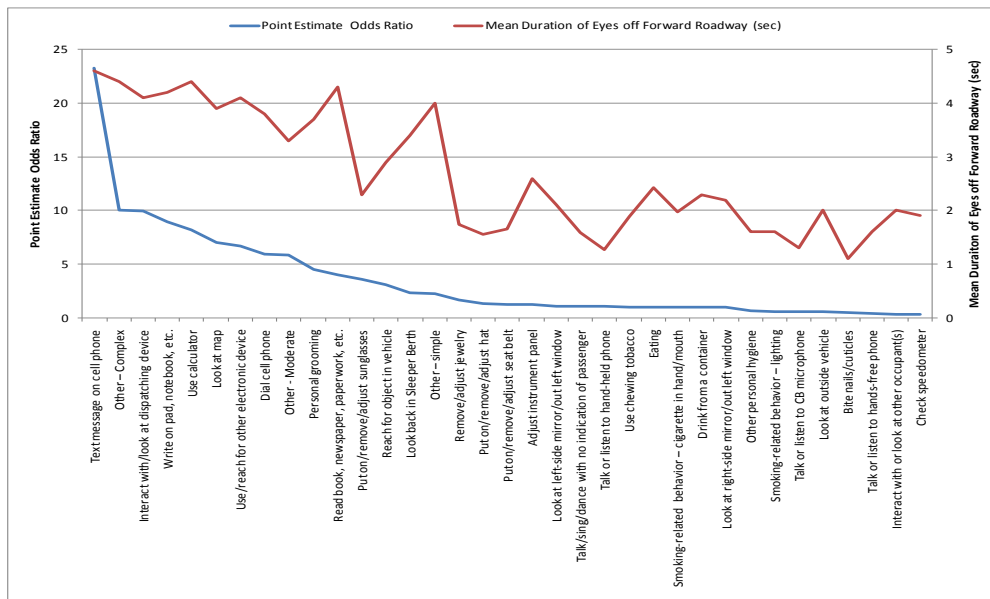


Naturalistic Truck Studies

- Two separate studies:
 - ▣ 203 drivers, 7 fleets, 55 trucks, 3 million miles
 - ▣ Study 1: ~12 weeks per driver
 - ▣ Study 2: ~ 4 weeks per driver
- 4,452 safety-critical events
 - ▣ 21 crashes
 - ▣ 197 near-crashes
 - ▣ 3,019 crash-relevant conflicts
 - ▣ 1,215 unintentional lane deviations
- 19,888 baseline epochs (normal driving)

Odds Ratios in Olson et al. (2009)

Task	Odds Ratio	Visual Distraction (6 sec) / Distance Traveled (ft) going 55 mph
Text message on cell phone	23.24	4.6 sec / 371 ft
Interact with/look at dispatching device	9.93	4.1 sec / 330 ft
Write on pad, notebook, etc.	8.98	4.2 sec / 338 ft
Use calculator	8.21	4.4 sec / 354 ft
Look at map	7.02	3.9 sec / 314 ft
Dial cell phone	5.93	3.8 sec / 306 ft
Baseline (no task)	1.00	1.2 sec / 96 ft
Talk or listen to hand-held phone	1.04	1.3 sec / 104 ft
Talk or listen to hands-free phone	0.44	1.6 sec / 129 ft
Talk or listen to CB radio	0.55	1.3 sec / 104 ft



Noted Study Limitations

- ❑ *Relatively few crashes*
- ❑ *Relatively few drivers/trucks/miles*
- ❑ FMCSA-funded study using DriveCam data was conducted to address these limitations...

DriveCam Event Recorder

- Event recorder placed on truck's windshield
- Two cameras
 - ▣ Driver's face
 - ▣ Forward view
- Three accelerometers
 - ▣ X-, Y-, and Z-axis
- Records in constant loop
 - ▣ Trigger $\geq |0.5g|$
 - ▣ Saves 8 sec before, 4 sec after trigger
- Event status light



Image Courtesy of [DriveCam Powered by Lytx](#)

Overview of Data Set

- June 6, 2009 to September 5, 2009
- 183 different commercial truck and bus fleets
 - ▣ 13,306 vehicles (buses, 3-axle or more trucks, tractors/tankers)
 - 1,085 crashes, 8,375 near-crashes, 30,661 crash-relevant conflicts, and 211,171 non-events (baselines)
- Re-review of cell phone use into discrete subtasks
 - ▣ Dialing cell phone
 - ▣ Talking/listening on cell phone (hands-free and hands-held)
 - ▣ Reaching for cell phone
 - ▣ Reaching for hands-free device
 - ▣ Texting/email/web

Hickman et al. (2010)

- 13,305 vehicles (trucks and buses)
- 1,085 crashes; 39,036 near-crashes and events
- 211,171 baselines

Tertiary Task	Odds Ratio	95% Confidence Interval	# of SCEs	# of Baselines
Cell Phone	1.14*	1.06 – 1.23	895	4,262
Dialing a Cell Phone	3.51*	2.89 – 4.27	165	256
Talk/Listen on a Hands-free Cell Phone	0.65*	0.56 – 0.76	194	1,626
Talk/Listen on a Hand-held Cell Phone	0.89	0.80 – 1.00	372	2,266
Reach for Bluetooth Device	3.38*	2.64 – 4.31	104	168
Reach for Cell Phone	3.74*	2.97 – 4.71	122	178

Module 3: Strategies and Techniques to Reduce Distracted Driving



Trip Preparation

- ❑ Disable all electronic devices before trip
- ❑ Place electronic devices and other materials in a place where they can't be reached while driving
- ❑ Schedule a time and location to stop and use devices

Training and Education

- ❑ Training is necessary, but not sufficient
- ❑ Keep eyes on the road
- ❑ Simple work-related tasks (calculator, read, write, look at maps)
- ❑ No manual phone activities
- ❑ Use of dispatching device
- ❑ Passenger “practice”
- ❑ It's a job, not worth taking the risk

Electronic Device Policy

- The only effective policy is one that's enforced
- Specific policy
 - ▣ Application, exemptions, penalties
- All employees should follow
 - ▣ Don't limit to drivers
- Mindful of devices drivers bring into cab
- Provide input to carrier

Blockers, Jammers, & Locking

- Cell phone jammer
 - ▣ Emits signals in the same frequency range creating strong interference
 - ▣ Illegal (Federal Communications Commission)
 - ▣ Leakage
- Locking Technology
 - ▣ Prevents the driver from continuing a distracting task
 - ▣ GPS and dispatching devices
- Cell phone blocker
 - ▣ Apps a user can install on cell phone
 - Some require additional hardware installed in vehicle
 - ▣ Rely on speed (obtained via GPS) or ignition
 - ▣ Only works if installed or activated



Voice-Activated Cell Phone Use

- Allow voice-activated dialing and reading and composing text messages
 - ▣ Naturalistic studies find this safe
- Apps that allow voice-activation use
- Several car manufacturer systems



Crash Avoidance/Mitigation Technologies

- Technologies warn and/or maneuver for driver
- Not designed specifically for distraction
- Does not reduce distraction, prevents crashes that may result due to distraction
 - ▣ Forward collision warning
 - ▣ Lane departure warning
 - ▣ Side collision warning
 - ▣ Collision mitigation braking / Brake Assist
 - ▣ Roll stability control and electronic stability control

Onboard Safety Monitoring Systems

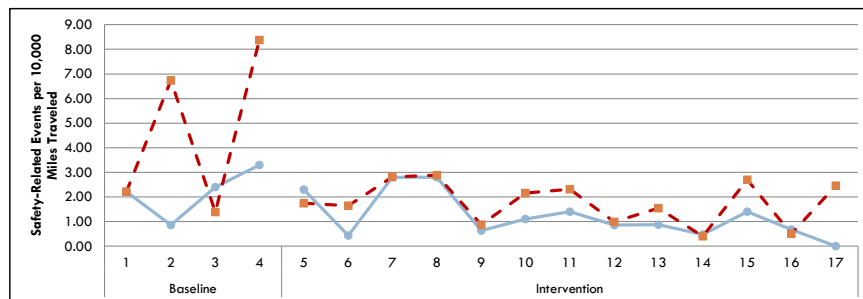
(1 of 2)

- In-vehicle device that has accelerometers (x,y,z)
 - ▣ Swerves, hard brakes, crashes
 - ▣ Video, GPS, tap into vehicle's computer
- Data transmitted to client
- Use data to coach driver
- Gaining popularity with commercial fleets and novice drivers
 - ▣ Trucks, buses, shuttles, taxis, transit, waste, sales personnel
- Not designed specifically for distraction

Onboard Safety Monitoring Systems

(2 of 2)

- Hickman & Hanowski (2011)



- Distraction in 6% of SCEs vs ~60% (Olson et al. 2009)

Effective Coaching

- Shouldn't be a "gotcha" program
 - ▣ Point is to keep you safe, not assess blame!
- You should:
 - ▣ Review video
 - ▣ Pinpoint problem/safe maneuver
 - ▣ Plan to address problem

Summary

- High-risk tasks had high eyes-off-road time
- Work-related tasks are dangerous
- Countermeasures should not be limited to education, training and PSAs
 - ▣ Policy
 - ▣ Crash avoidance systems
 - ▣ Voice-activated systems
 - ▣ Onboard safety monitoring

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Driver Drowsiness/Fatigue:
A Wake-up Call

Goal

- Provide you with education, training, and materials on topics related to commercial driver drowsiness and fatigue so you can effectively train your drivers to become aware of the warning signs and strategies for combating drowsiness and fatigue while driving.

Topics

- **Understanding the Issue**
 - Defining Drowsiness vs. Fatigue
 - The commercial driving environment and drowsiness/fatigue
 - Real-world video examples
- **Detecting and Monitoring Driver Drowsiness and Fatigue**
 - Onset of Drowsiness
 - Measures of Drowsiness
- **Managing Driver Drowsiness and Fatigue**
 - FMCSA's Driving Tips Website
 - The North American Fatigue Management Program
 - "Million-Miler" Best Practices

Learning Objectives

Learners should have an understanding of:

- The impact of driver drowsiness/fatigue on commercial trucking;
- Current means of detecting and monitoring driver drowsiness/fatigue; and
- Sources of training materials for educating commercial drivers on the dangers of drowsy driving and strategies for preventing it.

Quick Quiz* (True or False)

1. There is no relationship between one's sleep and work schedule and risk of being involved in a drowsy-driving crash.
 - **FALSE.** Studies have found a direct correlation between the numbers of hours a person works and their risk of being in a drowsy driving crash. People who work more than one job where their primary job involves an atypical schedule are twice as likely to be involved in a sleep-related crash when compared to people in non-sleep related crashes.
2. The largest at-risk group for sleep-related crashes is commercial drivers.
 - **FALSE.** Sleep-related crashes are most common in young people, who tend to stay up late, sleep too little, and drive at night. One study found that in 55 percent of sleep-related crashes, drivers were age 25 years or younger and were predominantly men. Another study found almost one-third of commercial drivers have some degree of sleep apnea.

Quick Quiz* (True or False)

3. Overall, sleep-related crashes have certain characteristics that set them apart from other types of crashes.
 - **TRUE.** Research has provided a good picture of the common characteristics of drowsy-driving crashes, which tend to occur at night or in mid-afternoon, involve a single vehicle running off the roadway, lack any evidence of braking, and involve a young male driving alone.
4. People with a sleep and breathing disorder called obstructive sleep apnea have about the same risk as the rest of the general population of being involved in a drowsy-driving crash.
 - **FALSE.** Sleep apnea is a condition in which a person's airway collapses many times to halt breathing until the person briefly awakens. The most common signs of sleep apnea are loud, irregular snoring, and excessive daytime sleepiness. Studies indicate that persons with untreated sleep apnea have two to seven times more crashes than people without the disorder. Studies also show that once treated, most patients can be safe drivers once again.

Quick Quiz* (True or False)

5. Eating a big lunch tends to make everyone sleep.
 - **FALSE.** Things such as heavy meals, warm rooms, and long drives only unmask the presence of sleep deprivation or sleep debt; they do not cause sleepiness.
6. People can usually tell when they are going to fall asleep.
 - **FALSE.** Sleep is not voluntary. If you're tired, you can fall asleep and never know it. When you're driving at 60 miles per hour and fall asleep for a few seconds (a microsleep), you can travel up to the length of a football field without any control of your vehicle.

Quick Quiz* (True or False)

7. Drivers in drowsy-driving crashes are more likely to report sleep problems.

- **TRUE.** According to studies, drivers in fatigue-related crashes were more likely to report problems sleeping prior to a crash than drivers in other non-sleep crashes.

8. Rolling down a window or singing along with the radio while driving will help keep someone awake.

- **FALSE.** An open window or music has no lasting effect on a person's ability to stay awake. In fact, they may mask the person's lack of alertness further.

Quick Quiz* (True or False)

9. Wandering, disconnected thoughts are a warning sign of driver fatigue.

- **TRUE.** If you are driving and your thoughts begin to wander, it is time to pull over and take a short nap, consume some caffeine, or stop driving for the day..

10. You can stockpile sleep on the weekends to avoid being sleepy during the week.

- **FALSE.** Sleep is not money. You can't store up sleep to borrow it later on. But, just as with money, you can go into debt.

Defining the Issue

- Driver drowsiness/fatigue is a contributing factor in many vehicle crashes¹
 - ▣ 100,000 crashes per year
 - ▣ 40,000 injuries/1,550 deaths per year

- 2 out of 5 drivers (41%) admit to “falling asleep or nodding off” while driving at least once in their lifetime.²

Defining the Issue

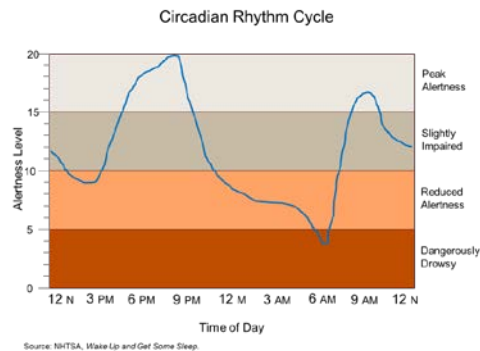
- Drowsy/fatigued drivers:
 - ▣ Are often unaware of their condition
 - ▣ Pay less attention to the driving environment, leading to *driver errors*
- Frequently drive for 3-30 seconds with their eyes totally closed.

Who is at Risk?

- Young people
 - ▣ Under the age of 26
 - ▣ Particularly males
- Shift workers
 - ▣ Long work hours (especially at night)
- Commercial Drivers
 - ▣ Long driving hours (especially at night)
- Individuals with untreated sleep disorders
 - ▣ Obstructive sleep apnea (OSA)

Characteristics of a Sleep-rated Crash

- More likely to occur at night or mid-afternoon



- Single vehicle running off the roadway
- Higher-speed roadways
- No indication of braking
- Driver is alone (often younger male)

The Impact on Commercial Trucking

- Drowsy driving crashes¹
 - ▣ Estimated to cost \$12 billion annually
 - ▣ Account for 35% of the 4,400 annual truck driver deaths

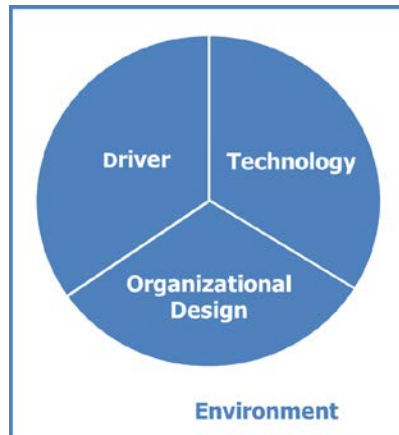


Driver Drowsiness vs. Fatigue

- Fatigue
 - ▣ A state of reduced physical or mental alertness which impairs performance (*Williamson et al., 1996*)
 - ▣ Results from physical or mental exertion
- Drowsiness
 - ▣ Inclination to sleep (*Stutts et al., 1999*)
 - ▣ Results from boredom, lack of sleep, hunger, or other factors
- Terms are often used interchangeably

Understanding the Driving Environment

Socio-technical Systems (STS) Model



The Driver, Fleet, Technology, and Environment do not function independently but influence each other.

Examples:

- ▣ A fleet's sleep hygiene policy (*organizational design*) impacts a driver's ability to rest as needed (*driver*).
- ▣ The occurrence of false alarms (*technology*) impacts the driver's trust (*driver*) of the system.

Understanding the Commercial Driving Environment

- ▣ Conducted several focus groups to support the development of an Operator Drowsiness Monitoring System
- ▣ Objectives
 - ▣ Elements of a **typical 24-hour work day**
 - ▣ Potential **countermeasures** commercial drivers chose to combat drowsiness (*What do drivers do now to fight drowsiness?*)
 - ▣ **Barriers** that impact commercial drivers' decision to pull over and rest (*Why won't drivers stop and get some rest?*)

Understanding the Commercial Driving Environment

- Typical Work Day
 - ▣ Reported duration of sleep per day Mean: 5.7 hours; SD=0.82 hours (*recommended 7-8 hours minimum*)

 - ▣ Top reported reasons for taking breaks
 - Fuel (5 of 13)
 - Use restroom (4 of 13)
 - Eat (4 of 13)
 - Sleep (1 of 13)

Understanding the Commercial Driving Environment

- How drivers fight drowsiness:
 - ▣ Most common strategy used to stay awake (9 of 13) was a caffeinated or energy drink.
 - ▣ Other popular strategies (6 of 13) included rolling down the window, adjusting the radio, talking on CB, and getting out of the truck and walking around.
 - ▣ Only 2 participants mentioned napping as a strategy.

Understanding the Commercial Driving Environment

- Why don't drivers stop when tired?
 - ▣ **#1 Reason** that would prevent them from pulling over because of the onset of drowsiness or fatigue
 - **Parking** (9 of 13)
 - ▣ Lack of safe, legal, quiet, and/or fee-free parking
 - **Others barriers mentioned include:**
 - ▣ Demands of the job
 - ▣ Being on time

Understanding the Commercial Driving Environment

- Key Take-Aways
 - ▣ Numerous and challenging factors that may deter CMV drivers from pulling over even when they know they are drowsy.
 - Environmental reasons (i.e., parking) are the most commonly faced.
 - Organizational design factors (i.e., job demands) were also mentioned as deterrents to pulling over to rest.
 - ▣ Solution will involve everyone.

Participant Comment:

"It all comes back to economics. If a company and driver can make a reasonable living by stopping regularly and following all of the laws, drowsiness would not be a problem or issue."

Real-World Examples



Real-World Examples



Detecting and Monitoring Driver Drowsiness

- Onset of Driver Drowsiness
 - ▣ Gradual, cumulative process
 - ▣ Often takes some time before it manifest into noticeable signs
 - ▣ Warning Signs
 - Physical characteristics
 - ▣ Yawning
 - ▣ Tired, frequently blinking eyes
 - ▣ Slack face
 - Driving performance
 - ▣ Lane drifting
 - ▣ Difficulty maintaining constant speed
 - Driver mannerisms
 - ▣ Rubbing the face
 - ▣ Frozen stare
 - ▣ Feeling restless or irritable

Measures of Drowsiness and Fatigue

- Driver-based measures (physical changes)
 - ▣ Electroencephalography (EEG)
 - Monitors brain's electrical activity

Advantages	Disadvantages
Reliable under controlled conditions	Susceptible to coughing, sneezing, vibration, and large body movements
Regarded as the standard	Intrusiveness to the driver (must wear headgear)

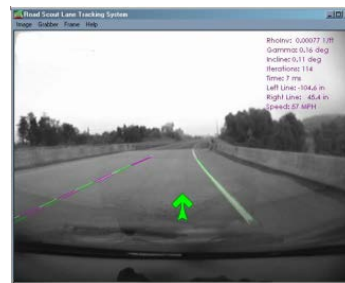
Measures of Drowsiness and Fatigue

- Driver-based measures (physical changes)
 - ▣ Ocular (Eye) measures
 - Monitors ocular movement (e.g., eye closures [PERCLOS], eye blinks)

Advantages	Disadvantages
Eye closures are most effective ocular measure	Eye blink monitoring is confounded by the individual differences
Non-intrusive	Difficulties with well-lit conditions, eyewear, and rapid changes in head position

Measures of Drowsiness and Fatigue

- Vehicle-based measures
 - ▣ Lane Position (e.g., lane-drift, time-to-lane crossing)
 - Monitors the vehicle's position relative to the lane markings



Advantages	Disadvantages
Have promised as an indicator of fatigue and drowsiness especially when tied with driver-based measures	Dependent on lane marking presence and quality
	Difficulties with weather conditions such as snow or rain.

Measures of Drowsiness and Fatigue

- Vehicle-based measures
 - ▣ Steering wheel inputs
 - Monitors the driver's steering behavior

Advantages	Disadvantages
Non-intrusive	Have difficulties with road condition and cross-winds
Most researchers agree that increased fatigue results in increased steering variability	Susceptible to individual differences in driving styles

Measures of Drowsiness and Fatigue

- Key Take-Aways
 - ▣ Drowsy driving is difficult to detect
 - Physiological measures have promise but difficult to implement
 - Individual differences are important
 - ▣ No single measure is successful 100% of the time
 - Weather
 - Eyewear
 - Individual differences
 - ▣ Possible solution is data fusion
 - Integration of information from multiple sources
 - Output has potentially greater value than the original data from individual sources.

Current Fatigue/Safety Tools for Fleets

- ❑ Website: www.fmcsa.dot.gov
- ❑ Real-world examples



Current Fatigue/Safety Tools for Fleets

- ❑ **Fatigue Management Program**
 - ❑ Online fatigue management training for drivers, drivers' families, carrier executives and managers, dispatchers and shippers/receivers
 - ❑ Information on how to develop a corporate culture that facilitates reduced driver fatigue;
 - ❑ Information on sleep disorders screening and treatment;
 - ❑ Driver and trip scheduling information;
 - ❑ Information on Fatigue Management Technologies.



Summing up Driver Drowsiness

- Driver Drowsiness has a significant impact on vehicle safety
- Driver Drowsiness develops slowly and is difficult to reliably detect. Need multiple measures of drowsiness.
- Solution is dependent on everyone (Driver, Fleet, Government, Public)
- Million-Milers' Recommendations for best practices:
 - ▣ Maintain more predictable and regular work schedules
 - ▣ Obtain adequate sleep before driving
 - ▣ Take rest breaks and naps to help manage fatigue
 - ▣ Recognize the warning signs and risks of drowsy driving
 - ▣ Optimize the sleeping environment

APPENDIX D. DRIVER HEALTH PRESENTATION

NSTSCE

**National Surface Transportation
Safety Center for Excellence**

**Driving Healthy:
Wellness Over the Road**



Driving Healthy: Wellness Over the Road



Learning Objectives

Learners should have an understanding of:

- ❑ Health concerns among CMV drivers and how health impacts safety
- ❑ How weight loss can improve overall health
 - ❑ Strategies to help CMV drivers develop positive health behaviors considering their mobile lifestyle
- ❑ How carriers may develop and implement a successful health and wellness program for their drivers



Topics

- ❑ The importance of health and wellness
- ❑ Truck driving: a risky occupation
- ❑ Health concerns among CMV drivers
- ❑ The connection between health and safety for commercial motor vehicle (CMV) operations
- ❑ Disqualifying medical conditions
- ❑ Health improvement through behavior and lifestyle modifications

Health and Wellness: Why is it Important?

- ❑ Increased energy
- ❑ Improved quality of life
- ❑ Alertness and job performance
- ❑ Longevity on the job
- ❑ Increased life expectancy

Components of wellness



Truck Driving: A Risky Occupation

- ❑ Trucking classified as one of the highest-risk occupations (*BLS 2007*)
- ❑ Workplace conditions encourage unhealthy behaviors
 - ▣ Shift work/long hours
 - ▣ Chronic physical and psychological stress
 - ▣ Sedentary lifestyle
 - ▣ Poor nutrition/eating habits
- ❑ Drivers may have a 12-19 year reduced life expectancy (*Salzman 2007*)

Health Concerns in CMV Operations



Overweight and Obesity

- 90% of CMV drivers may be overweight and 70% obese
 - Vs. 68% and 34% among general U.S. population
- Consequences of excess weight
 - Heart disease
 - High blood pressure
 - High cholesterol
 - Diabetes
 - Osteoarthritis
 - Sleep apnea
 - Cancer
 - Depression

High Blood Pressure (Hypertension)

- High BP may affect up to 40% of CMV drivers (*Mabry 2013 submitted for publication*)
- Easily controlled
 - ▣ Lifestyle modifications
 - ▣ BP medications
- Risky if uncontrolled
 - ▣ Vascular damage
 - ▣ Heart disease/damage
 - ▣ Neural damage

Blood Pressure Category	Systolic mm Hg (upper #)		Diastolic mm Hg (lower #)
Normal	less than 120	and	less than 80
Prehypertension	120 – 139	or	80 – 89
High Blood Pressure (Hypertension) Stage 1	140 – 159	or	90 – 99
High Blood Pressure (Hypertension) Stage 2	160 or higher	or	100 or higher
Hypertensive Crisis (Emergency care needed)	Higher than 180	or	Higher than 110

Cardiovascular Disease (CVD)

- Professional drivers at increased risk for:
 - ▣ Stroke
 - ▣ Heart attack
 - ▣ Vascular diseases
- Heart Disease is one a serious illnesses affecting truck drivers
 - ▣ Heart attack or acute cardiovascular event during driving could be catastrophic

Physical Inactivity

- Physical activity recommendations
 - ▣ 150 mins/week moderate intensity aerobic activity
 - ▣ ≥ 2 days/week muscle-strengthening activities
- 92% of truck drivers are inactive or don't exercise regularly (*Bigert 2003*)
 - ▣ Compared to 28% of the general U.S. population
- Exacerbates obesity and related health issues
- Directly related to cardiovascular mortality

Nutrition and Eating Habits

- Truck-stop and fast food fare
 - ▣ Convenient, low-cost, and “appealing”
- Irregular eating schedules
- Limited space and opportunity to store and prepare meals on the road
- Half of truck drivers report consuming ≤ 1 serving of fruit and vegetables daily (*Whitfield 2007*)
 - ▣ But indicate they would choose healthful foods if available and appetizing (*Whitfield 2007*)

Type II Diabetes

- Prevalence of diabetes among CMV drivers outpaces U.S. population
 - ▣ 12-16% vs. 8% (*Mabry 2013 submitted for publication; ADA 2011*)
- Easily controlled
 - ▣ Lifestyle modifications (prediabetes)
 - ▣ Medications
- Risky if uncontrolled
 - ▣ Neuropathy
 - ▣ Impaired vision/blindness
 - ▣ Heart disease/stroke
 - ▣ Kidney failure

	Fasting Glucose (mg/dL)
Normal	<100
Prediabetes	100-125
Diabetes	>125

Short/Poor Quality Sleep

- Fragmented and erratic work schedules
 - ▣ Short sleep
 - ▣ Poor quality sleep
 - ▣ Wake-time fatigue
- Truckers average 3.8 to 5.2 hrs of sleep daily (*Balkin et al., 2000; Dinges et al., 2005*)
 - ▣ 6-8 hrs recommended
- Sleepiness has been linked with fatal crashes (*Hakkanen et al., 2000; Lyznicki et al., 1998*)

Sleep Disorders

- Sleep disorders are prevalent, though most sufferers are unaware and undiagnosed
- Obstructive sleep apnea (OSA) is one of the most common sleep disorders
 - An estimated 1 in 4 CMV drivers in the U.S. has OSA
(Pack 2002)



Health Consequences of OSA

- Obesity
- CVD
 - High blood pressure
 - Coronary artery disease
 - Abnormal heart rhythms
 - Stroke
- Metabolic diseases
 - Diabetes and insulin resistance
- Diminished quality of life
- Depression
- Cognitive impairment

Stress

- Truck driving among highest stress occupations
 - ▣ Social isolation
 - ▣ Dangerous/high risk
 - ▣ Lack of job satisfaction/control
 - ▣ Insufficient sleep/chronic fatigue
- Severe health repercussions
 - ▣ Negatively impact relationships
 - ▣ Metabolic and cardiovascular implications
 - ▣ Poor mental health and depression

Tobacco Use

- >50% of CMV drivers smoke
 - ▣ Compared to 20% of general population
- Causes lung cancer, lung diseases, heart disease, respiratory disorders, and many other medical conditions
- Expensive
 - ▣ Smoking 1 pack/day=\$1,600-\$3,300 yearly
 - ▣ Increases cost of healthcare by >\$3,000 yearly

Health and Safety...What's the Connection?



Importance to Safety

- Medical crises are a major cause of road deaths for drivers
 - Heart attack, stroke, hypoglycemia, loss of consciousness
- Drivers with CVD (non-CMV) are at increased risk for crashes (*FMCSA 2007*)
- CMV drivers with OSA 4.6 times as likely to be in a severe crash (*Pack 2002*)
- Falling asleep-at-the-wheel is a top cause of crash deaths for CMV drivers
 - Fatigue is the principal cause of 31% of large truck crashes (*NTSB 1990*)
 - 47% CMV drivers reported falling asleep at the wheel (*McCartt et al., 2000*)

Disqualifying or Limiting Medical Conditions *Adapted from §391.41 of 649-F*

- Cardiovascular disease
 - Heart attack, stroke, angina, vascular disease, high blood pressure, etc.
- Diabetes
- Respiratory dysfunction
- Psychiatric disorders
- Hearing and vision problems
- Epilepsy/seizures
- Drug/substance abuse

Behavior and Lifestyle Modifications to Better Health

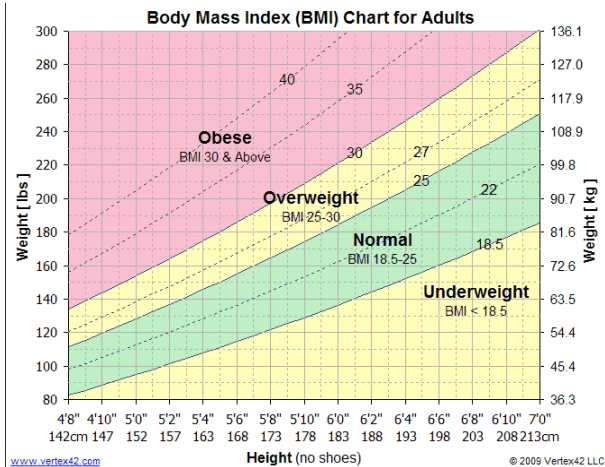


Prioritize Your Health

- CMV driving is a challenging job under often difficult conditions
- Drivers have a personal responsibility to wisely manage his or her own health and lifestyle
 - ▣ Employer support

Weight Loss/Maintenance

- Strategy: **diet** and **exercise**
- Small, manageable, realistic goals
- Don't go "cold turkey"
- Acknowledge interim successes
- Make it fun
 - Friendly competition
- Lifestyle change
- Weight loss has "trickle down" effect



Blood Pressure Reduction

- BP reducing medications
 - Reduce cardiac stress, reduce blood volume, influence hormones
- Weight loss
 - 10 lb loss can normalize BP
- Exercise
 - 30 mins/day can lower BP within weeks
- Nutrition
 - Increase whole grains, fruits, veggies, low-fat dairy
 - Reduce animal fats, sodium
- Reduce alcohol
 - ≤1 drink/day for women; ≤ 2 drinks/day for men

Cardiovascular Disease – Reduce your Risk

- Quit smoking
 - Smoking increases risk for heart attack 2x
- Improve cholesterol
- Achieve a healthy weight
- Manage blood pressure
- Exercise
 - 30 mins/day of moderate-intensity exercise (walking) reduces CVD risk
- Manage anger/stress
- Control diabetes

Exercise

- Recommendation:
 - **2.5 hours per week aerobic exercise** (e.g., fast walking)
 - **+ Muscle-strengthening workouts** twice a week (e.g., weightlifting, pushups).
 - *Consult a physician before beginning an exercise program*
- Strategies:
 - 10-minute walks \geq twice daily
 - Stairs instead of elevator
 - Work out more vigorously on weekends/when time permits
 - Take exercise equipment with you on trips
 - Resistance bands, medicine balls, stability balls, hand-held dumbbells
 - Schedule regularly and keep an exercise log
 - Set short-term and long-term goals
 - Find enjoyable activities and involve friends/family/co-workers

Nutrition

- Strategies:
 - Start with small, manageable goals, then add to them
 - Ex. Reduce soda intake from 3/day to 1/day, then eliminate
 - Limit fries to 3x/week, then replace with side salad
 - Strive for 5 servings of fruits or vegetables/day
 - Replace “bad” fats (e.g., chips) with “good” fats (e.g., nuts)
 - Replace simple carbs (e.g., potatoes, sweets) with complex carbs (e.g., whole grains)
 - Replace sweet drinks with water
 - Everything in moderation

Eat This Not That!

Eat this!

- ❑ McDonald's Quarter Pounder
- ❑ BK's Whopper Jr. w/o mayo
- ❑ Wendy's sour cream and chive potato
- ❑ Subway 6-in roast beef sub
- ❑ DQ chocolate sundae

Not that!

- ❑ McDonald's Grilled Chicken Club
- ❑ BK Fish Sandwich
- ❑ Wendy's fries
- ❑ Subway 6-in tuna sub
- ❑ DQ chocolate chip cookie dough blizzard

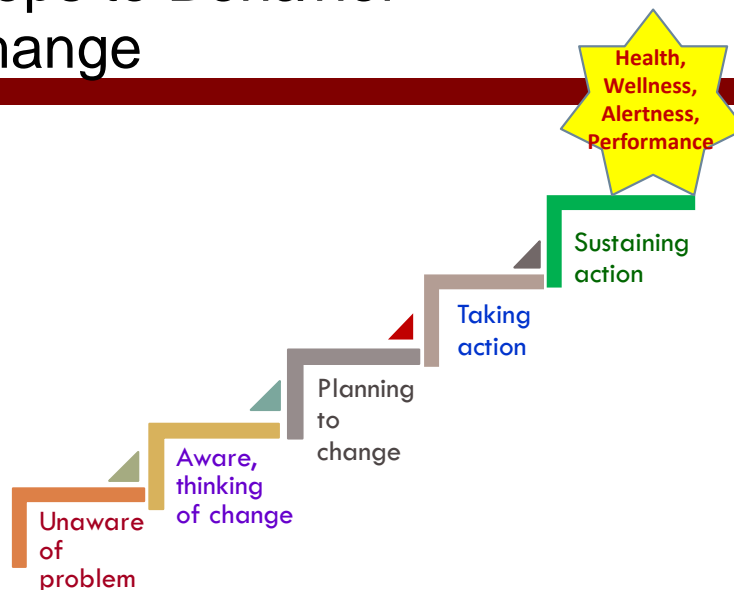
Diabetes Management

- ❑ Involve your physician
 - ▣ Glucose monitoring
 - ▣ Medications
- ❑ Exercise
 - ▣ Improves blood-sugar control and insulin response
- ❑ Nutrition
- ❑ Quit smoking
- ❑ Brush and floss teeth regularly
 - ▣ Prevent dental decay
- ❑ OSA evaluation
 - ▣ Diabetes increases risk for OSA and OSA worsens insulin resistance
- ❑ Watch your feet!
 - ▣ Nerve damage in extremities

OSA

- Seek screening/testing
- Symptoms
 - Loud, disruptive snoring
 - Waking with gasping or choking
 - Non-refreshing sleep
 - Excessive sleepiness/fatigue
 - Morning headaches or dry throat
 - Poor memory, clouded thoughts, irritability
- Preventable and Manageable
 - Maintain a healthy weight
 - Avoid alcohol and sedatives before sleeping
 - Quit smoking and/or tobacco
 - Avoid sleeping on back
 - Keep nasal airflow open
- Treatments
 - Weight loss
 - Positive airway pressure (PAP)
 - Delivers pressurized air to prevent collapse and snoring
 - Positive effects experienced immediately

Steps to Behavior Change



Steps to Behavior Change: An Example

- **Unaware of problem:** Joe seeks a job with Company Z and undergoes the DOT medical exam.
- **Aware, thinking of change:** Joe learns that he is obese and has Stage 2 HTN.
- **Planning to change:** Joe is given a temporary card and must return in 3 months to prove his HTN is under control. Joe makes an appt with his PCP to discuss his HTN and treatment options.
- **Taking action:** Joe is prescribed a beta blocker and follows his PCP recommendation to reduce his sodium intake and increase his exercise.
- **Sustaining action:** At his 3-mo recert, Joe has lost 20 lbs and his HTN is under control. Joe continues making small, manageable behavior changes to improve his health.

Work-Site Wellness Programs



Work-Site Wellness Programs

- Work-site wellness programs are a need in the CMV industry
- Ideal for CMV drivers
 - ▣ Time spent on the job
 - ▣ Trucking community support
 - ▣ Benefits driver and carrier
- Leading carriers implementing these programs for employees
- Return on Investment

Does Your Company Have a Work-Site Wellness Program?

- How does it work?
- What works well with your existing programs?
- What could be improved upon?
- Success stories?

Health and Wellness Case Study

- A collaboration with Schneider National, Inc. (SNI), Atlas Ergonomics, and United HealthCare
- Recommendations for a work-site wellness program
 - Market program strongly to gain participation
 - Educational component
 - Accessible occupational health clinics
 - Privacy of health information crucial
 - Clinical and physical testing
 - Trust and rapport between program staff and drivers
 - Exercise coaching and monitoring
 - Regular communication, individualized, follow-up
 - Provide at no-cost
 - Participation incentives
 - Reduced premiums, health benefits, etc.

Additional Resources

- <http://www.drivinghealthy.org/>
- <http://www.nafmp.com/en/downloads.html>

NSTSCE

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Hours-of-Service Regulations

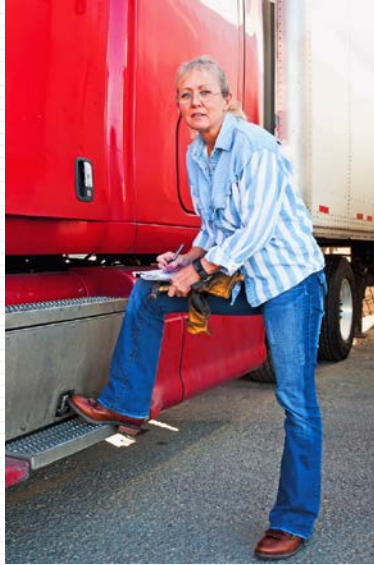
Goals

- To explain why Hours-of-Service (HOS) regulations exist and how they are developed
- To explain what the HOS regulations specify and how the regulations have changed as of July 1, 2013
- To show how HOS compliance affects drivers, fleets, companies, and other people on the road

Topics

- The Reasons for HOS Regulations
 - ▣ Driver Drowsiness
 - ▣ HOS Regulations Research
 - ▣ Safety Impact of HOS Regulations
- HOS Regulations
 - ▣ Changes in HOS Regulations as of July 1, 2013
 - ▣ Current HOS Regulations
 - ▣ Exceptions to the HOS Regulations
- Compliance
 - ▣ The Importance of HOS Compliance to Drivers and Fleets
 - ▣ Tips for HOS Compliance
- HOS Regulations Practice

The What, Why, and How of HOS Regulations



What are HOS Regulations?

- FMCSA issued regulations for drivers of CMVs to guide:
 - ▣ Daily and weekly driving time
 - ▣ Daily and weekly workday hours
 - ▣ Rest periods for shift-restart
- Main purpose of HOS regulations is to reduce crashes caused by driver drowsiness

Driver Drowsiness

- Driver drowsiness is estimated to be one of the leading causes of crashes for commercial drivers
- Drowsy drivers:
 - Are less attentive to the driving environment
 - Have a slowed reaction time to potential hazards
 - Often are not aware of their decreased alertness
- Driving after being awake ~18 hours is similar to driving with a BAC of 0.05%
 - Driving after being awake ~24 hours is similar to driving with a BAC of 0.10%

Can you think of reasons commercial drivers may be at risk for drowsy driving?



Other sleep disorder

- Work includes hard labor
- Irregular meal times
- Uncomfortable sleep conditions on truck
- Feeling of pressure to finish work

HOS Regulations Research

- Changes to HOS Regulations are based on research
- FMCSA considered results of four studies in the recent rulemaking
- Before making changes, FMCSA considers
 - ▣ Safety impacts
 - ▣ Environmental impacts
 - ▣ And costs & benefits to trucking industry

HOS Regulations Research

- A 2011 VTTI study found:
 - ▣ No difference in Safety-Critical Event (SCE) rate for hour 11 compared to hours 3-10
 - Hours 1 and 2 did have a significantly lower SCE rate than hour 11
 - ▣ SCE risk increased when drivers drove deep in the 14-hour shift
 - ▣ A break from driving of at least 30 minutes reduced SCE rate in the 1 hour following the break
 - Off-duty breaks and rest during duty period breaks were associated with the greatest decrease in SCE rate

HOS Regulations Research

- After the revised regulations were proposed, drivers, carriers, industry associates, and the general public were invited to submit comments
- Comments could be submitted through
 - ▣ Public listening sessions
 - ▣ Online via the Federal eRulemaking Portal
 - ▣ Fax/Mail
- Comments were considered and addressed by FMCSA before creating a final rule

HOS Regulations Safety Impact

- FMCSA estimates that, on an annual basis, the new safety regulations will:
 - ▣ Save 19 lives
 - ▣ Prevent approximately 1,400 crashes
 - ▣ Prevent 560 injuries each year
 - ▣ Save an estimated \$280 million from fewer large truck crashes
 - ▣ Save an estimated \$470 million in savings from improved driver health

The Current HOS Regulations



HOS Regulations- Key Terms

HOS Term	Definition
On-Duty Time	All time driver is working for a motor carrier, paid or not, or working for pay for any other employer
Off-Duty Time	All time driver is relieved of all duty and responsibility for performing work
Driving Time	All time spent at the driving controls of a commercial motor vehicle in operation
Driving Window	The period of time during which a driver can legally drive a CMV
Sleeper Berth Time	All time spent in the sleeper berth— a space in the truck cab that includes a bed
Team Driver	A driver who drives with another driver; one driver usually rests or sleeps while the other operates the CMV

Changes in HOS Regulations

□ 34-Hour Restart Break

- The 34-consecutive-hour off-duty time to restart the 60/70 hour limit must have two periods between 1am and 5am
- The 34-consecutive-hour off-duty time may be used once per week (168 hours)
- Exceptions to this rule include:
 - Construction materials and equipment drivers require only 24 hours off duty to restart 60/70 hour limit

Changes in HOS Regulations

□ 30-Minute Break

- Drivers may not drive if it has been more than 8 consecutive hours of being on duty since taking a 30-minute rest break
- Exceptions to this rule include:
 - Short-haul drivers are exempt
 - All drivers (CDL and non-CDL) that operate within 100 air-miles of their normal work reporting location
 - Non-CDL drivers that operate within 150 air-mile radius of the location where the driver reports for duty
 - Livestock truck driver currently have a 90-day waiver (July, August, September)
 - Drivers of Division 1.1, 1.2, or 1.3 explosives may use 30 minutes or more of attendance time to meet the requirement for a rest break, but may not perform any other work during the break- must record the rest break as on-duty time in their record of duty status

Changes in HOS Regulations

- On-duty time no longer includes:
 - ▣ Any time *resting* in a parked vehicle
 - Driver must be resting and *not* performing on-duty activities, such as waiting for loading/unloading
 - ▣ Up to 2 hours in the passenger seat immediately before or after 8 consecutive hours in the sleeper berth
 - Team drivers may spend 8 consecutive hours in the sleeper berth and 2 additional hours riding in the cab to get their 10 consecutive hour rest break that allows them to begin driving

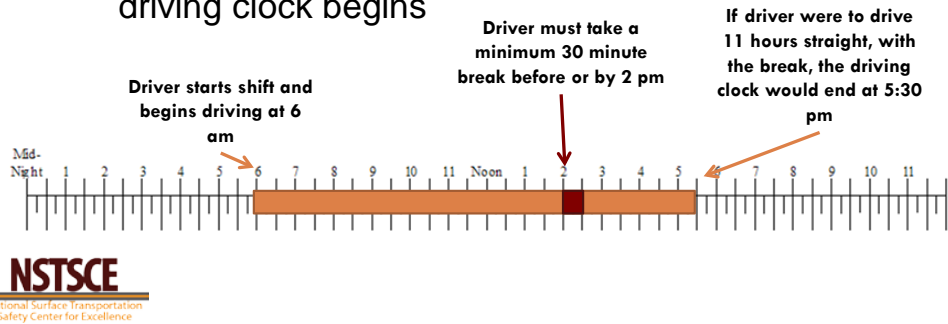
Current HOS Regulations

- 10 consecutive hours of off-duty time allows drivers to begin a new shift
- Off-duty time can be spent at home, at a rest stop or hotel, or in the sleeper berth
- Property-carrying CMV regulations will be discussed first, followed by passenger-carrying CMV regulations

Current HOS Regulations

□ 11-Hour Driving Limit

- ▣ Drivers may drive a maximum of 11 hours during a 14-consecutive-hour window
- ▣ Drivers must take a 30-minute off-duty break within 8 hours of coming on duty to continue driving
- ▣ After 10 consecutive hours off duty, a new 11-hour driving clock begins

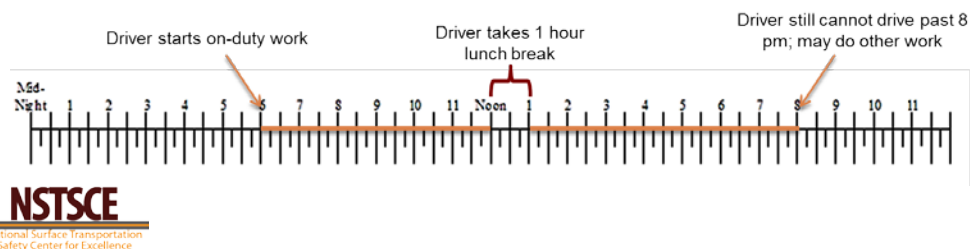


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Current HOS Regulations

□ 14-Hour Driving Window

- ▣ Drivers have a “driving window” of 14 consecutive hours
- ▣ The 14-consecutive-hour driving window begins when driver comes on duty and starts any kind of work (not just driving)
- ▣ Driver may not drive past the 14-consecutive-hour driving window, but may remain on duty (doing paperwork, unloading, etc.)
- ▣ A new driving window begins after 10 consecutive hours of off-duty time
- ▣ Off-duty time does not stop the 14-consecutive-hour driving window (exceptions for the sleeper berth provision)

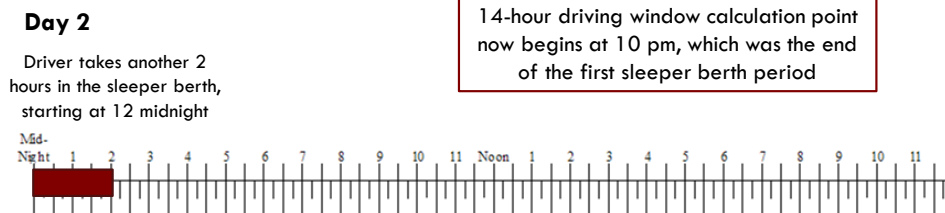
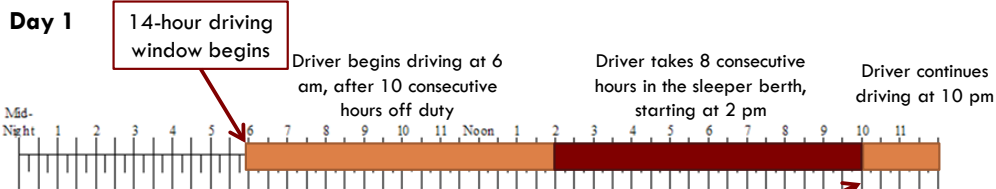


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Current HOS Regulations

- Sleeper Berth Provision splits the required off-duty time into two shorter periods to get the equivalent of at least 10 consecutive hours off duty
 - ▣ Break #1 must be at least 8 consecutive hours and in the sleeper berth
 - ▣ Break #2 must be at least 2 consecutive hours and in the sleeper berth, off duty but not in the sleeper berth, or a combination of both
 - ▣ Breaks #1 and #2 can be taken in either order
 - ▣ After completing the second break, drivers have a new driving window calculation point (demonstrated on next slide)
 - The new calculation point is the end time of the first require break
 - ▣ Use sleeper berth to extend 14-hour driving window as any sleeper berth time of at least 8 consecutive hours does not count as part of the 14 hours

SBP Example



Current HOS Regulations

□ 60/70-Hour On-Duty Limit

- Drivers may not drive after being on duty for a max of 60 hours in 7 days or 70 hours in 8 days
 - If your company does not operate vehicles every day of the week, you are not allowed to drive a commercial motor vehicle after you've been on duty 60 hours during any 7 consecutive days
 - If your company does operate vehicles every day of the week, drivers may follow the 70 hours/8 day schedule
- After a driver has reached the 60 hours/7 days or 70 hours/8 days limit, they must be off duty long enough to operate again before driving a CMV
- Limit based on a rolling or floating week (7-day or 8-day)
 - The oldest day's hours drop off at the end of the day when you calculate the total on-duty time for the past 7 or 8 days

Current HOS Regulations

Week 1							
Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Daily Hours	10	0	10	0	10	10	10
Rolling Week Hours	10	10	20	20	30	40	50
Hours Available to Drive	60	60	50	50	40	30	20

Week 2			
Day	Mon	Tues	Wed
Daily Hours	0	10	10
Rolling Week Hours	40	50	50
Hours Available to Drive	30	20	20

The hours available for work on Week 2 Wed are found by adding the hours from Week 1 Tues through Week 2 Tues:
 $T+W+Th+F+S+S+M+T$
 or
 $10+10+0+10+10+10+0+10$

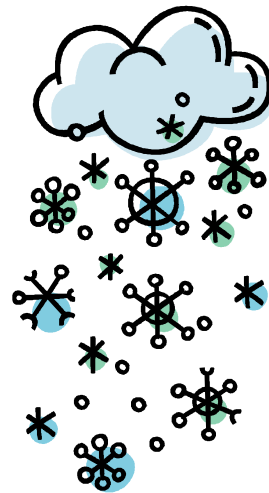
Current HOS Regulations

- Passenger-carrying CMV driver regulations:
 - ▣ 10-hour driving limit*
 - ▣ 15-hour on-duty limit*
 - ▣ To use the sleeper berth provision, drivers must take at least 8 hours in the sleeper berth and may split the time into two periods (a period cannot be less than 2 hours long)*
 - ▣ 60/70-hour on-duty limit

* these regulations differ from property-carrying CMV driver regulations

Current HOS Regulations

- Adverse Driving Conditions Exception
 - ▣ In unexpected adverse driving conditions, drivers may drive up to 2 additional hours to complete what could have been driven under normal conditions
 - ▣ Still may not drive after 14th consecutive hour on duty and must comply with 30-minute break rule
 - ▣ Adverse driving conditions are conditions that drivers did not know of when they *started* their run, such as bad weather (snow or fog) or a traffic shut-down due to crashes



Current HOS Regulations

- Additional exceptions include:
 - ▣ Non-CDL Short-Haul Exception
 - ▣ 16-Hour Short-Haul Exception
 - ▣ 100 Air-Mile Radius Driver
 - ▣ Agricultural Operations
 - ▣ Construction Materials and Equipment
 - ▣ Hawaii
 - ▣ Movie and Television Production
 - ▣ Oilfield Operations
 - ▣ Utility Service Vehicles
 - ▣ Several others, details can be found on FMCSA website

HOS Regulations and Driver Drowsiness

- How do the HOS regulations address the risks for CMV driver drowsiness?
 - ▣ Short breaks during the work period are opportunities for
 - Getting regular meals
 - Taking naps, if needed
 - Disrupt the monotony of the driving task
 - ▣ The 34-hour restart break provides more sleep time in a comfortable space
 - ▣ A 14 hour work day with a 10 hour rest period is 24 hours of consistent scheduling

HOS Compliance



HOS Violations

- 576,000 violations related to HOS regulations were found in 2011 by federal and state inspectors at roadside inspections
- These violations were 48% of the total violations found
- The violations included
 - ▣ exceeding driving limits (daily and weekly)
 - ▣ fabricated logs, no logs, and non-current logs

Why HOS Compliance is Important

- The #1 reason to be HOS compliant is to save the lives of commercial drivers and other drivers/passengers using the roads
- HOS violations can result in penalties, including:
 - ▣ Drivers being placed out-of-service at roadside
 - ▣ Monetary penalties such as fines (assessed by state and local enforcement officials) or civil penalties on driver or carrier (ranging from \$1,000 to \$11,000 per violation depending on severity)
 - ▣ Downgrading carrier safety rating
 - ▣ Federal criminal penalties against carriers or drivers who knowingly and willfully allow or require HOS violations
 - ▣ Being at risk for lawsuit even in not-at-fault crashes

Why HOS Compliance is Important

- Not knowing about the regulations or violations is not considered a sufficient explanation by FMCSA
 - ▣ “Carriers ‘permit’ violations of the hours of service regulations by their employees if they fail to have in place management systems that effectively prevent such violations.” - FMCSA

Tips for Drivers to Stay Compliant

- Plan out your trip before getting behind the wheel
 - ▣ If you are familiar with your route, think of where or when you might take your 30-minute rest break
 - ▣ The best time might be your preferred meal time or before you expect to be in traffic
 - ▣ The best place might include your preferred restaurants or rest stops
- Communicate with other drivers
 - ▣ Share your tips with other drivers, ask them to share their tips
 - ▣ Help drivers with an unfamiliar route, if you have experience with the route

Tips for Drivers to Stay Compliant

- Work with your fleet manager
 - ▣ HOS compliance affects you, other drivers, and the fleet so be sure to communicate with your safety manager
 - ▣ Make your safety manager aware of any issues that concern HOS compliance
 - ▣ Fleet managers can work with you to help resolve these issues

Tips for Drivers to Stay Compliant

- Use resources available to you
- FMCSA offers driver handbooks, logbook examples, and a visor card at their website
 - ▣ <http://www.fmcsa.dot.gov>
- Print a copy of the visor card, located at:
 - <http://www.fmcsa.dot.gov/documents/hos/HOS-Regulations-7-1-2013.pdf>

SUMMARY OF HOURS OF SERVICE (HOS) REGULATIONS AS OF JULY 2013

Changes Compared to Current Rule

PROVISION	CURRENT RULE	FINAL RULE - COMPLIANCE DATE JULY 1, 2013
Limitations on minimum "34-hour restarts"	None.	(1) Must include two periods from 1 a.m. to 5 a.m., home terminal time. (2) May only be used once per week, 168 hours, measured from the beginning of the previous restart.
Rest breaks	None except as limited by other rule provisions.	May drive only if 8 hours or less have passed since end of driver's last off-duty or sleeper berth period of at least 30 minutes. [49 CFR 397.5 mandatory "in attendance" time for hazardous materials may be included in break if no other duties performed]
PROVISION	CURRENT RULE	FINAL RULE - COMPLIANCE DATE FEBRUARY 27, 2012
On-duty time	Includes any time in CMV except sleeper berth.	Does not include any time resting in a parked vehicle (also applies to passenger-carrying drivers). In a moving property-carrying CMV, does not include up to 2 hours in passenger seat immediately before or after 8 consecutive hours in sleeper berth.
Penalties	"Egregious" hours-of-service violations not specifically defined.	Driving (or allowing a driver to drive) more than 3 hours beyond the driving-time limit may be considered an "egregious" violation and subject to the maximum civil penalties. Also applies to passenger-carrying drivers.
Oilfield exemption	"Waiting time" for certain drivers at oilfields (which is off-duty but does extend 14-hour duty period) must be recorded and available to FMCSA, but no method or details are specified for the recordkeeping.	"Waiting time" for certain drivers at oilfields must be shown on logbook or electronic equivalent as off duty and identified by annotations in "remarks" or a separate line added to "grid."

SUMMARY OF HOURS-OF-SERVICE (HOS) FINAL REGULATIONS

The following table summarizes the HOS regulations for property-carrying and passenger-carrying CMV drivers.

PROPERTY-CARRYING CMV DRIVERS (Valid as of July 1, 2013)

11-Hour Driving Limit

May drive a maximum of 11 hours after 10 consecutive hours off duty.

14-Hour Limit

May not drive beyond the 14th consecutive hour after coming on duty, following 10 consecutive hours off duty. Off-duty time does not extend the 14-hour period.

Rest Breaks

May drive only if 8 hours or less have passed since end of driver's last off-duty or sleeper berth period of at least 30 minutes. [49 CFR 397.5 mandatory "in attendance" time may be included in break if no other duties performed]

60/70-Hour On-Duty Limit

May not drive after 60/70 hours on duty in 7/8 consecutive days. A driver may restart a 7/8 consecutive day period after taking 34 or more consecutive hours off duty. Must include two periods from 1 a.m. to 5 a.m. home terminal time, and may only be used once per week, or 168 hours, measured from the beginning of the previous restart.

Sleeper Berth Provision

Drivers using the sleeper berth provision must take at least 8 consecutive hours in the sleeper berth, plus a separate 2 consecutive hours either in the sleeper berth, off duty, or any combination of the two.

Note: See 49 CFR 395.1 (h) for State of Alaska HOS Regulations.

PASSENGER-CARRYING CMV DRIVERS

10-Hour Driving Limit

May drive a maximum of 10 hours after 8 consecutive hours off duty.

15-Hour On-Duty Limit

May not drive after having been on duty for 15 hours, following 8 consecutive hours off duty. Off-duty time is not included in the 15-hour period.

60/70-Hour On-Duty Limit

May not drive after 60/70 hours on duty in 7/8 consecutive days.

Sleeper Berth Provision

Drivers using a sleeper berth must take at least 8 hours in the sleeper berth, and may split the sleeper berth time into two periods provided neither is less than 2 hours.

For more information visit www.fmcsa.dot.gov/hos

CMV drivers should always use safe driving practices - Scan this QR code with your smart phone when you are not driving to learn more about hours-of-service regulations.



U.S. Department of Transportation
Federal Motor Carrier Safety Administration



Tips for Drivers to Stay Compliant

- Consider using Electronic Logging Devices (ELDs) or Electronic On-Board Recorders (EOBRs)
- These devices electronically record many aspects of a driver's hours of service, including:
 - Date and time
 - Location of CMV
 - Starting time
 - Hours in each duty status for the 24-hour period
 - Distance traveled
 - Cumulative duty hours and driving time in the 7 day or 8 day period
- ELD/EOBR Pros: could potentially increase HOS compliance, improve safety, increase productivity, and lead to more efficient operations
- ELD/EOBR Cons: cost of switching to an electronic system, unproven technology, and limited safety benefits

Tips for Drivers to Stay Compliant?

- Do you have any experiences with managing your own hours-of-service while driving?
- What lessons about staying compliant did you learn from your own experience?
- What tips would you share for new drivers?

HOS Regulations Practice

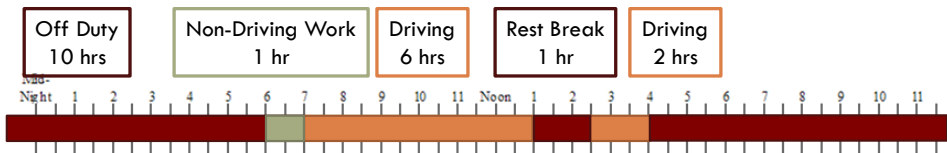


HOS Regulations Practice

- In each exercise, determine:
 - ▣ The working hours
 - ▣ The driving hours
 - ▣ If any violations have occurred
- Daily tasks are color-coded as:
 - Non-driving work
 - Driving
 - Off duty or rest periods

Exercise 1

- Drives a property-carrying CMV



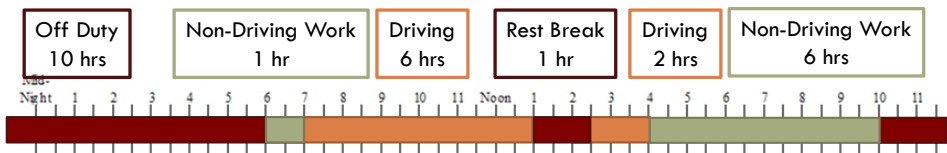
Task	Time of Day	Duration
Off Duty	8 pm – 6 am	10 hours
Non-Driving Work	6 am – 7 am	1 hour
Drive	7 am – 1 pm	6 hours
Rest Break	1 pm – 2 pm	1 hour
Drive	2 pm – 4 pm	2 hours
Shift Ends		

Exercise 1

- Total Work Time: 6 am – 4 pm or 10 hours
- Total Drive Time: 8 hours
- Violations?: No violations

Exercise 2

- Drives a property-carrying CMV



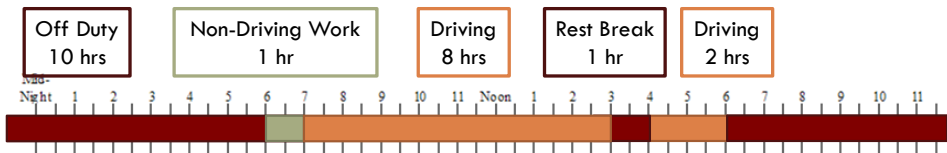
Task	Time of Day	Duration
Off Duty	8 pm – 6 am	10 hours
Non-Driving Work	6 am – 7 am	1 hour
Drive	7 am – 1 pm	6 hours
Rest Break	1 pm – 2 pm	1 hour
Drive	2 pm – 4 pm	2 hours
Non-Driving Work	4 pm – 10 pm	6 hours
	Shift Ends	

Exercise 2

- Total Work Time: 6 am – 10 pm or 16 hours
- Total Drive Time: 8 hours
- Violations?: No violations; drivers may continue to do non-driving work after the 14-hour driving window

Exercise 3

- Drives a property-carrying CMV



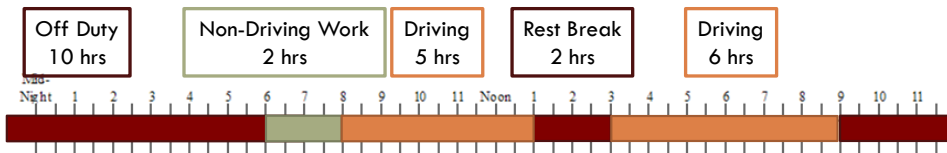
Task	Time of Day	Duration
Off Duty	8 pm – 6 am	10 hours
Non-Driving Work	6 am – 7 am	1 hour
Drive	7 am – 3 pm	8 hours
Rest Break	3 pm – 4 pm	1 hour
Drive	4 pm – 6 pm	2 hours
Shift Ends		

Exercise 3

- Total Work Time: 6 am – 6 pm or 12 hours
- Total Drive Time: 10 hours
- Violations?: Yes; break must be taken no later than 8 hours from last 10-consecutive-hour off-duty period

Exercise 4

- Drives a property-carrying CMV



Task	Time of Day	Duration
Off Duty	8 pm – 6 am	10 hours
Non-Driving Work	6 am – 8 am	2 hours
Drive	8 am – 1 pm	5 hours
Rest Break	1 pm – 3 pm	2 hour
Drive	3 pm – 9 pm	6 hours
Shift Ends		

Exercise 4

- Total Work Time: 6 am – 9 pm or 15 hours
- Total Drive Time: 11 hours
- Violations?: Yes; driving past the 14-consecutive-hour window

Summary

- HOS Regulations are issued to reduce driver drowsiness and drowsiness-related crashes
- New HOS Regulations went into effect July 1, 2013
 - ▣ The new regulations were developed based on research and public feedback
- Compliance is believed to help improve fleet safety, driver health, and costs associated with crashes

Appendix

- FMCSA Definition of On Duty (source: <http://www.fmcsa.dot.gov>)
- "On-duty time means all time from the time a driver begins to work or is required to be in readiness to work until the time the driver is relieved from work and all responsibility for performing work.
- On-duty time shall include:
 - All time at a plant, terminal, facility, or other property of a motor carrier or shipper, or on any public property, waiting to be dispatched, unless the driver has been relieved from duty by the motor carrier;
 - All time inspecting, servicing, or conditioning any commercial motor vehicle at any time;
 - All driving time as defined in the term driving time;
 - All time in or on a commercial motor vehicle, other than:
 - Time spent resting in or on a parked vehicle, except as otherwise provided in §397.5 of this subchapter;
 - Time spent resting in a sleeper berth; or (iii) Up to 2 hours riding in the passenger seat of a property-carrying vehicle moving on the highway immediately before or after a period of at least 8 consecutive hours in the sleeper berth;
 - All time loading or unloading a commercial motor vehicle, supervising, or assisting in the loading or unloading, attending a commercial motor vehicle being loaded or unloaded, remaining in readiness to operate the commercial motor vehicle, or in giving or receiving receipts for shipments loaded or unloaded;
 - All time repairing, obtaining assistance, or remaining in attendance upon a disabled commercial motor vehicle;
 - All time spent providing a breath sample or urine specimen, including travel time to and from the collection site, to comply with the random, reasonable suspicion, post-crash, or follow-up testing required by [part 382](#) of this subchapter when directed by a motor carrier;
 - Performing any other work in the capacity, employ, or service of, a motor carrier;
 - Performing any compensated work for a person who is not a motor carrier. Off duty time is when you are relieved of all duty and responsibility for performing work"

APPENDIX F. SAFETY SYSTEMS PRESENTATION

NSTSCE

**National Surface Transportation
Safety Center for Excellence**

Driving With Safety Technologies



Introduction

- Drivers can only look in one location at a time
- Even the best drivers can miss unfolding conflicts
- Failing to look forward at onset of conflict can:
 - ▣ Substantially delay a response maneuver, and
 - ▣ Drastically increase conflict severity

Introduction

- There are many safety technologies that help drivers:
 - ▣ Improve their understanding of safe behaviors
 - Learn where to look, and what not to do, to be safe
 - ▣ Improve their awareness of the road
 - Help drivers see objects in blind-spots
 - ▣ By alerting them to unfolding conflicts
 - Direct drivers' attention when unfolding conflicts are missed

Objective

- Present safety technologies
- Identify their benefits
- List potential limitations

Improving Drivers' Understanding of Safe Behavior



Improving Understanding of Safe Behavior

- Commercial drivers are professionals
 - ▣ Certified drivers
 - ▣ Pride themselves on proper vehicle operation
 - ▣ Experience gained over years of driving

- Is there a way to accelerate learning?

Event Recorders

- Records a short clip when harsh driving detected

- Captures:
 - ▣ Driver's face and forward roadway
 - ▣ Speed
 - ▣ Acceleration in x, y, and z directions

- Status light shown when event recorded



Images Courtesy of [DriveCam Powered by Lytx](#)

Event Recorders



Event Recorders

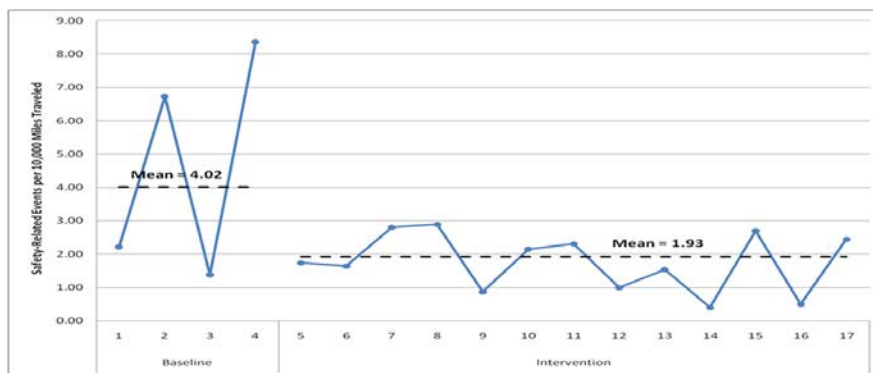


Event Recorders

- Recorded events reviewed by safety manager
- Severe events discussed with driver
 - ▣ Discuss conflict
 - ▣ Driver pinpoints good behavior and/or mistake
 - ▣ Identify what could have been done differently
 - ▣ Develop a plan

Event Recorders

- Coaching has a measurable effect
 - ▣ Reduces number of safety-critical events (SCEs)
 - ▣ Reduces distraction from 60% to 6% of SCEs



Event Recorders

- Are not a spy tool
- Self-review allows you to see things that you can do better
- In addition to coaching, they exonerate drivers
 - ▣ In crashes, everyone blames truck drivers
 - ▣ Video can show that you were just doing your job

Driver Exoneration



Limitations

- ❑ Success dependent on level of coaching
- ❑ Can discourage bad behavior, but cannot prevent it
- ❑ Do not capture adjacent lanes or rear of vehicle
- ❑ Video data collected at low frame rate can exaggerate driver actions

Share Your Opinions

- ❑ What are your opinions on event recorders?



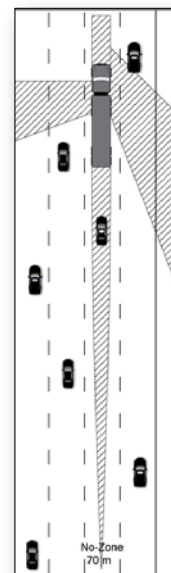
Improving Drivers' Awareness of the Road



Improving Awareness of the Road

- ❑ Spatial awareness important
 - ▣ Keep eyes on road
 - ▣ Scan mirrors frequently

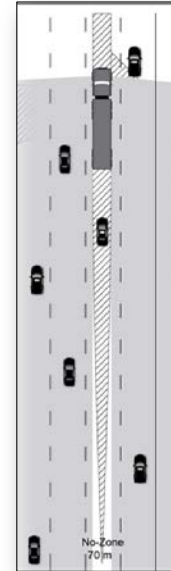
- ❑ Trucks have large blind spots
 - ▣ Large No-Zone on right side
 - ▣ Small vehicles can be missed
 - ▣ No-Zone increases for shorter drivers and drivers who sit low



Camera/Video Imaging Systems

- Camera/Video Imaging Systems

- ▣ Cameras on side of truck
- ▣ Monitors inside cab



- Display objects in blind-spots
- ▣ Low-cost solution to blind-spot crashes

Limitations

- Driver required to scan monitors to benefit from information
 - ▣ Extra location to attend to
- Monitors could be a distraction
- Monitors themselves can create blind spots
 - ▣ If not positioned properly
- Monitors can generate glare at night if not dimmable

Driver State Monitoring Systems

- Assess
 - ▣ Driver distraction and drowsiness
- Alert generated when
 - ▣ Driver looks down for extended period of time
 - ▣ Eyes closed for extended period of time
 - ▣ Steering becomes jerky or truck weaves in lane
- Alert drivers return attention back to road



Attention Monitoring Systems



Limitations

- Technology still being developed
 - ▣ False alerts are annoying
 - Difficult to track eyes when wearing glasses
 - Vehicle-only measures imprecise
- Can lead new drivers to believe activities are safe if performed without an alert
 - ▣ Difficult conditions demand full attention
- Can encourage drivers to continue driving drowsy
 - ▣ Believe system generates alert before falling asleep

Share Your Opinions

- What are your opinions on:
 - ▣ Camera/video imaging systems?
 - ▣ Driver state monitoring systems?

Alerting Drivers to Unfolding Conflicts



Adaptive Cruise Control (ACC)

- Convenience feature that maintains a constant following distance from the lead vehicle
- Distance and speed is set by the driver
- Decelerates with the lead vehicle
 - De-throttles the engine
 - Applies engine retarder
 - Applies foundation brakes
- Accelerates up to set speed or following distance, whichever is reached first

Limitations

- Does not track non-metallic objects like motorhomes
- Does not track small objects like motorcycles
- Does not bring truck to a complete stop
 - Will only apply up to 1/3 of the vehicle's maximum braking force
- Radar may lose track of lead vehicle in curves causing the ACC to accelerate the truck to the set speed

Forward Collision Warning (FCW) Systems

- Use radar/lasers to detect objects ahead
- Generate alert when unfolding crash is detected
- The alerts can be visual, auditory, and haptic (vibration)
- Older systems have been estimated to reduce rear-end crashes by 21%

Cautionary Alert

- Generated first to make you aware of conflict



Imminent Alert

- Generated when immediate action required



Stationary Object Alerts

- Generated when stationary object in path detected



Collision Mitigation Braking

- Collision Mitigation Braking automatically decelerates truck when driver fails to brake



Collision Mitigation Braking



Limitations

- ❑ Alerts can be difficult to hear if windows open
 - ▣ Driver must have good hearing to detect alerts
- ❑ Systems are complex
 - ▣ Object must be metallic
 - ▣ Not designed to work in curves
 - ▣ Drivers need training in addition to reading manual
- ❑ Systems can change behavior
 - ▣ Caution needed when returning to legacy trucks
- ❑ Systems are also imperfect

False and Nuisance Alerts

- False Alerts

- ▣ Generated when there is no object in the path of the vehicle

- Nuisance Alerts

- ▣ The system works as designed, but provides little to no utility to the driver

Nuisance Alert



Lane Departure Warning Systems

- Use video of the forward roadway to track lane markings
- Generate an alert when truck passes lane markings without turn signal activation

Lane Departure Warning



Limitations

- Do not work well in low visibility (e.g., fog)
 - ▣ Because systems are video-based

- Also subject to repeated false and nuisance alerts
 - ▣ Merging lanes can be perceived as lane drifts

Share Your Opinions

- What are your opinions on collision avoidance systems?

- How can driver training for these systems be improved?

Conclusion

- More than 90 percent of all heavy truck crashes involve driver error
 - ▣ The majority of those are related to inattention
- Inattention can be reduced by improving your driving behavior
 - ▣ Pay attention to where you look and what you see
- Technologies that help drivers operate vehicles safely and avoid crashes are worth the investment

Take Away

- Safety technologies can:
 - ▣ Coach drivers with event recorders
 - ▣ Improve spatial awareness with cameras
 - ▣ Alert drivers to unfolding conflicts with collision avoidance systems
- Each technology has its benefits and limitations
 - ▣ Drivers must be aware of their capabilities to get the most out of them

NSTSCCE

National Surface Transportation
Safety Center for Excellence

Best Practices: Teaching Driver
Education Students to Share the
Road with Heavy Trucks

Goals

- To provide key sharing the road information for driver education students.
- To provide guidance on how fleets in partnership with driver education teachers can convey key sharing the road information to students.



Goal: Provide key sharing the road information for driver education students

- VTTI researchers reviewed materials from a number of helpful sources (i.e., Federal Motor Carrier Safety Administration, Commercial Vehicle Safety Alliance, Wal-Mart Truck Team, Wisconsin Road Team, American Trucking Association, and the Drive Right Textbook) to develop a list of “Key Sharing the Road Tips.”
 - Don’t Hang Out in the “No Zone”
 - Properly Pass Trucks
 - Don’t Cut Trucks Off
 - Don’t Get Squeezed
 - Maintain a Safe Following Distance

Goal: Provide guidance on how to convey key sharing the road information to students

- Include a Kinesthetic Learning Experience
 - A recent NSTSCE survey study found that some driver education teachers want to provide students with updated materials (e.g., DVD) and/or a hands-on experience with a truck.
 - Videos of real things and demonstrations are examples of kinesthetic learning. Neil Fleming's VARK model* describes kinesthetic learning as processing information through the use of experience and practice (simulated or real).

Goal: Provide guidance on how to convey key sharing the road information to students

Two suggested ways to provide a Kinesthetic Learning Experience

1. Approach 1: Video
 - Example: Video produced by Commercial Vehicle Safety Alliance (CVSA)
2. Approach 2: Hands-on Experience
 - Example: Virginia Tech Transportation Institute (VTTI) Truck Demonstration

Approach 1: Video



Share the Road Video

- In a current NSTSCE case study, VTTI used a “Teens and Trucks” video produced by the CVSA to teach driver education students how to share the road with heavy trucks.
- The video covers the following topics:
 - ▣ **Don't Cut Off Trucks**
 - ▣ Stay out of the **Blind Spots/No Zones**
 - ▣ Maintain a **Safe Following Distance**
 - ▣ Understand Trucks make **Wide Turns**
 - ▣ If your car breaks down, **Pull Off Highway** as far as you can
- CVSA encourages industry and educators to use their video and other materials to help spread the word on how to safely share the road with trucks. To learn more, visit:
 - ▣ http://www.cvsa.org/programs/teens_and_trucks.php

Approach 2: Hands-on Experience



Hands-on Experience

- In the current NSTSCE case study, VTTI developed a hands-on experience to teach students how to share the road with heavy trucks. There were two parts to the hands-on experience:
 - **Presentation.** Immediately before the Truck Demonstration, students were presented with information to help them understand why they need to safely share the road with heavy trucks.
 - **Truck Demonstration.** Next, students sat in the cab of a heavy truck and saw the blind spots for themselves. Also, light vehicles were strategically placed around the heavy truck to show students proper following, leading, and passing positions.
- For more information on VTTI's driver education research and outreach visit:
 - <http://www.vtti.vt.edu/moreinformation/sharing-the-road.html>

Presentation



Things to know: Sobering facts

- Light-vehicle drivers are usually at fault in a crash with a heavy vehicle.
 - ▣ 78% of near-crashes and crashes involving large trucks are initiated by the light-vehicle driver.
 - Source: Hanowski, R. J., Hickman, J. S., Wierwille, W. W. Keisler, A. (2007). A descriptive analysis of light vehicle – heavy vehicle interactions using in situ driving data. *Accident Analysis and Prevention*, 39 (2007), 169-179.
- Light-vehicle drivers often don't survive the crash.
 - ▣ Of the fatalities in crashes involving large trucks in 2011, 72% were occupants of other vehicles.
 - Source: NHTSA Traffic Safety Facts 2011 Data (<http://www-nrd.nhtsa.dot.gov/Pubs/811752.pdf>)
- Passenger vehicle crashes are the leading cause of death for teenagers in the United States.
 - ▣ In 2010, on average seven teens ages 16 to 19 died every day from motor vehicle injuries.
 - Source: Teen Drivers: Fact Sheet (http://www.cdc.gov/motorvehiclesafety/teen_drivers/teendrivers_factsheet.html)

Things to know: Heavy-Vehicle Characteristics

- Large trucks are very different in size than passenger vehicles
 - ▣ Tractor-trailers typically weigh up to 80,000 lbs.
 - Passenger vehicles typically weigh approximately 3,000 lbs.
 - ▣ Source: CVSA Teens and Trucks Share the Road Student Workbook
 - ▣ Trucks can exceed 65 feet in length
 - Passenger vehicles range from 12 to 17 feet in length
 - ▣ Source: CVSA Teens and Trucks Share the Road Student Workbook
 - ▣ Trucks are not just longer but also wider than passenger vehicles
 - ▣ Truck drivers sit much higher off the roadway, however this doesn't improve a truck driver's visibility



* For Student Workbook see CVSA's Teens and Trucks Tool Kit at:
http://www.cvsa.org/programs/teens_and_trucks_toolkit.php

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Things to know: Heavy-Vehicle Characteristics

- Large trucks usually lose speed when going uphill and gain speed when going downhill
 - ▣ It is safer to pass a truck that is going uphill than a truck that is going downhill
 - Source: Crabb, O., Thiel, R., Mottola, F., & Weaver, E. (2010). Drive Right, (11th ed.). Boston: Pearson Education, Inc., page 219
- Large trucks have much longer stopping distances than passenger cars
 - ▣ At 55 mph it takes a tractor-trailer more than the length of a football field to stop
- Light-vehicle drivers should be aware of surroundings
 - ▣ Observe tractor trailer turn signals
 - ▣ Trucks may straddle lanes to set up a turn
 - ▣ Trucks may start by moving in the opposite direction of the turn (e.g., swing wide to the left when making a right turn)



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Truck Demonstration



Key Sharing the Road Tips

- ❑ Cover at least these tips with students during the truck demonstration:
 - ❑ Don't Hang Out in the No Zone
 - ❑ Properly Pass Trucks
 - ❑ Don't Cut Off Trucks
 - ❑ Don't Get Squeezed
 - ❑ Maintain a Safe Following Distance

Truck Demonstration: Logistics

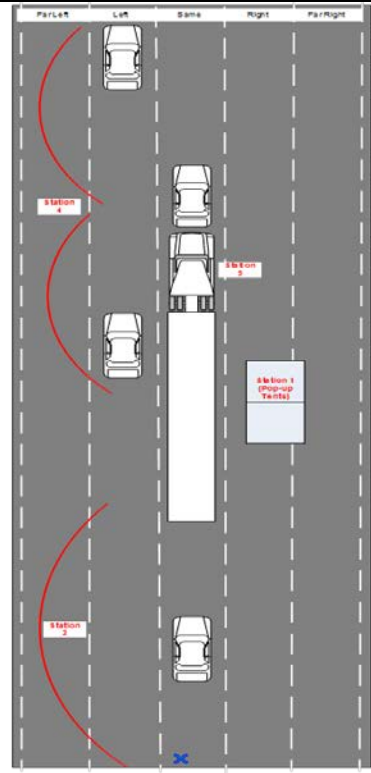
- Logistics:
 - Coordination: Work with driver education teachers to secure permission to use a large enough section of a parking lot for the demonstration. The teachers may also be able to provide light vehicles for the demonstration (i.e., driver education cars).
 - Site Preparation: Block off the demonstration area with cones well in advance to avoid others parking in the demonstration area.
 - Set up Time: Show up approximately 1 hour prior to start time
 - Presentation Time: Approximately 20 minutes
 - Demonstration Time: Approximately 40 minutes
 - Example: Nine groups of 3 spend approximately 4 minutes per station
 - Team: Four Drivers/Safety Managers

Truck Demonstration: Equipment

- Equipment:
 - 4 compact light vehicles
 - Class 8 Combination-unit Truck
 - 2 pop-up tents for students and demonstration personnel
 - Measurement device (e.g., 100 ft. long tape)
 - Bright colored chalk for marking positions on pavement

Truck Demonstration Station Map

- ❑ **Station 1** (Tents on Passenger Side of Trailer):
 - Staging Point for Students and Demonstration Personnel.
- ❑ **Station 2** (Rear of Truck):
 - Rear Blind Spot, Proper Following Distance & Turning Trucks
- ❑ **Station 3** (Inside Cab):
 - Blind Spots & No Passing on Right
- ❑ **Station 4** (Left Side & Front of Truck)
 - Passing (Pass Properly & Don't Cut In)
 - Front Blind Spot



Station 1: Staging Point for Students and Demonstration Personnel



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Station 1: Set up, Staff, and Procedure



- **Set up:** Place tents on the passenger side in adjacent lane halfway down the trailer.
- **Staff:** Driver/Safety Manager A
 - Teacher may stand with students at Station 1 if not enough drivers/safety managers available.
- **Procedure:** Station 1 leader will describe how the hands-on demo will work, depending on class size and availability of truck drivers/managers.
 - Example: a class of 18 can be broken into 6 groups of 3 students. Three groups may begin at a teaching station (Station 2, 3, or 4). The other 9 students will wait in the tents on the passenger side of the truck at Station 1. Essentially, students in groups of 3 will move in a clockwise fashion through the 3 teaching stations in and around the truck.
- **Talking Points:** There are no talking points for Station 1

Station 2: Rear Blind Spot, Proper Following Distance & Turning Trucks



Station 2: Set up and Staff



- **Set up:** Place a car in the truck's rear blind spot (80 ft. back) and place an **X** using chalk at a safe following distance (distance far enough back to where the mirrors are visible when positioned in the driver seat position of a following vehicle).
- **Staff:** Driver/Safety Manager B

Station 2: Procedure



- **Procedure:** Station 2 leader should keep track of the timing of the groups working through the stations.
 - Take 3 students from tent to car at rear of truck. Explain that the car is in rear blind spot.
 - Walk them to the **X** and ask them if they can see the truck's mirrors. Explain that if you can't see the truck's side-mirrors, the truck driver can't see you.
 - Explain that trucks make wide turns and it is unsafe to pass a turning truck.
 - After 4 min, walk students to the cab and help students into the cab.
 - Return to the tent and get next 3 students and begin circuit again.

Station 2: Talking Points for Rear Blind Spot



- **Position:** Stand next to car in rear blind spot
- **Prompt Question:** “We are in the rear blind spot. Why is this spot a bad place to be?”
- **Responses:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “Following this close behind a truck is dangerous for lots of reasons. You can’t see what’s in front of the truck on the road ahead. If the truck straddles debris in the road, like a truck tire, you won’t see it in time to safely avoid hitting it.”
 - ▣ “If the truck driver brakes and you are following this close, you won’t have enough time and space to avoid crashing into the back of the truck.”
 - ▣ “Another problem with being in this blind spot is that some trucks carry cargo that may move and fall from the truck onto the road in front of you, leaving you no time or space to avoid an accident. So stay back ... it is unsafe to be this close.”

Station 2: Talking Points for Proper Following Distance



- **Position:** Move back to the X
- **Prompt Question:** “How do you decide if you are far enough back when following a truck?”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “A good way to know if you are far enough back is to look for the truck driver’s mirrors as you are following. To do this properly, first be sure your car and the truck are both centered in the lane. Once you are centered, look for the truck’s side mirrors. Ideally you want to be far enough back to see the mirrors on both sides of the truck. But, at a minimum, you should see the mirrors on the left side. And remember if you don’t see his side mirrors, he doesn’t see you.”

Station 2: Talking Points for Turning Truck



- **Position:** Stand at X
- **Prompt Question:** “Why is it dangerous to pass a truck on the right, especially at an intersection?”
- **Responses:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “It is never safe to pass a truck on the right. The right side has the largest blind spot around a truck. And at intersections, such as stoplights, it is especially risky because heavy trucks swing left before they turn right so they can get their trailer around the corner safely. If you try to squeeze between a truck and the curb, you can get crushed. Stay back and wait. Let the truck make its turn.”

Station 3: Blind Spots & No Passing on the Right



Station 3: Set up, Staff, and Procedure



- **Set up:** Make space available for 3 students to sit in cab
- **Staff:** Driver/Safety Manager C
- **Procedure:**
 - 3 students will sit in the cab at a time, with each student having a chance to sit in the driver's seat to see blind spots.
 - Students take turns in driver's seat learning about blind spots and passing behavior (avoid right side).
 - After 4 minutes they will go to Station 4.
 - Station 4 Driver/Safety Manager should help students out of the cab as they move to Station 4.

Station 3: Talking Points for Overall Visibility



- **Position:** Students sitting in truck driver seat, passenger seat, and on a stool in between other seats. Driver/Safety Manager sits in sleeper berth area.
- **Prompt Question:** “**Sitting and looking out the window and in all these mirrors, do you think a truck driver has better visibility around her truck than you do in your car?**”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - “I know it is hard to believe because we are sitting up so high and we have all these mirrors, but a truck driver DOES NOT have better visibility around her truck than you do in your car. The truck driver has blind spots all around the truck where your car disappears from her view.”

Station 3: Talking Points for Blind Spots



- **Position:** Students sitting in truck driver seat, passenger seat, and on a stool in between other seats. Driver/Safety Manager sits in sleeper berth area.
- **Prompt Question:** “**What do you see behind the truck?**”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “If you recall there is a car about 80 feet behind the truck. That car is in the rear no zone. As a truck driver, you can’t see someone that is in that rear no zone or blind spot. Trucks don’t have rearview mirrors.”

Station 3: Talking Points for Blind Spots



- **Position:** Students sitting in truck driver seat, passenger seat, and on a stool in between other seats. Driver/Safety Manager sits in sleeper berth area.
- **Prompt Question:** “**Look in the mirror on the left, what can you see?**”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “You can’t see the car because the car is in the left blind spot. The blind spot on this left side of the truck is small and located here along the cab. It is okay to pass on this left side, just don’t linger.”

Station 3: Talking Points for Blind Spots



- **Position:** Students sitting in truck driver seat, passenger seat, and on a stool in between other seats. Driver/Safety Manager sits in sleeper berth area.
- **Prompt Question:** “**Look out through the windshield, do you see a car in front of the truck?**”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “There is a car located directly in front of the truck in the front no zone. Do not cut into that no zone. If you cut in there and hit the brakes the truck driver won’t see you and you will cause a crash. Look for the entire front of the truck cab (bumper to the top of cab) in your rearview mirror before you pull back in. See that car in the passing lane ahead? That is the minimum proper passing distance for merging in front of a truck.”

Station 3: Talking Points for Blind Spots



- **Position:** Students sitting in truck driver seat, passenger seat, and on a stool in between other seats. Driver/Safety Manager sits in sleeper berth.
- **Prompt Question:** “**Look in the mirror on the right, do you see the tents?**”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “Take a moment and think about how big those tents are that you were standing under. That is a HUGE area where the truck driver can’t see you at all. When you need to pass a heavy truck, DON’T pass on the RIGHT. It is the most dangerous area to try and pass!”

Station 3: Talking Points for Blind Spots



- **Overall Point for Blind Spots:**
 - ▣ “So remember, a heavy truck has 4 no zones or blind spots where your car ‘disappears’ from the truck driver’s view. The no zones are at the front, back, left, and right sides of the truck. These areas are dangerous. The only blind spot you should ever be in is the left blind spot and you should move through it steadily when you are passing a truck.”

Station 4: Passing (Pass & Don't Cut In) & Front Blind Spot



Station 4: Set up and Staff



- **Set up:** Position a car in left blind spot, a car in front blind spot, and a car in the passing lane in front of the truck at the distance ahead a car should be before pulling in front of a truck.
- **Staff:** Driver/Safety Manager D

Station 4: Procedure



- **Procedure:** Explain proper procedure for passing a truck.
 - Pass steadily on left, do not linger.
 - Point out car in left blind spot. Tell students to pass on left and don't linger in no-zone.
 - As you pass a truck, look to see the entire front of the truck in your rearview mirror
 - If time allows, let students get in car and look for front of the truck in rearview mirror.
 - Signal intention to change lanes.
 - Make sure you are far enough ahead before pulling in front of the truck.
 - Point out car at the correct distance ahead of truck [*when you can see the entire front of the truck (top of cab to bottom of bumper) in your rear view mirror*] prior to pulling in versus the car that is in the front no-zone.
 - Once you change lanes, maintain speed (do not slow down!)
 - Stress that students should NEVER cut off a truck.
 - Take 3 students to the tent and repeat circuit.

Station 4: Talking Points for Proper Passing Behavior



- **Position:** Standing at car located in front left passing lane. Look back at car in left no zone.
- **Prompt Question:** “Why is it best to pass a truck in the left lane?”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “Pass a truck in the left lane because that is the side where the truck driver is sitting. He can see better on his left side. The left blind spot is much smaller than the right blind spot. So the BEST place to pass is on the left at a steady speed, just don’t linger alongside the truck.”

Station 4: Talking Points for Pulling in Front of a Truck



- **Position:** Standing and/or sitting in car in front left passing lane.
- **Prompt Question:** “After passing a truck, what should you do before pulling back in front of it?”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - ▣ “Before you pull in front of a truck, signal your intent to change lanes AND as part of safe scanning, glance in your mirrors to see if you have enough space. You want to see AT A MINIMUM the entire front of the truck in your rearview mirror (bottom of bumper to top of cab). You must leave plenty of space between you and the truck before you pull in front. Never cut into the front no zone [*point to car in the front no zone*], or you can cut your life short. Then once you safely pass, maintain your speed.”

Station 4: Talking Points for Front Blind Spot



- **Position:** Standing at car in front no zone.
- **Prompt Question:** “When you were in the cab, could you see that car through the windshield?”
- **Response:** Confirm anything correctly answered, but go over all points below regardless.
 - “The car is in the truck’s front no zone. The front no zone of a truck can extend more than 20 feet. Imagine you are driving down the road and you cut in front of a truck, putting yourself in the front no zone. A moment later, a deer runs into the road and you slam on your brakes. The truck will not have time to stop and you will have an approx. 80,000 lb. truck crashing into the back of your car. Don’t put yourself and others in harm’s way—stay out of the front no zone.”

Quick Quiz: Key Sharing the Road Information



Quick Quiz

- After the video and/or hands-on experience, give students a quick quiz. Ask them questions about the key sharing the road information they learned. Make sure and cover at least these key sharing the road tips:
 - ▣ Don't Hang Out in the No Zone
 - ▣ Properly Pass
 - ▣ Don't Cut Off Trucks
 - ▣ Don't Get Squeezed
 - ▣ Maintain Safe Following Distance

Quick Quiz: Don't Hang out in The No Zone

□ Question*

The heavy-truck no zone (truck blind spots or areas where a driver cannot see other motorists) contains the following areas around the truck. (Please choose one option from the list)

- A. The right and left sides of a truck only
- B. The front and back of a truck only
- C. The right side and back of a truck only
- D. The front, back, left and right sides of a truck

□ Answer

The answer is D. A heavy truck has 4 blind spots where your car "disappears" from the truck driver's view. The no zones are at the front, back, left, and right sides of the truck. These areas are dangerous. The only blind spot you should ever be in is the left blind spot and you should move through it steadily when you are passing a truck.

Quick Quiz: Properly Pass

❑ Question*

When you are attempting to pass a heavy truck, which area around the heavy truck is the most dangerous?

- A. Front
- B. Right
- C. Left
- D. Behind
- E. All areas above are equally dangerous

❑ Answer

The answer is B. When you need to pass a heavy truck, DON'T pass on the RIGHT. It is the most dangerous area to try and pass a heavy truck.

Quick Quiz: Properly Pass

❑ Question*

Which is the BEST approach to passing a heavy truck? (Please choose one option from the list)

- A. Heavily accelerate your vehicle until you have completely passed the truck
- B. Pass the heavy truck steadily and do not linger
- C. Do not ever pass a heavy truck
- D. Pass the heavy truck in the left lane while moving steadily and do not linger
- E. All of the above

❑ Answer

The answer is D. Pass a truck in the left lane because that is the side where the truck driver is sitting. He can see better on his left side. The left blind spot is much smaller than the right blind spot. So the BEST place to pass is on the left at a steady speed, just don't linger alongside the truck.

Quick Quiz: Don't Cut Off Trucks

□ Question*

Which sentence below describes the BEST way you can safely share the road with heavy trucks? (Please choose one sentence)

- A. When pulling in front of a heavy truck, signal your lane change well in advance and leave plenty of space.
- B. Give 15 feet of space (1 car length) when merging in front of a truck.
- C. Pass a heavy truck at an intersection when the truck is not signaling a turn because truck drivers always signal the way in which they turn

□ Answer

The answer is A. Before you pull in front of a truck, signal your intent to change lanes AND as part of safe scanning, glance in your mirrors to see if you have enough space. You want to see AT A MINIMUM the entire front of a truck in your rearview mirror (bottom of bumper to top of cab). You must leave plenty of space between you and the truck before you pull in. Never cut into the front no zone of a truck! Once you safely pass, maintain your speed.

Quick Quiz: Don't Get Squeezed

□ Question*

At a roadway intersection, why is it common for a heavy truck to initially turn left while signaling a right turn? (Please choose one option)

- A. Truck drivers are notoriously bad at using their turn signals properly
- B. Truck drivers prefer to make right turns from left lanes only
- C. Truck drivers are making space available on the right side for light vehicles to pass
- D. Truck drivers swing left prior to a right turn so that their trailer can make it around the corner safely

□ Answer

The answer is D. It is never safe to pass a truck on the right. The right side has the largest blind spot around a truck. And at intersections, such as stoplights, it is especially risky because heavy trucks swing left before they turn right so they can get their trailer around the corner safely. If you try to squeeze between a truck and the curb you can get crushed. Stay back and wait.

Quick Quiz: Maintain Safe Following Distance

❑ Question*

True or False? If you can't see the truck driver's mirrors, the truck driver can't see you.

❑ Answer

The answer is True. A good way to know if you are far enough back is to look for the truck driver's mirrors as you are following. To do this properly, first be sure your car and the truck are both centered in the lane. Once you are centered look for the truck's side mirrors. Ideally you want to be far enough back to see the mirrors on both sides of the truck. But at a minimum, you should see the mirrors on the left side. And remember if you don't see his side mirrors, he doesn't see you.

APPENDIX H. SAFETY TOPIC EVALUATION



Heavy-Vehicle Safety Outreach Workshop Safety Topic Evaluation

Please rate

1 = poor 3 = average 5 = excellent

On-screen presentation	1	2	3	4	5
Speaker's knowledge about subject	1	2	3	4	5
Speaker's interaction with audience	1	2	3	4	5
Session length	1	2	3	4	5
Would you recommend this session to others?	1	2	3	4	5
Value of information presented	1	2	3	4	5
Did the session content match the description?	1	2	3	4	5
Overall session evaluation	1	2	3	4	5

1. What is one important objective you learned from this safety topic presentation?

2. What did you find most useful about this safety topic presentation?

3. What did you find least useful about this safety topic presentation?

4. What improvements would you like to see for this safety topic presentation in the future?

REFERENCES

1. National Surface Transportation Safety Center for Excellence. (2013). *Annual Report: January – December 2012*. Blacksburg, VA. Retrieved November 18, 2013, from: <https://secure.hosting.vt.edu/www.apps.vtti.vt.edu/NSTSCE/2012-Annual-Report/#/0>
2. Mayfield, Milton. (2011). Creating training and development programs: Using the ADDIE method. *Development and Learning in Organizations*, 55(3), 1–22.