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Utah Department of Transportation - Research Division
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SNOWPLOW OPERATOR DRIVING TIME: SURVEY OF STATE AND LOCAL PRACTICES

Prepared For:

Utah Department of Transportation
Research Division

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Final Report
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16. Abstract

In February 2015, Utah Department of Transportation (UDOT) issued interim guidance for continuous working hours for UDOT's snowplow operators. Letter of Instruction 15-1 specified the number of hours that could be worked by snowplow operators and the approval required for certain shift lengths. This research examines best practices for snowplow operator driving time to inform development of a formal policy that will replace the Letter of Instruction 15-1 interim guidance.

The major tasks of this research include a literature search that gathered information about the implications of driving time, rest breaks and other driving time policies with a focus on commercial motor vehicle drivers and snowplow operators. Two surveys—one provided to 39 state departments of transportation and another distributed to 20 specially selected UDOT region staff—gathered information about current snowplow operator driving time practices across the country and within UDOT.

Recommendations for UDOT's consideration in preparing a formal policy for snowplow operator driving time include establishing 12-hour shifts given the successes reported by survey respondents; establishing different shift limits for emergency conditions; including breaks in the operator's work schedule; specifying a minimum rest period between shifts that accommodates long commute times for drivers; identifying ways to remediate staffing challenges; considering reducing the level of service during extended storm events; managing public expectations; allowing for flexibility at the area, region or station level; and monitoring the impact of the new policy.

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LIST OF ACRONYMS

CDL	commercial driver's license
CMV	commercial motor vehicle
DOT	department of transportation
DPW	Department of Public Works (Erie County, New York)
EEG	electroencephalogram
FMCSA	Federal Motor Carrier Safety Administration
GAO	Government Accountability Office
HOS	hours of service
LTL	less-than-truckload
NAFMP	North American Fatigue Management Program
SCE	safety-critical events
TL	truckload
UDOT	Utah Department of Transportation

EXECUTIVE SUMMARY

In February 2015, Utah Department of Transportation (UDOT) issued interim guidance for continuous working hours for UDOT's snowplow operators. Letter of Instruction 15-1 specified the number of hours that could be worked by snowplow operators and the approval required for certain shift lengths. This research examines best practices for snowplow operator driving time to inform development of a formal policy for UDOT consideration that will replace the Letter of Instruction 15-1 interim guidance.

The major tasks of this research include a literature search that gathered information about the implications of driving time, rest breaks and other driving time policies with a focus on commercial motor vehicle drivers and snowplow operators. Two surveys—one provided to 39 state departments of transportation (DOTs) and another distributed to 20 specially selected UDOT region staff—gathered information about current snowplow operator driving time practices across the country and within UDOT. Survey responses from 27 state DOTs and 10 UDOT region staff members informed the recommendations presented in this report for UDOT's preparation of a formal policy.

Findings from this project's limited review of relevant research and the snowplow operator driving time practices identified in the two surveys conducted for this project brought to light no particular standard, uniform best practice, or definitive prescription for safe and effective snowplow operator driving time practices. However, this review did identify some general recommendations based on research results, areas of concern highlighted in the literature and survey results, and commonalities in practice that can guide development of a snowplow operator driving time policy.

Results of the literature search indicate that fatigue can begin as quickly as the second hour of driving, and shift length may be less important than time of day when seeking to reduce driver fatigue. Rest breaks and minimum rest periods between shifts can reduce the likelihood of crashes, and shorter sleep, sleep in the early stage of a nonwork period and getting less sleep between 1 a.m. and 5 a.m. can all be problematic for commercial drivers.

The surveys sought information about shift length, a key element of UDOT's interim guidance and any future policy. Almost all respondents specify a maximum shift length under one or more of the situations examined in the survey (typical and emergency conditions, and required by policy, union agreement or regulation). While respondents reported a wide range of shift lengths—from a low of seven and one-half hours to shifts of unlimited length—the most frequently cited maximum shift length reported by state DOTs was 12 hours. Most state DOTs and UDOT regions specify different shift limits in different situations.

The following recommendations for preparation of a formal policy with regard to driving time limits for UDOT snowplow operators are derived from project findings:

- Consider shift start and end times to help reduce fatigue in night shift crews.
- Consider the use of 12-hour shifts given the successes reported by survey respondents.
- Establish different shift limits for emergency conditions.
- Include breaks in the operator's work schedule.
- Consider specifying a minimum rest period between shifts that accommodates long commute times for drivers living some distance from the station.
- Identify ways to remediate staffing challenges to better manage snowplow operator driving time and address the impact of limited staff, such as:
    - Staggering shift changes.
    - Approving enough on-call and seasonal drivers to fill the shifts, and providing adequate training.
    - Rotating drivers among various conditions.
    - Deploying all agency resources at the outset of a storm.
- Consider reducing the level of service during extended storm events.
- Manage public expectations if the policy allows for reductions in current levels of service under certain circumstances.
- Allow for flexibility at the area, region or station level to meet the unique demands of each region and station.
- Monitor the impact of the new policy by soliciting feedback from UDOT region staff and other stakeholders.

1.0 INTRODUCTION

1.1 Problem Statement

In February 2015, Utah Department of Transportation (UDOT) issued interim guidance for continuous working hours for UDOT's snowplow operators. Letter of Instruction 15-1 specified the number of hours that could be worked by snowplow operators, the approval required for certain shift lengths, a maximum shift length after which operators are to be released from their duties and the minimum time an operator must be off duty before returning to work. UDOT issued this policy as an interim measure while investigation continued into development of a final policy defining safe practices related to operator time in a snowplow.

1.2 Objectives

This research examines best practices for snowplow operator driving time to inform development of a formal policy for UDOT consideration that will replace the Letter of Instruction 15-1 interim guidance.

The major tasks of this research include a literature review to examine over-the-road trucking, local trucking and snowplow operator shift-related requirements and guidelines; the factors critical to setting driving/operation limits; and publicly available documents that specify driving/operation limits for local agencies or other entities responsible for winter maintenance. Two surveys—one provided to state departments of transportation (DOTs) and another distributed to selected UDOT region staff—sought information about current snowplow operator driving time practices from both the state and local perspectives. Augmenting a core set of questions common to both surveys, state- and UDOT-specific questions gathered information about outsourcing practices at the state level and local practices before and after distribution of UDOT's interim guidance on snowplow operator driving time.

1.3 Outline of Report

This report is organized in the following sections: Section 2 presents findings from a literature review, with a brief narrative summarizing the results followed by an annotated list of citations. In Section 3, results of the survey of state DOTs are presented; Section 4 presents results of the UDOT region survey. In Section 5, results from the literature review and the two surveys are compiled and analyzed. Section 6 provides a preliminary set of recommendations for UDOT's review in advance of preparing a draft policy that specifies snowplow operator duration of operations.

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2.0 LITERATURE REVIEW

2.1 Overview

This section provides an overview of recent literature regarding over-the-road trucking, local trucking and snowplow operator shift-related requirements and guidelines; the factors critical to setting driving/operation limits; and publicly available documents that specify driving/operation limits for local agencies or other entities responsible for winter maintenance. A brief summary of the literature is followed by annotated citations.

2.2 Summary of the Literature

2.2.1 Managing Fatigue in Winter Operations

An April 2014 Clear Roads report sought to address the dearth of fatigue-related literature specific to snowplow operators with a report that offers "… cost-effective, realistic recommendations for reducing or eliminating winter maintenance operator fatigue." Researchers recommended the use of breaks and suggested considering operators' sleep schedules when scheduling a night shift. As the report indicates, "research shows that sleep schedules that do not correspond to the circadian rhythm tend to provide inadequate amounts of rest." The circadian rhythm is described by the National Institutes of Health as the "physical, mental and behavioral changes that follow a roughly 24-hour cycle, responding primarily to light and darkness in an organism's environment."

The Clear Roads report also indicates that research shows "an increased risk of winter maintenance operator fatigue during circadian lows (between 2:00 a.m. and 6:00 a.m.)," and noted that "star[t]ing or ending a shift during these times may be dangerous." This early-morning period may also "be the best time to encourage drivers to take a break." Researchers also noted that "[a]s non-driving activities impact the winter maintenance operator's level of fatigue, shift length should take into consideration any possible non-driving responsibilities."

In another, undated report that examined fatigue management by private contractors providing snowplowing service to Alberta, Canada, researchers noted that tolerance for erratic sleep schedules and sleep deprivation tends to decrease with age. The length of a shift was less important than time of day, time awake and the amount of sleep a driver had before beginning a shift.

2.2.2 Federal Rules

Federal hours of service (HOS) regulations are not applicable to snowplow operators but may inform development of winter maintenance shift limits. Much of the research conducted in connection with driver fatigue—a factor in setting snowplow operator shift limits—centers around the federal HOS rules. The federal regulations impose an 11-hour limit for property-carrying commercial motor vehicle (CMV) drivers after 10 consecutive hours off duty. Drivers are not permitted to drive beyond the 14th consecutive hour after coming on duty. A rest break of at least 30 minutes is required after eight hours (not applicable to drivers using short-haul exceptions). In December 2014, enforcement of the federal requirement for use of a 34-hour restart after 60/70 hours on duty in seven/eight consecutive days was suspended pending submission of a report to Congress.

2.2.3 Shift Length

Some studies have found that fatigue can set in quickly. In one study, researchers identified the second hour of driving as being more hazardous than the first hour, and hazards near the 11th hour have three times the hazard odds of the first driving hour.

In examining the crash risk associated with the number of hours spent driving, one study found that crash odds increased after the fourth and sixth hours of driving. In another study, crash risk was estimated to increase by 50 to 260 percent as compared to the first hour of driving. Researchers examining sleeper and nonsleeper CMV operations found that for nonsleeper operations, crash risk is strongly associated with multiday driving somewhat more than with hours of driving. In other research, findings indicate the longer the shift, the greater the possibility for the driver to experience a safety-critical event (SCE).

2.2.4 Rest Breaks and Minimum Rest Periods

Breaks can be used to mitigate the effects of driver fatigue. In one study, breaks reduced crash odds up to 50 percent as compared to drivers with no breaks; another study places that number as high as 85 percent. When comparing nap and rest breaks, researchers found that a nap break reduced physiological and self-reported sleepiness, while an active rest break did not reduce physiological sleepiness but did result in a reduction in an operator's self-assessment of sleepiness. The latter case indicates that operators taking active rest breaks may incorrectly assess their level of sleepiness.

Taking more rest breaks can help to reduce crash risk, with one study indicating that two rest breaks are sufficient for a 10-hour trip. This researcher noted that a 30-minute break is usually adequate. In other research, breaks were found to be beneficial in reducing SCEs and counteracting what researchers described as the "negative effects of time-on-task." Some research findings suggest that drivers may need some time to adjust to driving tasks after a rest break. In one study evaluating crash risk in connection with a range of factors, researchers found that crash odds were lowest when drivers returned to work after a minimum period of off-duty time. Extended recovery periods tended to have the opposite effect.

2.2.5 Sleep Patterns and Drowsiness

Sleepiness studies often consider multiday schedules. In one study, sleepiness was most prevalent on the first night and least on morning shifts. Another study evaluated sleep patterns in connection with the rate of SCEs, finding that the highest rate of SCEs was associated with shorter sleep, sleep in the early stage of a nonwork period and getting less sleep between 1 a.m. and 5 a.m. A study that took place over a 20-hour period where operators were continuously kept awake evaluated driver performance at different points during the 20-hour period. Steering performance deteriorated the longer drivers were kept awake. Researchers identified an increase in steering instability during an afternoon drive as compared to drives in the morning and evening, which suggests a circadian rhythm effect.

2.2.6 Human Factors

Research conducted on drowsiness in CMV drivers found higher levels of drowsiness to be associated with younger and less experienced drivers. In another study, researchers found an association between drivers with fewer years of CMV driving experience and higher body mass index with deteriorated driving performance and increased driving risk.

2.2.7 Local Practices

In this section, shift limits for large cities in snow states are provided to augment the driving time practices highlighted in the survey responses described in Sections 3 and 4. Also included are policy templates intended for use by local agencies in defining work schedules and other issues related to winter maintenance.

2.3 Annotated Citations

2.3.1 Managing Fatigue in Winter Operations

Environmental Factors Causing Fatigue in Equipment Operators During Winter Operations, Virginia Tech Transportation Institute, Clear Roads Pooled Fund, April 2014. http://clearroads.org/wp-content/uploads/dlm_uploads/11-05-Factors-Causing-Fatigue-Final-Report_MnDot.pdf

This report's executive summary offers a series of "cost-effective, realistic recommendations for reducing or eliminating winter maintenance operator fatigue [that] were derived from the literature review, naturalistic and actigraph data, and the winter maintenance operator and manager questionnaires." Among them (from page 19 of the PDF):

- **Encourage use of breaks/naps:** Management should continue to encourage winter maintenance drivers to take breaks/naps when fatigued/tired. Results from the questionnaires revealed there was little emphasis on the use of body movement and naps to reduce fatigue.
- **Investigate winter emergency shift start/end times (including shift length):** Research shows an increased risk of winter maintenance operator fatigue during circadian lows (between 2:00 a.m. and 6:00 a.m.). Thus, star[t]ing or ending a shift

during these times may be dangerous. This may also be the best time to encourage drivers to take a break. Furthermore, winter maintenance operators may be at an increased risk of fatigue at the start of a shift and after an extended period of driving. Shift start and end times should be assigned with consideration of circadian lows. As nondriving activities impact the winter maintenance operator's level of fatigue, shift length should take into consideration any possible nondriving responsibilities.

- **Offer shift options:** Winter maintenance operators' rest periods preceding their shifts should be taken into account when scheduling shifts. Research shows sleep schedules that do not correspond to the circadian rhythm tend to provide inadequate amounts of rest. Therefore, if the winter maintenance operator was required to work a night shift just prior to being scheduled, this should be considered by management before requiring another night shift.

The report's Appendix J, which begins on page 222 of the PDF, includes results from the project's winter maintenance operator questionnaire. Results related to shift length and breaks begin on page 243 of PDF.

Snowplow Operation: Unique Issues in Fatigue Risk Management, Marlene Reimer, Adam Moscovitch, Ron Heslegrave and Matthew Kealey, undated.
http://www.ibrarian.net/navon/paper/SNOWPLOW_OPERATION__UNIQUE_ISSUES_IN_FATIGUE_RISK.pdf?paperid=11995175
This Canadian report examines the fatigue management processes of six private contractors providing snow clearing services to Alberta, Canada. The project's literature review indicates:

- Vigilance, judgment and safety declined in relation to hours on the job.
- Duration of driving is less important than time of day, time awake and previous sleep duration.
- Safety risks are compounded by the interaction of operator factors, working conditions and environmental conditions.

Other findings with regard to the impact of internal and external variables on fatigue:

- Tolerance for erratic sleep schedules and sleep deprivation tends to decrease with age.
- Differences in hours of daylight between summer and winter affect mood and alertness.

2.3.2 Fatigue Management Guidance

North American Fatigue Management Program: A Comprehensive Approach for Managing Commercial Driver Fatigue, North American Fatigue Management Program (NAFMP) Steering Committee, 2016.
http://www.nafmp.org/en/
From the website: The NAFMP is designed to address the issue of driver fatigue with a comprehensive approach that includes:

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

NAFMP offers training in a variety of formats, including PowerPoint presentations that are available on the website with and without audio narration. Among the issues addressed in the NAFMP training program's Module 9, Driver Scheduling and Tools, available at https://www.dropbox.com/s/rwau8t6aavn3ixk/module_09_en_audio.ppsx?dl=1, are ways to "maximize the benefit of scheduling tools in ongoing operations."

2.3.3 Federal HOS Regulations

Summary of Hours of Service Regulations, Federal Motor Carrier Safety Administration, December 2014.
https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations
This Web page summarizes the HOS rules applicable to CMV drivers. These rules are not applicable to state winter maintenance operators but may be of interest when considering shift limits for snowplow operators. Separate rules apply to property-carrying and passenger-carrying drivers. The following summarizes the rules currently in effect for property-carrying drivers:

- *11-hour driving limit*. May drive a maximum of 11 hours after 10 consecutive hours off duty.

- *14-hour limit*. May not drive beyond 14th consecutive hour after coming on duty after 10 consecutive hours off duty; off-duty time does not extend the 14-hour period.
- *Rest breaks*. May drive only if eight hours or less have passed since end of driver's last off-duty or sleeper berth period of at least 30 minutes. Does not apply to drivers using short-haul exceptions.

In December 2014, enforcement of requirements for use of a 34-hour restart was suspended and will remain so "until the Secretary submits the CMV Driver Restart Study final report to Congress."

Field Study on the Efficacy of the New Restart Provision for Hours of Service, Hans P. A. Van Dongen and Daniel J. Mollicone, Federal Motor Carrier Safety Administration, January 2014.
http://ntl.bts.gov/lib/51000/51400/51417/Efficacy-of-HOS-Restart-Rule-Report.pdf
The abstract describes the objective of this research:

> The objective of this research project was to examine the efficacy of the new restart rule promulgated as part of the Hours of Service of Drivers Final Rule, published on December 27, 2011, with a compliance date of July 1, 2013. Under the new restart rule, if commercial motor vehicle (CMV) drivers choose to use a provision allowing "restart" of the 60- or 70-hour duty-cycle limit, they are required to include at least two nighttime periods (from 1 a.m. until 5 a.m.) in their restart breaks in order to have sufficient time for sleep recuperation before beginning another duty cycle.

Findings as summarized in the article's abstract include:

- Drivers affected by the new rule were primarily nighttime drivers, the drivers who are at the greatest risk of fatigue.
- Drivers affected by the new rule reverted to a predominantly nighttime sleep schedule during the restart break. Extending the restart break for drivers affected by the new rule to include an additional nighttime period provides them with greater opportunity for sleep recuperation.
- Having at least two nighttime periods (from 1 a.m. until 5 a.m.) in the restart break helps to mitigate fatigue.

Related Resource:

Motor Carrier Safety: Additional Research Standards and Truck Drivers' Schedule Data Could Allow More Accurate Assessments of the Hours of Service Rule, Report to Congressional Requesters, United States Government Accountability Office, July 2015.
http://www.gao.gov/assets/680/671716.pdf
This Government Accountability Office (GAO) report to Congress evaluates the January 2014 report cited above that assesses the impact of the 2013 changes in the Federal Motor Carrier Safety Administration's (FMCSA's) HOS regulations. The GAO report highlighted concerns about the FMCSA's research methods that may have overstated the extent to which crash risk is reduced by the change to the HOS rule.

2.3.4 Shift Limits/HOS

Hours of Service and Driver Fatigue: Driver Characteristics Research, Paul P. Jovanis, Kun-Feng Wu and Chen Chen, Federal Motor Carrier Safety Administration, May 2011.
http://ntl.bts.gov/lib/51000/51300/51317/HOS-Driver-Fatigue.pdf
In this study, carrier-supplied driver logs were used to examine the probability of a crash after a certain amount of driving time. Two types of drivers were included in the study—truckload (TL) and less-than-truckload (LTL). Findings as summarized in the report's abstract include:

- LTL drivers experienced increased crash odds after the sixth hour of driving.
- Breaks from driving reduced crash odds. In particular, a second break reduced crash odds by 32 percent for TL drivers and 51 percent for LTL drivers.
- Researchers identified an increase in crash odds associated with the return to work after a recovery period of 34 hours or more.

"Hours of Service and Truck Crash Risk: Findings from Three National U.S. Carriers During 2004," Sang-Woo Park and Paul Jovanis, *Transportation Research Record 2194*, pages 3-10, 2010.
Citation at http://trrjournalonline.trb.org/doi/abs/10.3141/2194-01
In this study, researchers examined truck crashes using data from three trucking companies from 2004, when new commercial truck driver HOS regulations went into effect in the United States.

Findings as summarized in the article's abstract include:

- Increased crash risk is associated with hours of driving, with risk increases of 50 percent to 260 percent compared with the first hour of driving.
- Models of nonsleeper operations indicate that crash risk is strongly associated with multiday driving somewhat more than with hours of driving. This contrasts with models of sleeper operations, which indicate strong association of crash risk with hours driving.

2.3.5 Shift Timing

"Sleepiness, Sleep, and Use of Sleepiness Countermeasures in Shift-Working Long-Haul Truck Drivers," M. Pylkkönen, M. Sihvola, H. K. Hyvärinen, S. Puttonen, C. Hublin and M. Sallinen, *Accident Analysis & Prevention*, Vol. 80, pages 201-210, July 2015.
Citation at http://dx.doi.org/10.1016/j.aap.2015.03.031
Using unobtrusive data-collection methods and a self-report questionnaire of 54 long-haul truck drivers, researchers categorized drivers' working hours based on shift timing. Findings as summarized in the article's abstract include:

- Severe sleepiness was most prevalent on the first night and least on the morning shifts.
- Drivers slept reasonably well prior to duty hours, with main sleep being longest prior to the first night and shortest prior to the morning shifts.
- Drivers reported using at least one sleepiness countermeasure outside statutory rest breaks more often for the night than the non-night shifts.
- Compared to the day/evening shifts, the odds of severe sleepiness were greater only on the first night shifts.

2.3.6 Rest Breaks and Minimum Rest Periods

"Stop and Revive? The Effectiveness of Nap and Active Rest Breaks for Reducing Driver Sleepiness," Christopher N. Watling, Simon S. Smith and Mark S. Horswill, *Psychophysiology*, Vol. 51, No. 11, pages 1131-1138, November 2014.
Citation at http://dx.doi.org/10.1111/psyp.12256

In this study, researchers compared the effects of two sleepiness countermeasures—a nap break and an active rest break—using physiological, subjective and driving performance measures (the physiological test is an EEG (electroencephalogram), a test that detects electrical activity in the brain). Participants completed two hours of simulated driving, followed by a 15-minute nap break or a 15-minute active rest break, and then completed another hour of simulated driving. Findings as summarized in the article's abstract include:

- The nap break reduced physiological and subjective sleepiness.
- The active rest break did not reduce physiological sleepiness, with sleepiness levels eventually increasing, and resulted in an immediate reduction of subjective sleepiness.
- No difference was found between the two breaks for the driving performance measure.

As researchers noted, "[t]he immediate reduction of subjective sleepiness after the active rest break could leave drivers with erroneous perceptions of their sleepiness, particularly with increases of physiological sleepiness after the break."

"Modeling the Safety Impacts of Driving Hours and Rest Breaks on Truck Drivers Considering Time-Dependent Covariates," Chen Chen and Yuanchang Xie, *Journal of Safety Research*, Vol. 51, pages 57-63, December 2014.
Citation at http://dx.doi.org/10.1016/j.jsr.2014.09.006
Researchers applied modeling to investigate the effects of driving hours and rest breaks on safety. Using data collected from two national TL carriers in 2009 and 2010, researchers divided driving time into 11 one-hour intervals. Findings as summarized in the article's abstract include:

- Only the crash odds ratio of the 11th driving hour is statistically significant.
- Taking one, two and three rest breaks can reduce drivers' crash odds by 68 percent, 83 percent and 85 percent, respectively, as compared to drivers who did not take rest breaks.
- Findings suggest that drivers may need some time to adjust to normal driving tasks after a rest break.

"The Impacts of Multiple Rest-Break Periods on Commercial Truck Driver's Crash Risk," Chen Chen and Yuanchang Xie, *Journal of Safety Research*, Vol. 48, pages 87-93, February 2014.

Citation at http://www.sciencedirect.com/science/article/pii/S0022437513001722

The article's abstract includes these findings from an investigation of the impact of off-duty periods and rest breaks on the safety of commercial truck operations:

- Increasing the total duration of rest breaks can consistently reduce fatigue-related crash risk.
- Taking more rest breaks can help to reduce crash risk.
- Two rest breaks are generally considered enough for a 10-hour trip, with three or more rest breaks not resulting in a substantial reduction in crash risk.
- The length of each rest break does not need to be very long, with 30 minutes usually adequate.
- Taking rest breaks too soon after a trip starts will cause the rest breaks to be less effective.

"Effects of Hours of Service and Driving Patterns on Motor Carrier Crashes," Paul P. Jovanis, Kun-Feng Wu and Chen Chen, *Transportation Research Record 2281*, pages 119-127, 2012.

Citation at http://dx.doi.org/10.3141/2281-15

Using data logs from LTL carrier operations in 2004 to 2005 and 2010, researchers estimated the probability of a crash after a certain amount of time spent driving. Findings as summarized in the article's abstract include:

- A consistent increase in crash odds was observed as driving time increased beyond the fourth hour.
- Breaks from driving reduced crash odds by as much as 50 percent as compared to drivers with no breaks.
- Crash odds were lowest when drivers returned to work with at least a minimum required off-duty time but without an extended recovery period immediately preceding the return to work.

- Drivers returning to work immediately after a 34-hour recovery period had crash odds 50 percent to 150 percent higher than drivers without the extended recovery period immediately before a trip. This effect diminished over time.

"Analysis of Discrete Hazard and Survival of Driving Hours with Rest Breaks for Drivers of Truckload Carriers," Chen Chen, Peter G. Furth and Daniel M. Dulaski, *TRB 91st Annual Meeting Compendium of Papers DVD*, Paper #12-1941, 2012.
Citation at http://trid.trb.org/view/2012/C/1129541
Researchers used statistical methods to identify how driving hours with rest breaks influence truck drivers' crash risk using data from two national TL carriers. Findings as summarized in the article's abstract include:

- The second driving hour can decrease the hazard rate by 32 percent compared to the first driving hour. Hazard odds near the 11th driving hour are three times the hazard odds of the first driving hour.
- Rest breaks (for purposes of this study, only off-duty and sleeper berth breaks) during the last trip also reduce crash risk.
- Having only one break, or having three or more breaks, yields a slightly lower crash risk than having no breaks during the last trip.

2.3.7 Influence of Tasks on Driver Fatigue

The Impact of Driving, Non-Driving Work, and Rest Breaks on Driving Performance in Commercial Motor Vehicle Operations, Myra Blanco, Richard J. Hanowski, Rebecca L. Olson, Justin F. Morgan, Susan A. Soccolich, Shih-Ching Wu and Feng Guo, Federal Motor Carrier Safety Administration, May 2011.
http://ntl.bts.gov/lib/51000/51300/51387/Work-Hours-HOS.pdf
Using data from the Naturalistic Truck Driving Study, researchers examined the activities conducted during a 14-hour workday, including the relationship between SCEs and driving hours, work hours and breaks. Findings include:

- On average, drivers spent 66 percent of their shift driving, 23 percent in nondriving work and 11 percent resting.

- Analyses on work hours (i.e., driving in addition to nondriving work) found that the risk of being involved in an SCE increased as work hours increased. This suggests that time-on-task effects may not be related to driving hours alone, but implies an interaction between driving hours and work hours.
- Breaks from driving were found to be beneficial in reducing SCEs (during a one-hour window after a break) and were effective to counteract the negative effects of time-on-task.

2.3.8 Sleep Patterns

"The Influence of Daily Sleep Patterns of Commercial Truck Drivers on Driving Performance," Guang Xiang Chen, Youjia Fang, Feng Guo and Richard J. Hanowski, *Accident Analysis & Prevention*, Vol. 91, pages 55-63, June 2016.
Citation at http://www.sciencedirect.com/science/article/pii/S0001457516300604
Using data from the Naturalistic Truck Driving Study, researchers examined the sleep patterns of 96 commercial truck drivers during nonwork periods to evaluate the influence of sleep patterns on truck driving performance. After identifying four distinct sleep patterns, researchers measured driving performance by the incidence of SCEs. Findings as summarized in the article's abstract include:

- The sleep pattern with the highest SCE rate was associated with shorter sleep, sleep in the early stage of a nonwork period, and less sleep between 1 a.m. and 5 a.m.
- Male drivers with fewer years of commercial vehicle driving experience and higher body mass index were associated with deteriorated driving performance and increased driving risk.

The Effect of Sleep Deprivation on Driving Performance, John Bloomfield, Kathleen A. Harder and Benjamin J. Chihak, Intelligent Transportation Systems Institute, Center for Transportation Studies, University of Minnesota, January 2009.
http://www.cts.umn.edu/Publications/ResearchReports/pdfdownload.pl?id=1078
Twenty CMV drivers participated in this study that examined their driving performance in a single experimental session that took place over a 20-hour period during which the participants were continuously kept awake. The session included four drives—a morning drive that began at

9 a.m., an afternoon drive that began at 3 p.m., an evening drive that began at 9 p.m. and a late-night drive that began at 3 a.m. The following are excerpts from the results, which begin on page 41 of the PDF:

- *Steering*. The steering performance of CMV operators was somewhat impaired after they had been continuously kept awake for 20 hours, with a "considerable increase in steering instability" from the morning drive to the 3 a.m. nighttime drive.
- *Steering*. Researchers found an increase in steering instability during the afternoon drive compared to the steering instability values obtained in the morning and evening, which suggests a circadian rhythm effect.
- *Time of day performance*. Results obtained with two reaction time tests did not show reductions in performance related to the time of day. Instead, results suggested that performance improved and there may have been practice effects.

2.3.9 Drowsiness

An Assessment of Driver Drowsiness, Distraction, and Performance in a Naturalistic Setting, Lawrence C. Barr, C. Y. David Yang, Richard J. Hanowski and Rebecca Olson, Federal Motor Carrier Safety Administration, February 2011.
http://ntl.bts.gov/lib/36000/36200/36202/DOT-VNTSC-FMCSA-04-01.pdf
In this study, researchers sought to assess the impact of drowsiness on driving performance using video data collected in a previous FMCSA study of the effects of fatigue on drivers in local/short haul operations. Findings as summarized in the article's abstract include:

- Higher levels of drowsiness were found to be associated with younger and less experienced drivers.
- A strong and consistent relationship was found between drowsiness and time of day. Drowsy driving events were twice as likely to occur between 6 a.m. and 9 a.m. as compared to nondrowsy driving.
- Approximately 30 percent of all observed instances of drowsiness occurred within the first hour of the work shift.

Results also indicate that drowsiness occurred during periods of extremely low driver workload brought on by boredom and monotony. As the researchers noted in the report's conclusion,

"… few quantitative data exist to characterize the relationship between driver workload, distraction, and drowsiness. Providing a better understanding of this relationship could be an area for further research."

2.3.10 Local Practices

2.3.10.1 Colorado

Snow and Ice Removal, Douglas County, Colorado, 2015.
http://www.douglas.co.us/road-work/snow-and-ice-removal/
Douglas County is part of the Denver-Aurora-Lakewood metropolitan statistical area. The county's website identifies the number of shifts and length of shifts for its snowplow operators.
Excerpts from the website:

> **Number of shifts and length of shifts for drivers:**
> Snow removal personnel are notified of anticipated start times based upon available weather data. Douglas County typically assigns personnel to two 12-hour shifts with the major workforce deployed during the daylight hours to assist rush-hour traffic. A limited number of units are deployed during evening hours to keep roads open, continue widening operations, and to respond to requests for emergency assistance. If you have an emergency during a snow storm, call 911 for assistance.
>
> **Assistance from Contractors**
> During major snowstorms like those in 2006-2007, contractors were heavily utilized throughout the County to assist staff in snow removal activities. Contractors supplemented County operations with front-end loaders and motor graders on residential streets to clear ice and snow pack. The County maintains a list of qualified contractors and incorporates them into the snow removal operation plan when needed.

2.3.10.2 Minnesota

League of Minnesota Cities Insurance Trust Model Snowplowing and Ice Control Policy, League of Minnesota Cities, February 2011.
https://www.lmc.org/media/document/1/modelsnowplowingpolicy.pdf
This model policy provided as a guide for Minnesota cities includes a work schedule for snowplow operators:

> While work breaks are not guaranteed, generally operators will take breaks in accordance with city policy, provided the breaks do not interfere with city services or operations. In addition, operators will be allowed sufficient time to eat a meal during any shift which is eight or more hours, or as provided in the collective bargaining agreement. After a twelve-hour shift, the operators will be replaced if additional qualified personnel are available.

The policy says this about deviations from the policy:

> The Superintendent of Streets may deviate from this policy when in his or her judgment it is in the best interest of the city or is necessary because of budget needs or other circumstances.

2.3.10.3 Missouri

Snow Removal Process, Public Works, City of Kansas City, Missouri, 2016.
http://kcmo.gov/publicworks/snow/snow-removal-process/
This website indicates that the city's primary streets are "plowed from curb-to-curb and receive salt throughout the entire system as crews working 12-hour shifts can plow 24 hours each day to keep the system open." For the secondary system of roads that carry local traffic, crews "typically plow snow from 6 a.m. to 6 p.m. each day as they work to keep streets passable for motorists to reach primary and arterial streets."

2.3.10.4 New York

An Analysis of Highway District Overtime, Mark C. Poloncarz, Controller, Erie County, New York, December 2011.
http://www2.erie.gov/comptroller/sites/www2.erie.gov.comptroller/files/uploads/12-13-11%20Review%20of%20Overtime%20in%20the%20Department%20of%20Public%20Works.pdf

This review of increasing overtime costs within the Department of Public Works (DPW) in New York's Erie County (home to Buffalo) includes this with regard to maximum on-duty hours drivers may work (from page 10 of the PDF):

> The New York State Department of Transportation ("NYSDOT") has guidelines for drivers in a weekly duty period and has set a maximum limit for on-duty hours. These limitations are 60 hours in seven days or 70 hours in eight days. While we readily acknowledge that the NYSDOT guidelines do not apply to DPW drivers, we believe that driving plows in excess of these hour limitations is done at risk to the safety of both the driver and other drivers on the road and can be a risk to increased personal property damage. It has been a long standing practice of DPW to limit continuous hours of work to twelve. However, in an emergency situation or if a critical condition exists, this limit can be pushed to 16. It is the responsibility of the General Crew Chief or shift supervisor to assess the ability of the plow driver to continue past twelve hours for safety purposes.

2.3.10.5 Ohio

"City of Cleveland Introduces 2015-16 Winter Weather Plan," Press Release, City of Cleveland, Ohio, November 12, 2015.
http://www.city.cleveland.oh.us/sites/default/files/pressReleases/11.12.%2015%20RELEASE%20City%20of%20Cleveland%20Introduces%202015-16%20Winter%20Weather%20Plan.pdf

This press release indicates that "[d]uring any given snowfall event, the city fleet may operate on three shifts for twenty-four hours depending on snow accumulation."

2.3.10.6 Pennsylvania

PSATS CDL Program Guidance: Driving Time Limits for Local Government CMV Employees and Emergency Exemption, PSATS CDL Program, Pennsylvania State Association of Township Supervisors, undated.
http://www.psats.org/ckfinder/userfiles/files/CDL%20Guidance%20-%20Driving%20time%20limits%20rev%20-%2001-17-12.pdf

This document provides guidance for local agencies in Pennsylvania wishing to establish driving time limits for their snowplow operators. A template policy includes this with regard to shift limits:

> As guidance, the individual making driving assignments during an emergency should employ best efforts to limit any individual driver's emergency assignment to fourteen (14) total driving hours before requiring at least eight (8) hours off-duty before re-assignment.

3.0 SURVEY OF STATE DEPARTMENTS OF TRANSPORTATION

3.1 Overview

This section presents findings from a survey of state DOTs. Survey recipients included 32 members of the Clear Roads pooled fund, a national research program that engages transportation professionals and researchers in seeking innovative solutions in the field of winter maintenance, and seven other states expected to have experience with winter maintenance. Twenty-seven state DOTs responded to the survey:

- Alaska
- Arizona
- Arkansas
- Colorado
- Connecticut
- Delaware
- Idaho
- Illinois
- Iowa
- Kansas
- Maryland
- Massachusetts
- Missouri
- Montana
- Nebraska
- New Hampshire
- New York
- North Dakota
- Oregon
- Pennsylvania
- South Dakota
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

The 21-question survey gathered information in eight topic areas: responsibility for winter maintenance; snowplow operator policies and guidance; shift limits; breaks; other driving time practices; exceeding typical driving time limits; factors affecting the management of shift limits; and successful practices. Survey responses in each topic area are described in the following sections. The full text of the survey questions appears in **Appendix A**.

3.2 Responsibility for Winter Maintenance

To get a sense of the level of respondents' responsibility for snowplowing operations, the survey asked respondents to indicate the percentage of their agencies' overall snowplowing operations conducted by particular employer types. For the purposes of this survey, "snowplowing operations" includes snow removal, anti-icing, deicing and other activities that require staff to operate plow trucks.

Slightly more than half of respondents (15 of 27) indicated that the DOT is responsible for all snowplowing operations. Only one state DOT outsources all snowplowing operations (Wisconsin DOT outsources its snowplowing operations to Wisconsin counties). Connecticut counties or other local agencies also provide a significant percentage of snowplowing services for the state (65 percent), with the remaining snowplowing operations shared by Connecticut DOT, another state agency and a private contractor. Other states opting to outsource (Maryland and Massachusetts) use a private company for most snowplowing operations (80 and 90 percent, respectively). Table 3.1 identifies the responsibility for winter maintenance by entity type for each of the respondents.

Table 3.1 Responsibility for Winter Maintenance

Type of Entity	Percentage	State
State DOT	100	Alaska, Arizona, Arkansas, Delaware, Idaho, Illinois, Iowa, Kansas, Missouri, Montana, North Dakota, Vermont, Washington, West Virginia, Wyoming
	99	Oregon
	98	Nebraska
	95	Colorado, South Dakota
	90	Pennsylvania
	84	New York
	75	Virginia
	45	New Hampshire
	25	Connecticut
	20	Maryland
	10	Massachusetts
Other State Agency	5	Connecticut
	1	Virginia
County or Other Local Agency	100	Wisconsin
	65	Connecticut
	16	New York
	6	Pennsylvania
	3	Colorado, South Dakota
	2	Nebraska

Type of Entity	Percentage	State
	1	Oregon
Private Company	90	Massachusetts
	80	Maryland
	55	New Hampshire
	24	Virginia
	5	Connecticut
	4	Pennsylvania
	2	Colorado, South Dakota

3.3 Snowplow Operator Policies and Guidance

Before delving into the specifics of driving time limits, the survey sought information about the foundation for agency practices, including the elective application of federal driving time limits and the types of influences that guide respondents' winter maintenance practices.

3.3.1 Requirement to Hold Commercial Driver's License

Snowplow operators who are employed by an eligible unit of local government can be exempted from federal regulations related to the holding of a commercial driver's license (CDL). The survey asked respondents if their agencies require their operators to hold a CDL, and if so, what class of license is required. Only one respondent—Wisconsin DOT—does not require that their snowplow operators hold a CDL, and only one state—Virginia—requires snowplow operators to hold all three CDL classes (A, B and C). (Wisconsin counties provide snowplowing services for the state; individual county CDL requirements are not known.) Survey results indicated no consensus among the remaining 25 respondents. Table 3.2 lists the CDL classes required by state.

Table 3.2 CDL Class Requirements by State

CDL Class	State
Class A Only	Alaska, Arizona, Arkansas, Iowa, Kansas, Montana, South Dakota, Vermont, Wyoming
Class B Only	Connecticut, Delaware, Idaho, Maryland, New Hampshire, New York, Washington, West Virginia

CDL Class	State
Class A and B	Colorado, Illinois, Massachusetts, Missouri, Nebraska, North Dakota, Oregon, Pennsylvania
Class A, B and C	Virginia

3.3.2 Influences in Determining Driving Time Practices

Respondents were asked to consider a range of influences that could impact driving time practices, including:

- Formal policy adopted by the agency
- Informal practice documented by the agency
- Union regulation or agreement
- State regulation
- Federal CDL driving time limits and/or off-time requirements
- Guidelines or policies established by agencies contracted to perform snowplow operations

The snowplowing activities of 11 of the 27 respondents are impacted by more than one source of guidance. The most frequently cited source—a formal policy adopted by the agency—was reported by more than half of respondents. Nine states reported a documented informal practice, and the practices of seven states are influenced by federal CDL driving time requirements. Only seven states are guided, at least in part, by union regulation or agreement. The policies of contracting agencies guide the fewest respondents, with only two states reporting such guidance (shown in Table 3.3).

Table 3.3 Guidance Influencing State DOT Driving Time Practices

Type of Guidance	State
Formal policy adopted by the agency	Alaska, Arizona, Arkansas, Connecticut , Delaware, Idaho, Illinois, Iowa, Missouri, New York, North Dakota, Pennsylvania, West Virginia, Wyoming
Informal practice documented by the agency	Colorado (under revision), Maryland, Missouri, Montana, New Hampshire, North Dakota, South Dakota, Vermont, Wisconsin
Union regulation or agreement	Connecticut, Illinois, Kansas, Oregon, Vermont, Washington, Wisconsin

Type of Guidance	State
State regulation	Massachusetts, New York, Pennsylvania
Federal CDL driving time limits	Illinois, New York, Oregon, Pennsylvania, South Dakota, Washington, West Virginia
Policies or guidance of contracting agencies	Connecticut, Wisconsin

Several respondents provided supplemental information about the guidance directing their driving time practices.

Formal Agency Policy

- Arizona DOT's Snowplow Stipend Policy describes the scheduling of snowplow drivers (see **Appendix C**).
- Iowa DOT's Instructional Memorandum on Snow and Ice Removal Operations (see **Appendix D**) provides level of service expectations and driving time limits for the agency's snowplow operators.
- Missouri DOT's policy on working hours and overtime is available at http://hr.modot.mo.gov/index.php/Policy_3000.
- The North Dakota DOT respondent provided untitled excerpts from the agency's driving time guidance (see **Appendix E**).
- While Wisconsin DOT outsources its snowplowing activities to Wisconsin counties, the agency's Highway Maintenance Manual, available at http://wisconsindot.gov/Documents/doing-bus/local-gov/hwy-mnt/mntc-manual/chapter06/06-10-40.pdf, includes this statement on HOS: The department feels that the typical upper limit for continuous hours of service should not exceed 18 hours.

Union Agreement

- The state of Alaska's union agreement, available at http://doa.alaska.gov/dop/fileadmin/LaborRelations/pdf/contracts/LTC2012-2015.pdf, addresses employee breaks and other working rules.

- Oregon DOT's collective bargaining agreement, available at http://www.oregon.gov/das/HR/CBA/ODOT.pdf,includes work schedule guidance for ODOT employees that begins on page 69 of the PDF.
- The state of Washington's collective bargaining agreement, available at http://www.ofm.wa.gov/labor/agreements/15-17/wfse_gg.pdf, includes Article 6.14 on page 37 of the PDF:

  6.14 Department of Transportation – Commercial Driver's License (CDL) Required Positions

  The Employer will not require an employee utilizing his or her CDL to work more than fifteen (15) consecutive hours without providing a rest period of at least eight (8) consecutive hours.

State Regulation

- Pennsylvania state regulation exempts DOT and municipal employees from federal driving time limits and describes state-imposed limits (see 67 Pa. Code Chapter 231.8(15), available at http://www.pacode.com/secure/data/067/chapter231/s231.8.html). An excerpt from the regulation:

  (15) 49 CFR 395.1 (relating to scope of rules in this part) is modified by adding subsections as follows:

  (q.1) This part does not apply to transportation relating to snow removal, roadway maintenance and traffic control support activities performed by a state or any political subdivision of the state.

  (q.2) A driver performing highway snow removal operations on behalf of the state or any political subdivision of the state who is not eligible to be exempted under subsection (q.1) may operate a commercial motor vehicle for up to 12 hours provided that:

  (1) The driver does not drive a commercial motor vehicle after having been on duty for more than 16 hours; and

  (2) The driver has not been on duty 70 hours in 7 consecutive days or 80 hours in 8 consecutive days.

Federal CDL Driving Time Limits

- Arizona DOT's Commercial Driver License Policy clarifies CDL requirements for Arizona DOT employees and volunteer drivers (see **Appendix F**).

Policies or Guidance of Contracting Agencies

- A Pennsylvania DOT template to request quotes for snow and ice removal in Pennsylvania counties includes operator requirements such as HOS, equipment loading and call-out periods (see **Appendix G**).

3.4 Shift Limits

Respondents were asked to describe the shift limits applied to their snowplow operators in three situations:

- ***As required by policy, agreement or regulation*.** Maximum shift limits established by an agency's policy, union agreement or other regulation.
- ***In practice under typical conditions*.** A light snow or ice event of limited duration.
- ***In practice under emergency conditions*.** A multiday winter weather event, an event with extremely heavy or blowing and drifting snow, or any other winter weather event deemed an emergency.

Twelve hours is the most frequently cited maximum shift length across all situations, though survey responses indicated relatively little consensus with regard to shift limits generally or specific to a particular situation. Most states do, however, specify different limits in different situations. Only three states—Delaware, Maryland and New York—reported the same shift limit for all three situations addressed in the survey. Two states—Nebraska and New Hampshire—have no maximum shift limits. Table 3.4 summarizes the maximum continuous shift lengths reported by respondents for the three situations described above.

Table 3.4 Maximum Continuous Shift Length by State

State	Maximum Continuous Shift Length Required by Policy, Agreement or Regulation (Hours)	Maximum Continuous Shift Length Under Typical Conditions (Hours)	Maximum Continuous Shift Length Under Emergency Conditions (Hours)
Alaska	16	7.5	16
Arizona	N/A	12	None
Arkansas	12	12	14
Colorado	15	12 hours on/12 hours off	15
Connecticut	Varies	Varies	Varies
Delaware	24+ hours	24+ hours	24+ hours
Idaho	12	12	12 (can be exceeded)
Illinois	15	8	12
Iowa	8	N/A	16
Kansas	12	8	12
Maryland	72	72	72
Massachusetts	23.5	23.5	Supervisor discretion
Missouri	12	12	12+ (if directed by supervisor)
Montana	N/A	12	12 (not a requirement)
Nebraska	None	None	None
New Hampshire	None	None	None
New York	12 (can be up to 16)	12 (can be up to 16)	12 (can be up to 16)
North Dakota	14 (exceptions)	8	14+
Oregon	12	12	14
Pennsylvania	12	8	12
South Dakota	16	12	16+
Virginia	N/A	12	12 (or until released)
Washington	15	10.5	15
West Virginia	10/11	10	12
Wisconsin	County policy	County policy	County policy
Wyoming	12	12	18

The frequency of a particular shift length or a range of hours per shift can be compared across the three situations considered by survey respondents. Table 3.5 summarizes shift lengths by ranges, highlighting the lack of consistency across respondents and also identifying the most frequently reported shift length across all three snow removal circumstances—12 hours. However, for shifts based on policy, agreement or regulation, or under emergency conditions, more than half of respondents reported shift lengths of more than 12 hours (53 percent and 55 percent, respectively).

Table 3.5 Percent of Shift Length by Situation (State DOTs)

Shift Length (Hours)	Percent of Respondent Shifts Determined by Policy, Agreement or Regulation	Percent of Respondent Shifts Under Typical Conditions	Percent of Respondent Shifts Under Emergency Conditions
<12	11	33	0
12	37	48	45*
>12 and <16	26	5	25**
16	11	0	10
>16	16	14	20

* Five of the nine respondents reporting a 12-hour shift noted that the shift length could be extended if needed.

** One respondent indicated that a 14-hour shift could be extended if needed.

3.4.1 Shift Lengths Required by Policy, Union Agreement or Regulation

Respondents reported a wide range of maximum shift lengths as required by a policy, union agreement or other regulation, with a low of eight hours in Iowa to a high of 72 hours in Maryland. (The Maryland DOT respondent estimated that 95 percent of the winter events experienced in the state last fewer than 48 hours, which means the 72-hour shift length is not typically relevant. After 72 hours of continued operation, snowplow operators transition to a 12-hour shift without regard to the storm intensity or need for resources.)

In lieu of providing a number of hours for this and the other two survey questions related to maximum shift length, the Connecticut DOT respondent noted that every storm is considered an emergency operation and managed accordingly. The Pennsylvania DOT respondent reported

that DOT and municipal employees are exempt from HOS requirements, but the agency's contractors are not. The agency's policy is to run two eight-hour shifts and extend those shifts by four hours during storms.

While individual county policy determines shift length, a Wisconsin DOT policy recommends that shifts do not exceed 18 hours. The Vermont DOT respondent did not provide shift limits, noting instead that with only 1.2 drivers per route, drivers stay with a storm from start to finish.

3.4.2 Shift Lengths Under Typical Conditions

The most commonly cited maximum continuous shift length under typical conditions—12 hours—was also the most frequently cited shift limit as required by policy, union agreement or regulation. However, more respondents—10—reported the 12-hour limit under typical conditions as compared to the seven respondents citing the same shift limit required by policy, agreement or regulation. Alaska has the shortest maximum shift length at seven and one-half hours, with Maryland reporting the longest—72 hours.

3.4.3 Shift Lengths Under Emergency Conditions

The 12-hour limit was the shortest shift length reported by respondents under emergency conditions, with the longest again being the 72-hour shift that could be worked by Maryland's snowplow operators. Almost two-thirds of respondents permit longer shifts under emergency conditions than during a typical shift. Several respondents noted that "maximum shift" is a misnomer, and a maximum shift length can be exceeded under certain conditions.

3.5 Breaks

Respondents were asked to describe the break times applied to their snowplow operators in three situations:

- ***As required by policy, agreement or regulation*.** Break requirements established by an agency's policy, union agreement or other regulation.
- ***In practice under typical conditions*.** A light snow or ice event of limited duration.

- ***In practice under emergency conditions.*** A multiday winter weather event, an event with extremely heavy or blowing and drifting snow, or any other winter weather event deemed an emergency.

Almost all respondents provide their operators with some type of formalized break schedule, and almost two-thirds of respondents provide their operators with multiple breaks, with some including lunch. The most typical break duration is 15 minutes, with lunches usually 30 minutes. Breaks were similar across two of the situations examined in the survey (required by policy, union agreement or regulation, and typical conditions). As might be expected, the breaks offered during emergency conditions tend to be more variable than breaks offered under the other two scenarios.

To provide a representative sampling of the types of breaks offered by respondents, Table 3.6 summarizes the frequency and duration of operator breaks reported by respondents under typical conditions.

Table 3.6 Operator Breaks Under Typical Conditions (State DOTs)

Frequency and Duration of Operator Breaks	**State/Description**
Multiple breaks of varying duration	*Delaware*. Five-hour sleep break plus multiple meal breaks based on operational requirements. Sleep break must be started prior to 24 hours of being on duty. *Kansas*. Twenty-minute breaks (morning and afternoon). *North Dakota*. Fifteen-minute breaks (morning and afternoon).
Multiple breaks plus lunch	Alaska, Colorado, Illinois, Montana, New York, Oregon, Pennsylvania, Virginia, Washington Selected descriptions: • *Colorado*. Two 15-minute breaks and one 30-minute lunch break for 12 hours on/12 hours off. • *Illinois*. First half 15-minute break, 30-minute lunch, second half 15-minute break. • *Montana*. Two 15-minute breaks and a 30-minute lunch. • *New York*. Two to three 15-minute breaks per shift; lunch is 30 minutes. Two meal breaks may be allowed for long shifts.

Frequency and Duration of Operator Breaks	State/Description
Multiple breaks after specific time period	*Arkansas*. Ten to 15 minutes every two to two and one-quarter hours. Meal break at sixth hour; operators normally take a break when spreader is being loaded. *Idaho*. Fifteen-minute break every two to three hours; lunch is 30 to 60 minutes. *Nebraska*, *South Dakota*, *Wyoming*. Fifteen-minute break every two hours.
30-minute meal break	*Missouri.* When conditions do not allow, employee may work a 12-hour shift without a meal break.
Two hours in 12 hours; four hours in 24 hours	New Hampshire
Two hours in 24 hours	Massachusetts
Three-hour break every 17 hours	Connecticut
Eight hours after working 10 hours	West Virginia
Varies	*Arizona*. As needed and as weather conditions allow. *Maryland*. Varies based on storm intensity and resource needs/availability. *Wisconsin*. Depends on county policy.

3.6 Other Driving Time Practices

3.6.1 Operator Activities Outside of the Snowplow

Most respondents do not classify all periods operators spend out of the plow as break times. Only four states—Colorado, New Hampshire, New York and Wyoming—consider such times as break times. Almost three-quarters of respondents (19 of 27) reported that operators perform nondriving tasks during periods out of the snowplow. The most frequently cited nondriving task is loading or unloading salt or brine. Other tasks commonly performed by operators when not actively engaged in plowing are minor repairs and maintenance, refueling and truck inspections. The tasks reported most frequently by respondents are listed below, with the frequency of each response noted in parentheses.

- Loading/unloading salt or brine (15)
- Minor repairs/maintenance (7)
- Refueling (7)

- Walk-around inspections (6)
- Completing paperwork (5)
- Changing blades (5)

3.6.2 Minimum Rest Periods

Slightly less than half of respondents (12 of 27) reported that they do not require a minimum rest period or time off between shifts. Among the remaining 15 respondents, the most frequently reported minimum rest period—eight hours—was cited by eight respondents. Other rest periods ranged from a low of two hours (Colorado and Massachusetts) to a high of 12 hours (Maryland and Pennsylvania). Table 3.7 summarizes the minimum rest periods reported by respondents.

Table 3.7 Minimum Rest Periods Between Shifts (State DOTs)

Minimum Rest Period (Hours)	State/Description
2	Colorado, Massachusetts
3	*Connecticut*. Rest period required after 17 hours of work.
4	*Wyoming*. Operators off at least four hours, but most are eight hours.
5	*Delaware*. Operators must take a five-hour sleep break before being on duty for 24 continuous hours.
8	*Alaska*. After 16 hours, eight hours of rest required; two days after four continuous 16-hour shifts. *Iowa*. The unwritten rule is eight hours. *Montana*. Operate outside of this in the event of an emergency. *South Dakota*. Unless an emergency is issued, there is no time off requirement. An eight-hour break is recommended after 16 hours. New York, Oregon, Washington, West Virginia
9	*Illinois*. Minimum of nine-hour rest after 15-hour shift. Typically 12 hours on, 12 hours off.
12	*Maryland*. After 72 hours of continued operations, operators are required to receive 12 hours of rest before returning for duty. Pennsylvania

3.7 Exceeding Typical Driving Time Limits

Respondents were asked to describe the conditions or circumstances that warrant exceeding typical driving time limits. Weather conditions were most frequently cited by respondents, with issues related to staffing, roadways and equipment also reported as reasons for exceeding typical limits. The most frequently reported conditions are listed below, with the frequency of each response noted in parentheses.

Weather Conditions

- Emergency conditions (11)
- Ongoing storm/storm with significant snowfall (5)
- Drifting snow (2)

Staffing

- Lack of staff (5)

Roadway Issues

- Road/pass closures (2)

Equipment

- Truck breakdowns/hot-swapping vehicles (2)

Respondents were also asked to describe how extensions of typical drive time limits are approved. Four states—Delaware, Nebraska, North Dakota and Virginia—reported no formal approval process. Other responses indicate that decisions are made at three levels of the agency—executive, district or area, and local. The following categorizes survey responses.

Executive Decisions

- General management (Connecticut, Missouri)
- Executive director (Colorado)
- Governor (Maryland, South Dakota)
- Maintenance manager (New York)
- Director of operations, secretary of transportation (South Dakota)
- Commissioner of highways (West Virginia)
- County commissioner or patrol superintendent (Wisconsin)

District or Area Decisions

- District superintendent (Alaska, Arizona)
- District engineer (Arkansas)
- Area manager (Montana)
- District office (Pennsylvania)
- Supervisor or area superintendent (Washington)

Local Decisions

- Technical staff in charge of team section (Illinois)
- Garage supervisors (Iowa)
- Manager approval through the crew coordinator (Oregon)
- Local shop foreman (Wyoming)

3.8 Factors Affecting the Management of Shift Limits

To gain a better understanding of the factors that have the greatest impact on managing shift limits, respondents were presented with lists of factors in two categories—environmental and driving conditions, and personnel and equipment factors—and asked to rate each factor with regard to the significance of that factor in managing shift limits.

3.8.1 Environmental and Driving Conditions

Increased hours of continuous driving was rated by respondents as having the greatest impact on managing shift limits. One of only two weather-related factors rated by respondents—blowing and drifting snow—received the second-highest rating. Low traffic density received the lowest respondent rating. Table 3.8 provides an ordered list of environmental and driving conditions included in the survey that reflects the average rating for each factor (5 = high impact; 1 = low impact). The higher the rating, the greater the impact.

Table 3.8 Respondent Ratings of Environmental and Driving Conditions (State DOTs)

Environmental and Driving Condition	Average Rating
Increased hours of continuous driving	4.64
Blowing and drifting snow	4.36
Nighttime shift	4.08
High traffic density	3.92
Urban roadways	3.44
Mountainous areas	3.24
Extreme cold	2.88
Rural roadways	2.68
Daytime shift	2.44
Flat terrain	2.32
Low traffic density	2.16

Respondents took a slightly different approach when asked to comment on the environmental and driving conditions that have the greatest impact on snowplow driver fatigue. Instead of commenting on the impact of extended shifts, respondents commented most frequently on weather conditions and visibility. The most frequently reported factors are summarized below, with the frequency of each response noted in parentheses.

Weather Conditions/Visibility

- Blowing or drifting snow (4)
- Back-to-back snow events (3)
- Storm intensity (3)
- Low visibility (3)

Roadway Type

- High traffic volume/density (6)
- Mountainous terrain (4)

Shift-Related Issues

- Increased shift length (5)
- Night shift (3)

3.8.2 Personnel and Equipment Factors

Lack of personnel received by far the highest average rating when respondents were asked to rate a variety of personnel and equipment factors. Condition of the truck or equipment came in a fairly distant second in the average ratings. Least challenging for respondents was working with a manual versus automatic truck transmission. Table 3.9 provides an ordered list of personnel and equipment factors included in the survey that reflects the average rating for each factor (5 = most challenging; 1 = least challenging). The higher the rating, the greater the challenge.

Table 3.9 Respondent Ratings of Personnel and Equipment Factors (State DOTs)

Personnel and Equipment Factor	Average Rating
Lack of personnel	4.46
Condition of the truck or equipment	3.63
Individual operator circumstances and requirements (medical, other)	3.67
Lack of equipment	3.21
Ergonomics of the truck controls	3.21
Age of the truck or equipment	3.25
Plow type and configuration (tow plow versus standard wing plow)	2.96
Manual versus automatic truck transmission	2.79

Respondents expanded on the lack of personnel with the following comments:

- The agency is finding it difficult to provide adequate levels of service on some critical routes. It can be challenging to encourage shops to identify operational efficiencies that can offset a driver shortage (Arizona).
- Filling positions in mountain towns and hard-to-fill locations requires the agency to hire from outside the area, creating longer commute times for operators (Colorado).
- Lack of temporary on-call help during a snow response is one of the agency's biggest concerns (Illinois).

- Without enough full-time staff available, the use of seasonal staff is required. This can be challenging due to scheduling conflicts and training issues (Iowa).
- Some locations are experiencing difficulties fully staffing crews due to attrition to local agencies. Improved equipment such as tow plows may reduce the number of hours needed to treat routes, reducing overtime and crew fatigue over the long term (Washington).

3.8.3 Other Challenging Factors

The following highlights respondent comments on other factors that contribute to driver fatigue or present additional challenges in managing snowplow driver shifts.

Human Factors

- In severe storm conditions, drivers feel a need to keep going and will work through breaks even when directed to take breaks for safety purposes (Oregon).

Political Pressure

- Having beltway interstates of two major cities within 25 miles of one another and Interstate 95 running from north to south through the state creates an environment of political pressure that can be relentless no matter the circumstances (Maryland).

Visibility/Weather Conditions

- Adequate lighting is critical for night operations. Plow configurations that allow snow to blow over the hood and onto the windshield require frequent stops to clear windshields (Alaska).
- The severity of a storm event, blinding snows and heavy precipitation contribute to increased stress and accelerated fatigue; winter-related accidents add additional stress (Idaho).
- Almost all of the state's roads are rural, which produces a lot of blowing snow that reduces visibility and places more stress on the driver (South Dakota).

3.9 Successful Practices

Respondents were asked to share successful practices in managing shift limits. Several noted the success of 12-hour shifts, while others offered suggestions for staffing and shift scheduling. Respondent comments are highlighted below.

Use of 12-Hour Shifts

- In Arkansas, mandating 12-hour shifts and staggering shift changes better serves the traveling public and department needs. Twelve-hour shifts have also worked well for Illinois DOT.
- Scheduling shifts as 12 hours on/12 hours off has worked well but creates a shortage of operators in Colorado.
- Montana DOT has switched to predetermined 12-hour shifts in a major event, which also gives drivers 12 hours off.

Staffing

- In Arizona, a volunteer/loaner plow driver program helps to mitigate challenges in clearing mountainous areas that regularly receive a high rate of hourly snowfall. However, volunteer/loaner staff members do not have the on-the-road experience necessary to participate in severe winter weather events.
- Virginia DOT has found that rotating drivers between various conditions can be helpful in mitigating stress and boredom.

Shift Scheduling

- In Idaho, the "swarm the storm" concept deploys 100 percent of agency resources at storm outset, with an estimated 30 percent employee reserve for any second shift. This is contrasted with the old model of 60/40 or 50/50 percent splits. Under the old model, the first shift included more lane miles per operator, while the following shift may not be called out on short-duration events. The switch to allocating resources on the front end of a storm has resulted in less operational time expended per storm.

- Pennsylvania DOT uses a fleet model, with contractors and municipal agreements that allow the agency to maintain two operators for every truck. This allows the agency to continually run dual shifts of eight to 12 hours.
- Half of Pennsylvania DOT's districts use on-demand shifts, splitting the workforce into two shifts only when it snows. One half of the crews plow while the other half stays on seasonal dual shift throughout the entire winter regardless of snow.
- In Washington, some portions of the state run night shifts from 5 p.m. to 3:30 a.m., while others have moved those shifts up to 4 p.m. to 2:30 a.m. The latter shift has helped reduce fatigue in night shift crews but comes at a slight cost in day shift fatigue/morale by requiring operators to come in earlier, typically 4 a.m.

Equipment

- South Dakota DOT noted the benefits of better equipment—automatic truck transmissions, sander controllers and user-friendly equipment mounted in the cab.

3.10 Summary

This section presented results from a survey of state DOTs expected to have experience with winter maintenance, the first of two surveys conducted for this project. A second survey of UDOT regions included many of the questions posed to the state DOTs. A comparison of responses to the core survey questions appearing in both surveys is included in Section 5, Conclusions.

The broad range of questions addressed by state DOT respondents included the source of guidance for determining driving time practices and a description of the entities responsible for winter maintenance. Respondents reported their driving time practices, including shift limits, breaks and minimum rest periods, in three situations (as required by policy, agreement or regulation; under typical conditions; and under emergency conditions).

The most commonly reported shift limit was 12 hours across the three types of plowing situations considered by the survey, but more than half of respondents reported shift lengths of more than 12 hours in two of the three situations. Almost all respondents provide their operators with some type of formalized break schedule, and most respondents apply different shift limits under emergency conditions.

Respondents also described the approval process for exceeding typical driving time limits and rated a wide range of factors (environmental, driving conditions, personnel and equipment) that may affect the management of shift limits. Finally, respondents offered information about their successful practices in managing the time their operators spend in a plow.

4.0 SURVEY OF UDOT REGIONS

4.1 Overview

The Snowplow Driver Research Project team identified 20 UDOT staff members across UDOT's four regions to receive a survey that gathered information about the respondents' snowplow operator driving time practices. Of the 20 UDOT region staff members selected to receive the survey, 10 provided mostly complete survey responses (one respondent completed slightly more than half of the survey). The survey responses summarized in this section are associated with a region and not a specific respondent.

The 19-question survey gathered information in seven topic areas: local policies; shift limits; breaks; other driving time practices; exceeding typical driving time limits; factors affecting the management of shift limits; and successful practices and recommendations. Survey responses in each topic area are described in the following sections. The full text of the survey questions appears in **Appendix B**.

4.2 UDOT's Interim Driving Time Guidance

While most of the UDOT survey questions sought information about the UDOT regions' driving time practices before issuance of the interim guidance contained in Letter of Instruction 15-1, a few questions addressed the regions' application of this guidance. The following is an excerpt from Letter of Instruction 15-1 (available at https://www.udot.utah.gov/main/uconowner.gf?n=20549817311126084):

> The following are the approved operational limits that all UDOT Maintenance leaders, supervisors and station personnel will follow for the continuous working hours during snow removal season.
>
> **0 to 12 hours:** Duration determined by the **Station Supervisor** based on the evaluation of the equipment operator to be able to perform snow removal operations in a safe manner.

12 to 16 hours: Approval determined by the **Area Supervisor** based on the evaluation of the equipment operator to be able to perform snow removal operations in a safe manner.

Greater than 16 hours: Operators are to be relieved of his or her duties and released. The operator will be off the clock at this time.

Once a snow plow equipment operator has been relieved of his or her duties, the operator may not return to perform snow removal operations for a minimum of 4 hours.

4.3 Local Policies

4.3.1 Application of Letter of Instruction 15-1

All respondents reported adopting the guidelines included in Letter of Instruction 15-1 as an interim measure to manage their snowplow operators' driving time. All but one of the 10 respondents reported challenges in implementing the interim guidelines.

Four respondents cited a lack of adequate staff or the lack of available relief drivers. Respondents reported other issues associated with the lack of relief drivers, including the inability to hire this type of driver for the hourly wage offered, and requiring management to decide between letting snow accumulate and breaking policy to ensure public safety when relief drivers are not available in remote areas.

A few regions described challenges presented by the 16-hour shift limit. One respondent commented that some routes turn to ice after pulling off a route due to the 16-hour maximum, when a few more hours on the route beyond the shift limit could have prevented the ice. Another respondent noted the lack of time to allow for truck cleanup.

4.3.2 Policy or Practice Before Letter of Instruction 15-1

Seven of the 10 respondents, from Regions One, Two and Four, reported following an unwritten rule of thumb when asked about the type of guidance the respondent's region used to manage snowplow operators' driving time before issuance of UDOT's interim guidance. In

Region One, the unwritten rule of thumb indicated any hours over 13 require approval from the area supervisor, and any hours over 18 require district engineer approval. The two respondents from Region Three reported no guidance prior to the region's adoption of Letter of Instruction 15-1, and a respondent from Region Two indicated that a formal written policy guided region practices (a copy of this policy was not provided by the time of publication of this report).

4.4 Shift Limits

Respondents were asked to describe the shift limits applied to their snowplow operators in two situations:

- ***In practice under typical conditions***. A light snow or ice event of limited duration.
- ***In practice under emergency conditions***. A multiday winter weather event, an event with extremely heavy or blowing and drifting snow, or any other winter weather event deemed an emergency.

Most respondents reported different shift lengths based on conditions, with only two respondents reporting the same continuous shift length for typical and emergency conditions (12-hour shifts in Region Two, and shifts of eight to 12 hours in Region Four). UDOT region respondents were more likely than their state DOT counterparts to report a range of hours when asked about shift length.

One respondent noted that operators may continue working after completing a plowing shift by operating heavy equipment to push back heavy snow with grader loaders, changing blades or repairing equipment. While the operator's time on the job may exceed policy limits, actual driving time in the plow does not. One of the 10 respondents noted that each storm is different and opted not to respond to questions about shift length. Table 4.1 summarizes the shift limits reported by the nine respondents for the two situations described above.

Table 4.1 Continuous Shift Length by UDOT Region

UDOT Region	Continuous Shift Length Under Typical Conditions (Hours)	Continuous Shift Length Under Emergency Conditions (Hours)
Region One	10	16

UDOT Region	Continuous Shift Length Under Typical Conditions (Hours)	Continuous Shift Length Under Emergency Conditions (Hours)
Region One	10	16
Region Two	12	12
Region Two	12 (plus 1 hour for shift change)	13 to 16
Region Three	14 to 16	18
Region Three	24	Unlimited
Region Four	12	16
Region Four	8 to 12	8 to 12
Region Four	10 to 12	14 to 18

The frequency of a particular shift length or a range of hours per shift can be compared across the two situations considered by survey respondents. Table 4.2 summarizes shift lengths by ranges, highlighting the same lack of consistency across UDOT region responses found in state DOT responses. Similar to their state DOT counterparts, the majority of UDOT regions reported shift lengths under emergency conditions of more than 12 hours (77 percent).

Table 4.2 Percent of Shift Length by Situation (UDOT Regions)

Shift Length (Hours)	Percent of Respondent Shifts Under Typical Conditions	Percent of Respondent Shifts Under Emergency Conditions
<12	44	11
12	33	11
>12 and <16	11	11
16	0	33
>16	11	33

4.4.1 Shift Lengths Under Typical Conditions

Like the responses to the same question in the state DOT survey, survey results indicated no consensus among UDOT region respondents with regard to a typical maximum shift length,

with responses ranging from eight to 24 hours. Results also indicate inconsistencies in practices across some regions.

4.4.2 Shift Lengths Under Emergency Conditions

Consistent with questions related to shift length in other situations, survey results indicated no consensus in survey responses, with a low of eight to 12 hours in Region Four to unlimited shifts in Region Three. Sixteen hours—the maximum shift length identified in Letter of Instruction 15-1—was the most common shift length, reported by just three of the nine respondents.

4.5 Breaks

While all regions provide operators with breaks, respondents again offered no consensus on how often snowplow operators are offered breaks or the length of break times during a typical shift. The range of responses from the UDOT regions mirrored those from state DOT respondents—some breaks are provided after a specified period of time, while others follow a set schedule (morning and afternoon breaks with a midshift lunch). Still other regions offer breaks as needed. Under emergency conditions, it is more common to offer breaks as needed than to specify when breaks are taken and for how long. One region noted that under emergency conditions, breaks are used to reload trucks, grab a quick bite to eat or drink, and check weather conditions.

To provide a representative sampling of the types of breaks offered by respondents, Table 4.3 summarizes the frequency and duration of operator breaks reported by respondents under typical conditions.

Table 4.3 Operator Breaks Under Typical Conditions (UDOT Regions)

Break Category	Frequency and Duration of Operator Breaks	UDOT Region
Multiple breaks	15-minute morning and afternoon break, 30-minute lunch	Region One
	15-minute break, 30-minute lunch (when possible)	Region One

Break Category	Frequency and Duration of Operator Breaks	UDOT Region
Multiple breaks after specific time period	10- to 15-minute break every two hours	Regions Two and Three
	15- to 30-minute breaks every two to three hours	Region Four
As needed	15-minute breaks as needed	Region Three
	25- to 30-minute break as needed	Region Four
	30-minute break as needed	Region Four
	Based on equipment operator and storm	Regions Two and Three

4.6 Other Driving Time Practices

4.6.1 Operator Activities Outside of the Snowplow

Most respondents (seven of 10) do not classify all periods operators spend out of the snowplow as break times. Even more respondents (eight of 10) reported that operators perform nondriving tasks during periods out of the snowplow. The most frequently mentioned tasks are listed below, with the frequency of each response noted in parentheses.

- Changing blades (6)
- Washing windows/truck (3)
- Refueling (3)
- Reloading (3)
- Small equipment/wiper repairs (2)
- Paperwork, such as completing snow logs and time sheets (2)

4.6.2 Minimum Rest Periods

All but two respondents (from Regions Three and Four) require minimum rest periods or time off between shifts. While the provision of rest periods between shifts is more prevalent within UDOT than in the state DOT respondent group, the length of the typical UDOT rest period is shorter (four hours as opposed to eight hours for most state DOT respondents). Table 4.4 summarizes the minimum rest periods reported by respondents.

Table 4.4 Minimum Rest Periods Between Shifts (UDOT Regions)

Minimum Rest Period (Hours)	Number of Respondents	UDOT Region
4*	6	Region One, Two, Three, Four
5	1	Region Four
8**	1	Region Two

* Regions One and Four: If plow time reaches 16 hours, drivers are given a minimum four-hour break.

** Each shift starts at 6 a.m. or 6 p.m. During extreme events, operators are often on shift for up to 16 hours but do not return until the next shift starts (eight hours or more between shifts).

One respondent highlighted a challenge not identified in the survey that can affect sparsely populated and possibly other areas of the state. With some drivers living at a significant distance from the station, limited rest times often require the driver to spend too much of that rest time getting home and back to the station.

4.7 Exceeding Typical Driving Time Limits

When asked to describe the conditions or circumstances that warrant exceeding their typical driving time limits, extreme weather conditions or a lengthy storm event were mentioned most frequently by respondents. The conditions or circumstances reported most frequently by respondents are listed below, with the frequency of each response noted in parentheses.

Weather Conditions

- Extreme storm conditions/duration of storm (5)

Roadway Issues

- Unsafe road conditions (2)

Staffing

- Lack of relief drivers (2)

Equipment

- Equipment failure (1)

Two respondents noted that their regions do not exceed drive time limits. A Region One respondent reported that his region opts to let lower-level routes "slip" rather than exceed the agency's guidance in Letter of Instruction 15-1.

For four of the six respondents, the area supervisor is contacted for approval to exceed limits. For the other two respondents, approval is obtained further up the chain of command, reaching the region or district director.

4.8 Factors Affecting the Management of Shift Limits

Mirroring the state DOT survey, the survey of UDOT regions presented respondents with lists of factors in two categories—environmental and driving conditions, and personnel and equipment factors—and asked them to rate each factor with regard to the significance of that factor in managing shift limits.

4.8.1 Environmental and Driving Conditions

While respondents reflected a diversity of opinion and the actual average ratings varied slightly, both state DOT and UDOT region respondents identified the same two environmental and driving condition factors as having the greatest impact on managing shift limits (increased hours of continuous driving received the highest rating, and blowing and drifting snow received the second-highest rating). Also consistent with state DOT respondents, UDOT region staff gave the lowest rating to low traffic density. Table 4.5 provides an ordered list of environmental and driving conditions included in the survey that reflects the average rating for each factor (5 = high impact; 1 = low impact). The higher the rating, the greater the impact.

Table 4.5 Respondent Ratings of Environmental and Driving Conditions (UDOT Regions)

Environmental and Driving Condition	Average Rating
Increased hours of continuous driving	4.44
Blowing and drifting snow	4.00
Mountainous areas	3.67
High traffic density	3.56
Nighttime shift	3.56

Environmental and Driving Condition	Average Rating
Urban roadways	3.44
Flat terrain	2.89
Rural roadways	2.78
Extreme cold	2.56
Daytime shift	2.44
Low traffic density	2.22

4.8.2 Personnel and Equipment Factors

When rating the challenge presented by a range of personnel and equipment factors, UDOT region responses were again similar to state DOT responses. While the actual ratings varied slightly, UDOT regions also considered the lack of personnel as most challenging when managing operator driving time, with this factor again receiving by far the highest average rating. Also consistent with state DOT responses, UDOT region respondents rated the use of a manual versus automatic truck transmission as the least challenging factor. Table 4.6 provides an ordered list of personnel and equipment factors included in the survey that reflects the average rating for each factor (5 = most challenging; 1 = least challenging). The higher the rating, the greater the challenge.

Table 4.6 Respondent Ratings of Personnel and Equipment Factors (UDOT Regions)

Personnel and Equipment Factor	Average Rating
Lack of personnel	4.67
Condition of the truck or equipment	3.89
Individual operator circumstances and requirements (medical, other)	3.89
Lack of equipment	3.78
Ergonomics of the truck controls	3.56
Age of the truck or equipment	3.33
Plow type and configuration (tow plow versus standard wing plow)	2.67
Manual versus automatic truck transmission	2.56

4.9 Successful Practices and Recommendations

Respondents were asked to identify successful practices in their management of shift limits, and also to provide recommendations to enhance safety and improve the effectiveness of UDOT's snowplow operators.

Only two respondents reported limited or no success in managing shift limits. A Region One respondent noted that he was "[n]ot sure I would list successes. I think in most cases we have had a decrease in service." A Region Four respondent reported that "[w]e do our best to follow policy, but meeting public expectations is becoming increasingly difficult."

The following summarizes respondents' feedback on what is working well in their management of shift limits and recommendations for implementation of a future policy.

Policy Issues

- Reduce plow service from 11 p.m. to 5 a.m. (except for emergencies and freeways) to allow for a reliable rest period. It is critical to inform the public how thinly the agency's operators are stretched during an extended storm, and advise the public that conditions will deteriorate during this time.
- Give supervisors the latitude to do the job as they see fit.
- Leave room in the policy for reasonable flexibility. Staff is "at the mercy of Mother Nature," and the regions need to either extend hours or reduce the level of service.

Shift Limits/Breaks

- Run 12-hour shifts.
- Limit shift times to enhance the safety of drivers and the public. The time limitation requires supervisors to be more proactive in scheduling.
- Shorten driving limits to allow operators to receive more rest to avoid fatigue.
- Permit operators to rest as needed.

Staffing

- Retain more trained relief drivers.
- Rotate crew members to help lower the number of plow hours.
- Approve enough on-call and seasonal drivers to fill the shifts.

Event Planning

- Assess the storm event before, during and after. Check in with operators before and during the storm event.

4.10 Summary

This section presented survey results from a survey of selected UDOT region staff, the second of two surveys conducted for this project. A survey of state DOTs conducted for this project, described in Section 3, included many of the questions posed to UDOT region staff. A comparison of responses to the core survey questions appearing in both surveys is included in Section 5, Conclusions.

Identifying a consensus among respondents was challenging given the limited number of responses. However, similarities with state DOT responses were noted in many areas, including the range of shift limits reported, the provision of operator breaks, and the types of factors that present the greatest challenges in managing the time operators spend in a plow. This section closes with successful practices and respondents' recommendations for UDOT's final snowplow operations policy to ensure safety and improve the effectiveness of snowplow operators.

5.0 CONCLUSIONS

5.1 Summary

UDOT is seeking information about best practices for snowplow operator driving time to inform development of a formal policy that will replace interim guidance issued in February 2015. To support this effort, this project examined recent publications and conducted surveys of two groups—representatives from state DOTs and UDOT's four regions—to gather information about the implications of driving time, rest breaks and other driving time policies, and current snowplow operator driving time practices across the country and within UDOT.

5.2 Findings

5.2.1 Winter Maintenance Program Background

5.2.1.1 State DOTs

More than half of the 27 survey respondents indicated that the DOT is responsible for all snowplowing operations. The few states that do outsource most of their snowplowing activities (Maryland, Massachusetts and Wisconsin) did not provide sample contracts or agreements used in connection with the contractor's or other agency's responsibilities.

While snowplow operators who are employed by an eligible unit of local government can be exempted from federal regulations related to the holding of a CDL, all but one of the respondents require their snowplow operators to hold at least one class of a CDL. Survey results indicated no consensus among respondents as far as which of the three license classes—A, B or C—are required. Only Virginia DOT requires operators to hold all three classes.

More than half of respondents have adopted a formal policy for their snowplowing activities. The driving time practices of almost half of respondents are influenced by multiple sources, including a union regulation or agreement, state regulation, federal CDL driving time limits or guidelines for contracting agencies. Respondents provided examples of guidance documents in each of these categories. Only two states—Connecticut and Wisconsin—reported

the use of policies or guidance of contracting agencies. For Wisconsin, those agencies are the 72 Wisconsin counties that are responsible for snowplowing operations in the state. Each county has its own guidance, though a Wisconsin DOT policy does provide a recommended maximum shift limit.

5.2.1.2 UDOT Regions

All 10 of the UDOT region respondents reported adopting the interim driving time guidance contained in UDOT's Letter of Instruction 15-1, and all but one of the respondents reported challenges in implementing that guidance. The biggest challenge for respondents in adhering to the guidance was the lack of drivers or a sufficient number of relief drivers. Unlike the state DOT respondents, almost all UDOT region respondents did not have a formal written policy in place prior to issuance of the interim guidelines.

5.2.2 Shift Limits

Research has found that fatigue can set in relatively quickly, with differences in hazard odds showing up in some studies as soon as the second hour of driving. Researchers have also found that the longer the shift, the greater the possibility for the driver to experience an SCE.

Rather than attempting to determine the effects of different shift limits, the surveys focused on simple numbers—how many hours do operators spend in a plow under varying circumstances. Both surveys found little consensus among survey respondents with regard to a standard shift length under one or more of the three situations considered in the survey—as required by a policy, agreement or regulation, and shifts under typical and emergency conditions (the UDOT region survey considered only typical and emergency conditions). Survey results did indicate commonalities within a respondent group and across the two types of respondents, including:

- Almost all respondents specify a maximum shift length under one or more of the situations examined in the survey.
- Respondents reported a wide range of shift lengths—from a low of seven and one-half hours to shifts of unlimited length.

- Twelve hours is the most frequently cited maximum shift length by state DOTs across all situations. With so few region responses and the regions' tendency to specify a range of hours rather than a specific shift length, the most frequent response—also 12 hours—is cited only once more than the next most frequent response.
- Most state DOTs and UDOT regions specify different shift limits in different situations.
- A few respondents in both groups have unlimited shift lengths. Several other state DOTs reported that "maximum shift length" was a misnomer and established shift limits could be exceeded in certain circumstances, typically under emergency conditions.
- For shifts under emergency conditions, the majority of both respondent groups reported shift lengths of more than 12 hours.

5.2.3 Shift Timing

Supplementing the surveys' focus on the number of hours that snowplow operators spend in the plow is research examining the effects of shift timing and how the circadian rhythm affects fatigue. Overnight shifts between 2 a.m. and 6 a.m. can present challenges if beginning or ending a shift during this time period. It can be helpful to schedule breaks during this time. Other research has found that the length of a shift was less significant than the time of day, the amount of sleep a driver had before beginning the shift, and the time spent awake.

5.2.4 Breaks

Breaks can be used to mitigate the effects of driver fatigue. Studies have shown that breaks can reduce driver sleepiness and allow for recovery from an extended period of driving.

It is difficult to identify a standard for the provision of operator breaks within or across the two respondent groups, even though almost all respondents in both groups provide their operators with a somewhat formalized break schedule. Almost two-thirds of state DOT respondents provide their operators with multiple breaks, while half of UDOT region respondents provide breaks as needed rather than specifying a particular break frequency and/or duration.

The types of breaks were somewhat similar across the two respondent groups, with some respondents providing multiple breaks of varying duration (15 minutes tends to be the most commonly used break time); some break schedules include lunch. Other agencies specify a break at a particular point during a shift (morning and afternoon, for example), while others specify a break after a certain number of hours worked. Among the state DOT respondents, a break schedule that offers multiple breaks plus lunch was more frequently cited. In both respondent groups, breaks are more variable under emergency conditions.

5.2.5 Other Driving Time Practices

5.2.5.1 Operator Activities Outside of the Snowplow

Most respondents in both groups do not classify all periods operators spend out of the plow as break times. Most of the state DOT snowplow operators are loading and unloading winter materials during their time out of the plow, while most UDOT region staff members are maintaining their trucks (changing blades, and washing the truck or windows).

5.2.5.2 Minimum Rest Periods

Rest periods between shifts are required under federal CDL driving limits. While this requirement does not apply to the state DOTs and UDOT regions surveyed for this project, most of the UDOT regions require a minimum rest period. However, only slightly more than half of state DOT respondents require one. The most common rest period reported by state DOT respondents is eight hours, while the most common minimum rest period for UDOT regions is four hours. The range of rest periods is greater for state DOTs, ranging from two to 12 hours, while UDOT region rest periods range from four to eight hours.

5.2.6 Exceeding Typical Driving Time Limits

Both respondent groups most often cited weather conditions as the reason typical driving limits are exceeded. Both groups also mentioned lack of staff or relief drivers and equipment problems as requiring longer shifts.

Most of the UDOT region respondents who reported exceeding drive time limits do so after the approval of an area supervisor. A Region One respondent who reported that his region

does not exceed drive time limits indicated that the region opted to let the level of service for lower-level routes "slip." For state DOTs, approval is most likely to come from the executive or district level. Only a few state DOT respondents obtain approval for exceeding driving time limits at the local level.

5.2.7 Factors Affecting the Management of Shift Limits

When considering a wide range of factors that could affect the management of shift limits, respondents indicated a consensus of opinion in both factor categories. While the actual average ratings differed slightly, both respondent groups rated the same factors as most and least challenging:

Environmental and Driving Conditions
Greatest impact—Increased hours of driving
Least impact—Low traffic density

Personnel and Equipment Factors
Most challenging—Lack of personnel
Least challenging—Manual versus automatic truck transmission

State DOT respondent comments on the lack of personnel highlighted the lack of on-call or seasonal staff and attrition to local agencies. Long driver commute times were noted by both groups. When agencies hire staff for hard-to-fill locations, the crew members often live some distance from the station, which requires the driver to spend too much of the between-shift rest time driving to and from the station.

5.2.8 Successful Practices

When asked to describe successful practices, respondents from both groups recommended the use of 12-hour shifts, with state DOT respondents recommending this shift length more frequently. UDOT region respondents recommended shortening driving time limits to allow operators to rest as needed and require supervisors to be more proactive in shift scheduling. Shift scheduling was also highlighted in responses to the state DOT survey, with Idaho's "swarm the storm" concept that deploys 100 percent of the agency's resources at the

beginning of a storm, Pennsylvania DOT's split on-demand shifts, and Washington State DOT's change in the timing of night shifts.

5.2.9 UDOT Region Recommendations

The survey of UDOT regions sought recommendations from staff that could inform development of UDOT's final driving time policy. Respondents encouraged flexibility in the policy and in the latitude given to supervisors to allow regions to either extend shifts or reduce levels of service. Other recommendations highlighted the need for more trained relief drivers to fill the shifts. Respondents also noted that limiting shift times would allow operators to rest as needed and enhance the safety of drivers and the public. For one respondent, that means limiting shifts to 12 hours.

5.3 Limitations and Challenges

The scope of this project did not permit an exhaustive review of relevant literature on the subject of driving time practices and fatigue associated with CMV drivers. Instead, the literature review for this project focused on more recent publications to present a representative sampling of research in areas related to establishing driving time policies for snowplow operators.

Findings from this limited review of relevant research and consideration of UDOT and national snowplow operator driving time practices identified in the two surveys conducted for this project brought to light no particular standard, uniform best practice, or definitive prescription for safe and effective snowplow operator driving time practices. However, this review did identify some general recommendations based on research results, areas of concern highlighted in the literature and survey results, and commonalities in practice that can guide development of a snowplow operator driving time policy.

6.0 RECOMMENDATIONS

UDOT may wish to consider the following as the agency prepares to draft a final policy with regard to driving time limits for its snowplow operators:

- **Consider shift start and end times.** Research has shown that operator sleep schedules and lows in the circadian rhythm that occur during the overnight hours can present challenges. In Washington, shift schedules were moved up one hour, to 4 p.m. to 2:30 a.m., to help reduce fatigue in night shift crews.

- **Consider the use of 12-hour shifts.** While survey results indicated no standard for shift length, several respondents highlighted their own successes with 12-hour shifts.

- **Establish different shift limits for emergency conditions.** Most respondents manage shifts differently under typical and emergency conditions, with the majority of both respondent groups reporting shift lengths under emergency conditions of more than 12 hours.

- **Include breaks in the operator's work schedule.** Research indicates that breaks can be effective in relieving fatigue, and almost all respondents provide snowplow operators with some type of opportunity for a break. Most of the respondents in both groups do not consider the time spent performing tasks such as loading and unloading winter materials or refueling as break times. A break of 15 minutes was common among respondents, with some agencies specifying multiple breaks during the first and second halves of a shift, along with a 30-minute or longer lunch break. Many agencies reported more flexible break schedules under emergency conditions.

- **Consider specifying a minimum rest period between shifts.** While only slightly more than half of state DOT respondents require a minimum rest or off-duty period between shifts, this practice is common among the UDOT regions surveyed. Long commute times for drivers living some distance from the station might be considered when setting a minimum rest period between shifts.

- **Identify ways to remediate staffing challenges.** In both respondent groups, survey responses indicated a concern about the lack of personnel and highlighted the need for well-trained relief or on-call drivers. UDOT may wish to consider these practices offered by respondents to better manage snowplow operator driving time and address the impact of limited staff:
    - Stagger shift changes.
    - Approve enough on-call and seasonal drivers to fill the shifts, and provide adequate training.
    - Rotate drivers among various conditions to mitigate stress and boredom and better manage plow hours.
    - **S**plit the workforce into two shifts so that one shift operates on an on-demand basis during winter storm events.
    - "Swarm the storm" by deploying all agency resources at the outset of a storm.
    - Transition to more efficient equipment (for example, tow plows) to reduce the number of hours required to treat routes.
    - Lower the level of service expectations under certain circumstances.

- **Consider reducing the level of service during extended storm events.** A UDOT region staff member suggested a reduction in plow service from 11 p.m. to 5 a.m. coupled with public outreach that alerts the public to a reduced level of service and the reason for it (limited resources).

- **Manage public expectations.** If the final policy allows for reductions in current levels of service under certain circumstances, consider a public information campaign that advises the public of what to expect and when, and of the agency's need to balance road conditions with the safety of snowplow operators.

- **Allow for flexibility.** Each region is unique in its terrain, staffing and other factors. Some state DOT respondents indicated a level of flexibility in their practices that allows maximum driving limits to be exceeded under certain conditions. UDOT may wish to consider including in its policy the opportunity for flexibility at the area, region or station level to meet the unique demands of each region and station.

- **Monitor the impact of the new policy.** UDOT region respondents reported challenges associated with implementing the interim guidance contained in Letter of Instruction 15-1. An organized effort to monitor the impact of a new policy, by soliciting feedback from UDOT region staff and other stakeholders or through other means, is recommended during the first several winter seasons the new policy is applied.

APPENDIX A: STATE DOT SURVEY

The following survey was provided to selected state DOTs expected to have experience with winter maintenance activities.

The Utah Department of Transportation is gathering information about state DOT practices related to snowplow operator driving time. This information will be used to inform UDOT's development of a new policy on safe driving practices for snowplow operators.

Please provide information about your snowplow operator driving time practices by responding to the questions below. We would appreciate receiving your survey response by **February 5**.

Please let us know if you have any questions as you complete the survey. Thanks very much for your participation.

Chris Kline, CTC & Associates
chris.kline@ctcandassociates.com
608-318-1416

Thomas Hales, UDOT Research Project Manager
tahales@utah.gov
801-633-6226

Responsibility for Winter Maintenance

1. Indicate the percentage of your agency's overall snowplowing operations that is conducted by each employer type below. "Snowplowing operations" includes snow removal, anti-icing, deicing and other activities that require staff to operate plow trucks.

	Percentage of overall snowplowing operations
State DOT	_____
Other state agency	_____
County or other local agency	_____
Private company	_____

Please answer the questions that follow based on applicability to the majority of your snowplow operators (whether they are public employees or contractors).

Snowplow Operator Policies and Guidance

1. Are your agency's snowplow operators required to hold a commercial driver's license (CDL)?
   __ No
   __ Yes

2. If you responded "Yes" to Question 1, what CDL class does your agency require? Select all that apply to your snowplow operators.
   __ Class A
   __ Class B
   __ Class C
   __ N/A

3. Which of the following sources of guidance influence your agency's snowplow operator driving time practices? Select all that apply.
   ___ Formal policy adopted by my agency
   ___ Informal practice documented by my agency
   ___ Union regulation or agreement
   ___ State regulation
   ___ Federal CDL driving time limits and/or off-time requirements
   ___ Guidelines or policies established by agencies contracted to perform our snowplow operations
   ___ Other (please specify)

4. Briefly describe any of the guidance sources marked above that your agency uses to guide snowplow operator driving time practices.

5. Please provide links below to any policies, agreements or regulations used to guide snowplow driver practices by your agency or your contractors. Send any files not available online to Chris Kline at chris.kline@ctcandassociates.com.

Driving Time Practices—Shift Limits and Breaks

In this section, we're asking you to describe the shift limits and break times applied to your snowplow operators in three situations:

- ***As required by policy, agreement or regulation*.** Maximum shift limits and break requirements established by your agency's policy, union agreement or other regulation.
- ***In practice under typical conditions*.** A light snow or ice event of limited duration.
- ***In practice under emergency conditions*.** A multiday winter weather event, an event with extremely heavy or blowing and drifting snow, or any other winter weather event deemed an emergency.

1. As Required by Policy, Agreement or Regulation
   Maximum continuous shift length (including breaks):
   Frequency or timing of operator breaks:
   Duration of each break:

2. In Practice Under Typical Conditions
   Continuous shift length (including breaks):
   Frequency or timing of operator breaks:
   Duration of each break:

3. In Practice Under Emergency Conditions
   Continuous shift length (including breaks):
   Frequency or timing of operator breaks:
   Duration of each break:

Other Driving Time Practices

1. Are all periods your operators spend out of the snowplow (for example, time spent refueling, reloading salt, etc.) classified as break times?
   __ No
   __ Yes

2. Do some of the periods out of the snowplow involve nondriving tasks?
   __ No
   __ Yes (please describe these nondriving tasks below)

3. Does your agency require minimum rest periods or time off between shifts (when the operator is off duty)?
   __ No
   __ Yes (please describe the rest period or time off duty below)

Exceeding Typical Driving Time Limits

1. Describe the conditions or circumstances that warrant exceeding your typical driving time limits.

2. How is approval provided, and by whom, when typical driving time limits are exceeded?

Factors Affecting the Management of Shift Limits

1. Below are environmental and driving conditions that may contribute to snowplow driver fatigue. Please rate the impact of each factor using 1 = low impact to 5 = high impact. (Insert an "x" in the appropriate box next to each factor to indicate your selection.)

Environmental and Driving Conditions	1 = Low impact	2	3	4	5 = High impact
Extreme cold					
Blowing and drifting snow					
Mountainous areas					
Flat terrain					
Rural roadways					
Urban roadways					
Low traffic density					
High traffic density					

Environmental and Driving Conditions	1 = Low impact	2	3	4	5 = High impact
Daytime shift					
Nighttime shift					
Increased hours of continuous driving					

2. Please comment on the environmental and driving conditions described above that have the greatest impact on snowplow driver fatigue.

3. Below are personnel and equipment factors that may present challenges in managing the time your snowplow operators spend in a plow truck. Please rate each factor using 1 = least challenging to 5 = most challenging. (Insert an "x" in the appropriate box next to each factor to indicate your selection.)

Personnel and Equipment Factors	1 = Least challenging	2	3	4	5 = Most challenging
Age of the truck or equipment					
Condition of the truck or equipment					
Ergonomics of the truck controls					
Individual operator circumstances and requirements (medical, other)					
Lack of equipment					
Lack of personnel					
Manual versus automatic truck transmission					
Plow type and configuration (tow plow versus standard wing plow)					

4. Please comment on the personnel and equipment factors described above that present the greatest challenges in managing staff and equipment to optimize snowplow shifts.

5. Please describe any other factors not described above that contribute to snowplow driver fatigue or present other challenges in managing snowplow driver shifts.

Wrap-Up

1. What successes has your agency experienced in managing operator driving time limits?

2. Please use this space to provide any comments or additional information about your answers above.

APPENDIX B: UDOT REGION SURVEY

The following survey was provided to selected staff of UDOT regions and stations.

The Utah Department of Transportation is developing a statewide policy that identifies safe practices related to operator time in a snowplow. To assist in this effort, CTC & Associates is gathering information from other state DOTs and UDOT regions and stations about current practices related to snowplow operator driving time.

Please provide information about snowplow operator driving time practices in your region/station by responding to the questions below. Several months ago, UDOT distributed Letter of Instruction 151, Snow Plow Operator Duration of Operations Direction (see https://www.udot.utah.gov/main/uconowner.gf?n=20549817311126084) as an interim policy while work proceeded on developing a final policy. Please use your activities ***before*** release of this Letter of Instruction as the basis for your responses to the survey questions about your driving time practices.

We would appreciate receiving your survey response by **February 12**. Your feedback about local practices will be critical to UDOT's efforts to develop a statewide policy for safe practices related to operator time in a snowplow.

Please let us know if you have any questions as you complete the survey. Thanks very much for your participation.

Chris Kline, CTC & Associates
chris.kline@ctcandassociates.com
608-318-1416

Thomas Hales, UDOT Research Project Manager
tahales@utah.gov
801-633-6226

Local Policies

1. Have you adopted the guidelines included in Letter of Instruction 15-1, Snow Plow Operator Duration of Operations Direction, as an interim measure to manage your snowplow operators' driving time?
   __ No
   __ Yes (please respond to Question 1A below)

1A. Have you encountered any challenges in implementing the guidelines in Letter of Instruction 15-1?
   __ No
   __ Yes (please describe these challenges below)

2. Prior to distribution of Letter of Instruction 15-1, what type of guidance did your region/station use to manage your snowplow operators' driving time?
   ___ Written policy (see Question 3 below)
   ___ Unwritten rule of thumb
   ___ None

3. Please provide a link to your written policy used to guide snowplow driver practices. Send any file not available online to Chris Kline at chris.kline@ctcandassociates.com.

Driving Time Practices—Shift Limits and Breaks

In this section, we're asking you to describe the shift limits and break times applied to your snowplow operators in two situations:

- ***In practice under typical conditions.*** A light snow or ice event of limited duration.
- ***In practice under emergency conditions.*** A multiday winter weather event, an event with extremely heavy or blowing and drifting snow, or any other winter weather event deemed an emergency.

1. In Practice Under Typical Conditions
   Continuous shift length (including breaks):
   Frequency or timing of operator breaks:
   Duration of each break:

2. In Practice Under Emergency Conditions
   Continuous shift length (including breaks):
   Frequency or timing of operator breaks:
   Duration of each break:

Other Driving Time Practices

1. Are all periods your operators spend out of the snowplow (for example, time spent refueling, reloading salt, etc.) classified as break times?
   __ No
   __ Yes

2. Do some of the periods out of the snowplow involve nondriving tasks?
   __ No
   __ Yes (please describe these nondriving tasks below)

3. Does your region/station require minimum rest periods or time off between shifts (when the operator is off duty)?
   __ No
   __ Yes (please describe the rest period or time off duty below)

Exceeding Typical Driving Time Limits

1. Describe the conditions or circumstances that warrant exceeding your typical driving time limits.

2. How is approval provided, and by whom, when typical driving time limits are exceeded?

Factors Affecting the Management of Shift Limits

1. Below are environmental and driving conditions that may contribute to snowplow driver fatigue. Please rate the impact of each factor using 1 = low impact to 5 = high impact.

Environmental and Driving Conditions	1 = Low impact	2	3	4	5 = High impact
Extreme cold					
Blowing and drifting snow					
Mountainous areas					
Flat terrain					
Rural roadways					
Urban roadways					
Low traffic density					
High traffic density					
Daytime shift					
Nighttime shift					
Increased hours of continuous driving					

2. Please comment on the environmental and driving conditions described above that have the greatest impact on snowplow driver fatigue.

3. Below are personnel and equipment factors that may present challenges in managing the time your snowplow operators spend in a plow truck. Please rate each factor using 1 = least challenging to 5 = most challenging.

Personnel and Equipment Factors	1 = Least challenging	2	3	4	5 = Most challenging
Age of the truck or equipment					
Condition of the truck or equipment					
Ergonomics of the truck					

Personnel and Equipment Factors	1 = Least challenging	2	3	4	5 = Most challenging
controls					
Individual operator circumstances and requirements (medical, other)					
Lack of equipment					
Lack of personnel					
Manual versus automatic truck transmission					
Plow type and configuration (tow plow versus standard wing plow)					

4. Please comment on the personnel and equipment factors described above that present the greatest challenges in managing staff and equipment to optimize snowplow shifts.

5. Please describe any other factors not described above that contribute to snowplow driver fatigue or present other challenges in managing snowplow driver shifts.

Wrap-Up

1. What successes has your region/station experienced in managing operator driving time limits?

2. What recommendations can you offer to improve snowplow operator effectiveness and enhance safety?

3. Please use this space to provide any comments or additional information about your answers above.

APPENDIX C: ARIZONA DOT SNOWPLOW STIPEND POLICY

ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
POLICIES AND PROCEDURES

PER 05-1 Snowplow Stipend Policy

Effective: August 19, 2013 | **Review: August 19, 2016**
Supersedes: PER 05-1 (November 29, 2012) | Page 1 of 5

PURPOSE

The purpose of this policy is to present instructions for recording snowplow activities on the Bi-Weekly Time Sheet (BTS) and to present a clearly defined policy regarding the applicability and eligibility of the snowplow stipend.

The purpose of the snowplow stipend is to ensure the ability to attract and retain fully qualified individuals willing to conduct critical snowplow operations during winter snowstorms. This stipend is intended to recognize the demands and hazardous conditions of snowplowing and to reduce employee turnover in the districts requiring emergency snowplowing activities. It also assists the Arizona Department of Transportation (ADOT) in competing with other local employers for skilled Commercial Driver License (CDL) drivers trained in snow removal.

SCOPE

This policy pertains to ADOT employees whose job descriptions include snowplow duties and those (from any division) who register as volunteers in the ITD volunteer pool of CDL drivers. In addition, this policy applies to the particular duties performed by eligible employees. Four of the work activities in the 170 series, as tracked in PeCoS, are eligible for the stipend. See policy statement A (2) for eligible activities. This policy applies to all districts affected by snow issues.

This policy and the stipend do not apply to emergency conditions outside of snow removal.

BACKGROUND

The snowplow stipend was originally approved by the Arizona Department of Administration (ADOA) for the Intermodal Transportation Division (ITD) in 2004. With the change in pay structure and reclassification of the Maintenance employees, the stipend policy was restructured and approved by ADOA in 2007. The new format ensured that employees would continue to receive a competitive rate of pay for performing snowplow activities. In 2007, an explanation of how to record overtime, shift differential, and stipend pay associated with eligible winter storm management activities was added to the policy. PeCoS activity 172, Winter Storm Patrol, was added to this policy as an activity that is eligible for the stipend effective

November 29, 2012. In 2013, the instructions for how to record shift differential were removed; the explanation of how to record the time spent performing snowplow and winter storm management activities was updated; clarification was added pertaining to the stipend being paid for every hour spent performing the four eligible activities in the 170 series.

POLICY

ITD shall:

A. Pay $9.00 per hour **snowplow stipend** in addition to wages for employees performing snowplow and winter storm management activities. This rate is effective beginning November 17, 2007, and will be reviewed as needed by ADOA in order to remain competitive with local employers.

Please note, that in keeping with the intent of the approved stipend **not all snowplow and winter storm management activities** are eligible for the stipend. The stipend is designed to attract and retain qualified individuals to conduct critical snowplow operations and winter storm management activities.

Eligibility:

1. Employees must have a current CDL, and their job titles must be on the list of eligible classifications (Exhibit 1), or the employee must be registered with the volunteer pool of CDL drivers. If not on either list, the employee will not be eligible to receive the snow plow stipend.

2. The stipend will be paid for each hour spent conducting the following activities during winter storm conditions and storm warnings:

    - Activity 171 Plow Snow and/or Apply Abrasives/De-icers;
    - Activity 172 Winter Storm Patrol;
    - Activity 173 Spot Ice Control;
    - Activity 174 Anti-Icing w/De-icers.

3. Employees **will not receive the stipend** while conducting the following activities:

    - Activity 175 Cleaning of all Snow Related Equipment;
    - All 179 Activities.

B. Require a **CDL** for all employees receiving the snowplow stipend.

1. ITD shall obtain employment history (if any), pertaining to an ADOT employee's CDL driving record and drug testing history when there has been a previous employer within the past two years.

2. The operation of a snowplow that requires a CDL is considered a safety-sensitive function. In compliance with 49 CFR 382.301 *Controlled Substances and Alcohol Use Testing*, ITD requires any employee to pass a drug test before performing a safety-sensitive function. In addition, all CDL

drivers are subject to random drug testing in accordance to ADOT PER-1.03 *Commercial Driver License (CDL) Drug and Alcohol Testing Policy*, this includes employees driving a snowplow as a volunteer.

C. Mandate snowplow and equipment training **prior** to performing snowplow duties. Employees must at a minimum complete twenty-four hours of on-the-job training (OJT) and then pass an Operational Evaluation, earning a qualified status on their training transcript. The required number of OJT hours that it takes to produce a qualified snowplow operator varies. Therefore, training is provided by, and at the discretion of, the org supervisor. This would be the receiving org supervisor, if the driver is from the volunteer pool. The trainee (second CDL holder in the snowplow) is eligible for the stipend while being trained in the snowplow. Time spent training in the snowplow simulator is not eligible for the stipend.

   Every year, employees who are planning, or are required to plow snow, must attend a Winter Readiness Workshop, a Snowplow Refresher Course, and complete two hours of simulator time.

D. Uphold **safety** as the foremost consideration when scheduling snowplow drivers. It is in the best interest of ADOT to reduce the cost of overtime and keep our employees safe. The use of volunteer **CDL drivers** rather than scheduling employees for overtime is encouraged as a best practice when possible and practical to do so. Flexibility remains with the District, Supervisors, and Managers when scheduling snowplow drivers. There are no "sleep" or "break" requirements between shifts. Snowplow drivers may be called out to drive a snowplow shift immediately following their normal workday when necessary. *However, it is the employees' responsibility to keep the supervisors and managers aware of their exhaustion level as it applies to their ability or inability to perform snowplow responsibilities safely before being assigned to work a snowplow shift.*

E. Require volunteer CDL drivers to register as part of the ITD volunteer pool **prior** to being allowed to operate any ADOT equipment, including the snowplow and allow discretion by the district supervisors **when choosing and scheduling** volunteer drivers for duties related to winter weather conditions. Supervisors of the volunteers are encouraged to coordinate the use of registered CDL drivers so they may fulfill their commitment to work when needed as CDL drivers. The ITD volunteer pool of CDL drivers is not rotational and there is no guarantee that a volunteer will be chosen from the pool. ITD shall be fair and equitable in the selection of volunteer drivers from the ITD volunteer pool and will comply with all ADOT policies regarding discrimination. However, the decision remains with the supervisor requesting the assistance. Volunteer drivers may be called upon often or not at all. Please contact Central Maintenance for a current list of registered volunteer CDL drivers.

RECORDING TIME FOR SNOWPLOW AND WINTER STORM MANAGEMENT ACTIVITIES

A. Record all snowplow stipend hours on the employee's BTS as they are actually worked according to the instructions in this policy and ADOT FIN-10.05 *Pay and Timekeeping*.

B. Record the snowplow hours on two separate lines on the BTS using pay code 729 and pay code 100, 101, 800, etc. This will result in the employee receiving their regular pay AND $9.00 per hour for the snowplow hours.

C. Do not use pay code 900 for snowplow and winter storm management activities as it has been reserved for **critical response** (unrelated to snowplow activities).

D. Do not use pay code 729 to record eligible paid **travel time** as the stipend will only be paid on hours spent performing an authorized snowplowing activity. Eligible paid travel time is paid in accordance with ADOT PER-8.05 Overtime Policy.

E. Record all hours accurately, and as per this policy, on the BTS (timesheet). Employees are responsible for entering their time on the BTS. It is the supervisor's responsibility for ensuring the accuracy of the BTS.

F. Do not intentionally misuse the snowplow pay code or falsify the BTS. Such actions are considered fraud and are cause for disciplinary action, up to and including dismissal.

G. Enter the "charge to" org number on the BTS. The snowplow stipend and the corresponding regular hours are paid to a volunteer from the org requesting the assistance, not from the volunteer's home org. The **BTS is signed** by the employee's home org supervisor. Snowplow activities for the volunteer CDL driver must be verified before signing.

REFERENCES

ITD PER 04-1 Commercial Driver License (CDL) Policy

ADOT PER-1.03 Commercial Driver License (CDL) Drug and Alcohol Testing Policy

ADOT FIN-10.05 Pay and Timekeeping

ADOT PER-8.05 Overtime Policy

49 CFR 382.301 Controlled Substances and Alcohol Use Testing

08/19/2013

Jennifer Toth
Deputy Director for Transportation

Date

Job Classifications Eligible For The Snowplow Stipend

Job Code	Job Title
AUN06895	Administrative Services Officer I
AUN09023	Administrative Services Officer II
AUN08127	Airport Firefighter II
ACV34598	Airport Firefighter II
AUN08128	Airport Firefighter Supervisor
AUN03864	Equipment Operator III
ACV64653	Equipment Operator III
ACV34809	Equipment Repair Lead Technician
AUN07495	Equipment Repair Lead Technician
AUN03879	Equipment Repair Technician
ACV34812	Equipment Repair Technician
AUN08150	Equipment Shop Supervisor
AUN08146	Equipment Services Assistant
ACV34807	Equipment Services Assistant
AUN04034	Fleet Services Supervisor
AUN08119	Highway Operations Technician I
ACV34508	Highway Operations Technician I
ACV34509	Highway Operations Technician II
AUN08120	Highway Operations Technician II
AUN08121	Highway Operations Technician III
ACV34510	Highway Operations Technician III
ACV34512	Highway Operations Technician IV
AUN08122	Highway Operations Technician IV
AUN08123	Highway Operations Technician Supervisor
AUN08118	Highway Operations Worker
ACV34507	Highway Operations Worker
AUN04492	Mechanical Equipment Engineering Designer
AUN04463	Programs and Projects Specialist II
AUN07257	Regional Equipment Manager
ACV34396	Transportation Construction Technician I
AUN08114	Transportation Construction Technician I
ACV34397	Transportation Construction Technician II
ACV34398	Transportation Construction Technician III
AUN08116	Transportation Construction Technician III
AUN08117	Transportation Construction Technician IV
ACV34399	Transportation Construction Technician IV
AUN08391	Transportation Engineering Specialist
AUN08492	Transportation Maintenance Management Analyst II
AUN08500	Transportation Materials Field Crew Technician II
AUN08501	Transportation Materials Field Crew Technician III
AUN08326	Traffic Signal and Lighting Area Manager
AUN08325	Traffic Signal and Lighting Crew Supervisor
AUN08555	Traffic Signal and Lighting Technician I
ACV39462	Traffic Signal and Lighting Technician II
AUN08324	Traffic Signal and Lighting Technician II
AUN04213	Training Officer I

Exhibit 1

APPENDIX D: IOWA DOT IM 8.100 SNOW AND ICE REMOVAL OPERATIONS

INSTRUCTIONAL MEMORANDUM
IOWA DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION – OFFICE OF MAINTENANCE

CHAPTER: SNOW AND ICE CONTROL	No. 8.100
TITLE: SNOW AND ICE REMOVAL OPERATIONS	
APPROVED: Bob Younie	ORIGINATION DATE: October 15,1984
	REVISION DATE: July 1, 2015

I. Purpose:

To provide guidance to field personnel regarding the establishment of criteria and priorities for snow and ice removal operations.

II. Definitions:

A. Reasonably Near Normal Surface – A pavement surface sufficiently free of snow, ice, frost or slush, permitting reasonable vehicle control when the vehicle is operated within the framework of existing laws and regulations. Some isolated spots or strips of packed snow or ice may be present.

B. Service Level – The maintenance classification given to a section of highway in accordance with the current Office of Maintenance Service Level Map. The Service Levels are labeled A, B, and C, with A being the highest level followed by B, followed by C being the lowest level.

C. Phase 1 – Operations when overtime is authorized

D. Phase 2 – Operations normally conducted during non–overtime hours.

III. References:

A. Iowa DOT Policies and Procedures Manual (PPM):

610.02 – Maintenance of Primary Road Extensions
610.17 – Traffic Control on Interstate Highways During Emergencies
800.02 – Cooperation with Department of Public Safety
800.04 – State Park and Institutional Roads Program

B. Office of Maintenance Standards for Maintenance Activities – Functions:

675 – Phase I Snow and Ice Control
676 – Phase II Snow and Ice Control
678 – Abrasives and Chemicals
679 – Snow Fencing
680 – Equipment Cleanup
681 – Other Snow and Ice Activities

682 – Anti–Icing
699 – Making Brine

IV. General Guidelines:

A. Snow and Ice Control operations should be performed in accordance with Iowa DOT Standards for Maintenance Activities and as defined in agreements negotiated with counties and cities.

B. Crew shifts, including supervisors, should be limited to a maximum of 12 continuous hours of work; employees may work 16 hours on their first shift going into a storm forecasted to be of lengthy duration.

C. The physical endpoints for snow and ice removal (where snow runs meet) should be predetermined to fall within cities or at intersections where possible. Each District Maintenance Manager (DMM) should set up a system providing necessary coordination between crews.

D. When the Iowa DOT's Weather Advisory Service forecasts a prolonged storm moving into the area, consideration should be given to splitting crew shifts. The HMS determines whether or not to split shifts and informs the DMM if requested. If split shifts are used, part of the crew may be sent home to rest, presuming they will be called back to work later.

E. Phase 2 operations shall be conducted during employees' non–overtime hours.

F. During clean–up operations, the Department is not required to load or haul snow from primary road extensions but may do so if considered necessary by the DMM to maintain traffic flow. Some loading or hauling of snow may be necessary at bridges, interchanges or other locations where snow storage capacity is limited.

V. Procedures:

A. Snow and Ice Removal Operations

1. To make the most effective use of available resources, a system of prioritized Service Levels has been established. The prioritized Service Level system consists of Service Level A as the highest priority, followed by B and then C as the lowest priority. When determining the appropriate priority, the Department should consider the following items, which include, but are not limited to: late night traffic volumes, special events, school activities, and medical emergencies.

2. Begin appropriate action with respect to frost, ice, and snow on pavement surfaces within 3 hours after the Department has actual notice of the condition. Response should be based on the Service Level assigned to each

segment of the highway system. Clearing blockages and lane restrictions should be conducted on the basis of the Service Level priorities assigned to each segment of the highway system. The general priorities for the various operations are as follows:

Priority Number	Phase	Description of Work
1	1	Service Level A–B highways: Achieve a reasonably near normal surface condition within 24 hours after a storm ends. This includes ramps, turn lanes, main drives through rest areas, and paved Intersection crossovers except crossovers for private drives. This does not include frontage roads.
2	1	Service Level C highways: Achieve a reasonably bare wheel path in each direction of travel within 24 hours after a storm ends.
3	2	All Service Levels: Remove snow from the traffic side of extended or continuous traffic barriers and from attenuators in gore areas to expose the barriers. Overtime for this work may be approved by the HMS.
4	2	All Service Levels: Remove snow from driveways and parking areas of weigh stations and rest areas. No sand or salt is to be used on driveways and ramps within 40 feet of the scale platform.
5	2	Service Level C highways: Achieve a reasonably near normal surface condition within three working days after Phase I operations are completed.
6	2	Service Level A–B highways: Plow shoulders as necessary within three working days following completion of Phase 1 operations.
7	2	Service Level C highways: Plow shoulders as necessary, as time permits.
8	2	All Service Levels: Remove snow from curbs and gutters of bridges and from the traffic side of traffic barriers and attenuators at spot locations as time permits.
9	2	All Service Levels: Remove snow from raised medians and islands as necessary to delineate traffic lanes as time permits.

B. Snow and Ice Removal Operations on State Highways maintained by other entities.

1. Snow and ice removal operations will be performed to the level of service determined by the Department.

C. Operational Limitations

1. Snow and ice removal operations may be suspended during periods of extremely poor visibility, with notifications to DMM's and law enforcement as provided in DOT PPM 800.02 (Cooperation with Department of Public Safety).

2. When limited benefits are expected from continued snow and ice operations, the HMS may elect to suspend operations until weather conditions improve or resources can be better utilized. Notifications will be made to DMM's and law enforcement as provided in DOT PPM 800.02 (Cooperation with Department of Public Safety).

3. Following storms, conditions including but not limited to drifting, blockages, lane restrictions, lack of resources, or abnormal conditions may preclude achieving the objectives outlined above in section V.A.2 of this I.M.

4. Phase 2 operations may require special procedures, such as transferring snow from one side of a roadway to the other or using rotary snow plows to widen out heavily drifted areas. The affected areas should be returned to the appropriate service level condition as soon as practical once the operation has been completed.

APPENDIX E: NORTH DAKOTA DOT EXCERPTS DRIVING TIME GUIDANCE

Snowplow Operator Driving Time Guidance
Provided by North Dakota Department of Transportation

Core Hours of Work
Core hours of the work day for Central Office employees and district administrative staff are from 8:30 a.m. to 4:00 p.m. Core hours for district maintenance and field engineering staff are determined by the division director or district engineer based on needs and operation of the division or district.

Employees will work regularly-scheduled hours unless the hours are changed for the following Reasons:

1. To protect the public during storms and emergencies.
2. To meet contract schedules.
3. To use materials when weather conditions are favorable and when normal work schedules will unduly increase costs, result in lost materials, or delay work needed to make highways safer.
4. To conserve energy.

Supervisors have the authority to make changes to work schedules to meet the above criteria. The need to change working hours will be described to each employee if time, safety, and field conditions allow.

Standard Work Week
The work week begins at 12:01 a.m. Monday and ends at 12:00 midnight Sunday. An employee's schedule will consist of 40 hours composed of five consecutive 8-hour days. The standard schedule begins on Monday and ends on Friday. Saturday and Sunday are not normally regular work days.

Other temporary exceptions may be made by division directors, district engineers, and Executive Management, but only to meet clearly-defined needs which cannot be met by normal work schedules. (NDAC 4-07-07)

Standard Work Schedules
Regular work schedules are established, changed, and enforced at the discretion and approval of the division director, district engineer, or Executive Management. Except in emergencies, work schedules may be changed only after the employee has had seven days' notice that a change will be made.

A staffing schedule must be available and updated whenever permanent changes are made to ensure that all employees and supervisors are fully aware of the schedule.

Work Breaks
Under normal conditions, every employee will be allowed a 15-minute break in the morning and a 15-minute break in the afternoon. Under deadlines and during periods of unusual conditions, any employee may need to forgo the break privilege for the period required.

Snowplow Operator Driving Time Guidance
Provided by North Dakota Department of Transportation

A minimum 30-minute meal period must be provided in each shift exceeding five hours when there are two or more employees on duty. Employees may waive their right to a meal period upon prior agreement with the supervisor.

Employees do not have to be paid for meal periods if they are completely relieved of their duties and the meal period is ordinarily 30 minutes in length. The employee is not completely relieved if required to perform any duties during the meal period. Generally, the Department will not require employees to perform regular work during their lunch breaks.

Work Hours

Start Times

A start time of no later than 5:00 AM LOCAL TIME at district headquarters and major sections on interstate, 4-lane highways, and other major commuter routes shall be uniform throughout the State. This early start time will generally consist of one (1) Transportation Technician per section, or additional staffing as determined by the District Engineer. This early start time has been established for purposes of early morning road condition reporting and to provide for increased service to motorists. Start time for remaining staff will be determined by district administration as conditions warrant. Start time for sections in outlying areas may be allowed a later start time, such as 7:00 AM, should early morning commuting be minimal. Districts with time zone boundaries should coordinate start times to insure seamless boundaries.

An early start time for all sections and all employees may reduce the overall time and effort needed to keep or return roads to a good condition. Additional staffing will be called in as needed by analysis of short range weather forecasting and actual roadway conditions. This analysis should be cooperative efforts between district headquarter maintenance staff and Transportation Services Supervisors for each respective section.

Each winter season will need to be evaluated based on local conditions. Start and end dates are to be determined by individual districts and based on local weather forecasts.

Shift Length

The maximum working shift for Transportation Technicians should be 14 hours. Exceptions to the working shift include assisting in medical or rescue-type emergencies and during snow events to meet designated service levels. Darkness is not a criterion for quitting as long as it is safe to be out.

Shift Differential and On-Call

Shift differential and on-call status policies are encouraged to be used by districts to achieve desired service levels. This should be implemented by all districts for which early reporting is required at specific sections and where additional staff is needed to respond to local forecasted events. For implementation guidance refer to NDDOT Policy numbers 14.2 and 14.25 on On-Call, Call Back, Holiday and Weekend Road Check, Residence and Reporting to Work Requirements, and Shift-Differential Pay.

Night Shift

The major highways in the immediate areas of Bismarck-Mandan, Minot, and Fargo will have three shifts working to have 24 hour coverage. The sections in these cities are expected to work as a team to bring about the best efforts to remove snow and ice in these urban areas. Extended work shifts will be used if road conditions warrant it. See the District Snow & Ice Control Manuals for more information.

APPENDIX F: ARIZONA DOT COMMERCIAL DRIVER LICENSE POLICY

ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
POLICIES AND PROCEDURES

PER 04-1 Commercial Driver License (CDL) Policy

Effective: February 6, 2015
Supersedes: PER 04-1 (April 20, 2011)

Review: February 6, 2018

PURPOSE

The purpose of this policy is to clarify Commercial Driver License (CDL) requirements for Intermodal Transportation Division (ITD) employees and volunteer CDL drivers and to define when and how the Arizona Department of Transportation (ADOT) pays for CDL-related expenses.

SCOPE

This policy and the CDL requirements discussed herein pertain to ITD employees who are required by their job description to obtain and maintain a CDL with or without endorsements and to employees who are listed in the Volunteer CDL Registry (VCR) as volunteer CDL drivers. This policy does not detail how a CDL or endorsements are obtained; refer to the ADOT Motor Vehicle Division (MVD) website at http://www.azdot.gov/mvd/ for more information on the licensing process.

AUTHORITY

This ITD policy is intended to supplement the ADOT Administrative Procedure PER-1.03 *Commercial Driver License (CDL) Drug and Alcohol Testing Polic;* Arizona Administrative Code R17-5-204 *Motor Carrier Safety: 49 CFR 391 Qualifications of Drivers and Longer Combination Vehicle (LCV) Driver Instructors* provides the requirements for CDL drivers; 49 CFR 172 *Hazardous Materials . . . Training Requirements, and Security Plans* defines hazmat training requirements; Arizona Revised Statutes Chapter 8, Article 5 *Commercial Driver Licensing* §28-3221 through §28-3228 provides the state's CDL licensing requirements.

DEFINITIONS

Class A CDL — A commercial driver license allowing a driver to operate any combination of vehicles with a gross combination weight rating (GCWR) of 26,001 pounds or more and tow trailers or other vehicles with a gross vehicle weight rating (GVWR) of over 10,000 pounds. A Class A CDL can be either intrastate (valid for driving within Arizona only) or interstate (valid for in-state and out-of-state driving).

Class B CDL — A commercial driver license allowing a driver to operate a single vehicle with a GVWR of 26,001 pounds or more and tow trailers or other vehicles with a GVWR of 10,000 pounds or less. A Class B CDL can be either intrastate (valid for driving within Arizona only) or interstate (valid for in-state and out-of-state driving).

H Endorsement	An endorsement code designating a driver's eligibility to drive a vehicle that carries hazardous materials in the amounts requiring markings or placards. A driver must be 21 years of age to receive an H endorsement. Often referred to as the "hazmat" endorsement, an H endorsement can be issued to the holder of an interstate or intrastate CDL.
N Endorsement	An endorsement code designating a driver's eligibility to drive a vehicle designed to transport a liquid or gaseous material within a tank that is either permanently or temporarily attached to the vehicle or chassis, including a cargo tank, a portable tank and a trailered tank, but excluding a portable tank having a rated capacity under 1000 gallons. The N endorsement is often referred to as the "tanker" endorsement. Fingerprinting and background checks are not required for holders of a CDL with an N endorsement. The N endorsement may be held with a Class A intrastate CDL by an employee less than 21 years of age.
Position Required CDL	A requirement that the employee must hold and maintain a CDL to perform the essential functions of the position requirements.
Volunteer CDL Driver	An ITD employee whose position does not require a CDL and who volunteers and is registered in the ITD Volunteer CDL Registry in the event that a CDL driver is needed.
X Endorsement	A combination of the N (tanker) and H (hazmat) endorsements.

POLICY

A. Persons being hired by ITD **must have their CDL and required endorsements by the time they report to work. There are three exceptions to this requirement: Highway Operations Worker, Traffic Signal and Lighting Technician I, and Transportation Materials Field Crew Technician I**; all of which must have their **permit** (written portion of CDL) when reporting to work and must obtain their CDL and required endorsement within six months from the date of hire. The CDL instruction permit is valid for six months. It can be renewed one time providing it has been less than twelve months from the initial application date.

B. Applicants and employees hired or working in a position requiring a CDL are required to have a **Class A Interstate CDL with the N (tanker) endorsement with the following exceptions:**

1. Applicants and employees in the following classifications are required to have a **Class A Interstate CDL. Traffic Signal and Lighting Series employees are not required to have their "N" (tanker) endorsement.**

Traffic Signal & Lighting Tech I
Traffic Signal & Lighting Tech II
Traffic Signal & Lighting Crew Supervisor

2. Applicants and employees in the following classifications are required to have a **Class B Interstate CDL. Class B operators are not required to have their "N" tanker endorsement.**

   Transportation Materials Field Crew Tech I **Transportation Materials Field Crew Tech II**
   Transportation Materials Field Crew Tech III

C. Employees in positions with the potential to drive a vehicle that carries hazardous materials in amounts requiring markings or placards are required to have a **Class A interstate CDL with an X endorsement**.

In addition to the positions that currently require a CDL, other position descriptions may be reviewed to determine if there is a possibility that employees in these positions would need to operate a vehicle requiring a CDL and endorsements. If a position meets the criteria, the CDL and endorsements will become part of the requirements for that position.

Supervisors will ensure that the requirements for CDL class and endorsements are met and will prohibit an employee without a CDL from operating equipment requiring a CDL, except for training and/or testing purposes (in which case the employee must hold the required permit).

D. All CDL drivers are subject to random drug testing per ADOT Policies and Procedures PER-1.03 *Commercial Driver License (CDL) Drug and Alcohol Testing Policy*.

E. A CDL obtained in another state must be transferred to Arizona by the employee or applicant. However, a CDL from a bordering state is acceptable when the applicant or employee has permanent residence in the bordering state.

F. No exceptions are allowed to the requirement for a CDL or endorsement. The requirement for a CDL or endorsement is specific to the position, not the person in the position.

G. Federal regulations require that CDL holders with hazmat (H or X) endorsements successfully complete a **fingerprint-based background records check** and knowledge test prior to the issuance or renewal of the hazmat endorsement. The background records check is valid for five years. It is the responsibility of the CDL holder to arrange for a new background records check prior to its expiration to avoid cancellation of the CDL.

Employees whose positions require the hazmat endorsement may use state time to complete the fingerprint-based background check, including travel to specific MVD offices as necessary. Overtime may NOT be used to complete the backgrounds records check or to travel to the exam site.

All CDL holders with an H or X endorsement will be notified by mail sixty days before their hazmat endorsement expires. Upon receiving the letter indicating it is time to renew the hazmat endorsement:

1. **Employees whose jobs require a hazmat endorsement** must apply for and successfully receive a hazmat endorsement renewal or must surrender the hazmat endorsement to MVD. Situations where current employees are unsuccessful in receiving an endorsement renewal will be evaluated by the supervisor and Human Resources on an individual basis.

2. **Employees whose jobs do not require or no longer require a hazmat endorsement** may renew their CDL and surrender the hazmat endorsement or may choose to renew the hazmat endorsement at their own expense. No fingerprinting or background check will be conducted if the hazmat endorsement is voluntarily surrendered. Employees who surrender their hazmat endorsement must obtain an N (tanker) endorsement when they renew their CDL; ADOT will pay the fee for the N endorsement.

H. **Employees who do not meet the age requirement** (21 years old) for obtaining an interstate CDL and endorsements may obtain an intrastate CDL (available to drivers at least 18 years of age). Employees may be considered for positions requiring an interstate CDL with hazmat endorsements once they have reached 21 years of age and have obtained the interstate CDL with hazmat endorsements. Exceptions cannot be granted for underage employees or applicants. **Failure to obtain the required CDL or endorsements after reaching the age of 21 is considered grounds for disciplinary action up to and including dismissal.**

When a position requires a CDL, failure to fulfill those requirements is grounds for disciplinary action up to and including dismissal. A driver operating with a CDL instruction permit must be accompanied by the holder of a valid CDL of the proper class. Exceptions will not be granted for new hires who cannot obtain the appropriate CDL or endorsements.

I. **Volunteer CDL Drivers**—ITD employees whose positions do not require a CDL may volunteer as CDL drivers for the purpose of working/driving in the event that a CDL driver is needed. The following requirements and procedures apply to volunteer CDL drivers:

1. All volunteer CDL drivers must have a Class A or Class B interstate CDL (employees under 21 may hold a Class A or B CDL with the intrastate restriction) prior to volunteering. Volunteer Class B operators are not required to have their "N" tanker endorsement.

2. Volunteers do not need to obtain a hazmat endorsement in order to join the VCR. Volunteers will be given appropriate work assignments based on the class of CDL and endorsements they hold.

3. In order to be eligible to be placed on the volunteer list as a snowplow operator, volunteers will need to complete the following training requirements BEFORE they can be added to the volunteer list:

    - Complete snowplow simulator training each year
    - Attend the Winter Readiness Workshop conference each year
    - Complete TCH4830 Snow Removal Equipment training class and OJT requirements to receive "Q" Qualified Operator status

- Have a current CDL Class A license (over 26,000 lbs. w/air brake)

4. **Payment of fees:**

   a. ADOT does not pay for any portion of the costs related to obtaining a new CDL. Fees are not reimbursable to the employee.

   b. ADOT will pay for the renewal of the CDL for volunteer CDL drivers. No retroactive payments will be made for renewals prior to the effective date of this policy.

5. Volunteer CDL drivers are listed on the ITD Volunteer CDL Registry maintained by the Central Maintenance Section. Volunteers join the VCR for two years by completing the Volunteer Registration form available at ITD Volunteer CDL Registry. The registration period is August 1st through September 30th each year. Registration forms submitted outside of this period will be reviewed by Central Maintenance and exceptions granted on a case by case basis.

6. There is no special compensation for registering for the VCR. Overtime or emergency overtime pay will be given when the situation requires it.

7. Supervisors are encouraged to coordinate the use of registered volunteer CDL drivers.

8. Appropriate clothing (jackets, boots, gloves, etc.) will be provided to volunteer CDL drivers by their own Unit. Equipment will be provided by the Org for which they volunteer.

9. If a volunteer CDL driver receives a citation, suspension, revocation, or loss of CDL privileges, the employee's supervisor must notify the Central Maintenance Section. Employees will be removed from the VCR upon receiving a citation or suspension of CDL privileges.

J. Employees may complete the driving portion of the CDL test **on state time** (including retesting).

K. **Physical exams:**

1. A physical exam is required every two years and in some cases more often to maintain the CDL.
2. Employees may use state time to take or renew the physical exam required for a CDL. Overtime may NOT be used to take the physical exam or to travel to the exam site.
3. The pre-employment physical exam and the CDL physical exam may be completed at the same time; however, they are unrelated tests and separate paperwork is required for each.
4. ADOT will pay for the physical exam required for the CDL. The exam must be conducted by a doctor or facility that is contracted by ADOT to perform CDL physical exams. The current list of contracted facilities is available at CDL Physicals - Contracted Facilities. **Employees cannot be reimbursed for physical exams provided by a doctor or facility that is not contracted by ADOT.**

L. It is the **employee's responsibility** to obtain and maintain the CDL and any required endorsements (including physical exams as required) as a condition of employment. **Failure to fulfill these requirements is grounds for disciplinary action up to and including dismissal.** It is also the employee's responsibility to obtain equipment training prior to accepting an assignment requiring the use of their CDL. These responsibilities also apply to employees who voluntarily obtain and maintain a CDL for a two year commitment as a volunteer CDL driver with the VCR.

M. It is the **supervisor's responsibility** to ensure that their employees comply with the requirements of obtaining and maintaining a CDL and the associated endorsements, including physical exams, renewals, and refresher courses. This responsibility is established in 49 CFR 172.704 *Training Requirements*, section (c)(4) *Compliance*, and 49 CFR 391 *Qualifications of Drivers and Longer Combination Vehicle (LCV) Driver Instructors*. The HR Link Database is available through Administrative Services Officers and may be used to verify that employees are current on their CDL, endorsements, and physical exams.

N. The OSHA/DOT refresher course TCH1112, "Hazardous Materials Awareness," is required every three years for employees whose positions require the hazmat endorsement. Maintenance employees who complete this class annually as required by their training matrix will fulfill this requirement automatically; all other employees are responsible for attending the class every three years to keep their hazmat endorsement current. In the case of volunteer CDL drivers, it is the **"loaning" supervisor's responsibility** to ensure that their employees comply with the requirements of obtaining and maintaining a CDL and the associated endorsements, including physical exams, renewals, and refresher courses. It is the **"receiving" supervisor's responsibility** to ensure that a volunteer driver is reasonably trained on the equipment before assigning the employee to drive.

O. Employees must notify their supervisor immediately (within 24 hours) upon receipt of a citation, suspension, revocation, or loss of CDL privileges, as required by ADOT policy PER-1.03 *Commercial Driver License (CDL) Drug & Alcohol Testing*. In the event that an employee's **CDL is suspended,** the CDL and endorsements must be reinstated at the employee's expense, using personal time for testing and physical exams. If a volunteer CDL driver receives a citation, suspension, revocation, or loss of CDL privileges, the employee's supervisor must notify the Central Maintenance Section. Employees will be removed from the VCR upon receiving a citation or suspension of CDL privileges.

PAYMENT OF CDL-RELATED EXPENSES

A. Employer Obligations

ADOT will incur the following CDL-related expenses:

1. Time off work with pay for written and driving tests and physical exams (use indirect task code C).

2. CDL endorsement(s) required by the position and time off for testing.

3. Physical exams conducted by a doctor or facility that is contracted by ADOT to perform CDL physical exams.

4. **CDL renewal fee for volunteer CDL drivers ONLY.** When a position requires a CDL, the employee is responsible for paying for the CDL renewal.

5. Supervisors will provide an employee with a reasonable amount of practice and training time during normal business hours for the purpose of attaining the skills needed to pass the driving portion of the CDL test.

6. **Removal of the intrastate restriction on the CDL for volunteer CDL drivers ONLY.** When a position requires a CDL, the employee is responsible for paying for the removal of the intrastate restriction.

7. Fingerprinting and background check required by the position and time off for testing.

B. Employee Obligations

An employee or applicant will pay for the following CDL-related expenses:

1. Initial CDL license.

2. Written/driving test retake fees and time away from work.

3. Fees to transfer a CDL from another state.

4. CDL renewal fee for a position required CDL.

5. Removal of the intrastate restriction for a position required CDL.

6. Any additional medical testing required during the initial physical exam should be referred to the employee's personal physician.

7. Reinstatement fees for a late or renewal license.

8. Written test preparation (study time) will be done on the employee's personal time.

9. All CDL-Related expenses when the employee chooses to maintain a CDL for their own personal use and it is not a position required CDL nor is the employee a volunteer CDL driver.

PAYMENT PROCEDURES

When an employee is eligible for ADOT payment of CDL and endorsement-related expenses as discussed in the previous section, these expenses **must be paid by ADOT** utilizing the procedures as described

below. Employees **may not** pay these charges **themselves and submit the expenses for later reimbursement. CDL-related charges are not reimbursable to employees. No exceptions.**

A. **Endorsement fees (including renewal fees):** The eligible employee shall have their supervisor complete the MVD form CDL Payment Authorization. This completed form authorizes payment via an ADOT Procurement Card (P-Card). The form must be signed by the supervisor and presented in a sealed envelope to an MVD CDL Customer Service Representative before the employee takes the written test for endorsements. A receipt will be given to the employee to take back to the supervisor as proof of the P-Card payment; this receipt must be sent to Accounts Payable with the monthly log.

B. **Fingerprint-based background records checks** (required for hazmat endorsements): The Transportation Security Administration (TSA) issues authorization numbers for fingerprint-based background records checks online and by telephone. Employees must obtain an authorization number **prior to** being fingerprinted and **payment is required at the time this number is issued**. Employees may obtain an authorization number from the TSA in two ways:

1. Online at http://www.tsa.gov/stakeholders/hazmat-endorsement-threat-assessment-program, or
2. By telephone at 1-877-429-7746.

Employees must provide a P-Card number as payment. Employees should make arrangements with their Unit regarding the P-Card payment prior to initiating this process. Payment documentation must be sent to Accounts Payable with the monthly log.

More information about obtaining a fingerprint-based background records check is available at http://www.azdot.gov/mvd/faqs/scripts/FAQsResponse.asp?Category=13&Keyword.

C. **Physical exams:** Payment will be required during the physical exam process, if ADOT is paying for an employee's exam, the exam must be conducted by a doctor or facility that is contracted by ADOT to perform CDL physical exams. The current list of contracted facilities is available at: http://adotnet/forms/hr/Contracted_Physical.pdf. **Employees cannot be reimbursed for physical exams provided by a doctor or facility that is not contracted by ADOT.** A PD, PG, or P-Card must be used as payment for physical exams paid for by ADOT. The doctor or facility must be active as a vendor in the Advantage system.

Dallas Hammit

Dallas Hammit
Deputy Director for Transportation

2/13/2015
Date

APPENDIX G: PENNDOT WINTER EQUIPMENT RENTAL TEMPLATE

Revised 7/20/2015

Request for Quotes for PennDOT Winter Equipment Rental for 2015/2016 Snow and Ice Removal in XXXXX Counties Under ITQ Contract Number 221001

Comment [dstclair1]: Edit highlighted locations

Specifications/ Special Terms and Conditions

QUOTE PACKAGE INCLUDES

Attachment A – Specifications

- Locations
- Number of Trucks & Use
- Equipment Requirements
- Operator Requirements
- Mobilization per Truck
- Seasonal Hourly Guarantee
- Spread Rate Verification and Inspection
- Contractor Single Point of Contact
- Call Out Periods and Response Time
- Purchase Order Validity Period
- Purchase Order Estimated Hours
- Invoice and Billing Instructions
- Insurance Requirements
- Contractor Performance Issues

Attachment B – Quote Sheet with Contractor Signature

Comment [dstclair2]: The Quote sheet lists contractor route assignment options (by route, stockpile, on demand, etc). District or county needs to edit the quote sheet line items appropriately as they apply to your county. The number of trucks assigned to each line item is up to the county, it can be 1 or multiple. Amount of mobilization an guaranteed hours is a district policy.

Attachment C – TAPER Log

Attachment D – Confirmation of Services Form

1

Attachment A

Winter Equipment Specifications 2015/16
Snow and Ice Removal for XXXX Counties

LOCATIONS

The locations for service of this RFQ are listed in Attachment B. Services however, may include a specific state route or routes, a stockpile or a county based upon the County's need. When a state route or routes are assigned, the total Snow Lane Miles (SLM) of each route(s) is listed.

A Snow Lane Mile (SLM) is defined as a travel lane that is up to 12' wide and 1 lineal mile long. Travel lanes that are wider than 12' should be counted as additional snow lane miles. The following chart provides a reference for converting lane width to snow lane miles:

Lane Width	Snow Lanes
0-12 Feet	1 Lane
13-24 Feet	2 Lanes
25-36 Feet	3 Lanes
37-48 Feet	4 Lanes
49-60 Feet	5 Lanes

NUMBER OF TRUCKS AND USE

Contractor must supply the total number and type of equipment for snow and ice removal operations as indicated on Attachment B. Equipment may cross county or district lines.

PennDOT reserves the right to require the contractor to service: other state roads (if assigned a route via this RFQ), counties, or districts to meet operational needs.

PennDOT reserves the right to require the contractor to use the equipment for activities other than snow removal services such as transporting materials from stockpile to stockpile.

PennDOT may request that contractor participate in a pilot to place a portable Global Positioning System device into each truck during PennDOT business hours at PennDOT's expense to track vehicle locations. The vehicle locations would be displayed along with PennDOT owned vehicles on an internal PennDOT based software solution or external solution such as PA511.

EQUIPMENT REQUIREMENTS

Equipment must be available 24 hours a day, seven days a week, and be capable of operating continuously, subject to driver hours of service requirements (as more fully explained below), until released by the PennDOT.

All trucks must have an odometer.

Equipment must conform to all applicable laws for that type of equipment including without limitation operator licensing. Trucks must have valid Pennsylvania vehicle inspections, have truck or apportioned tags, and copies of vehicle registration cards must be sent to PennDOT's purchaser prior to execution of Purchase Order.

Additional requirements are listed in Attachment B by line item.

OPERATOR REQUIREMENTS

The Contractor is to ensure that all operators and the operation of trucks comply with all CDL, and Federal Motor Carrier Safety Administration laws and regulations, including without limitation driver hours of service.

A. Driver Hours of Service

See 49 C.F.R. §§ 395.1 through 395.3. While federal regulations allow states to modify federal hours of service requirements, those modifications cannot go beyond certain limitations. 49 CFR § 350.341. Under 67 Pa. Code § 231.8(15), Pennsylvania has modified the hours of service requirements to the extent possible under federal law. A driver performing snow removal on behalf of the state may operate a commercial motor vehicle for a maximum of 12 hours, if:

1. The driver does not drive a commercial motor vehicle after having been on duty for more than 16 hours; and

2. The driver has not been on duty 70 hours in 7 consecutive days or 80 hours in 8 consecutive days.

Please also note that a driver that remains in a truck as a passenger (after a shift as driver or otherwise) is still considered "on duty" and the minimum rest period established by law (10 hours) must be followed prior to returning to an "on duty" period. See 49 CFR § 395.3; and 67 Pa. Code § 231.8(15)(q.2). There is no other "exemption."

B. Equipment Loading

PennDOT reserves the right, when, in its discretion, it determines it is necessary to achieve time sensitive, operational tasks related to winter services, to direct operators of winter rented equipment to load equipment provided under the Purchase Order with winter maintenance materials purchased by PennDOT, utilizing PennDOT's front end loaders. Any such work performed shall be considered part of the Purchase Order, and will be included in the hourly rate per truck for the rental of winter rented equipment with operator. Contractor agrees that it will be responsible for its operators, and will fully comply with its contractual obligations relative to indemnification and insurance.

Contractor shall ensure that all operators under the Purchase Order are trained in the safe operation of front end loaders. Each operator of winter rented equipment may be tested in the operation of PennDOT owned front end loaders by the District Equipment Manager, or designee, at a designated time, prior to the operation of any PennDOT owned front end loader. Testing will include, but not limited to a brief familiarization with the specific model the individual will be asked to operate.

Each operator at the end of each shift must turn in a TAPER LOG to their PennDOT Foreman. TAPER stands for temperature application product event results. Questions regarding this Form can be discussed during Snow Academy.

MOBILIZATION PER TRUCK

Successful contractor may receive a Mobilization Fee payment per truck as listed in each line item on Attachment B. Eligibility and payment for mobilization will be paid as follows:

a) 70% will be paid upon satisfactory completion of the PennDOT's inspection of the contractor's equipment and attendance of a District Snow Academy. Each operator is required to attend the Snow Academy Meeting.

b) 30% will be paid after April 30 contingent upon satisfactory completion of assigned duties during the purchase order period provided that the contractor is not found to be in default at any time during performance of its contractual obligations.

SEASONAL HOURLY GUARANTEE PER TRUCK

PennDOT will guarantee payment of hours listed in Attachment B, column "Seasonal Hourly Guarantee per Truck". Payment = (Number of hours x hourly rate quote for each piece of equipment), provided that the contractor is not found to be in default at any time during performance of its contractual obligations. Including but not limited to, equipment, inspection, callout and response time requirements. The contractor may compare the total actual payments per truck for the purchase order period to the Seasonal Hourly Guarantee per Truck. If the Seasonal Hourly Guarantee per Truck is greater than the actual payment(s) made per truck, the contractor may invoice for the difference. Within the Attachment B line items that include multiple trucks, the hours per truck don't have to be distributed equally amongst the trucks, but PennDOT still has to guarantee payment for the total number of hours listed within the Seasonal minimum Hourly Guarantee per Truck column.

Example: A line item calls for three trucks, each with a 40 hours' minimum guarantee (120 hours seasonal minimum hourly guarantee). Truck 1 is used 60 hours, Truck 2 is used 60 hours and Truck 3 is used 0 hours. By paying for 120 hours of actual use the 120 hours seasonal minimum hourly guarantee has been met and the Department would not be responsible for paying additional compensation for Truck 3 in this scenario.

SPREAD RATE VERIFICATION AND INSPECTION

All trucks must be inspected, verified and approved by PennDOT prior to use. All inspections and verifications will be scheduled by PennDOT at a PennDOT approved location prior to the start of the winter season.

All trucks with tailgate spreaders must be spread rate verified so the high setting does not exceed the Maximum Spread Rate per snow lane mile (lbs. per SLM) based on 100% salt. Maximum spread rates are listed in Attachment B.

Failure to perform the work with sufficient labor, equipment, or material to insure the completion of the specified work in accordance with the Contract or contract purchase order terms; is an event of default.

CONTRACTOR SINGLE POINT OF CONTACT

The Contractor will be required to designate a single point of contact for PennDOTs County Manager. Any costs incurred by the contractor for this single point of contact are incidental and must be included in the Hourly Rate per Truck quote provided by the contractor in Attachment B.

CALL-OUT PERIODS & RESPONSE TIME

An example shift under a call out period could run from 4:00 am to noon and noon to 8:00 pm. Contractors could be asked to extend shifts to midnight to noon

and noon to midnight. PennDOT reserves the right to create shift times, change shift times by extension and reduction (or send trucks home with the possibility of a later call-out), especially in those instances where changing weather forecasts and climatic conditions warrant changing PennDOT and contractor responses. Additionally, PennDOT may call out the contractor at any time to provide services not under a standard shift.

All trucks, when in use for PennDOT, must have an activated cell phone with the cell phone number made available to the County Manager or designee. Contractors are responsible for supplying their own cell phone and fully bearing the costs of those cell phones.

For call-outs without prior notifications, for example a non-forecasted winter weather event, contractors will be required to report to their assigned stockpile within two hours of the call-out to provide winter service.

For call-outs with three or more hours' notification prior to the actual call-out time, contractors will be required to report at the designated call-out time to their assigned stockpile.

PURCHASE ORDER VALIDITY PERIOD

The Purchase Order validity period will be for one year with the option to renew for one additional one-year period.

Comment [dstclair3]: Delete highlighted if one year only

Comment [SCDR4]: IMPORTANT, Do not add this clause (a validity period) if you print out automated pages from the rented Equipment Database RFQ Cover Sheet.

At the time of the renewal, the Contractor may request a price increase of up to 3.0% over the previous year's hourly rate/truck. Renewal will be at the discretion of PennDOT and the Contractor will be notified by letter. All other terms and conditions of the Purchase Order will remain the same for the entire Purchase Order Validity Period. Equipment will be subject to re-inspection, verification and approval each year.

The performance time period specified in a Purchase Order may extend beyond the current expiration date of the ITQ Contract term and the Contractor may perform services until the Purchase Order end date specified; provided, however, that an ITQ Contract extension and/or a new ITQ Contract with the Contractor is in place without any interruption in valid contract coverage and if necessary a new Purchase Order against the extended or new ITQ Contract is issued for the remaining period of performance.

PURCHASE ORDER ESTIMATED HOURS

The Purchase Order Estimated Hours as listed on Attachment B are for all trucks required under the line item and is based on previous average usage. More hours may be required. If more hours are needed the quantity on the resulting purchase order will be changed in accordance with Paragraph 31 of the ITQ.

INVOICE AND BILLING INSTRUCTIONS

The Contractor shall complete PennDOT's TAPER Log, Attachment C, at the completion of each shift.

A completed Confirmation of Services Form (Form OS-501), Attachment D, as well as all TAPER Logs shall be submitted by the Contractor to the County Manager, for review and verification, INSERT on a per event or monthly basis. The County Manager will notify the Contractor if corrections are needed. Each Form OS-501 shall be itemized, include sufficient detail, and coordinate with the line items on the Purchase Order. Untimely or incomplete submissions of Form OS-501 and required supporting documentation may delay processing of a "proper invoice" as required by the Payment section of the Terms and Conditions.

Invoices shall be submitted by the Contractor on a DEFINE- per event or monthly basis. For further instructions regarding invoicing, see the Billing Requirements section of the Terms and Conditions.

PennDOT reserves the right, throughout the life of the contract, to make changes to the TAPER Log and/or OS-501, including their instructions, content, and all other requirements.

INSURANCE REQUIREMENTS

The contractor must furnish a copy of their insurance certificate with PennDOT named as an additional insured in accordance with ITQ 2210-01, Part IV paragraph 22(d.)prior to execution of Purchase Order.

CONTRACTOR PERFORMANCE ISSUES

Contractor performance issues, including default, will be governed by the ITQ.

Revised 7/20/2015

ATTACHMENT C
TAPER LOG

SAMPLE COUNTY TRUCK TRACKING SHEET

FOR OFFICE USE ONLY
Taper Log ID Number: ______

DATE: ______

OPERATOR: ______ Shift: ______ Work Start Time: ______

TRUCK NO: ______ Work Stop Time: ______ FOREMAN: ______

STOCKPILE: ______ Total Work Hours: ______

AM 1	12 AM to 8 AM
AM 2	8 AM to 4 PM
PM	4 PM to 12 AM

ROUTES	TIME OUT	SURFACE TEMP	TIME IN	[illegible] MILES Beginning Odometer	[illegible] MILES Ending Odometer	SERVICE TYPE	MIX CODE	MATERIAL USED (TONS)	LIQUID TYPE	LIQUID USED (GAL)	Stockpile Material Came From	STORM TYPE	OBS ROAD CONDITION	Comments
1														
2														
3														
4														
5														
6														

SERVICE TYPE	
AI	Pretreat / Anti-Ice
DI	De-icing
CL	Cleanup / Widening After Storm
PO	Plow Only (Tandem Team)
PS	Plow & Spread
SO	Spread Only
PA	Patrolling
SS1	Spot spreading (25%)
SS2	Spot spreading (50%)
SS3	Spot Spreading (75%)

MIX CODES			
A	100% A	G	25A / 75S
B	90A / 10S	H	100% S
C	75A / 25S	J	80A / 20S
D	67A / 33S	W	Salt Brine
E	50A / 50S	Y	CA. CL.
F	33A / 67S	Z	MAG. CL.

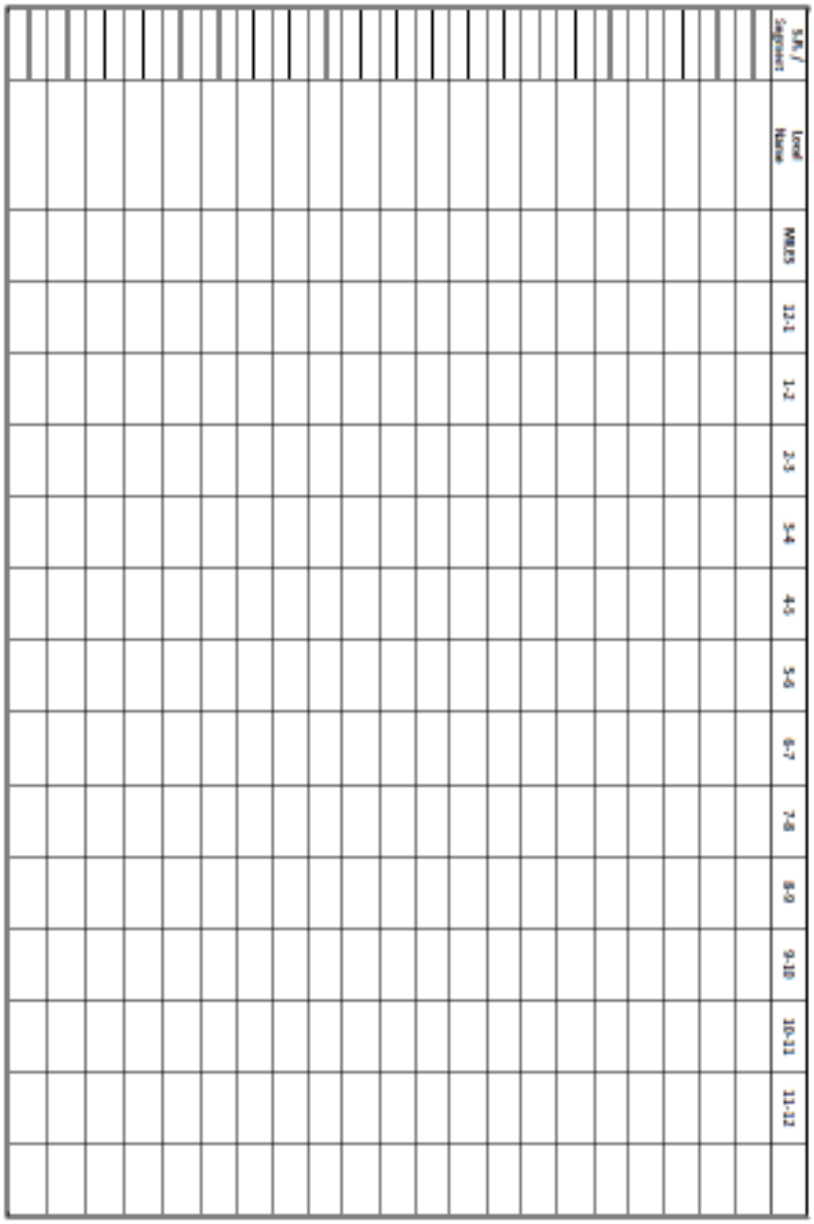
STORM TYPE	
1	Snow
2	Frost / Black Ice
3	Freezing Rain
4	Pre Storm
5	Drifting / Post Storm

OBS ROAD CONDITIONS	
1	Clear and Dry
2	Clear and Wet
3	Snow and/or Slush Covered Tracks Exposed
4	Snow and/or Slush Covered
5	Icy
6	Closed

NOTE:
A NEW SHEET MUST BE STARTED
IF YOU WORK PAST MIDNIGHT

EQUIPMENT CHECKLIST	
Verify All Lights OK	
Chains On/Off	
Plow Inspected (Pre-Trip)	
Plow Inspected (Post-Trip)	

GL 400 SPREADER INFO.			
Mix			
Spread Lbs.			
Miles Driven			
% in auto			
Avg. Lbs / Mile			



SAMPLE ROUTE TRACKING

ATTACHMENT D
CONFIRMATION OF SERVICES FORM

pennsylvania

CONFIRMATION OF SERVICE

Date Service Rendered: ____________ SAP Vendor Number: ____________
Contractor Name: ____________ Address (1): ____________
Phone: ____________ Address (2): ____________
PURCHASE ORDER #: ____________ City: ____________ State: ______ Zip Code: ______

(Reference line items on purchase order that match the services that were performed.)

PO Line #	Description / Product ID	Quantity	U.O.M.	Unit Price	Item Total
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00

☐ Continue on page 2

Total of Page 1	$ 0.00
Total of Page 2	$ 0.00
Grand Total	$ 0.00

Contractor Signature ____________ Date ____________

PENNDOT USE ONLY

I certify the services represented by the confirmation of service form above were received satisfactorily. Therefore, I approve payment for same.

____________ Project Manager Signature ____________ Date (mm/dd/yyyy)

I certify that I have entered a Goods Receipt in SAP for this service. (Goods Receipts should be entered within 48 hours per Management Directive 310.31.)

____________ [illegible] ____________ Date (mm/dd/yyyy) ____________ [illegible]

1

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