**Need Statement 563 – Snow Plow Driver Fatigue: Literature Search**  
Thursday, June 20, 2019

**Prepared for:** Marcus Bekele

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**Resources searched:** Library catalog, ASCE Database, RiP, TRID, Transport Database, Web

**Summary:** Results are compiled from the databases named above. Links are provided for full-text, if applicable, or to the full record citation. I completed my searches using the following terminology: Driver, fatigue, drowsy, drowsiness, snow plow, snow plough, snowplow. Results are listed below divided between the categories of most relevant and least relevant.

### Most Relevant Results

**Transport Database**

Result 1.

<table>
<thead>
<tr>
<th>Title</th>
<th>Prevalence of Operator Fatigue in Winter Maintenance Operations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Accident Analysis &amp; Prevention. 2019/5. 126(0) pp 47-53 (14 Refs.)</td>
</tr>
<tr>
<td>URL</td>
<td><a href="http://dx.doi.org/10.1016/j.aap.2018.01.009">http://dx.doi.org/10.1016/j.aap.2018.01.009</a></td>
</tr>
</tbody>
</table>

**Abstract**  
Similar to commercial motor vehicle drivers, winter maintenance operators are likely to be at an increased risk of becoming fatigued while driving due to long, inconsistent shifts, environmental stressors, and limited opportunities for sleep. Despite this risk, there is little research concerning the prevalence of winter maintenance operator fatigue during winter emergencies. The purpose of this research was to investigate the prevalence, sources, and countermeasures of fatigue in winter maintenance operations. Questionnaires from 1043 winter maintenance operators and 453 managers were received from 29 Clear Road member states. Results confirmed that fatigue was prevalent in winter maintenance operations. Over 70% of the operators and managers believed that fatigue has a moderate to significant impact on winter maintenance operations. Approximately 75% of winter maintenance operators reported to at least sometimes drive while fatigued, and 96% of managers believed their winter maintenance operators drove while fatigued at least some of the time. Furthermore, winter maintenance operators and managers identified fatigue countermeasures and sources of fatigue related to winter maintenance equipment. However, the countermeasures believed to be the most effective at reducing fatigue during winter emergencies (i.e., naps) were underutilized. For example, winter maintenance operators reported to never use naps to eliminate fatigue. These results indicated winter maintenance operations are impacted by operator fatigue. These results support the increased need for research and effective countermeasures targeting winter maintenance operator fatigue.

**Publication Year**  
2019
Monitoring Motor Vehicle Driver Fatigue

Abstract. Minnesota Department of Transportation (MnDOT) staff are required to complete a wide range of driving tasks, and MnDOT is interested in determining how fatigue affects an individual's ability to drive safely. To better understand the relationship between fatigue and unsafe driving, MnDOT would like to learn more about the methods, tools and technologies used to predict, diagnose and monitor driver fatigue. To meet this need, CTC & Associates conducted a review of recently published research and supporting documents that examine the characteristics of driver fatigue and how to predict and monitor it. There is a wealth of information on the topic of fatigue monitoring—especially with regard to commercial drivers—and the research highlighted in this report is only a sampling of the available information. It is also important to note that advancements in technology make for a rapidly changing landscape. The information in this report is organized by topic to allow for a more comprehensive and concise review of each topic area. Citations in each topic area may include both domestic and international research as well as research focused on different vehicle classes (commercial and passenger). This report is divided into the following sections: Training Resources; General Research on Fatigue Monitoring Technologies; Out-of-Vehicle Fatigue Monitoring; In-Vehicle Fatigue Monitoring; Fatigue Management in Winter Operations; and Techniques to Avert Fatigue.

Record Type: Publication
Record URL: http://www.dot.state.mn.us/research/TRS/2015/TRS1501.pdf; /common/images/covers/large/1409224.png

Filing Info
Accession Number: 01600670
Files: TRIS; ATRI; STATEDOT
Created Date: 5/25/2016 10:19 AM

Pilot testing a naturalistic driving study to investigate winter maintenance operator fatigue during winter emergencies

Camden, M C; Hickman, J S; Hanowski, R J

Abstract. Although numerous research studies have investigated the effects of fatigue in commercial motor vehicle drivers, research with winter maintenance (WM) drivers is sparse. This study pilot-tested the feasibility of evaluating WM operator fatigue during winter emergencies using naturalistic driving data. Four WM operators participated in the study and drove two instrumented snow plows for three consecutive winter months. The operators also wore an actigraph device used to measure sleep quantity. As this was a pilot study, the results were limited and only provided an estimation of what may be found in a large-scale naturalistic driving study with WM operators. Results showed the majority of safety-critical events (SCEs) occurred during the night, and approximately half of the SCEs occurred when participants were between 5 and 8 h into their shifts. Fatigue was identified as the critical reason in 33% of the SCEs, and drivers were found to average less sleep during winter emergencies versus winter non-emergencies. However, one participant accounted for all fatigue-related SCEs. Although data were limited to two instrumented trucks and four drivers, results support the approach of using naturalistic driving data to assess fatigue in WM operators. Future on-road research is needed to understand the relationship between fatigue and crash risk in WM operators.

Record Type: Publication
Record URL: https://doi.org/10.3390/safety3030019
Web

Identification and Recommendations for Correction of Equipment Factors Causing Fatigue in Snowplow Operators
https://clearroads.org/project/15-02/

Report recommends ways to reduce snowplow operator fatigue
https://mntransportationresearch.org/tag/snow-plow-operator-fatigue/

Monitoring and detecting snowplow driver fatigue

Least Relevant Results

Research in Progress Database

LED Snowplow Lights

Abstract. The NHDOT snowplow fleet currently uses halogen lights mounted on the push frame for night time snowplowing operations. Due to the excessive vibration, frequent bulb replacement is necessary. LED bulbs are less susceptible to vibrations and could reduce long term maintenance cost. Plow drivers have suggested that LED lighting improves their visibility while operating as well as reducing the fatigue experienced during extended hours of plowing. Mechanical Services does not have a firm policy on the use of LED headlamps and needs to determine if the fleet would experience benefits by using LED bulbs. The proposed project will entail comparing the use of halogen bulbs to heated/non-heated LED bulbs. The in-house research project will target District 1 and 3 because of the available interstate and rural routes. Six operators and trucks per district will be equipped for the trial. The operators will include a variety of drivers who have preference to stay with halogen and those who favor LED. Through social media and/or online surveys, the Department’s Districts will solicit feedback from the traveling public. Snowplow operators and supervisors will track the effect and collect feedback. The results of this will support whether converting the NHDOT snowplow fleet from halogen bulbs to LED bulbs reduces maintenance requirements, increases service life, and improves operator visibility for safer snowplow operations. Additional benefits may include increase of employee morale and traveling public safety

Record Type: Project
Record URL: https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962x.htm
Language: English

Project
Contract Numbers: 26962X
Status: Proposed
Funding Amount: $15,000
Sponsor Organizations:
New Hampshire Department of Transportation
John O. Morton Building
P.O. Box 483
Concord, NH 03302-0483 United States
Managing Organizations:
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Performing Organizations:
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Concord, NH 03302-0483 United States
Principal Investigators:
Fogg, Daniel
Notice Date: --
Start Date: 2018-11-01
Expected Completion Date: 2020-12-31
Actual Completion Date: --

Media Info

Subjects/Keywords
Subject Areas: I61: Equipment and Maintenance Methods; I62: Winter Maintenance
Keywords: Lighting; Snow and ice control; Snow removal

Filing Info
Accession Number: 01686176
Source Agency: New Hampshire Department of Transportation
John O. Morton Building
P.O. Box 483
Concord, NH 03302-0483 United States
Files: RiP; STATEDOT
Created Date: 11/20/2018 12:16 PM

Web
Pilot Testing a Naturalistic Driving Study to Investigate Winter Maintenance Operator Fatigue during Winter Emergencies