

# **Snow and Ice Accumulation on Vehicles**

Principal Investigator/Corresponding Author:

Todd Trego  
Senior Research Associate  
American Transportation Research Institute  
Atlanta, GA  
ttrego@trucking.org

Co- Principal Investigator:

Rebecca M. Brewster  
President and COO  
American Transportation Research Institute  
Atlanta, GA  
rbrewster@trucking.org

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American Transportation Research Institute  
950 N. Glebe Road  
Arlington, VA 22203

Phone: (703) 838-1966  
Fax: (770) 432-0638

**1 ABSTRACT**

2 During the winter months in regions with significant snowfall, snow and ice accumulates on the  
3 tops of vehicles, which can then dislodge during travel. These chunks of snow and ice may  
4 strike other vehicles, creating a safety issue that results in property damage or injury to other  
5 motorists. The research objectives of this study included quantifying the scope of the problem,  
6 identifying potential solutions and developing a recommended action plan for highway safety  
7 stakeholders. ATRI conducted a thorough scan of existing literature, snow/ice removal products  
8 and regulatory actions relating to snow and ice safety issues. Stakeholder interviews and surveys  
9 were also conducted to better understand the technical and institutional challenges and potential  
10 solutions. The comprehensive review and synthesis of available research and information  
11 yielded little to no data on the scope of snow and ice accumulation on vehicles. The research  
12 findings discretely document the myriad safety, financial, technical and institutional challenges  
13 associated with effectively addressing or mitigating the safety concerns associated with snow and  
14 ice falling from vehicles. To offer a comprehensive set of solutions, a list of actions for the  
15 short-, mid- and long-term are recommended in the research. Short-term actions include a public  
16 outreach and education campaign targeting operators of all vehicle types. A mid-term action is  
17 to further explore the feasibility of locating snow removal devices at public weigh stations and  
18 ports of entry. The recommended long-term action plan involves investigation of potential  
19 vehicle-based solutions which would prevent or impede snow and ice accumulation on vehicles.

## 20 **BACKGROUND**

21

### 22 **The Trucking Industry**

23 The trucking industry drives the U.S. economy, delivering 69 percent of the nation's goods. In  
24 2006, the industry represented a \$645.6 billion industry, comprising over 83 percent of the  
25 nation's freight bill (1). In addition, the U.S. trucking industry is one of the largest employers in  
26 the country, accounting for over 8.9 million industry-related jobs of which 3.46 million are truck  
27 drivers (1).

28 The trucking industry is extremely diverse; trucking company size ranges from an owner-  
29 operator with one truck to large carriers that operate thousands of trucks with dozens of  
30 terminals. Additionally, the industry consists of many sectors, each with very different operating  
31 environments. Though most fleets are comprised of van trailers, a sizable number of others are  
32 specialized carriers that utilize tanker trucks or flatbed trailers.

33 Throughout the industry, safety is a top concern for all stakeholders as evidenced by  
34 continued decreases in truck-involved crash rates. While economic growth in the U.S. has  
35 driven the number of miles traveled by large trucks to increase 16 percent from 1998 to 2007, the  
36 vehicle involvement rate for large trucks in fatal crashes has declined 47 percent (2).

37

### 38 **Snow and Ice Accumulation on Vehicles – A Safety Concern**

39 During the winter months in regions that experience significant snowfall, snow and ice  
40 accumulates on the tops of all vehicle types, including automobiles, straight trucks, intermodal  
41 containers, large trucks, trailers and buses. This accumulation of snow and ice potentially causes  
42 a significant safety issue as chunks of ice may form when accumulated snow melts, then  
43 refreezes. During transit, a piece of ice may dislodge from the vehicle, potentially damaging  
44 vehicle components, causing property damage to other vehicles and even injuring other  
45 motorists.

46 However, the size and weight of ice sheets that may dislodge from larger vehicles in  
47 transit create a more significant safety concern for the trucking industry. Operational impacts  
48 from accumulated snow and ice are also possible, including size and weight limit violations and  
49 lowered fuel economy.

50 Removing snow and ice from the tops of trailers creates a series of safety and operational  
51 challenges, documented in detail later in this report. What may be viewed as the simplest  
52 solution, to have workers or drivers climb onto a trailer roof and manually remove snow and ice  
53 by shoveling or raking the trailer roof, creates its own set of serious safety issues, including slips  
54 and falls from trailers. Other methods for snow and ice removal can be more complex, require  
55 routine maintenance, or be cost-prohibitive to a significant portion of the industry.

56 Routinely removing accumulated snow and ice can mitigate several safety-related risks  
57 including:

58

- 59 • Snow blowing off the trailer roof and impairing motorist visibility;
- 60 • Ice falling from a vehicle and causing injury or property damage to other motorists;
- 61 • Violations of snow and ice removal laws or fines for falling ice;
- 62 • Violations of other vehicle operations-related regulations.

63

64 Other benefits of routinely removing snow and ice accumulations are improved fuel  
65 economy (by reducing the weight of the accumulated snow and ice) and the reduction of

66 potential insurance claims or civil litigation resulting from falling ice. However, the  
67 costs/benefits of routinely removing snow may be difficult to determine due to the fact that snow  
68 frequently (and harmlessly) blows off the vehicle while in transit.

69 While the safety risks from snow and ice dislodging from large commercial vehicles have  
70 been reported by the media, there is little empirical research on the scope of the problem,  
71 potential solutions and their respective value for industry safety and operations.

72

### 73 **RESEARCH APPROACH**

74 At the request of several State Trucking Associations (STAs) and upon recommendation of its  
75 Research Advisory Committee (RAC), the American Transportation Research Institute (ATRI)  
76 initiated research in March 2008 to determine the scope of the problem, document current  
77 industry practices and quantify for the industry potential solutions for mitigating the safety risks  
78 of snow and ice falling from vehicles.

79

80 Specifically, the research objectives were to:

81

- 82 • Document the extent of the problem;
- 83 • Review current and proposed legislation targeted toward the problem;
- 84 • Identify snow and ice removal methods for trucks and trailers and evaluate the efficacy of  
85 each;
- 86 • Recommend potential solutions for the industry.

87

88 In support of these objectives, the following tasks were initiated by ATRI:

89

- 90 1. Literature review of existing research;
- 91 2. Environmental scan of the current regulatory environment;
- 92 3. Documentation of the scope of the problem;
- 93 4. Development of a compendium of snow and ice removal tools, technologies and  
94 practices;
- 95 5. Development of a recommended industry action plan.

96

97 The research design focused on soliciting industry input from stakeholders in North  
98 America and Europe and included an online survey, internet searches, personal interviews and  
99 solicitation of commercial driver input through ATRI's biweekly XM Satellite Radio program.

100 Stakeholder groups contacted included:

101

- 102 • Motor carrier safety and operations personnel;
- 103 • Large shippers/receivers;
- 104 • Law enforcement;
- 105 • Motor carrier insurers;
- 106 • Safety advocacy groups;
- 107 • Truck tractor and trailer manufacturers;
- 108 • Trucking industry associations.

109

110

111

## 112 RESEARCH FINDINGS

113

### 114 Literature Review and Regulatory Environmental Scan

115 Strong concern for the potential safety issues created by the dislodgement of snow and ice from  
116 moving vehicles has been expressed by state legislators, law enforcement, the trucking industry  
117 and the motoring public. However, despite this concern and periodic publicity of high-profile  
118 incidents involving serious injuries and significant property damage, ATRI was unable to  
119 identify any research studies conducted on the issue of snow and ice dislodging from large  
120 commercial vehicles while in transit.

121

#### 122 *U.S. Federal Regulations*

123 Currently in the U.S. there are no federal regulations specifically mandating the removal of snow  
124 or ice from a vehicle prior to transit. Additionally, there are no specific regulations in which a  
125 driver or motor carrier may be cited if snow or ice dislodges and causes injury or property  
126 damage to another motorist or pedestrian. In the absence of specific federal regulations, the  
127 research identified two areas where states are enforcing snow and ice removal:

128

- 129 • Law enforcement may cite drivers or motor carriers under several other commercial  
130 motor vehicle operation regulations; or
- 131
- 132 • Pursuing and/or enacting state or roadway-only legislation targeting *any* vehicle traveling  
133 with accumulated snow or ice or if snow or ice dislodges from a vehicle while in transit  
134 and causes property damage or injury.

135

#### 136 *State Regulations*

137 The regulatory environmental scan identified five states with existing or proposed legislation  
138 related to snow and ice removal (Connecticut, Massachusetts, New Jersey, New York and  
139 Pennsylvania). However, the majority of states in the U.S. that experience substantial annual  
140 snowfall have enacted neither specific regulations requiring the removal of accumulated snow  
141 and ice prior to travel nor legislation to cite drivers for falling ice causing injury or property  
142 damage to other motorists or pedestrians.

143 Research indicates that many states as well as Canadian provinces do employ regulations  
144 covering the safe operation of commercial motor vehicles as a means for enforcing snow and ice  
145 removal from large trucks, often at the discretion of the investigating officer. For example,  
146 drivers or motor carriers may be cited for weight or height violations, operating a vehicle that is  
147 not in safe operating condition or in a manner that creates a potentially dangerous situation.

148

#### 149 *Canadian Regulations*

150 In many ways, Canadian efforts to address this safety issue mirror those in the U.S., though some  
151 aspects are more progressive than the U.S. (likely due to the increased frequency and volume of  
152 snow and ice). For example, Canadian carriers may have agreements with distribution centers  
153 and other customers on who is responsible for removing snow and ice from “dropped” or staged  
154 trailers. Similarities shared by the two countries include:

155

- 156 • Stakeholders agree this is a serious safety problem;
- 157 • Some jurisdictions have specific legislation, while others do not;

- 158 • Some jurisdictions rely on regulatory interpretation of cargo securement, safe motor  
159 vehicle operation and height/weight restrictions;  
160 • Tolerance of some additional weight/height from accumulated snow and ice is sometimes  
161 allowed at the officer's discretion.  
162

163 Similar to the U.S. with no specific federal regulation, snow and ice removal from  
164 vehicles resides at the provincial level in Canada. The majority of Canadian provinces do not  
165 have specific regulations either requiring the removal of snow and ice from vehicles prior to  
166 operation, or provisions to cite a driver if snow or ice falls from a vehicle and causes injury or  
167 property damage. However, Quebec has a regulation explicitly prohibiting vehicle operators  
168 from allowing snow or ice to fall from their vehicle (3).  
169

### 170 *The European Experience*

171 ATRI contacted several European governments and transportation stakeholder groups and the  
172 European Commission. Countries contacted included Sweden, Norway and Switzerland. All  
173 interviewees were unaware of specific legislation requiring snow and ice removal, though a  
174 representative of the Swedish National Road and Transport Research Institute (VTI) indicated  
175 that there is an awareness of the problem and that some motor carriers use truck washes to  
176 remove snow and ice (Claes Eriksson, unpublished data).  
177

178 Similar to the U.S. and Canada, enforcement may broadly interpret general regulations  
179 governing the safe operations of vehicles. These regulations include the roadworthiness of a  
180 vehicle and cargo securement regulations. An interviewee from the Swedish Road  
181 Administration indicated that several civil cases have reinforced that motor carriers and drivers  
182 may be held liable if a piece of ice falls and causes injury or property damage (Soren Hedberg,  
183 unpublished data).

184 Another interviewee representing a heavy duty truck manufacturer indicated that while  
185 this is an issue in Europe, there appears to be no systematic approach for addressing snow and  
186 ice accumulation on large trucks (Skip Yeakel, unpublished data). Efforts to quantify the scope  
187 of the problem in Europe yielded similar findings for both the U.S. and Canada. A lack of  
188 quantifiable data on the frequency of events likely explains the lack of a systematic approach for  
189 addressing it. Anecdotal evidence alone may prove insufficient for enforcement, transportation  
190 agencies and private industry to devote significant resources and funding to solving this problem.  
191

### 191 *Worker Safety*

192 One of the most commonly discussed issues surrounding snow and ice removal is worker/driver  
193 safety. Many outside the industry believe that the solution to mitigating this safety risk is for  
194 drivers or maintenance personnel to ascend to the top of the truck or trailer to remove the snow  
195 and ice. However, the hazards of requiring a driver or maintenance personnel to climb 13-feet in  
196 the air, often in icy or snowy conditions, to remove snow and ice from a trailer is a significant  
197 safety concern for truck drivers and motor carriers. In many cases, this practice violates federal  
198 or state worker safety guidelines.

199 The U.S. Occupational Safety and Health Administration (OSHA) issues guidelines  
200 protecting worker safety and has jurisdiction over facilities defined as "workplaces." OSHA has  
201 issued guidelines for protecting workers from falls and dictates personal protection equipment  
202 (PPE) standards for workers using raised platforms or catwalks to remove snow or ice from  
203 trailers. This standard is applicable to employees that:

204 “... are working atop stock that is positioned inside of or contiguous to a building or  
205 other structure where the installation of fall protection is feasible (4).”

206

207 However, this standard is only applicable to locations where a fall protection system is  
208 feasible. Except in the above scenario:

209

210 “The current fall protection standard in general industry (Subpart D) does not specifically  
211 address fall hazards from the tops of rolling stock. The new proposed fall protection  
212 standard, 55 Fed. Reg. 13360, explicitly excludes rolling stock from coverage (5).”

213

214 Rolling stock (i.e. vehicles or trailers) is exempted from this standard due to the nature of  
215 trucking and the fact that drivers may have to inspect or perform duties on numerous types of  
216 trailers, including van trailers, tankers, grain-hoppers and others. However, the underlying basis  
217 of OSHA jurisdiction, the OSHA Act, contains a “General Duty Clause” that:

218

219 “requires an employer to provide employees with a workplace that is free from hazards  
220 that are recognized by the employer's industry and that are likely to cause death or serious  
221 physical harm (6).”

222

223 If OSHA is notified or an OSHA inspector witnesses a driver or any other employee at a  
224 company facility of climbing on top of a trailer without fall protection, the trucking company can  
225 be cited for violating the “General Duty Clause” of protecting workers from workplace hazards.  
226 Conversely, according to the American Trucking Associations, if the same behavior is reported  
227 or observed at a large distribution center, the distribution center can be cited for violating the  
228 clause (Christina Cullinan, unpublished data). Requiring drivers to clear snow and ice from a  
229 trailer top has other implications and would require motor carriers to verify an employee is  
230 physically able to perform the job function and has been trained to do so.

231

232 Lastly, it should be noted that OSHA guidelines are not enforceable on public roadways,  
233 public weigh stations or public rest areas. These areas are not considered a “workplace,” and are  
234 therefore outside of OSHA jurisdiction. If an OSHA inspector observed a driver climbing on top  
235 of a trailer to clear snow or ice at a public facility, neither the carrier nor the driver could be cited  
236 under OSHA guidelines. However, due to worker/driver safety concerns, most carriers strongly  
237 discourage employees from climbing tractors or trailers to clear accumulated snow and ice.

237

238 Similar to the U.S., there are Canadian worker safety guidelines that strongly discourage  
239 workers from climbing on top of trailers, a height greater than three meters, without a safety  
240 harness or restraint device (7).

240

### 241 **Safety Impact Analysis**

242 Through its environmental scan, ATRI identified that research and statistics to quantify the  
243 frequency of falling ice incidents, or the number of citations issued to drivers for snow- and ice-  
244 related issues is almost non-existent. Stakeholders with in-depth knowledge of a variety of  
245 safety-related data sources were contacted to discern the availability of data on the frequency or  
246 severity of incidents caused by falling ice or snow. Data sources vetted include:

247

- 248 • U.S. federal and state traffic accident and fatality data sources;
- 249 • Royal Canadian Mounted Police accident statistics;

- 250 • Several state and provincial driver citation databases;
- 251 • Insurance industry claim frequency and risk mitigation databases;
- 252 • Motor carrier accident data;
- 253 • European accident data.

254

### 255 *Frequency Analysis*

256 According to the U.S. National Highway Traffic Safety Administration (NHTSA), in 2006 there  
257 were approximately 116,000 traffic collisions in which snow or ice was present. Most involved  
258 property damage only (93,000); another 22,000 were crashes that involved injuries, while 463  
259 crashes resulted in at least one fatality (8). In 2007, large trucks were involved in 12,143  
260 accidents when the weather included snow or blowing snow conditions and 19,222 accidents  
261 when there was snow, slush or ice on the roadway (2). However, these data sources do not  
262 explicitly identify crashes that may be attributed to falling snow or ice.

263

### 264 *Media Reports*

265 As incidents involving ice dislodging from a truck occur, the stories are often covered by the  
266 local media. Oftentimes these news reports are the impetus for state legislatures to pursue tighter  
267 regulations mandating snow and ice removal from vehicles, or penalties for drivers operating a  
268 vehicle in which snow or ice falls and causes injury or property damage to another motorist.  
269 ATRI identified several articles anecdotally documenting the frequency of safety incidents  
270 involving snow and ice dislodging from vehicles ( 9, 10, 11).

271 Other news articles offer insight into the scope of the problem of snow or ice falling from  
272 different types of vehicles. These articles recount instances of snow and ice falling from vehicles  
273 other than large trucks (12) and how a single storm may cause several reports of falling ice from  
274 vehicles (13,14).

275

### 276 *Motor Carrier Interviews*

277 U.S. and Canadian motor carriers representing a cross-section of the trucking industry were  
278 interviewed on the frequency of snow and ice issues, potential solutions and industry practice.  
279 Carriers interviewed included truckload (TL), less-than-truckload (LTL) and parcel/package  
280 carriers.

281 Motor carrier safety personnel were asked to provide details on the frequency and  
282 severity of these incidents. Of the 14 carriers contacted, none were aware of any incidents  
283 related to ice falling from one of their trucks, though one carrier indicated that a piece of ice had  
284 fallen from a pickup truck and caused extensive body damage to a company tractor. However,  
285 carriers did note that it is not uncommon for truck drivers involved in one of these incidents to be  
286 unaware that a piece of ice has fallen from their truck or trailer. None of the Canadian carriers  
287 contacted had experienced a major incident.

288

### 289 **Industry Survey**

290 To augment efforts to determine the scope of the problem and identify what solutions, if any,  
291 motor carriers are employing, ATRI developed and made available an online survey targeting  
292 motor carriers with operations in areas of snow and ice accumulation. The survey was  
293 distributed via the American Trucking Associations Technology and Maintenance Council (ATA  
294 TMC) and the ATA's Technical Advisory Group, a formal group of carrier members that  
295 collaborate with ATA staff on technical and engineering-related issues. In total, 57 motor



296 carriers, representing both the for-hire and private segments of the industry, responded to the  
297 survey.

298

### 299 *Industry Survey Results*

300 Less than half of the survey respondents (35%) indicated that snow or ice has fallen from one of  
301 their trucks or trailers causing injury or property damage to another motorist. Another 21 percent  
302 responded “not sure,” underscoring the fact that drivers, and thus motor carriers, frequently are  
303 unaware that a piece of ice has fallen while a vehicle is in-transit.

304 Of the 35 percent reporting that they had experienced snow or ice falling and causing  
305 injury or property damage, 65 percent indicated that the incident resulted in an insurance claim.  
306 Only one respondent indicated that falling snow and ice resulted in litigation. The high incident  
307 rates of respondents experiencing falling ice that causes injury or property damage which  
308 resulted in an insurance claim may indicate that carriers with past experience were more likely to  
309 complete the online survey.

310

### 311 *Liability Issues*

312 Research indicates that at least one civil case resulted from falling ice. This case was prompted  
313 when a motorist was injured by a dislodged piece of ice from a truck while in transit and was  
314 filed on the basis that the driver was liable for not performing a sufficient driver vehicle  
315 inspection report (DVIR) (15). Plaintiffs contended that the driver was negligent in performing  
316 the DVIR for not inspecting the roof of the trailer for accumulated ice, even though ice was not  
317 observed hanging from top or sides of the trailer.

318 The investigating officer, a Pennsylvania State Trooper, issued two citations; one to the  
319 motor carrier for “systematically maintaining a vehicle with snow and ice on the top of the trailer  
320 in violation of the Federal Motor Carrier Safety Regulations (FMCSR) and another to the truck  
321 driver for the failure to secure a load. (75 Pa.C.S.A. 4107(b)(2).”

322 An expert witness contended that the driver violated FMCSR Section 396.13 and that,  
323 given the weather conditions, was negligent for not inspecting the top of the trailer for ice.  
324 Additionally, the expert witness suggested that the motor carrier should have provided a ladder,  
325 or some other means, for the driver to inspect the trailer roof. The court found it was not  
326 reasonable, nor was it industry practice, for drivers to inspect trailer roofs for ice accumulation,  
327 even though environmental conditions may exist that favor the formation of ice. Both the carrier  
328 and the driver were absolved of any negligence or liability.

329

### 330 *Motor Carrier Insurers*

331 Several major insurance carriers were contacted to provide insights into the scope of the  
332 problem. ATRI requested data on the frequency of insurance claims for truck damage caused by  
333 falling ice as well as the frequency and amounts of insurance settlements for motorists suffering  
334 injury or property damage from falling ice. All interviewees indicated that insurance claims are  
335 not coded in such a way as to make this information available. One interviewee from a large  
336 insurer could not recall any large claims arising from a severe incident involving falling snow or  
337 ice (Dave Melton, unpublished data).

338

### 339 *Premium Reductions*

340 Some snow removal device vendors suggest in marketing materials that the installation and use  
341 of snow removal devices might result in lower insurance premiums for motor carriers. One

342 insurance industry interviewee indicated that this is not the case. No premium discounts are  
 343 associated with installation of snow removal devices due to the inability to ensure that the  
 344 devices are consistently and appropriately used in every situation that may pose a risk  
 345 (Wellington Roemer III, unpublished data). Rather insurers note that if snow removal devices  
 346 and practices reduce claims, then lower premiums will result.

347  
 348 *Snow and Ice Removal Solutions*

349 Though the risk of falling snow and ice is well recognized, there remains a lack of economically  
 350 feasible, easily deployable solutions available to motor carriers. However, the industry survey  
 351 does indicate that some carriers have either purchased or built devices or are using other  
 352 approaches (see Table 1).

353  
 354 *Snow Removal Devices Used – Survey Results*

355 Forty-one percent of respondents listed at least one type of snow removal device used, consistent  
 356 with the percentage of respondents that answered that they removed snow and ice sometimes or  
 357 often (47%). Of these respondents, nearly two-thirds (61%) listed the use of one device, while  
 358 another 39 percent listed the use of multiple devices for snow removal.

359 Drive-through scrapers were the most commonly used device, followed by some type of  
 360 platform, truck washes and private contractors. Open ended responses listed under “Other”  
 361 included a shop door opening and “shovel and elbow grease.” Of the drive-through scrapers,  
 362 about half were purchased and half were built in-house. Of the platforms, two-thirds were built  
 363 in-house, while the remaining were purchased. The majority of respondents ranked the top three  
 364 devices utilized as doing a “fair” job of removing snow and ice. As part of the research, ATRI  
 365 documented user perceptions of individual system advantages and disadvantages in a  
 366 compendium of snow removal devices (16).

367  
 368 **TABLE 1 Use of Snow Removal Devices**

Type of Device	Percent of Total Devices in Use	Percent of Devices at Company Facilities	Device Ratings, Percent of Respondents		
			Poor	Fair	Good
Drive-Thru Scraper	47%	100%	6%	65%	18%
Drive-By Platform (catwalk) or Mobile Lift (Skyjack)	17%	80%		67%	33%
Truck Wash	14%	50%	20%	80%	
Private Contractor	8%	n/a		33%	67%
Other *	14%	n/a	20%	20%	40%

\* Does not total to 100% as not all respondents ranked system performance.

382  
 383 *Vehicle-Based Solutions*

384 Interviewees also identified other potential vehicle-based solutions including:

- 385 • Redesigned trailer tops that minimize the thickness, size or likelihood of ice formation;
- 386 • Improved trailer aerodynamics that reduce the likelihood of falling ice;

- The use of emerging truck technologies such as ambient temperature sensors to warn drivers or motor carriers of the likelihood of ice formation.

*Deicing*

ATRI also investigated the use of deicing in the aviation industry to determine applicability for commercial trucks. The use of deicing for commercial vehicles does not present a viable solution for several reasons:

- The properties of the chemicals needed are vastly different between aircraft and trailer tops.
- The stringent environmental standards which govern the use of deicing chemicals do not make their use practical for the hundreds of thousands of trucks traveling in snowy conditions on any given day.

*Industry Practice*

The industry survey queried respondents on the frequency of snow and ice removal from the tops of trailers. Over half of motor carrier survey respondents (54%) never or rarely remove accumulated snow or ice. However, over a third of these respondents indicated that they are aware of existing legislation or new efforts to mandate the removal of snow and ice. Virtually all respondents who indicated that their companies never or rarely remove snow or ice had no driver training or snow and ice removal policies. These results may reflect several possible underlying factors:

- The lack of available snow removal devices;
- A lack of empirical evidence has stymied stakeholder efforts to address the problem in a comprehensive approach.

Of those respondents that often or sometimes remove snow or ice, 42 percent remove snow often while the remaining 58 percent remove snow sometimes. Of this group, half do not have policies or training for drivers – suggesting these companies may have an informal intracompany understanding of the need for snow removal, though policies and procedures are not fully integrated with core fleet operations (see Table 2).

Lastly, half of the respondents that remove snow and ice often or sometimes were unaware of existing or pending legislation – suggesting these practices were based solely on improving safety and mitigating safety risks. When looking at survey respondents in total, nearly three-quarters (74%) do not have policies or training requiring drivers to remove snow or ice.

**TABLE 2 Carrier Practices**

Question	Yes	No	Not Sure
Snow and ice removal polices for drivers?	19%	74%	7%
Arrangements with customers for dropped trailers?	2%	88%	11%

Canadian carriers interviewed report that, prior to travel, various countermeasures are utilized (with varying degrees of success), including:

428

- 429 • Use of the company truck wash;
- 430 • Mechanics use long handled squeegee-type devices to push snow off the tops of trailers;
- 431 • 3<sup>rd</sup> party contractors are used to clear snow and ice, typically at a cost of approximately
- 432 \$50-\$150 per truck (which can create delays for the drivers of several hours);
- 433 • Use of snow removal systems.

434

435 These practices, however, only deal with the trailer as it leaves the company facility and  
 436 do not address snow and ice removal while in transit. Another commonality among Canadian  
 437 interviewees was the incorporation of snow and ice removal, and the hazards of falling ice, into  
 438 several core fleet operational areas including:

439

- 440 • Driver training programs;
- 441 • Procedures for removing snow and ice from trailers at company terminals;
- 442 • Dispatching/procedural guidelines for drivers picking up trailers with accumulated snow  
 443 and ice;
- 444 • The development of internal and private contractor networks to maximize the availability  
 445 of snow removal options;
- 446 • Driver disciplinary procedures for traveling with accumulated snow and ice on company  
 447 vehicles or trailers.

448

#### 449 *Trucking Industry Customers – Shippers, Consignees and Distribution Centers*

450 The research identified few trucking industry customers with snow and ice removal devices or  
 451 procedures in use at shipping and receiving locations. Just one survey respondent indicated  
 452 having an agreement with a customer to remove snow and ice from dropped trailers.

453 Carrier interviewees indicate that most of their customers consider accumulated snow and  
 454 ice on trailers as the carrier's problem, namely because it is the carrier's equipment.

455 Interviewees note that third-party contractors are most often used to clear snow and ice from  
 456 trailers dropped at customer locations, at the carrier's expense. Lastly, interviewees note that  
 457 there is a reluctance to press their customers for snow removal devices at distribution centers,  
 458 namely due to capital and maintenance costs, and the concern that these customers will simply  
 459 turn to the carrier's competitors for freight services. However, one snow removal device vendor  
 460 lists several distribution centers in the northeast United States as customers. As another  
 461 example, one "home-made" device is located in the regional logistics center for a major  
 462 hardware chain store.

463

#### 464 *Truckstops and Rest Areas*

465 NATSO, a national trade association representing travel plazas and truckstops, indicates that  
 466 many truckstops operated by their members have truck washes that can be used to remove snow,  
 467 but very few offer any other type of fixed location snow removal devices (Stephen Beaulieu,  
 468 unpublished data). In addition, there is anecdotal evidence of a very small number of truckstops  
 469 that offer other types of snow removal devices and typically charge \$10-\$30 per trailer. These  
 470 facilities may play a role in developing a comprehensive network of snow removal options for  
 471 motor carriers. ATRI did not find any evidence to indicate any type of snow removal devices  
 472 located at traveler rest areas in the U.S., Canada or Europe.

473

## 474 **THE CHALLENGES FOR SNOW AND ICE REMOVAL**

475 The findings from the literature review, environmental scan, industry survey and interviews all  
476 serve to highlight the challenges associated with effectively dealing with or mitigating the safety  
477 concerns associated with snow and ice falling from large trucks.

478  
479

### 480 **Nature of Trucking**

481 Freight transportation, and in particular trucking, is a 24/7 operation. However, federal rules  
482 regulate the number of hours drivers can work and drive, which means that at any given point in  
483 the day drivers will be parked for their required hours of rest. This provides an opportunity for  
484 snow and ice to accumulate on the top of trailers.

485 Furthermore, drivers often wait to pick up and deliver freight at customer locations or  
486 drop a trailer and pick up a trailer that has been sitting at the customer's facility, again providing  
487 opportunities for snow and ice to accumulate on top of the vehicle. Drivers who operate across  
488 the U.S./Canadian border also experience long waits to navigate through the various customs and  
489 inspection facilities, which in winter months very likely means waiting in snow and ice, again  
490 allowing accumulation.

491 Identifying viable solutions which address the countless areas where drivers could  
492 experience an accumulation of snow and ice is perhaps one of the biggest challenges.  
493 Essentially, wherever it snows presents an area where snow and ice could accumulate on the top  
494 of large trucks.

495

### 496 **Worker Hazards**

497 Although drivers or other personnel present one of the lowest cost options for snow and ice  
498 removal, they also represent one of the most dangerous options. The tops of trailers are not  
499 designed to withstand the weight of a driver on top to clean the accumulated snow and ice.  
500 Furthermore, the potential for slips, falls and even death associated with individuals attempting  
501 to get to the tops of trailers covered in snow and ice to clean the trailer top far outweigh any  
502 potential benefits from this as a solution. The hazards for workers are recognized and in many  
503 cases regulated by agencies responsible for worker safety.

504 The use of platforms and catwalks helps mitigate the risk somewhat by providing safety  
505 harnesses for workers, but do not completely eliminate the hazards from the snow and ice. As  
506 documented through the interviews, the platforms and catwalks provide a fixed location solution  
507 for snow removal but removing ice is more difficult when it bonds to the trailer top.

508

### 509 **Availability of Snow and Ice Removal Devices**

510 There are several devices for snow and ice removal currently available, with patents pending and  
511 production forthcoming for additional devices. However, with the exception of one, the current  
512 devices all have limitations in terms of removing ice. The other, a Snow Thrower, is purported to  
513 do well in removing snow and ice, but has capital costs of over \$70,000, making its viability as a  
514 widespread solution extremely limited.

515 The other issue with fixed location devices, regardless of their efficacy in removing snow  
516 and ice, is that they only provide a solution for trucks with access to those locations. Given the  
517 24/7, highly mobile nature of trucking, any widespread solution would likewise need to be  
518 available 24/7 to the majority of trucks operating in snow-prone areas.

519

520

**521 Vehicle-Based Solutions**

522 Vehicle-based solutions proposed by interviewees generally focus on redesigning trailers to  
523 impede the formation of ice sheets and/or improved trailer aerodynamics which would reduce the  
524 likelihood of ice falling from the trailer.

525 Contact with the trailer manufacturer industry group indicates an awareness of the  
526 potential safety issues related to snow and ice falling from trailers. However, staff from the  
527 Truck Trailer Manufacturers Association (TTMA) reported that TTMA members are unaware of  
528 any requests from customers to develop a solution. Additionally, the organization reports that  
529 there are no engineering or aerodynamic redesign efforts underway to mitigate the accumulation  
530 of ice or snow on truck trailers (Jeff Sims, unpublished data).

531 The challenge for a vehicle-based solution is the time horizon associated with fleets  
532 turning over their trailer fleet. Even if a redesigned trailer were engineered, tested, and on the  
533 market within 3-5 years, it would still be another 10-15 years before the majority of the existing  
534 trailer fleet were replaced, making a vehicle-based solution a more long-term proposition.

535

536

**537 INDUSTRY ACTION PLAN**

538 Challenges exist but the research has identified some potential action items which, when jointly  
539 undertaken by both private and public sector partners, may reduce the safety impacts from snow  
540 and ice falling from vehicles. The following outlines proposed actions for the short-, mid- and  
541 long-term.

542

**543 Short-Term**

544 The short-term proposals focus on outreach and education on the issue for all motorists and on  
545 exploring the potential for documenting a network of available snow removal devices.

546 In 2002, the Commercial Vehicle Safety Alliance (CVSA) developed and distributed a  
547 pamphlet detailing the problem and solutions for removing accumulated snow and ice from  
548 commercial motor vehicles (17). Among the recommendations are for drivers to:

549

- 550 • Anticipate inclement weather and load the vehicle to allow for extra weight  
551 accumulation;
- 552 • Carry appropriate equipment during the winter months to help remove the accumulation  
553 of snow and ice;
- 554 • Remove ice and snow when at a safe location, such as a truck stop or rest area;
- 555 • Check load weights before ice and snow accumulate.

556

557 A revised outreach campaign could be developed which expanded on the original CVSA  
558 information by providing a compendium of available snow and ice removal devices and their  
559 location. A similar approach was initiated by the Ontario Trucking Association (OTA), with  
560 some challenges noted below (Stephen Laskowski, unpublished data).

561 In recognition of the safety risks inherent in snow and ice accumulation on large trucks,  
562 OTA has solicited participation from several stakeholder groups to make snow and ice removal  
563 devices available to all truck drivers operating throughout the province. Outreach efforts have  
564 targeted carrier members, the provincial government and trucking-related groups that include  
565 large shippers and distribution centers.

566 The OTA indicates that there are no snow/ice removal devices at public facilities, like  
567 weigh stations or rest stops, or private facilities like truckstops. Several association members  
568 own and operate snow removal devices, typically accessible to company drivers only. The more  
569 commonly used devices include brush removal devices, snow and ice scrapers and truck washes.  
570 Lastly, the OTA has found that there are very few devices located at trucking industry customer  
571 locations such as distribution centers or large shippers.

572 Due to the lack of snow removal devices, the OTA promoted an initiative to develop and  
573 publicize a network of member-owned snow removal devices located throughout the province.  
574 The plan called for a compendium of devices, available via the internet that provided device  
575 location, cost to use (if any) and hours of operation.

576 However, development of the compendium stalled due to several concerns among  
577 member carriers including:

- 578
- 579 • Worker safety issues;
- 580 • Device maintenance costs and snow removal costs;
- 581 • Vehicle damage liability issues;
- 582 • Facility security-related issues and 24-hour availability;
- 583 • Violation of Customs-Trade Partnership Against Terrorism (C-TPAT) security/secure  
584 facility provisions;
- 585 • Potential safety issues with trucks waiting to use the device.
- 586

587 Though the OTA's vision of a network of snow removal devices has not yet materialized,  
588 the OTA continues to seek solutions to mitigate this safety risk and advocate a comprehensive  
589 solution available to all trucks traveling in Ontario.

590 In the U.S., the American Trucking Associations (ATA) could convene a stakeholder  
591 working group to explore the potential for a similar compendium, combined with an outreach  
592 and education component for all vehicle drivers, carriers, law enforcement, truckstop operators,  
593 distribution centers and others. Potential members for the stakeholder working group include:

- 594
- 595 • ATA
- 596 • American Automobile Association (AAA)
- 597 • CVSA
- 598 • State Trucking Associations
- 599 • NATSO
- 600 • FMCSA
- 601 • National Industrial Transportation League (NITL)
- 602

603 In addition, this stakeholder working group could begin identifying the requirements for  
604 the development of future data collection activities and mechanisms. A possible starting point  
605 could be the data collected in states that have enacted snow and ice removal regulations. Issues  
606 that would need to be addressed would include:

- 607
- 608 • Types and format of data that could be collected from motor carriers, insurers and  
609 enforcement agencies;
- 610 • Housing/maintaining a centralized database;

- 611 • Defining how the data would be used to improve safety.

612  
613

### 614 **Mid-Term**

615 One area regularly frequented by large numbers of trucks is state weigh stations and ports of  
616 entry. A mid-term solution would be to explore the possibility of installing snow removal  
617 devices at these facilities for use by all trucks passing through. This public sector approach has  
618 been implemented in the Canadian provinces of New Brunswick and Nova Scotia, where fixed  
619 snow removal devices are available at public weigh stations.

620 New Brunswick makes snow removal devices available at seven fixed, public weigh  
621 stations. If the weigh station is open, the scale operator may require a truck driver to clear snow  
622 and ice, or the driver may use the device voluntarily. The device consists of a  
623 platform/scaffolding which a driver uses to manually scrape off snow with a long-handled,  
624 heavy-duty scraper/squeegee, which the province has custom made.

625 Transportation officials report these devices are more effective at removing snow than ice  
626 (Nancy Lynch, unpublished data). Officials indicate the cost of removing piles of snow near the  
627 devices are minimal and are included in the costs of using snowplows to clear the parking lot and  
628 access/egress ramps. Lastly, there is anecdotal evidence that, since these facilities are open year  
629 round, the catwalks are also used by drivers with flatbed or logging trailers to check the security  
630 of their loads while in transit. The safety features, including the safety harness, appear to be  
631 adequate as no safety incidents have been reported (Diane Nash, unpublished data).

632 New Brunswick DOT personnel indicate that the platforms, though low tech, have  
633 worked well and believe that the availability of these devices to all truckers have reduced snow  
634 and ice falling incidents. In addition, interviewees indicate that these devices have required  
635 little, if any, maintenance (Nancy Lynch, unpublished data).

636 Based on the success of this model in New Brunswick, Nova Scotia purchased two fixed  
637 scrapers. One scraper is located in Amherst, while the other is located outside of Halifax. The  
638 devices are available to all trucks passing through the weigh stations.

639 Interviews with transportation industry professionals from these provinces indicate that  
640 these devices work well at removing snow and that there has been no reported safety problems  
641 associated with the operation of these devices.

642 The lack of proliferation of these devices across other Canadian provinces may be  
643 explained by three factors:

644

- 645 1) Cost of installation – ranging from \$12,000 for “catwalks” to \$18,000 or more for fixed  
646 scrapers;
- 647 2) Concerns over the ongoing costs associated with removal of snow that accumulates as the  
648 trailers are cleared;
- 649 3) Potential provincial liability for falls or injury from drivers falling from the platform or  
650 damage to vehicle equipment.

651

652 This mid-term solution clearly has associated costs, both capital costs for purchase and  
653 installation of the devices and ongoing maintenance and snow removal costs. However, it should  
654 be noted that the availability of the devices at public weigh stations should not be used as an  
655 opportunity to ticket drivers for overweight violations resulting from the accumulated snow and



656 ice. Instead, the installation of devices at public sector facilities should provide a proactive  
657 safety solution by allowing drivers to clear the snow and ice prior to being weighed.

658 One recent state bill dedicates fines for failing to remove snow and ice to purchase snow  
659 removal equipment in public locations (18).

660 An industry working group comprised of motor carrier associations, law enforcement and  
661 state Departments of Transportation could collaborate to explore the viability of this potential  
662 solution.

663

#### 664 **Long-Term**

665 Perhaps the greatest potential exists in vehicle-based solutions; redesigned trailers which impede  
666 the formation of ice sheets or lessen the potential for falling ice would eliminate the challenges  
667 with the 24/7, highly mobile nature of the trucking industry. The newer trailers would also  
668 eliminate the hazards associated with drivers or other personnel cleaning trailer tops.

669 However, given that the average trailer life is 10-15 years, widespread deployment of the  
670 redesigned trailers as the national trailer fleet turns over makes this solution a long-term  
671 proposal.

672 As a first step, a joint meeting with trailer manufacturers and motor carriers should be  
673 held to reach an understanding on the issue and explore potential solutions.

674 **REFERENCES**

675

676 1. American Trucking Associations. *American Trucking Trends, 2008-2009*. Arlington, VA,  
677 2008.

678 2. Federal Motor Carrier Safety Administration. *Large Truck and Bus Crash Facts 2007*.  
679 Washington, D.C., January, 2009.

680 3. Quebec Highway Safety Code, Section 498 (amended)

681 4. U.S. Department of Labor. Occupational Safety and Health Administration. *Enforcement of*  
682 *Fall Protection on Moving Stock Standard Interpretations*, October 18, 1996.

683 5. U.S. 29 Code of Federal Regulations 1910.28(a)(1).

684 6. United States Department of Labor. The OSH Act of 1970, Section 5(a)(1).

685 7. Menzies, James. "Heated Trailer Roofs Coming to Canada." *Truck News*. April, 2008.

686 8. National Highway Traffic Safety Administration. *2006 Traffic Safety Facts*, Washington,  
687 D.C., page 47.

688 9. Belanger, Joe. "Ice Fell- Falling Ice Causing Problems; Truckers Warned to Clear Snow and  
689 Ice from Trailers." *The London Free Press*, London, Ontario, Canada, Feb. 11, 2008.

690 10. Graham, George. "Ice Flying Off Trucks Shatters Windshields." *Republican Newsroom*,  
691 February 15, 2008.

692 11. Bloomquist, Sarah. "Flying Ice Danger on Area Highways." February 17, 2007,  
693 <http://abclocal.go.com/wpvi/index>. Accessed March 20, 2008.

694 12. National Coalition for School Bus Safety. *School Bus Crash Reports 2007: Motorist Shaken*  
695 *By Ice Flying Off Bus*. March 20, 2007.

696 13. Lehman, Pamela. "Ice from Truck Smashes into Pennsylvania Ambulance, Hurting 2 in  
697 Crew." *Fire Rescue News: Morning Call*, December 21, 2007.

698 14. New York State Assembly. "Spano Reissues his Call for Passage of Legislation to Protect  
699 Motorists from Snow and Ice Debris." *News from Assembly member Mike Spano*, December 19,  
700 2007.

701 15. Clark, Delia A. Ice. *Transportation Law Update*, Volume 7, Number 4, 2006.

702 16. Trego, Todd and R. Brewster. *Snow and Ice Accumulation on Vehicles*. American  
703 Transportation Research Institute, Arlington, VA., December, 2008, Appendix C.

704 17. Commercial Vehicle Safety Alliance. "Ice and Snow." 2002.

705 18. New Jersey Legislature. Senate, No. 520.

706 [http://www.njleg.state.nj.us/2008/Bills/S1000/520\\_R4.HTM](http://www.njleg.state.nj.us/2008/Bills/S1000/520_R4.HTM), Accessed July 27, 2009.