

INTRODUCTION

SNC Lavalin O&M is the company responsible for the operations, maintenance and rehabilitation of 275 kilometres of Trans-Canada Highway in New Brunswick; from the Quebec border to Longs Creek (west of Fredericton), and Route 95 between the United States border and Woodstock, until 2033.

During its winter operations, SNC Lavalin O&M utilizes echelon plowing, the practice of staggering snowplows across all lanes of a multi-lane highway. By passing the ridge of snow from the lead snow plow to the following plow, echelon plowing makes it possible to clear accumulation from all lanes at once. It is, however, extremely dangerous for motorists to pass between or around the snowplows while in this formation, due to the possibility of whiteout conditions between the plow trucks. There is also the danger of impact with the back of the right side wing plow as it becomes obscured by snow.

THE PROBLEM

The number of collisions between motorists and the snow plow right wings was an issue even after many public awareness campaigns on the risks involved when passing between the plow trucks. A total of forty four (44) collisions were recorded between 2007 and 2013 (see Appendix A). The collisions recorded were due to motorists attempting to weave between the plows while they are engaged in echelon plowing operations. These collisions, sometimes severe, were a safety concern for our plow operators and the motorists. Also, the plow trucks involved in these collisions could be out of service for months due to serious damage.

To help prevent these collisions, SNC Lavalin O&M installed bright retro-reflective orange tape, flags, and high intensity LED flashing lights on the wing plows. However, these devices often became obscured by wet snow collecting on the wing plow itself, or became invisible due to whiteout conditions behind the wing plow. The installation of these devices did not reduce the number of collisions that were occurring.

THE SOLUTION

After the last collision with injury to the plow operator in March 2013, and in the continuing effort to keep motorists as well as employees safe, SNC Lavalin O&M developed a "Safety Swing Arm". The Safety Swing Arm consists of a 2.7 meter mechanical arm with high intensity flashing lights, installed on the back of the

lead plow truck. When the right side wing plow is deployed, the arm simultaneously extends to create a further visual and break-a-way physical barrier between the motorists and the right wing plow. The Safety Swing Arm has been proven to prevent motorists from hitting the right wing while passing the plow during poor visibility conditions.

The Safety Swing Arms were installed on the rear right side of all the lead plow trucks. The Safety Swing Arm is deployed when the wing front post is lowered and will retract when the front post is raised. An in-cab hydraulic safety shut off is installed, in case the Safety Swing Arm does not need to be deployed when the wing is down. Some of the safety components of the Safety Swing Arms are:

- Four (4) high intensity strobe lights;
- High intensity retro-reflective tape;
- Low bumper in case of collision with small vehicles (45 cm from the ground);
- Light steel frame with breakable point in case of an impact;
- Kick back bumper system (to avoid damages to the arm in case the bumper gets in contact with a snow bank).

In cases where the Safety Swing Arm is impacted by a vehicle, the small stroke cylinder that opens and closes the arm acts as a break-away point as well. In case of an impact, the small cylinder will break and the arm will retract back against the plow truck spreader, resulting in minimal property damage and more importantly, decreasing the chance of injuries.

CONCLUSION

We are currently on the 2nd design and 3rd version of the Safety Swing Arm. The Safety Swing Arm has become a simple design that is adaptable on different types of snow plow trucks. The simplicity of the arm makes the unit inexpensive, and very low maintenance. The Safety Swing Arm can easily be removed and stored during the summer months. Since the introduction of the Safety Swing Arm in fall 2013, zero collisions have been recorded between motorists and the snow plows right wing. Some of the benefits resulting from the initiative are:

- Eliminate collisions between the motorists and the plow trucks
- Safer for the motorists
- Safer for the plow operators
- No more plow trucks out of service due to damage caused by collisions.

APPENDIX A – Historical Data on Number of wing hits per year

Year	Number of Wing Hits	Number of Safety Swing Arm Hits	Comments
2007	6	NA	
2008	10	NA	
2009	3	NA	
2010	3	NA	
2011	5	NA	
2012	8	NA	
2013	9	NA	Introduction of the Safety Swing Arm in fall 2013
2014	0	0	
2015	0	3	
2016	0	0	
2017	0	0	

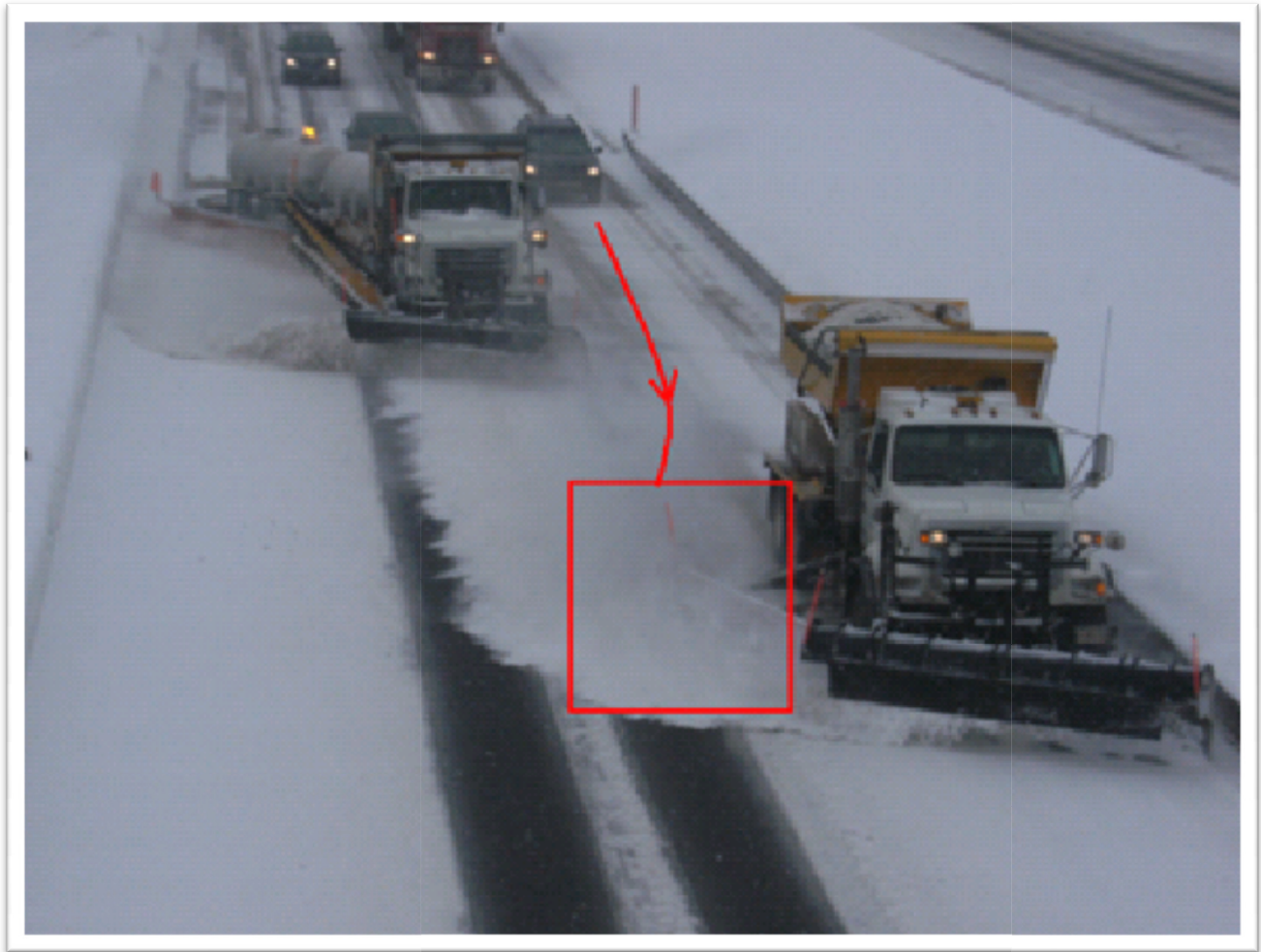


Figure 1 The danger of impact with the back of the right side wing plow



Figure 2 Result of a severe impact between a transport truck and the right wing of a snow plow truck in March 2013



Figure 3 Impact between a small vehicle and the right wing plow



Figure 4 Safety Swing Arm deployed (2nd version, 3.0 meter in length)

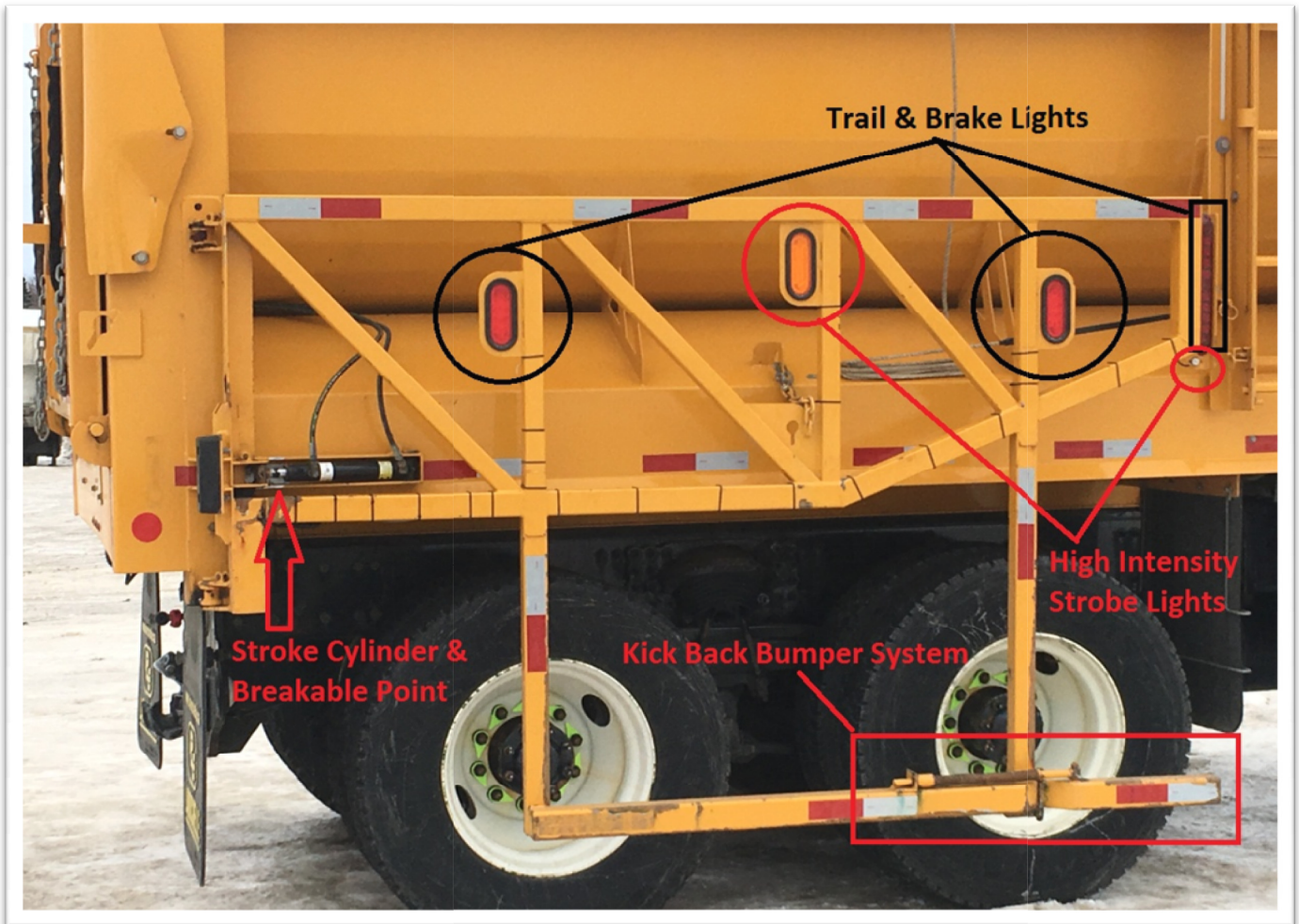


Figure 5 Safety Swing Arm retracted (3rd version, with kick back bumper system, shorter length and overall lighter weight)



Figure 6 Lead plow (left) with deployed Safety Swing Arm.