



REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION R15-04

Grade separation guidelines

Background

On 18 September 2013, at about 0832 Eastern Daylight Time, westward VIA Rail Canada Inc. (VIA) passenger train No. 51 departed from the VIA Ottawa Station on time and proceeded enroute to Toronto. At 0847:27, OC Transpo double-decker bus No. 8017 departed from the Fallowfield Station on the OC Transpo bus Transitway. At 0848:06, while proceeding at about 43 mph, the train entered the OC Transpo Transitway crossing, located at Mile 3.30 of VIA's Smiths Falls Subdivision. At the time, the crossing lights, bells and gates were activated. The northbound bus was travelling at about 5 mph with the brakes applied when it struck the train. As a result of the collision, the front of the bus was torn off. The train, comprising 1 locomotive and 4 passenger cars, derailed but remained upright. Among the bus occupants, there were 6 fatalities and 9 serious injuries, and about 25 minor injuries were reported. No VIA crew members or VIA passengers were injured.

The Board concluded its investigation and released report R13T0192 on 2 December 2015.

TSB Recommendation R15-04 (December 2015)

Woodroffe Avenue and Fallowfield Road are major arterial roads that service the area and, along with the Transitway, cross railway tracks used daily by numerous VIA passenger and some freight trains. The VIA Fallowfield Station (Mile 3.57) is located between the Woodroffe Avenue/Transitway and the Fallowfield Road level crossings (Mile 3.28/3.30 and 3.88 respectively) and adjacent to the OC Transpo Fallowfield bus station. Each of the crossings is equipped with automatic warning device (AWDs), which include flashing lights, bells, gates and constant warning time track circuits. The railway signalling system throughout this area is complex with a number of additional built-in safety features.

While the signalling system was generally reliable, with the additional features and programming, additional potential points of failure were introduced. During the course of this investigation, the TSB reviewed a number of other OC Transpo bus incidents at these crossings, as well as a number of reported trouble calls concerning the AWDs.

When one or more components or systems fail, the crossing protection enters the fail-safe mode and remains activated. While this is a designed safety feature, such repeated activations are categorized as nuisance operations that can impose significant delays to roadway users and erode public confidence in the system.

With recent improvement in technology, additional crossing warning systems may be available, including the following:

- Talking GPS systems have become quite advanced and can be programmed to alert drivers to an upcoming crossing and the need to slow down approaching the crossing.
- Other train detection technologies (e.g., GPS, radar, wheel sensors based on magnetic flux) can be used to provide low-cost active warning sign alternatives.
- Collision avoidance technologies for the automobile industry, which include blind spot detection, vehicle spacing, speed control and automated emergency braking, have been developed and/or implemented.

However, these technologies and applications do not specifically include systems for detecting and automatically responding to a potential collision with a train approaching from the side. While these technologies may be helpful, they may also increase driver workload, especially when approaching and traversing a crossing.

Ultimately, the safety of a crossing is dependent on a roadway vehicle driver making appropriate decisions based on the information displayed and responding appropriately to any additional warnings. Consequently, the only way to ensure that similar accidents do not occur at such high-traffic locations is to physically separate the roadway from the railway through grade separation.

Cross-product has always been one of the primary criteria used to assist in identifying potential grade separation projects. Historically, a cross-product (number of trains X number of vehicles per day) of 200 000 was the accepted threshold used by TC and industry for considering grade separation. However, there was no indication of when, why or how the 200 000 threshold was established and no research to support it.

The new *Grade Crossings Standards* identify cross-product thresholds at which AWD protection is required. Part C, Section 9, outlines warning systems specification and states in part:

9.1 The specifications for a public grade crossing at which a warning system without gates is required are as follows:

- a) where the forecast cross-product is 2,000 or more

[...]

9.2 Specifications for a public grade crossing at which a warning system with gates is required are as follows:

- 9.2.1 a warning system is required under article 9.1 and;

- (a) the forecast cross-product is 50,000 or more.

While TC does regulate as to when a crossing at-grade is not permitted, there is no requirement outlining when a grade separation should be considered. In Canada, there are no guidelines and no specific cross-product value at which grade separation should be built. In comparison, the United States Department of Transportation (DOT) Federal Highway Administration (FHA)

Railroad-Highway Grade Crossing Handbook (2007) provides specific guidance as to when grade separation should be considered. Chapter V, Part A, Section 6, Grade Separation, states in part:

- [...]
- b. Highway-rail grade crossings should be considered for grade separation across the railroad right-of-way whenever the cost of grade separation can be economically justified based on fully allocated life-cycle costs and one or more of the following conditions exist:
- [...]
- viii. Crossing exposure (the product of the number of trains per day and AADT [average annual daily traffic]) exceeds 500,000 in urban areas or 125,000 in rural areas; or
 - ix. Passenger train crossing exposure (the product of the number of passenger trains per day and AADT) exceeds 400,000 in urban areas or 100,000 in rural areas.

Considering the 2013 train and traffic volume cross-product values of Woodroffe Avenue (699 108) and Fallowfield Road (406 592), both roads met the United States FHA cross-product criteria for grade separation. If occupant cross-product is also considered, the Transitway (532 703) would also meet the FHA cross-product criteria.

It is recognized that federal guidelines are generally not enforceable, particularly in other jurisdictions. However, the Board considers that guidance similar to that contained in the United States DOT FHA *Railroad-Highway Grade Crossing Handbook* would be a useful framework that provides consistent guidance on issues related to grade separation for the industry as well as federal, provincial and municipal road authorities. Since Canada has no such guidelines for grade separation, the Board recommends that

the Department of Transport provide specific guidance as to when grade separation should be considered.

TSB Recommendation R15-04

Transport Canada’s response to Recommendation R15-04 (February 2016)

Transport Canada accepts this recommendation.

Grade crossing safety is a shared responsibility between railway companies, road authorities, and private authorities. In 2014, Transport Canada published new *Grade Crossings Regulations* which clearly define the roles and responsibilities at grade crossings for the design, construction, maintenance and inspection of the crossing surface, signage, and warning systems. Although the regulations specify when new at-grade crossings are prohibited, they do not regulate when grade separation should be implemented at existing grade crossings.

Transport Canada will work with the provinces and railways to develop guidelines which would assist road authorities and railways to determine when grade separation should be considered. The decision to construct a grade separation will continue to be the responsibility of the road authority and the railway.

TSB assessment of Transport Canada's response to Recommendation R15-04 (March 2016)

Transport Canada has accepted this recommendation.

TC indicates that new *Grade Crossings Regulations* were published in 2014, but acknowledges that these regulations specify when new at-grade crossings are prohibited and do not specify when grade separation should be implemented at existing grade crossings. TC will work with the provinces and railways to develop guidelines to help determine when grade separation should be considered.

The Board is encouraged that TC will be working collaboratively with key stakeholders to develop guidelines for determining when grade separation should be considered.

Although no timelines have been established yet for this work, the Board assesses the response to Recommendation R15-04 as having **Satisfactory Intent**.

Transport Canada's response to Recommendation R15-04 (February 2017)

TC has initiated a dialogue with provincial counterparts and stakeholders, including the Transportation Association of Canada, and Federal/Provincial Working Group, for the development of guidelines. Once TC has a commitment for the project from key partners, TC will be able to provide a timeline on the development of grade separation guidelines.

In the interim, TC is gathering information from various sources, which will help form the basis for recommended best practices.

To support this work, TC will be engaging an external organization to conduct analysis to support the development of guidelines. It is expected that outputs from this work will facilitate engagement with provincial counterparts and stakeholders.

TSB reassessment of Transport Canada's response to Recommendation R15-04 (March 2017)

TC is gathering information from various sources and has initiated dialogue with provincial counterparts and stakeholders for the development of grade separation guidelines. TC will be engaging an external organization to conduct analysis to support the development of the guidelines.

However, TC has not yet obtained the required commitment from key partners. TC is therefore unable to provide a timeline as to when the work can actually begin on the development of grade separation guidelines. Although no timelines have been established, the Board reassesses the response to Recommendation R15-04 as having **Satisfactory Intent**.

Transport Canada's response to Recommendation R15-04 (January 2018)

TC has identified a university to conduct a review of research and practices on the implementation of grade separations at railway grade crossings. The proponent will conduct a literature review of relevant research and current grade separating practices (guidelines, standards or criteria) being used in various jurisdictions. The proponent will then identify criteria and best practices for supporting grade separation decisions. The criteria will consider

the safety and operational characteristics of a crossing such as road and railway speeds, vehicle and train volumes, cross product and accident history.

A report is expected in 2018 which will serve to facilitate engagement with provincial counterparts and other stakeholders on the development of grade separation guidelines.

TSB reassessment of Transport Canada's response to Recommendation R15-04 (March 2018)

A university has been identified to conduct the review of research and practices for grade separation at railway grade crossings in various jurisdictions. The criteria and best practices for supporting grade separation decisions will then be identified. The criteria will consider the safety and operational characteristics of a crossing such as road and railway speeds, vehicle and train volumes, cross product and accident history.

The research report, to be completed in 2018, will then facilitate engagement with stakeholders to begin the development of the grade separation guidelines. The Board considers the response to Recommendation R15-04 as having **Satisfactory Intent**.

Transport Canada's response to Recommendation R15-04 (February 2019)

In 2016, TC committed to the development of a grade separation guideline, which railway companies and road authorities could use to assist in determining when grade separation should be considered for an at-grade railway crossing.

In February 2018, TC funded a study carried out by the University of Manitoba to review relevant academic literature and publicly available documents currently in use by jurisdictions when considering grade separation. The findings were synthesized in the August 22, 2018, report titled "Review of Research and Practice on the Implementation of Grade Separation", which identifies criteria and best practices that could potentially be adopted in Canada to help make grade separation decisions.

The department has developed a Grade Separation Assessment Guideline which is based on findings from the University of Manitoba study and input received from various stakeholders since September 2018. The Guideline, currently in draft form, was developed to be applicable for freight and passenger railway crossings in Canada and was shared with key stakeholders, such as organizations representing railways and road authorities for their comments, in January 2019. The report written by the University of Manitoba was also provided to stakeholders to facilitate their review of the draft guideline.

Once finalized, the Grade Separation Assessment Guideline will serve to assist stakeholders in the identification of locations along the rail network which would benefit from grade separation. The Guideline consists of criteria that would be readily available to transportation practitioners.

Transport Canada is planning to publish the Grade Separation Assessment Guideline by April 2019.

The Grade Separation Assessment Guideline is one element of the department's continuing efforts to improve crossing safety. In addition, Transport Canada has supported numerous crossing safety improvement projects under the Rail Safety Improvement Program (RSIP). The

Minister of Transport has also approved several grade separation projects under the National Trade Corridors Fund (NTCF) that will provide significant safety benefits in addition to improving the efficiency of rail networks. These include the grade separation of a rail crossing at 50 Street in Edmonton, Alberta (about \$40 million federal funding), and three railway grade separations in Metro Vancouver, British Columbia (\$125 million federal funding).

In addition, TC continues to encourage provinces, territories and municipalities to adopt the *Guidelines for New Development in Proximity to Railway Operations* (Proximity Guidelines) into their land use planning policies. These guidelines were developed by the Federation of Canadian Municipalities and the Railway Association of Canada under their joint Proximity Initiative.

Transport Canada continues to administer its Risk-Based Oversight Program and monitor for safe and compliant railway operations. TC has conducted over an average of 1500 crossing inspections per year and have taken enforcement action as necessary, such as issuing Notices, Notices and Orders, issuing Letters of Warning, and serving Notices of Violations, including monetary penalties to railway companies for not complying to applicable rules and regulation. Notices of Violation are publically [available] on TC's website.

TSB reassessment of Transport Canada's response to Recommendation R15-04 (March 2019)

In February 2018, Transport Canada (TC) initiated a study, conducted by the University of Manitoba, to review academic literature and publicly available documents relating to grade separation, including guidance currently in use by various jurisdictions. In August 2018, the study report (i.e., Review of Research and Practice on the Implementation of Grade Separation) was completed. This report identified criteria and best practices that could potentially be adopted in Canada to help make grade separation decisions.

Based on the findings of the University of Manitoba study, TC developed the draft *Grade Separation Assessment Guideline*. In January 2019, the draft guideline document along with the University of Manitoba study were shared with key stakeholders (including railways and road authorities) for comments. The TSB notes that some of the thresholds identified in the guideline are less stringent than those used in the United States.

Once comments are received, the guideline document will be finalized. TC expects to publish the *Grade Separation Assessment Guideline* by April 2019. The Board considers the response to Recommendation R15-04 as having **Satisfactory Intent**.

Transport Canada's response to Recommendation R15-04 (December 2019)

The *Grade Separation Assessment Guidelines* were published on Transport Canada's website earlier this year (April 2019) and can be found at the following link:
https://www.tc.gc.ca/en/services/rail/grade-crossings/grade_separation_assessment_guidelines.html.

The department shared these Guidelines with the Federation of Canadian Municipalities and the Railway Association of Canada for distribution to their members.

While Transport Canada has completed its work to address this recommendation, the department continues to undertake measures to improve safety at crossings. More information on programs to improve crossing safety can be found on the department's Grade Crossing Safety webpage at <https://www.tc.gc.ca/en/services/rail/grade-crossings.html>.

TSB reassessment of Transport Canada's response to Recommendation R15-04 (March 2020)

In April 2019, Transport Canada (TC) published the *Grade Separation Assessment Guidelines* on its website. The TSB notes that some of the thresholds identified in the new guidelines are less stringent than those used in the United States.

TC's guidelines were shared with the Federation of Canadian Municipalities and the Railway Association of Canada for distribution to their members. In addition, TC continues to undertake measures to improve safety at crossings. The TSB encourages TC to continue monitoring the efficacy of its guidelines to determine if they are improving safety at crossings.

The response to Recommendation R15-04 is assessed as **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.