



## STAFF REPORT ACTION REQUIRED

### Gap Between Subway Trains and Platforms

<b>Date:</b>	November 13, 2017
<b>To:</b>	TTC Board
<b>From:</b>	Chief Executive Officer

### Summary

---

This report is in response to an October 2016 Board motion for information on the current condition of gaps between subway trains and platforms. Platform gaps exist because of station designs and/or operational reasons. Depending on their dimensions, these gaps may create accessibility barriers and safety concerns for customers using mobility devices, strollers, and customers with vision loss.

The Accessibility for Ontarians with Disabilities Act (AODA) does not specify acceptable gap dimensions, therefore the TTC turned to the Americans with Disabilities Act 2010 (ADA), which has guidelines for gap sizes between platforms and trains that are intended for transit systems in the United States. The retrofit standard under ADA Exception 2 (Section 1192.53d (3)) supports 102 mm for the horizontal gap and 51mm for the vertical gaps.

Over the course of several months, laser equipment was mounted onto trains that passed through the entire subway system to collect detailed measurements of the vertical and horizontal gaps between the platforms and trains. TTC staff consulted with the Advisory Committee of Accessible Transit (ACAT) throughout the process and with ACAT support carried out a number of physical trials of horizontal gap dimensions.

With ACAT's endorsement, a horizontal gap of 89mm between the platform edge and train door and 38mm in the vertical gap between the platform edge and the train floor was determined to be the maximum manageable gap size that would yield a beneficial improvement. If this standard is applied to 90% of a platform's length then retrofit work will be required along sections of platforms at 62 subway stations. Some of the platform gaps at the 62 stations can be addressed through minor corrective solutions, while others require a more detailed engineered solution.

Further work is required to refine and adopt a formal retrofit standard for platform gaps, and to scope out a subsequent capital program with a focus on station-specific and site modifications. It is proposed to present this gap retrofit program for Board consideration as part of the 2020 budget cycle.

## Recommendations

---

It is recommended that the Board:

1. Endorse a platform gap retrofit standard of 89 mm horizontal and 38 mm vertical along a minimum of 90% of each platform on an interim basis until the final study is complete.
2. Authorize staff to commence basic corrective work to meet the interim retrofit gap standard to address horizontal and vertical gaps at key platform edges in coordination with Wheel-Trans Family of Services priorities; and
3. Direct staff to report back to the Board in 2019 on the findings of the study and a proposed gap retrofit program.

## Financial Summary

Minor corrective work to some platform gaps to meet the interim retrofit standard will be incorporated as part of the 2018 state of good repair program.

The cost of the study noted in recommendation 3 is approximately \$500,000.00 and will be paid for from the Family of Services program budget, which is part of the 10 Year Wheel-Trans Strategy. A capital program will be developed to implement recommendations of the study and the costs will be incorporated as part of the 2020-2029 capital budget.

There will be an ongoing cost to maintain the gap solutions. The costs will be absorbed as part of the operating budget. Future budgets will need to make provisions to account for the additional cost for maintenance and future replacement.

The Chief Financial Officer has reviewed this report and agrees with the financial impact information.

## Accessibility/Equity Matters

The TTC has a strong organizational commitment to equity and accessibility and is making continuous progress towards making its vehicles, facilities, and services more inclusive for all customers, which includes compliance with the Accessible for Ontarians Disability Act (AODA).

The TTC's implementation of accessibility improvements is guided by the *2014-2018 TTC Multi-Year Accessibility Plan*, which was adopted by the Board in April 2014. This document outlines the TTC's long-term vision for an accessible transit system. Item 6.3.2 of the *Multi-Year Accessibility Plan* explains the TTC's commitment to increase use of

the conventional transit system by people with disabilities, including Wheel-Trans customers where appropriate.

Successful and practical solutions to manage the gap enable a higher percentage of people travelling with mobility devices to use the conventional transit system and not rely exclusively on Wheel-Trans. The introduction of the Family of Services model, as described in the Wheel-Trans 10-Year Strategy, increases the number of customers with disabilities using the conventional transit system, including the subway.

Staff has worked closely with ACAT in the preparation of this report and on this initiative. ACAT has been actively involved in the physical testing of various platform gap configurations and has been consulted throughout this process.

Work to address the gap issue will be co-ordinated and phased to complement the Easier Access III program, which aims to make all stations accessible by 2025.

## **Decision History**

At its October 27, 2016 meeting, the Board received correspondence from ACAT specifically requesting that safety and accessibility between the subway trains and platforms be improved by examining larger than normal gaps and ACAT specifically requested that the TTC:

1. Expedite detailed measurements of subway vertical and horizontal platform gaps at all stations where this data remains to be collected;
2. Define the scope of remedial work; and
3. Package work as a capital project to be funded and implemented as soon as possible.

[http://www.ttc.ca/About the TTC/Commission reports and information/Commission meetings/2016/October 27/Reports/3 Improving Safety and Accessibility when moving between Sub.pdf](http://www.ttc.ca/About%20the%20TTC/Commission%20reports%20and%20information/Commission%20meetings/2016/October%2027/Reports/3%20Improving%20Safety%20and%20Accessibility%20when%20moving%20between%20Sub.pdf)

A motion was passed by the Chair directing staff to investigate and report back to the Board:

[https://www.ttc.ca/About the TTC/Commission reports and information/Commission meetings/2016/November 30/Minutes/October 27 Minutes.jsp](https://www.ttc.ca/About%20the%20TTC/Commission%20reports%20and%20information/Commission%20meetings/2016/November%2030/Minutes/October%2027%20Minutes.jsp)

## **Background**

ACAT provides the TTC with critical feedback on projects and initiatives that will help make improvements to the transit system from an accessibility perspective. ACAT raised the issue that there are many instances where the wheels of mobility devices are getting stuck in the gap between the train and platform, and in their correspondence to the Board note that this is “causing panic, unnecessary wear/damage to mobility devices, and

system delays which ultimately undermine confidence that the subway is truly accessible.”

The gaps between subway trains and platforms exist because of station design and construction, and operational reasons. The gap size was established on the basis of technical tolerances to provide sufficient clearance between the train and platform to ensure that there would not be contact with the platform while entering and exiting stations at posted speeds. Subway car manufacturing and maintenance tolerances, suspension characteristics, platform construction tolerances and track maintenance tolerances play a role in the determination of the gap.

Trains and track both experience normal wear during which various parameters deviate from their initial “as-new” values. Track geometry deteriorates, train wheels and rail wear vertically and laterally, and vehicle suspensions become softer, all leading to inconsistencies in the train-to-platform gaps from train-to-train and station-to-station. All of these values are periodically inspected. At predetermined limits, corrective actions are employed to bring the values back to within the accepted design envelope for the gaps.

### **Design Intent**

The current design intent, as contained in the TTC’s Design Standards, is that the horizontal gap between a stationary, new vehicle and new platform is 70 mm horizontally and 35 mm vertically. It is designed to achieve the minimum safe distance between trains and platforms considering the physical realities of construction, manufacturing and operating limitations. This value conforms to design guidelines from the *ADA Standards for Accessible Design (2010 – Section 1192.53d(2))*, which recommends 76 mm of horizontal gap between new train and existing platform, and maximum of 38 mm of height difference, known as the vertical gap. These are nominal values that allow for subsequent wear. Wear limits of vehicles and track are not prescribed by ADA and other identified gap standards, as these vary among transit agencies due to different vehicle and track technologies. These standards are adopted by each transit agency in line with their asset management practices, operational considerations and budgetary limitations. For retrofit conditions, ADA Exception 2 defines maximum gaps of 102 mm vertically and 51 mm horizontally.

It must be noted that the ADA was first published decades after the TTC system was built, and that it applies to new vehicles and stations or significant retrofits in the United States. The ADA standards are noted here because no comparable Canadian standard was identified. Guidelines for platform gaps on rapid transit systems are not included in the *Accessibility for Ontarians with Disabilities Act, 2005 (AODA)* or its *Transportation Standard*, contained within Ontario Regulation 191/11 Integrated Accessibility Standards.

## Comments

The TTC completed preliminary measurements of all platform gaps system wide using train mounted laser measuring (LiDAR) equipment to document the distance between the centre of the track and the platform edge, assuming nominally consistent train door sill positions. In summary:

- 94% of cumulative platform edge length (16.2 of 17.2km) on Lines 1 and 2, and 98% on Lines 3 and 4 (1.96 of 2 km) have horizontal and vertical gaps less than or equal to 102 mm and 51 mm respectively on 90% of the length of each platform, making them compliant to ADA Exception 2.
- 81% of cumulative platform edge length (13.9 of 17.2km) on Lines 1 and 2, and 94% (1.88km of 2 km) on Lines 3 and 4 have horizontal and vertical gaps less than or equal to 89 mm and 38 mm respectively on 90% of the length of each platform, thereby meeting and improving upon the requirements of ADA Exception 2.

The largest horizontal gaps are at stations where tracks curve as they enter or leave the platform; in these situations, trains require more clearance adjacent to the platform due to the outswing of the vehicle body. Examples of stations with large platform gaps include:

Station	Gap *	Reason
Union	Horizontal gap averaging 150mm at both ends	Track curvature on northbound platform to Sheppard West
St. Clair	Horizontal gap averaging 150mm	Track curvature at south end of platforms
Eglinton	Vertical gap averaging 64 mm	Platform is constructed below current design height along entire length

\*ADA Exception 2 max horizontal gap is 102mm and max vertical gap is 51mm

The middle 121 metres of every platform is straight and not affected by adjacent track curvature. The condition of track is typically very good throughout all platforms; deteriorating condition of track was not found to contribute to excessive gaps in any of the stations.

Staff recommend retrofitting all stations to meet tighter requirements (89mm horizontal/38mm vertical, notwithstanding minor variations in train door sill position). This provides the greatest and most equitable level of accessibility for customers. Improving on the minimum ADA requirements will help position the TTC as a leader in accessibility.

**Table 1 – Comparison of Gaps**

<b>Parameter</b>	<b>ADA Exception 2</b>	<b>Recommended Option – Option 4</b>
Horizontal Gap	102 mm	89 mm
Vertical Gap	51 mm	38 mm

## **Implementation**

Staff are recommending that TTC proceeds with further study and definition of a platform gap retrofit program that targets compliance with a provisional retrofit standard, based on maximum gap sizes of 89 mm horizontally and 38 mm vertically, along a minimum of 90% of each platform, as this will best support *TTC's Multi-Year Accessibility Plan*, Wheel-Trans 10-Year Strategy and the ongoing recommendations of ACAT. The study will need to be scoped and may include a review of various measures in narrowing the gap:

1. Installation of soft and compliant horizontal gap fillers to overcome horizontal gaps.
2. Installation of localized vertical ramping to overcome vertical gaps.
3. Installation of wide gap space signage, as required where measures 1 and 2 above do not provide a viable solution.

Concurrent with the development of the retrofit standard and associated capital program, initial corrective work can be undertaken at platform edge locations where less complex horizontal gap situations exist. This work will involve the installation of rubber horizontal gap filler strips to reduce excessive gap dimensions, and will be co-ordinated with Wheel-Trans staff to ensure appropriate prioritization of suitable stations. The work will be carried out by contractors or TTC staff using existing funds, and would allow for progress to be made in advance of the formal gap retrofit standard and program being finalized.

Proposed retrofit methodologies are different for horizontal and vertical gaps. Stations may require retrofit in the same areas for both horizontal and/or vertical. Retrofit methodologies have been trialled on small sections of Davisville Station (horizontal gap filler material and Eglinton Station (vertical retrofit ramps). Depending on the solutions developed, station closures may be required to facilitate construction work at track level.

Staff has previously evaluated available options to modify subway trains, including the installation of ramps or bridge plates on the subway trains; unfortunately, there is no viable solution that is compatible with the TTC subway environment. Future subway vehicle orders will consider lower nominal floor height below the current 35mm standard, which becomes feasible with reduced variation in platform edge heights.

## **Work to Date**

To-date, the following platform gap improvements have been made:

1. **Lowering of Toronto Rocket Trains**  
All new Toronto Rocket trains were delivered with the same floor height specifications as the previous T1 generation of trains. However, initial measurements found that the trains were higher compared to the older trains. This was attributed to all trains arriving with new wheels and new suspensions, which meant that trains were at the upper end of the height specification. Based on ACAT's recommendation, the nominal train height was lowered by 10mm to reduce the vertical gap. It is expected that the height difference of new trains with respect to platforms will improve further as the wheels continue to wear.
2. **Eglinton Station Platform Edge Improvements**  
In response to an ACAT recommendation and customer feedback from the 2014 Public Forum on Accessible Transit, TTC staff designed, tested, and implemented improvements to the subway platform at Eglinton Station to make it easier for customers using mobility devices to board subway trains at this location. In mid-2015, the platform edge was modified at the south end of the subway platform, in the vicinity of the elevator, to better align with the height of subway trains, and nearly eliminate the vertical gap issue. Customer feedback on these improvements has been overwhelmingly positive. However, this local vertical ramping only addresses the issue for two of the 24 doors on each train.

Similar to the work undertaken at Eglinton Station, the recommended option described in this report is anticipated to expand the use of vertical ramping to other locations in the subway system where platforms are currently lower than the provisional retrofit standard.

## **Impact on other Programs**

The following programs may be impacted by the platform gap issue:

1. **Wheel-Trans 10-Year Strategy service delivery model**, which requires co-ordinated improvements to subway station accessibility.
2. **Capital Budget - Funding for gap fillers, ramps, edge retrofits, structural modifications, or other solutions to be determined.**
3. **State-of-Good Repair – Track access time is limited.** Increased attention on maintenance of the platform-train interface in stations will impact SOGR work outside of stations. There may be an increase in system closure requests to maintain overall SOGR progress.
4. **ATC – Platform modifications will need to be co-ordinated with future train door opening positions as train stopping positions become more precise under ATC operation.**

These interdependencies will be considered as part of the next steps described below.

## Next Steps

Define a formal retrofit standard for platform gap enhancement and define a multi-year capital project to deliver associated improvements.

Project definition will address the following:

- Determine project lead, stakeholders, responsibilities, scope and schedule.
- Identify mode of project execution, refine field measurements and identify range of specific retrofit techniques to be applied at various platform locations.
- Determine necessary resources for project execution (workforce, funding, technology, phasing).
- Develop full budgetary Business Case for evaluation through the 2020 budget process.

2018	Begin mitigation work at stations identified as a priority by ACAT, and where the work can be undertaken by the TTC within current SOGR budget. Initial assessment and consultation with ACAT indicates we will prioritize: <ol style="list-style-type: none"><li>1. Davisville southbound (vertical gap)</li><li>2. St Clair, southbound (vertical and horizontal gap)</li><li>3. St Clair, northbound (vertical and horizontal gap)</li><li>4. Union, northbound to Sheppard West (horizontal gap)</li><li>5. Dundas, southbound (horizontal gap)</li></ol>
2018	Initiate full study on platform gaps
2019	Report back to the Board on findings of the platform gap study, and develop a capital program to address complex platform gaps.
2020	Begin work on complex gap mitigation solutions.

## Contact

James Ross  
Deputy Chief Operating Officer  
Phone: 416-393-4356  
Email: [james.ross@ttc.ca](mailto:james.ross@ttc.ca)