INFORMATION REPORT

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	April 3, 2023
SUBJECT/REPORT NO:	HSR Vibration Study (PW23022) (City Wide)
WARD(S) AFFECTED:	City Wide
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SUBMITTED BY: **SIGNATURE:**	Maureen Cosyn Heath Director, Transit Public Works Department 

COUNCIL DIRECTION

N/A

INFORMATION

In the first quarter of 2019, the Operations section of the Transit Division met with Human Resources (Return to Work Services and Health, Safety & Wellness) to better understand the growing list of medical accommodations being requested by Operators related to a particular series of bus. Initial consultation with Return to Work Services determined that Transit needed additional information to assess the basis for the accommodation requests as the medical documentation provided by employees was often vague. It was agreed that an assessment of an Operator's exposure to vibration would help to respond to these accommodation requests.

As a result of the global COVID 19 pandemic, this assessment was placed on hold as maintaining reliable and safe transit operations during the pandemic became a priority. The matter was revisited in 2022 and in Q3 of 2022, Human Resources engaged Abilitech to assess a total of 30 buses in the fleet, comprised of different makes and models. The City requested that Abilitech measure and assess both whole-body vibration and hand-arm vibration exposure for Operators when operating a selection of the six different types of buses currently in the Transit fleet on both open routes (i.e.,

with regular passenger pickup along the route) and closed routes (i.e., without regular passenger pickup).

To develop the testing protocol with Abilitech, HSR's management team and Human Resources consulted with the Joint Health and Safety Committee (composed of worker and management members) and included ATU Local 107 union executives in the discussions. The group provided input into the design of the testing strategy to ensure that the data collected was representative of an Operator's exposure to vibration.

The goal of the assessment conducted by Abilitech was to complete a statistical examination of the vibration data collected for each type of bus in order to ascertain whether a specific style of bus may be superior in terms of vibration mitigation for the Operators responsible for driving these vehicles. In addition, the vibration data collected for each type of bus was compared to the ISO standards for both whole-body vibration (ISO 2631) and hand-arm vibration (ISO 5349).

The data collection for both whole-body vibration (WBV) and hand arm-vibration (HAV) was completed on a total of thirty, randomly selected HSR buses. These buses were comprised of six different models and 4 manufacturers. Testing for all buses was conducted over 15 days from July 4, 2022 to July 22, 2022. Two buses were tested per day, allowing for all 30 buses associated with this study to be tested during the 15-day window.

The City's Health, Safety & Wellness team received the report in October 2022 and reviewed the findings with the consultant who prepared the report. The report was subsequently shared and reviewed with Transit management to gain a better understanding of the results and any technical questions were addressed in further meetings with the consultant. Based on the technical nature of the report and complexity of the findings, further detailed review was undertaken from Transit management that included the General Manager of Public Works. The results of the report were shared with the Joint Health and Safety Committee on December 1, 2022 and the consultant met with the committee on December 15, 2022 to review the study report.

There are limitations on how the test results may be applied to an actual Operator's schedule. The study collected data for 4-hour running times for each bus tested, the results were extrapolated over an 8-hour day and compared against standards predicated on 8 hours of solid driving time. However, in normal operations, Operator shifts vary widely, from 7.5 hours to 9 hours, and split shifts with both morning and afternoon work assignments. While a standard shift for an Operator is approximately 8 to 8.5 hours in length, the shift time does not reflect the scheduled recovery time. Each scheduled trip on a route is provided with scheduled recovery time at the end of each trip to allow for the bus to catch up on time if the bus is running late and for the Operator to get out of their seat to stretch, use the bathroom or eat or drink. Based on the

embedded recovery time, no driver is operating a vehicle for 8 hours straight. As an example, from the summer 2022 board when the testing was conducted, the average total shift time was 7 hours and 10 minutes, driving time average was 5 hours and 59 minutes with 1 hour and 10 minutes of recovery throughout the shift. Therefore, an average shift represents 80% productive driving time and 20% recovery (break) time, with recovery time at the end of every loop.

Key highlights of the Abilitech report are as follows:

- Results are based on singular trips on controlled routes and have been extrapolated over a continuous 8-hour period.
- Some routes tested both WBV and HAV and resulted in levels of vibration that were above the upper limits according to ISO. For example, in Table 1 within the report, Route 2 and Route 4 both had multiple buses exceed the 1.15 WBV limit outlined by ISO. Likewise, in Table 2 Route 1, 2 and 4 all had multiple buses exceed the recommended 5.0 vibration limit for HAV exposure. In these instances, Operators may be exposed to elevated risk when driving for 8 hours without recovery.
- The report indicates that there were no statistically significant differences in terms of WBV exposure by make and model of bus in the standard bus and articulated bus size; however, the smaller Vicinity buses performed better than all others in terms of WBV and appeared to mitigate poor road conditions better than the other vehicles tested.
- Under good road conditions, none of the bus models in the fleet would expose an Operator to any elevated risks associated with WBV.
- For HAV, the results indicated that under optimal road conditions, none of the bus models in the fleet would expose an Operator to any elevated risks associated with HAV. However, under less optimal road conditions there were several statistically significant differences between the bus models for HAV.
- Generally, both the Nova and 60’ Excelsior model buses were most impacted by less optimal road conditions for HAV, with the Nova models being the most affected and the Vicinity buses being least affected. Under less optimal road conditions, an Operator is exposed to elevated risks associated with HAV.
- Overall, the vibration analysis indicates that road conditions had the most impact on both WBV and HAV for the Operator.

Based on the findings of the report, Transit management and Human Resources, in consultation with the Joint Health and Safety Committee (JHSC), are working towards a number of mitigation strategies to promote wellness and the safety of staff. Transit is taking the following steps:

- Working with Transportation Operations & Maintenance (TOM) staff to develop a reporting and repair mechanism for potholes and other road repairs where

conditions may be of concern, guided by O.Reg. 239/02: Minimum Maintenance Standards for Municipal Highways;

- Working with Engineering Services to provide a list of bus routes and frequencies to cross reference with state of good repair and planned capital projects;
- Developing a series of steps for Operator education, including:

    - General reminders through postings and newsletters that overall health and wellness and physical activity outside of working hours positively impacts comfort at work.
    - Incorporated seat positioning, steering wheel adjustment, mirror adjustments and ergonomic principles in Operator refresher training;
    - Distribution of materials provided from corporate Health and Safety on WAV and HAV through in-person information sessions performed by JHSC members;
    - Distribution and posting of stretching for Operators to decrease risk of repetitive body positioning and strain at both the Mountain Transit Centre and Frank A. Cooke Transit Terminal;
    - Seat adjustment for optimal ergonomic posture is provided on board each bus;
    - Stretching guide provided on board each bus for Operator use during recovery periods; and
    - JHSC members and frontline Supervision have been provided all materials to assist with support for Operators;

Transit Management and the JHSC will continue to meet on the matter and develop additional action plans as may be appropriate.

APPENDICES AND SCHEDULES ATTACHED

N/A