

## SIT TIGHT AND DRIVE RIGHT

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### ABSTRACT

**Purpose:** A transit company experienced challenges when bus drivers produced doctors' notes that restricted them from driving specific bus models, as it was difficult for the employer to determine those employees who had legitimate limitations requiring accommodation versus those employees who had a preference. A more defined comprehensive review was undertaken, and the employer enlisted the assistance of an ergonomist. The ergonomist's role in solving this challenge was to introduce objectivity to the process. **Method:** This case study describes a transit company's experience in objectively accommodating workers with specific restrictions. The ergonomist quantified job demands for drivers on different bus routes and in different bus models, and developed a protocol for driver compartment adjustment that would identify "fit" issues. From there, the ergonomist clarified physical capabilities and limitations with health care providers and made recommendations to appropriately accommodate drivers. **Solution: The ergonomist was able to address** longstanding restrictions through this process, with many of the restrictions being successfully removed. Also, modifications to the drivers' compartments were made that allowed the accommodation of even more drivers. **Benefit:** "Sit Fit" training was developed for all new drivers, and the relationship between the employer and the employees was improved.

## 1.0 DESCRIPTION OF THE PROBLEM

A transit company experienced challenges when bus drivers produced doctors' notes that restricted them from driving particular buses, bus models, or routes. While the objectivity of these notes could certainly be questioned by the company, the primary issue was that the employee associated certain buses or routes with discomfort, and expressed a preference for one bus type or route over others. Often, the employee's doctor validated the employee's preference with medical documentation. Accommodating these preferences resulted in administrative challenges, when not enough drivers were available to drive the less-preferred buses, or routes that included the use of these less preferred bus models. The ergonomist's role in solving this challenge was to introduce objectivity to the process. This case study describes a transit company's experience in objectively accommodating workers with medically confirmed restrictions.

This transit company provides service to a mid-sized city with a population of approximately 300,000 people. The company employs approximately 562 people, with 58 in Administration, 97 in Fleet & Facilities, and 407 in Transportation and Planning, which includes 360 bus drivers. This transit company's fleet of 190 buses includes 7 different models, with the majority of buses being one of two models (Inveros, and New Flyers).

Taylor'd Ergonomics had been working with this transit company since 2007. Since then, we had been asked to assist with 57 accommodation cases (1-2008; 12-2010; 29-2011; 6-2012; 1-2013). Fifty of these cases involved bus operators. Four of these bus operators entailed 2 accommodation projects each, and one bus operator required 3 separate accommodation projects.

When the ergonomist was asked to support this effort, typical restrictions from health care providers included:

- ♦ "lifting floor to waist 5-10 kg"
- ♦ "lifting waist to shoulder 5-10 kg"
- ♦ "no reaching/stretching with left arm"
- ♦ "limited pushing/pulling with the right arm/hand maximum force"
- ♦ "limited use of left hand: reaching/pulling/turning steering wheel"
- ♦ "bending/twisting repetitive movement of the back; bending/twisting repetitive movement of the low back/extended reaching"
- ♦ "work at or above shoulder - no resistance"
- ♦ "no squatting and no kneeling"
- ♦ "stair climbing: short flight"
- ♦ "ladder climbing: 4-6 steps only"
- ♦ "bending twisting/bending of neck"
- ♦ "sitting, up to 30 minutes-1 hour."

Forty-seven of the bus operators had restrictions imposed by their health care provider to avoid driving a specific bus model. Thirty-three of these restrictions were related to one bus model in particular, the Invero. In addition, eight accommodations were related to whole body vibration that the employees had reported to be significant in a specific bus model (not necessarily the same models for everyone). Examples of these specific directives include:

- ♦ "needs tilt steering wheel & telescopic steering wheel"
- ♦ "avoid excessive jarring, bouncing, etc."
- ♦ "foot and pressure when signaling-to give strategies to overcome this"
- ♦ "drive the DL-40 [New Flyer] bus only"

- ♦ “avoid repetitive or periodic axial loading on spine – such as ones that are experienced on buses 400-449 (Inveros) with poor suspension system”
- ♦ “heavy steering associated with driving Invero buses”
- ♦ “refrain from driving Invero buses due to ongoing low back issues”
- ♦ “would benefit from an ergonomic bus with telescopic steering wheel and with door controls near him”
- ♦ “avoid Invero buses to minimise the demands on his neck. “
- ♦ “arms, hands, thumbs, neck and shoulders were aggravated by continuing to drive the Invero bus; drive a more ergonomically designed bus for her body type”
- ♦ “avoid the articulated buses, which jar his neck and cause pain”
- ♦ “not to drive the specific [articulating] bus”
- ♦ “to operate power steering bus (New flyer 450 and up)”
- ♦ “it is recommended (the) patient does not drive articulated buses in order to avoid permanent disability.”

The difficulty with accommodating the latter set of restrictions was that the health care provider was writing a list of the employee’s bus preferences, and not providing an objective list of medically confirmed restrictions that could be realistically or easily accommodated.

## **2.0 INTERVENTION AND METHODS**

The ergonomist first quantified job demands by completing physical demands descriptions for different bus routes (e.g. “busiest”) and bus styles. For each bus model, this included developing a task listing, and describing the physical demands requirements for drivers (e.g. working heights, reaches, forces to steer, accelerate, brake, open doors, etc.).

Secondly, the ergonomist quantified the design differences between bus models by completing a bus comparison report. For example, the ergonomist determined seat pan slide and height-adjustability, steering wheel height and telescopic capabilities, forces and step heights to access the bus, mirror, pedal and signal locations, and other details that may affect the ability to accommodate bus operators. Where applicable, these dimensions were compared against industry standards to ensure that the forces and adjustability parameters were within recommended guidelines (CSA, 2011; Diffrient, et. al., 1981; Glosse, 1994; MIL-STD, 1999).

Thirdly, the ergonomist reviewed functional abilities forms (FAFs), doctors’ notes, and functional assessment evaluations (FAEs), and obtained operators’ medically confirmed physical capabilities and limitations through communication with health care providers in quantitative and objective language (Taylor Van Velzer and Siu, 2011). These clarifications helped the ergonomist and the employer to develop a protocol that addressed accommodations rather than bus preference.

Finally, the ergonomist developed and implemented a protocol for driver compartment adjustment to accommodate the driver, and identified any “sit fit” issues. Bus operators were also asked to drive so that the ergonomist could evaluate and provide feedback on driving postures and techniques. Following the assessment, the ergonomist would conclude one of the following:

- that the operator could go back to driving without accommodations,
- that the operator could go back to driving with accommodations, or

- that the operator should be restricted from driving a specific bus model due to a mismatch between the design of the driver's compartment and the employee's anthropometric dimensions.

Separately, an outside company was retained to complete whole body vibration studies on some bus models so that the ergonomist could address whole body vibration concerns, which some operators associated with a particular model. Their results were compared against industry standards to ensure that exposures were within recommended guidelines, and used for comparison across bus models (OshTech, 2008, 2010 and 2011; ISO, 1997).

The assessment reports were provided to Human Resources, who then met with the driver to discuss the ergonomist's findings and determine next steps (i.e. restriction was to be lifted or retained).

### **3.0 SOLUTIONS**

While not all cases can be conclusively resolved with this method, many longstanding "permanent" restrictions were addressed through this process, with the benefit that more drivers can drive all routes, on any bus. In summary:

- Twenty-eight of fifty restrictions were lifted, although a few continue to self-limit themselves by choosing routes that don't employ a particular bus model.
- Twenty-two of the fifty original restrictions were maintained as the ergonomist found during the assessments that they were substantiated.
- Eleven of the twenty-two cases were associated with "sit fit" concerns. (i.e. The driver's compartment legitimately did not accommodate the driver's anthropometry.)
- Six additional cases could not be accommodated due to the permanent nature of the drivers' injuries. (e.g. Disc herniations restricted 3 bus operators from driving articulating buses due to the vibrational demands in the horizontal plane.)
- In five cases, the transit company has yet to reintegrate the drivers into the full fleet even though the ergonomist recommended that all restrictions be lifted; additional issues, unknown to the ergonomist, may be present in these cases.

Through this process, the ergonomist identified many design issues, which if addressed, would allow the accommodation of more drivers. For example, in the Invero bus model, the location of the high beam switch did not allow the driver's left leg to be aligned at the same forward distance as the right leg. As a result, the drivers sat with a slightly twisted back posture, which over time led to back discomfort for many. By relocating this switch (in a total of 50 buses), we accommodated restrictions that were related to this issue, and prevented future drivers from developing similar problems. In addition, the replacement of retractable pedals with fixed pedals, in 26 New Flyer buses, minimised many of the awkward lower limb postures that drivers were experiencing while driving buses with this type of pedal. To accelerate, the driver was unable to heel plant, had to flex his/her ankle less than 90 degrees, and drive with the right hip and knee externally rotated.

### **4.0 LEARNING EXPERIENCES AND BENEFITS**

The employee/employer relationship has been improved through the use of an objective process that emphasizes using medically confirmed restrictions for accommodation, rather than employee preference. As shown, the frequency of cases peaked in 2011, and has been steadily declining over the last two years.

To ensure that this trend continues, Training Supervisors were instructed in how to conduct “sit-fits”, and use this process now as a first step in accommodation cases, leaving only more challenging cases for the ergonomist. Training Supervisors also incorporated the “sit fit” procedures and training into the orientation of new bus drivers. The training provides guidance on the adjustability features of the seat and steering wheel, describes how to properly position themselves to drive, how to apply optimum driving tips/techniques, and how to stretch, in order to prevent workplace injuries.

## **5.0 REFERENCES**

*CSA Office Ergonomic Guideline* (2011).

Diffrient, N., A. Tilley, and D. Harman (1981). *Humanscales*. Cambridge: The MIT Press.

Golsse, J.M. (November, 1994). *Revised Feric Ergonomic Checklist for Canadian Forest Machinery*. Forest Engineering Research Institute of Canada Special Report.

ISO 2631-1 (1997). *Guide for the Evaluation of Human Exposure to Whole Body Vibration*. Geneva

Occupational Health, Safety and Environmental Services (Oshtech) (March 19, 2008) *Whole Body Vibrations During the Operation of Public Transit Buses* report for London Transit Commission, London, Ontario.

Occupational Health, Safety and Environmental Services (Oshtech) (December 22, 2010) *Whole Body Vibration Study: Invero Bus Drivers* report for London Transit Commission, London Ontario.

Occupational Health, Safety and Environmental Services (Oshtech) (April 8, 2011) *Whole Body Vibration Exposures from Operation of Articulated Transit Buses* report for London Transit Commission, London Ontario.

MIL-STD-1472F (1999). *Department of Defense Design Criteria Standard*.

Taylor Van Velzer, and S. Siu (ACE 2011 Conference Proceedings) *Interpreting the Functional Abilities Form Criteria*, London, ON

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