

Safety Advisory 23-1

Bus-to-Person Collisions

October 5, 2023

Frank Hackett

Program Manager, Safety Assurance and Risk Management Division
Office of Transit Safety and Oversight
Federal Transit Administration



Meeting Purpose & Agenda

The purpose of this presentation is to provide a summary of Safety Advisory 23-1 issued by the Federal Transit Administration (FTA) regarding bus-to-person collisions and to provide an overview of risk assessment considerations.

AGENDA

- Overview of Safety Advisory 23-1
- Background of Safety Advisory 23-1
- Bus-to-Person Collisions Hazards
- Recommended Action
- Resources
- Next Steps



Safety Advisory 23-1 Overview

- **Distribution:** Published in the Federal Register
- **Effective Date:** September 19, 2023
- **Audience:** Agencies that provide bus service
- **Overview:** Recommends transit agencies that provide bus service...
 - Consider mitigation strategies to reduce bus-to-person collisions
 - **Identify specific hazards** that may cause or contribute to bus-to-person collisions, **assess the associated safety risk**, and **implement appropriate mitigations** to reduce the likelihood and severity of those collisions



Bus-to-Person Collisions Definition

Safety Advisory 23-1 defines bus-to-person collisions as collisions between buses and:



Pedestrians



Bicyclists



People using micromobility devices



Purpose of Safety Advisory 23-1: The Data



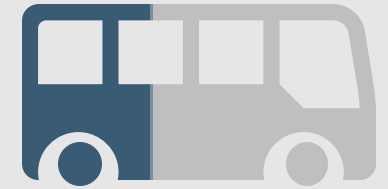
From 2008 to 2021, transit agencies reported **7,298 bus-to-person collisions** to the National Transit Database, which resulted in **537 fatalities** and **7,329 injuries**

Bus-to-Person collisions accounted for:



15%

Of All Transit Fatalities



37%

Of Bus-Transit Fatalities

Injuries and Fatalities by Location

Injuries and Fatalities

Location of Bus-to-Person Collision injuries and fatalities from 2017 to 2021:

Roadway Intersections

42%

Mid-Block of Roadway

38%

Bus Stops

15%

All Other Locations

5%

Source: National Transit Database, 2017–2021



Roadway Intersection Collisions

Between 2017 and 2021, **42%** (948) of bus-to-person collisions occurred at **roadway intersections**, resulting in **957 injuries and fatalities**

Let's have a closer look...



Roadway Intersection Injuries and Fatalities

Injuries and
Fatalities

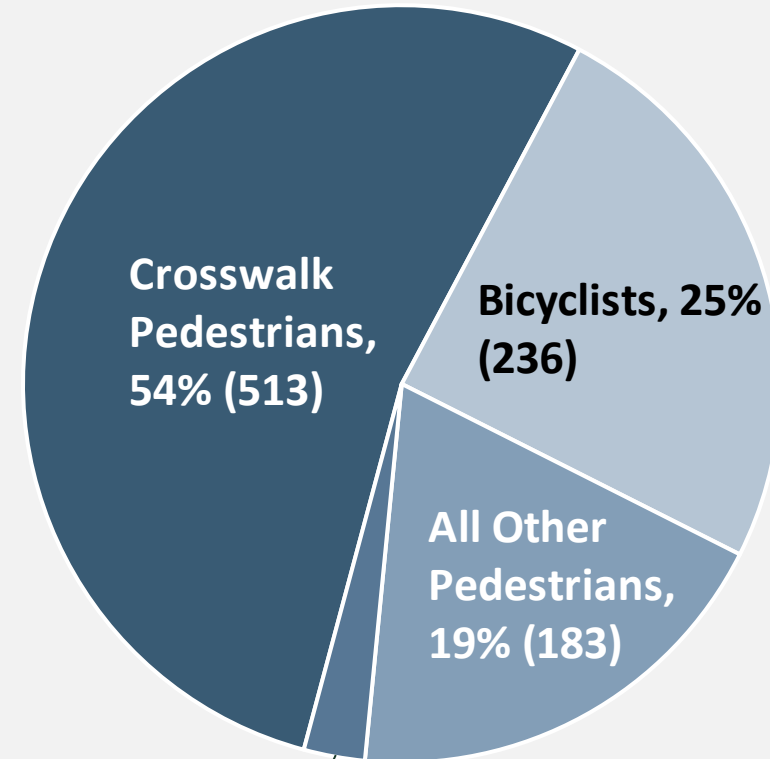
Roadway
Intersections

54%

of Roadway Intersection Injuries and Fatalities were
with **Crosswalk Pedestrians**



Intersection Bus-to-Person Collision
Injuries and Fatalities (957) by Type



Other Non-Pedestrians,
~2% (25)

Source: NTD, 2017-2021



Crosswalk Pedestrian Injuries and Fatalities

Injuries and
Fatalities

Roadway
Intersections

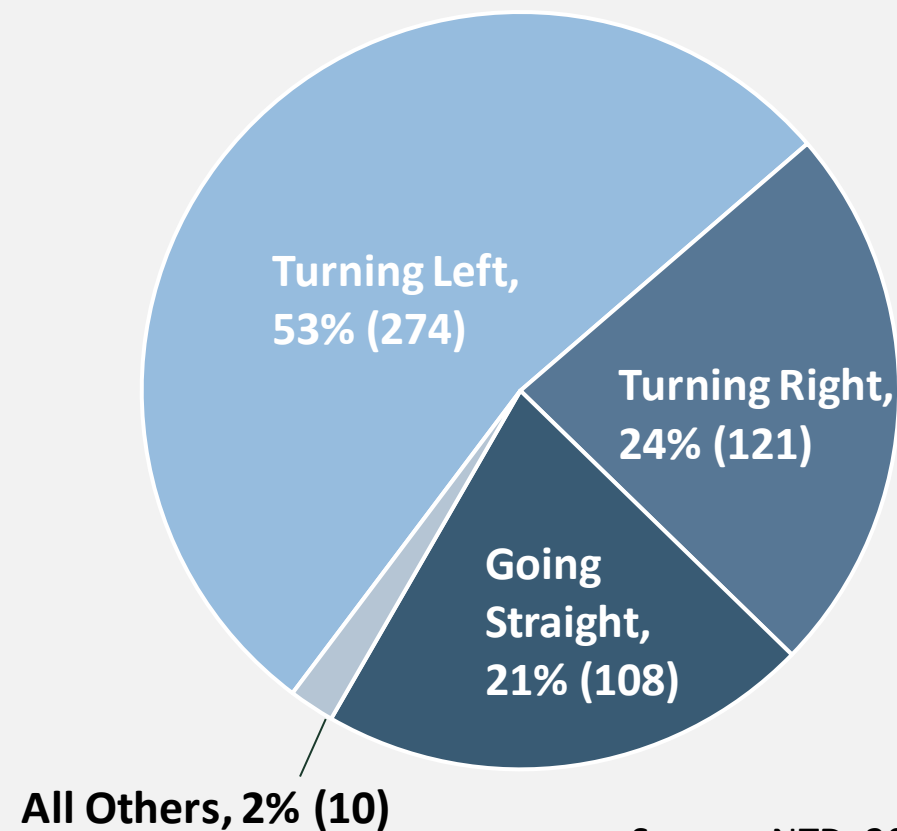
Crosswalk
Pedestrian

53%

of Crosswalk Pedestrian Injuries and Fatalities occur
when **Buses are Turning Left**



Crosswalk Pedestrian Injuries and Fatalities (513) from Intersection Collisions



Source: NTD, 2017-2021



Mid-Block of Roadway Collisions

Between 2017 and 2021, **38%** (868) of bus-to-person collisions occurred at the **mid-block of roadways**, resulting in **862 injuries and fatalities**

Let's have a closer look...

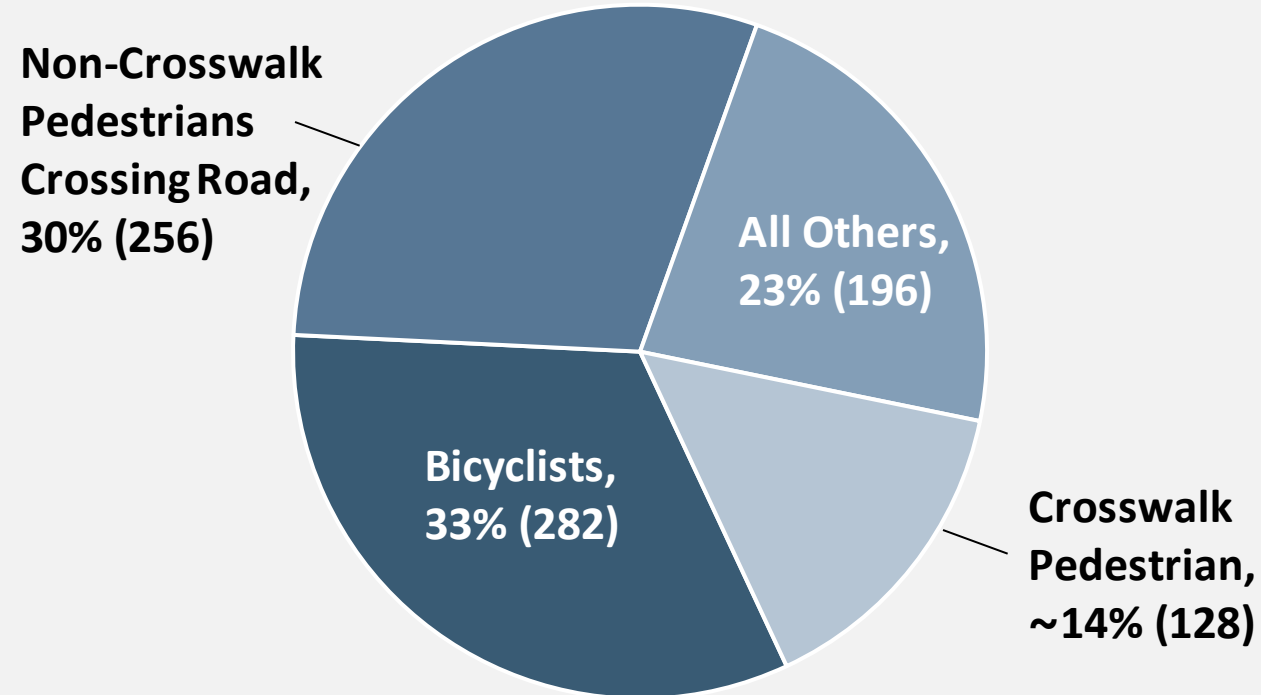


Mid-Block of Roadway Injuries and Fatalities

Injuries and
Fatalities

Mid-Block of
Roadway

Mid-Block Bus-to-Person Collision Fatalities and Injuries (862)



Source: NTD, 2017-2021



Bicyclists at the Mid-Block of Roadway

Injuries and
Fatalities

Mid-Block of
Roadway

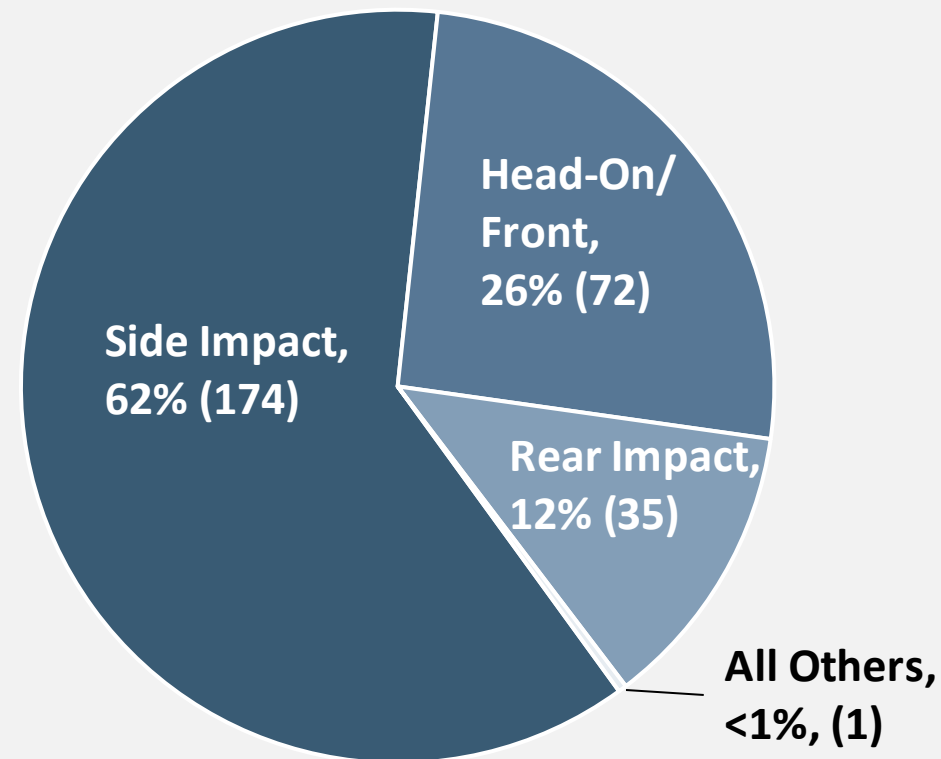
Bicyclists

62%

of Bicyclist Injuries and Fatalities from Mid-Block
Collisions resulted from **Side Impact**



Bicyclist Injuries and Fatalities (282) from Mid-Block Collisions with Buses



Source: NTD, 2017-2021



Non-Crosswalk Pedestrians Injuries and Fatalities

Injuries and
Fatalities

Mid-Block of
Roadway

Non-crosswalk
pedestrians

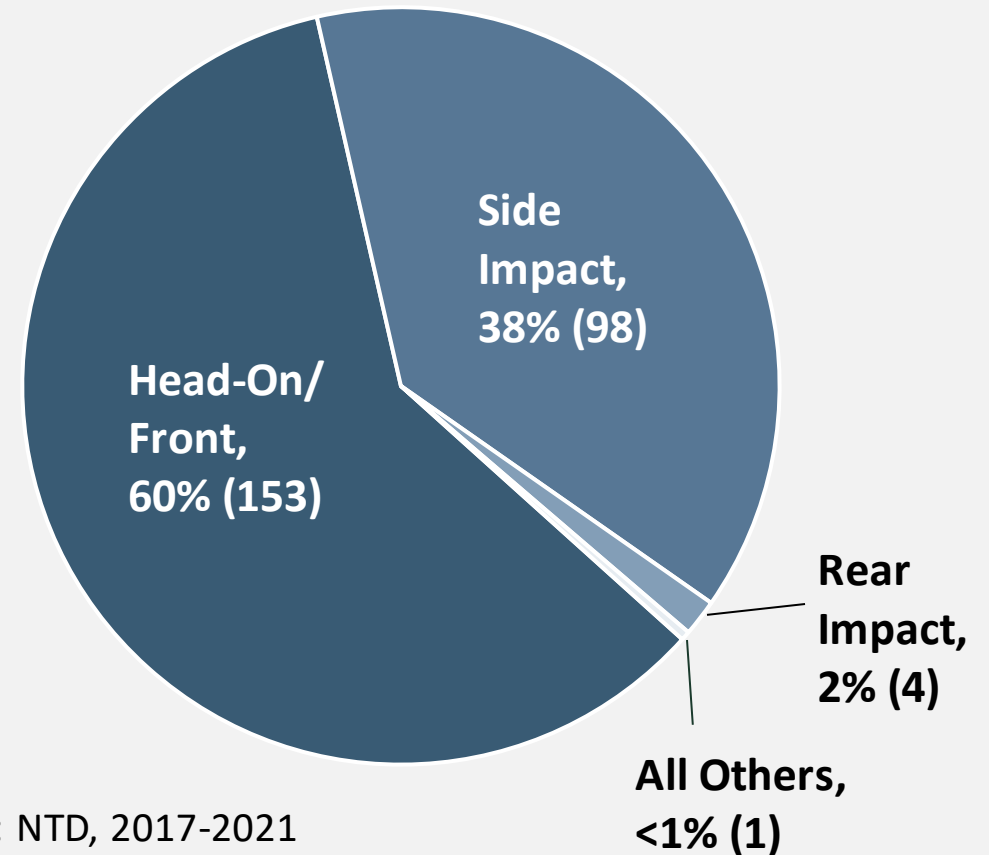
60%

of Non-Crosswalk Pedestrian Injuries and Fatalities
from Mid-Block Collisions occurred

Head-On or in the Front



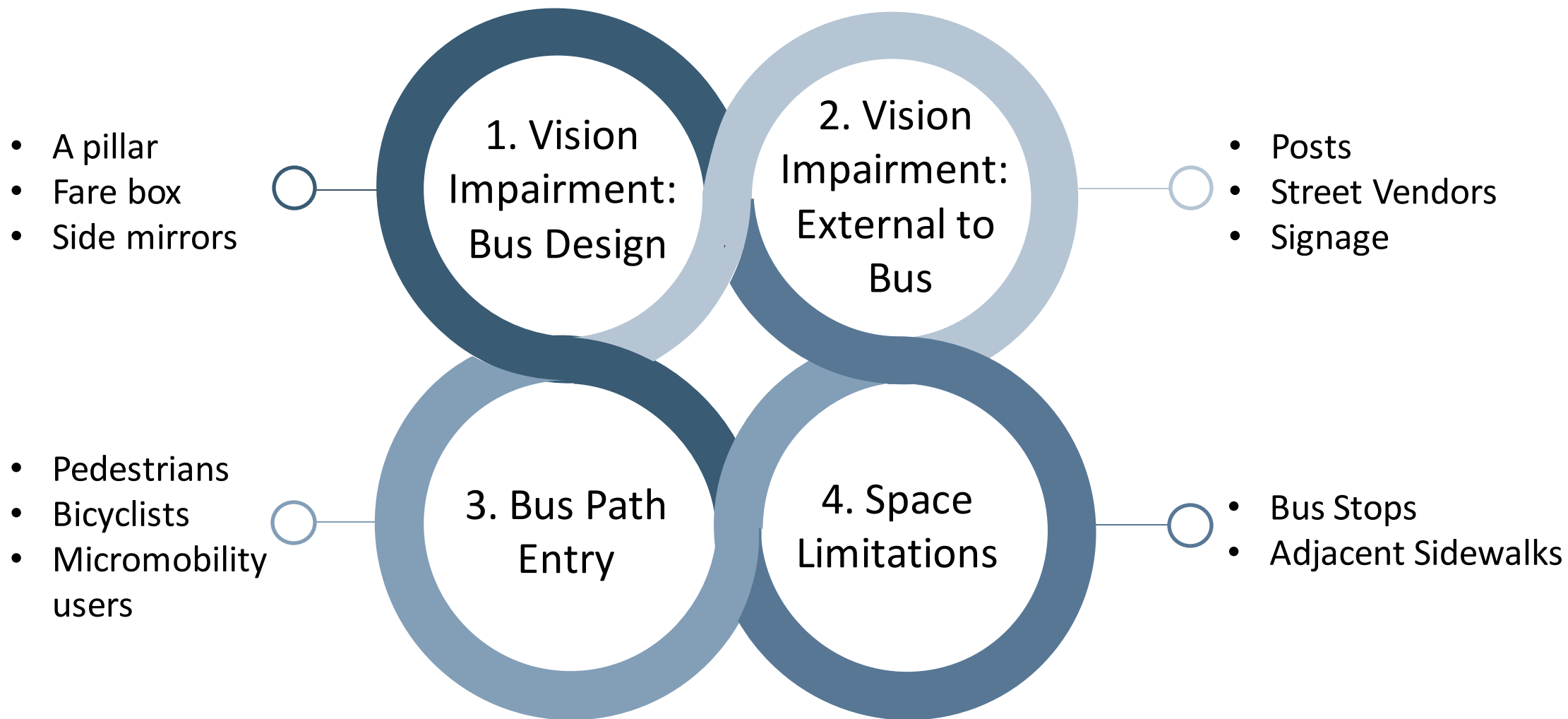
Non-Crosswalk Pedestrian Injuries and Fatalities (256) from Mid-Block Collisions



Source: NTD, 2017-2021



Bus-to-Person Collisions Hazards



Recommended Actions (1 of 2)

Follow Safety Advisory 23-1 Guidance:

- **Consider mitigation strategies** to reduce bus-to-person collisions
- **Identify specific hazards** that may cause or contribute to bus-to-person collisions
- **Assess the associated safety risk**
- **Consider safety risk mitigations**

FTA also recommends that transit agencies identify and assess additional hazards **unique to their agency's operating environment.**



Recommended Actions (2 of 2)

*Transit agencies that focus on **bus operator vision impairment** as a safety hazard may consider the below categories of safety risk mitigations, among others:*



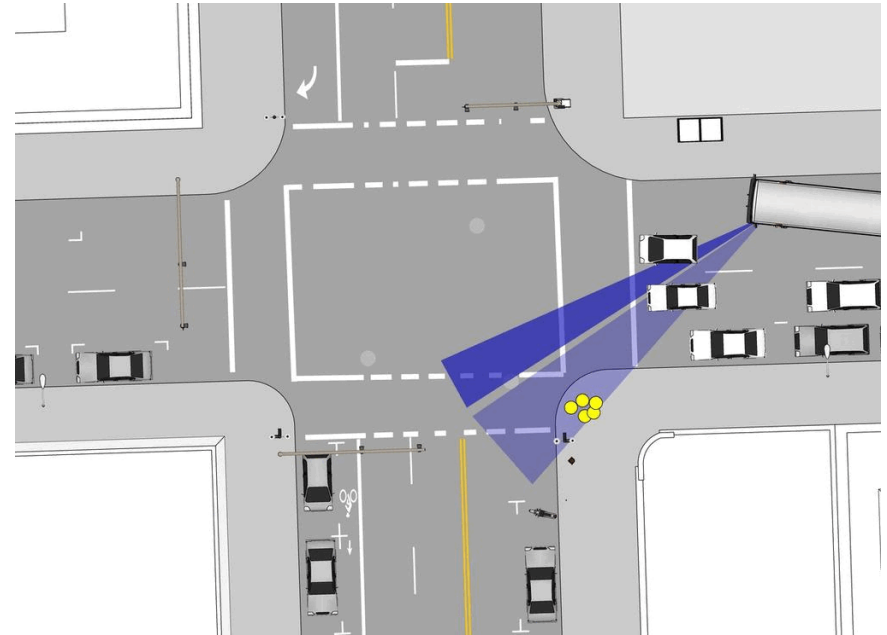
Vehicle Design

1. Vehicles
2. Vehicle Systems



Operator Driving Policies and Procedures

1. Scanning
2. Square Left Turns



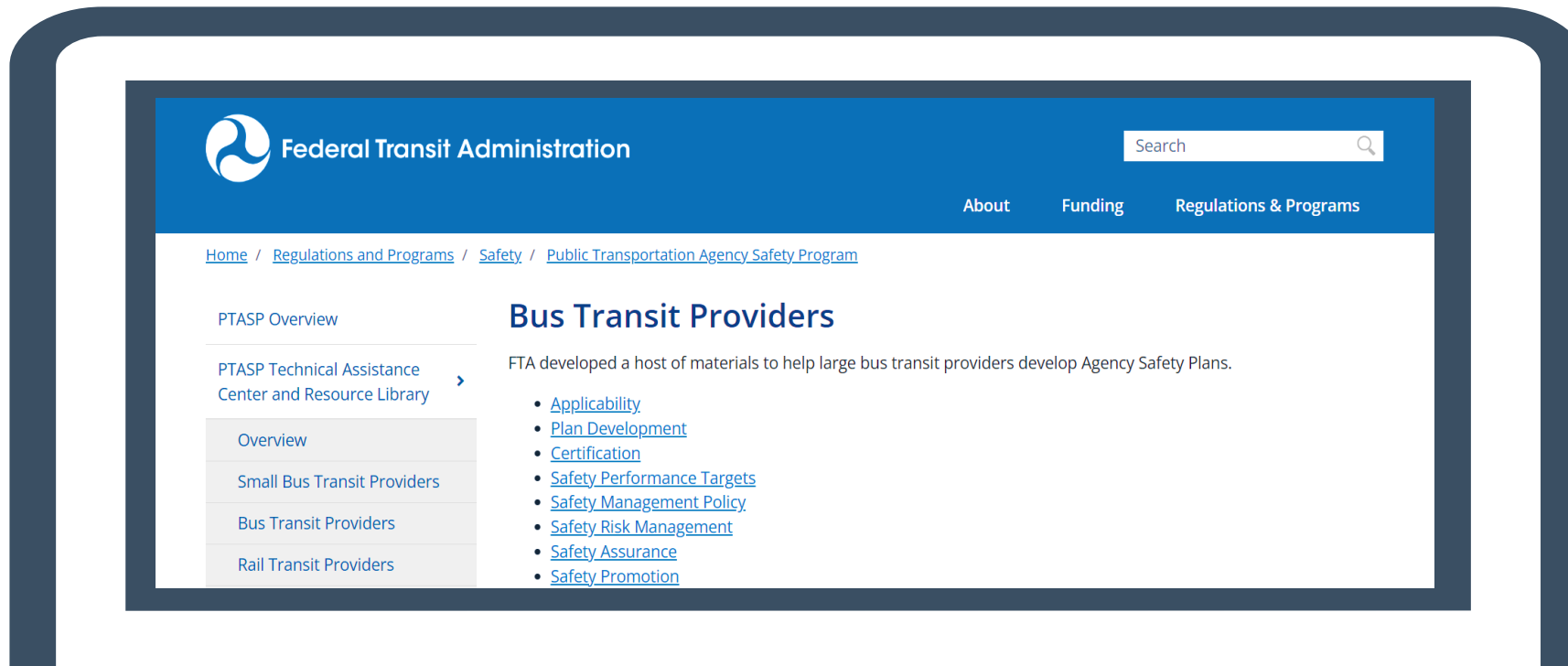
Safety Advisory 23-1 Resources (1 of 3)

Visit FTA's Dedicated Bus-to-Person Collision Webpage



Safety Advisory 23-1 Resources (2 of 3)

Visit FTA's Dedicated Bus Transit Providers Website



Safety Advisory 23-1 Resources (3 of 3)

US Department of Transportation's National Roadway Safety Strategy

FTA's focus:

1. Implementing transit/bus-only lanes
2. Improving pedestrian/bicycle access to rail/bus stations
3. Using collision avoidance technology to reduce collisions
4. Other projects to help reach zero roadway fatalities



Future Campaigns

If you have any questions or examples of successful implementation of a safety risk assessment or the development and implementation of safety risk mitigations for bus-to-person collisions that you would like to share, please send them to the FTA Public Transportation Agency Safety Plan Technical Assistance Center (PTASP TAC) by email at PTASP-TAC@dot.gov.



FTA is committed to reducing incidences of bus-to-person collisions. **Future campaigns** to support the safety of drivers, riders, and pedestrians **are underway.**



Right Side Clearance and Bus Zone Safety

Reggie Reese
Chief Safety Officer
Pierce Transit – Tacoma, WA





**Pierce
Transit**

**FORMATTING AND CONDUCTING OPERATOR
REFRESHER TRAINING UTILIZING SMS PRACTICES AND
PRINCIPLES**



2022-2023

**PUBLIC TRANSPORTATION AGENCY
SAFETY PLAN FOR PIERCE TRANSIT**



Pierce Transit
3701 96th ST SW
Lakewood, WA 98499
Safety Hotline
253-983-3330
safetyhotline@piercetransit.org

Revision 012122

FORMATTING AND CONDUCTING OPERATOR REFRESHER TRAINING UTILIZING SMS PRACTICES AND PRINCIPLES

1. Safety Policy: Establishes our commitment to continually improve safety; defines the methods, processes, and organizational structure needed to meet safety goals.

2. Safety Risk Management (SRM) — Determines the need for, and adequacy of new or revised risk controls based on the assessment of acceptable risk.

ACTION: *Our agency has committed to Senior Operator Refresher Training (SORT). Utilizing key performance indicators before deployment, we determine:*

- *What types of hazards exist to a degree that we must mitigate them;*
- *The employees who will benefit most from the training (tenure, service type, accident history, safety event history, etc.)*
- *Format of training (classroom, hands on, etc.)*

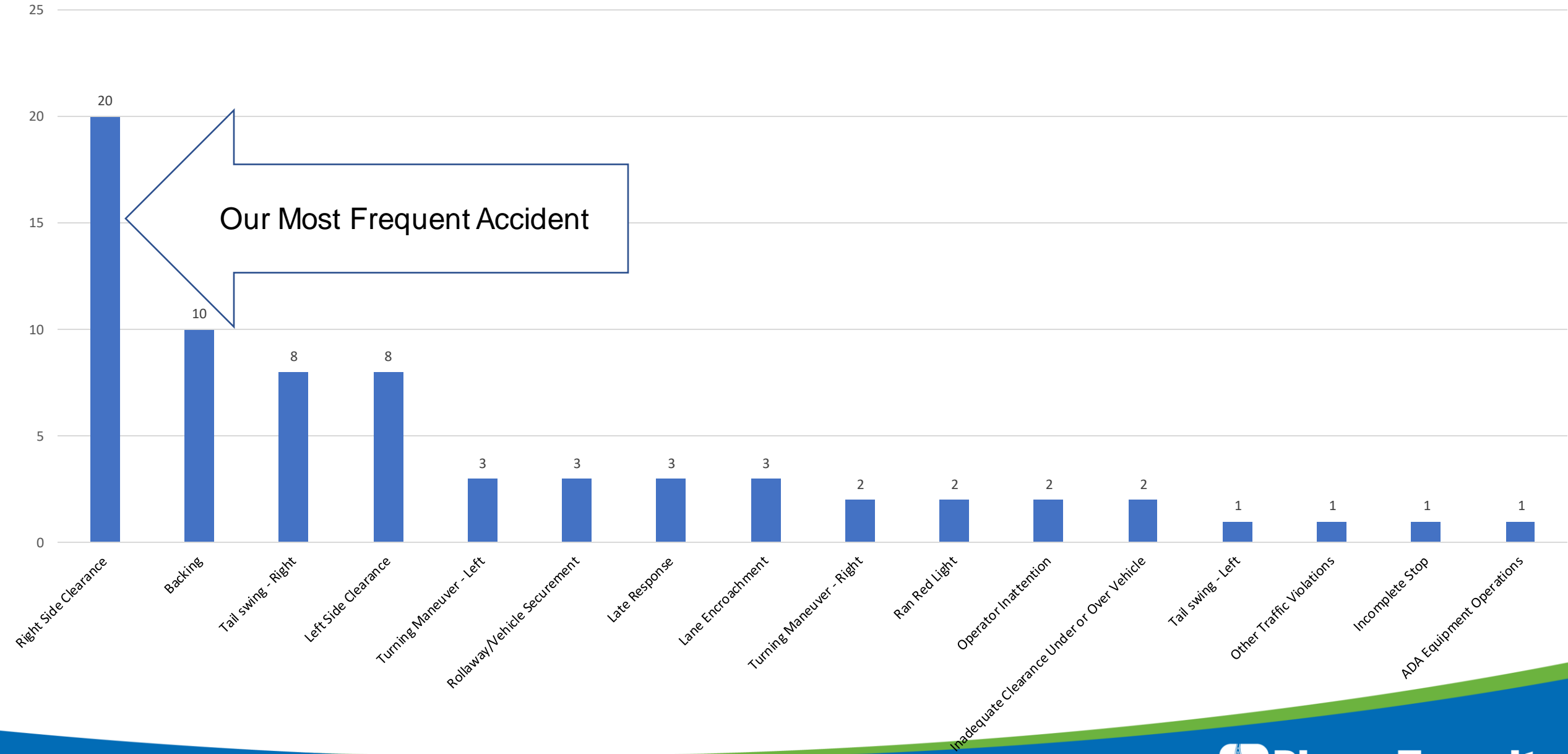
3. Safety Assurance (SA) — Evaluates the continued effectiveness of implemented risk control strategies; supports the identification of new hazards.

ACTION: *Field observations, performance evaluations, “hot spot” checks were performed based on system indicators.*

4. Safety Promotion — *Includes training, communication, and other actions necessary to create a positive safety culture at all levels within the Agency.*

ACTION: *Conducted SORT training for all “at risk” personnel according to KPIs. Training included hands on “behind the wheel” closed course with upright poles, accident history review, videos from actual accidents and training manual references to negotiating right side objects. Advertised new format of SORT throughout agency. KPIs published daily to operators include (1) increase of preventable right side clearance events (2) identification of accident locations (3) operator tenure (4) vehicle types. our Safety Department developed a list of employees to participate in SORT training classes to prevent the trend of right side clearance accidents.*

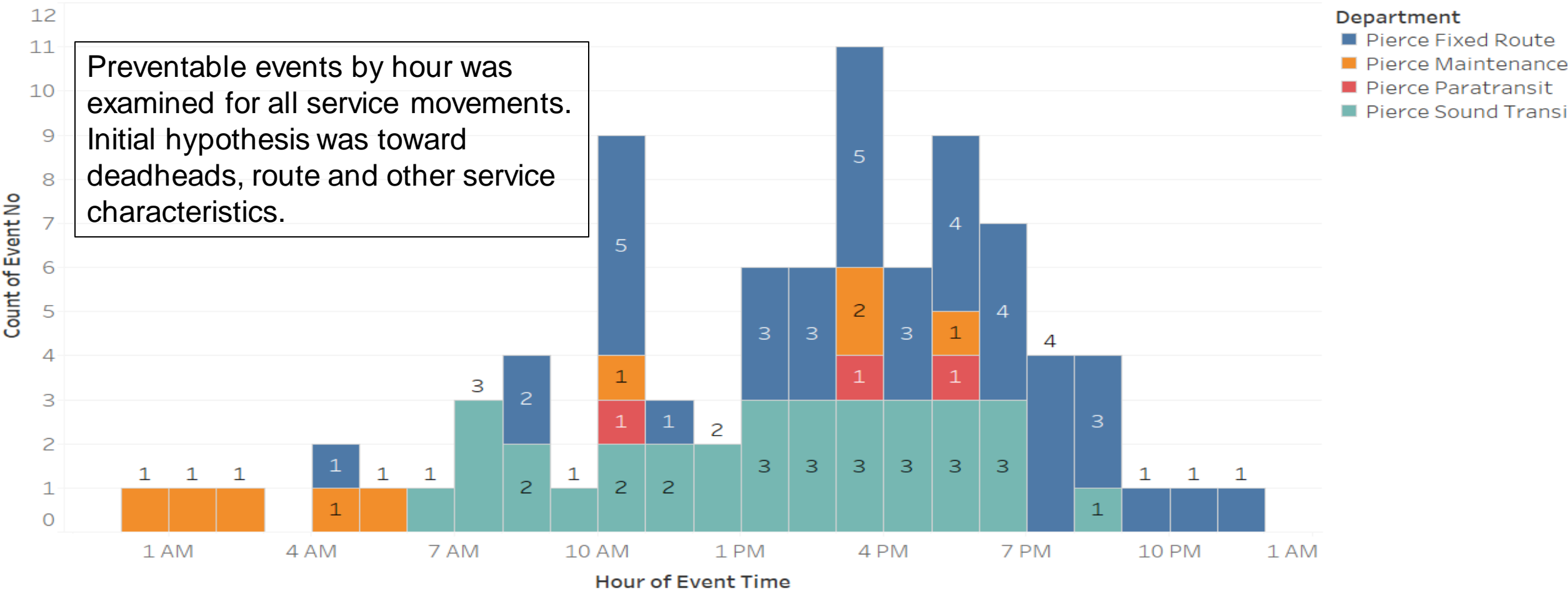
YEAR TO DATE PREVENTABLE ACCIDENTS BY TYPE



EXAMPLE

Number of Events by Hour

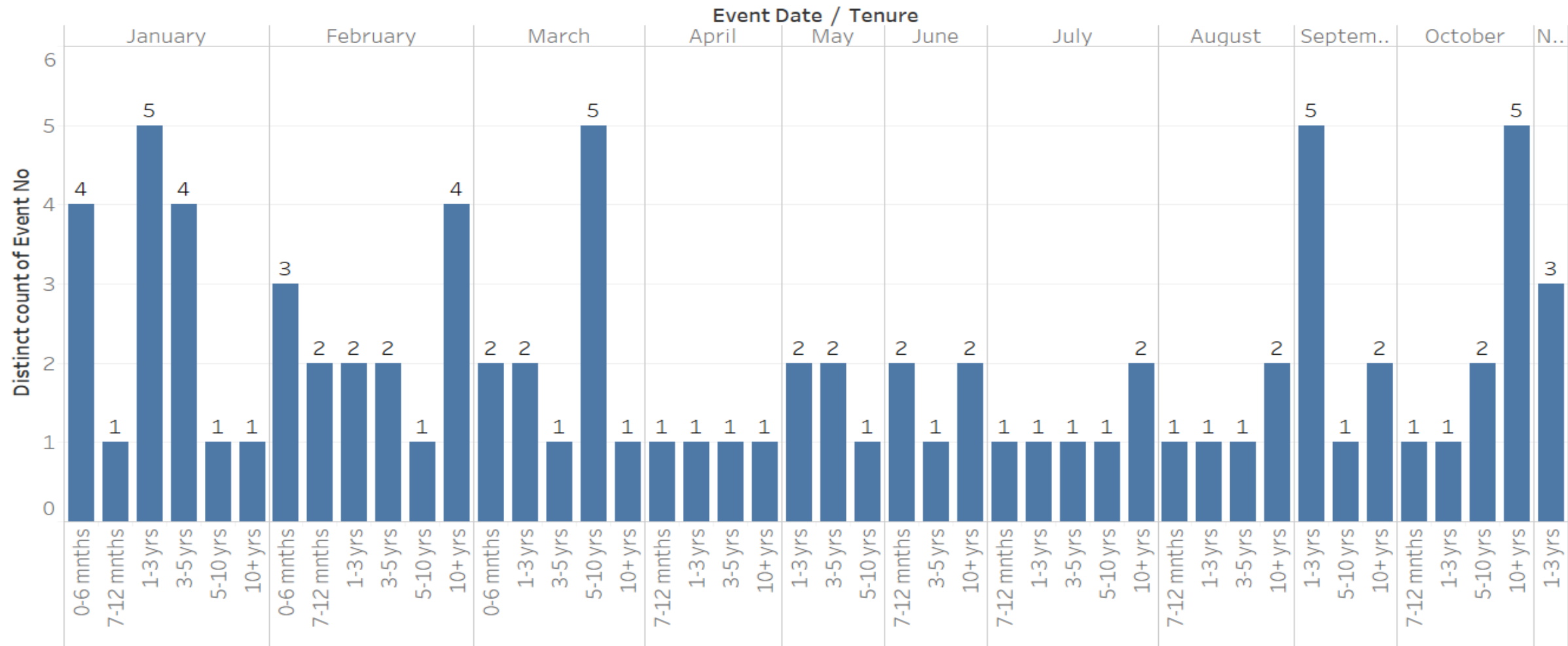
Jan - Nov, 2020



The plot of count of Event No for Event Time Hour. Color shows details about Department. The marks are labeled by count of Event No. The data is filtered on Event Date (MY), which keeps 11 of 47 members. The view is filtered on Department, which keeps Pierce Fixed Route, Pierce Maintenance, Pierce Paratransit and Pierce Sound Transit.

Count of Preventable Events by Tenure Group

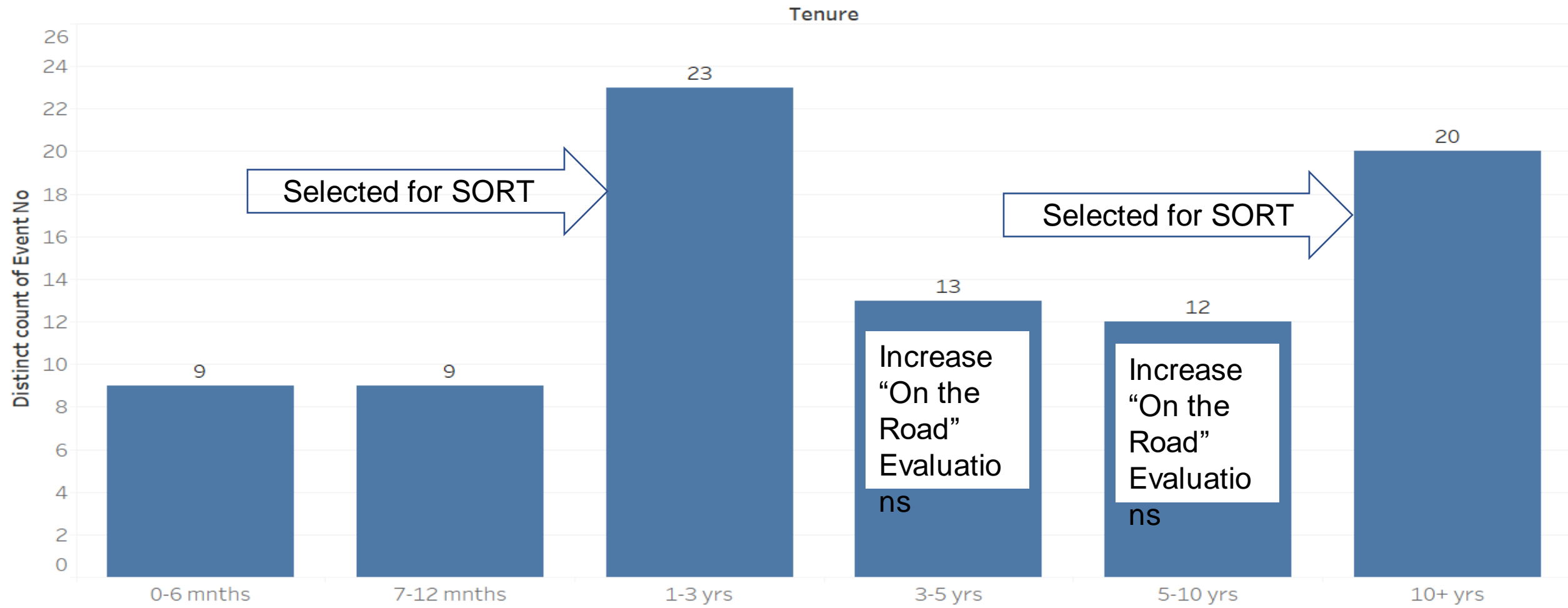
Monthly Comparision



Distinct count of Event No for each Tenure broken down by Event Date Month. The marks are labeled by distinct count of Event No. The data is filtered on Event Date (MY), which keeps 11 of 47 members.

Count of Preventable Events by Tenure Group

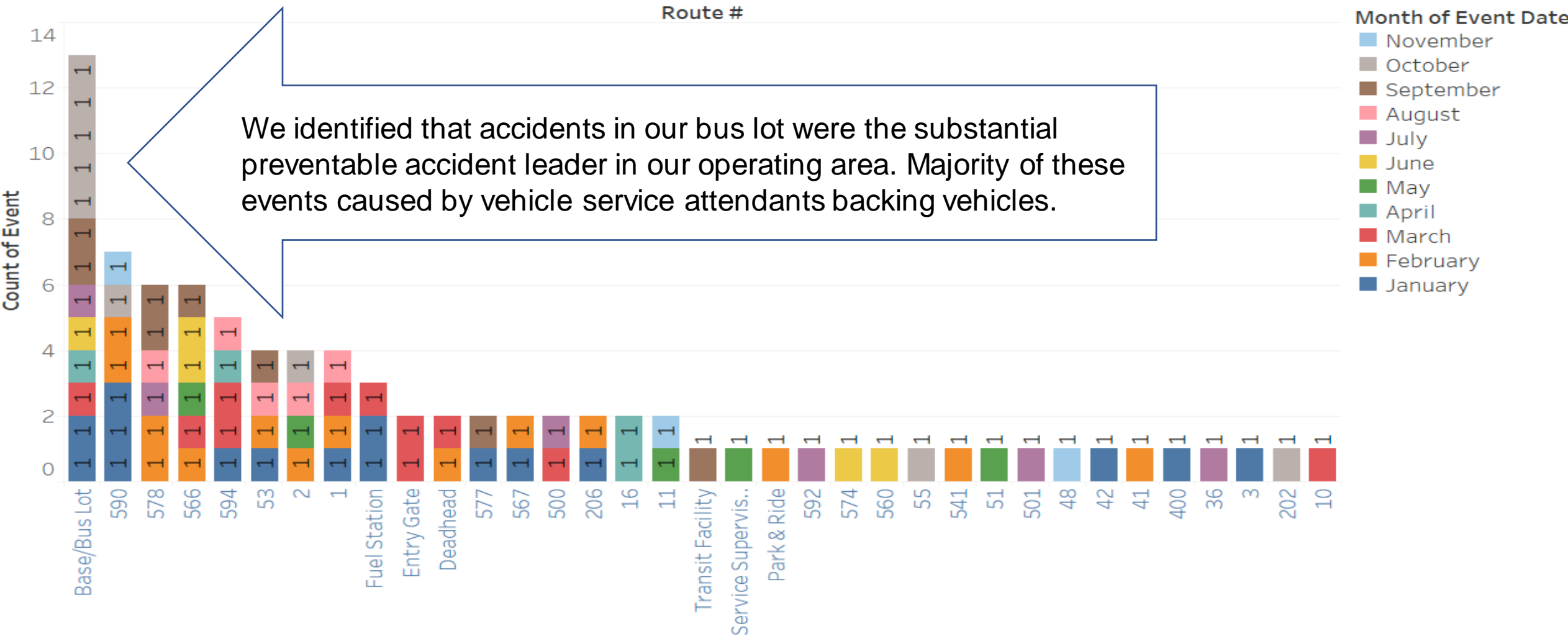
2020 YTD



Distinct count of Event No for each Tenure. The marks are labeled by distinct count of Event No. The data is filtered on Event Date (MY), which keeps 11 of 47 members.

EXAMPLE

2020 YTD Number of Preventable Events by Route



Count of Event No for each Route #. Color shows details about Event Date Month. The marks are labeled by count of Event No. Details are shown for KPI and Event Description. The data is filtered on Event Date (MY), which keeps 11 of 47 members.

DriveCam Frequent Triggers

ID	Driver	Employee	Group	Vehicle	What happened
6721	Jamacia Ya	2813	Pierce Trai	10114	Lane merge with late respo
9132	Mark Davil	1713	Pierce Trai	2547	Following distance, late res
9485	Alin Vintila	2602	Pierce Trai	9728	Failed to stop red light
2483	Amy Heen	3475	Pierce Trai	10131	Following too close, vehicle
7201	Patrick Jos	1738	Pierce Trai	10111	Failed to stop red light
3072	Timothy Je	3776	Pierce Trai	10113	Lane change w/o mirror use
4290	Susana Dia	2820	Pierce Trai	10175	Entered intersection without
7822	Christi Rob	3535	Pierce Trai	2533	Distracted driving, drinking
0875	Gerald Har	2335	Pierce Trai	10147	Following too close into int
7669	Robert vor	3793	Pierce Trai	9221	Late braking for car stalled
2829	Lisa Lenow	1939	Pierce Trai	2848	Distracted driving, eating wh
1729	Henrik Bal	3749	Pierce Trai	2270	Distracted driving, looked at
2545	Melissa Co	3433	Pierce Trai	51403	Following too closely, late b
5197	Jami Killick	2833	Pierce Trai	9202	Late response on freeway, c

	A	B	C	D	E
1	DC Following Too Closely	Employee	Group	Total Even	Total
2	Kwang Lee	1403	Pierce Trai	3	
3	Cregg Handy	2559	Pierce Trai	2	1
4	Dwight Reece	3352	Pierce Trai	2	
5	Jami Killick	2833	Pierce Trai	2	
6	Kenneth Seaton	1494	Pierce Trai	2	
7	Laura Massey	2427	Pierce Trai	2	
8	Melissa Cosme	3433	Pierce Trai	2	1
9	Riley MacDonald	3587	Pierce Trai	2	
0	Sandra Mwambata	3696	Pierce Trai	2	
1	Tim Rolle	3536	Pierce Trai	2	
2	Vuthy Chhun	2766	Pierce Trai	2	
3	Alan Durkee	1370	Pierce Trai	1	
4	Alan Trominski	3188	Pierce Trai	1	
5	Andrea Kila	3443	Pierce Trai	1	
6	Audie McSwain	2883	Pierce Trai	1	
7	Benjamin Atoigue	2224	Pierce Trai	1	
8	Bo Gerg	3903	Pierce Trai	1	
9	Brenda Smith	2323	Pierce Trai	1	
0	Carl Cariaga	967	Pierce Trai	1	
1	Delmar Sherrell	2981	Pierce Trai	1	
2	Dennis Stanton	2836	Pierce Trai	1	
3	Dylan Hickox	3851	Pierce Trai	1	
4	Ernest Jefferson	1976	Pierce Trai	1	
5	Evlyn Kekua	3882	Pierce Trai	1	
6	Floyd Crosswhite	2091	Pierce Trai	1	
7	Ian Barlis	3664	Pierce Trai	1	
8	James Keating	3628	Pierce Trai	1	
9	James Olason	3403	Pierce Trai	1	
0	James Scott	3883	Pierce Trai	1	

.....added to
SORT training

	Driver	Employee	Group	Total Even
1	Brenda Smith	2323	Pierce Trai	4
2	Dwight Reece	3352	Pierce Trai	4
3	Ernest Jefferson	1976	Pierce Trai	4
4	Jami Killick	2833	Pierce Trai	4
5	Kwang Lee	1403	Pierce Trai	4
6	Layth Seal	1874	Pierce Trai	4
7	Lisa Solorio	3828	Pierce Trai	4
8	Nathaniel Avery	2799	Pierce Trai	4
9	Sammy Luppino	2566	Pierce Trai	4
0	Bryan De Lara	3881	Pierce Trai	3
1	Donald Brinkley	2343	Pierce Trai	3
2	Douglas Campbell	3680	Pierce Trai	3
3	Geoffery Gathuku	3929	Pierce Trai	3
4	James Pyon	1765	Pierce Trai	3
5	John Gumataoto	3280	Pierce Trai	3
6	Jonathon Cooper	3735	Pierce Trai	3
7	Julius Pernell	3430	Pierce Trai	3
8	Kenneth Seaton	1494	Pierce Trai	3
9	Kevin Preugschat	3574	Pierce Trai	3
0	Laura Massey	2427	Pierce Trai	3
1	Martin Blackmer	3467	Pierce Trai	3
2	Robert Moshier	3136	Pierce Trai	3
3	Sandra Mwambata	3696	Pierce Trai	3
4	Valentino Riviere	3873	Pierce Trai	3
5	Vuthy Chhun	2766	Pierce Trai	3
6	Alan Trominski	3188	Pierce Trai	2
7	Arthur Mayberry	3856	Pierce Trai	2
8	Bo Gerg	3903	Pierce Trai	2
9				

river	Employee	Group	Total Even To
Brenda Smith	2323	Pierce Trai	4
Dwight Reece	3352	Pierce Trai	4
Ernest Jefferson	1976	Pierce Trai	4
Jami Killick	2833	Pierce Trai	4
Kwang Lee	1403	Pierce Trai	4
Layth Seal	1874	Pierce Trai	4
Lisa Solorio	3828	Pierce Trai	4
Nathaniel Avery	2799	Pierce Trai	4
Sammy Luppino	2566	Pierce Trai	4
Bryan De Lara	3881	Pierce Trai	3
Donald Brinkley	2343	Pierce Trai	3
Douglas Campbell	3680	Pierce Trai	3
Geoffery Gathuku	3929	Pierce Trai	3
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Martin Blackmer	3467	Pierce Trai	3
Robert Moshier	3136	Pierce Trai	3
Sandra Mwambata	3696	Pierce Trai	3
Valentino Riviere	3873	Pierce Trai	3
Vuthy Chhun	2766	Pierce Trai	3
Alan Trominski	3188	Pierce Trai	2
Arthur Mayberry	3856	Pierce Trai	2
Bo Gerg	3903	Pierce Trai	2
Charlie Kingson	3850	Pierce Trai	2

SORT Training Dates and Times*

SORT Training	Mon 2/6/23	Tues 2/7/23	Weds 2/8/23	Thurs 2/9/23	Mon 2/13/23	Tues 2/14/23	Weds 2/15/23	Thurs 2/16/23	Mon 2/20/23	Tues 2/21/23	Weds 2/22/23	Thurs 2/23/23	Mon 2/27/23	Tues 2/28/23				
8am-10am	Alder	Alder	No Class	Alder	Alder	Alder	Alder	No Class	No Class	Alder	Alder	Alder	No Class	Alder				
12pm-2pm	Alder	Alder	No Class	Alder	Alder	Noble	Alder	No Class	No Class	Alder	Noble	Alder	No Class	Alder				
SORT Training	Weds 3/1/23	Thurs 3/2/23	Mon 3/6/23	Tues 3/7/23	Weds 3/8/23	Thurs 3/9/23	Mon 3/13/23	Tues 3/14/23	Weds 3/15/23	Thurs 3/16/23	Mon 3/20/23	Tues 3/21/23	Weds 3/22/23	Thurs 3/23/23	Mon 3/27/23	Tues 3/28/23	Weds 3/29/23	Thurs 3/30/23
8am-10am	Alder	Alder	Alder	Alder	Alder	Alder	No Class	No Class	No Class	No Class	No Class	No Class	No Class	No Class	No Class	Alder	Alder	Alder
12pm-2pm	Alder	Alder	Alder	Alder	Noble	Alder	No Class	No Class	No Class	No Class	No Class	No Class	No Class	No Class	No Class	Alder	Alder	Alder
SORT Training	Mon 4/3/23	Tues 4/4/23	Weds 4/5/23	Thurs 4/6/23	Mon 4/10/23	Tues 4/11/23	Weds 4/12/23	Thurs 4/13/23	Mon 4/17/23	Tues 4/18/23	Weds 4/19/23	Thurs 4/20/23	Mon 4/24/23	Tues 4/25/23	Weds 4/26/23	Thurs 4/27/23		
8am-10am	Alder	Alder	Alder	Alder	Alder	Alder	Alder	Alder	Alder	Alder	No Class	No Class	No Class	No Class	No Class	Alder		
12pm-2pm	Noble	Alder	Noble	Alder	Alder	Alder	Alder	Alder	Alder	Alder	No Class	No Class	No Class	No Class	No Class	Alder		

*Because of Operator shortages, we reformatted a historically 8 hour refresher training class into 2-to-4 hour blocks. Normally, class size had been up to 15 operators average per week. By focusing on our KPI targets and specific tenures, we were able to deploy a class almost every day of the week containing no more than 4-8 students.

As you will see, we utilized mostly short video clips specifically depicting RS clearance events accompanied with the rules operators already know to emphasize defensive driving. **Rather than use stock footage, we used local routes all were familiar with to point out hazards they face every day.**

By discussing mistakes WE are making everyday, our aim is to inform, warn and educate operators toward avoidance.

Effective Date: November 1, 2019
 Replaces: N/A
 See Also: POL-1200.26 Pierce Transit Base Vehicle Bus Lot S
 Approved By: Adam Davis, Interim Executive Director of Maintenance

POL-MAINT.01 MAINTENANCE SAFETY SPOTTER USAGE

This policy applies to all Pierce Transit Maintenance Department (time), contract, and temporary personnel. To prevent accidents, it is vitally important to be clear with the Maintenance backing buses. Personnel will incorporate the usage of any size.

1. Common Safety Practice

Common safety practices require whenever a bus is required to utilize a safety observer (Spotter) to aid the driver to its intended parking position. Utilizing a Spotter prior to reducing the risk of preventable accidents. Most drivers understand he/she still maintains primary responsibility stated by the National Safety Council:

"The organization should rule practically all collisions backing preventable. A professional driver is not safe when another person acts as a guide in the movement of the vehicle. Therefore, the driver maintains clearances."

2. Spotter Required When Backing in and Around Building

When backing buses into Building 1 maintenance bays, a Spotter will always be used. The driver of the bus will make arrangements with a coworker to assist with spotting the intended maintenance bay or parking spot. This is to save unnecessary time to search for someone to assist the driver outside the building.

3. Backing Over Maintenance Pit

Additionally, special care will be taken when backing over a maintenance pit. Under normal circumstances while backing, the rear wheel with the prepositioned wheel stop applicable to their vehicle extra cautious to not have the operator inadvertently

- Similar to other backing operations, once the driver provides guidance into the proper position and the wheels are relatively close or touching the wheel stop, instructions could cause extensive damage to the vehicle or personnel working in the surrounding area.
- In the Maintenance Bays, there have been occasions where a preventable accident, equipment damage

Standard Operating Procedure

Pierce Transit Vehicle Backing and Close Quarters Assistance (Spotter) Training

Revised 09 29 2017

Hazard/Risk Assessment: When moving large vehicles in reverse, safety precautions must be maintained for the safety of all present. In addition to blind spots created by the size and shape of the vehicle, personnel are many times expected to reverse the vehicle into spaces not much larger than the vehicle. This can be hazardous, even under the most ideal situations. When we consider that pedestrians (working personnel), company equipment and facility structures are normally present within in our maneuvering environment, we realize that we MUST take every precaution when moving large vehicles in reverse to avoid injuring personnel or damaging equipment.

As we identify the hazards of moving vehicles in reverse, we must also realize that moving large vehicles into and out of tight spaces can be just as hazardous without proper precautions. Right, left and top side clearances are hard to judge as distance distortion, blind spots and peripheral vision limits our ability to perform these maneuvers safely without assistance.

Hazard Mitigation: Spotters are a proven method of protecting employees and equipment while moving vehicles in reverse. In addition, vehicle guides ("spotters") themselves can be at risk for injury or even death while assisting drivers to safely move vehicles in reverse and in close spaces. As transit professionals, it is our job to implement the following actions to help keep personnel, equipment and structures safe by utilizing "spotters" as **Standard Operating Procedure**. Department management must ensure that personnel receive training on these processes, practice the processes to proficiency and utilize these processes as **Standard Operating Procedure** in all cases where backing and maneuvering vehicles in close quarters is warranted. All new and existing maintenance department employees are to receive documented training on these procedures, and are expected to demonstrate proficiency performing these tasks.

1. **Ensure that spotters and drivers agree on hand signals before backing up.** We have provided samples of hand signals that may be used. Please understand that whatever hand signals are decided on, the driver of the vehicle and the spotter must agree and understand the same signals. For this reason, we must insist that the entire staff learn and practice one standardized set of hand signals so that everyone in the department is certain of the signal and corresponding action. For examples of hand signals used to guide large vehicles, please see Table #1.
2. **Instruct spotters to always maintain visual contact with the driver while the vehicle is maneuvering.** Decide which side of the vehicle the spotter will guide from. It is understood that the spotter is responsible for watching all sides of the vehicle when guiding the operator. The spotter should NEVER place his/her body between the vehicle and a fixed object in close proximity to either. When guiding the driver by mirror sight (spotter viewed by driver in rear facing mirror), the spotter must ensure that he/she is in an affixed position, as walking backward or alongside the vehicle is a dangerous procedure. The spotter could trip and fall.

Spotters must have a whistle and wear high visibility clothing at all times and use a flashlight when appropriate.





SENIOR OPERATOR REFRESHER TRAINING

**Right Side Clearance
&
Bus Zone Safety**

Objectives for Today's Class

- Review accident history from the Safety Office
- Identify safety best practices for Service Stops
- Observe and discuss videos of actual events
- Practical application on road at Lakewood Station



Pacific Hwy SW

Pacific Hwy SW

Pacific Hwy SW

Set up of R/L side clearance closed course training.....

...pulling into stops, avoiding side clearance obstacles

80'

60'

40'

Lakewood Station



SORT training included closed course, recreating right side clearance problems at bus stops....



**Set up of R/L side
clearance closed
course training
adding poles for
mirror clearance
training.....**



Safety Best Practices

- Scan and plan ahead to evaluate the bus zone for safety issues
- Ensure that the doors are free from obstructions and hazards
- Place the bus in the zone parallel and a safe distance from the curb
- Head and eye movement pulling out of stops



2019-06-13 16:44:01

**Scan and
plan ahead
to evaluate
the bus zone
for safety
issues**

**Watch right
side
clearance
when pulling
into a stop**



**Scan and
plan ahead
to evaluate
the bus zone
for safety
issues**

**Don't forget
about your
tail sweep**



**Cars are not
supposed to
park in bus
zones but...**

**Watch your
tail sweep,
especially if
you had to
angle into the
zone**



2020-02-11 14:20:45

**Here is
another car
pretending
to be a bus...**

**As you're
scanning the
zone, think...
Is it safer for
me to stop in
the street?**



**Mistakes
happen...**

**Don't let a
small
mistake
turn into a
larger
problem**



**Pulling into
the tunnel
from Zone C
at Commerce
Street**

**Drop off
passengers in
Zones A or B**



2020-03-09 16:50:32



Drop off passengers in Zones A or B

If Zones A and B are full, use the rear of Zone C

**Watch for
right side
clearance in
Transit
Centers**

**What is the
proper exit
procedure
from Tacoma
Mall TC?**



**Place the
bus at a safe
distance
from the
curb**

**Practice good
head and eye
movement
when pulling
out of bus
stops**



Q&A

Thank you!



<https://www.transit.dot.gov/TSOWebinars>



Contact Information

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