

Public Safety Report

| 2023 Edition





The Technical Standards and Safety Authority (TSSA) delivers public safety services on behalf of the Government of Ontario in the following key sectors:

1. Boilers and Pressure Vessels and Operating Engineers
2. Elevating Devices (Elevators, Escalators and Ski Lifts) and Amusement Devices
3. Fuels

TSSA enforces the *Technical Standards and Safety Act, 2000* (the Act) and its associated regulations.

Refer to www.tssa.org for further information on TSSA.
Refer to www.ontario.ca/laws/statute/00t16 for the Act.

Acknowledgements

TSSA would like to express gratitude to its inspectors and engineers for collecting and documenting valuable pieces of information and data - through their inspections, investigations and engineering services - that have been instrumental in developing this report, as well as the Communications and Stakeholder Relations team for reviewing and supporting the drafting of the report. TSSA would like to especially acknowledge the Strategic Analytics Team for developing this report.

TSSA would also like to acknowledge Safety and Risk Officer Angela Byrne, CPA, CMA, for her ongoing advice and independent review of the report.

Finally, TSSA would like to thank its partners in industry, government, advisory councils and the public, who help keep Ontarians safe.

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Message from TSSA Directors

On behalf of the Technical Standards and Safety Authority (TSSA), we are pleased to present this year's edition of the Public Safety Report for the fiscal year 2023 (May 1, 2022 - April 30, 2023); hereinafter referred to as FY23.

TSSA regularly reviews and assesses the state of public safety in Ontario by analyzing key safety metrics. Using data from inspections and incidents reported, TSSA can report to its industry stakeholders and partners the most high-risk issues and the harm caused by regulated devices, equipment and businesses.

TSSA takes a risk-informed approach to safety oversight. The organization's focus is on safety outcomes – and its goal is to use its expertise and strong partnerships to achieve positive safety outcomes for the people of Ontario. TSSA uses data to understand risk, shape the safety oversight framework and develop programs to better target risk and harm reduction and enable compliance. This is what TSSA means by being a modern, Outcome-Based Regulator. The Public Safety Report presents a complete and comprehensive picture of the metrics and results that TSSA uses to inform its regulatory approach.

Incidents

There was a 10% increase in reported incidents in 2023, compared to 2022. Among permanent injuries, 2023 highlighted 10% fewer permanent injuries than in 2022.

Since 2014 there have been 36 fatalities, an average of four per year over the 10-year period.

While fatalities involving TSSA's regulated devices/equipment are rare, TSSA investigates all of the fatalities, regardless of the root cause, to ensure that we identify key lessons that can be applied moving forward. In many cases, the root cause of fatalities is determined to be an external factor, like a behaviour or circumstance that could not have been prevented by TSSA's involvement. Such was the case in 2023, as the one fatality reported to TSSA was the result of an individual suffering a cardiac arrest after falling from an escalator. TSSA investigated the incident

and found nothing out of order with the escalator. The individual had been using a walker to ride the escalator and tripped over it.

In addition to counts of injuries and fatalities, TSSA reports on the Observed Injury Burden (OIB) for all program areas collectively and individually. In order to compare across programs, incidents and near-misses are measured in fatality equivalents per million people (FE/mp) in Ontario.

This year's OIB was lower compared to previous years: 0.11 FE/mp in 2023 compared to a 10-year average of 0.35 FE/mp.



The **Observed Injury Burden (OIB)** is a comprehensive metric on the relative severity of injuries reported. The count of incidents alone does not necessarily portray a complete picture because of the wide range of definitions, in different regulations, for what constitutes an incident and a near miss. TSSA takes a standardized approach to incident analysis by requiring all industries to report on incidents and near-misses.

In addition to the OIB, which is a measure of what did occur, historically, TSSA has reported on a predictive measure of incidents, called the Risk of Injury or Fatality (RIF). This year's RIF is also lower compared to previous years: 0.20 FE/mpy compared to 0.32 FE/mpy in 2022.



TSSA's **Risk of Injury or Fatality (RIF)** estimates the potential for injury or fatality by performing a Monte Carlo¹ simulation on 10-year historical data. This provides an estimate of the potential for injuries based on past performance. However, as reported previously, there are very different regulatory requirements, definitions and approaches to incident reporting across the industries that TSSA regulates. For that reason, using only incident data to predict risk has limited TSSA's ability to effectively use the RIF to inform decisions.

Inspections

To take a more data-driven and risk-based approach to decision-making, TSSA categorizes the potential issues found during inspections as high-risk orders or safety tasks. High-risk orders are issued when a device, equipment or facility has issues that could cause harm to the public if not addressed within 14 days. TSSA conducts follow-up inspections on all high-risk orders. Safety tasks are low- or medium-risk issues that, in most cases, can be resolved within a longer timeframe.

For the past five years, 2019 to 2023, 90% of all periodic inspections found no high-risk issues. In other words, 10% of devices, equipment or facilities inspected had an issue that required a follow-up inspection to verify full compliance, while 27.5% of periodic inspections found no issues or safety tasks at all.

With the data collected at inspections, TSSA estimates the relative risk of devices, equipment and sites it regulates. Since 2007, TSSA has been using a risk-based scheduling approach to determine the frequency of periodic inspections for 35% of its inventory, which includes the following sectors: elevators, escalators, ski lifts, amusement rides, propane facilities, liquid fuel sites, and operating plants.

In FY23, TSSA saw a decrease in the number of high-risk sites, devices and equipment (from 1.7% in FY22 to 1.4% in FY23) resulting in a declining need for more frequent periodic inspections.

¹ JE Gentle. "Computational Statistics." In International Encyclopedia of education, third edition (2010): 93-97. A Monte Carlo simulation is used to model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables. It is a technique used to understand the impact of risk and uncertainty.

Partners in Compliance

Since TSSA embarked on its modernization transformation, a number of outcome-based regulatory initiatives have been launched, particularly over the past three years. This year's Public Safety Report highlights the key measurable outcomes from Outcome-Based Regulator initiatives that have improved safety, including the following programs and tools.

Enhanced Authorizations

TSSA protects the health and well-being of Ontarians by providing oversight of individuals, organizations, devices and equipment in several **technical sectors** to ensure their regulatory safety obligations are being met. Authorizations (e.g., licences and registrations) are the only effective method of monitoring the activities of the businesses, facilities, equipment and devices operating in the province. An active authorization is necessary for TSSA to have oversight of the technical operations it regulates. By collecting the data required to validate knowledge, competency and qualifications through periodic inspections and audits and regulatory prerequisites, TSSA ensures authorization holders are operating safely. To bolster its efforts to create a safer Ontario, TSSA took action to enhance the authorization process.

- **Lapsed Authorizations**

In an effort to help regulated parties keep their authorizations in good standing and remain compliant with safety laws, TSSA launched a lapsed authorizations program in FY22 to ensure that all devices, equipment and sites operating in the province are up to date with their TSSA authorizations. If an authorization expires and is not renewed within 60 days, TSSA will follow-up to determine the operating status of the device or business. TSSA will then resolve the case by renewing the expired authorization or by ensuring that the device is not operating illegally. In the first two years of the program, 93% of authorizations that had lapsed were resolved.

- **Historical Lapsed Authorizations**

In FY23, TSSA identified about 3,500 authorizations that had expired between April 30, 2016, and April 30, 2021, and launched another initiative to resolve them. TSSA's historical lapsed authorization resolution procedure requires former authorization holders

who are no longer operating to provide TSSA with confirmation that their business, facility or device is out of operation or voluntarily shut down. Former authorization holders who are still operating their business, facility or device must reinstate their authorizations. In this first year, 819 historical lapsed authorizations were resolved – well above the internal target set by TSSA. The initiative will continue into the new year.

Compliance Support

Organizations may be non-compliant for a variety of reasons, including a lack of understanding. In October 2019, TSSA launched a Compliance Support Program to provide entities with high-risk devices, equipment and operations the opportunity to work directly with TSSA to address their specific issues.

The Compliance Support Program involves a proactive intervention by a TSSA Compliance Support Advisor. The Compliance Support Advisor plays a significant role in supporting organizations to understand their regulatory obligations and guiding them in the development of tools to achieve compliance and reduce the potential for harm to Ontarians. To date, of the over 160 owners, operators and contractors who participated in the program, 87% saw an improvement in their safety outcomes and a reduction in their overall risk profiles.

Compliance Standards

As TSSA continues its transformation into an Outcome-Based Regulator, compliance standards play a key role as they focus TSSA and regulated parties on reducing harm by addressing non-compliances based on the level of risk posed.

In this fiscal year, TSSA launched three compliance standards for passenger elevators (hydraulic and traction), ski lifts, and escalators. The compliance standard focuses owners, contractors, mechanics and inspectors on high-risk non-compliances. It also acknowledges that regulated parties have the primary responsibility for compliance and can resolve safety tasks (low- or medium-risk orders) without further TSSA inspection.

TSSA establishes these safety priorities using an evidence-based and data-driven approach to identify which areas are most correlated to risk. The desired

end state is that regulated parties will address high-risk non-compliances in zero to 14 days and long before a TSSA periodic inspection.

Data-Driven Safety Community

TSSA is committed to transparency, and we hope making this data available will help others to understand our risk-informed approach and to inform their own evidence-based decisions. We have also included a number of case studies in this report to illustrate how TSSA fulfills our safety mandate and the important contributions of our safety partners.

For more detailed tables with breakdowns of the data and additional metrics, please refer to our [Data Tables and Appendices](#) that outlines our approaches, methodologies and definitions.

We hope that you find this year's Public Safety Report useful as you endeavour to enhance your own safety practices.

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About Us

The Technical Standards and Safety Authority (TSSA) is Ontario's public safety regulator, mandated by the Government of Ontario to enforce technical safety regulations and enhance public safety.

Throughout Ontario, TSSA regulates the safety of amusement devices, boilers and pressure vessels, elevating devices, fuels, operating engineers, and ski lifts. TSSA's range of safety services includes public education and consumer information, examination, certification, licensing and registration, engineering design review, data analytics, risk evaluation, standards development, inspections, investigations, safety management consultation, compliance support, and enforcement and prosecution activities. TSSA also provides limited non-regulatory services through contracts to organizations in Ontario, mainly in the nuclear industry.



93.0%

of devices, equipment and sites inspected by TSSA are considered **low-risk**

Low-risk Inventory

All Programs **93.0%**



Elevators (a part of the Elevating Devices Safety Program) **99.2%**



Escalators (a part of the Elevating Devices Safety Program) **96.9%**



Propane (a part of the Fuels Safety Program) **96.7%**



Amusement Devices **95.7%**



Ski Lifts (a part of the Elevating Devices Safety Program) **92.1%**



Liquid Fuels (a part of the Fuels Safety Program) **91.2%**



Operating Engineers **87.6%**

Inspection Results

5-Year Average

90%

Inspections with no high-risk issues

Incidents

5,116



Non-permanent Injuries **1,470**

Permanent Injuries **26**

Fatalities **1**

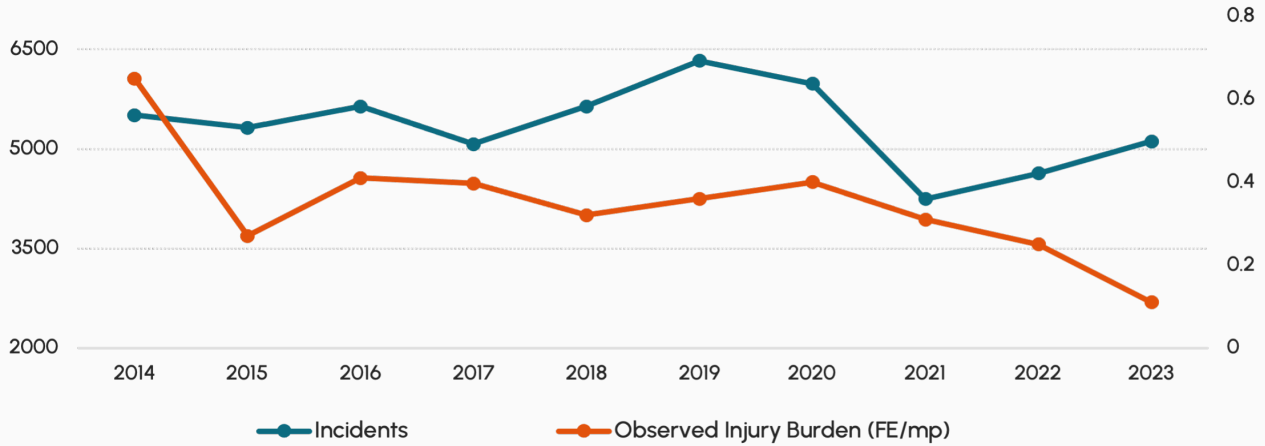
State of Safety in Ontario in 2023

All Programs Combined

The OIB has been decreasing for the past four years. At the same time, the number of incidents reported has increased since the dip in 2020-2021 caused by COVID-19-related closures.

There were 5,116 incidents in FY23 compared to 4,634 in FY22, an increase of 10.4% year over year.

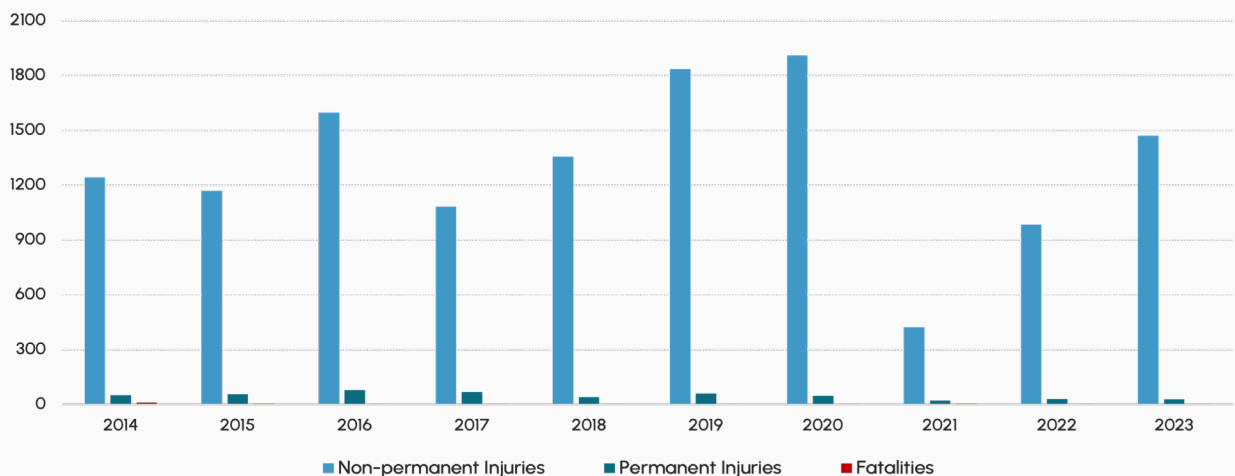
Figure A1: 10-Year Safety Trends for All Programs



In FY23, there were 26 permanent injuries, which was well below the 10-year average of 48. However, there were 164 more non-permanent injuries in FY23 compared to the 10-year average – an increase of 13%.

To account for the impact of COVID-19 on TSSA-regulated sectors, it is helpful to compare this year's results to the five-year averages before COVID-19 (FY16-20). In the five years prior to COVID-19, there was an average of 59 permanent injuries and 1,555 non-permanent injuries.

Figure A2: 10-Year Injuries and Fatalities for All Programs





Since the injuries reported in all programs have decreased overall, both health impact metrics – the OIB and RIF – were lower in FY23 than in previous years.

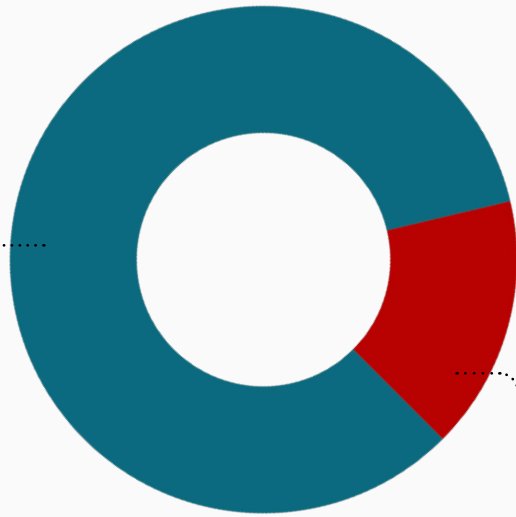
Summary of Safety Numbers				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year Average	5,350	1,306	48	4
2023	5,116	1,470	26	1
Incidents Currently Under Review*				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	911	41	2	0

*Open incidents as of August 3, 2023

Health Impact			
Observed		Potential	
0.35 FE/mp 10-year Average Injury Burden	0.11 FE/mp (2023) Injury Burden	0.20 FE/mpy (2023) Risk of Injury Fatality	0.32 FE/mpy (2022) Risk of Injury Fatality

Risk Profile of Regulated Entities

Figure A3: Periodic Inspection Results



Inspections with no high-risk orders: **12,563**

Inspections with high-risk orders: **2,429**

Of the 14,992 periodic inspections performed this year:

38%

(5,652)
found no issues at all

46%

(6,911)
found safety tasks

16%

(2,429)
found one or more high-risk issues

High-Risk Inventory

Based on the results of periodic inspections, there is a slight reduction in high-risk inventories from 192 (1.7%) in FY22 to 172 (1.4%) in FY23.

FY2022 **1.7%**

FY2023 **1.4%**

▶ **Refer to Appendix A** for more detailed information on cross-program data.



Amusement Devices



TSSA's Amusement Devices Safety Program regulates the devices designed to entertain thrill seekers, including roller coasters, Ferris wheels, merry-go-rounds, water slides, go-karts, bumper cars, inflatables, bungee devices and Zip Lines. Before a new amusement device is registered,

TSSA reviews engineering designs to ensure compliance with Ontario's safety requirements. TSSA licenses amusement rides and operators and issues certificates to qualified mechanics.

TSSA also issues permits for rides each year the rides are in operation. TSSA inspects new devices prior to their start up and again at the start of every new season. When necessary, TSSA also conducts investigations.

Permitted Rides

1,255



Operators

254



Registered Designs

129



Certified Mechanics

584



Registered Contractors

807



Inspection Results

5-Year Average

71.3%

Periodic inspections with no high-risk issues

Orders

1,178



Incidents

995



Non-permanent Injuries **979**

Permanent Injuries **8**

Fatalities **0**

State of Public Safety in Ontario

Amusement Devices Safety Program

During FY21 and FY22, the overall number of incidents dipped sharply due to COVID-19-related closures.

As the province's amusement rides began ramping back up to full operations, TSSA and industry partners expected to see an increase in the number of incidents in FY23. As predicted, there was an 83% increase in reported incidents in FY23 compared to FY22.

Significantly, the overall severity of incidents reported, tracked through the OIB, remained relatively low compared to pre-COVID-19 averages. This is a promising trend.

Common incidents that resulted in injuries in FY23 include:

- A rider on a waterslide leaned to the side and hit their head
- A rider on a zip line hit their head on the platform padding at the end of the line because the force made it difficult for them to stop
- A rider on a go-kart reported whiplash after the go-kart behind them rolled forward and hit them

Reports of dizziness, nausea and even whiplash are frequent and considered less severe than permanent injuries. They are classified as non-permanent injuries. While TSSA uses this data for risk analytics and public reporting, it does not believe that there are significant gaps in the safety performance of amusement devices in Ontario.

The ability to analyze patterns in amusement device incident data through a risk lens is limited by the amount of detail provided in a report and whether there is enough data to accurately identify a root cause. TSSA reviews all reports and determines whether a failure to comply contributed to an incident and/or if more data is required. If so, an inspector is dispatched to investigate.



Risk Profile of Regulated Entities

All amusement devices require an inspection by TSSA prior to becoming operational for the season. Every year, periodic, pre-season inspections are conducted to ensure that the devices are fit for the public before they become active. These inspections include verifying that the owner and operators are licensed and the amusement device mechanics working on the equipment are certified for the purpose. These are critical requirements of the licensing renewal process for owners and operators.

In FY23, TSSA conducted 1,937 periodic inspections, 71% of which found no high-risk issues. TSSA worked with device owners and operators to resolve any high-risk issues prior to authorizing devices for service.

In addition, operational inspections are conducted on devices while they operate during the season. TSSA conducted 468 operational inspections, of which 92% found no high-risk issues.

Overall, more than 95% of all devices that were permitted to operate in FY23 were considered low-risk. The remainder were permitted to operate once all non-compliances were addressed and the devices were safe to operate.

Most common high-risk issues for amusement devices:

- All fasteners were not secured in an approved manner
- A crack at the weld required repairs
- The passenger carrying unit (PCU) surface was not smooth or free of sharp objects

Most common high-risk issue for waterslides:

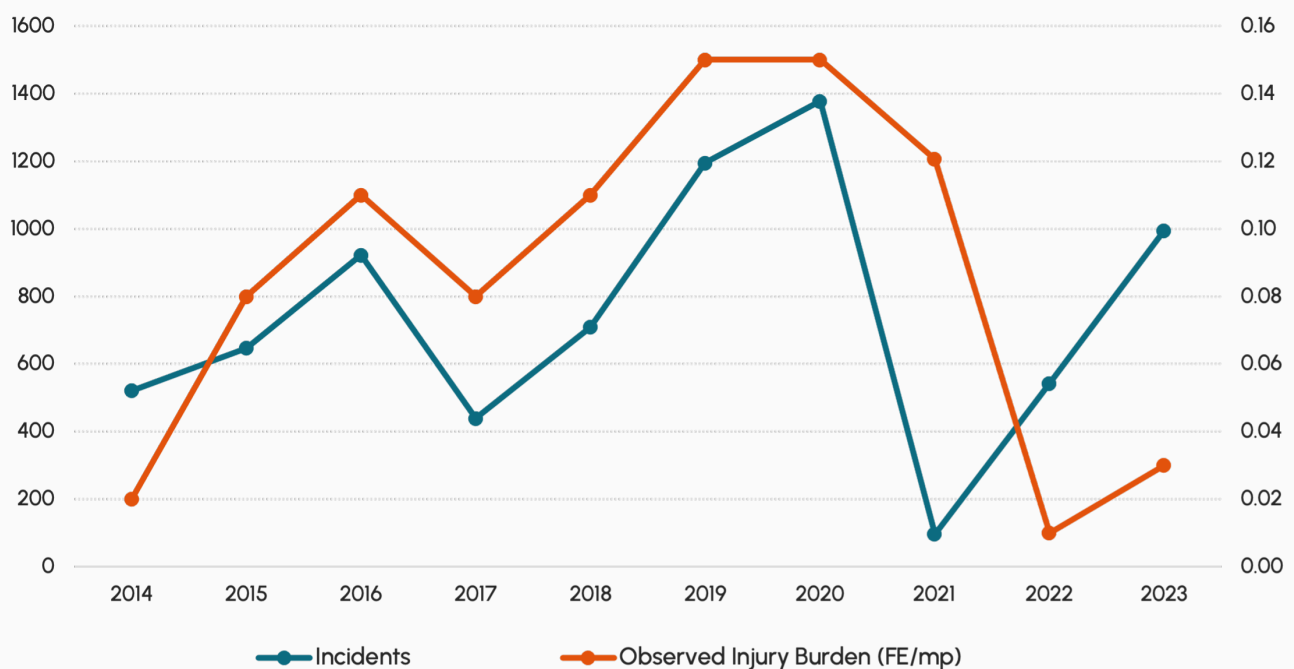
- Slide attendants required training
- Seams and chips on the slides required repairs
- The slide surface was not buffed properly

Additionally, during operational inspections, TSSA often found no record of training of staff and operators, which is also considered a high-risk issue.

Detailed Results: Amusement Devices

There was an 83% increase in the number of incidents reported in FY23 (995) compared to the previous year (543). The five-year average between FY16-20 was 929 incidents. This year's counts were comparable to historical averages prior to COVID-19.

Figure B1: 10-Year Safety Trends for Amusement Devices





Over the past year, there were eight permanent injuries, including concussions, major bone fractures, and burns. Most incidents on amusement devices (98%) were minor (non-permanent) like dizziness, nausea and superficial cuts.

While there were more non-permanent injuries (979) reported in FY23 compared to the previous year (527), there were eight permanent injuries in both FY22 and FY23 – this is significantly fewer permanent injuries compared to the five-year average prior to FY20 and the COVID-19-related closures. Between FY16–20, an average of 30 permanent injuries were reported annually.

Incidents				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year average	745	686	22	0
2023	995	979	8	0

Incidents Currently Under Review*				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	8	6	0	0
2022	2	2	0	0

*Open incidents as of June 27, 2023



Of the 995 incidents reported:

- 60% (598) occurred on amusement rides (e.g., rollercoasters)
- 30% (283) occurred on waterslides
- the rest occurred on zip lines, with a few incidents on go-karts and other amusement devices



Top Safety Issues FY 2014 - 2023

Device Type

By Number of Incidents

Amusement Rides	51.88%
Water Slides	30.86%
Zip Lines	13.05%

By Observed Injury Burden

Amusement Rides	35.39%
Water Slides	26.15%
Zip Lines	21.39%



In FY23, almost all reported incidents were classified by TSSA inspectors as the result of a user failing to follow device operation safety instructions. In other words, the root cause of the incidents was user-related and not related to a device, operator or owner compliance issue or hazard.

Top three types of incidents reported:

1. Riders falling while getting off a stationary ride
2. Riders complaining of nausea, headaches, and lower/upper back pains after completing a ride
3. Riders grabbing a zip line cable while moving

Health Impact

Observed

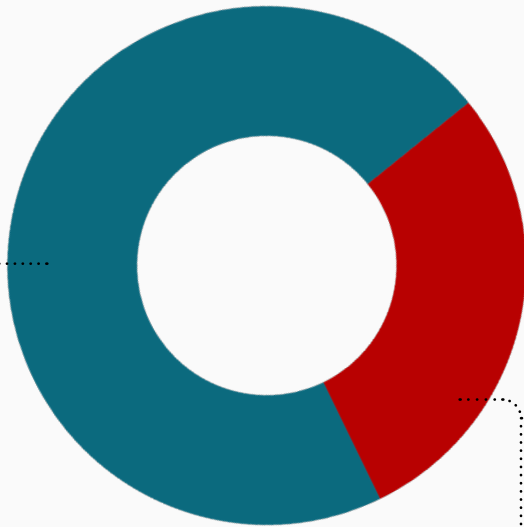
0.09 FE/mp 10-year Average Injury Burden	0.03 FE/mp (2023) Injury Burden
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Potential

0.06 FE/mpy (2023) Risk of Injury Fatality	0.07 FE/mpy (2022) Risk of Injury Fatality
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Given that the injuries reported on amusement devices decreased overall, both health impact metrics – the OIB and RIF – were lower in FY23 than in the past.

Figure B2: Periodic Inspection Results



Inspections with no high-risk orders: 1,383

Inspections with high-risk orders: 554

Of the 1,937 periodic inspections performed this year:

54%

(1,048)
found no issues at all

17%

(335)
found safety tasks

29%

(554)
found one or more high-risk issues

▶ **Refer to Appendix B**
for more detailed information
on amusement devices.

Amusement Devices Case Study



Stock image: Woman ziplining

Zip Line Rider Hits Head on Platform and Suffers Concussion

Background

While riding a zip line at a forested amusement park in Southern Ontario, a guest struck her head and back on a padded platform and was towed to the end of the zip line. Having reported no injuries, she completed the rest of the course.

The park was later informed that the guest went to the hospital the next day and was diagnosed with a concussion. The park manager reported the incident to TSSA.

TSSA Analysis & Actions

Zip lines at the park are inspected multiple times a day by a contracted amusement device mechanic, who confirmed that the zip line involved in the incident was in good working order.

Directly following the incident, the amusement device mechanic reminded the park guides to ensure that guests are instructed on the proper method of steering while riding the zip line and landing on the platform.

TSSA highlights this incident to remind Ontarians that safety is a shared responsibility. Explicit operational amusement device instructions provided by parks and a willingness from guests to heed safety rules work in tandem to reduce the risks of harm in amusement park settings.

The number of zip line-related incidents and injuries in this reporting year are slightly lower in comparison to the 10-year averages, yet have increased very slightly since last year, indicating the industry continues to show signs of recovery from COVID-19 lockdown impacts.

Boilers and Pressure Vessels



TSSA's Boilers and Pressure Vessels Safety Program regulates the design, construction, maintenance, use, operation, repair and service of all pressure retaining components manufactured or used in Ontario. This includes equipment that produces and distributes hot water, steam, compressed air, and other compressed liquids and gases used in commerce and industry.

TSSA is involved in all aspects of the lifecycle of pressure vessels: from design, manufacture and installation to operation, maintenance and decommissioning.

TSSA conducts engineering reviews, examines pressurized equipment and facilities prior to start-up, conducts periodic inspections on uninsured boilers and pressure vessels, surveys quality programs for equipment manufacturers, and certifies inspectors employed by insurers licensed to conduct periodic inspections of insured equipment.

Boilers and Pressure Vessels



40,662

Certificate of Authorizations Holders



2,750

Certificates of Inspection Issued



36,387

Orders

177



Incidents

116



Non-permanent Injuries 0

Permanent Injuries 0

Fatalities 0

State of Public Safety in Ontario

Boilers and Pressure Vessels Safety Program

To facilitate complete and accurate data collection and risk analytics, TSSA continues to encourage industry partners, insurance companies, owners and operators to report incidents and near-misses to TSSA.

TSSA does not currently collect inspection and compliance data for 98% of the BPVs in Ontario, as most BPVs are insured, and insurance companies are responsible for those inspections. In these instances, TSSA provides a Certificate of Inspection for equipment with a valid inspection record submitted by insurance companies.

For this reason, it is not possible to provide aggregated safety performance measures at this time. As a result, the overall injury burden remains low for boilers and pressure vessels (BPVs).

TSSA is exploring additional ways of tracking and analyzing data on insured BPVs to support its risk-based approach to harm reduction in Ontario.

Outcome-Based Regulator Initiatives

Lapsed Authorizations

In the first two years of TSSA's lapsed authorizations program, **91% of BPV authorizations that had lapsed were resolved**. In addition, TSSA is also finding and resolving authorizations that had lapsed in the five-year period

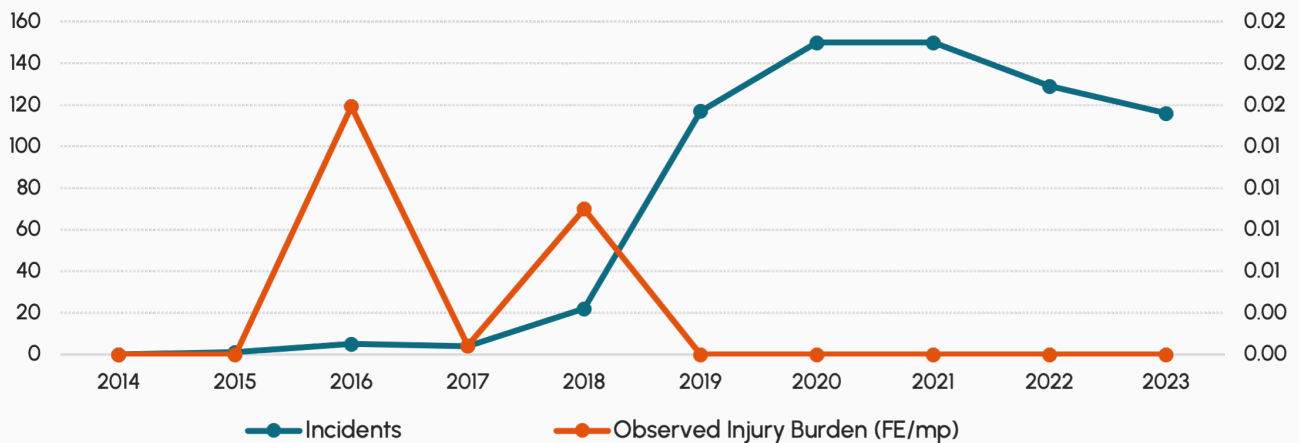
prior to FY22. Since the historical lapsed authorization program started in FY23, 352 historic lapsed authorizations have been resolved. This exceeds TSSA's targeted results for the first year of the program. Moving forward, the program will continue to operate to address lapsed authorizations and enhance public safety, as individuals, businesses and equipment operating without a valid TSSA licence can pose significant risks to the public.

Detailed Results: Boilers and Pressure Vessels Safety Program

BPV incidents have decreased 10% since the previous reporting year – from 129 in FY22 to 116 in FY23. However, the number of incidents in FY23 is 66% higher than the 10-year average, an increase TSSA attributes to improved industry incident reporting practices.

Most incidents reported are refrigerant leaks – for example, ice built up on a pipe, causing it to leak. Refrigerant leaks have not caused any injuries. As a result, the overall injury burden remains low for the BPV sector.

Figure C1: 10-Year Safety Trends for Boilers and Pressure Vessels



Incidents involving this type of equipment could include cracked and corroded vessels or piping, as well as leaks or ruptures, resulting in poisonings, suffocations, fires and/or explosions. Failures can be catastrophic and may immediately threaten life and property. The safe design, installation, operation, and maintenance of BPVs, in accordance with appropriate codes and standards, are essential to public safety. TSSA's activities help ensure that safeguards are in place for the lifecycle of this type of equipment.

Incidents				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year average	70	0	0	0
2023	116	0	0	0

Incidents Currently Under Review*				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	5	0	0	0
2022	4	0	0	0
2021	4	0	0	0

*Open incidents as of June 27, 2023

Most BPVs in the province are inspected periodically by insurance companies. Since FY19-23, TSSA performed 160 periodic inspections on uninsured equipment and issued 49 high-risk orders.

The top compliance issues found between FY19-23 were:

- Lack of proper procedures, qualified technician and/or report submitted for Magnetic Particle or Liquid Penetrant examination
- Equipment not being prepared for TSSA inspection
- Equipment not being maintained in safe working condition

▶ **Refer to Appendix C**
for more detailed
information on BPVs.



Boilers and Pressure Vessels Case Study



Exploded expansion tank



Hoses on rooftop attached to unknown vessel

Plant's Water Heater System Tank Explodes Destroying Building Sections

Background

A water heating system expansion tank exploded inside of a manufacturing plant, causing cinder blocks and water to fall onto the gas meter and the station that feeds gas into the building. The plant sustained structural damage with sections of the facility completely demolished. Forty-two people were evacuated.

In addition to emergency services, Enbridge arrived on the scene and reported the incident to TSSA.

TSSA Analysis & Actions

A joint investigation – which included TSSA's BPV, Operating Engineers, and Fuels Safety programs, as well as other safety partners – determined that this was a very rare incident caused by poor system design and a lack of technical knowledge on the part of the plant operators, who further altered the design.

When a water heating system starts, a great deal of condensation builds up. The system usually has two ports: one for venting and another for condensation overflow. However, the plant's machinery only had one port for both of these functions, and the plant had installed a valve on the port.

The vent from the water heating system travelled outside of the building, and when the system ran, water would fall onto the gas meter at the side of the facility. As such, the plant modified the system's piping and started collecting the water runoff into a vessel on the roof.

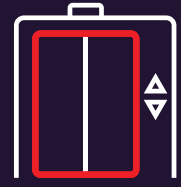
At the end of one work week, the plant shut the water heating system down, in an effort to save energy, and closed the valve on the port. Due to a sudden drop in the outside temperature that weekend, too much condensation built up and froze in the vent lines, which pressurized and caused the system's expansion tank to blow up.

TSSA did not issue any non-compliance orders in association with this incident as the equipment operates at 15 pounds per square inch (PSI) and is exempt from BPV regulation 220/01.

However, TSSA provided consultation to the plant in order to avoid future similar incidents and recommended a new water heating system configuration for the facility to install as part of its rebuilding plans.

TSSA highlights this incident to remind industry that safety is a shared responsibility when it comes to safe operation of BPVs in the province of Ontario.

Elevating Devices: Elevators

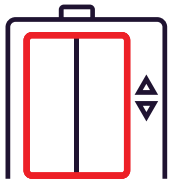


TSSA's Elevating Devices Safety Program regulates elevators in Ontario to ensure all devices conform to the Act and applicable regulations, codes and standards. This includes: passenger, freight, hand-powered, observation, sidewalk, temporary, limited use/application elevators, dumbwaiters, material and freight platform lifts, lifts for persons with physical disabilities, man-lifts, construction hoists, incline lifts, stage lifts, and parking garage lifts.

TSSA reviews and register elevators, issues licences, conducts inspections, performs incident investigations, provides engineering services, registers contractors and certifies mechanics.

TSSA works closely with industry, through advisory councils and technical risk reduction committees, to propose improvements and implement effective safety strategies and solutions. Collectively, TSSA strives to ensure a safe environment for the riding public.

Devices



Total Devices	61,592
Passenger Elevators	45,860
Non-passenger Elevators	15,732

Registered Designs

4,664



Owners

23,198



Registered Contractors

213



Certified Mechanics

6,350



Inspection Results

5-Year Average

93%

Periodic inspections with no high-risk issues

Orders

5,838



Incidents

656



Non-permanent Injuries **85**

Permanent Injuries **5**

Fatalities **0**

State of Public Safety in Ontario

Elevating Devices Safety Program – Elevators

In Ontario, there are 61,592 elevators moving millions of people and goods on a day-to-day basis. Based on FY23 TSSA safety data collected on incidents and during risk-based inspections, **elevators operating in Ontario continue to be safe for the public**. In fact, 93% of periodic inspections conducted by TSSA found no high-risk issues.

In certain circumstances, inspectors might find a device operating in an unsafe condition and determine that it must be shutdown. In FY23, 16 elevators were shut down – four in residential buildings and six in office buildings.

In order for a shut-down elevator to be able to operate again, a TSSA inspection is required to ensure the elevator can operate safely. The owner of the elevator is responsible for complying with all safety requirements and informing TSSA when the elevator is ready to be reinstated. In FY23, 23 elevators were reinstated.

Of the 61,592 elevators authorized by TSSA to operate in Ontario, most of them are passenger elevators (45,860 or 74%). Passenger elevators can be found in:

- rental buildings (25%)
- condominiums (23%)
- office buildings (22%)
- hospitals and group homes (9%)
- schools, universities and colleges (7%)

The remaining elevators (15,732 or 26%) regulated by TSSA are:

- lifts for persons with disabilities (approximately 8,000 or 50%)
- freight elevators designed to move materials and equipment (approximately 1,300 or 8%)
- wind turbine tower elevators (approximately 1,000 or 6%)

Outcome-Based Regulator Initiatives

Lapsed Authorizations

Every elevator in Ontario must have a TSSA authorization in order to operate. Elevator authorizations must be renewed annually. In FY22, TSSA identified a potential safety gap where owners and operators of elevators were not renewing their authorizations on time and, as a result, TSSA was unable to verify the safety of those elevators.

In response to this potential safety gap, TSSA launched a lapsed authorizations program in FY22 to ensure that all elevators operating in the province are up to date with their TSSA authorization. If an elevator's authorization expires and is not renewed within 60 days, TSSA will follow-up to resolve the case by renewing the authorization or by ensuring that the device is not operating illegally. In the first two years of the program, 94% of elevator authorizations that had lapsed were resolved.



TSSA is also resolving authorizations that lapsed in the five-year period prior to FY22 to ensure they are not operating unsafely and bring those that are back to compliance. In FY23, 467 elevator authorizations that expired within that five-year period were resolved.

Compliance Standards

In FY23, TSSA introduced compliance standards for the elevating devices industry. Compliance standards are an Outcome-Based Regulator initiative being rolled out by TSSA to help device owners and operators better understand their safety priorities. Compliance standards use data and evidence to identify the issues that pose the highest risk to public safety and guide the industry and TSSA inspectors to focus on those high-risk priorities.

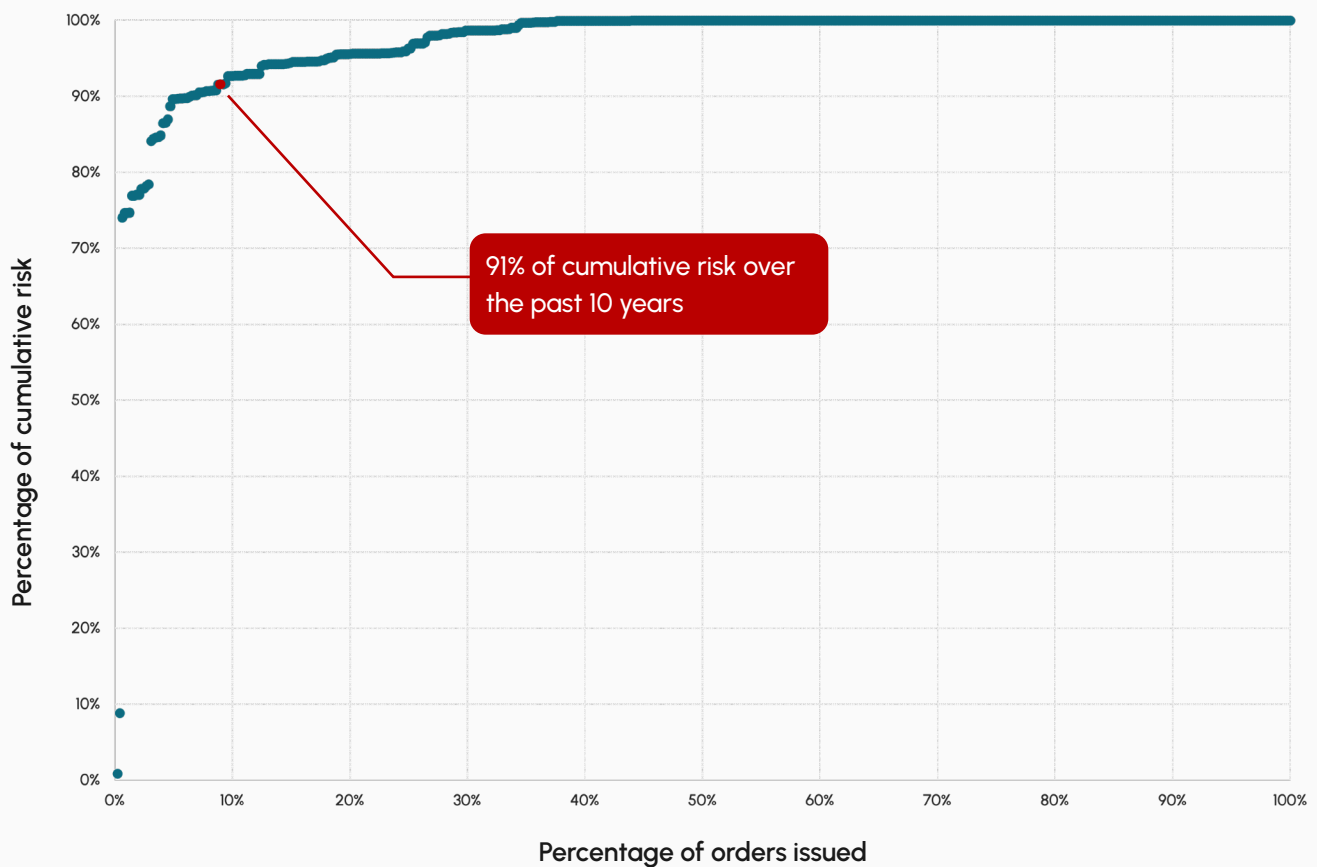
The original threshold used to define high-risk orders was set based on an external benchmark that had been used in a different industry to support land-usage planning. TSSA decided to review the threshold used to define high-risk issues because continuing to apply the original threshold would have resulted in a high number of inspections that would require a follow-up for non-compliances that carry a relatively low-risk score.

As part of the review, TSSA analyzed data and patterns in inspection results over the past 10 years to find out how often each safety issue was found and the cumulative risk of each safety issue. TSSA determined this by multiplying the risk score of a safety issue by the number of times it was found in the field. This representation of the cumulative risk clearly demonstrated that the majority of issues found at inspections did not present a significant risk to the public. In fact, TSSA discovered there are 60 high-risk safety issues that represent 91% of the cumulative risk.

TSSA used this compelling evidence to determine a revised threshold for the safety issues that TSSA has determined require immediate compliance to avoid harm to the public. The threshold was revised for hydraulic and traction elevators, and updated compliance standards were launched on June 12, 2023. Data and results from the Compliance Standards rollout will be reported in the FY24 edition of this report.

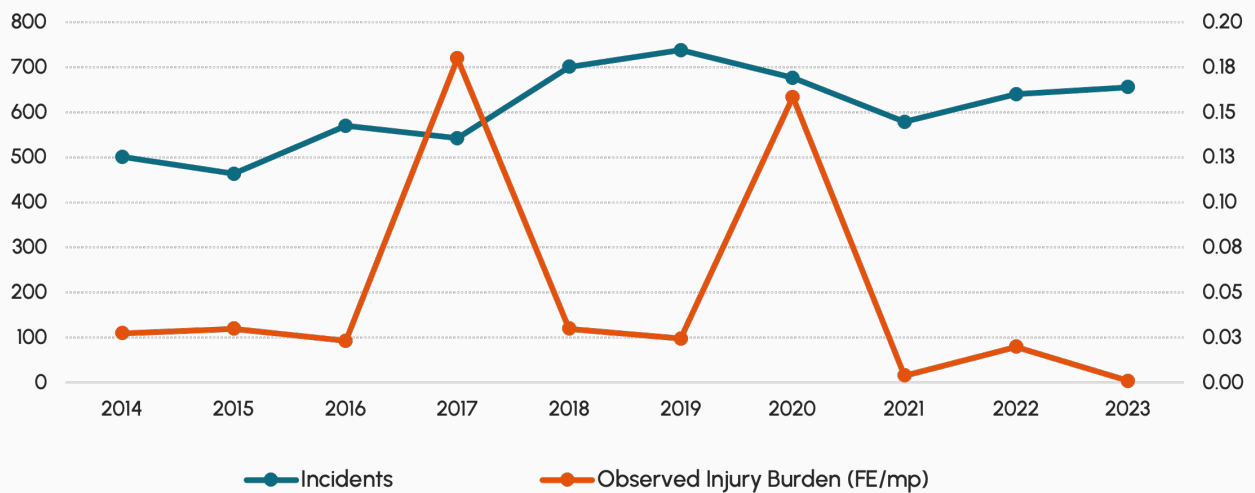
Figure D1 visualizes the inspection results from the past 10 years. The horizontal axis represents the percentage of orders (issues), and the vertical axis represents the cumulative risk represented by that order.

Figure D1: Cumulative Risk Curve



Reported incidents on elevators have increased over the past year and are on par with the five-year average prior to FY20. There were 656 incidents in FY23 compared to 640 in FY22, an increase of 2.5%. Between FY16–20, there were 646 incidents.

Figure D2: 10-Year Safety Trends for Elevators



Since FY20, TSSA has recorded fewer injuries in elevators. It is helpful to consider the results for the five years prior to 2020, when TSSA's regulated sectors were impacted by pandemic-related closures. There were 739 injuries between FY16–20, which is an average of 148 per year. In the three years since, there has been an average of 89 injuries per year. This demonstrates that the decrease in injuries could be long-lasting, even as ridership returns to normal.

Incidents

Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year Average	607	125	7	1
2023	656	85	5	0

Incidents Currently Under Review

Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	88	26	2	0
2022	14	5	0	0
2021	11	2	0	0

*Open incidents as of June 27, 2023



Over the past 10 years, 20% of incidents were a result of non-compliances. However, in FY23, the rate of incidents caused by non-compliances dropped to 15%. TSSA determined that the remaining incidents (549) were caused by external factors and not related to compliance.

The most common causes of incidents were:

1. Flooding in the elevator pit
2. Sewer backup
3. Water from activated sprinkler systems getting into condominium elevators



Most incidents occurred in apartment buildings, condos and offices. These three types of structures are where most elevators are installed in the province.

Top Safety Issues FY2014 - 2023

By Number of Incidents

Rental Apartment Buildings	22.49%
Condominiums	20.17%
Offices	18.83%

By Observed Injury Burden

Condominiums	33.41%
Offices	25.92%
Rental Apartment Buildings	16.35%



Over the past 10 years, most elevator-related injuries reported to TSSA occurred in the following building types:

- condominiums
- offices
- rental apartment buildings
- student residences
- assemblies (locations where the public can congregate such as theatres, sporting events/facilities, convention centres etc)

This data is based on the total sum of injuries recorded and their severity – for example, a permanent injury would have a higher OIB compared to a fall with no injury.

Health Impact

Observed

0.05 FE/mp (10-year Average) Injury Burden	0.001 FE/mp (2023) Injury Burden
--	--

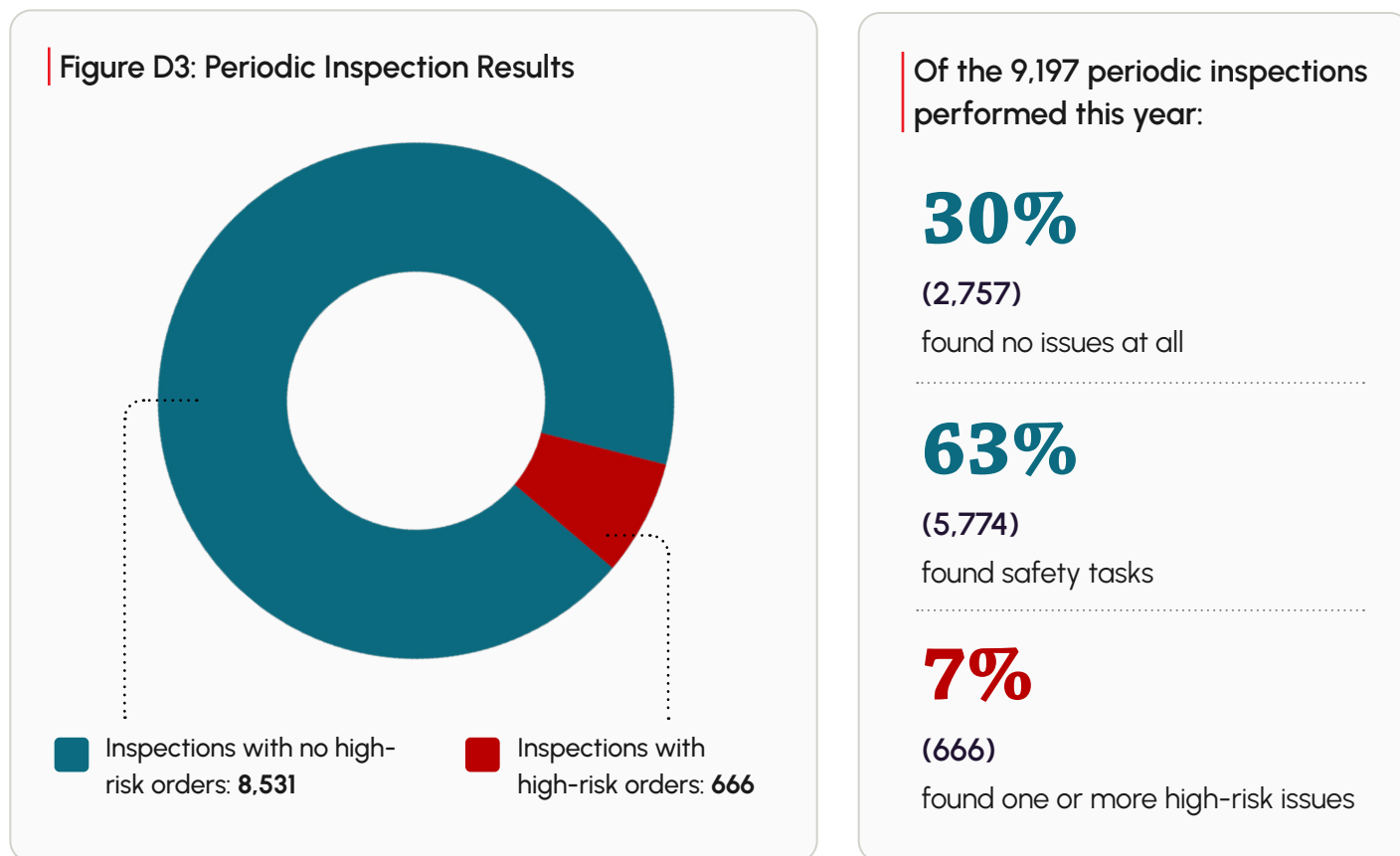
Potential

0.01 FE/mpy (2023) Risk of Injury Fatality	0.04 FE/mpy (2022) Risk of Injury Fatality
--	--

Risk Profile of Regulated Entities

Using an approach developed in 2007, TSSA estimates the relative risk of elevators by analyzing the data collected during inspection activities. Orders issued at a periodic inspection are risk-assessed, and the regulated parties are given a specific amount of time to comply relative to the risk assessment. Non-compliances that are more likely to cause harm are classified as high-risk. High-risk non-compliances must be rectified within 14 days.

Based on the most recent inspection results, TSSA estimates that there were 25 high-risk elevators in Ontario in FY23 (based on the 2007 risk score).



The most common high-risk issue found during inspections was the restrictor not consistently locking the car door when the elevator was out of the unlocking zone. This issue represented almost half the total risk captured between 2019-2023.

The next most common high-risk issues found during periodic inspections were:

- the machine break requiring maintenance
- having no record of maintenance in the logbook

The most common issues found during periodic inspections were:

- the annual periodic tasks for emergency and lowering operations being done late or not at all
- the firefighter emergency annual periodic task not being completed
- license posted in conspicuous location

In certain circumstances, inspectors might find a device operating in an unsafe condition and determine that it must be shut down. In FY23, 16 elevators were shut down – four in residential buildings and six in office buildings.

For a shut down elevator to be reinstated, a TSSA inspection is required to ensure the elevator can operate safely. The owner of the elevator is responsible for complying with all safety requirements and informing TSSA when the elevator is ready to be reinstated. In the same year, 23 elevators were reinstated.

TSSA Shutdowns FY23	
Building Type	Count
Office	6
Industrial	3
Condominium	2
Rental	2
Mercantile	1
Assemblies	1
Learning Institution	1

Reinstated devices FY23	
Building Type	Count
Office	6
Assemblies	5
Condominium	3
Hospital	2
Rental	2
Hotel	1
Mercantile	1
Mass Transportation	1
Learning Institution	1
Industrial	1



▶ **Refer to Appendix D** for more detailed information on elevating devices: elevators.

Elevator Devices Case Study



Vertical platform lift exterior



Vertical platform lift interior

Retirement Home Resident Falls 10 Inches into Elevator Misaligned with Floor and Hits Head

Background

A resident of a small retirement home in Southwestern Ontario stepped into a vertical platform lift (also known as a handicap elevator) that sat approximately 10 inches below the top landing floor. Because the lift was not level with the floor, the resident fell into the lift and hit his head on the elevator enclosure.

The injured resident was taken by ambulance to the local hospital and later cleared to go home with a suspected concussion and minor bruising.

The retirement home staff called an elevator mechanic to repair the lift. Upon becoming aware of the injured resident, the elevator mechanic reported the incident to TSSA.

TSSA Analysis & Actions

During its investigation, TSSA discovered that the lift had been out of service for nearly a month due to intermittent failures prior to the incident. An elevator mechanic visited the retirement home and made what he thought were the necessary repairs, and then put the lift back into service.

When a resident went to use the in-service lift, the lift descended approximately 10 inches before the lift's controller detected a potentially unsafe condition and shut the lift down with the resident stuck inside. The retirement home staff used a special unlocking device to unlock the top landing door so that the resident could step up onto the landing floor and free himself from the lift.

However, after the resident was freed, the staff failed to lock the top landing door properly so that no other residents could access the lift. The staff also did not inform the other residents that the lift was out of service again.

The following morning, another resident went to use the lift, unaware that it was out of service. He was able to gain access to the lift because the staff had left the top landing door unlocked. Due to poor lighting conditions in the hallway, the resident did not notice that the lift was not level with the top landing floor, and he fell approximately 10 inches when attempting to step into the lift.

There were a number of factors that contributed to this incident, but the incident likely would not have occurred if the retirement home staff and management team had been trained on the proper safety procedures for the lift.

TSSA issued eight non-compliance orders related to the retirement home staff's unsafe evacuation of a resident from the lift, unsafe shutdown of the device, and improper training on vertical platform lift evacuation procedures. There were additional orders issued for the failure of the elevator licensee to report the incident to TSSA and the poor hallway lighting at the top landing.

TSSA continues to reinforce that safe operation, preventative maintenance and proper certification and training of personnel is the cornerstone of elevator safety. Additionally, TSSA works with stakeholders to remind the industry of the importance of reporting incidents. TSSA also recently launched an elevator availability portal through which owners and operators are required to report outages.



Elevating Devices:

Escalators and Moving Walks



TSSA's Elevating Devices Safety Program regulates escalators and moving walks in Ontario to ensure all devices conform to the Act and applicable regulations, codes and standards. TSSA reviews and registers escalator and moving walks, issues licences, conducts inspections, performs incident investigations, provides engineering services, registers contractors and certifies mechanics.

TSSA works closely with industry, through advisory councils and technical risk reduction committees, to propose improvements and implement effective safety strategies and solutions. Collectively, TSSA strives to ensure a safe environment for the riding public.

Devices

2,371



Inspection Results

5-Year Average

78.9%

Periodic inspections with no high-risk issues



Orders

230



Incidents

668



Non-permanent Injuries **375**

Permanent Injuries **2**

Fatalities **1**

State of Public Safety in Ontario

Elevating Devices Safety Program – Escalators and Moving Walks

In FY23, most reports of escalator incidents were considered to be a result of user behaviour – for example, a rider losing balance; clothing, footwear or suitcases getting caught at the end of an escalator; and the use of mobility devices or strollers on an escalator.

TSSA takes rider safety extremely seriously. During National Elevator Escalator Safety Awareness week in FY23, TSSA ran a digital campaign to raise public awareness of risks associated with riding elevators and escalators and proper safety etiquette. As part of the campaign, TSSA shared a case study from its FY22 Public Safety Report depicting a real-life example of an escalator incident, as well as videos from its 'Be Safe, Not Sorry' public education series illustrating risky elevator and escalator scenarios and ways to avoid them. TSSA's escalator safety resources can be accessed all year round at www.safetyinfo.ca.

TSSA also works very closely with the Toronto Transit Commission (TTC), Ontario's largest public transit provider. Through the Compliance Support Program, TSSA Compliance Advisors collaborate with TTC representatives to identify specific root causes of the risks associated with TTC's escalators and find effective solutions to improve safety outcomes. As a result of the TTC's participation in the Compliance Support Program, TTC effectively lowered the risk scores of its escalators.

Outcome-Based Regulator Initiatives

Compliance Standards

During FY23, TSSA conducted 69 periodic inspections and found fewer high-risk issues on escalators compared to the average for the previous years FY16-20. This is encouraging and indicates an improvement in overall compliance with safety standards.

TSSA introduced compliance standards for the elevating device industry in FY23. Compliance standards are an Outcome-Based Regulator initiative being rolled out by TSSA. Compliance standards use data and evidence to identify the issues that pose the highest risk to public safety and guide industry and TSSA inspectors to focus on those high-risk priorities. During periodic inspections, TSSA inspectors will issue orders for any high-risk issues found and will follow-up with inspections until the issue is resolved. Examples of high-risk orders for escalators include ensuring that the emergency stop buttons are operative and ensuring that the steps are not damaged and do not have missing components.

Given the critical role that contractors play with owners and operators to keep escalators safe, TSSA published compliance standards specifically for contractors. For example, an escalator compliance standard for contractors is to ensure compliance with the annual Maintenance Control Program requirements.

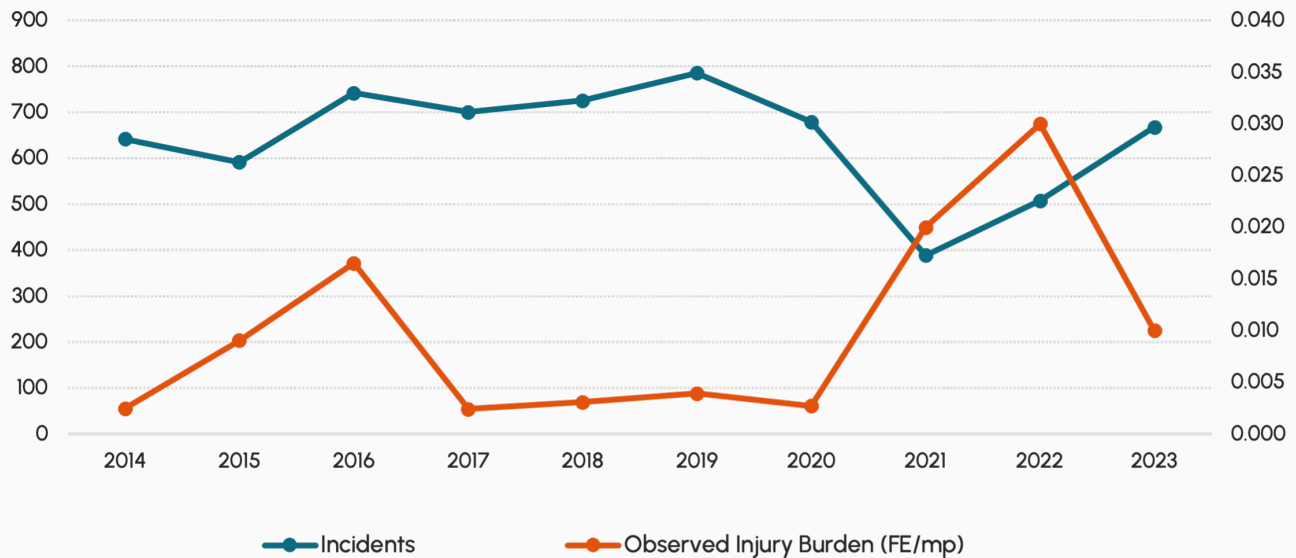
After analyzing the inspection and incident data available to TSSA and conducting risk assessment workshops, TSSA engaged with key external stakeholders from industry before finalizing the compliance standards for escalators.

TSSA may decide to stop a device from operating if a hazard found is posing an immediate risk to safety or if a device has been out of compliance for an extended period of time.



The number of incidents reported on escalators and moving walks has remained stable for the past five years – 668 incidents were reported in FY23. Although this is a 30% increase compared to the previous year (508), it is lower than the five-year average of reported incidents (727) from FY16-20.

Figure E1: 10-Year Safety Trends for Escalators and Moving Walks



This past year, TSSA investigated a tragic incident where an individual suffered a cardiac arrest after falling from an escalator. Prior to this, another fatality had occurred on an escalator in FY20. The fatality in FY20 occurred under similar circumstances, with a rider suffering fatal injuries following a fall.

In FY21 and FY22, COVID-19-related closures resulted in a significant dip in the use of escalators and moving walks, which artificially lowered the count of incidents, so it is more useful to compare the average to the years before. The FY23 results compared to the five-year average before COVID-19 indicate a promising decrease in incidents.

Incidents				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year Average	643	405	3	0
2023	668	375	2	1
Incidents Currently Under Review*				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	17	7	0	0
2022	3	0	0	0

*Open incidents as of 2023-06-27

Top Safety Issues FY2014 - 2023

By Number of Incidents

Mass Transportation	65.04%
Commercial (Mercantile)	27.23%
Offices	4.07%

By Observed Injury Burden

Mass Transportation	51.24%
Commercial (Mercantile)	46.12%
Assemblies	1.36%



Most incidents occur on escalators in public transportation settings.

In FY23, 645 incidents (97%) were deemed by TSSA to be caused by external factors such as a user not following instructions. The most common causes of incidents were:

- Trips and falls where passengers lose balance
- Passengers carrying carts and bicycles
- Kids running up and down the escalator

Health Impact

Observed

0.01 FE/mp 10-year Average Injury Burden	0.01 FE/mp (2023) Injury Burden
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Potential

0.0001 FE/mpy (2023) Risk of Injury Fatality	0.02 FE/mpy (2022) Risk of Injury Fatality
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Risk Profile of Regulated Entities

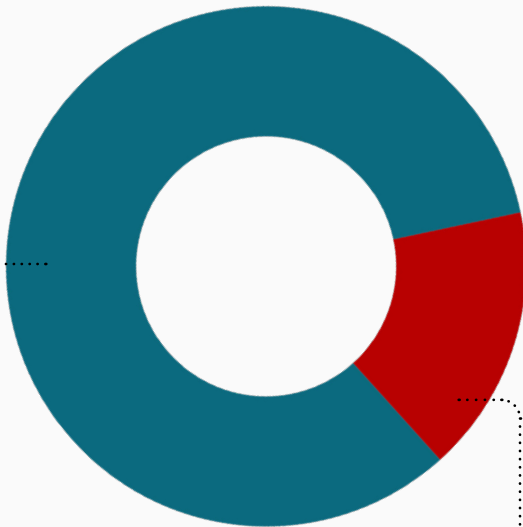
TSSA conducted fewer periodic inspections on escalators and moving walks in FY23 compared to previous years, due to a labour disruption that resulted in a strike between July to November 2022.

The most common high-risk issue found during inspections was handrail speed not synchronized with that of the steps.

Top issues found by count include the following requirements being performed late:

- annual periodic task for skirt/step performance index
- test for escalator clearance between the step and the skirt-loaded gap

Figure E2: Periodic Inspection Results



Inspections with no high-risk orders: **235**

Inspections with high-risk orders: **47**

Of the 282 periodic inspections performed this year:

23%

(66)

found no issues at all

60%

(169)

found safety tasks

17%

(47)

found one or more high-risk issues

▶ **Refer to Appendix E** for more detailed information on elevating devices: escalators and moving walks.



Escalators Case Study



Stock image: Hand on escalator handrail

Patron Loses Balance and Falls as Escalator Handrail Stalls

Background

A patron fell while riding an escalator at a commercial complex because the handrail stalled and lost her balance. The individual was taken to the hospital and treated for non-permanent injuries.

Securing the site, a licensed escalator maintenance contractor took the escalator out of service and reported the incident to TSSA.

TSSA Analysis & Actions

During the escalator inspection, the contractor determined that the escalator stalled as a result of the handrail drive chain (which moves the handrail along the escalator's handrail guide) was broken and one of the escalator drive roller bearings was damaged.

This type of escalator is not equipped with a handrail monitoring system, so when the handrail stalled, the escalator did not stop.

TSSA instructed the maintenance personnel to have the handrail drive chain replaced, the drive roller bearing repaired, and the entire handrail drive system reviewed

to ensure the future safe operation of the escalator. Additionally, the maintenance personnel was required to report the completion of the repairs to TSSA before having the escalator returned to service.

In this reporting year, TSSA saw a 31.5% increase in escalator incidents compared to the previous reporting year. There was also a year-over-year upsurge in injuries, with the number of non-permanent injuries increasing by 24.6% and permanent injuries doubling. There was no significant change in the number of incidents compared to the 10-year average. This indicates to TSSA that the year-over-year upsurges are likely due to ridership continuing to increase back to pre-pandemic volumes, following the easing of COVID-19 lockdown restrictions.

While Ontario's escalators are very safe and reliable, they require regular maintenance to ensure they remain in good working order. TSSA highlights this incident to reinforce the importance of building owners having their devices regularly inspected and upkept by TSSA-registered escalator maintenance contractors.

Elevating Devices:

Passenger Ropeways and Ski Lifts



TSSA's Ski Lifts Safety Program regulates the safety of passenger ropeways (ski lifts) in Ontario, including chair lifts, bar lifts, recreational conveyors, gondola lifts, reversible ropeways, passenger ropeways, rope tows, tube tows, belt tows and aerial tramways.

TSSA reviews and registers lift designs, licenses lift devices, conducts inspections, performs incident investigations and promotes public awareness of safe ski-lift behaviour throughout Ontario. In addition, TSSA certifies ski lift mechanics and registers contractors.

Devices

222



Registered Designs

19



Owners

67



Registered Contractors

514



Certified Mechanics

497



Inspection Results

5-Year Average

61.6%

Periodic inspections with no high-risk issues

Orders

86



Incidents

27



Non-permanent Injuries **20**

Permanent Injuries **1**

Fatalities **0**

State of Public Safety in Ontario

Elevating Devices Safety Program – Passenger Ropeways and Ski Lifts

After two years of unprecedented closures and limited activities due to COVID-19-related impacts, Ontario's ski resorts strived to provide high-quality services to Ontario's skiers.

Outcome-Based Regulator Initiatives

Compliance Standards

TSSA introduced compliance standards for the ski industry in FY23. Compliance standards are an Outcome-Based Regulator initiative being rolled out by TSSA. Compliance standards use data and evidence to identify the issues that pose the highest risk to public safety and guide industry and inspectors to focus on those high-risk priorities. During periodic inspections, TSSA inspectors will issue orders for any of the high-risk issues that are not in compliance and will follow-up with inspections until the issue is resolved. For example, compliance standard requirements include making sure the loading intervals are timed at the minimum required speed and ensuring that the rope position switch is functioning so that the ropeway stops when the rope is out of position.

TSSA may decide to stop a device from operating if a hazard found is posing an immediate risk to safety or if a device has been out of compliance for an extended period of time.

After analyzing the inspection and incident data available to TSSA and conducting risk assessment workshops, TSSA engaged key external stakeholders from industry before finalizing the ski compliance standards. Compliance standards for all ski lifts – above surface passenger ropeways, chair lifts, gondolas and surface ropeways (t-bar, platter lift), fibre or wire rope tow and conveyor – can be found on TSSA's website.

Incidents

There was a significant decrease in reported incidents this year, from 73 in FY22 to 27 in FY23. There was also a decline in incidents this year compared to the 10-year average of 69. TSSA is exploring potential reasons for the decrease.

Reporting incidents and near-misses is a critical aspect of a risk-based and data-driven approach to safety and harm reduction. This message is reinforced during periodic inspections, when TSSA provides important reminders and education to ski lift owners and operators about the importance of reporting incidents and near-misses. Given that TSSA conducted fewer periodic inspections this season (as a result of TSSA's labour disruption), the decrease in incidents could be a result of lack of reporting.

Other reasons are being explored include:

- increased emphasis on staff training in loading and unloading as a result of previous incidents
- poor weather at the start of the season delaying the opening of some resorts
- fewer group visitations, like school visits, at ski resorts
- implementation of new rider safety measures

As a precautionary measure, TSSA will continue to educate and make operators aware of the incident reporting requirements at its regularly scheduled industry meetings.



Risk Profile of Regulated Entities

Over the past five years, **the most common issue found during operational inspections** was the operator not being trained for a specific device.

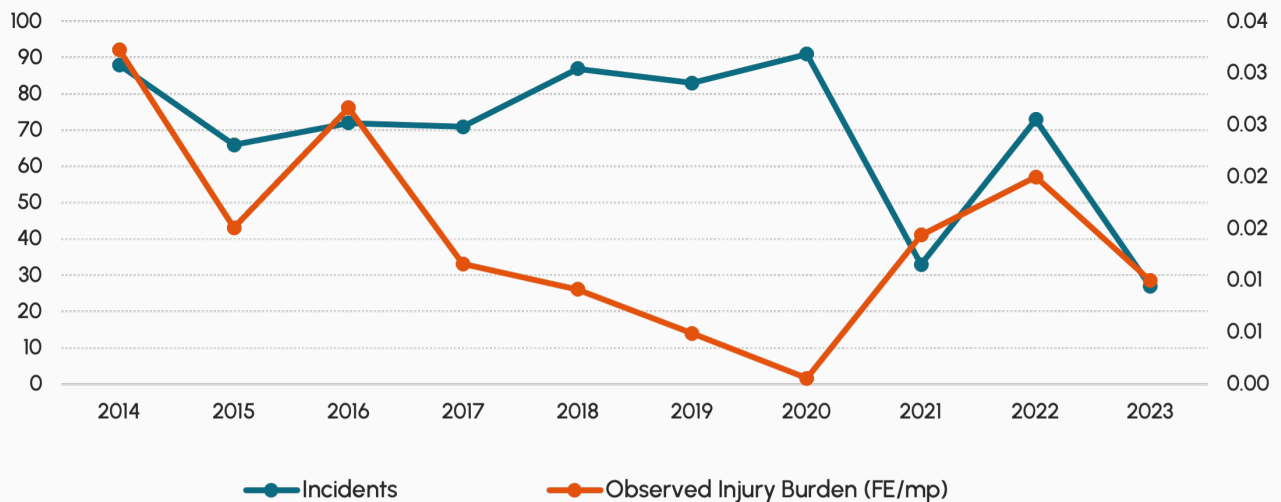
The most common high-risk issue found during periodic inspections was overhanging tree limbs not being removed.

The most frequently issued non-compliance orders included evacuation training not being conducted and lack of supervision and training for all personnel.

There was a significant decrease in the number of reported incidents in FY23:

- 27 reported incidents in FY23
- 73 incidents reported in FY22
- 81 incidents reported annually from FY16-20 (five-year average)

Figure F1: 10-Year Safety Trends for Ski Lifts



Of the 27 incidents, there were 21 injuries (one permanent). TSSA determined that most of the incidents were caused by external factors – for example, an action taken by a rider of a ski lift, like trying to exit the ski lift too soon or failing to follow instructions.

Incidents				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year Average	69	53	2	0
2023	27	20	1	0
Incidents Currently Under Review*				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	3	2	0	0
2022	1	0	0	0

*Open incidents as of June 27, 2023



Top Safety Issues FY2014 - 2023

By Number of Incidents

Chair Lifts	85.53%
Passenger Conveyors	8.68%
Bar Lifts	3.33%

By Observed Injury Burden

Chair Lifts	86.22%
Rope Tows	9.41%
Passenger Conveyors	3.31%



In FY23, 25 of the incidents were categorized by TSSA as being caused by a user's failure to follow lift instructions. For example:

- riders falling off the chair at the loading/unloading areas
- riders hitting their heads on the bar lift

Health Impact

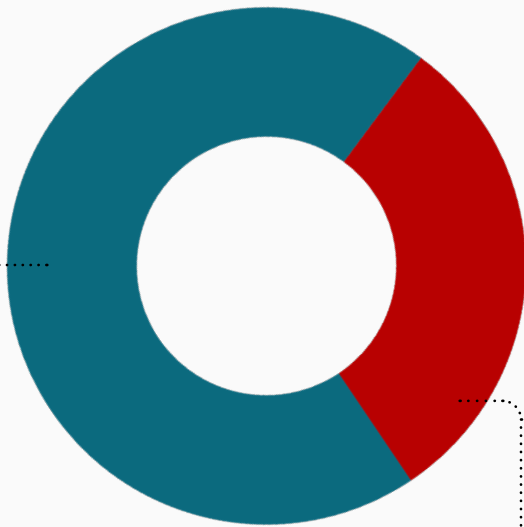
Observed

0.01 FE/mp (10-year Average) Injury Burden	0.01 FE/mp (2023) Injury Burden
--	---------------------------------------

Potential

0.01 FE/mpy (2023) Risk of Injury Fatality	0.01 FE/mpy (2022) Risk of Injury Fatality
--	--

Figure F2: Periodic Inspection Results



Inspections with no high-risk orders: 16

Inspections with high-risk orders: 7

Of the 23 periodic inspections performed this year:

48%

(11)
found no issues at all

22%

(5)
found safety tasks

30%

(7)
found one or more high-risk issues

▶ **Refer to Appendix F** for more detailed information on elevating devices: passenger ropeways and ski lifts.

Ski Lift Case Study



Stock image: Two people riding chairlift

Ski Instructor Suffers Concussion after Chairlift Strikes Head

Background

A ski instructor was unloading equipment from a chairlift at the top of the ski slope at a ski resort in southern Ontario. To make it easier for a student to unload gear, the instructor attempted to have the lift attendant slow the lift. Distracted by a conversation with another attendant, the lift attendant missed the instructor's signals. As a result, the instructor and student fell onto the unloading ramp.

As the lift continued to advance, the instructor and student attempted to duck out of the path of the chair they had just unloaded. However, the bottom of the chair struck the side of the instructor's helmet.

Not feeling any immediate pain, the instructor left the unloading ramp with the student and continued with the lesson. Later that evening, however, the instructor called the ski patrol complaining of a headache and nausea. The ski patrol recommended that the instructor go to the hospital, where the instructor was diagnosed with a concussion.

After receiving the report late that evening, the on-call ski lift mechanic inspected the ski lift chairs to ensure there were no defects that may have contributed to the incident. No issues were found.

TSSA Analysis & Actions

The ski resort disciplined the lift attendants who missed the instructor's signals. The attendants were required to undergo retraining with an emphasis on vigilance when attending the loading and unloading stations. Additionally, the resort sent a reminder to the rest of the staff emphasizing the importance of paying attention while operating ski lifts.

On the whole, ski lift incidents are on the decline. There were approximately 60% fewer ski lift incidents and approximately 60% fewer injuries in this reporting year, compared to the previous reporting year. Moreover, compared to the 10-year average of 69 incidents, there were only 27 in this reporting year. This significant reduction in incidents was likely due to the poor skiing weather at the start of the season, causing some resorts to delay opening until late January and early February. In addition, there were still some residual impacts from the COVID-19 pandemic, with many schools not participating in the Learn-to-Ski programs normally offered at various resorts.



Fuels

TSSA's Fuels Safety Program regulates the transportation, storage, handling and use of fuels in Ontario including natural gas, propane, fuel oil, gasoline, diesel, butane, hydrogen, digester gas, and landfill gas. TSSA carries out inspections and licenses pipelines, gas stations, propane filling stations, marinas and tanker trucks.

TSSA issues licences to operate fuel facilities and pipelines, registers contractors and certifies tradespersons who install and service fuel-burning equipment. TSSA reviews and approves facility plans for TSSA-licensed sites and performs custom equipment approvals and inspections to ensure fuel is handled and used safely.

TSSA investigates incidents and reports of non-compliance and provides technical expertise to industry stakeholders, safety partners and consumers.

Liquid Fuel Sites

Total Sites	4,087
Gas Stations	3,474
Marinas	427
Bulk Plants	186

Inspection Results Liquid Fuels

5-Year Average

87.8%

Periodic inspections with no high-risk issues

Propane Sites

1,201



Design Reviews

(facility plan reviews/approvals)

1,100



Inspection Results Propane

5-Year Average

88.0%

Periodic inspections with no high-risk issues

Certificate Holders

78,347



Registered Contractors

9,290

Contractor Audits

2,180

Accredited Training Providers

145



Orders

4,003



Incidents

2,653



Non-permanent Injuries 11

Permanent Injuries 9

Fatalities 0

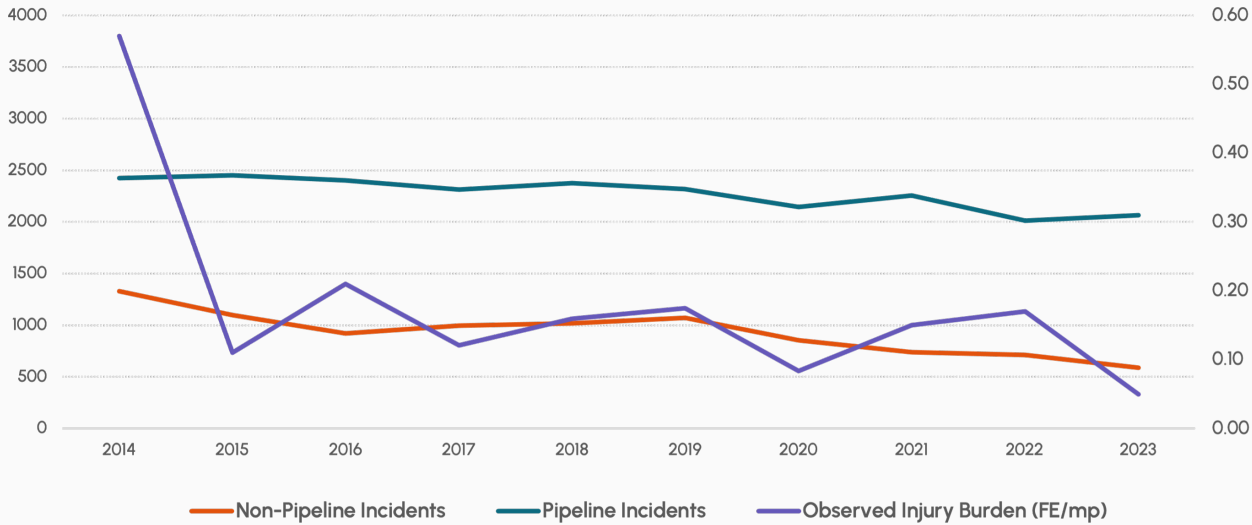


State of Public Safety in Ontario

Fuels Safety Program

There has been a decreasing trend in incidents and non-permanent injuries in the Fuels sector, from a 10-year average of 3,210 incidents annually to 2,653 incidents in 2023. On the other hand, the OIB does not show any clear trend, due to the lower number of permanent and non-permanent injuries, as well as there being no fatalities reported, in 2023.

Figure G1: 10-Year Safety Trends for Fuels



Incidents

Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year Average	3,210	37	13	3
2023	2,653	11	9	0

Incidents Currently Under Review*

Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	853	0	0	0
2022	364	8	0	1

*Open incidents as of July 27, 2023



Number of Incidents by Fuel Type (2014 – 2023)

Description	Fiscal Year										Total	10yr Average
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023		
Natural Gas	2,467	2,606	2,792	2,879	2,938	3,049	2,798	2,823	2,436	1,529	26,317	2,632
Liquid Fuel - Fuel Oil	188	167	175	165	143	134	80	68	52	28	1,200	120
Propane	72	77	55	58	48	56	47	47	19	27	506	51
Liquid Fuel - Diesel	52	27	47	36	54	53	30	18	19	27	363	36
Liquid Fuel - Gasoline	58	41	49	41	37	40	29	17	17	18	347	35
Liquid Fuel - Used / Waste / Lube Oil	3	0	1	1	2	1	0	1	4	4	17	2
Butane	0	1	1	1	2	0	0	0	0	0	5	1
Hydrogen	0	0	2	0	0	0	0	0	0	2	4	0
Liquid Fuel - Aviation Fuel	0	1	0	0	0	2	0	0	0	0	3	0
Compressed Natural Gas	1	0	0	0	0	0	0	0	0	0	1	0
Other	93	630	205	131	167	53	14	23	179	1,018	3,333	333



In FY23, the top high-risk liquid fuels sites were:

- Gas stations
- Marinas
- Bulk plants

Top High-Risk Licensed Sites FY23

Liquid Fuels

Gas Stations	87.9%
Marinas	9.1%
Bulk Plants	3.0%

Propane

Cylinder Refill Centres	58.3%
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Health Impact

Observed

0.18 FE/mp (10-year Average) Injury Burden	0.05 FE/mp (2023) Injury Burden
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Potential

0.12 FE/mpy (2023) Risk of Injury Fatality	0.19 FE/mpy (2022) Risk of Injury Fatality
--	--

Liquid fuels: the most common high-risk issues found during periodic inspections were:

- Employee training records not being kept for the duration of their employment
- Leak testing not being performed
- Retail outlets, marinas, private outlets, bulk plants and similar sites not being maintained and operated safely by the authorization holder

Propane sites: the most common high-risk issues found during periodic inspections were:

- Annual inspections not being conducted by authorized personnel
- Not having a portable fire extinguisher installed or available
- Not keeping training records of employees handling propane

Top 3 counties with the highest number of fuels incidents by population (normalized)

County	Number of Incidents	Population ²	Incidents/Per 1000 Population
Algoma	394	122,666	3.21
Cochrane	260	81,943	3.17
Parry Sound	147	46,753	3.14

Top 3 counties with the least number of fuels incidents by population (normalized)

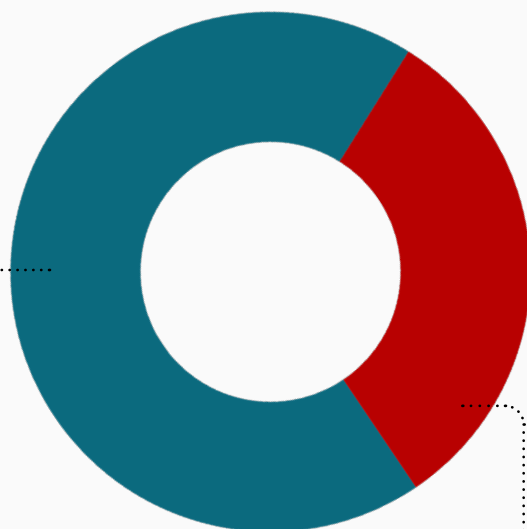
County	Number of Incidents	Population	Incidents/Per 1000 Population
Lennox and Addington	10	46,655	0.21
Manitoulin	5	14,525	0.34
Bruce	54	78,781	0.69

Risk Profile of Regulated Entities

Liquid Fuels

TSSA estimates that there were 66 high-risk liquid fuels equipment/sites in FY23, compared to 98 in FY22 – a decrease of 33%.

Figure G2: Periodic Inspection Results



Inspections with no high-risk orders: **1,045**

Inspections with high-risk orders: **484**

Of the 1,529 periodic inspections performed this year:

45%

(685)

found no issues at all

23%

(360)

found safety tasks

32%

(484)

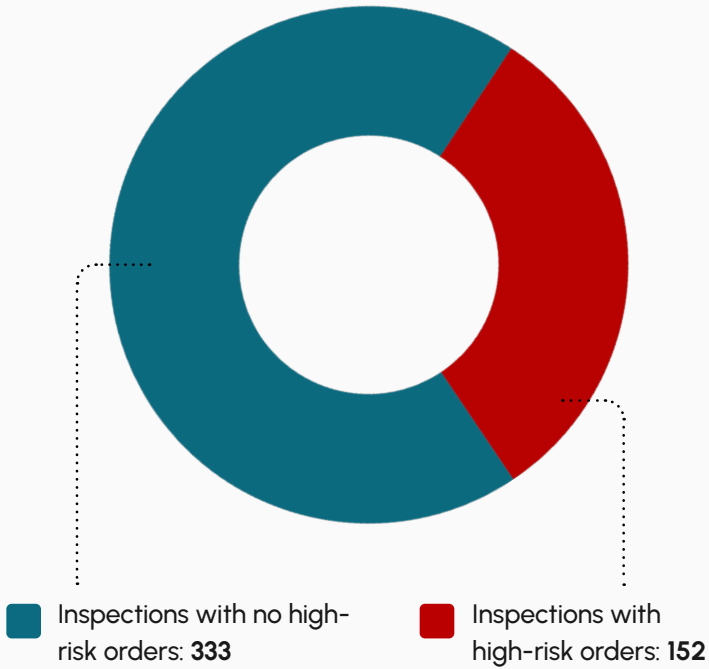
found one or more high-risk issues

² Population projections - 49_census_divisions_mof_population_projections_2022-2046 - Ontario Data Catalogue

Propane

TSSA estimates that there were 12 high-risk propane sites in Ontario in FY23, compared to nine in FY22 – an increase of 25%.

Figure G3: Periodic Inspection Results



Of the 485 periodic inspections performed this year:

60%

(289)

found no issues at all

9%

(44)

found safety tasks

31%

(152)

found one or more high-risk issues



▶ **Refer to Appendix G** for more detailed information on fuels safety.

Fuels Case Study



Cottage after explosion



Piping mice chewed through

Gas Leak Causes Cottage Explosion Injuring Two Roommates

Background

Two roommates arrived home one summer night to their small, single-story cottage in central Ontario. When they opened the door, a gas leak inside the cottage ignited causing an explosion. Both roommates suffered injuries and were taken to the hospital by ambulance. One was in critical condition. The fire department called TSSA.

TSSA Analysis & Actions

The investigation determined that the roommates had been living in the cottage with no running water or hydro. They had been using several appliances meant for outdoor use inside of the property.

The kitchen stove and fridge were illegally connected to 20-pound propane tanks that sat outside the cottage using rubber barbecue piping that was run through a hole the wall. Mice chewed through the piping, causing the gas leak that led to the explosion.

TSSA advised the property owner that the outdoor propane appliances had been installed illegally and issued non-compliance orders.

Committed to its ongoing efforts to educate the public about fuels safety, TSSA runs several awareness campaigns each year, partnering with local fire departments and various organizations, including the Canadian Propane Association, to reach wider audiences. Moreover, TSSA is constantly seeking new ways and potential partnerships to help deliver important fuels safety messaging with more impact to more Ontarians.

Operating Engineers



TSSA's Operating Engineers Safety Program registers, inspects and regulates plants that power Ontario with electricity, refrigeration, heating and cooling. TSSA is also responsible for the examination and certification of the professionals who manage power plant operations.

TSSA's comprehensive registration, inspection and certification activities ensure that operating engineers and operators have the skills and knowledge to safely manage, operate and maintain boilers, steam turbines and engines, gas compression plants, refrigeration plants, and associated mechanical and electrical systems in power generation, industrial processes and environmental plants.

Operating Engineers/ Certificate Holders

11,409



Registered Plants

2,720



Inspection Results

5-Year Average

78.0%

Periodic inspections with no high-risk issues

Orders

1,246



Incidents

1



Non-permanent Injuries **0**

Permanent Injuries **1**

Fatalities **0**



State of Public Safety in Ontario

Operating Engineers Safety Program

In FY23, 17 incidents were reported from operating engineer plants. However, 16 of these incidents were still under review at the end of the fiscal year due to ongoing inspection and investigation activity, so they will be included in the data for FY24. To keep informed of emerging trends and potential risks, TSSA staff regularly monitor information, incidents and near-misses in other jurisdictions. In the past, there was an incident outside of Ontario involving unattended refrigerated ice surface facilities. TSSA identified that the same potential risk could exist in Ontario's ice surface facilities.

Unattended refrigerated ice surfaces are an important part of Ontario's recreational landscape – they are operating plants authorized and inspected by TSSA. These facilities continue to expand to fulfil different sporting and recreational needs beyond traditional hockey arenas and curling clubs. TSSA recognizes that Ontario's aging recreational ice surfaces require proper operation, maintenance, and management to remain safe and serviceable. In addition, changes in equipment, refrigerants and technologies require continued investment by plant owners to ensure plant staff are properly trained.

In FY23, TSSA published an advisory to provide guidance on the roles and responsibilities for the safe operation and maintenance of registered unattended ice surface refrigeration plants in accordance with Operating Engineers (OE) regulation 219/01, the corresponding Director's Order, and applicable OE Alternate Rules.

The advisory also provides additional information related to:

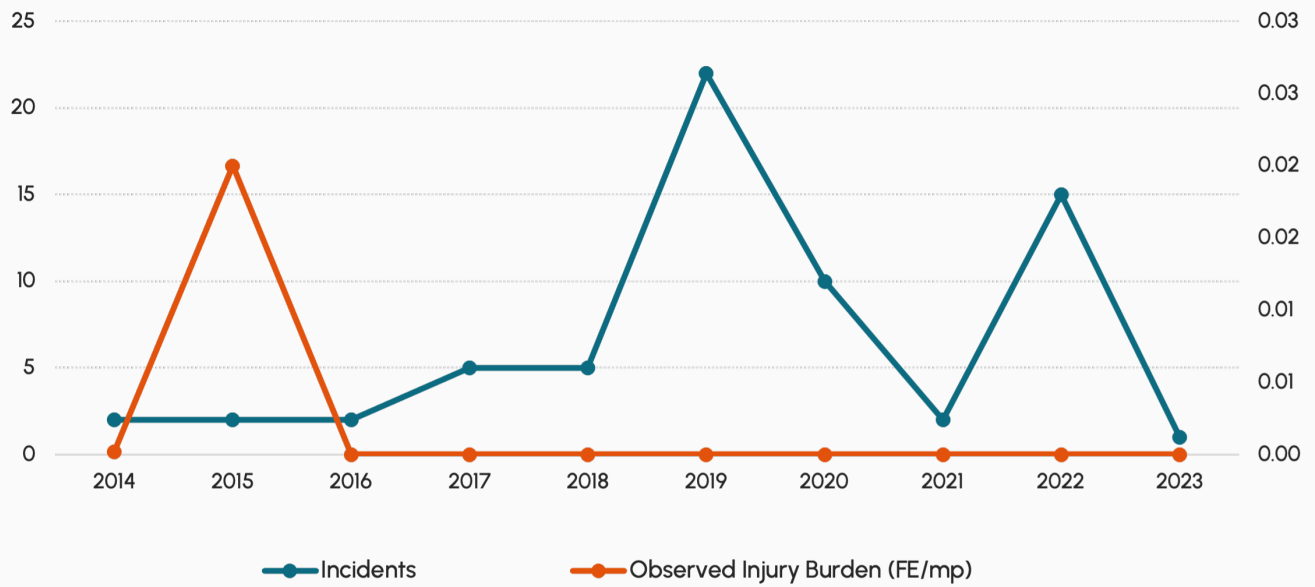
- logbooks
- holidays and seasonal closure inspections
- long-term shutdown, decommissioning and dismantling of a refrigeration plant
- training and emergency manuals
- asset management plans
- accident reporting



Risk Profile of Regulated Entities

Of the operating plants in Ontario, TSSA has determined that 2.2% require more frequent inspections. This determination is based on their inspection history and their risk score using TSSA's 2007 risk score model. Compared to FY22, there were 14 fewer high-risk plants in FY23.

Figure H1: 10-Year Safety Trends for Operating Engineers



The number of incidents related to operating engineers has remained very low – an average of seven in the past 10 years. While this is a positive indicator, TSSA continues to work with industry representatives to ensure there is a shared understanding of the value of reporting incidents and near-misses to facilitate data-driven decision-making.

Incidents				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
10-year Average	7	0	0	0
2023	1	0	1	0
Incidents Currently Under Review*				
Reporting Period	Incidents	Non-Permanent Injuries	Permanent Injuries	Fatalities
2023	16	0	0	0
2022	2	0	0	0

*Open incidents as of June 27, 2023

Most of the incidents reported to TSSA occurred in manufacturing industries, specifically in refrigeration plants, high-pressure water tube, low-water volume power plants, and low-pressure steam plants.

Top Safety Issues FY2014 - 2023

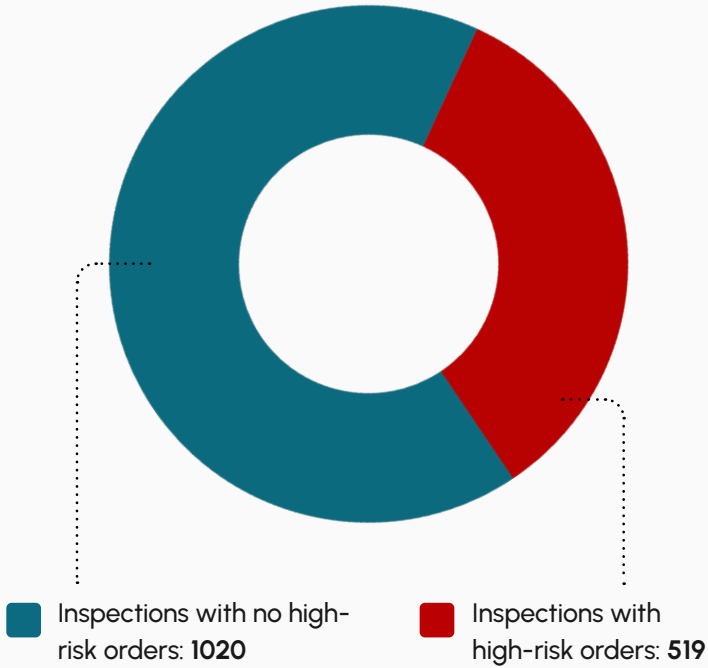
Plant Types	
Refrigeration Plant	20.69%
High-Pressure Water Tube Low-Water Volume Power Plant	17.24%
Low-Pressure Steam Plant	13.79%
Plant Function Types	
Manufacturing Industries	22.41%
Academic	10.34%
Medical	10.34%

Health Impact

Observed	
0.002 FE/mp 10-year Average Injury Burden	0.00 FE/mp (2023) Injury Burden
Potential	
0.001 FE/mpy (2023) Risk of Injury Fatality	0.001 FE/mpy (2022) Risk of Injury Fatality



Figure H2: Periodic Inspection Results



Of the 1,539 periodic inspections performed this year:

52%

(796)
found no issues at all

14%

(224)
found safety tasks

34%

(519)
found one or more high-risk issues

The most common high-risk issue found during inspections was equipment without TSSA-registered seals. The top compliance issues found include equipment not being inspected and posted by an insurance company and TSSA safety concerns not being rectified.

▶ **Refer to Appendix H** for more detailed information on operating engineers.

Operating Engineers Case Study

Operating Engineer Suffers Burn and Cut from Poorly Insulated Accumulator Steam Line

Background

A fourth-class power engineer was performing a routine boiler shutdown at a plant in the GTA. After he closed the valve and climbed down the ladder, his arm came into contact with a hot, poorly insulated accumulator steam line with exposed metal. He suffered a burn on his forearm and a minor cut.

The worker received first aid treatment on-site and went on with his duties. After work, however, the pain from his wound persisted, and he went to the hospital for further treatment.

He reported the incident to TSSA.

Upon investigation, TSSA found that the boiler had not been properly insulated.

TSSA Analysis & Actions

TSSA issued orders requiring the plant to insulate the exposed area of the accumulator steam line and submit a full report of the incident to the Statutory Director of TSSA's Operating Engineers Safety Program. In addition, TSSA is conducting a full in-depth root cause analysis on this incident to understand the factors that led to the incident occurring.

TSSA highlights this incident to remind the industry that every owner and operator of a boiler, pressure vessel, fitting or piping is responsible for ensuring that the equipment is maintained and operated safely.

TSSA sees very few incidents in the operating engineers sector. Therefore, this occurrence is not indicative of a trend.



Poorly insulated accumulator steam line