



DATA TABLES

TSSA PUBLIC SAFETY REPORT 2022



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Appendix A: Cross-Program Data

Incidents, Injuries and Risk Prediction

TSSA reports on two main measures of public safety and risk:

- 1. Observed Injury Burden:** Summarizes what has happened in the past and quantifies fatalities and injuries, expressed in terms of fatality equivalents per million people (FE/mp).
- 2. Risk of Injury or Fatality (RIF):** Uses a predictive approach¹ developed by TSSA. It is a composite score across all TSSA-regulated sectors that uses past data to predict what might happen in the future².

Table A1: Cross-Program State of Safety Measures (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE	TREND (ANNUAL)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Incidents	4,936	5,514	5,334	5,653	5,082	5,654	6,308	5,994	4,246	4,467	53,188	5,319	No Trend
Non-Permanent Injuries	953	1,243	1,168	1,597	1,082	1,357	1,835	1,908	421	983	12,547	1,255	No Trend
Permanent Injuries	35	51	56	80	69	41	59	46	20	29	486	49	No Trend
Fatalities	4	10	4	2	4	2	2	3	5	2	38	4	No Trend
Observed Injury Burden (FE/mp)	0.47	0.65	0.27	0.41	0.40	0.32	0.36	0.40	0.31	0.25	N/A	0.38	N/A

Table A2: Cross-Program Risk of Injury or Fatality (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.44	0.39	0.40	0.32

Anything with a RIF of 1.00 FE/mpy or higher is considered an area of concern.

¹ Veeramany A and Mangalam S. "Application of disability-adjusted life years to predict the burden of injuries and fatalities due to public exposure to engineering technologies." Population Health Metrics 12 (2014): 1-9.

² Readers are cautioned that composite Risk of Injury or Fatality has been established for reporting and benchmarking purposes only. Sections provided for the individual safety programs help gain an understanding of the significant causes, and more importantly, strategies for monitoring and managing risk to Ontarians.



Figure A1: Incidents and Observed Injury Burden for Regulated Program Areas (2013 – 2022)

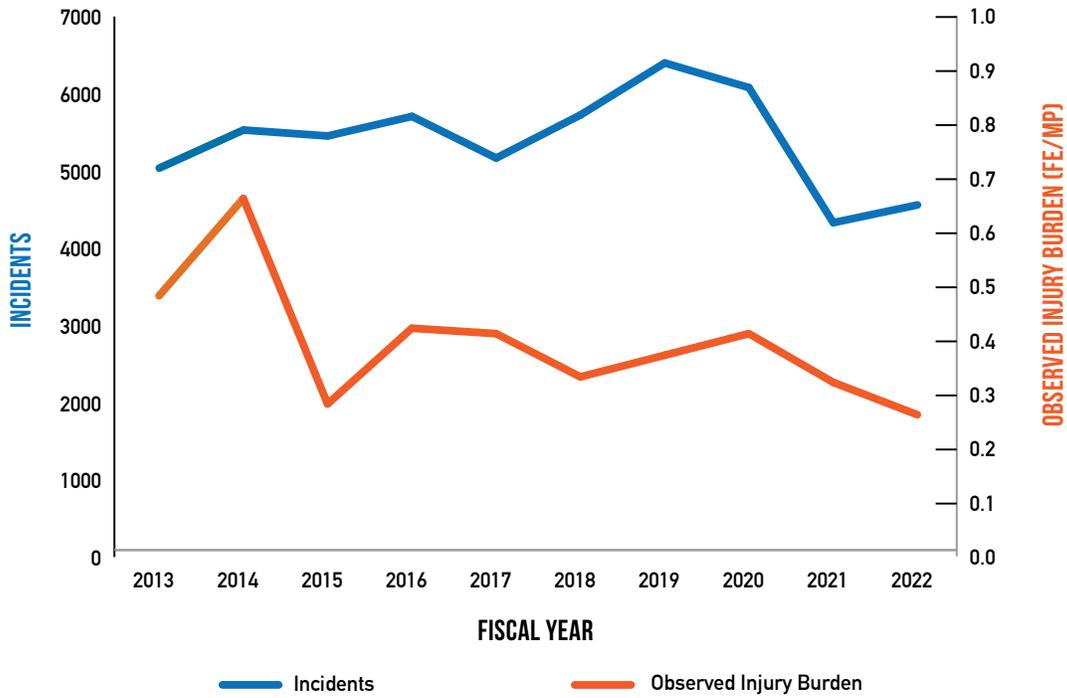
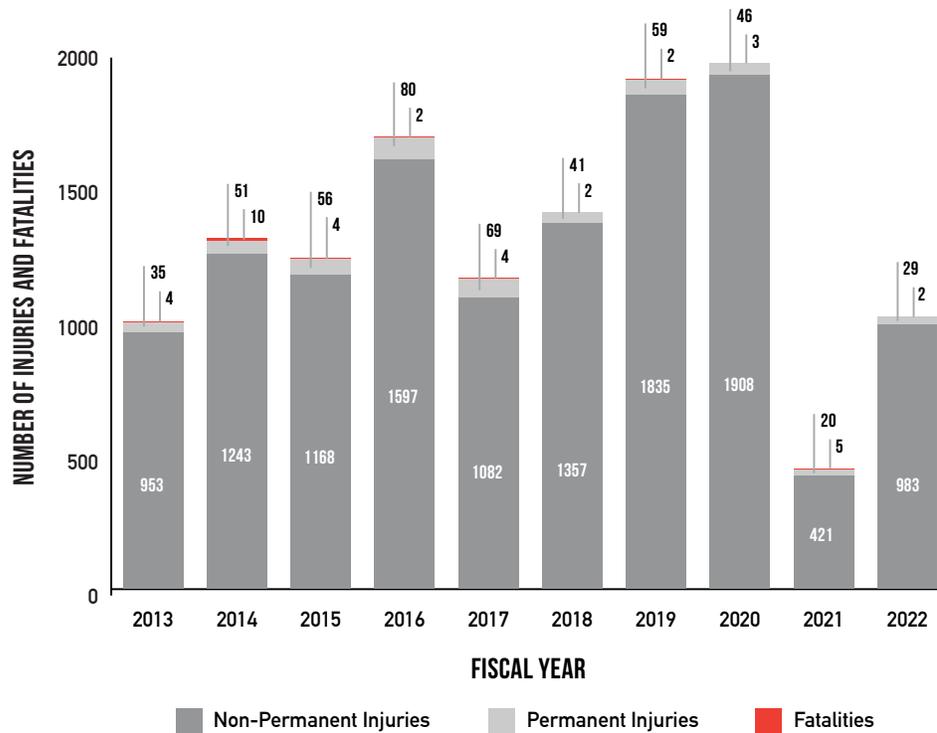


Figure A2: Injuries and Fatalities for Regulated Program Areas (2013 – 2022)



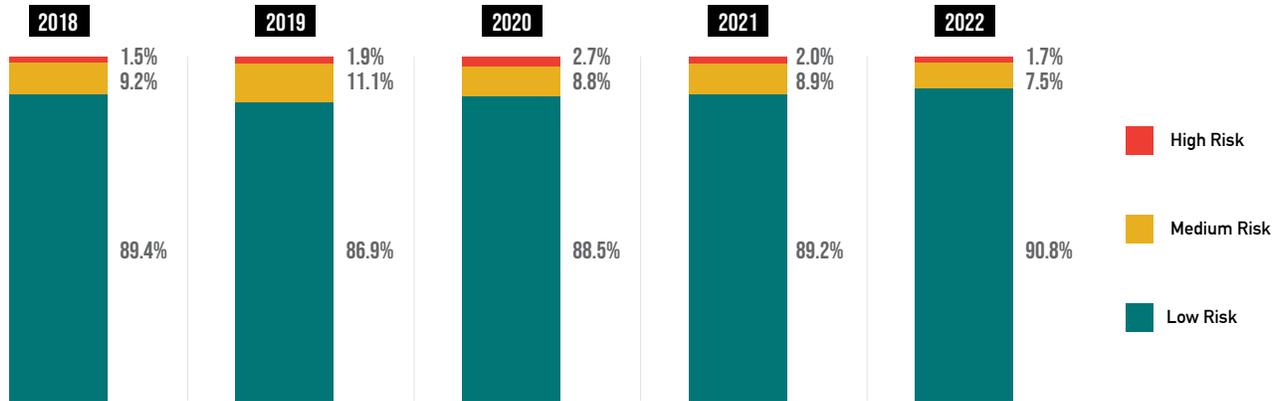
Risk of Facilities or Devices

Using a harmonized approach described in [Appendix N⁶](#), an inventory risk profile has been generated to reflect the risk of harm across TSSA's entire regulated inventory. The calculation only includes devices for which there is sufficient inspection history (i.e., three or more periodic inspections) to estimate the risk. Certain sectors (i.e., Elevating Devices) have a large fraction of new devices for which an assessment cannot yet be made.

Table A3: High Risk Inventory from Outcomes of Periodic Inspections Across All Programs (2021 – 2022)

DESCRIPTION	FISCAL YEAR 2021	FISCAL YEAR 2022	COMMENTS
High-Risk Inventory	2.0%	1.7%	Most of the change was seen in Fuels.

Figure A3: Inventory Risk Profiles from Outcomes of Periodic Inspections Across All Programs (2018 – 2022)



⁶ [Appendix N](#) is found in Technical Appendices report.

Compliance

TSSA uses a rolling five-year period for measurement and reporting of compliance information for this report. For more details on statistical methods, please refer to [Appendix M⁷](#).

The 5-year average compliance rate for all program areas is 28%. This means that 28% of devices and facilities for that are periodically inspected have had no orders issued. The Compliance Rate does not take into account the relative risk of the orders issued. For more information on the relative risk of inspections, please see below.

Table A4: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections Across All Programs (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)	COMMENTS
Compliance Rate (Mean)	28.0%	No Trend	Improving

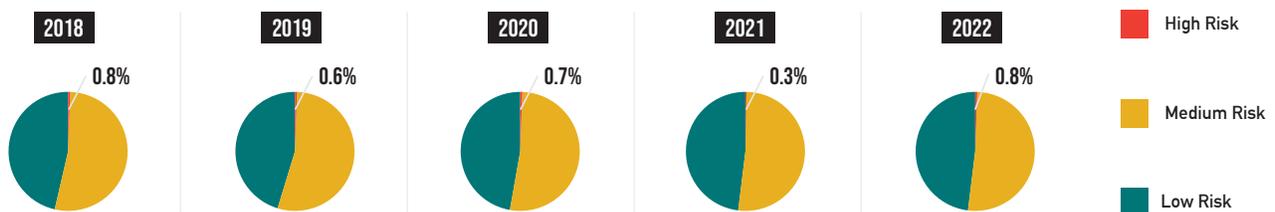
Risk of Orders

While the compliance rate provides an outcome of the periodic inspections (e.g., pass or fail), the inspection risk spectrum (shown as a pie chart) portrays the potential safety risks associated with non-compliance found during the inspections. The red segments of the spectrums show high levels of risk.

Table A5: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted in All Regulated Sectors (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.83%
Low-Risk Issues	44.96%

Figure A4: Inspection Risk Spectrums from Outcomes of Periodic Inspections Conducted in All Regulated Sectors (2018 – 2022)



⁷ [Appendix M](#) is found in Technical Appendices report.

Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate, which can result in small differences between the two numbers.

Table A6: Cross-Program Inspection and Re-Inspection Results (2022)

DESCRIPTION	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Ad Hoc/Unscheduled Inspections	1,695	1,164	144	3,003	59%
Alteration Inspections	71	4	0	75	95%
Complaint Inspections	343	41	0	384	89%
Initial Inspections	6,390	2,577	23	8,990	71%
Inspections for Certification	948	0	1,248	2,196	100%
Minor Alteration Inspections	1,497	1,165	0	2,662	56%
Non-Mandated/Non-Regulated Inspections	1,635	399	434	2,468	80%
Incident Inspections	345	112	2,580	3,037	75%
Operational Inspections	27	8	0	35	77%
Other Inspections	9,727	4,123	971	14,821	70%
Periodic Inspections	7,140	10,956	248	18,344	39%
Re-Inspections	10,452	14,665	271	25,388	42%
Repair Inspections	584	4	0	588	99%
All Programs Total	40,854	35,218	5,919	81,991	54%



Appendix B: Boilers and Pressure Vessels

TSSA's Boilers and Pressure Vessels Safety Program ensures the safe design, construction, maintenance, use, operation, and repair of pressure-retaining components in Ontario. This includes all pressure-retaining components that produce and distribute hot water, steam, compressed air and other compressed liquids and gases for industrial, commercial, or institutional purposes.

Note that numbers may not add up fully or may exceed the 100th percentile due to rounding off.

Incidents, Injuries and Risk Prediction

Table B1: State of Safety Measures for Uninsured Boilers and Pressure Vessels (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE	TREND (ANNUAL)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Incidents	2	0	1	5	4	22	117	150	148	123	572	57	Increasing
Non-Permanent Injuries	0	0	0	1	0	0	2	0	0	0	3	0	No Trend
Permanent Injuries	0	0	0	1	2	1	0	0	0	0	4	0	No Trend
Fatalities	0	0	0	0	0	0	0	0	0	0	0	0	No Trend
Observed Injury Burden (FE/mp)	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	N/A	0.00	N/A

TSSA recently published guidelines to clarify what incident and near miss data should be reported to TSSA, with the intent of improving the completeness of occurrences reported to TSSA for the purposes of data analytics and risk management.

Over 96% of the incidents in FY22 were refrigerant leaks which was similar to last fiscal year (FY21).

There have been no fatalities in the past 10 years.

Table B2: Risk of Injury or Fatality for Uninsured Boilers and Pressure Vessels (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.001	0.001	0.001	0.001

Anything with a RIF of 1.00 FE/mpy or higher is considered an area of concern.



Incidents involving these types of equipment could include cracked and corroded vessels or piping, leaks or rupture, 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 boilers and pressure vessels, 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.

Figure B1: Incidents and Observed Injury Burden for *Uninsured* Boilers and Pressure Vessels (2013 – 2022)

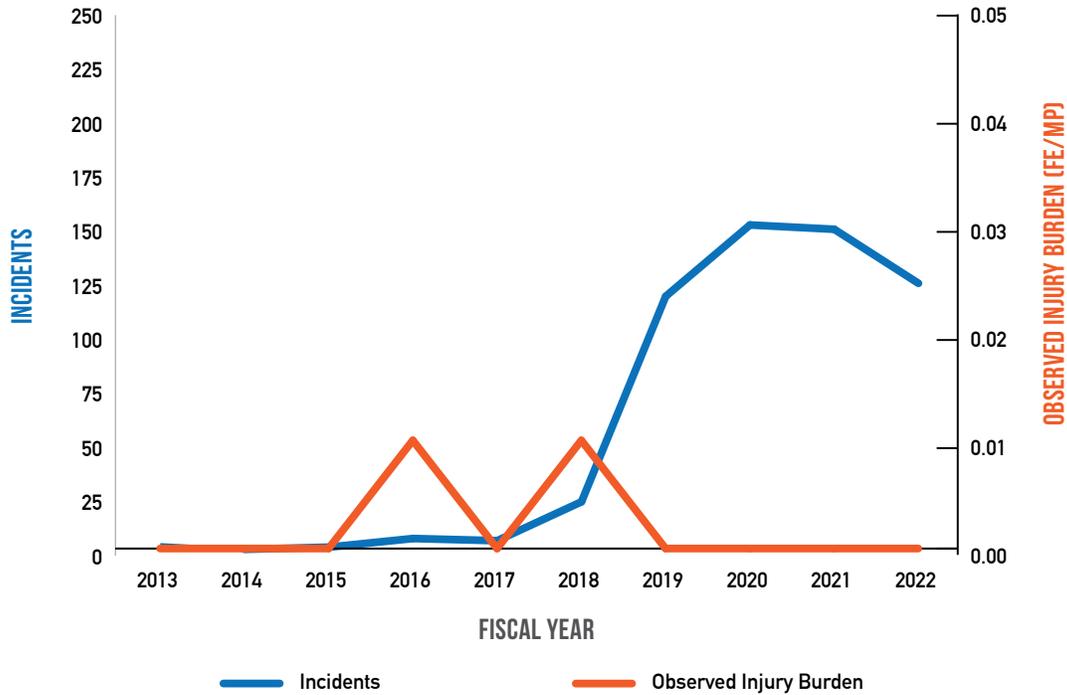


Figure B2: Injuries and Fatalities for *Uninsured* Boilers and Pressure Vessels (2013 – 2022)

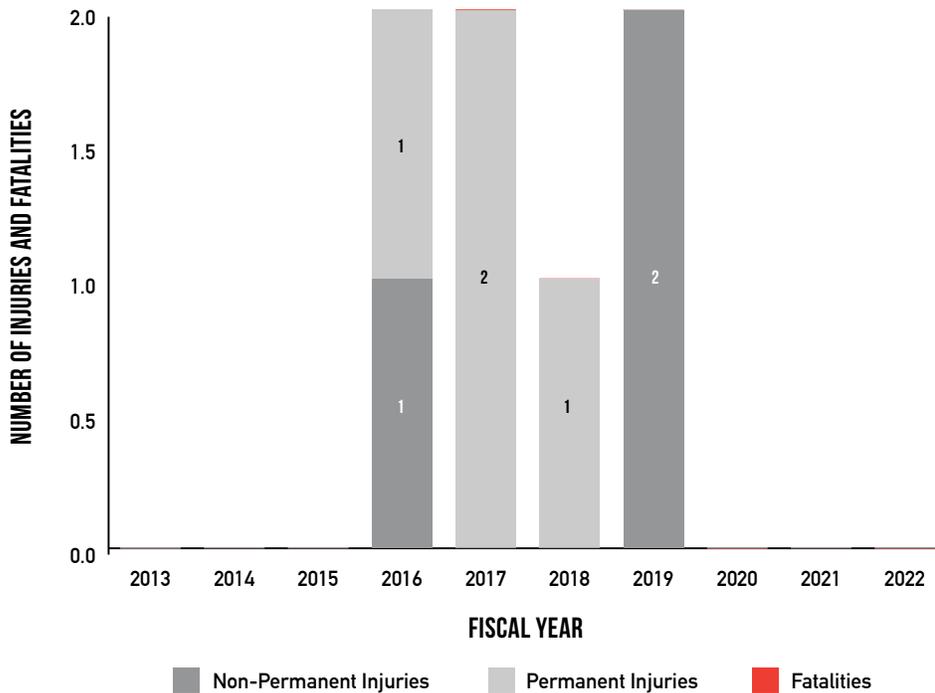
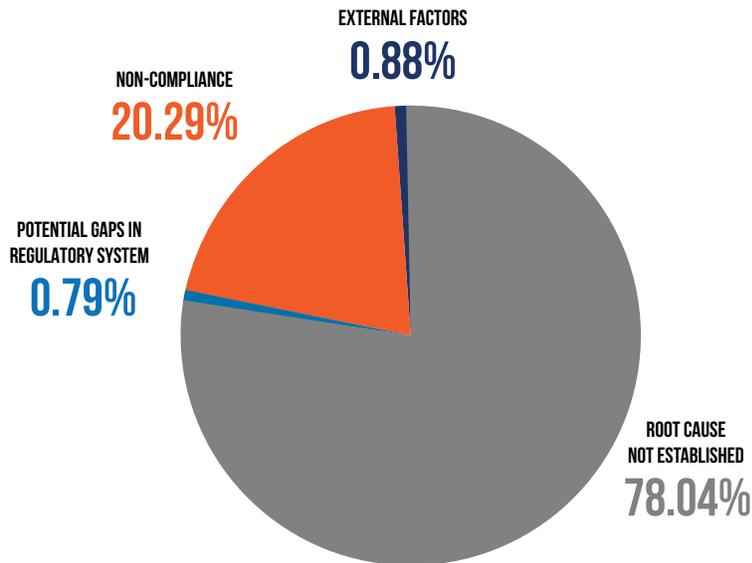


Figure B3: Risk of Injury or Fatality for Uninsured Boilers and Pressure Vessels by Casual Analysis Category (2013 – 2022)



Compliance

Ontario Regulation 220/01, Boilers and Pressure Vessels assigns periodic inspection responsibility to both TSSA and insurers who underwrite boiler and machinery insurance. Insurers conduct periodic inspections for the majority of Ontario’s fleet of boilers and pressure vessels.

On July 1, 2018, TSSA began issuing certificates of inspection (COI) for boilers and pressure vessels which had undergone periodic inspections.

The frequency of inspections is specified in the Code Adoption Document (CAD) associated with *Ontario Regulation 220/01*. Periodic inspections contribute to the preventative management of risk associated with boilers and pressure vessels. Through the inspection process, any non-conformances are directed to the owner for action within an appropriate time frame.

Uninsured Equipment

Table B3: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections Conducted on Uninsured Boilers and Pressure Vessels (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Equipment not prepared for TSSA inspection	44.78%
Equipment not maintained in safe working condition	19.40%
Pressure relief device is inadequate	13.43%

Note that the Boilers and Pressure Vessels Safety Program does not currently use a risk-based inspection system.

Insured Equipment

TSSA does not currently collect inspection and compliance data for 98% of BPV in Ontario. This is because most BPV are insured, and insurance companies are responsible for those inspections. TSSA provides a Certificate of Inspection for those devices that have a valid record of inspection submitted by insurance companies.

For this reason, it is no possible to provide aggregated safety performance measures at this point.



Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate used in the main body of the report, which can result in small differences between the two numbers.

Table B4: Uninsured Boilers and Pressure Vessels Inspection and Re-Inspection Results (2022)

DESCRIPTION	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Alteration Inspection	32	0	0	32	100%
Initial Inspection	2,427	279	19	2,725	90%
Inspection For Certification	948	0	1,248	2,196	100%
NonMandated/Non-regulated Inspection	1,294	0	135	1,429	100%
Incident Inspection	0	0	0	0	N/A
Other Inspection	8,411	148	198	8,757	98%
Periodic Inspection	197	12	3	212	94%
Reinspection	202	7	0	209	97%
Repair Inspection	584	4	0	588	99%
Grand Total	14,095	450	1,603	16,148	97%

Legislation and Regulatory Information

Table B5: TSSA Boilers and Pressure Vessels Legislation and Regulatory Information (2022)

LEGISLATION AND REGULATORY INFORMATION	LATEST REVISION
Ontario Regulation 220/01: Boilers and Pressure Vessels Regulation	2018
Summary of Key Changes for the Regulation of Pressure Equipment	2001
Minister’s Exemption for Agriculture – Revocation	2021
Boilers and Pressure Vessels CAD Amendment BPV-20-01 R1	2021
BPV Incident Reporting Advisory BPV-22-01	2022

During this fiscal year, there was one Boilers and Pressure Vessels advisory issued. See www.tssa.org for a comprehensive listing of legislation and regulatory information.

Appendix C: Operating Engineers

TSSA's Operating Engineers Safety Program registers, inspects and regulates plants that power Ontario with electricity, refrigeration, heating and cooling and is also responsible for the examination and certification of operating engineers (also known as power engineers). In addition, TSSA provides oversight of the management, operation, and maintenance of plants to ensure compliance to the regulation and established safety standards.

Note that numbers may not add up fully or may exceed the 100th percentile due to rounding off.

Incidents, Injuries and Risk Prediction

Table C1: State of Safety Measures for Operating Plants (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE	TREND (ANNUAL)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Incidents	0	1	2	2	5	4	21	9	2	14	60	6	No Trend
Non-Permanent Injuries	0	0	1	0	0	0	0	0	0	0	1	0	No Trend
Permanent Injuries	0	1	1	1	0	0	0	0	0	0	3	0	No Trend
Fatalities	0	0	0	0	0	0	0	0	0	0	0	0	No Trend
Observed Injury Burden (FE/mp)	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N/A	0.00	N/A

Table C2: Risk of Injury or Fatality for Operating Plants (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.001	0.001	0.002	0.001

Anything with a RIF of 1.00 FE/mpy or higher is considered an area of concern.



Figure C1: Incidents and Observed Injury Burden for Operating Plants (2013 – 2022)

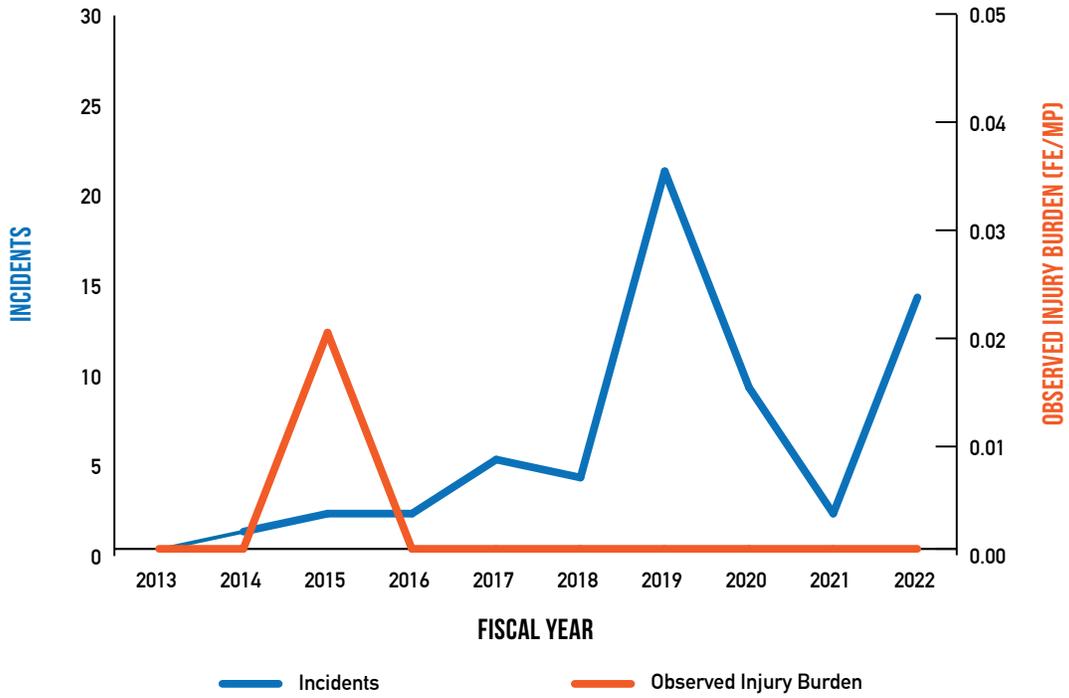


Figure C2: Injuries and Fatalities for Operating Plants (2013 – 2022)

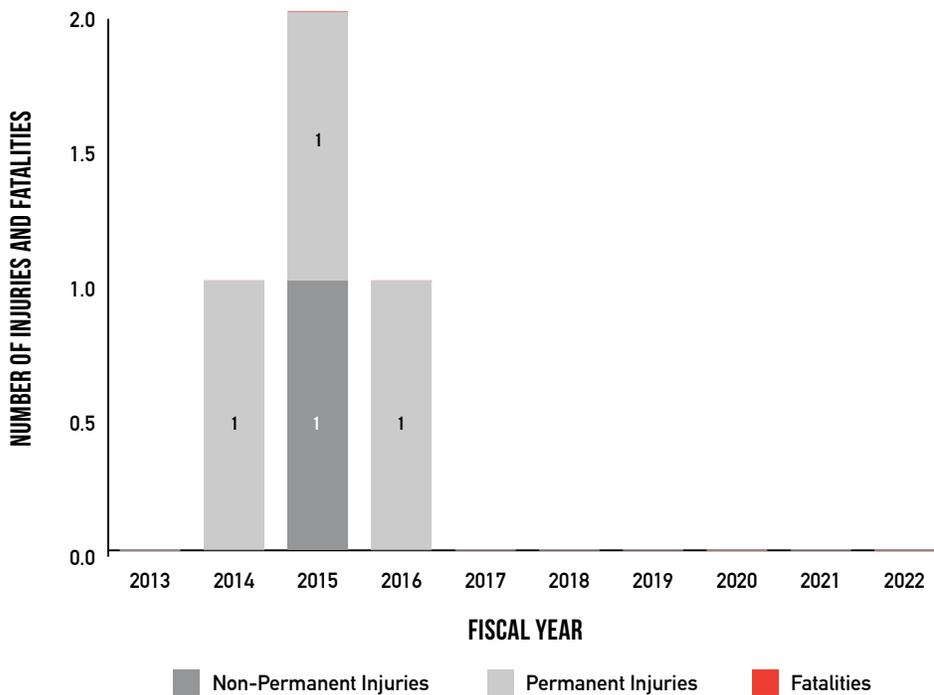
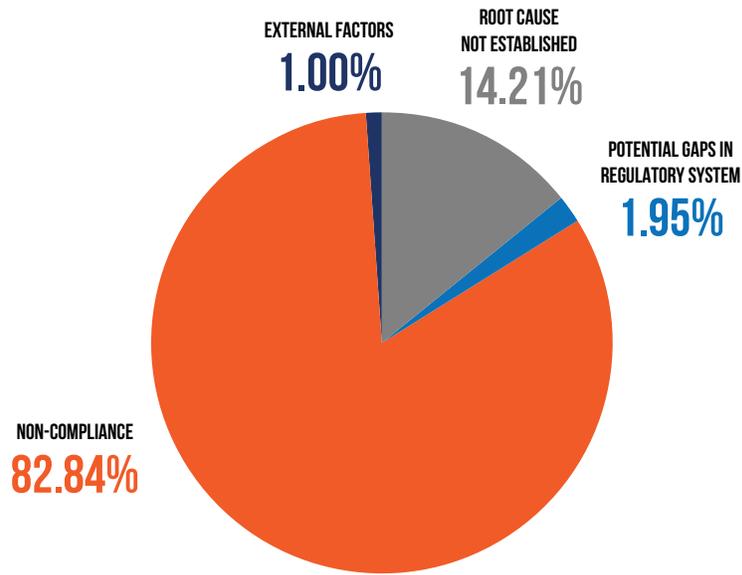


Figure C3: Risk of Injury or Fatality for Operating Plants by Casual Analysis Category (2013 - 2022)



Risk of Facilities

TSSA conducts periodic inspections of registered operating plants in Ontario. These inspections assist in maintaining a low to negligible risk of injury or fatality to Ontarians that may result from non-compliance with the regulatory requirements. TSSA uses a risk-based inspection scheduling process (RBS)⁸ to determine the frequency of inspections of all registered plants. Data collected through these inspections helps prioritize frequency of inspections and proactively manage risk of injury or fatality.

Table C3: Number of Operating Engineers (2022)

DESCRIPTION	NUMBER
Operating engineers	13,922

Table C4: Number of Operating Plants (2022)

DESCRIPTION	NUMBER
Operating plants inventory	3,189
Operating plants that had sufficient inspection history to calculate a risk score	3,081

⁸ Mangalam S, Mulamootil LA, Veeramany A, Witt D, and Karavas R. "System and method for inspecting and assessing risk of mechanical equipment and facilities." U.S. Patent No. 13/894,812, May 15, 2013.

Figure C4: Inventory Risk Profiles from Outcomes of Periodic Inspections Conducted on Operating Plants (2018 – 2022)

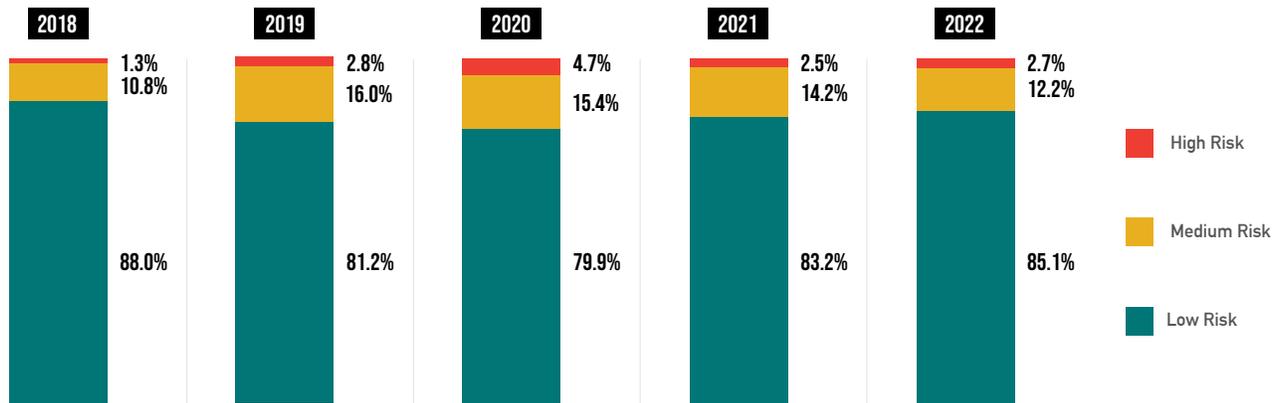


Table C5: Number of High-Risk Operating Plants (2022)

DESCRIPTION	NUMBER	PER CENT OF QUALIFIED PROVINCIAL INVENTORY
High-Risk Operating Plants	72	2.7%

Table C6: Top High-Risk Plant Types (2022)

PLANT TYPE	PERCENTAGE OF TOTAL HIGH-RISK PLANTS
Refrigeration Plant	24.79%
Low Pressure Steam Plant	23.93%
High-Pressure Water tube Low-Water-Volume Power Plant	14.53%

Table C7: Top High-Risk Plant Function Types (2022)

PLANT FUNCTION TYPE	PERCENTAGE OF TOTAL HIGH-RISK PLANTS
Manufacturing Industries	23.08%
Public Services	16.24%
Production Industries	13.68%

Compliance

The compliance rate is defined as the percentage of periodic inspections with no orders issued compared to the total number of periodic inspections.

Using a risk-based approach (i.e., RBS), the entire inventory is inspected at least once over a two-year period. The RBS model, described in [Appendix N](#)⁹ in detail, is based on a historical profile of the nature and significance of non-compliance found at the plants.

⁹ [Appendix N](#) is found in Technical Appendices report.

**Figure C5: Yearly Compliance Rates from Outcomes of Periodic Inspections
Conducted on Operating Plants (2018 – 2022)**



**Table C8: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections
Conducted on Operating Plants (2018 – 2022)**

DESCRIPTION	FISCAL YEAR 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	42.5%	Decreasing

TSSA deals with observed non-compliance by issuing inspection orders to the owner to address the non-compliance within an appropriate time frame. This process contributes to the preventative management of risk of injury or fatality associated with operating plants.

**Table C9: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections
Conducted on Operating Plants (2018 – 2022)**

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Equipment not inspected and posted by an Insurance Company or TSSA	10.68%
Safety concerns not rectified	7.54%
Testing of safety devices not recorded	4.99%

**Table C10: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Inspections
Conducted on Operating Plants (2018 – 2022)**

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
TSSA-registered seals missing	66.38%
Boiler safety valves over 5 years old not recertified or replaced	7.77%
Refrigeration plant safety valves over 5 years old not maintained or replaced	4.18%



Risk of Orders

While the compliance rate provides an outcome of the periodic inspection (e.g., pass or fail), the inspection risk spectrum (shown as a pie chart) portrays the potential safety risks associated with non-compliance found during the inspection. The red segments of the spectrums show unacceptable levels of risk.

Table C11: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted on Operating Plants (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.01%
Low-Risk Issues	65.99%

Figure C6: Inspection Risk Spectrums from Outcomes of Periodic Inspections Conducted on Operating Plants (2018 – 2022)



Some examples of minor issues include: the plant not being re-registered after changing its name or ownership; missing signage; the registration certificate not being posted in a conspicuous location; missing information from the logbook; and general housekeeping concerns.

Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate used in the main body of the report, which can result in small differences between the two numbers.

Table C12: Operating Plants Inspection and Re-Inspection Results (2022)

INSPECTION TYPE	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Initial Inspection	16	16	0	32	50%
Non-mandated/Non-regulated Inspection	3	2	0	5	60%
Incident Inspection	0	0	0	0	N/A
Other Inspection	4	10	0	14	29%
Periodic Inspection	811	741	5	1,557	52%
Reinspection	317	57	2	376	85%
Grand Total	1,151	826	7	1,984	58%



Legislation and Regulatory Information

Table C13: TSSA Operating Engineers Legislation and Regulatory Information (2022)

LEGISLATION AND REGULATORY INFORMATION	LATEST REVISION
Ontario Regulation 219/01: Operating Engineers Regulation	2001
Ontario Regulation 219/01: Director's Order	2003
Minister's Order for Operating Engineers Alternate Rules	2020

During this fiscal year, there were no Operating Engineers director's orders, advisories bulletins or guidelines issued. See www.tssa.org for a comprehensive listing of legislation and regulatory information.



Appendix D: Amusement Devices

TSSA's Amusement Devices Safety Program regulates amusement rides in Ontario to ensure all devices conform to the Act and its associated regulations, codes and standards. The various types of regulated amusement devices include roller coasters, Ferris wheels, merry-go-rounds (and other circular motion rides), water slides, flume rides, dry slides, go-karts, bumper cars, inflatables (inflatable bouncers), bungee devices, bungee-assisted bouncers, zip lines (track and cable rides), and other generic spinning and whirling rides. As part of the Amusement Devices Safety Program, TSSA: licenses operators; reviews and registers rides; conducts inspections and incident investigations; and issues permits for each ride in the current operating season.

Note that numbers may not add up fully or may exceed the 100th percentile due to rounding off.

Incidents, Injuries and Risk Prediction

Table D1: State of Safety Measures for Amusement Devices (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE	TREND (ANNUAL)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Incidents	331	521	647	922	439	709	1,195	1,378	97	543	6,782	678	No Trend
Non-Permanent Injuries	313	454	585	848	377	661	1,100	1,235	89	527	6,189	619	No Trend
Permanent Injuries	11	25	24	42	33	23	29	26	1	8	222	22	No Trend
Fatalities	0	0	0	0	0	0	1	0	1	0	2	0	No Trend
Observed Injury Burden (FE/mp)	0.06	0.02	0.08	0.11	0.08	0.11	0.15	0.15	0.12	0.01	N/A	0.09	N/A

Table D2: Risk of Injury or Fatality for Amusement Devices (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.06	0.08	0.09	0.07

Anything with a RIF of 1.00 FE/mpy or higher is considered an area of concern.



Figure D1: Incidents and Observed Injury Burden for Amusement Devices (2013 – 2022)

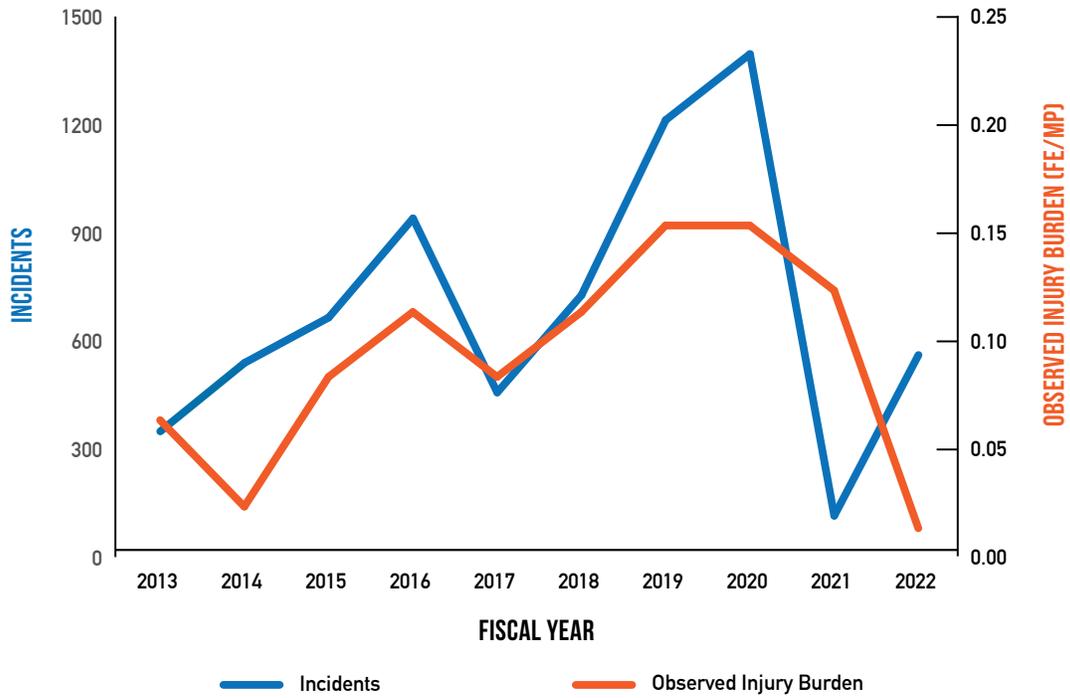


Figure D2: Injuries and Fatalities for Amusement Devices (2013 – 2022)

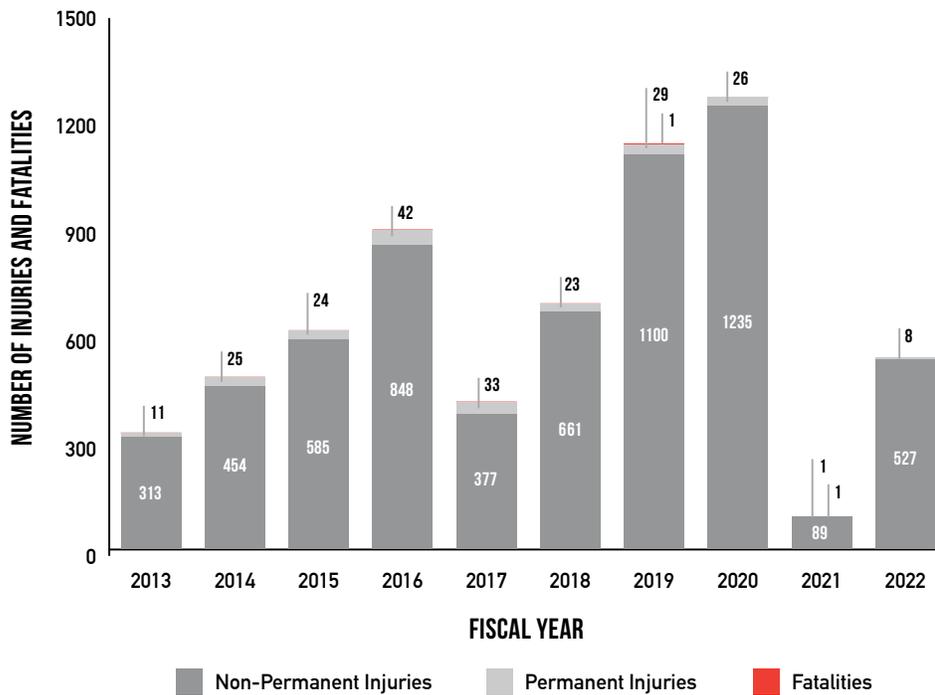
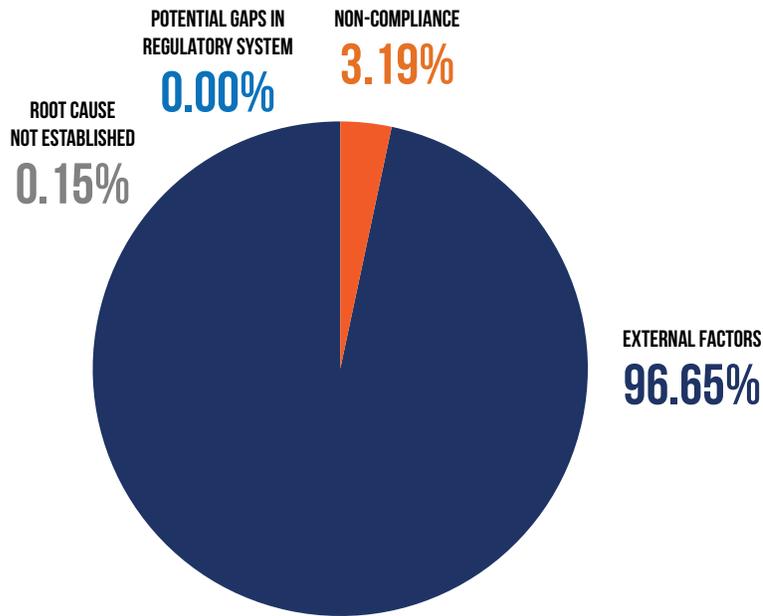


Figure D3: Risk of Injury or Fatality for Amusement Devices by Casual Analysis Category (2013 - 2022)



Risk of Potential Gaps in the Regulatory System

Some typical examples of potential gaps in the regulatory system include: head injuries that might have been avoided through the use of helmets and/or device padding; enhanced railings to prevent egress of riders from the device (e.g., railings along the sides of slides); and additional guarding of moving parts to prevent entrapment (e.g., finger under train wheel).

Risk of Non-Compliance

Some typical examples of non-compliance include: the operator not obeying the ride height restrictions; a lap bar spring becoming detached, a slip-ring wire coming loose and electrifying the fence; the drive wheel of a Ferris wheel coming loose; and the passenger-carrying unit coming loose due to a broken weld.

Risks due to External Factors (2013 – 2022)

Some typical examples of external factors include: a passenger on a zip line getting their finger caught in the pulley; a passenger having a finger pinched during closure of the lap bar; a passenger hitting their head while coming down a water slide; a go-kart colliding with another go-kart; and a patron tripping and falling while running towards the ride.

Risks due to All Causes

Table D3: Human Factors in Amusement Device Occurrences (2013 – 2022)

DESCRIPTION	PERCENTAGE OF OCCURRENCES
Human Factors	93.7%

Table D4: Top Amusement Device Types by Number of Occurrences (2013 – 2022)

DEVICE TYPE	PERCENTAGE OF OCCURRENCES
Amusement Rides	50.35%
Waterslides	31.14%
Zip Lines	14.05%

Table D5: Top Amusement Device Types by Observed Injury Burden (2013 – 2022)

DEVICE TYPE	PERCENTAGE OF OBSERVED INJURY BURDEN
Amusement Rides	38.00%
Waterslides	24.80%
Zip Lines	20.35%

Figure D4: Number of Occurrences by Amusement Device Types (2013 – 2022)

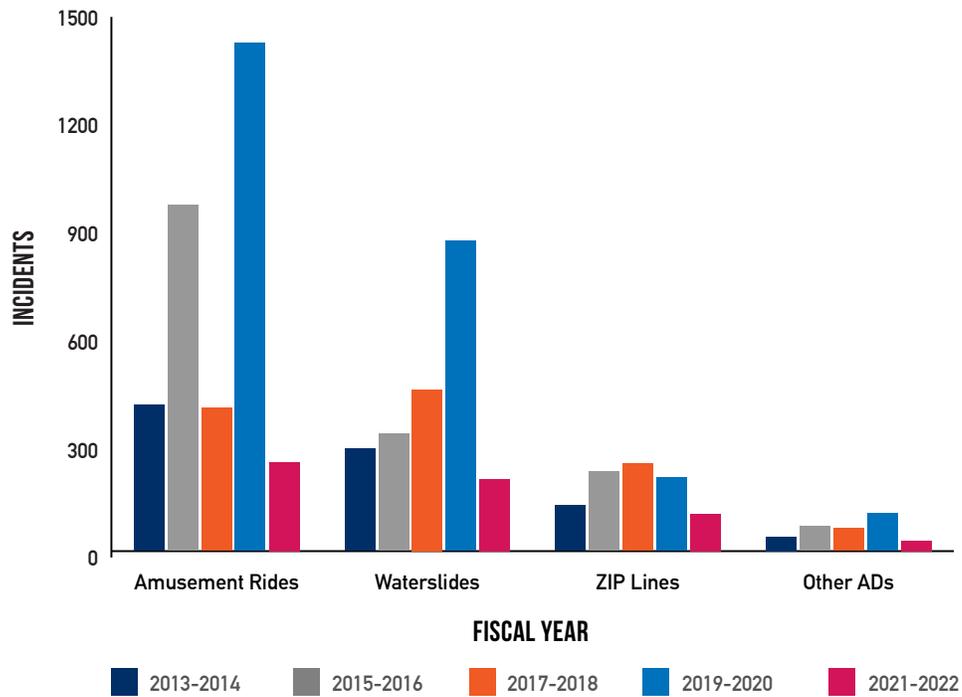


Figure D4 Shows that during FY19-20, the number of incidents in Amusement Devices declines across all device types. This is a result of pandemic related closures. In fact, in FY21-22, we are starting to see the number of incidents increase again.

Risk of Devices

TSSA conducts periodic inspections of all amusement devices at the start of the season to oversee and manage the state of compliance across permitted amusement devices in the province of Ontario. Amusement device operations are generally seasonal in nature with a few devices operating all year round. TSSA deals with non-compliance by requiring the owner to address observed failures within an appropriate time frame through the issuance of inspection orders. This process contributes to the preventative risk management of the inventory.

Table D6: Number of Amusement Devices (2022)

DESCRIPTION	NUMBER
Amusement devices inventory	4,382
Amusement devices that had sufficient inspection history to calculate a risk score	3,107

The number of Amusement Devices that have an active license to operate in any given year is usually lower than the total number of devices in TSSA's database. This is because any device can become inactive at any time during the year (eg. a portable device is moved out of province).

Figure D5: Inventory Risk Profiles from Outcomes of Periodic Inspections Conducted on Amusement Devices (2018 – 2022)

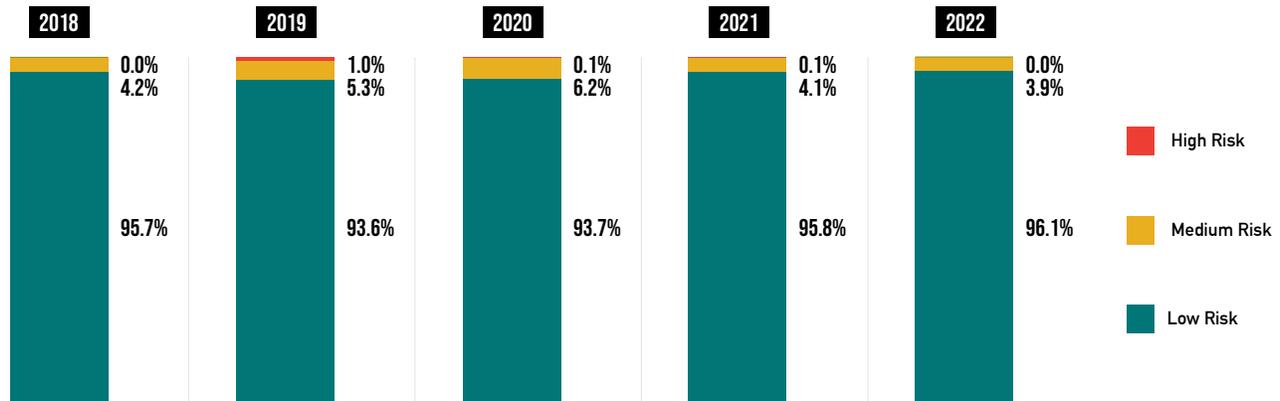


Table D7: Number of High-Risk Amusement Devices (2022)

DESCRIPTION	NUMBER	PERCENT OF QUALIFIED PROVINCIAL INVENTORY
High-Risk Devices	1	0.03%

Table D8: Top High-Risk Amusement Device Types (2022)

DEVICE TYPE	PERCENTAGE OF TOTAL HIGH-RISK DEVICES
Amusement Rides	100%

Compliance

For amusement devices, the ride operators perform an important role in ensuring that the users are adhering to the rules for safe riding. Part of TSSA's inspection is to witness the operation of the ride and verify that operating procedures are being followed, thus managing the risk of non-compliance.

The compliance rate is defined as the percentage of periodic inspections with no orders issued compared to the total number of periodic inspections.

Some operational inspections were also performed, and their numbers are given below for comparison purposes.

Figure D6: Yearly Compliance Rates from Outcomes of Periodic Inspections Conducted on Amusement Devices (2018 – 2022)



Figure D7: Yearly Compliance Rates from Outcomes of Operational Inspections Conducted on Amusement Devices (2018 – 2022)



Table D9: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections Conducted on Amusement Devices (2018 – 2022)

DESCRIPTION	FISCAL YEAR 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	52.88%	No Trend

Table D10: Five-Year Mean Compliance Rate from Outcomes of Operational Inspections Conducted on Amusement Devices (2018 – 2022)

DESCRIPTION	FISCAL YEAR 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	86.28%	No Trend

Table D11: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections Conducted on Amusement Devices (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Hole/tear in inflatable structure	3.06%
No record of training	2.93%
Secure fasteners in an approved manner	2.47%



Table D12: Top Compliance Issues by Number of Orders Issued from Outcomes of Operational Inspections Conducted on Amusement Devices (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Insufficient number of ride operators	6.70%
Lap bar restraint is not fully operational	5.15%
No record of training	3.61%

Table D13: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Inspections Conducted on Amusement Devices (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
Tie downs and anchors are not in place	20.08%
Tie downs and anchors are used in an unapproved manner	16.27%
Inadequate fencing for each AD where possible	11.22%

Table D14: Top Compliance Issues by Risk of Orders Issued from Outcomes of Operational Inspections Conducted on Amusement Devices (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
Tie downs and anchors are not in place	30.56%
Tie downs and anchors are used in an unapproved manner	22.92%
Lap bar restraint is not fully operational	17.29%



Risk of Orders

While the compliance rate provides an outcome of the periodic inspection (e.g., pass/fail), the inspection risk spectrum (shown as a pie chart) portrays the potential safety risks associated with non-compliance found during the inspection. The red segments of the spectrums show unacceptable levels of risk.

Table D15: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted on Amusement Devices (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	6.28%
Low-Risk Issues	58.74%

Figure D8: Inspection Risk Spectrums from Outcomes of Periodic Inspections Conducted on Amusement Devices (2018 – 2022)

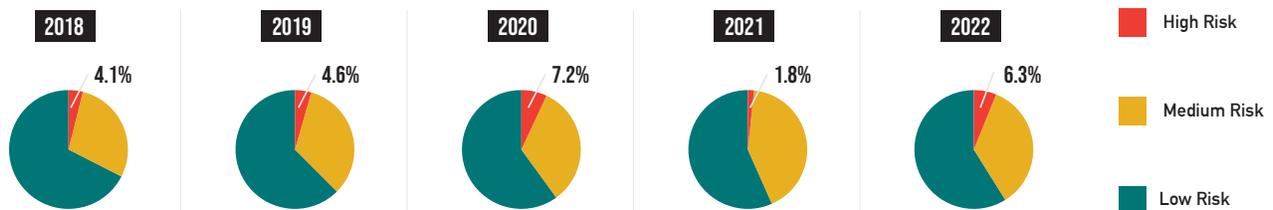
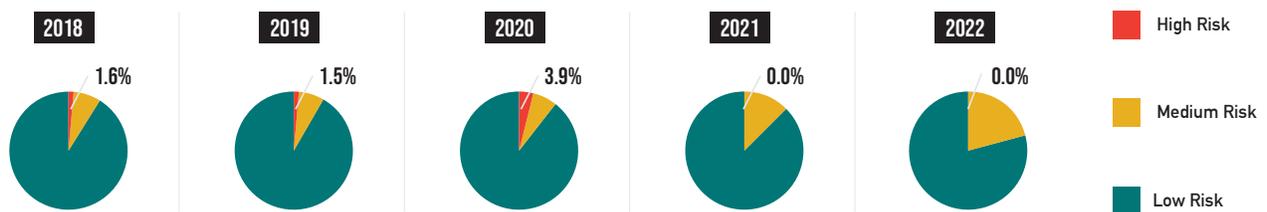


Table D16: Inspection Risk Spectrum from Outcomes of Operational Inspections Conducted on Amusement Devices (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.00%
Low-Risk Issues	78.95%

Figure D9: Inspection Risk Spectrums from Outcomes of Operational Inspections Conducted on Amusement Devices (2018 – 2022)



Some typical examples of minor issues include missing device information plates; missing signage; records of training not in the logbook; missing information from the technical dossier; and passenger-carrying units not identified with markers, letters, or colours.

Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate used in the main body of the report, which can result in small differences between the two numbers.

Table D17: Amusement Devices Inspection and Re-Inspection Results (2022)

INSPECTION TYPE	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Ad Hoc/Unscheduled Inspection	6	14	4	24	30%
Initial Inspection	40	37	0	77	52%
Minor Alteration Inspection	2	0	0	2	100%
Incident Inspection	3	6	0	9	33%
Operational Inspection	19	4	0	23	83%
Other Inspection	4	1	0	5	80%
Periodic Inspection	682	580	4	1,266	54%
Reinspection	189	185	1	375	51%
Grand Total	945	827	9	1,781	53%

Legislation and Regulatory Information

Table D18: TSSA Amusement Devices Legislation and Regulatory Information (2022)

LEGISLATION AND REGULATORY INFORMATION	LATEST REVISION
Ontario Regulation 221/01: Amusement Devices Regulation	2009
Ontario Regulation 187/03: Certification and Training of Amusement Device Mechanics	2013
Amusement Devices CAD Amendment 541/21	2021
Amendments to the Amusement Devices Code Adoption Document (CAD) 2021	2021
Canadian Bungee Safe Code of Practice	2000
Guideline for the Design Review of Rides manufactured prior to January 1, 2012 543/22e1	2022
Amusement Ride and Device Classifications Advisory 542/21	2021

See www.tssa.org for a comprehensive listing of legislation and regulatory information.

Appendix E: Elevators

The Elevating Devices Safety Program regulates elevating devices in Ontario to ensure all devices conform to the Act and applicable regulations, codes and standards. TSSA reviews and registers elevating devices, issues licenses, conducts inspections, performs incident investigations, registers contractors and certifies mechanics. The Elevating Devices Safety Program consists of three areas: 1) elevators; 2) escalators and moving walks; and 3) passenger ropeways (ski lifts). The various types of regulated elevators include passenger elevators, freight elevators, observation elevators, temporary elevators, limited use/limited application elevators, dumbwaiters, freight platform lifts, material lifts, lifts for persons with disabilities (including stair chair lifts, enclosed stair platform lifts, unenclosed stair platform lifts, enclosed vertical platform lifts, and unenclosed vertical platform lifts), manlifts, construction hoists, incline lifts (including funicular railways), stage lifts, parking garage lifts, and special elevating devices.

Note that numbers may not add up fully or may exceed the 100th percentile due to rounding off.

Incidents, Injuries and Risk Prediction

Table E1: State of Safety Measures for Elevators (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE	TREND (ANNUAL)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Incidents	382	501	463	570	541	696	705	677	577	637	5,749	575	No Trend
Non-Permanent Injuries	146	186	119	169	146	132	119	130	87	76	1,310	131	Decreasing
Permanent Injuries	11	7	7	11	11	4	5	8	6	7	77	8	No Trend
Fatalities	1	0	1	0	2	1	0	1	0	0	6	1	No Trend
Observed Injury Burden (FE/mp)	0.09	0.03	0.03	0.02	0.18	0.03	0.02	0.16	0.005	0.03	N/A	0.06	N/A

Table E2: Risk of Injury or Fatality for Elevators (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.06	0.08	0.07	0.04

Anything with a RIF of 1.00 FE/mpy or higher is considered an area of concern.



Figure E1: Incidents and Observed Injury Burden for Elevators (2013 - 2022)

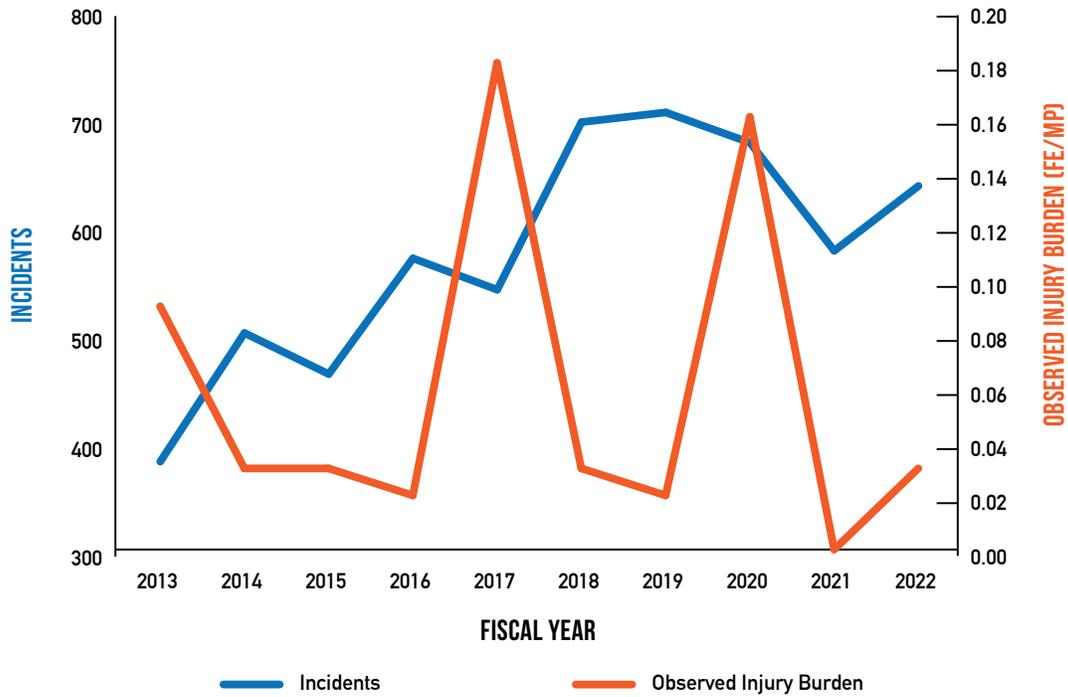


Figure E2: Injuries and Fatalities for Elevators (2013 - 2022)

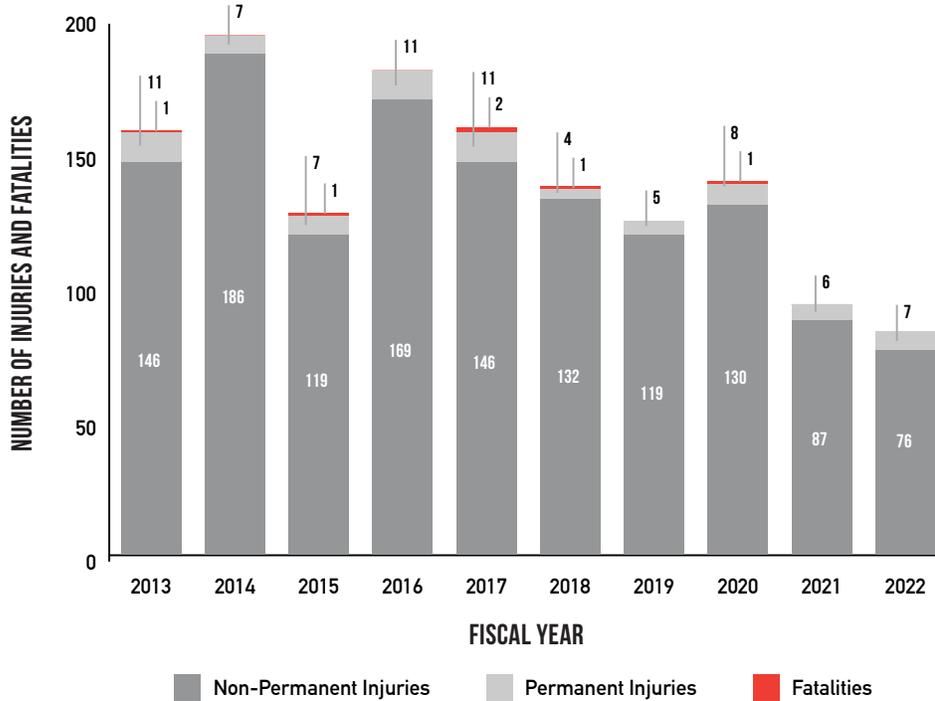
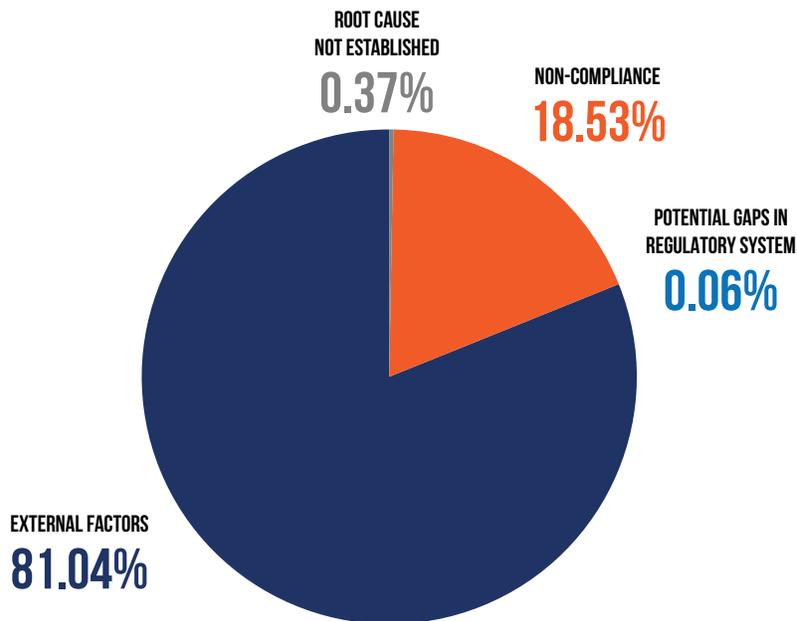


Figure E3: Risk of Injury or Fatality for Elevators by Casual Analysis Category (2013 – 2022)



Risks due to Potential Gaps in Regulatory System (2013 – 2022)

Some typical examples of potential gaps in the regulatory system include: door closing safety features to prevent injuries to passengers; fire protection requirements in the machine room; emergency braking requirements; out-of-level requirements to help reduce trips and falls; fastener locking requirements to prevent parts from coming loose and injuring passengers; prevention methods of passengers manually escaping the elevator during an entrapment; and procedures to prevent prolonged entrapment of passengers.

Risks due to Non-Compliance (2013 – 2022)

Some typical examples of non-compliance include: a worm shaft sheared at the brake drum coupling; an emergency brake seized in the open position; a hole in the hydraulic cylinder from corrosion; no employee training records; and, a brake replaced by an unauthorized person.

Risks due to External Factors (2013 – 2022)

Some typical examples of external factors include: a burst pipe flooding the elevator machine room; a child getting their fingers caught in the door; a passenger using their arm to stop a door from closing, resulting in a cut; a passenger with grocery bags tripping on entering the elevator; and the elevator pit flooding due to heavy rain.

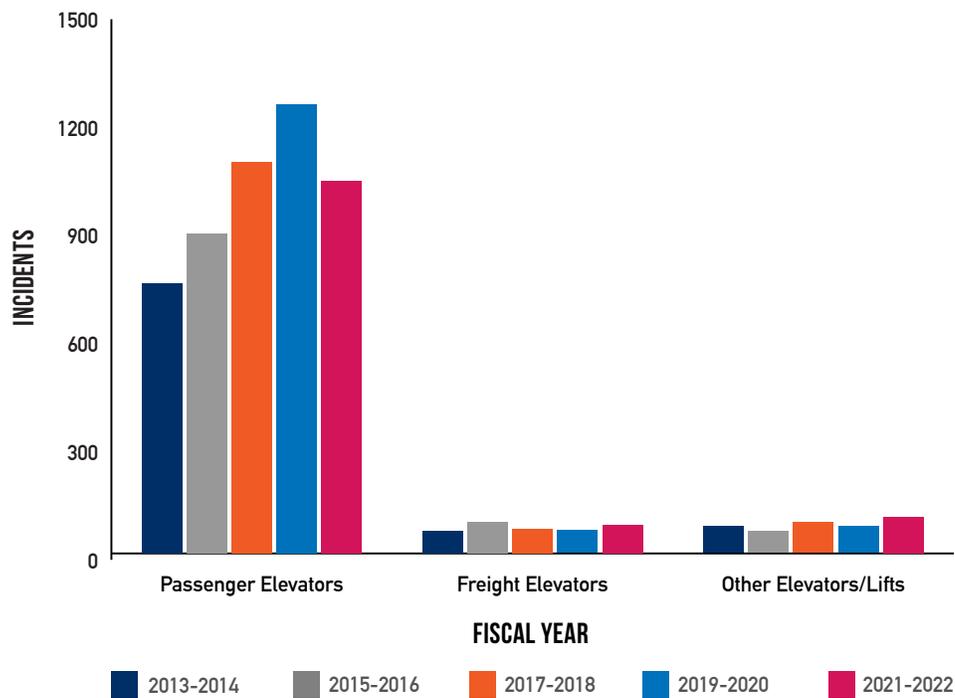
Table E3: Top Elevator Location Types by Number of Occurrences (2013 – 2022)

LOCATION TYPE	PERCENTAGE OF OCCURRENCES
Rental	22.98%
Condominium	20.35%
Office	20.06%

Table E4: Top Elevator Location Types by Observed Injury Burden (2013 – 2022)

LOCATION TYPE	PERCENTAGE OF OBSERVED INJURY BURDEN
Rental	30.71%
Office	27.47%
Condominium	15.89%

Figure E4: Number of Incidents by device types (2013 – 2022)



Risk of Devices

TSSA periodic inspections of all elevators use a risk-based approach to oversee and manage the state of compliance across all elevators in the province of Ontario. TSSA deals with non-compliance by requiring the owner to address observed failures within an appropriate time frame through the issuance of inspection orders. This process contributes to the preventative risk management of the inventory.

Table E5: Number of Elevators (2022)

DESCRIPTION	NUMBER
Elevator inventory	63,837
Elevators that had sufficient inspection history to calculate a risk score	47,215

Figure E5: Inventory Risk Profiles from Outcomes of Periodic Inspections Conducted on Elevators (2018 – 2022)

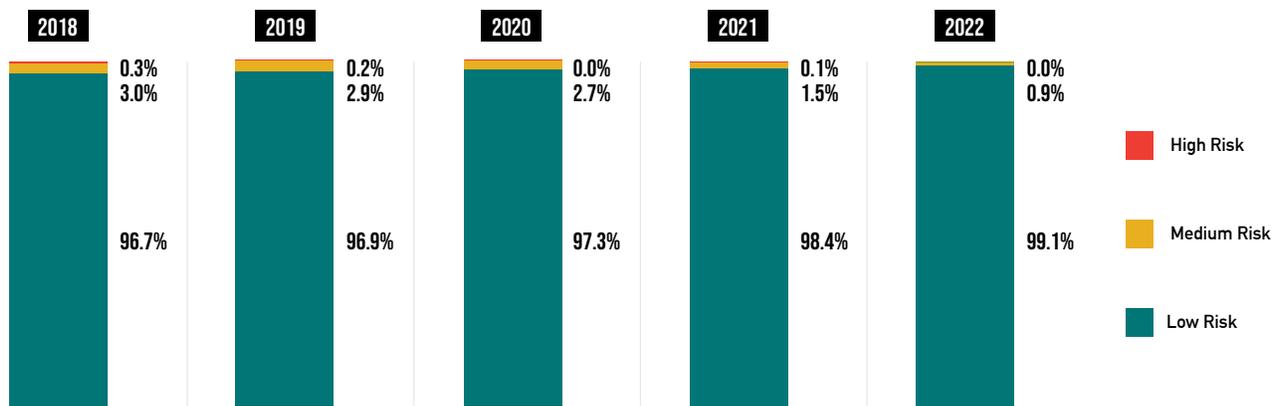


Table E6: Number of High-Risk Elevators (2022)

DESCRIPTION	NUMBER	PERCENT OF QUALIFIED PROVINCIAL INVENTORY
High-Risk Devices	8	0.02%

Table E7: Top High-Risk Elevator Location Types (2022)

LOCATION TYPE	PERCENTAGE OF TOTAL HIGH-RISK ELEVATORS
Assemblies	52.98%
Offices	24.32%
Hospitals	16.50%

Compliance

The compliance rate is defined as the percentage of periodic inspections with no orders issued compared to the total number of periodic inspections.

Figure E6: Yearly Compliance Rates from Outcomes of Periodic Inspections Conducted on Elevators (2018 – 2022)



Table E8: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections Conducted on Elevators (2018 – 2022)

DESCRIPTION	FISCAL YEAR 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	19.3%	No Trend

Table E9: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections Conducted on Elevators (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Late annual periodic task for emergency power and lowering operation	3.09%
Late annual periodic task for firefighter emergency operation	2.22%
Current elevator device licence not posted	1.99%

Table E10: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Inspections Conducted on Elevators (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
Drive machine brakes inadequate stopping and holding capacity	25.53%
Machine brake requiring repair or replacement	6.36%
No reference point for oil level	4.96%

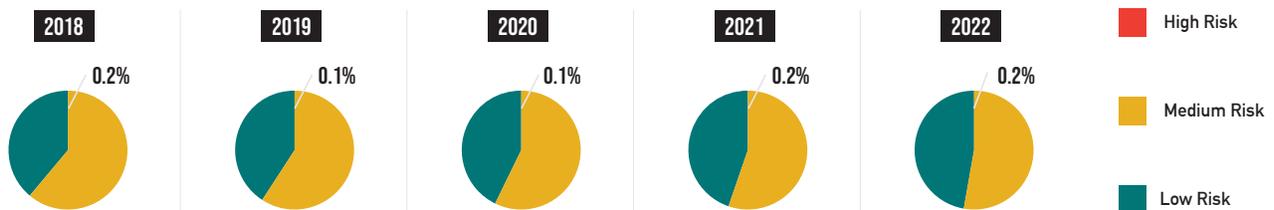
Risk of Orders

While the compliance rate provides an outcome of the periodic inspection (i.e., pass or fail), the inspection risk spectrum (shown as pie charts) portrays the potential safety risks associated with non-compliance. The red segments of the spectrums show unacceptable levels of risk.

Table E11: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted on Elevators (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.24%
Low-Risk Issues	26.89%

Figure E7: Inspection Risk Spectrums from Outcomes of Periodic Inspections Conducted on Elevators (2018 – 2022)



Some typical examples of minor issues include: overdue periodic testing; the car top not being cleaned; missing data plate for counterweight; current licence not posted in a conspicuous location; and, pit lighting being inoperative.

Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate used in the main body of the report, which can result in small differences between the two numbers.

Table E12: Elevators Inspection and Re-Inspection Results (2022)

DESCRIPTION	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Ad Hoc/Unscheduled Inspection	661	806	138	1,605	45%
Initial Inspection	897	1,950	0	2,847	32%
Minor Alteration Inspection	1,470	1,157	0	2,627	56%
Non-mandated/Non-regulated Inspection	321	380	4	705	46%
Incident Inspection	48	93	69	210	34%
Other Inspection	623	717	692	2,032	46%
Periodic Inspection	2,758	8,808	222	11,788	24%
Reinspection	7,859	12,279	243	20,381	39%
Grand Total	14,637	26,190	1,368	42,195	36%

Legislation and Regulatory Information

Table E13: TSSA Elevators Legislation and Regulatory Information (2022)

LEGISLATION AND REGULATORY INFORMATION	LATEST REVISION
Ontario Regulation 209/01: Elevating Devices	2021
Ontario Regulation 222/01: Certification and Training of Elevating Devices Mechanics	2009
Elevating Devices CAD Amendment 277-19	2019
Referenced Standards and Cross Reference Guideline for Parking Garage Lifts (PGL's) as adopted in ED CAD 295 / 22 Part 9	2022
The Director for the purposes of Ontario Regulation 209/01 (Elevating Devices), pursuant to section 4 of Ontario Regulation 223/01 CAD	2022

The advisories issued in 2021:

- 287 / 20 – Foot Operated Elevator Operating Buttons;
- 288 / 20 – Anniversary Dates for Category Tests;
- 289 / 20 – Monitoring of Cylinder Corrosion Protection;
- 290 / 20 – Elevator Phones – Acceptability of Communication Technologies (POTS, VoIP, Cellular / Wireless, other);
- 291 / 20 – Elevator Car Lighting Branch Circuit;
- 292 / 20 – Construction Hoist and Transport Platform Hoistway Wiring;
- 293 / 21 – Grounding of Transformers;
- 294 / 21 – TSSA regulatory jurisdiction as related to elevating devices when associated with federal or other non-regulatory activities or functions; and
- 299 / 21 – Temporary Special Provisions for EDM-T Construction Hoist Industry.

The advisories issued in 2022:

- 300 / 21- Escalator Step/Skirt Performance Index and Step to Skirt Clearance Requirements

See www.tssa.org for a comprehensive listing of legislation and regulatory information.

Appendix F: Escalators and Moving Walks

The Elevating Devices Safety Program regulates elevating devices in Ontario to ensure all devices conform to the Act and applicable regulations, codes and standards. TSSA reviews and registers elevating devices, issues licenses, conducts inspections, performs incident investigations, registers contractors and certifies mechanics. The Elevating Devices Safety Program consists of three areas: 1) elevators; 2) escalators and moving walks; and 3) passenger ropeways (ski lifts). The various types of regulated devices include escalators, and moving walks (including shopping cart conveyors).

Note that numbers may not add up fully or may exceed the 100th percentile due to rounding off.

Incidents, Injuries and Risk Prediction

Table F1: State of Safety Measures for Escalators and Moving Walks (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022		
Incidents	519	642	592	742	702	727	792	682	390	508	6,296	630
Non-Permanent Injuries	384	438	383	470	441	460	526	462	204	301	4,069	407
Permanent Injuries	3	3	7	5	4	0	4	1	3	1	31	3
Fatalities	0	0	0	0	0	0	0	0	1	0	1	0
Observed Injury Burden (FE/mp)	0.01	0.002	0.01	0.02	0.002	0.003	0.004	0.003	0.02	0.03	N/A	0.01

Table F2: Risk of Injury or Fatality for Escalators and Moving Walks (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.01	0.01	0.01	0.02

Anything with a RIF of 1.00 FE/mpy or higher is considered an area of concern.

Figure F1: Incidents and Observed Injury Burden for Escalators and Moving Walks (2013 – 2022)

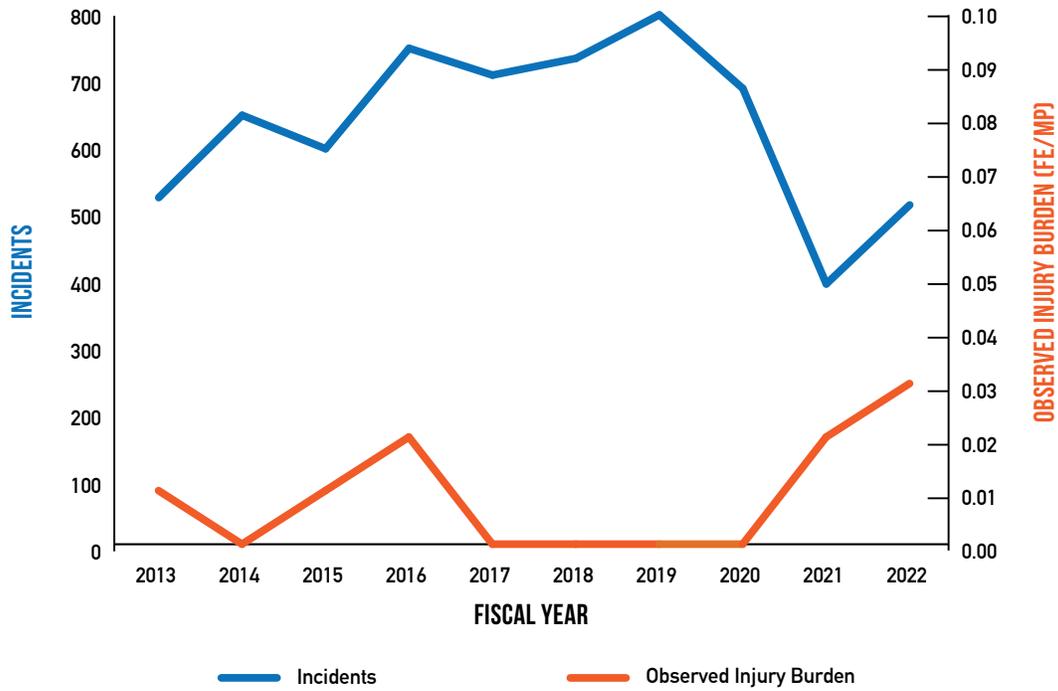
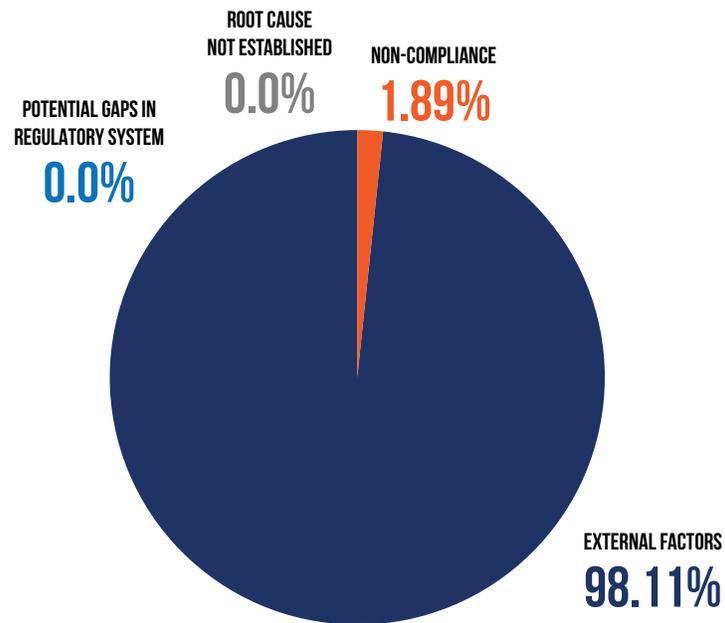


Figure F2: Injuries and Fatalities for Escalators and Moving Walks (2013 – 2022)



Figure F3: Risk of Injury or Fatality for Escalators and Moving Walks by Casual Analysis Category (2013 - 2022)



Risks due to Potential Gaps in the Regulatory System (2013 – 2022)

Some typical examples of potential gaps in the regulatory system include: warning signage or prevent access to stationary escalators to prevent injury to passengers (escalators are more dangerous than stairs because of varying step heights near the ends); design of comb teeth or warning signage to prevent entrapments; and fastener locking requirements to prevent parts coming loose and injuring passengers.

Risks due to Non-Compliance (2013 – 2022)

Some typical examples of non-compliance include: a relay coil failure in a controller; steps piled up on broken comb plates causing the handrail to stop; bull gear bolts loosened and sheared; and, a step chain that jumped out of the drive sprocket.

Risks due to External Factors (2013 – 2022)

Some typical examples of external factors include: a passenger with a walker losing their balance and falling down the escalator; passenger walking on a moving escalator missing a step and falling; a passenger getting their shoe caught in the escalator; a child running up the down escalator tripping and falling; and an infant falling out of a stroller.

Table F3: Top Escalator and Moving Walk Location Types by Number of Occurrences (2013 – 2022)

LOCATION TYPE	PERCENTAGE OF OCCURRENCES
Mass Transportation	63.79%
Mercantile	29.32%
Office	4.19%

Table F4: Top Escalator and Moving Walk Location Types by Observed Injury Burden (2013 – 2022)

LOCATION TYPE	PERCENTAGE OF OBSERVED INJURY BURDEN
Mercantile	56.90%
Mass Transportation	40.56%
Assemblies	1.31%

Risk of Devices

TSSA conducts periodic inspections of all escalators and moving walks to oversee and manage the state of compliance in the province of Ontario. TSSA deals with non-compliance by requiring the owner to address observed failures within an appropriate time frame through the issuance of inspection orders. This process contributes to the preventative risk management of the inventory.

Table F5: Number of Escalators and Moving Walks (2022)

DESCRIPTION	NUMBER
Escalators and moving walks inventory	2,227
Escalators and moving walks that had sufficient inspection history to calculate a risk score	1,625

Figure F4: Inventory Risk Profiles from Outcomes of Periodic Inspections Conducted on Escalators and Moving Walks (2018 – 2022)

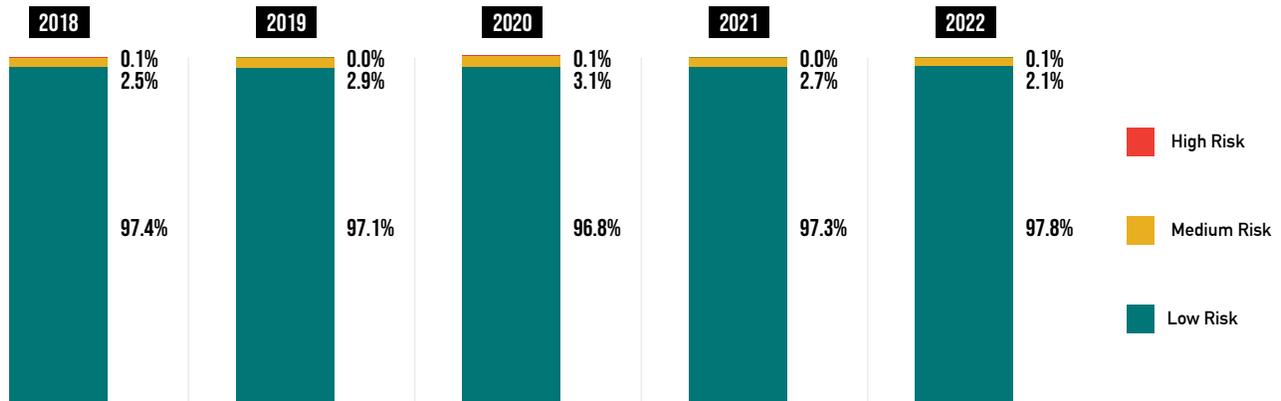


Table F6: Number of High-Risk Escalators and Moving Walks (2022)

DESCRIPTION	NUMBER	PERCENT OF QUALIFIED PROVINCIAL INVENTORY
High-Risk Devices	1	0.1%

Compliance

The compliance rate is defined as the percentage of periodic inspections with no orders issued compared to the total number of periodic inspections.

Figure F5: Yearly Compliance Rates from Outcomes of Periodic Inspections Conducted on Escalators and Moving Walks (2018 – 2022)

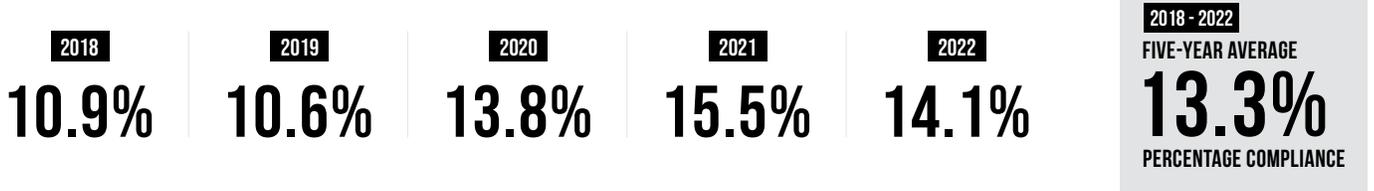


Table F7: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections Conducted on Escalators and Moving Walks (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	13.3%	No Trend

Table F8: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections Conducted on Escalators and Moving Walks (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Late annual periodic task for skirt/step performance index	5.22%
Late annual periodic test for escalator clearance between step and skirt-loaded gap	4.55%
Late maintenance for escalator cleaning	2.32%

Table F9: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Inspections Conducted on Escalators and Moving Walks (2013 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
Inadequate brake torque	16.97%
Incorrect no-loading stopping distance	10.24%
Issues with skirt obstruction device	6.27%



Risk of Orders

While the compliance rate provides an outcome of the periodic inspection (i.e., pass/fail), the inspection risk spectrum (shown as a pie chart) portrays the potential safety risks associated with non-compliance found during the inspection. The red segments of the spectrums show unacceptable levels of risk.

Table F10: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted on Escalators and Moving Walks (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.16%
Low-Risk Issues	77.64%

Figure F6: Inspection Risk Spectrums from Outcomes of Periodic Inspections Conducted on Escalators and Moving Walks (2018 – 2022)



Some typical examples of minor issues include: missing signage; inoperative lighting in the machine space; the brake adjustment procedure not being posted; and, records of authorized trained personnel not available.

Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate used in the main body of the report, which can result in small differences between the two numbers.

Table F11: Escalators and Moving Walks Inspection and Re-Inspection Results (2022)

INSPECTION TYPE	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Ad Hoc/Unscheduled Inspection	1	21	2	24	5%
Initial Inspection	13	39	0	52	25%
Minor Alteration Inspection	25	7	0	32	78%
Non-mandated/Non-regulated Inspection	17	17	0	34	50%
Incident Inspection	2	12	2	16	14%
Other Inspection	32	14	27	73	70%
Periodic Inspection	125	403	4	532	24%
Reinspection	385	576	7	968	40%
Grand Total	600	1,089	42	1,731	36%

Legislation and Regulatory Information

Table F12: TSSA Escalators and Moving Walks Legislation and Regulatory Information (2022)

LEGISLATION AND REGULATORY INFORMATION	LATEST REVISION
Ontario Regulation 209/01: Elevating Devices	2021
Ontario Regulation 222/01: Certification and Training of Elevating Devices Mechanics	2009
Elevating Devices CAD Amendment 277-19	2019

During this fiscal year, there were no Escalators and Moving Walks director's orders, bulletins or guidelines issued. The following advisories were issued:

- 286-20 – Simplified Revision Form to Correct / Revise a Registered Design Submission.\
- 288-20 – Anniversary Dates for Category Tests; and
- 294-21 – TSSA regulatory jurisdiction as related to elevating devices when associated with federal or other non-regulatory activities or functions.

See www.tssa.org for a comprehensive listing of legislation and regulatory information.

Appendix G: Passenger Ropeways (Ski Lifts)

The Elevating Devices Safety Program regulates elevating devices in Ontario to ensure all devices conform to the Act and applicable regulations, codes and standards. TSSA reviews and registers elevating devices, issues licenses, conducts inspections, performs incident investigations, registers contractors and certifies mechanics. The Elevating Devices Safety Program consists of three areas: 1) elevators; 2) escalators and moving walks; and 3) passenger ropeways (ski lifts). The various types of regulated ski lifts include chair lifts, bar lifts, recreational conveyors, gondola lifts, reversible ropeways, passenger ropeways, rope tows, tube tows, belt tows and aerial tramways.

Note that numbers may not add up fully or may exceed the 100th percentile due to rounding off.

Incidents, Injuries and Risk Prediction

Table G1: State of Safety Measures for Ski Lifts (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE	TREND (ANNUAL)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Incidents	83	88	66	72	71	87	83	90	33	73	746	75	No Trend
Non-Permanent Injuries	70	66	52	54	60	64	66	61	25	59	577	58	No Trend
Permanent Injuries	0	3	2	2	3	2	1	2	2	3	20	2	No Trend
Fatalities	0	0	0	0	0	0	0	0	0	0	0	0	No Trend
Observed Injury Burden (FE/mp)	0.00	0.03	0.02	0.03	0.01	0.01	0.00	0.00	0.01	0.02	N/A	0.01	N/A

Table G2: Risk of Injury or Fatality for Ski Lifts (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.01	0.01	0.01	0.01

Anything with a RIF of 1.00 FE/mpy or higher is considered an area of concern.

Figure G1: Incidents and Observed Injury Burden for Ski Lifts (2013 – 2022)

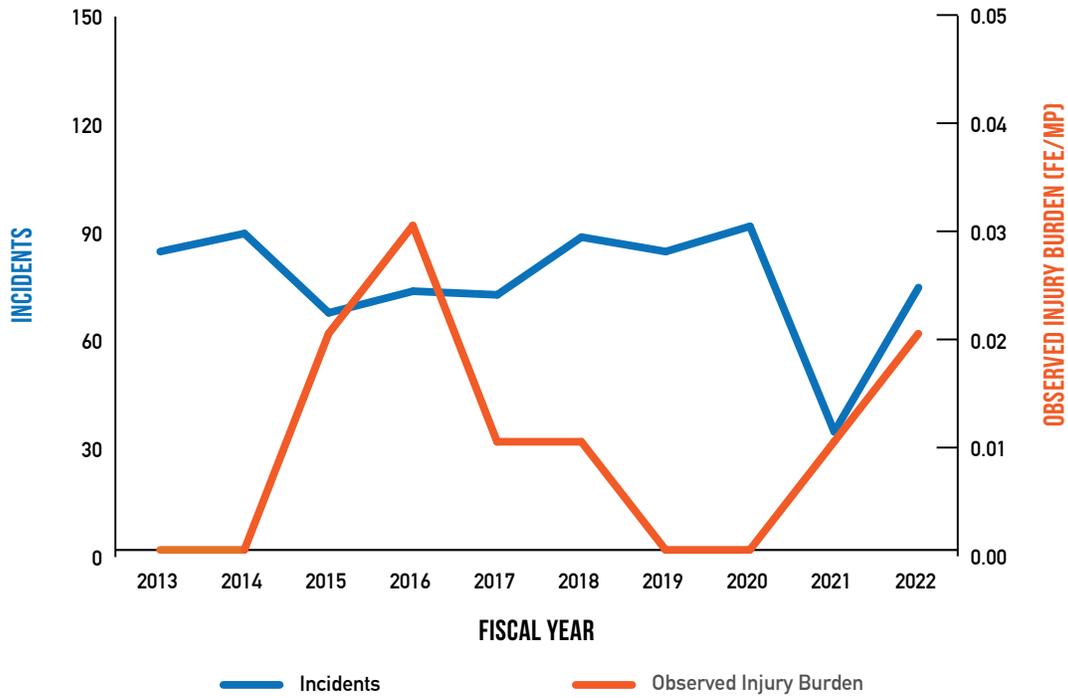


Figure G2: Injuries and Fatalities for Ski Lifts (2013 – 2022)

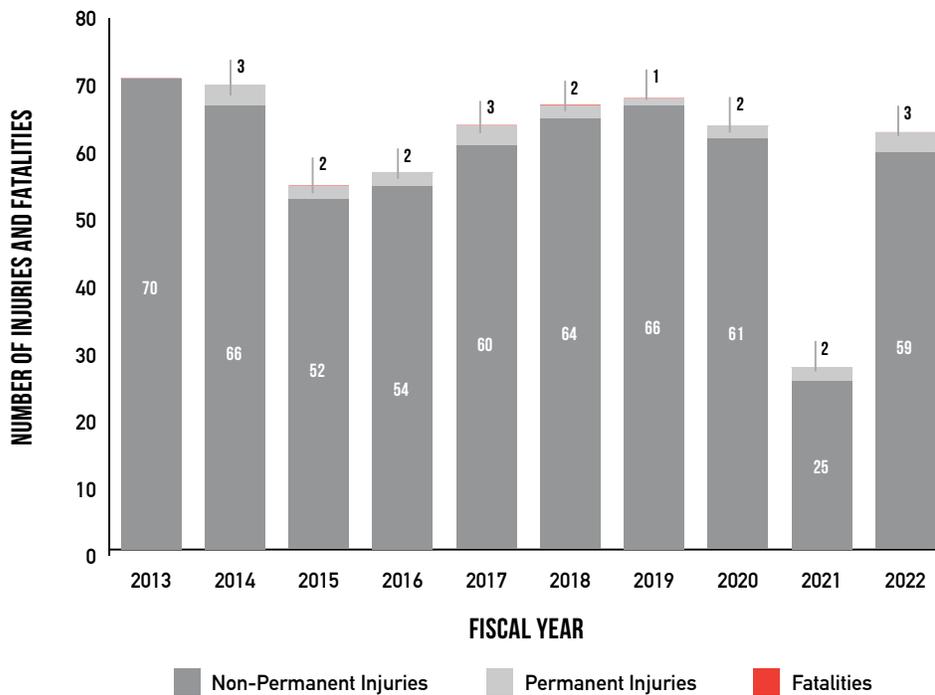
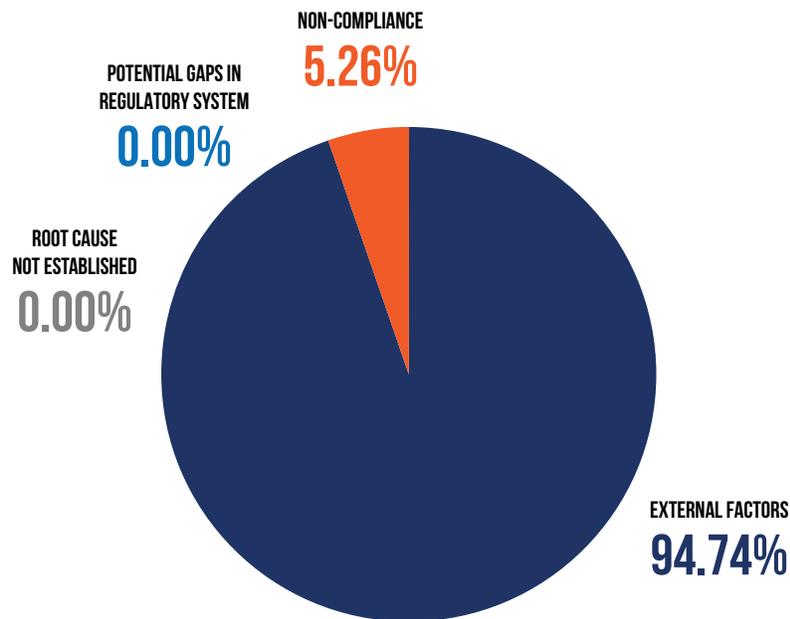


Figure G3: Risk of Injury or Fatality for Ski Lifts by Causal Analysis Category (2013 – 2022)



Risks due to Potential Gaps in the Regulatory System (2013 – 2022)

There was only one example of a potential gap in the regulatory system: the design requirements of ski lifts to remove parts that could potentially entrap the passenger.

Risks due to Non-Compliance (2013 – 2022)

Some typical examples of non-compliance include: a cracked seat pivot pin keeper tab; a bull wheel cracked shaft; a broken gearbox pinion shaft; stitching broken at a tow ring; and a broken heat pad in an electrical panel.

Risks due to External Factors (2013 – 2022)

Some typical examples of external factors include: a passenger’s friend lifting the bar and hitting him in the lip resulting in a cut; a passenger falling while loading and hurting their ankle; a passenger’s skis getting tangled with another skier’s resulting in a sprained ankle; a child not seated properly resulting in the child sliding out and hanging from the seat; and a child being hit in the head by the handle of the ski tow.

Risks due to All Causes

Table G3: Human Factors in Ski Lifts Occurrences (2013 – 2022)

DESCRIPTION	PERCENTAGE OF OCCURRENCES
Human Factors	92.9%

Table G4: Top Ski Lift Types by Number of Occurrences (2013 – 2022)

DEVICE TYPE	PERCENTAGE OF OCCURRENCES
Chairlift	84.32%
Passenger Conveyor	8.71%
Barlift	4.29%

Table G5: Top Ski Lift Types by Observed Injury Burden (2013 – 2022)

DEVICE TYPE	PERCENTAGE OF OBSERVED INJURY BURDEN
Chairlift	84.02%
Rope Tow	9.89%
Passenger Conveyor	4.13%

Risk of Devices

TSSA conducts periodic inspections of all ski lifts using a risk-based approach to oversee and manage the state of compliance across all regulated ski lifts in the province of Ontario with the inspection frequency ranging from as often as twice a season to once every two years. TSSA deals with non-compliance by requiring the owner to address observed failures within an appropriate time frame through the issuance of inspection orders. This process contributes to the preventative management of risk associated with ski lifts.

Table G6: Number of Ski Lifts (2022)

DESCRIPTION	NUMBER
Ski lifts inventory	299
Ski lifts that had sufficient inspection history to calculate a risk score	243

Figure G4: Inventory Risk Profiles from Outcomes of Periodic Inspections Conducted on Ski Lifts (2013 – 2022)

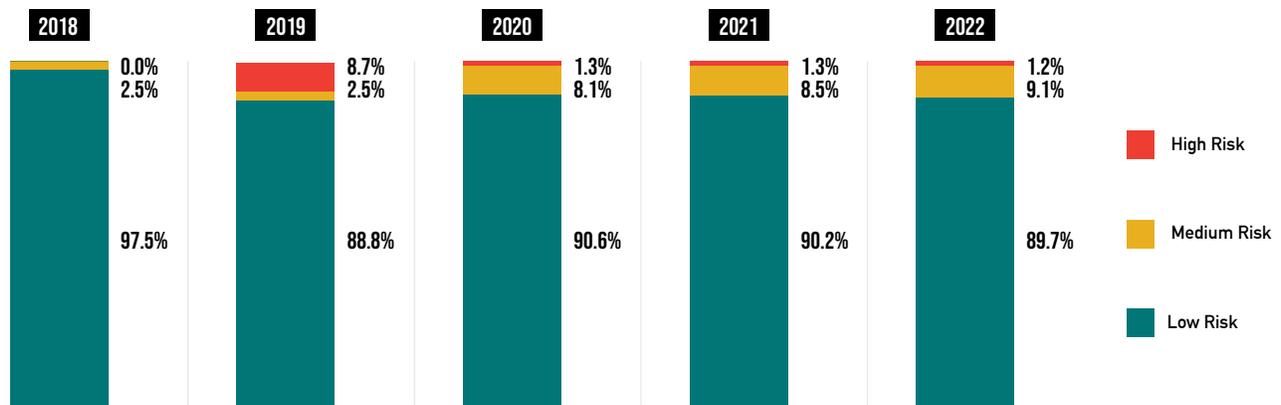


Table G7: Number of High-Risk Ski Lifts (2022)

DESCRIPTION	NUMBER	PERCENT OF QUALIFIED PROVINCIAL INVENTORY
High-Risk Devices	3	1.2%

Table G8: Top High-Risk Ski Lift Types (2022)

DEVICE TYPE	PERCENTAGE OF TOTAL HIGH-RISK SKI LIFTS
Chairlifts	66.7%
Barlifts	33.3%

Compliance

The compliance rate is defined as the percentage of periodic inspections with no orders issued compared to the total number of periodic inspections.

Some operational inspections were also performed and their numbers are given below for comparison purposes.

Figure G5: Yearly Compliance Rates from Outcomes of Periodic Inspections Conducted on Ski Lifts (2018 – 2022)



Figure G6: Yearly Compliance Rates from Outcomes of Operational Inspections Conducted on Ski Lifts (2018 – 2022)



Table G9: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections Conducted on Ski Lifts (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	38.4%	No Trend

Table G10: Five-Year Mean Compliance Rate from Outcomes of Operational Inspections Conducted on Ski Lifts (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	68.4%	No Trend



Table G11: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections Conducted on Ski Lifts (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Evacuation training has not been conducted	4.99%
Lack of supervising and training all personnel	2.28%
Gap between the belt guides is too large	2.20%

Table G12: Top Compliance Issues by Number of Orders Issued from Outcomes of Operational Inspections Conducted on Ski Lifts (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Personnel not adequately trained	31.65%
Operator not trained for specific device	15.11%
Device operated by untrained personnel	12.23%

Table G13: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Inspections Conducted on Ski Lifts (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
Inadequate clearance to carrier	17.89%
Operation of bypass switch	13.93%
Safety gate too far from unload point	6.80%

Table G14: Top Compliance Issues by Risk of Orders Issued from Outcomes of Operational Inspections Conducted on Ski Lifts (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
Safety gate too far from unload point	41.83%
Inadequate clearance to carrier	36.67%
Safety gate must be adjusted above snow level	15.56%

Risk of Orders

While the compliance rate provides an outcome of the periodic inspection (i.e., pass/fail), the inspection risk spectrum (shown as a pie chart) portrays the potential safety risks associated with non-compliance found during the inspection. The red segments of the spectrums show unacceptable levels of risk.

Table G15: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted on Ski Lifts (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	11.11%
Low-Risk Issues	38.46%

Figure G7: Inspection Risk Spectrums from Outcomes of Periodic Inspections Conducted on Ski Lifts (2018 – 2022)

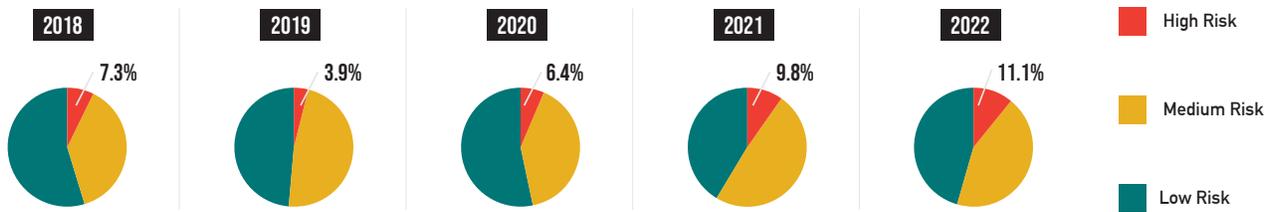
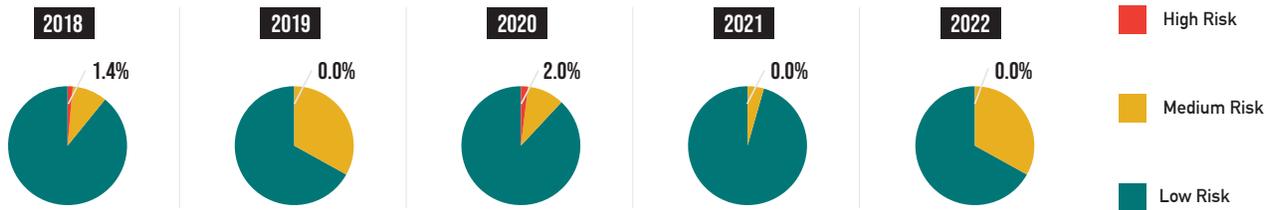


Table G16: Inspection Risk Spectrum from Outcomes of Operational Inspections Conducted on Ski Lifts (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.00%
Low-Risk Issues	66.67%

Figure G8: Inspection Risk Spectrums from Outcomes of Operational Inspections Conducted on Ski Lifts (2018 – 2022)



Some typical examples of minor issues include: the machine room lighting not being guarded; missing signage; general housekeeping requirements not being met; towers not being identified with successive numbers; and, start, run, stop and speed control switches not being permanently marked.

Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate used in the main body of the report, which can result in small differences between the two numbers.

Table G17: Passenger Ropeways (Ski Lifts) Inspection and Re-Inspection Results (2022)

INSPECTION TYPE	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Ad Hoc/Unscheduled Inspection	1	3	0	4	25%
Alteration Inspection	16	2	0	18	89%
Initial Inspection	3	3	0	6	50%
Minor Alteration Inspection	0	1	0	1	0%
Non-mandated/Non-regulated Inspection	0	0	0	0	N/A
Incident Inspection	0	1	0	1	0%
Operational Inspection	8	4	0	12	67%
Periodic Inspection	26	79	2	107	25%
Reinspection	48	30	0	78	62%
Grand Total	102	123	2	227	45%

Legislation and Regulatory Information

Table G18: TSSA Passenger Ropeways (Ski Lifts) Legislation and Regulatory Information (2022)

LEGISLATION AND REGULATORY INFORMATION	LATEST REVISION
Ontario Regulation 209/01: Elevating Devices	2021
Ontario Regulation 222/01: Certification and Training of Elevating Devices Mechanics	2009
Elevating Devices CAD Amendment 277-19	2019

During the last fiscal year one advisory was issued:

- 214-09 R2 – Incident Reporting Guideline as Applicable to Passenger Ropeways & Passenger Conveyors.

During this fiscal year, there were no Ski Lifts director’s orders, advisories, bulletins or guidelines issued. The following guideline was issued:

- 224-07 R2 – Aging Ski lift – Subsequent engineering assessments.

See www.tssa.org for a comprehensive listing of legislation and regulatory information.

Appendix H: Fuels

TSSA's Fuels Safety Program regulates the transportation, storage, handling and use of fuels in Ontario. Fuels under this program include: natural gas; propane; butane; hydrogen; digester gas; landfill gas; fuel oil; gasoline; and, diesel. TSSA licenses fuel facilities, registers contractors and certifies tradespeople who install and service equipment. TSSA also reviews and approves facility plans for sites licensed by TSSA and perform custom equipment approvals and inspection services to ensure safe handling and usage of fuel.

Note that numbers may not add up fully or may exceed the 100th percentile due to rounding off.

Incidents, Injuries and Risk Prediction

Table H1: State of Safety Measures for Fuels (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE	TREND
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Incidents	3,619	3,761	3,563	3,340	3,320	3,409	3,395	3,008	2,999	2,569	32,983	3,298	Decreasing
Non-Permanent Injuries	40	99	28	55	58	40	22	20	16	20	398	40	No trend
Permanent Injuries	10	12	15	18	16	11	20	9	8	10	129	13	No trend
Fatalities	3	10	3	2	2	1	1	2	3	2	29	3	No trend
Pipeline Strike Incidents	2,339	2,433	2,464	2,412	2,325	2,392	2,325	2,158	2,260	1,894	23,002	2,300.2	No trend
Non-pipeline Strike Incidents	1,280	1,328	1,099	928	995	1,017	1,070	850	739	675	9,981	998.1	No trend
Observed Injury Burden (FE/mp)	0.30	0.57	0.11	0.21	0.12	0.16	0.17	0.08	0.15	0.17	N/A	0.20	N/A

Table H2: Number of Incidents by Fuel Type (2013 – 2022)

DESCRIPTION	FISCAL YEAR										TOTAL	AVERAGE
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022		
Natural Gas	2,136	2,469	2,612	2,795	2,882	2,940	3,051	2,799	2,823	2,423	26,930	2,693
Fuel Oil	249	188	167	176	165	143	134	80	68	51	1,421	142.1
Propane	80	72	77	55	58	48	56	47	47	18	558	55.8
Diesel	48	52	27	47	36	54	53	30	18	18	383	38.3
Gasoline	40	58	41	49	41	37	40	29	17	14	366	36.6
Used / Waste / Lube Oil	2	3	1	1	1	2	1	0	1	3	15	1.5
Compressed Natural Gas	2	1	0	0	0	1	0	1	0	1	6	0.6
Butane	2	0	1	1	1	2	0	0	0	0	7	0.7
Aviation Fuel	0	0	1	0	0	0	2	0	0	0	3	0.3
Hydrogen	0	0	0	2	0	0	0	0	0	1	3	0.3
Other	1,060	918	636	214	136	182	58	22	25	40	3,291	329.10



Table H3: Risk of Injury or Fatality for Fuels (2019 – 2022)

DESCRIPTION	FISCAL YEAR			
	2019	2020	2021	2022
RIF	0.29	0.22	0.22	0.19

Anything with a RIF of 1.00 FE/MPJ or higher is considered an area of concern.

Figure H1: Incidents and Observed Injury Burden for Fuels (2013 – 2022)

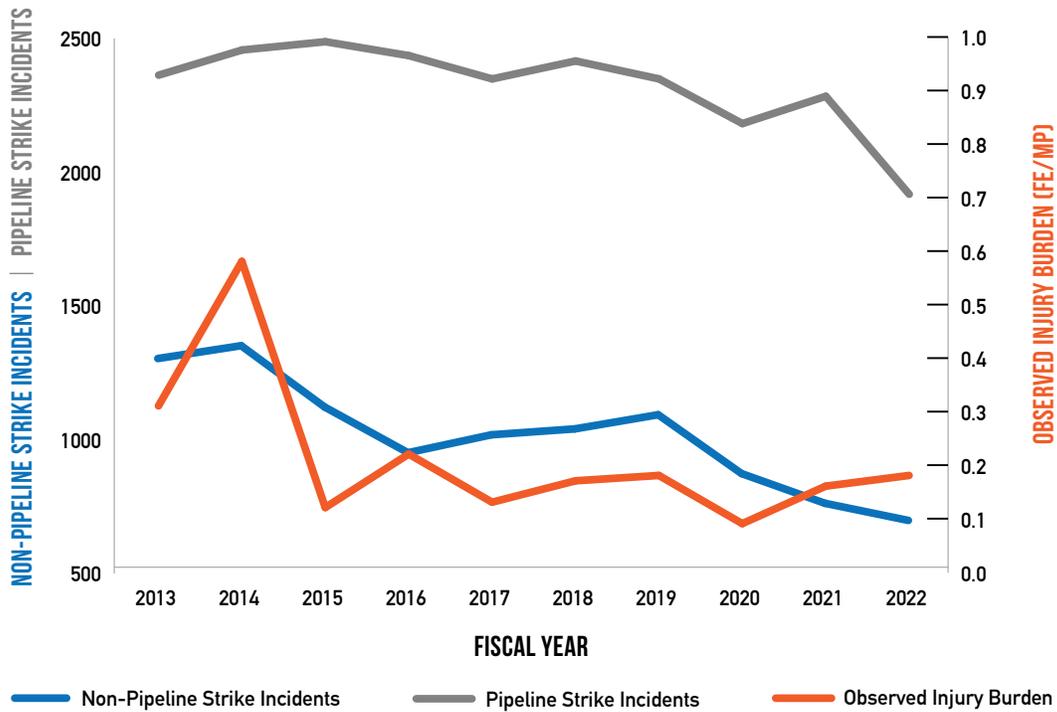


Figure H2: Injuries and Fatalities for Fuels (2013 – 2022)

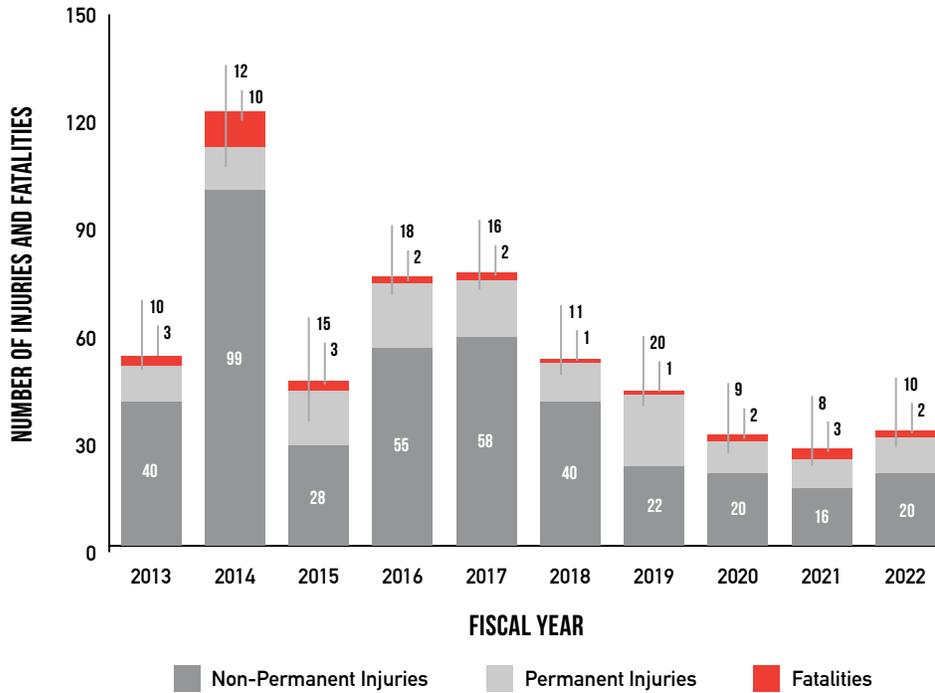


Figure H3: Risk of Injury or Fatality for Fuels by Casual Analysis Category (2013 – 2022)

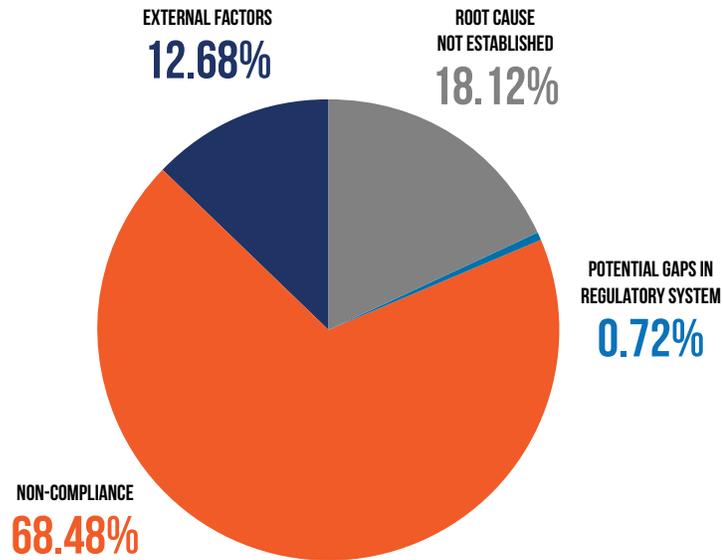


Figure H4: Incidents by Location Types in Ontario for Fuels (2013 – 2022)

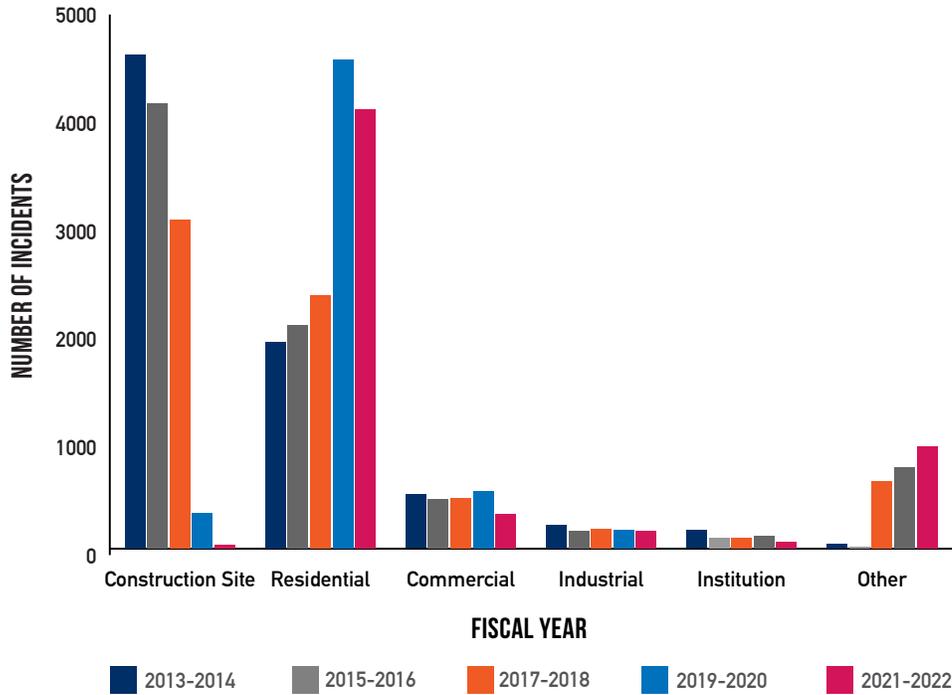
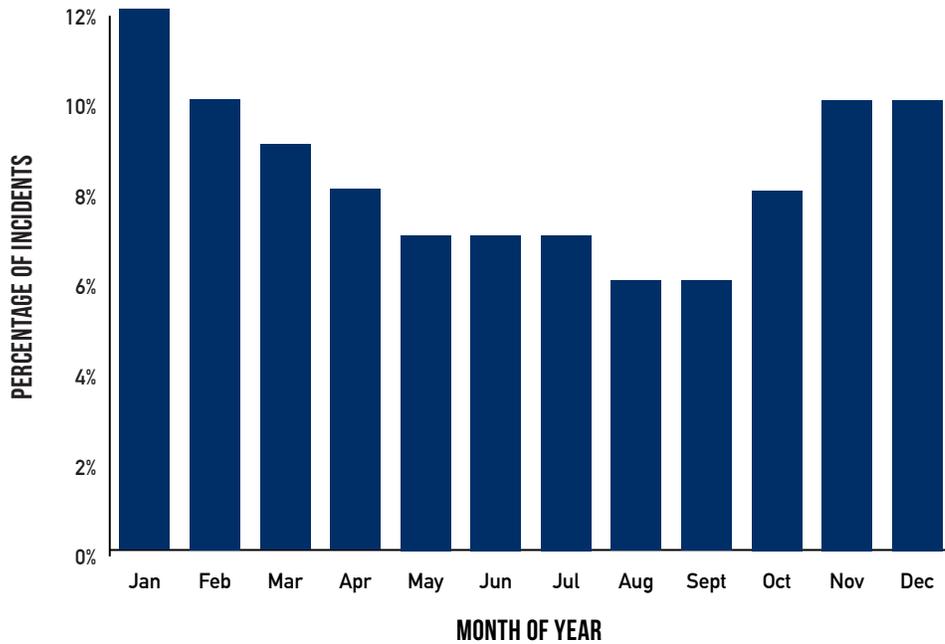


Figure H4 illustrates that incidents in residential locations continue to be the most common - primarily due to fuel powered appliances.

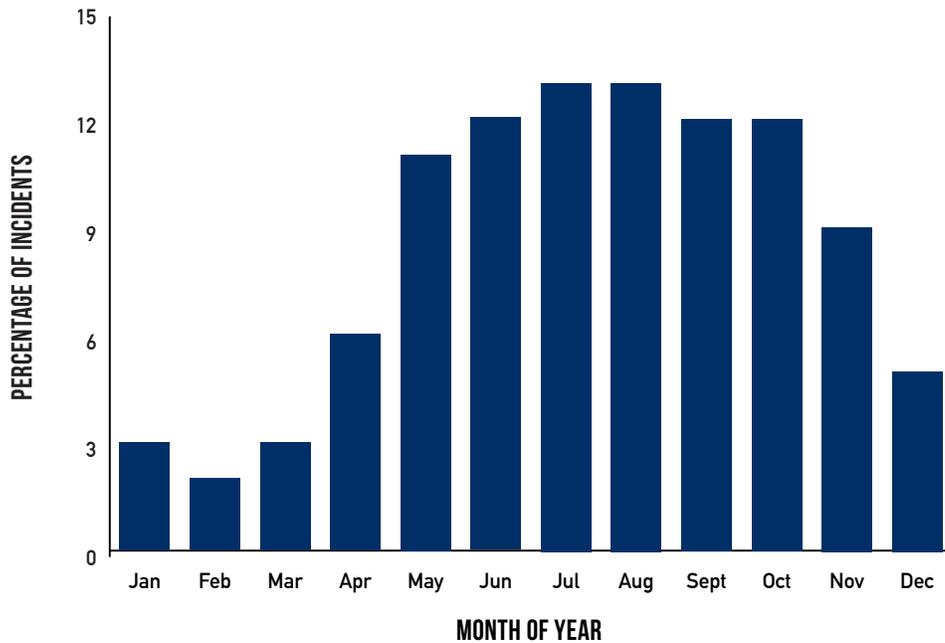
The number of incidents in Construction Sites has decreased from 4,562 in FY14 to 29 in FY22.

Figure H5: Percentage of Incidents by month – Non-Pipeline Strikes (2013 – 2022)



There is a 63% decrease in the number of FS non-pipeline incidents in the spring and summer (May to August) compared to fall and winter months (September to April). 74% of those incidents in the winter months occur in private dwellings.

Figure H6: Percentage of Incidents by month – Pipeline Strikes Only (2013 – 2022)



The number of pipeline strikes reported increases by 263% in the spring and summer months May-October because this is when most outdoor construction projects that requiring digging usually take place.



Figure H7: Incidents by Fuel Type Occurrences – (2013 – 2022)

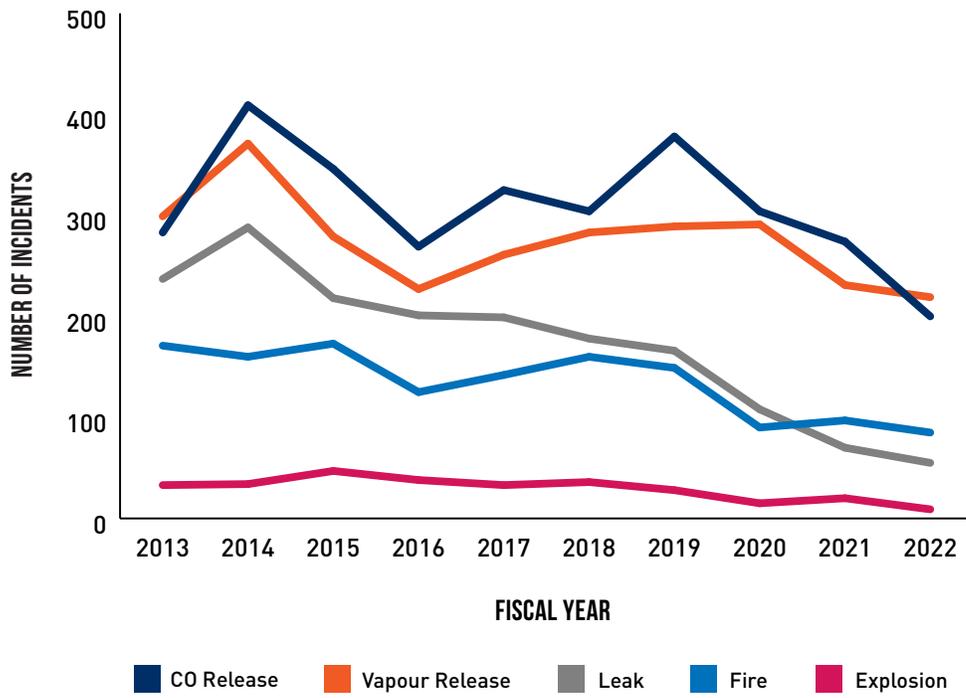
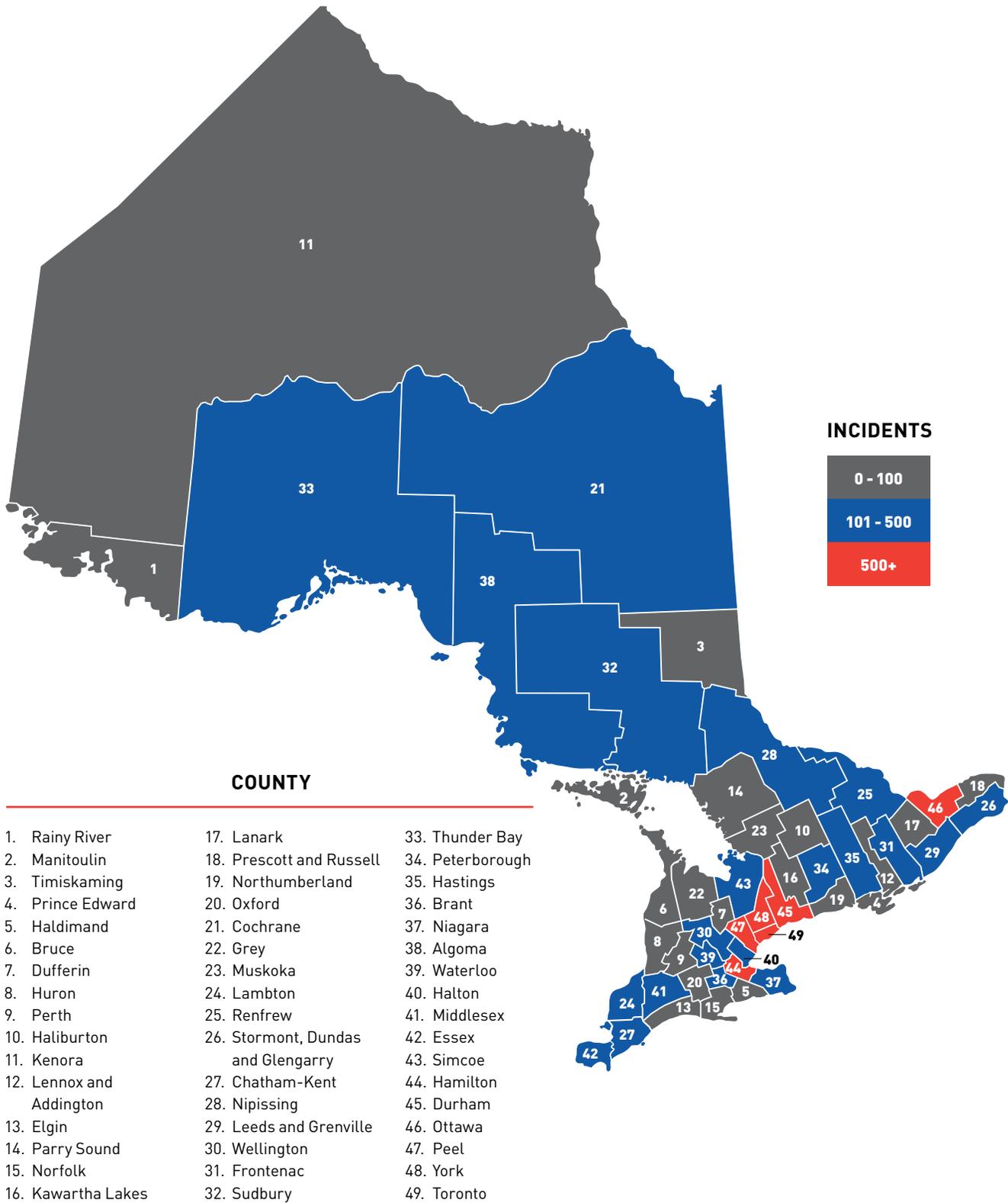


Figure H8: Incidents by Fuel Type Occurrences – (2013 – 2022)



Risks due to Potential Gaps in the Regulatory System (2013 – 2022)

Some typical examples of potential gaps in the regulatory system include: an improperly sized kitchen exhaust fan that caused negative pressure, resulting in a downdraft in the stove; uncertified equipment installed; a natural gas meter set damaged by a vehicle due to inadequate crash protection; and a faulty relief valve that resulted in a vapour release.

Risks due to Non-Compliance (2013 – 2022)

Some typical examples of non-compliance include: no maintenance performed on a water heater since installation resulting in failed component parts; logs not installed properly in a natural gas fireplace resulting in a carbon monoxide (CO) release; a chimney liner was installed too short, resulting in soot being released inside the residence; an appliance not installed to manufacturer's certified instructions; a worn out gasket; vent ducting not securely fastened; and a commercial kitchen fire as a result of a grease-laden exhaust hood

Risks due to External Factors (2013 – 2022)

Some typical examples of external factors include: a chimney damaged in a wind storm blocking the exhaust; high winds causing a downdraft; freezing rain causing the combustion air outlet to be partially blocked, resulting in a CO release; a rooftop Heating Ventilation and Air Conditioning unit buried under heavy snow; and vandalism of a meter set.

Pipeline Strikes (2013 – 2022)

A pipeline strike is a reportable pipeline incident (or near miss) involving damage to a pipeline, or its protective coating, including gouges, scrapes, dents or creases, resulting in, or having the potential to, damage a pipeline, even if there is no release/spillage of products or substances from the pipeline. Even small disturbances to a pipeline's integrity may cause a future leak due to subsequent corrosion. A pipeline strike can also involve the rupture of an underground natural gas pipeline during an excavation that results in the release of natural gas.

Liquid Fuels Licensed Sites

Risk of Sites

TSSA conducts periodic inspections of liquid fuels storage and dispensing facilities at least once every three years to oversee and manage the state of compliance across all licensed sites in Ontario.

Table H4: Number of Liquid Fuels Licensed Sites (2022)

DESCRIPTION	NUMBER
Licensed liquid fuels sites inventory	4,372
Licensed liquid fuels sites that had sufficient inspection history to calculate a risk score	3,516

Figure H9: Inventory Risk Profiles from Outcomes of Periodic Inspections Conducted on Licensed Liquid Fuels Licensed Sites (2018 – 2022)

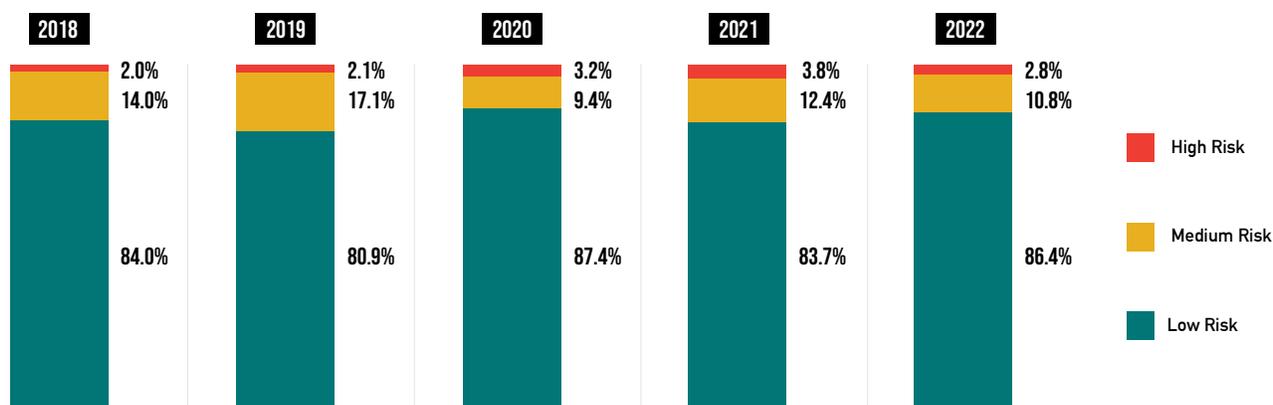


Table H5: Number of High-Risk Liquid Fuels Licensed Sites (2022)

DESCRIPTION	NUMBER	PERCENT OF QUALIFIED PROVINCIAL INVENTORY
High-Risk Sites	98	2.8%

Table H6: Top High-Risk Liquid Fuels Licensed Site Types (2022)

SITE TYPE	PERCENTAGE OF TOTAL HIGH-RISK SITES
Gas Stations	76.5%
Marinas	16.3%
Bulk Plants	7.1%

Compliance

The compliance rate is defined as the percentage of periodic inspections with no orders issued compared to the total number of periodic inspections.

Figure H10: Yearly Compliance Rates from Outcomes of Periodic Inspections Conducted at Licensed Liquid Fuels Licensed Sites (2018 – 2022)



Table H7: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections Conducted at Liquid Fuels Licensed Sites (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	41.1%	No Trend

Table H8: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections Conducted on Liquid Fuels Licensed Sites (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Shear valve and leak detection system maintenance documentation missing	12.58%
Defective equipment needs to be repaired or replaced	9.19%
Leak testing not being performed	6.64%

Table H9: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Inspections Conducted on Liquid Fuels Licensed Sites (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
Following proper outdoor storage procedures	37.47%
Uncertified persons working on equipment	13.91%
Operating equipment by certified personnel	10.86%



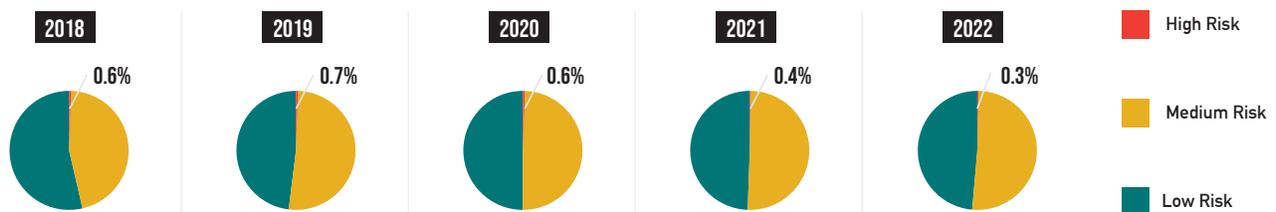
Risk of Orders

While the compliance rate provides an outcome of the periodic inspection (i.e., pass or fail), the inspection risk spectrum (shown as pie charts) portrays the potential safety risks associated with non-compliance. The red segments of the spectrums show unacceptable levels of risk.

Table H10: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted at Liquid Fuels Licensed Sites (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.30%
Low-Risk Issues	42.03%

Figure H11: Inspection Risk Spectrums from Outcomes of Periodic Inspections Conducted on Liquid Fuels Licensed Sites (2018 – 2022)



Some typical examples of minor issues include: above ground storage tanks not being permanently marked; missing signage; testing not being performed; licence not being displayed; and, underground storage tanks not being removed after being out of service for two years.

Propane Licensed Sites

Risk of Sites

TSSA conducts periodic inspections of propane facilities to oversee and manage the state of compliance across all licensed sites in the province of Ontario.

Table H11: Number of Propane Licensed Sites (2022)

DESCRIPTION	NUMBER
Licensed propane sites inventory	1,116
Propane licensed sites that had sufficient inspection history to calculate a risk score	1,039

Figure H12: Inventory Risk Profiles from Outcomes of Periodic Inspections Conducted on Propane Licensed Sites (2018 – 2022)

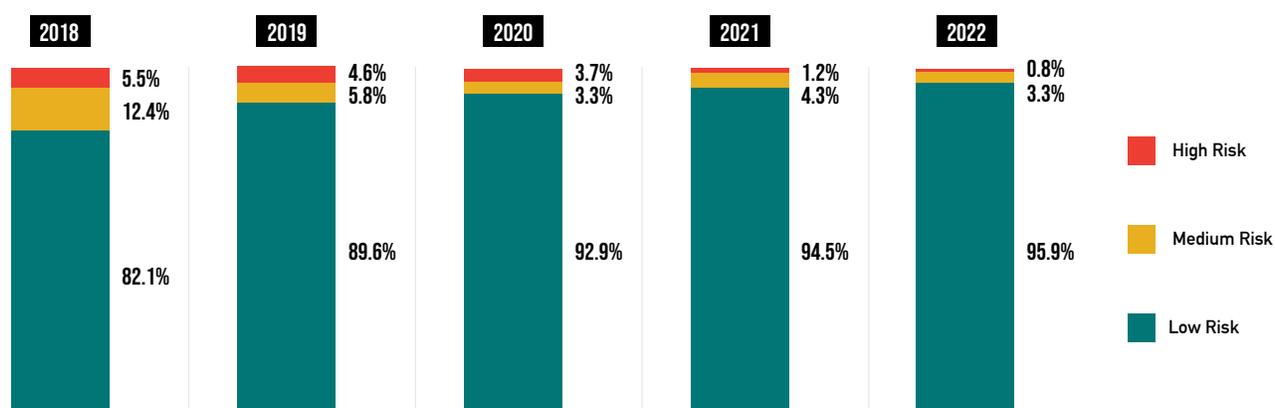


Table H12: Number of High-Risk Propane Licensed Sites (2022)

DESCRIPTION	NUMBER	PERCENT OF QUALIFIED PROVINCIAL INVENTORY
High-Risk Sites	9	0.9%

Table H13: Top High-Risk Propane Licensed Sites (2022)

SITE TYPE	PERCENTAGE OF TOTAL HIGH-RISK SITES
Cylinder Refill Centres	55.6%
Unknown	33.3%
Propane Filling Plants > 5000 USWG	11.1%

Compliance

The compliance rate is defined as the percentage of periodic inspections with no orders issued compared to the total number of periodic inspections.

Figure H13: Yearly Compliance Rates from Outcomes of Periodic Inspections Conducted at Propane Licensed Sites (2018 – 2022)



Table H14: Five-Year Mean Compliance Rate from Outcomes of Periodic Inspections Conducted at Propane Licensed Sites (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	74.0%	No Trend

Table H15: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Inspections Conducted on Propane Licensed Sites (2016 – 2020)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Readily ignitable materials around container	6.67%
Equipment must be maintained as per safety procedures	5.90%
Trucks and cargo liners should be inspected yearly	4.73%

Table H16: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Inspections Conducted on Propane Licensed Sites (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
No notification to inspector after occurrence	37.30%
Match, candle or flame used to check for propane leak	21.03%
Employee handling propane without certificate	19.55%

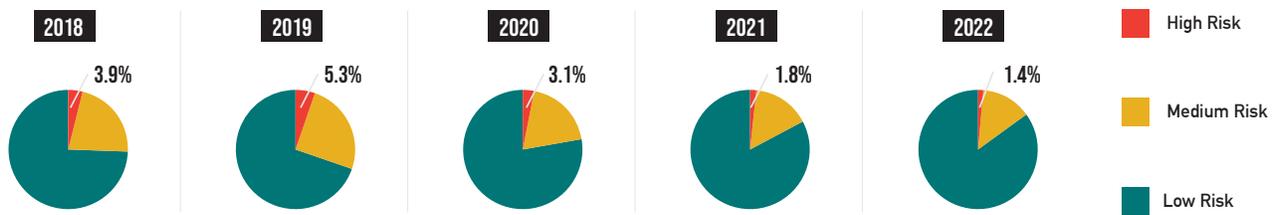
Risk of Orders

While the compliance rate provides an outcome of the periodic inspection (i.e., pass or fail), the inspection risk spectrum (shown as pie charts) portrays the potential safety risks associated with non-compliance. The red segments of the spectrums show unacceptable levels of risk.

Table H17: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted at Propane Licensed Sites (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	1.37%
Low-Risk Issues	81.91%

Figure H14: Inspection Risk Spectrum from Outcomes of Periodic Inspections Conducted on Propane Licensed Sites (2018 – 2022)



Some typical examples of minor issues include: missing signage; unpainted steel tanks; readily ignitable materials including vegetation being too close to containers, inadequate fencing, and licences not being displayed.

In the spirit of continuous improvement of TSSA's risk-based inspection scheduling, TSSA is heeding the advice of the Auditor General of Ontario, which noted that information used in Risk and Safety Management Plans (RSMPs) could also be used to inform inspection frequencies. For example, RSMPs list the land usage surrounding propane facilities. As such, the risk threshold for facilities in high density residential zones is 10% of that in remote/industrial locations and the threshold near sensitive receptors is 3% of the industrial threshold. In this way, TSSA can target inspection resources to facilities with the greatest potential for harm.

Heating Contractors

Compliance

TSSA conducts periodic audits on heating contractors in the province of Ontario to oversee and manage their state of compliance. The compliance rate is defined as the percentage of heating contractor audits with no orders issued compared to the total number of heating contractor audits.

Figure H15: Yearly Compliance Rates from Outcomes of Periodic Audits Conducted on Heating Contractors (2018 – 2022)

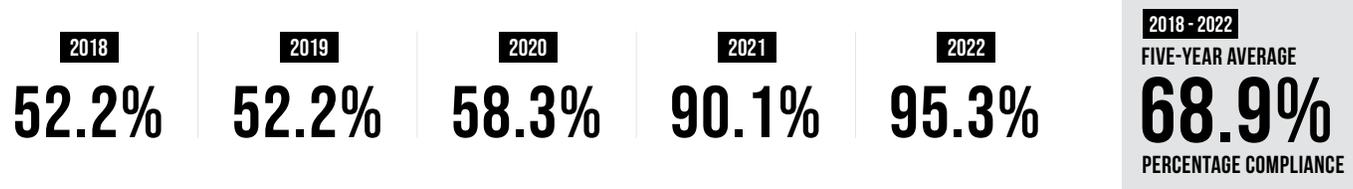


Table H18: Five-Year Mean Compliance Rate from Outcomes of Periodic Audits Conducted on Heating Contractors (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	68.9%	Increasing

Table H19: Top compliance Issues by Number of Orders Issued from Outcomes of Periodic Audits Conducted on Heating Contractors (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Unacceptable condition – no immediate hazard	28.22%
Equipment not installed per manufacturer’s certified instructions	7.38%
Ensure personnel comply with the Act	3.31%

Table H20: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Audits Conducted on Heating Contractors (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL RISK OF ORDERS ISSUED
No notification to inspector (TSSA) after occurrence	30.91%
Contractor working beyond scope of certification	23.15%
Personnel handling equipment must be certified	8.02%

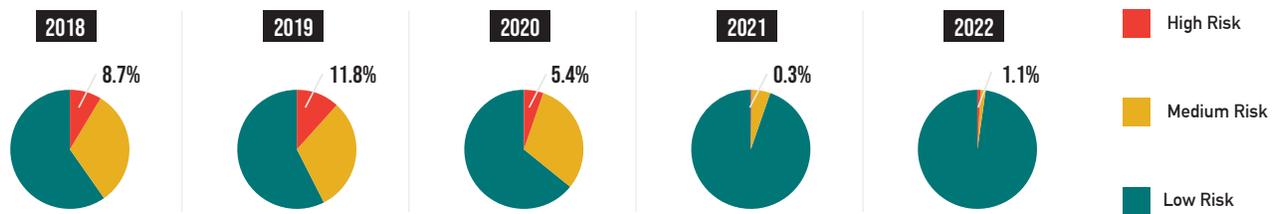
Risk of Orders

While the compliance rate provides an outcome of the periodic audit (e.g., pass or fail), the audit risk spectrum (shown as pie charts) portrays the potential safety risks associated with non-compliance. The red segments of the spectrums show unacceptable levels of risk.

Table H21: Inspection Risk Spectrum from Outcomes of Periodic Audits Conducted on Heating Contractors (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	1.15%
Low-Risk Issues	96.38%

Figure H16: Audit Risk Spectrum from Outcomes of Periodic Audits Conducted on Heating Contractors (2018 – 2022)



Some typical examples of minor issues include: the registration not being displayed in a conspicuous location; equipment not being installed per manufacturer’s instructions; use of unapproved equipment; drip or dirt pockets not readily accessible for cleaning; and the installer not leaving the manufacturer’s instructions with the user.

Petroleum Contractors

Compliance

TSSA conducts periodic audits on petroleum contractors in the province of Ontario to oversee and manage their state of compliance. The compliance rate is defined as the percentage of petroleum contractor audits with no orders issued compared to the total number of petroleum contractor audits.

Figure H17: Yearly Compliance Rates from Outcomes of Periodic Audits Conducted on Petroleum Contractors (2018 – 2022)



Table H22: Five-Year Mean Compliance Rate from Outcomes of Periodic Audits Conducted on Petroleum Contractors (2018 – 2022)

DESCRIPTION	FISCAL YEARS 2018 – 2022	TREND (ANNUAL)
Compliance Rate (Mean)	89.7%	No Trend

Table H23: Top Compliance Issues by Number of Orders Issued from Outcomes of Periodic Audits Conducted on Petroleum Contractors (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Above ground storage tank not protected from vehicular impact	5.13%
Installation/Operation shall be as per manufacturers specifications	4.49%
Operators' vehicle should display certification number and name	4.49%

Table H24: Top Compliance Issues by Risk of Orders Issued from Outcomes of Periodic Audits Conducted on Petroleum Contractors (2018 – 2022)

COMPLIANCE ISSUE	PERCENTAGE OF TOTAL NUMBER OF ORDERS ISSUED
Employees not being instructed to comply with Act and Regulation	47.73%
No notification of unacceptable condition	25.54%
Contractor/Operating personnel not registered	15.91%

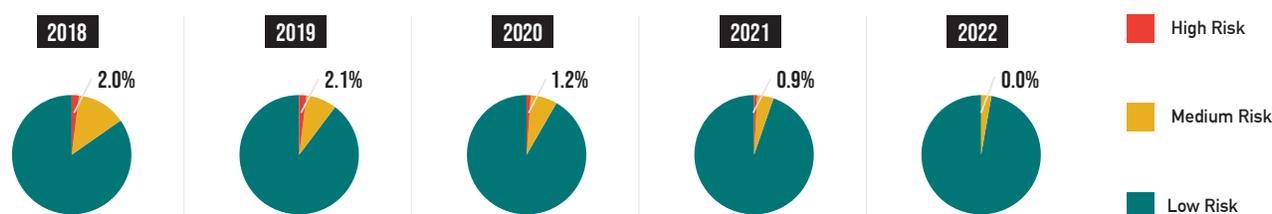
Risk of Orders

While the compliance rate provides an outcome of the periodic audit (i.e., pass or fail), the audit risk spectrum (shown as pie charts) portrays the potential safety risks associated with non-compliance. The red segments of the spectrums show unacceptable levels of risk.

Table H25: Inspection Risk Spectrum from Outcomes of Periodic Audits Conducted on Petroleum Contractors (2022)

INSPECTION RISK SPECTRUM	FISCAL YEAR 2022
High-Risk Issues	0.00%
Low-Risk Issues	2.83%

Figure H18: Audit Risk Spectrum from Outcomes of Periodic Audits Conducted on Petroleum Contractors (2018 – 2022)



Some examples of minor issues included: aboveground storage tanks not being permanently marked; aboveground storage tanks not being protected against vehicular impact; contractor vehicles not being marked with the name and registration number; missing signage; and, the application for licence renewal being made after it had already expired.

Inspection and Re-Inspection Results

The table below contains numbers and types of inspections, as well as re-inspection results. “Pass” or “Fail” was based on the outcome status of an inspection. “Other” was a group of inspection outcomes that included either non-mandated outcomes, outcomes that were neither pass or fail (such as validating installed base statuses or occurrence inspections), and various other miscellaneous statuses. “Other” outcomes were not included in the pass rate. There are subtle differences between the pass rate used in this table and the compliance rate used in the main body of the report, which can result in small differences between the two numbers.

Table H26: Fuels Inspection and Re-Inspection Results (2022)

INSPECTION TYPE	PASS	FAIL	OTHER	GRAND TOTAL	PASS RATE (%)
Ad Hoc/Unscheduled Inspection	1,026	320	0	1,346	76%
Alteration Inspection	23	2	0	25	92%
Complaint Inspection	343	41	0	384	89%
Initial Inspection	2,994	253	4	3,251	92%
Non-mandated/Non-regulated Inspection	0	0	295	295	N/A
Incident Inspection	292	0	2,509	2,801	100%
Other Inspection	653	3,233	54	3,940	17%
Periodic Inspection	2,541	333	8	2,882	88%
Reinspection	1,452	1,531	18	3,001	49%
Grand Total	9,324	5,713	2,888	17,925	62%

Legislation and Regulatory Information

Table H27: TSSA Fuels Legislation and Regulatory Information (2022)

LEGISLATION AND REGULATORY INFORMATION AS OF 2020	LATEST REVISION
Oil and Gas Pipeline Systems	
Ontario Regulation 210/01: Oil and Gas Pipeline Systems	2001
Ontario Regulation 210/01: Director's Order	2001
Oil and Gas Pipeline Systems CAD Amendment FS-253-20	2020
Propane Storage and Handling	
Ontario Regulation 211/01: Propane Storage and Handling	2015
Ontario Regulation 197/14: Liability Insurance Requirements for Propane Operators	2016
Propane CAD Amendment FS-254-20	2020
Mobile Food Service Equipment Code TSSA-MFSE-2020	2020
Gaseous Fuels	
Ontario Regulation 212/01: Gaseous Fuels	2015
Ontario Regulation 212/01: Director's Order	2001
Gaseous Fuels CAD Amendment FS-255-21	2021
Mobile Food Service Equipment Code TSSA-MFSE-2020	2020
Field Approval Code TSSA-FA-2020	2020
Digester, Landfill and Bio-Gas Code TSSA-DLB-2020	2020
High Pressure Piping Code TSSA-HPP-2020	2020
Fuel Oil	
Ontario Regulation 213/01: Fuel Oil	2001
Ontario Regulation 213/01: Director's Order	2001
Fuel Oil CAD Amendment FS-259-21	2021
Compressed Gas	
Ontario Regulation 214/01: Compressed Gas	2007
Compressed Gas CAD Amendment FS-143-09	2009
Liquid Fuels	
Ontario Regulation 217/01: Liquid Fuels	2001
Liquid Fuels CAD Amendment FS-235-18	2019
Minister's Exemption Liquid Fuels Regulation 217/01	2020
Requirements for Contractors	
Ontario Regulation 216/01: Certification of Petroleum Equipment Mechanics	2008
Ontario Regulation 215/01: Fuel Industry Certificates	2019
Amendment to Ontario Regulation 215/01 - CDT Activation (Ontario Regulation 184/03)	2003

The following advisories were issued last year:

- FS-247-19 R1 – Introduction of TSSA's Fuel Oil Distributor Audit Program; and
- FS-188-11 R4 – Propane Facility Licence Process.

During this fiscal year, there were no Fuels director's orders, bulletins or guidelines issued. The following advisories were issued:

- FS-256-21: Registration of High-Pressure Piping
- FS-260-22: Illegal Refilling of One-Pound Propane Cylinders Using Adaptor Kits.
- FS-258-21: Approval of Underground Propane Tank Installations.

See www.tssa.org for a comprehensive listing of legislation and regulatory information.

