State of Safety 2021

The State of Safety represents the work we are doing to improve the safety of the technical equipment we regulate in British Columbia. Read on to learn about safety trends, analysis and emerging risks.

Ammonia education and awareness

In collaboration with our industry partners, we continue to evolve the program to improve education, training, and awareness of ammoni…

Read more

Carbon monoxide safety education

Following a series of carbon monoxide exposures, Technical Safety BC led an in-depth

Read more

Climate resiliency

As the climate around us

continues to change, as a regulator we are adapting to identify, analyze, and mitigate the climate change risks to…

Read more

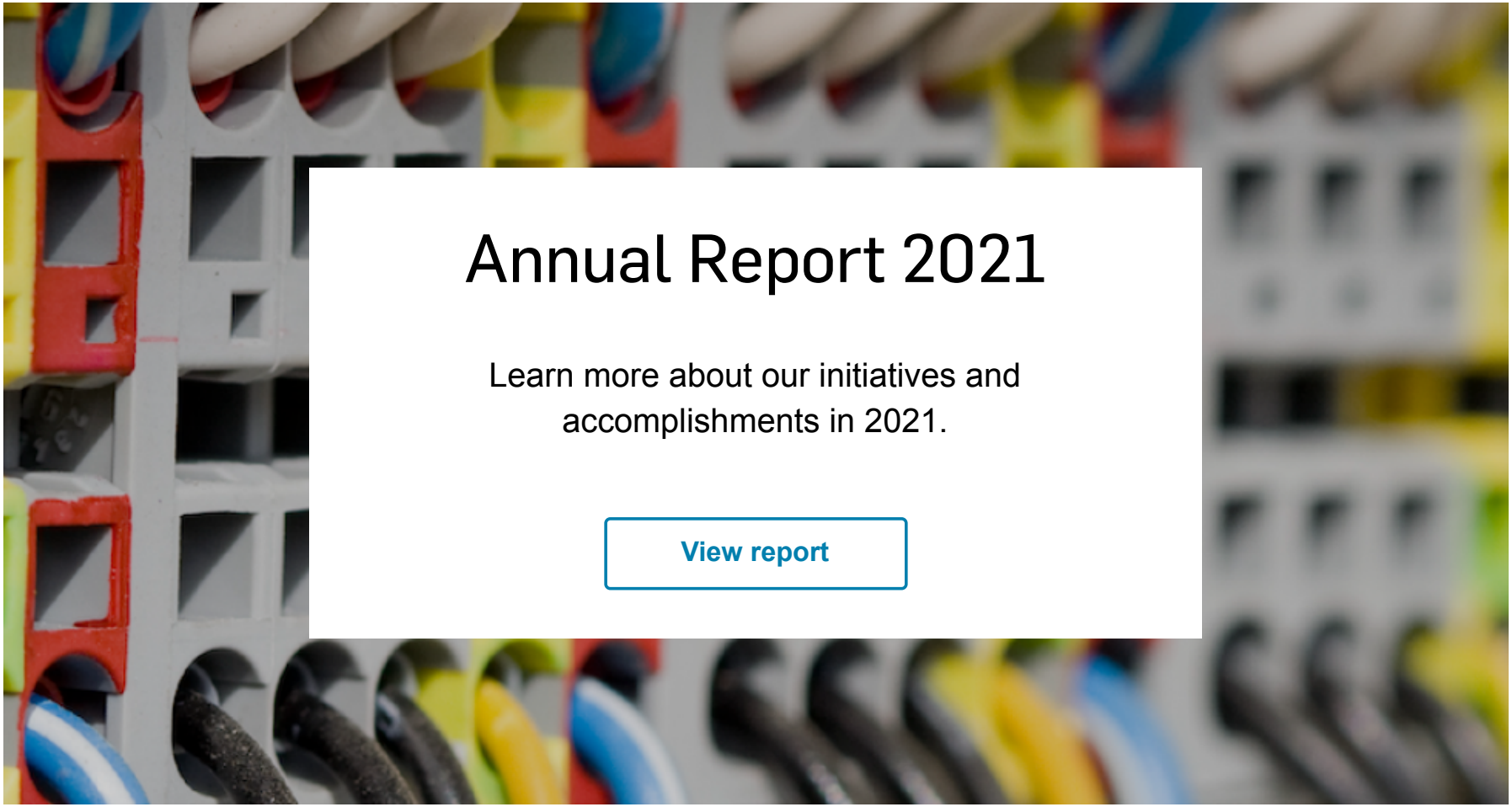
Business transformation

As COVID-19 pushed industries around the world to adopt digital tools, Technical Safety BC looked inward to make sure our technological framewor…

Read more

Previous State of Safety reports

State of Safety 2020	View
State of Safety 2019	View
State of Safety 2018	View
State of Safety 2017	View


Annual Report 2021
Learn more about our initiatives and accomplishments in 2021.
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Understanding Safety Risks: Incidents

Incidents

Incidents involving work or equipment regulated by the *Safety Standards Act* are required to be reported to the appropriate safety manager. We investigate many of these incidents to gain an understanding of safety hazards in British Columbia and determine what actions can be taken to manage them.

Key Statistics

479

Incidents reported in 2021

95

Incident investigations completed in 2021

3%

Increase in incidents reported compared to 2020

Explanation of incidents

Technical Safety BC completes investigations on certain incidents reported to us in all technologies except for rail. We investigate incidents reported to us when:

- Regulated work or regulated equipment is involved.
- Evidence is available to help determine causes and contributing factors.
- A learning opportunity exists to understand and document what caused the incident, and to inform prevention of similar incidents.

Learnings from incidents

As part of Technical Safety BC's commitment to share safety information with clients and the public, we share our incident investigation summaries. The investigations are documented in our enhanced incident investigation report format and organized by technology.

The number of reported incidents increased by 3% compared to 2021.

1. Carbon monoxide exposures remain a serious risk to our safety system

In 2021, Technical Safety BC conducted a comprehensive investigation into gas-burning furnaces manufactured between 1989-2011 by the Carrier Corporation. The investigation was prompted by the hospitalization of eight people across the province due to carbon monoxide (CO) exposure that involved a common brand of residential furnace. Our Incident Investigation team examined the incidents together to ensure that similarities were identified and scrutinized and findings from the investigation were compiled into a detailed analysis known as the Carrier Gas Furnace Report.

2. Technical Safety BC's Ammonia Safety Awareness Program has improved ammonia safety education and reduced risks

Throughout 2021, we worked in collaboration with our partners to pilot, launch, and evaluate the Ammonia Safety Awareness Program. Technical Safety BC and industry partners developed this no-cost specialized education and training program to share best practices for maintaining ammonia refrigeration equipment and systems across their lifecycle. The goal is to enable participants to establish formal maintenance and operational programs to identify, document and manage risks, and make informed budgetary decisions and plans to support the safety of the equipment. More than 170 individuals participated in the Ammonia Safety Awareness Program.

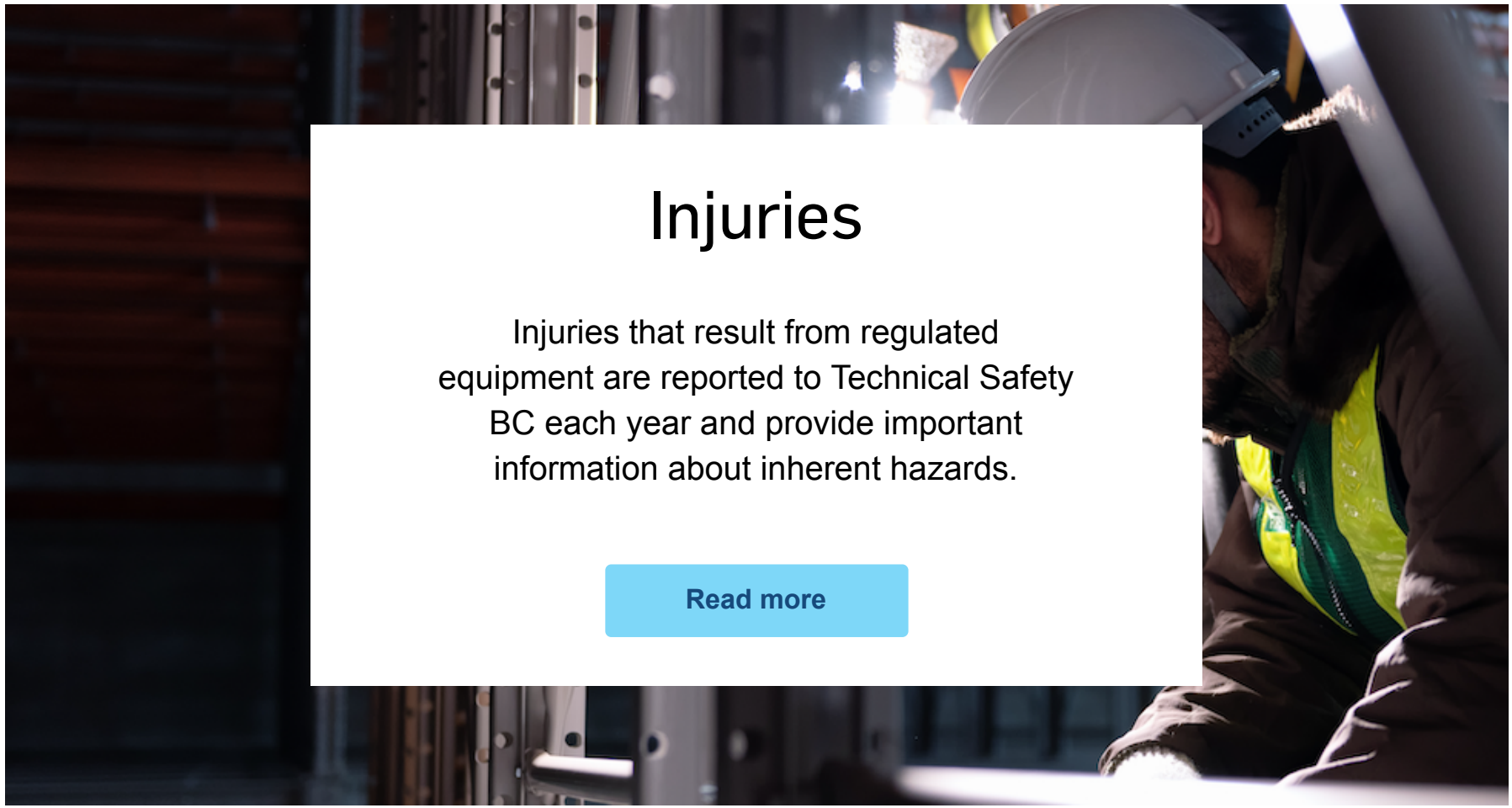
Incidents reported to us by category from 2017 - 2021

Incident Categories

Under Assessment	Still being assessed by Technical Safety BC and was not assigned to a category as of time of data collection.
Severe	An incident that resulted with a fatal injury and/or severe equipment damage.

Major	An incident that resulted with major injury and/or major equipment damage.
Moderate	An incident that resulted with moderate injury and/or equipment damage.
Minor	An incident that resulted with minor injury and/or minor equipment damage.
Insignificant	An incident that resulted with insignificant and/or insignificant equipment damage.

Incidents Reported by Technology in 2021



Injuries

Injuries that result from regulated equipment are reported to Technical Safety BC each year and provide important information about inherent hazards.

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Understanding Safety Risks: Injuries

Injuries

The number of injuries reported to us in a given year provides an important indicator of the impacts of the hazards inherent in regulated equipment. Together with industry, our goal is to minimize incidents and injuries.

Please note that Technical Safety BC receives its injury reports and descriptions from operators or first responders at the time of, or immediately following, the incident. Injuries reports are based on evidence available during investigation and any long term effects of an injury are not reflected in the statistics.

Key Statistics

Fatal injury in 2021

Injuries rated as Major

Decrease in injuries compared to 2020

Please note that injuries associated with incidents still under assessment are excluded.

Injury categories

Fatal	An injury causing death.
Major	An injury where residual effects are likely to significantly affect long-term quality of life.
Moderate	An injury where residual effects are unlikely to significantly affect long-term quality of life. E.g., temporary loss of consciousness, fractures, concussions.
Minor	An injury where there are typically no residual effects and recovery is expected. E.g., bruises, cuts, minor disorientation (confusion).
Insignificant	An injury where there are typically no residual effects and full recovery is expected. E.g., temporary pain and discomfort.

Fatal injuries

One incident involving a fatality related to electrical equipment was investigated in 2021.

A general contractor was refilling a gasoline fueled portable electric generator in the basement of a house under construction and perished after the exposure to carbon monoxide (CO). The investigation found that the generator was placed in the basement to combat frost damage to the concrete foundation during the -30 to -40C cold weather, to prevent theft, and to quiet running noise for neighbors. A fire fighter's gas detector maxed out at 1000 parts per million (PPM) of CO inside the basement where the worker was found, and the generator was no longer running. With the CO levels likely well over 1000 PPM when the worker had entered the space, the conditions within are considered immediately dangerous to life and health.

Carbon monoxide exposures continue to be a tenacious risk to our safety system. While the effects of CO poisoning can be devastating, they can be prevented. We are committed to providing continuous education on CO safety.

Major injuries

Of the closed investigations, 6 incidents were ranked as “major” in 2021. These included:

1. Gas incidents

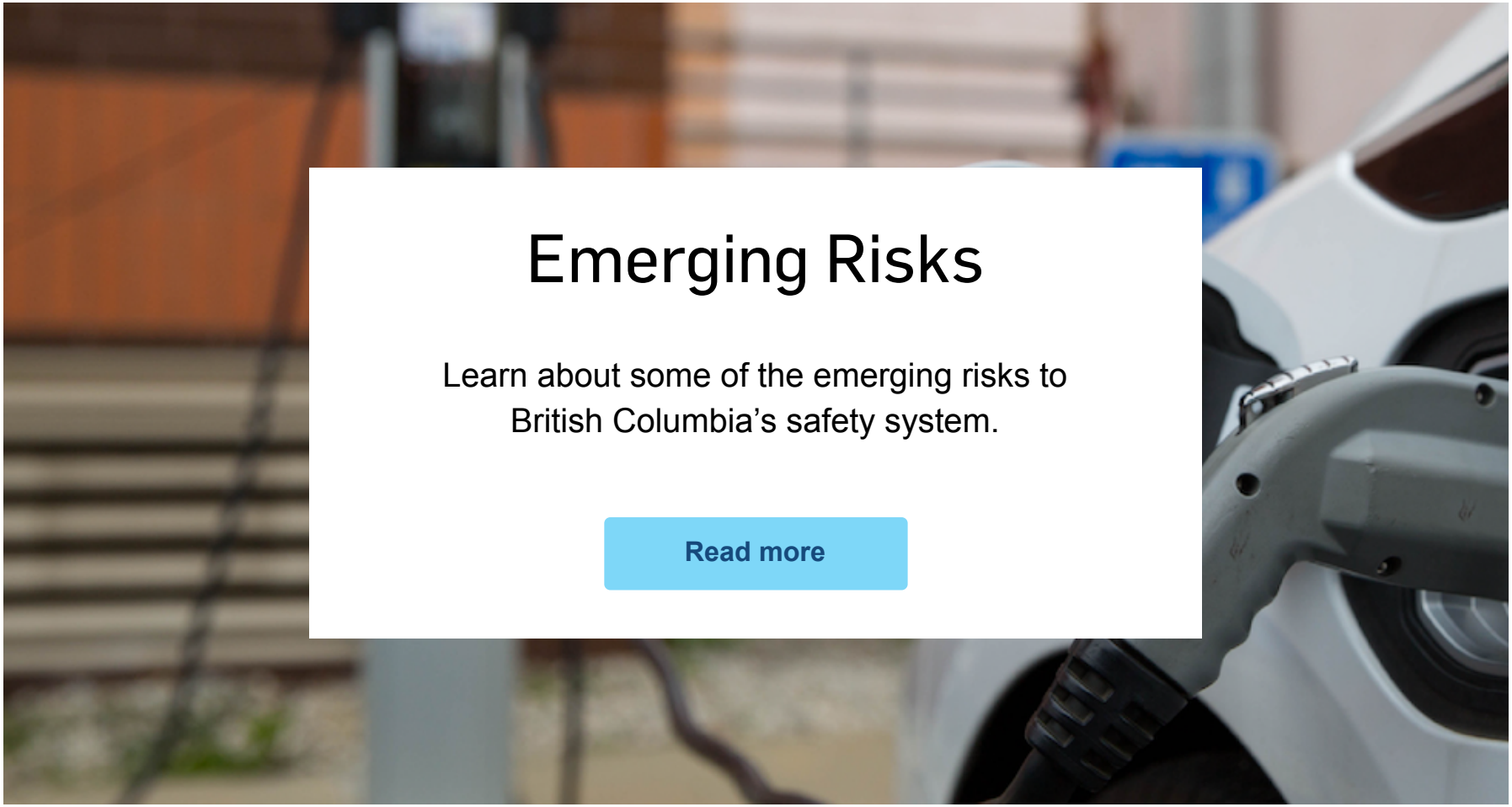
One incident involved a natural gas fired boiler in a residential home producing high levels of carbon monoxide, resulting in three individuals in medical distress due to exposure to carbon monoxide (CO). Another incident was an explosion involving propane gas in a recreational vehicle, resulting in burns to the victim’s face, hands, ears, and legs.

2. Electrical

Energized components of a 600 Volt main distribution center were removed without the equipment being shut down. As a result, an arc flash caused first to third degree burns to the head, neck, shoulders, chest, arms of an individual, while chest pain and breathing difficulties were reported by a second person. In another incident, an arc flash resulted in first degree burns for an electrician who was replacing a circuit breaker.

Injuries by Category (2017-2021)

Injuries by Technology in 2021



Emerging Risks

Learn about some of the emerging risks to British Columbia's safety system.

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Understanding Safety Risks: Emerging Risks

Emerging Risks

In 2021, noteworthy emerging risks included safety risks associated with extreme weather and climate resiliency, and work done by unlicensed individuals.

1. Extreme weather and climate resiliency

In 2021, the changing climate resulted in difficult weather conditions, including heat waves, wildfires, floods, and extreme cold. As these events become more common, people suffer personal and economic hardship, as well as increased risks. Every technology that Technical Safety BC regulates was impacted by the challenging environmental conditions.

As we build resiliency and prepare for a changing climate, we recognize that we must remain agile to best serve our clients. This includes collecting data on hazards related to extreme weather events, understanding how to aid in recovery, assessing emerging risks from gradual changes to climate over the lifecycle of technologies, and preparing to regulate new kinds of equipment.

Our 2021 public safety campaigns focused on raising awareness for the technology-related hazards caused by wildfires, floods, and extreme cold.

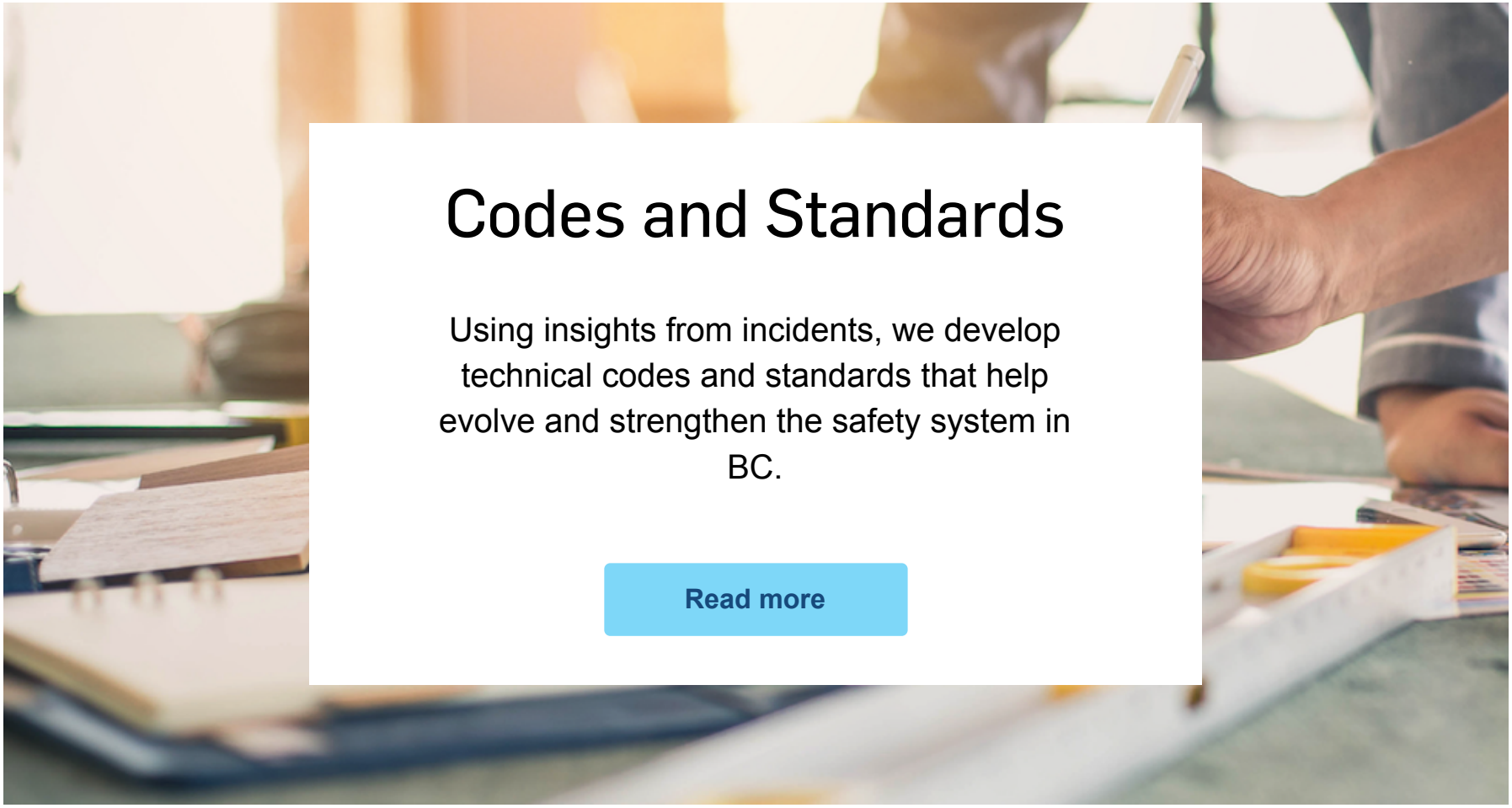
In addition, as new low-carbon technologies enter the market such as heat pumps, electric vehicle energy management systems,

hydrogen, and new types of refrigerants, we must be responsive and ready to intervene with programs designed to assure their safety. We also must understand how climate change will impact current technical systems and equipment, and build resiliency by adjusting our risk control activities.

2. Continued work by unlicensed individuals

Licensed contractors perform regulated work and make sure equipment is installed properly. While there are no numbers on how much regulated work is performed annually by unlicensed individuals, the danger this presents is significant.

Changes to the *Safety Standards Act* and *Safety Standards General Regulation,* will strengthen the public's ability to identify which contractors are licensed and legally allowed to perform work in BC. Effective September 6, 2022, contractors will be required to publish their company name and Technical Safety BC licence number when advertising their services to the public. This year, Technical Safety BC is seeking input from contractors to establish guidelines that more clearly define these rules, including what forms of advertising should require the company name and licence number and what forms should be exempt.



Codes and Standards

Using insights from incidents, we develop technical codes and standards that help evolve and strengthen the safety system in BC.

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Managing Safety Risks: Codes and Standards

In this section

Home > State of Safety 2021 > Codes and Standards

Codes and standards

As a regulator, we ensure British Columbia's specific needs are considered during the development of technical codes and standards. The insights and knowledge gained from incidents help evolve and strengthen the safety system.

Key Statistics

21

Regulatory instruments

10

Issue-specific consultations or research projects

81

Associations/national codes and standards committees

Codes and standards committees

The following is a list of all industry associations and national codes and standards committees in which Technical Safety BC participated in during 2021.

Alternative Safety Approaches (ASA)	Show more
Amusement Devices	Show more
Boilers, Pressure Vessels, and Refrigeration	Show more
Electrical	Show more
Elevating Devices	Show more
Gas	Show more
Passenger Ropeways	Show more
Railways	Show more

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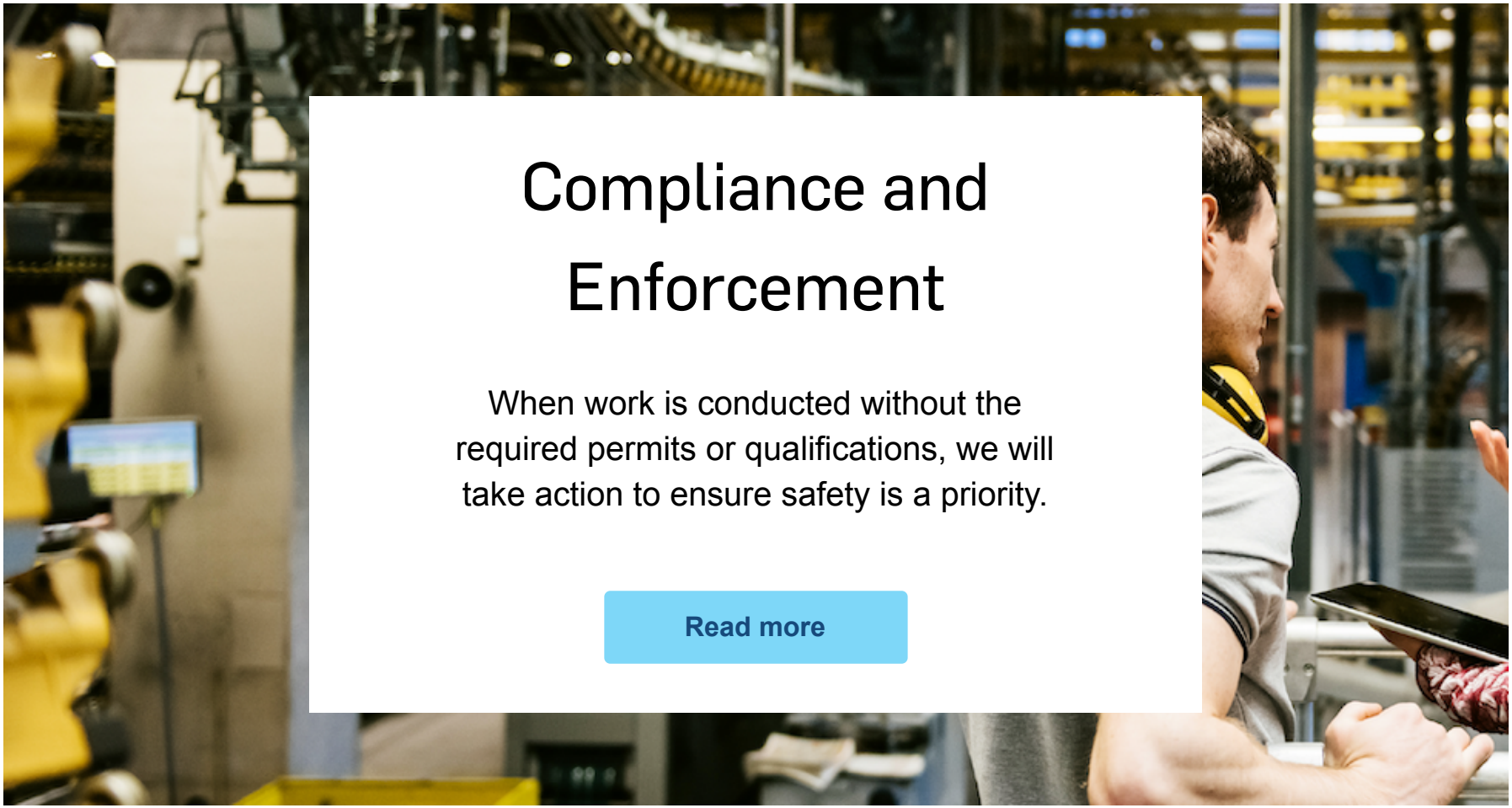

Compliance and Enforcement

When work is conducted without the required permits or qualifications, we will take action to ensure safety is a priority.

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Compliance and enforcement

When technical or administrative non-compliances are identified, our first step is often to work with duty holders to help them understand their obligations, and provide them with a clear pathway to resolution. However, when these interventions don't achieve the desired result, Technical Safety BC may take enforcement action to achieve compliance.

Key Statistics

Highest monetary penalty in 2021

Compliance orders issued in 2021

Compliance audits conducted in 2021

Compliance and enforcement actions

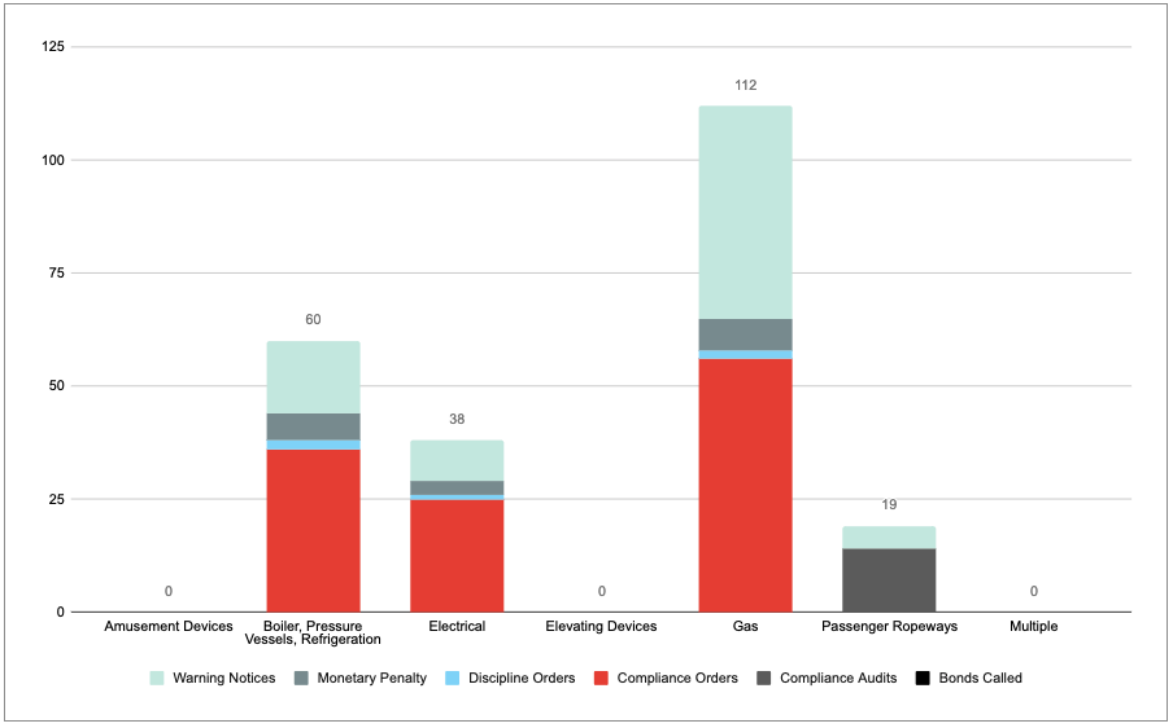
In 2021, we conducted 229 compliance and enforcement actions, of which 117 were compliance orders and 14 were compliance audits. Other compliance and enforcement activities include 77 warning notices issued, 16 monetary penalties, and five discipline orders. No bonds were called this year.

Action Definitions

Bonds	Show more
Compliance orders	Show more
Compliance audits	Show more
Warning notices	Show more
Monetary penalties	Show more

Discipline order	Show more
Duty holder	Show more

Compliance and Enforcement by Technology in 2021



Compliance and Enforcement by Technology in 2021

Compliance audit

Our compliance audits play an important role in our safety oversight. Technical Safety BC selects candidates in fairness and transparency. The following criteria illustrates how we segment our audits and then impartially distribute them across all technologies and in the contractor community. The criteria is organized into three distinct categories for determining compliance audits:

1. **Random:** An independent computer algorithm randomly selects a sample of contractor license data within all technologies, in all regions, on an annual basis.
2. **Investigation:** Analysis of the following indicators:
    - the average rate of obtaining permits in a given period of time compared to industry average and other companies of same size and scope
    - the number of non-compliances associated with a licence
    - the hazard level associated with any non-compliance(s)
    - the company’s payroll compared with their permitting activities
    - other factors such as previous enforcement history and the effectiveness of previous enforcement.
3. **Compliance Monitoring:** When enforcement action does not achieve the desired behavioural effect, a deeper dive into the duty holders activities is warranted. Audits on repeat offenders

will reveal the root cause of why the non-compliant behaviour continues.

Audits by Category in 2021

Audits by Category in 2021

Compliance and Enforcement by Year (2017-2021)

Compliance and Enforcement by Year (2017-2021)

Monetary penalties in 2021

While legislation empowers us to issue a monetary penalty at any time in the enforcement process, we use our discretion when doing so. In fact, we only issue monetary penalties after warning notices or compliance orders did not secure compliance, or when compliance was breached.

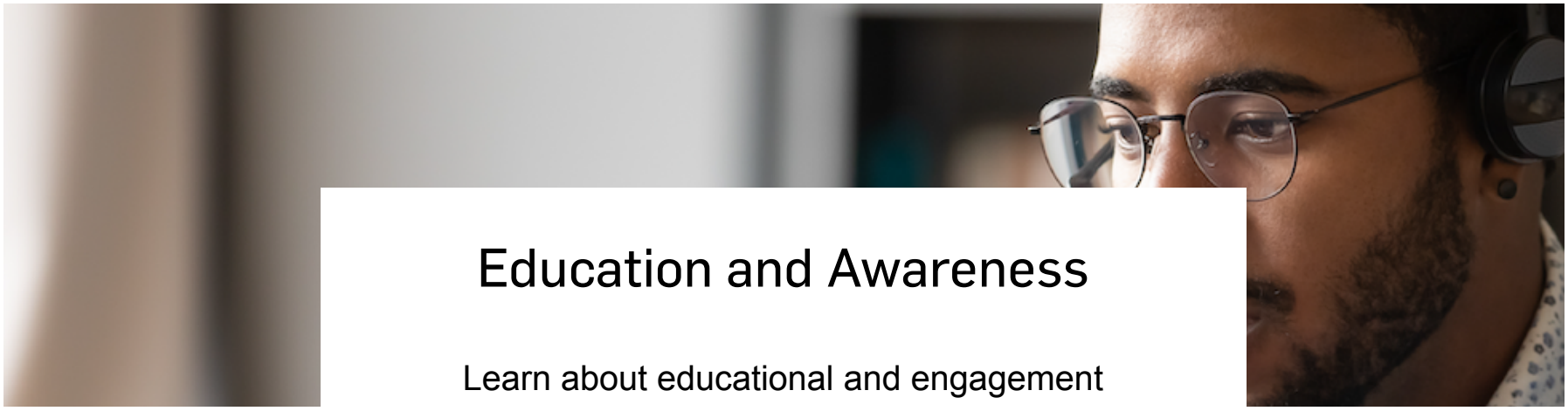
To provide transparency and understanding of where we are taking action, the following chart lists the monetary penalties issued in 2021. Most of these penalties were issued to those in the gas or electrical technologies.

Duty Holder	Technology	Category	Value
AL Thompson d.b.a. Total Heating	Gas	Failure to comply with a discipline order	Daily penalty of $250, Total of $16,500
Northland Mechanical Contracting Ltd.	Boiler & Pressure Vessel	Failure to comply with a compliance order	$3,000
Mario Alberto Ponte	Gas	Failure to comply with a compliance order	$2,000
Brad Penny d.b.a Living Big Tiny Home Company	Electrical	Failure to comply with a	Daily penalty of $200, Total of $6,000

		compliance order	
Pacific West Mechanical Ltd.	Boiler & Pressure Vessel	Failure to comply with a compliance order	$500
Milani Plumbing Heating & Air Conditioning Ltd.	Boiler & Pressure Vessel	Failure to comply with a compliance order	$7,500
Bricor Mechanical Ltd.	Boiler & Pressure Vessel	Failure to comply with a compliance order	$2,000
Lillie Family Heating & Plumbing (2014) Ltd.	Boiler & Pressure Vessel	Failure to comply with a compliance order	$3,000
Fraser Plumbing &	Gas	Failure to	$5,000

Heating Ltd.		comply with a compliance order	
Sim Electric Inc.	Electrical	Failure to comply with a compliance order	$5,000
Michael Fader d.b.a. Fader Industries	Gas	Failure to comply with a compliance order	$36,000
Household Heating Ltd.	Gas	Failure to comply with a compliance order	$6,000
BMB Signs Ltd.	Electrical	Failure to comply with a compliance order	$13,000

Troy McMillan d.b.a. McMillan's Plumbing and Heating	Gas	Failure to comply with a compliance order	$500
C.T. Control Temp Ltd.	Refrigeration	Failure to comply with a compliance order	Daily penalty of $250 Total of $12,000
Tycor Climate Control Inc.	Gas	Failure to comply with a compliance order	Daily penalty of $250 Total of $12,000

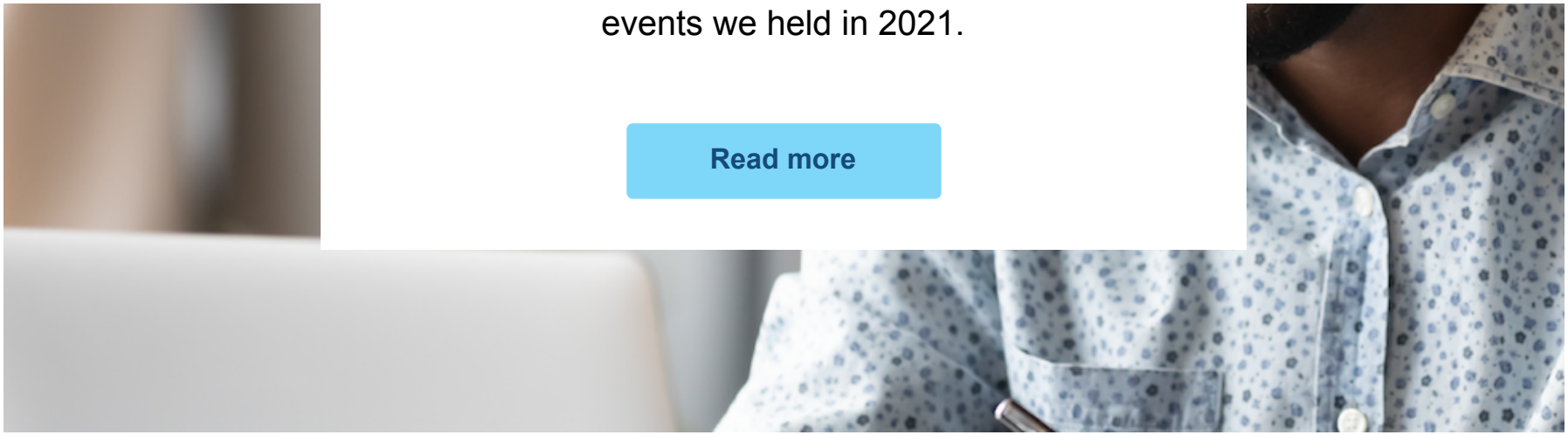


Education and Awareness

Learn about educational and engagement

events we held in 2021.

Read more



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Managing Safety Risks: Education and Awareness

Education and awareness

We use our educational courses and engagement programs to help build awareness around common hazards, best safety practices, and industry regulations and standards to keep the public and our clients safe.

Key Statistics

Educational events held in 2021

Satisfaction rating for our education programming

Registered learners at the end of 2021

Adapting our approach to safety education and engagement

Technical Safety BC provides safety and technical training across the province. Our insights from safety officer inspections, incident investigations, and direct feedback from clients helps us identify education opportunities and design courses. Our courses are designed and taught by industry leaders with the most up-to-date knowledge of regulatory codes, safety best practices, and potential hazards.

In 2021, we continued to offer self-paced online courses and online-blended formats to deliver education services to our clients, stakeholders, and the public. We also launched our digital engagement site engage.technicalsafetybc.ca to improve access for clients and stakeholders across the province. We use insights gathered to inform how we design, test, and improve our policies, programs, products, and services. It's essential that the voices we hear represent our clients, industry, and British Columbians. This includes ensuring everyone has a fair opportunity to participate and that traditionally under-represented and excluded groups also have a voice.

This year we conducted discovery research with building owners, property managers and contractors to understand the value and

challenges of obtaining and renewing their electrical operating permits, which is feeding into improvement efforts in 2022.

We began a new phase of engagement with the amusement rides and devices industry to understand how our regulatory framework can best support them in achieving safety within their facilities and for their equipment and devices.

In 2021, Technical Safety BC continued to provide education courses on the 2018 Canadian Electrical Code and the changes to BC's Acts and Regulations. The course includes interpretations and applications of the code and new definitions and tables.

We also launched the Ammonia Safety Awareness Program, developed by Technical Safety BC and industry partners. This no-cost specialized education and training program is designed to share best practices for maintaining ammonia refrigeration equipment and systems across their lifecycle. The goal is to enable participants to establish formal maintenance and operational programs to identify, document and manage risks, and make informed budgetary decisions and plans to support the safety of the equipment. Throughout 2021, we worked in collaboration with our partners to pilot, launch, and evaluate the program and make ongoing improvements to the content and delivery to ensure it would be accessible and impactful for the

industry. In 2021, more than 170 individuals participated in the Ammonia Safety Awareness Program.

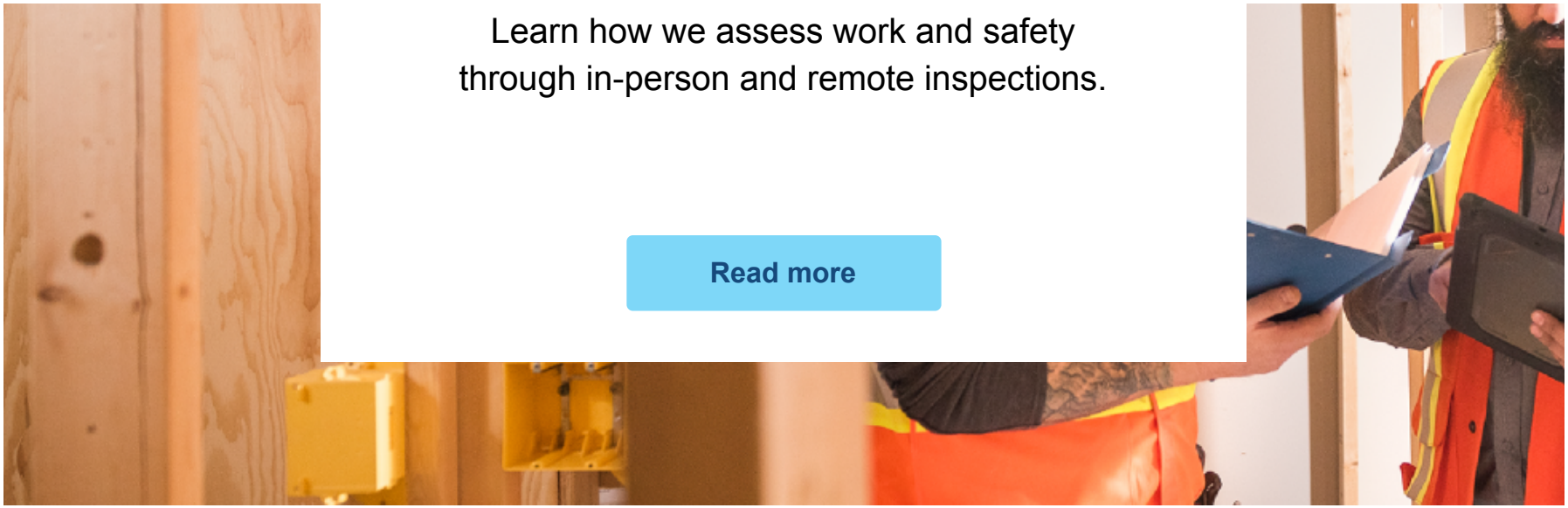
From July to mid-September 2021, our carbon monoxide marketing campaign provided safety tips to campers, RV owners, boaters and vacationers who stayed in rental homes. This was followed by a fall campaign, encouraging the importance of testing carbon monoxide alarms and protecting people who could be the most at risk of Carbon monoxide poisoning.

Ammonia education and awareness

Learn more about how we are improving education, training and awareness of ammonia risks.

Learn more

Inspections



Learn how we assess work and safety through in-person and remote inspections.

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Managing Safety Risks: Inspections

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Home > State of Safety 2021 > Inspections

Inspections

Technical Safety BC assesses the safety of work through in-person and remote inspections and by using predictive algorithms that support safety officer decision making. As a risk-based regulator, we use a combination of advanced analytics and expertise to identify the greatest sources of potential harm to the safety of British Columbians. This combination of technology and expertise enables us to target the highest risk systems, while optimizing efficiency and effort.

Assessments help Technical Safety BC confirm that owners are complying with the *Safety Standards Act* and associated regulations. Permit-holding contractors will provide information for inspections, and our safety officers will step in when their expertise is needed. In our high-volume energy technologies, Electrical and Gas, every permit that we receive is first assessed by a predictive Machine Learning algorithm that returns a risk score. This risk score is provided to our Safety Officers, who use their expertise to determine whether further assessment, in person or virtual, is required.

Note: We use “assessment” to refer to the overall safety assessment, whereas inspection refers only to the type of evaluation made by our safety officers.

Key Statistics

51,968

Total assessments completed in 2021

83%

Total pass rate in 2021

6,609

Total as-found hazards in 2021

In-person and Remote Inspections

Navigating the impacts of COVID-19 continues to change the way assessments are performed. With our clients' and employees' safety in mind, remote inspections are in important method of assessment. In-person inspections continue to be performed when we determine them to be critical to the safety system.

Structured Resource Allocation

Since 2020, we have used a Structured Resource Allocation (SRA) model to generate predictive insights from past and real-time assessment data. Model outputs facilitate safety officer decision-making with respect to ongoing assessment activities and the deployment of resources, enabling safety officers to focus on assessments where there is a higher probability of finding safety hazards.

The algorithms are dynamic and adapt with data inputs from safety officers across technologies, contributing to continued focus on, and resource allocation to, those areas that present higher probable risk. This enables safety officers to optimize oversight.

Remote inspections

28,018

Remote assessments in 2021

91%

Remote assessment pass rate

1,594

As-found hazards (remote)

Remote assessments are based on the same principles as in-person inspections, with an emphasis on hazard identification. They have more similarity to audits and include review of documentation, photos, videos, video conference, and also speaking with the client through phone, video calls, and email.

In 2021, 28,018 remote inspections were completed, compared to 20,158 completed in 2020. Technical Safety BC recognized the opportunity to strengthen client connections during the pandemic through the standardization and application of remote assessments. Enhancing protocols around remote assessments expands our reach and safety oversight.

Compliance of Duty Holder's Work by Technology in 2021 (Remote Inspections)

As-Found Hazard Assessments by Technology in 2021 (Remote Inspections)

In-person inspections

In-person assessments in 2021

In-person assessment pass rate

As-found hazards (in-person)

Compliance of duty holders' work

At Technical Safety BC, we refer to a person who owns regulated products or performs regulated work as a duty holder. When physically assessing the work of a duty holder, our safety officers provide a rating of:

Pass	The safety officer has assessed that the regulated work and/or regulated product was found to comply with the *Safety Standards Act*, regulations, and/or applicable technical code(s).
Conditional Pass	The safety officer has assessed that the regulated work and/or regulated product was found to not comply with the *Safety Standards Act*, regulations, and/or applicable technical code(s). Further regulated work may only be undertaken as directed on the certificate of inspection, while the identified non-compliances are being corrected.
Fail	The safety officer has assessed that the regulated work and/or regulated product was found to not comply with the *Safety Standards Act*, regulations, and/or applicable technical code(s). Further regulated work on the affected system or phase of work, and/or operation of the regulated equipment must not be undertaken until the identified non-compliances have been corrected.

Compliance of Duty Holder's Work by Technology in 2021 (Physical Inspections)

Technical Safety BC completes investigations on certain incidents reported to us in all technologies except for rail. We do not have jurisdiction to investigate rail incidents. We investigate incidents reported to us when:

- Regulated work or regulated equipment is involved.
- Evidence is available to help determine causes and contributing factors.
- A learning opportunity exists to understand and document what caused the incident and to inform prevention of similar incidents.

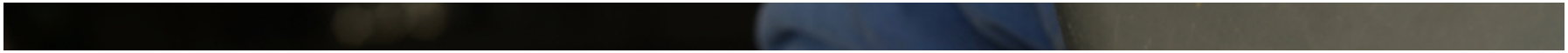
Investigation Categories

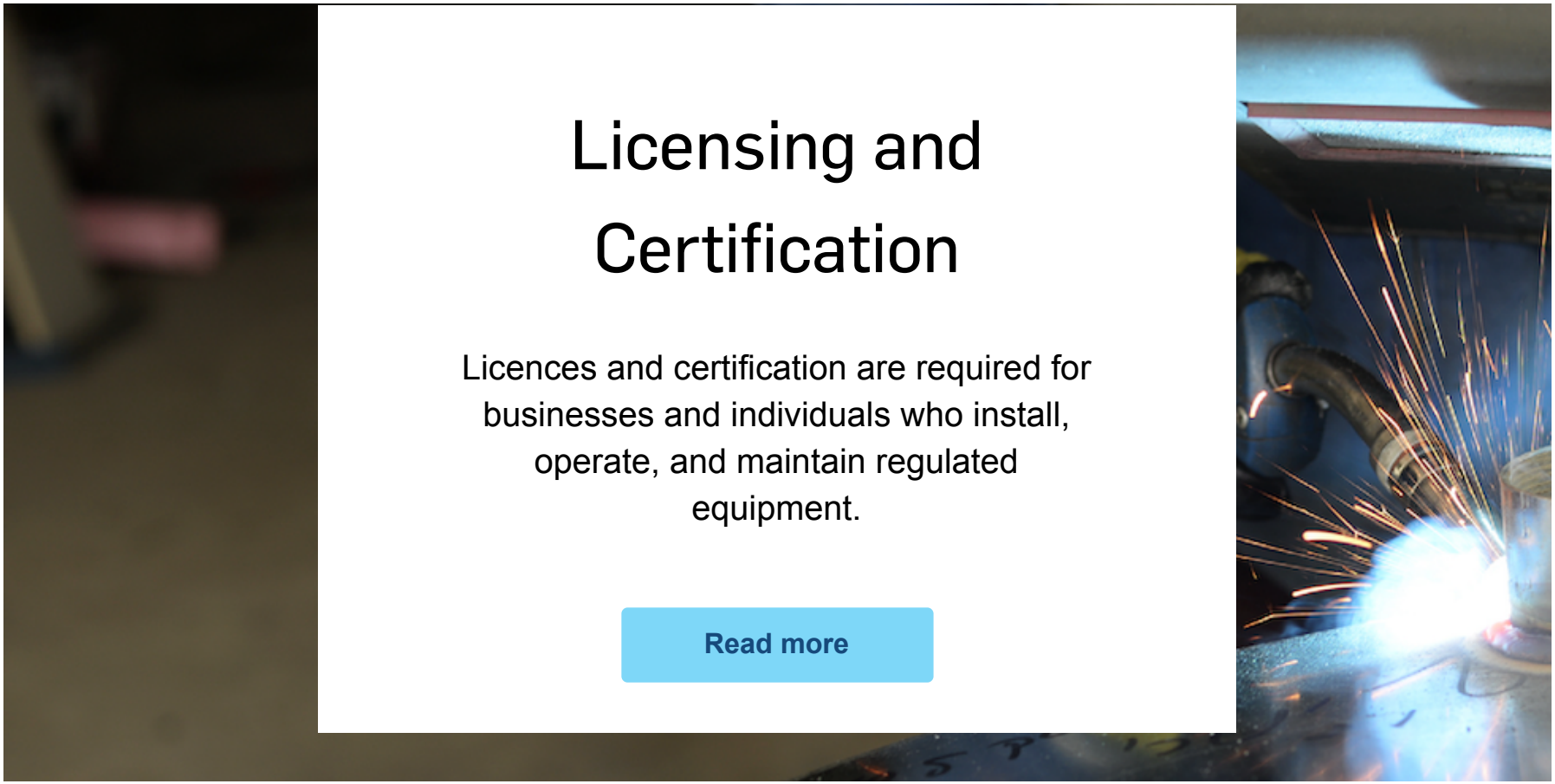
Under Assessment	Still being assessed by Technical Safety BC and was not assigned to a category as of time of data collection.
Severe	An incident that resulted with a fatal injury and/or severe equipment damage.
Major	An incident that resulted with major injury and/or major equipment damage.
Moderate	An incident that resulted with moderate injury and/or equipment damage.
Minor	An incident that resulted with minor injury and/or minor equipment damage.
Insignificant	An incident that resulted with insignificant and/or insignificant equipment damage.

As-Found Hazard Assessments by Technology in 2021 (Physical Inspections)

Sharing safety knowledge

In 2021, we expanded the remote inspection program by developing digital tools that help clients more efficiently upload images, communicate virtually, and better prepare for assessments before contacting safety officers. Safety officers continued to perform in-person inspections at mandatory and high-hazard sites and where there were opportunities to educate communities about systemic issues.





Licensing and Certification

Licences and certification are required for businesses and individuals who install, operate, and maintain regulated equipment.

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Managing Safety Risks: Licensing and Certification

Licensing and certifications

Technical Safety BC issues licences to contractors and contracting companies who install, operate, and maintain regulated equipment. We issue certificates of qualification to individuals working on regulated equipment. Together, they provide the public with assurances that certain standards of knowledge and proficiency are being maintained around regulated work.

Key Statistics

1,016

Licences issued to contractors and contracting companies

3,828

New certificates of qualification for completed training

Licences

The number of licences issued in 2021 increased by 31% from 2020 to a total of 1,016. This increase can be attributed in part due to a significant drop in new licences in 2020 as a result of the COVID-19 pandemic and subsequent health and safety guidelines.

Certificates

In 2021, Technical Safety BC expanded the offering of certification exams to align with new code change requirements and created procedures that are equitable for clients across the province. By moving many of our exams online, we were able to adhere to public health guidelines and support our clients in earning certification.

After receiving feedback from our clients, we refined our online exam experience with improved accessibility, special accommodations, a flexible exam schedule, and faster results. Over 2,364 clients took an online exam while 2,094 took an exam in person.

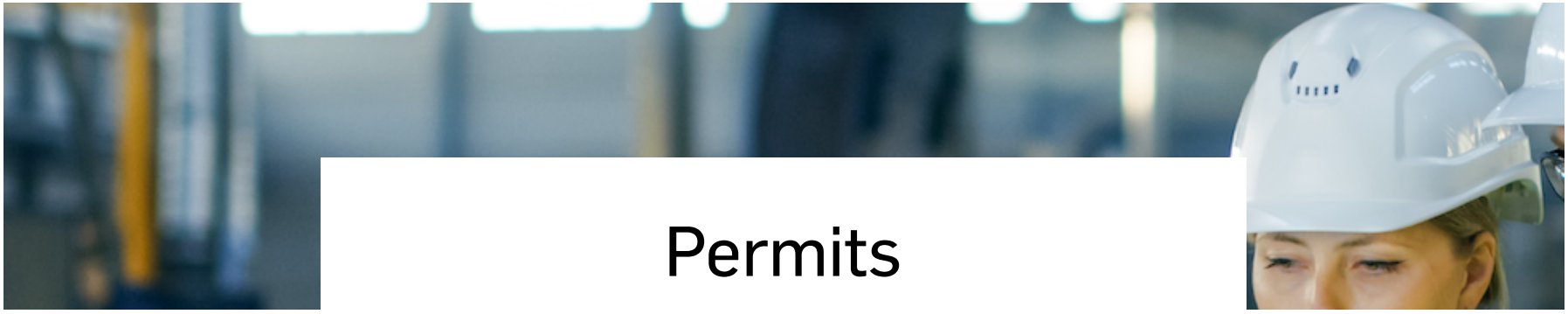
Note: Railways and Alternative Safety Approaches do not have licences or certificates of qualification and are not reflected in this chart.

New Licenses and Certificates by Year (2017 - 2021)

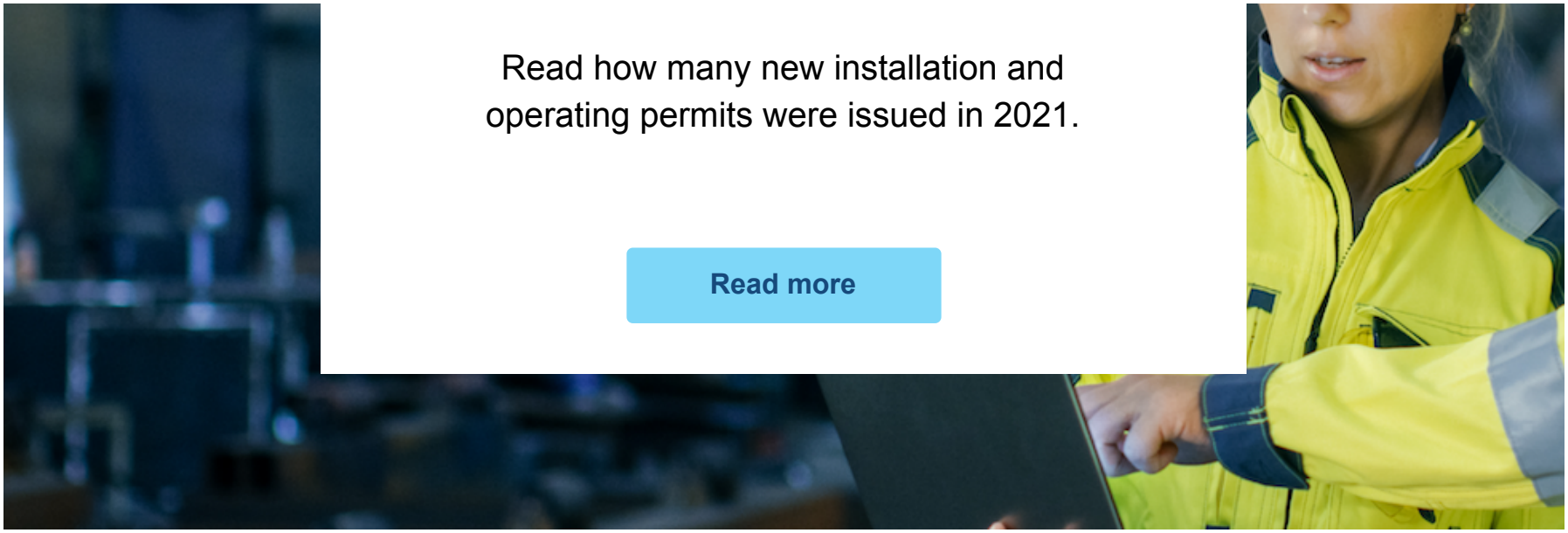
New Licenses and Certificates by Technology

Business transformation project

As COVID-19 pushed industries around the world to adopt digital tools, Technical Safety BC looked inward to make sure our technological framework puts people first. That's why our main focuses coming into 2021 were to provide tools that make participation in the safety system simpler and more effective. Learn more.



Permits



Read how many new installation and operating permits were issued in 2021.

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Managing Safety Risks: Permits

Permits

Technical Safety BC issues installation and operating permits to contractors and asset owners to ensure work is being done correctly and to connect them to the safety system. The data collected helps us track where regulated work is being done and by whom, should compliance and enforcement action be needed to correct unsafe work.

Key Statistics

105,887

Active operating permits in 2021

144%

Increase in passenger ropeways installation permits

20,651

More installation permits issued in 2021 than in 2020

Installation permits

In 2021, a total of 160,089 installation permits were issued, a 15% increase compared to 2021.

Amusement devices and passenger ropeways both saw increases in installation permits issued. In 2021 there were 22 amusement device installation permits issued, an 175% increase in comparison to 2020. This is in part due to the re-opening of many amusement devices that were not in operation in 2020 due to the COVID-19 pandemic and provincial health and safety guidelines.

Passenger ropeway installation permits increased to 22 in 2021 from 9 in 2020.

2021 saw an increase of 18% in electrical installation permits issued to 87,042 in 2021 from 73,966 in 2020.

Elevating devices saw a decrease of installation permits. In 2021, 1,751 installation permits were issued, a 25% decrease from 2020.

Installation Permits by Year (2017-2021)

Installation Permits by Technology in 2021

Operating permits

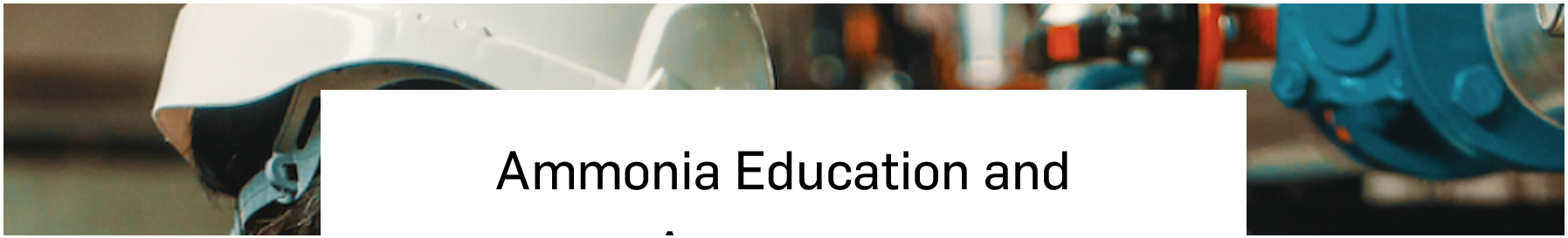
The number of active operating permits in 2021 increased by 6% compared to the previous year.

Passenger Ropeways saw an increase of 8% to 211 in 2021 from 195 in 2020.

Elevating devices saw an increase in active operating permits, with 26,963 (7%) in 2021, compared to 25,303 in 2020.

Operating Permits by Year (2017-2021)

Operating Permits by Technology in 2021



Ammonia Education and

Awareness

In collaboration with our industry partners, we continue to evolve the program to improve education, training and awareness of ammonia risks.

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Key Initiatives: Ammonia education and awareness

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Ammonia education and

awareness

In collaboration with our industry partners, we continue to evolve the Ammonia Safety Awareness Program to improve education, training and awareness of ammonia risks.

Key Statistics

143

Ammonia-related incidents between 2017-2021

170

Individuals participated in the Ammonia Safety Awareness Program

86

Facilities participated in the Ammonia Safety Awareness Program

Ammonia Safety Awareness Program

The devastating 2017 ammonia release at the Fernie Memorial Arena caused three fatalities and resulted in the evacuation of 95 residents in the nearby area. Four years later, the event continues to drive the improvement of our ammonia safety awareness efforts.

Following Technical Safety BC's incident investigation report on the tragedy in Fernie, we tracked ammonia-related incidents to understand how we could reduce risks, improve safety, and partner with industry to close the knowledge gap on safety procedures at ammonia refrigeration facilities.

This partnership led to the creation of the Ammonia Safety Awareness Program. Technical Safety BC and industry partners developed this no-cost specialized education and training program to share best practices for maintaining ammonia refrigeration equipment and systems across their lifecycle. The goal is to enable participants to establish formal maintenance and operational programs to identify, document and manage risks, and make informed budgetary decisions and plans to support the safety of the equipment.

Throughout 2021, we worked in collaboration with our partners to pilot, launch, and evaluate the program, as well as make ongoing

improvements to the content and delivery to ensure it would be accessible and impactful for industry.

Building capability and capacity

The Ammonia Safety Awareness Program empowered facility owners, managers, supervisors, operational staff, senior leadership and municipal councils with the tools and knowledge to become champions for safe ammonia refrigeration equipment.

After the co-creation of the program in 2020, it was piloted in March of 2021 with 10 BC ice arenas and clubs. In addition to increasing awareness of ammonia risks, the pilot provided an opportunity to build champions for ammonia safety and advocates for the program itself. The pilot invited participants to provide their feedback on the program to ensure it would suit industry needs.

Cocreation and continuous improvement

Following the success of the pilot, the program officially launched in May 2021, with reassessment at the six-month mark devoted to continuous improvement. This methodology has allowed the team to refine the audience and adapt content and delivery methods to create an impactful program. Based on feedback, we led recorded webinars that attendees could watch at their leisure, as well as live

learning opportunities to connect with Technical Safety BC, and each other. Modules were shortened, and downloadable resources were added for self-paced learning. After participants requested more ways to test their knowledge retention, a quiz was introduced for self-assessment. In total, more than 30 improvements have been made to the program content or delivery method over 2021, and by the end of the year 86 facilities had taken part. As we collect feedback from current participants and act on information we gathered during the pilot, we will continue to make improvements to the program on an ongoing basis.

Building a safer tomorrow

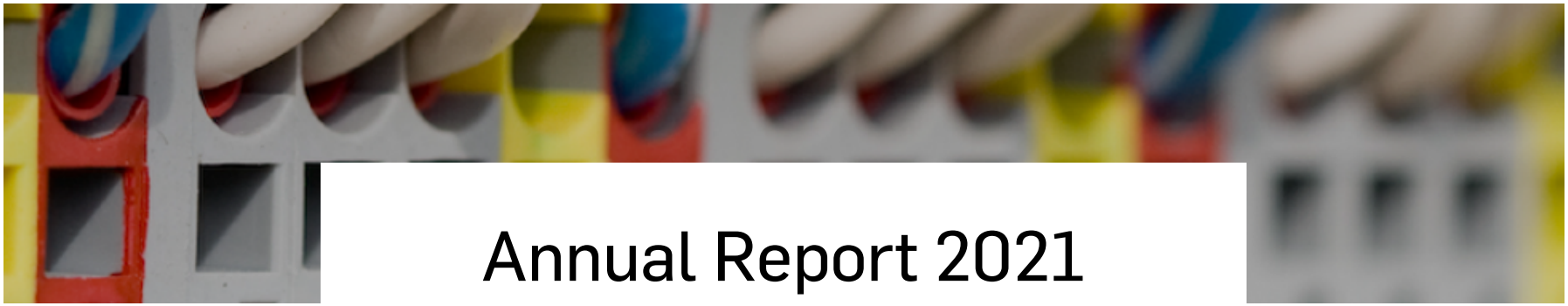
During 2021, more than 170 individuals participated in the Ammonia Safety Awareness Program. Our strong partnership with industry enabled us to recognize the need for two new safety orders regarding ammonia in refrigeration plants. After engaging with the industry about their needs, we hosted a live webinar to walk through the safety orders before they were issued and to answer any compliance related questions from stakeholders.

While we continue to partner to improve ammonia safety risk awareness, the success of the program, as well as the dedication to safety illustrated by participants, demonstrates that partnership is a key element in creating a strong safety system.

Carbon monoxide safety

In 2021, Technical Safety BC sought to reduce carbon monoxide risks with a multi-channel safety campaign to educate the public.

Read more



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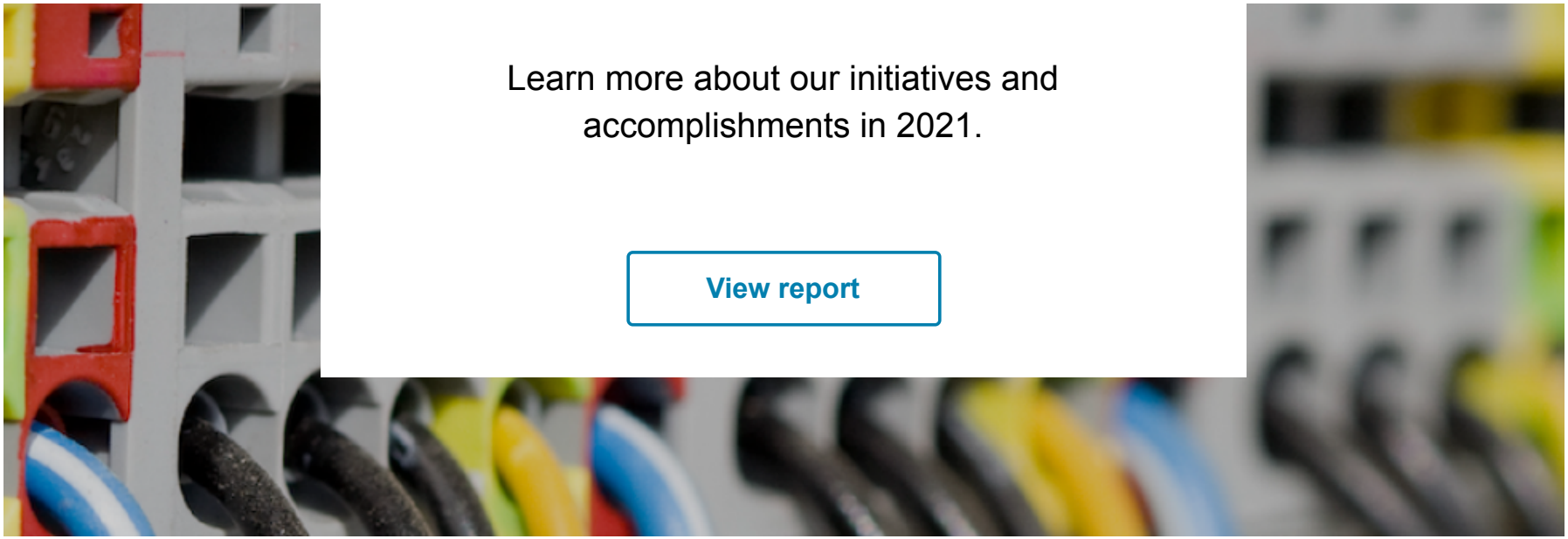

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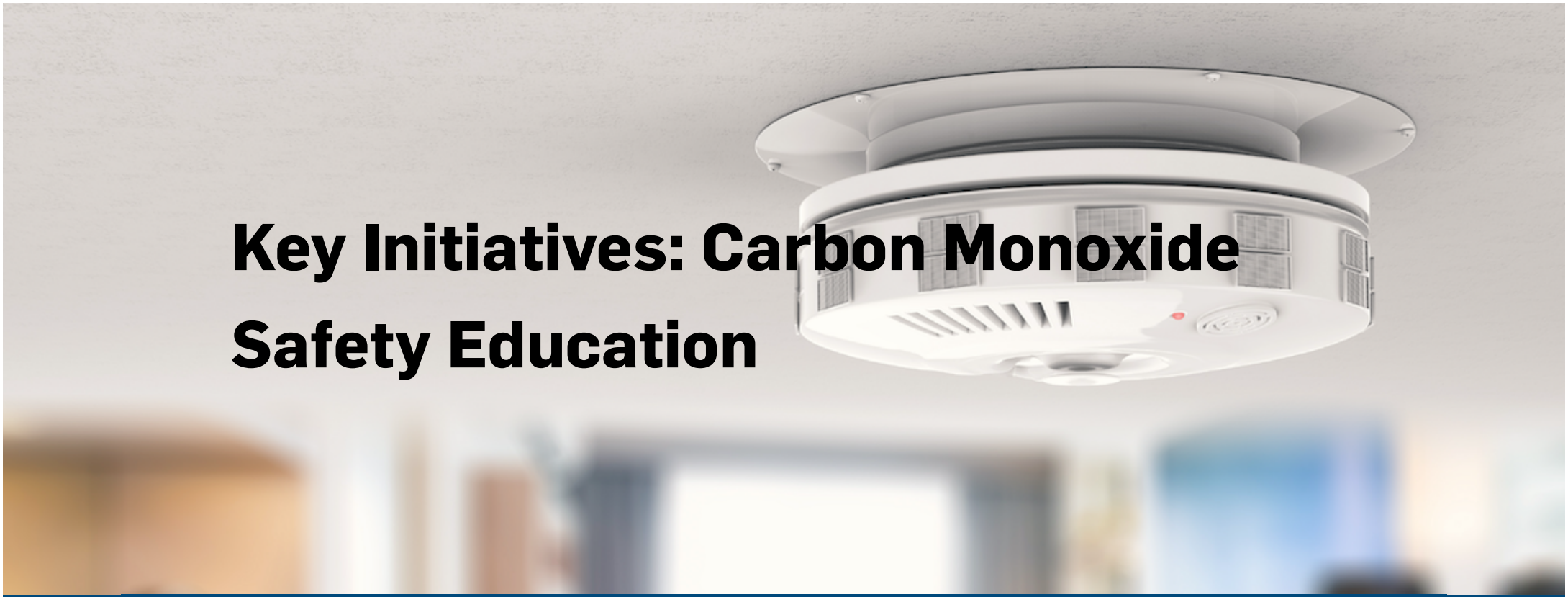

Key Initiatives: Carbon Monoxide Safety Education

Carbon monoxide safety

education

Following a series of carbon monoxide exposures, Technical Safety BC led an in-depth investigation and published a subsequent report as part of an ongoing effort to to provide actionable safety information to British Columbians.

Key Statistics

2

Average carbon monoxide fatalities per year in BC

49%

of households in BC do not have a carbon monoxide detector

The Carrier Gas Furnace Report

In 2021, Technical Safety BC conducted a comprehensive investigation into gas-burning furnaces manufactured between 1989-2011 by the Carrier Corporation. The investigation was prompted by the hospitalization of eight people across the province due to carbon monoxide (CO) exposure that involved a common brand of residential furnace. Our Incident Investigation team examined the incidents together to ensure that similarities were identified and scrutinized and findings from the investigation were compiled into a detailed analysis known as the Carrier Gas Furnace Report.

Our analysis revealed that the furnaces in each incident had a common design feature that contributed to the failures, specifically, polypropylene lined secondary heat exchangers. This component was found to be susceptible to corrosion, which ultimately led to failure of the heat exchangers and production of elevated levels of CO. While the Carrier Corporation stopped manufacturing these furnaces in 2011, older furnaces continue to operate across BC with the potential to release elevated levels of CO. In addition, symptoms of CO exposure can be misinterpreted for other illnesses such as the flu, so residents may not be aware of the hazard in their homes.

Public outreach of potential CO risk

Exposure to CO can be hazardous to health and life threatening if not detected. To preserve the health and safety of British Columbians and to help prevent further incidents of CO exposure with these gas furnaces, it was essential to inform the public of the possible risk. In addition to publishing the Carrier Gas report, we conducted a large-scale public safety campaign which included a media press release, email communications to the industry, and social media outreach. A two-pronged communications approach was adopted with targeted messaging for homeowners during the fall season — when furnace inspections commonly take place — as well as broader advisory messaging to the public. Information regarding the affected products was put together on our website along with instructions on how residents and contractors can check their furnace models.

The details of our report and the related risks received significant social media attention and coverage from over 80 local news sources across the province. Since the report was released, our Incident Investigation team has been notified of 17 additional confirmed failures of furnaces from the Carrier Corporation with the same type of heat exchanger. Some of the homes recorded extremely dangerous levels of CO, with measurements up to 9000ppm.

Continued investment in carbon monoxide safety awareness

From July to mid-September 2021, our summer CO marketing campaign provided safety tips to campers, RV owners, boaters and vacationers who stayed in rental homes. This was followed by a fall campaign which encouraged the importance of testing your CO alarm and protecting loved ones who could be the most at risk of CO poisoning.

Carbon monoxide exposures remain a serious risk to our safety system. With 49 per cent of households in BC without a CO detector and an average of two CO-related fatalities a year, it is essential for Technical Safety BC to continue providing continuous education on CO safety. While the effects of CO poisoning can be devastating, they can be prevented.

Climate Resiliency

As the climate around us continues to change, as a regulator we are adapting to

identify, analyze, and mitigate the climate change risks to technic…

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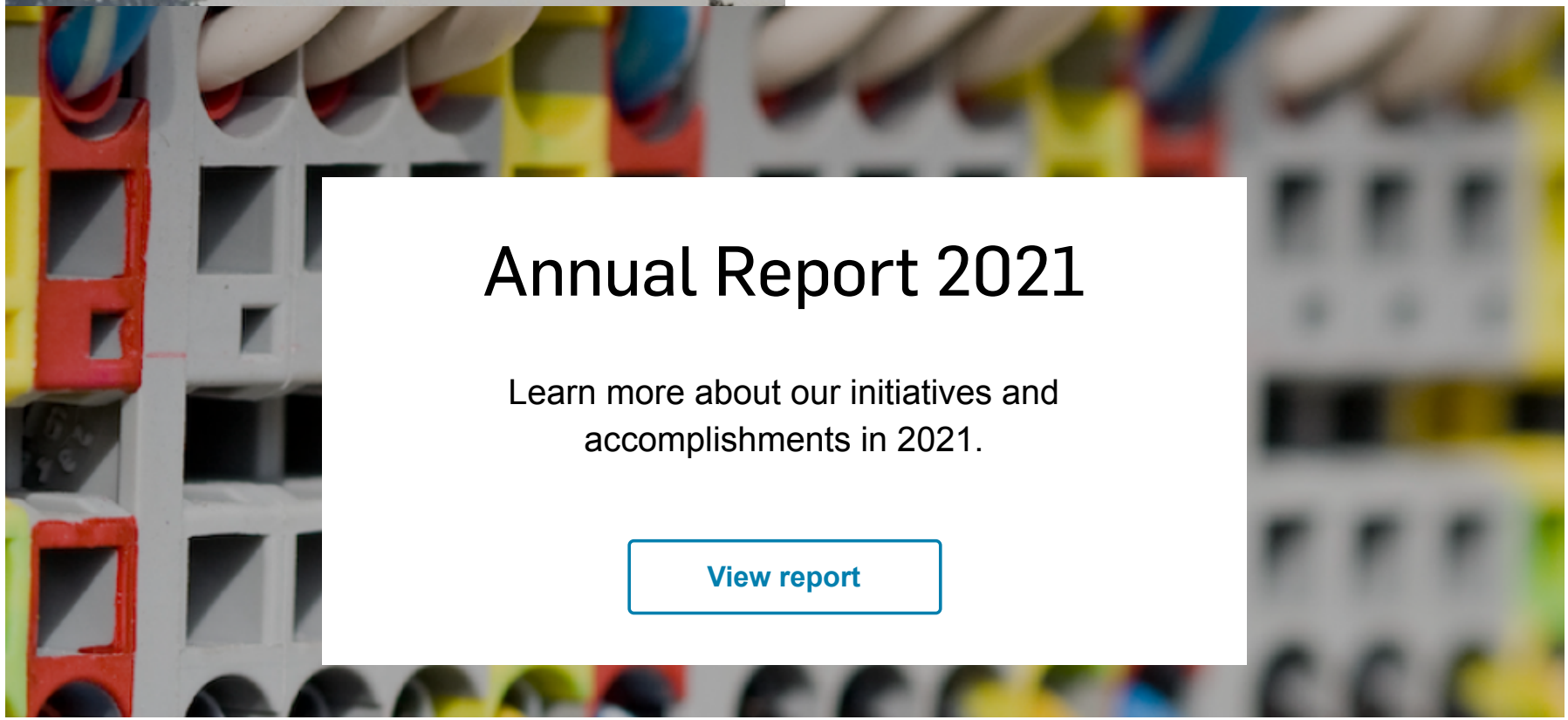

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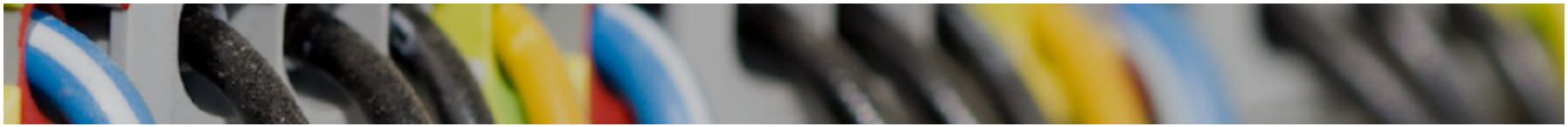

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Key Initiatives: Climate Resiliency

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Climate resiliency

As the climate around us continues to change, as a regulator we are adapting to identify, analyze, and mitigate the climate change risks to technical safety.

Key Statistics

Visits to our wildfire safety page

Direct communications issued regarding flood safety tips

Personal injury incidents reported from extreme climate events

Extreme weather and climate resiliency

In 2021, the changing climate resulted in difficult weather conditions, including heat waves, wildfires, floods, and extreme cold. As these events become more common, people suffer personal and economic hardship, as well as increased risks.

While this year's *State of Safety* offers summaries of some of the work that was undertaken, every technology that we regulate was impacted by the challenging environmental conditions.

Supporting the province during flood

When out-of-season flooding began in November 2021, the mix of debris, flood waters, and chemicals heightened the risk for the public, our partners, and our safety officers.

Our teams partnered with local contractors and utilities to align our services and answer questions about repairs and refurbishment. Safety officers and contractors prioritized inspections and used our remote assessment capabilities to get equipment recommissioned as quickly and as safely possible. As these urgent challenges required immediate solutions, we adapted our reporting processes to expedite our province's recovery.

The floods caused significant damage, with a total loss of assets in many cases. While elevating devices were largely preserved due to early intervention, two passenger ropeway units faced erosion

at their towers and up to 25 sites were affected in one common carrier rail line. Additionally, one Alternative Safety Approaches (ASA) client reported multiple locations of potential hazards stemming from equipment that was damaged or misplaced. Due to the urgency and dynamic nature of the situation, there is no definitive number of flood-related incidents. Technical Safety BC has established a plan to create a process for capturing data on floods and future events.

Taking action on heat-related hazards

During the heat dome in 2021, we encountered a high-risk situation involving a pressurized bank of compressed natural gas (CNG) cylinders that had been abandoned in a high-density urban area. As temperatures rose, the cylinders released natural gas into the atmosphere, as well as an adjacent building's HVAC system. Extreme heat intensified the danger, putting the surrounding community at risk.

Our safety officers and engineering team, partnered with professional consultants, the local fire department, Fortis BC, and the municipal government to assess the situation and find the safest viable solution to protect the public. This team was able to empty the cylinders and eliminate the danger to the community. Our learning from the incident will inform our response to similar

emerging risks. While this incident was resolved without complication, it highlights some of the potential risks that will emerge from climate change.

Awareness and Education

Our 2021 public safety campaigns focused on raising awareness for the technology-related hazards caused by wildfires, floods, and extreme cold.

While amplifying messages from emergency services, we emphasized the importance of relying on licensed electrical and gas contractors and aimed to keep preparedness top of mind throughout the year. Due to these efforts, in 2021 we not only strengthened our partnerships, but our weather-related public safety messaging reached more individuals than ever before.

Looking inward

In 2020, Technical Safety BC established a climate action team focused on: 1) understanding and managing risks from the interactions between technical systems and climate change; 2) supporting provincial efforts to reduce greenhouse gas emissions, e.g., enabling safe adoption of low-carbon technologies; and 3) measuring and reducing our own greenhouse gas emissions.

While helping our clients navigate the effects of extreme weather has always been a priority, during 2021 we launched our climate resiliency program and began development of a climate risk register to strategically prioritize and address climate interactions with the safety system.

In addition, we studied safety gaps and opportunities in emerging low-carbon technologies used in building electrification and hydrogen. This work supports BC's transition towards a low-carbon future, which will ultimately slow climate change.

Finally, we measured our greenhouse gas emissions from our own fleet and facilities. This has led to a plan to gradually transition all fleet vehicles to low-emissions vehicles.

The future

As we build resiliency and prepare for a changing climate, we recognize that we must remain agile to best serve our clients. This includes collecting data on hazards related to extreme weather events, understanding how to aid in recovery, assessing emerging risks from gradual changes to climate over the lifecycle of technologies, and preparing to regulate new kinds of equipment.

As new low-carbon technologies enter the market such as heat pumps, electric vehicle energy management systems, hydrogen,

and new types of refrigerants, we must be responsive and ready to intervene with programs designed to assure their safety. We also must understand how climate change will impact current technical systems and equipment, and build resiliency by adjusting our risk control activities.

Business Transformation

As COVID-19 pushed industries around the world to adopt digital tools, Technical Safety BC looked inward to make sure our technological framework put…

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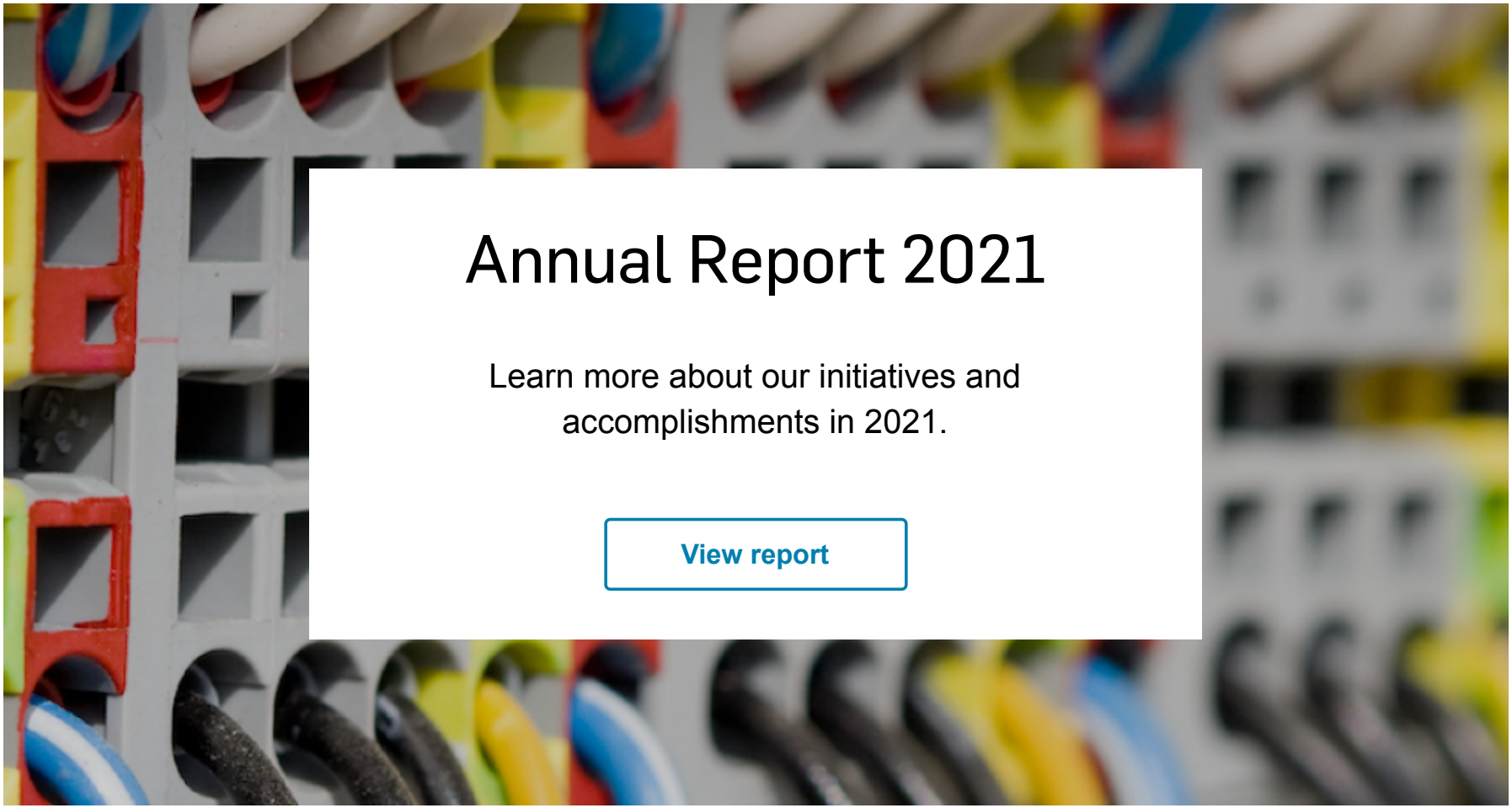

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Key Initiatives: Business Transformation

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Business transformation

As COVID-19 pushed industries around the world to adopt digital tools, Technical Safety BC looked inward to make sure our technological framework puts people first. That's why our focus coming into 2021 was to make participation in the safety system simpler and more effective by providing tools that empower our employees and clients.

In 2021, we took new steps to expand accessibility of safety information, key services, and products. We improved the experience of online certification exams, expanded our design registration online portal, piloted new automation processes to serve clients, and took an iterative approach to assessments that optimizes risk-based safety oversight. We also continued our multi-faceted business transformation project which will streamline the safety system for all British Columbians.

Key Statistics

Online exams taken in 2021

Remote assessments completed in 2021

Design registrations in 2021

Faster, more efficient design registration

In 2021, Technical Safety BC launched a new online portal dedicated to the submission and registration of technical equipment designs. Design registration is an important first step in the safety system because the majority of new or modified equipment originates from outside British Columbia. In 2021, we received over 4,000 submissions (compared to an average of 2,000 to 3,000 submissions from 600 global clients every year), reflecting increased investment in technical systems in the province.

Prior to the launch of our new online design registration portal, asset owners looking to modify or create new technical equipment had to courier their design plans to our Vancouver office to have them registered for approval and certification. With our new system, manufacturers, professional engineers, and designers can submit their designs digitally. This makes the registration process more transparent for clients who want to view the status of their request. Frontline operators can also immediately access their designs and correspond with safety officers throughout each phase of the process.

By removing barriers in the design registration process, we have cut turnaround times from an average of eight weeks to just four-to-six weeks, enabling clients to gain certification and implement their designs faster while using fewer resources. We are the first regulator in Canada to allow clients to submit their designs 100% electronically.

Digital assessments optimize safety oversight

Since 2020, we have used a Structured Resource Allocation (SRA) machine learning model to generate predictive insights from historical records of safety assessment data. Those insights inform the decisions of our safety officers about what they will assess in

the field, enabling them to focus on the assessments where they are most likely to find a safety hazard.

As the algorithm receives more feedback from the field, it adapts and improves safety officers' assessment work to where it was needed most. Our safety officers can identify levels of risk and optimize safety oversight while keeping clients better informed and prepared for safety assessments.

When the COVID-19 pandemic hit in 2020, we launched remote assessments so that safety officers could continue delivering safety services despite the pandemic. They used digital applications in collaboration with asset owners and duty holders to perform assessments remotely.

In 2021, we expanded the program by developing digital tools that help clients more efficiently upload images, communicate virtually, and better prepare for assessments before contacting safety officers. Safety officers continued to perform in-person inspections at high-hazard sites and where there were opportunities to educate communities about systemic issues.

Improved online certification exams

In 2020, Technical Safety BC launched an online exam pilot program. Previously, exams had been administered in offices

located throughout the province. By moving most of our exams online we were able to adhere to public health guidelines and support our clients in earning certification.

This year, we took steps to expand our offering of certification exams to align with new code change requirements and created procedures that are equitable for clients across the province. After receiving feedback from our clients, we refined our online exam experience with improved accessibility, special accomodations, a flexible exam schedule, and faster results.

Online exams have opened up access to certification programs across the province and fostered confidence among clients and duty holders. Throughout the year, over 2,364 clients took an online exam while 2,094 took an exam in person.

People first

In 2021, Technical Safety BC advanced our goal of creating a more efficient, responsive safety system. When we launched our multi-year business transformation project in 2020, our goals were to:

- decrease the time to make changes in the safety system;
- increase responsiveness to advances in technical systems;
- reduce complexity and foster confidence; and

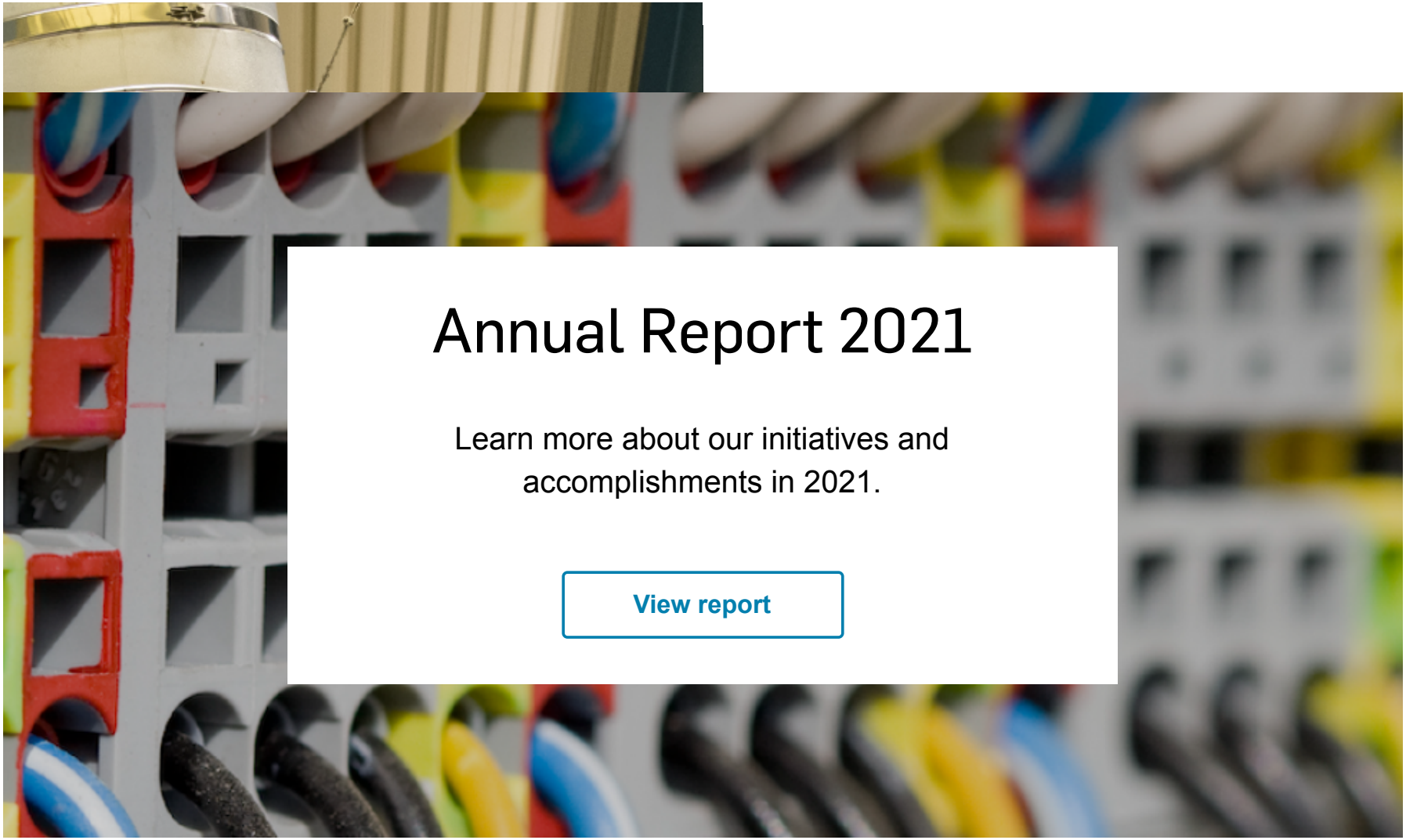
- improve safety-minded decision-making among duty holders and the public.

Looking forward, our focus will shift to data integration and consolidation in order to analyze and rapidly respond to new risks as they arise. As we develop and refine our technological framework, we aim to develop a platform that supports our organization to put the safety of British Columbians above all else.

Alternative Safety Approaches

Learn about injuries, incidents, assessments, and permits in 2021.

Read more



Annual Report 2021

Learn more about our initiatives and accomplishments in 2021.

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Data by technology: Alternative Safety Approaches

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Home > State of Safety 2021 > Alternative Safety Approaches

Alternative Safety Approaches

Alternative Safety Approaches (ASAs) are developed with owners and operators in the oil and gas, propane, bio-energy, LNG, and institutional sectors. They provide a way for an owner or primary operator to undertake regulated work or use regulated products in a way that is different from traditional prescriptive requirements, but consistent with the safety objectives of the *Safety Standards Act*.

We oversee the acceptance of ASAs for all technologies in accordance with the *Safety Standards Act* and the Alternative Safety Approaches Regulation.

Key Statistics

Safety management plans in 2021

Equivalent standard approaches

Types of Alternative Safety Approaches

There are two types of alternative safety approaches:

1. An Equivalent Standard Approach (ESA), which typically involves only one technology and requires a “like for like” substitution of regulatory requirements with alternative safety approaches which provide an equivalent level of safety
2. A Safety Management Plan (SMP), which is a broader approach involving the replacement of specified regulatory requirements with detailed, comprehensive safety management systems and which can involve multiple regulated technologies.

These options apply in different situations. The application process can vary in scale depending on complexity, but in all cases clients are required to demonstrate that their proposed alternatives will achieve an equivalent, or better, level of safety.

Assessments and Audits

A key feature of all alternative safety approaches is that clients take on increased responsibility for the safety of their equipment and work performed on their equipment or by their employees. We monitor the implementation of alternative safety approaches through a variety of oversight tools to assess client performance and the effectiveness of an alternative safety approach. Audits are central to this assessment and are performed using standard audit processes consistent with the International Standards Organization ISO19011—Guidelines for Auditing Management Systems.

Two types of audits are performed by the ASA program:

- *Registration* audits are performed to assess the readiness of a client to implement their alternative safety approach.
- *Conformance* audits are performed to assess the degree to which a client is effective in implementing the alternative safety approach.

Of the 23 audits in 2021, there were 10 audits deemed ‘Effective’, 13 ‘Effective, except for’ and 0 that were ‘Not Effective’.

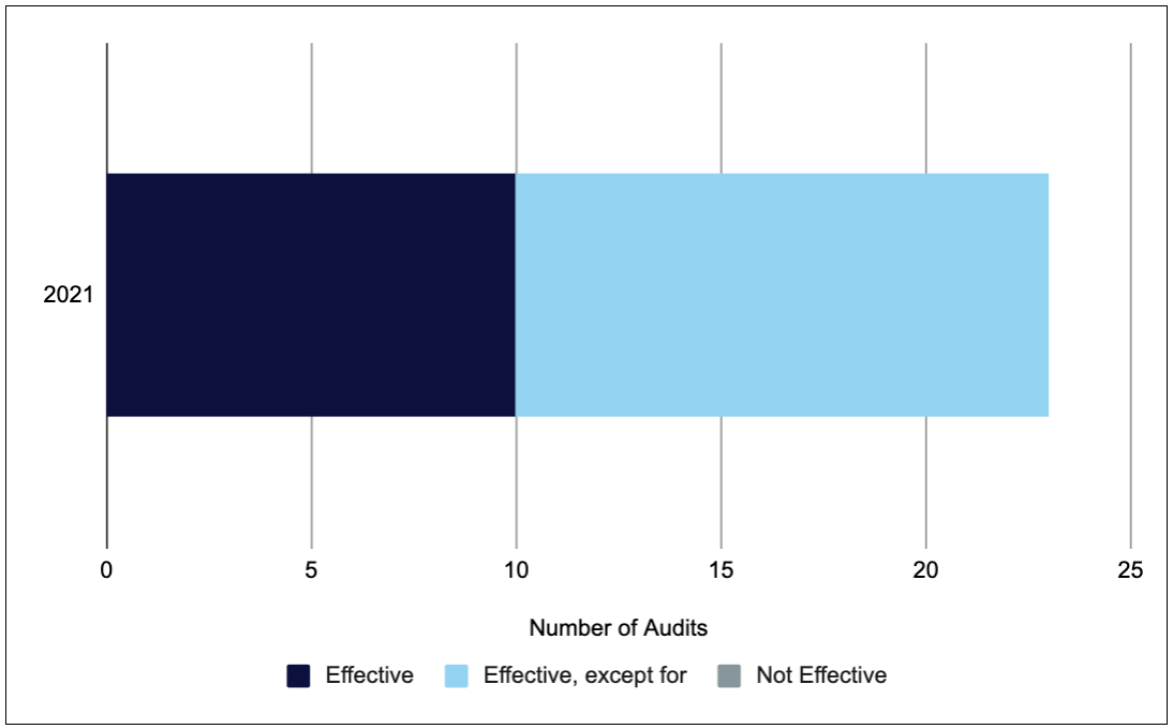
Audit findings for sites operating with an accepted ASA are categorized in a manner similar to as-found conditions for traditional inspection-based assessments. The audit process used by Technical Safety BC assesses how the procedures and processes identified in the ASA meet or exceed the objectives of

the *Safety Standards Act*, **to minimize risks, hazardous installation or operation.**

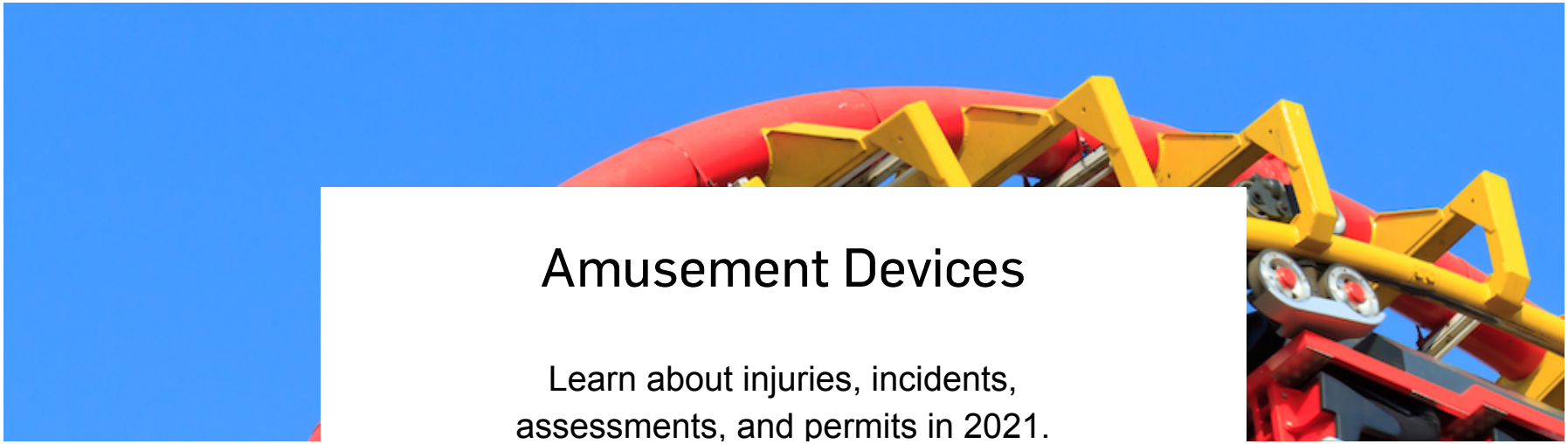
The audits were rated as follows:

Effective	Processes/and or controls are adequate, appropriate and effective to provide reasonable assurance that risks are being managed. Some enhancements may have been recommended.
Effective, except for	Processes/and or controls are adequate, appropriate and effective to provide reasonable assurance that risks are being managed, however, there are deficiencies that need to be addressed by management.
Not effective	Processes/and or controls are adequate, appropriate and effective to provide reasonable assurance that risks are being managed. There are a number of critical and high risk deficiencies that need to be addressed by management. These deficiencies have a significant impact on operations.

Alternative Safety Approaches by Rating in 2021

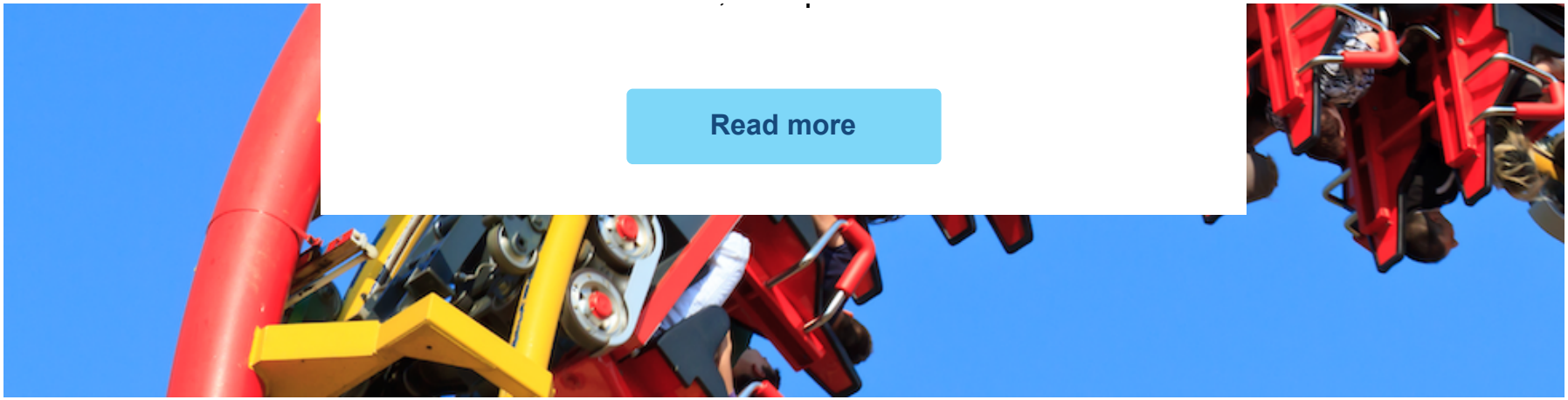


Alternative Safety Approaches Audit Ratings 2021



Amusement Devices

Learn about injuries, incidents, assessments, and permits in 2021.



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Data by technology: Amusement Devices

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Amusement Devices

Technical Safety BC oversees the installation and operation of amusement devices throughout British Columbia in accordance with the *Safety Standards Act* and the Elevating Devices Safety Regulation. The types of regulated amusement devices range from waterslides and inflatable play equipment to larger rides such as roller coasters.

Key Statistics

10

Incidents reported to us in 2021

8

Injuries reported to us in 2021

231

Assessments completed in 2021

Incidents

In 2021, the number of incidents reported to Technical Safety BC increased by one over 2020.

Almost all incidents that occurred on amusement rides and devices can be linked to patron actions, operational factors, or a combination of both. Technical Safety BC's oversight program evaluates reported incidents to inform our knowledge of risk in order to prevent injuries and enhance safety in Amusement Ride operations in BC. As well, we continue our efforts to educate those operating outside of the safety system on the importance of obtaining necessary licences and permits so that we can work together to prevent incidents.

Amusement Device Incidents by Year (2017 - 2021)

Injuries

The number of amusement device injuries increased by two compared to 2020.

Amusement Device Injuries by Year (2017 - 2021)

Permits

In 2021, there were 22 installation permits and 395 operating permits in the Amusement Devices technology. Installation permits increased by 175% and operating permits increased by nine percent. This is in part due to the re-opening of many amusement devices that were not in operation in 2020 due to the COVID-19 pandemic and provincial health and safety guidelines.

Amusement Device Permits by Year (2017-2021)

Assessments

Technical Safety BC safety officers completed a total of 231 assessments in 2021 which represents an increase of 14% compared to 2020. Of the 231 assessments, 225 were in-person inspections and six were remote inspections.

This increase in the total number of inspections is related to the re-opening of large number of rides that were not in operation in 2020 due to the COVID-19 pandemic.

Assessments are rated as follows:

Pass	The safety officer has assessed that the regulated work and/or regulated product was found to comply with the *Safety Standards Act*, regulations and/or applicable technical code(s).
Conditional Pass	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the

	Safety Standards Act, regulations and/or applicable technical code(s). Further regulated work may only be undertaken as directed on the certificate of inspection, while the identified non-compliances are being corrected.
Fail	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations and/or applicable technical code(s). Further regulated work on the affected system or phase of work, and/or operation of the regulated equipment must not be undertaken until the identified non-compliances have been corrected.

Amusement Device In-Person Inspections in 2021

Amusement Device Remote Inspections in 2021

Emerging risks

With public concern about trampoline parks rising, Technical Safety BC began a review of its Amusement Devices program as a

whole to address new and emerging types of equipment, including but not limited to trampoline parks.

Our review of the regulatory framework around amusement rides and devices indicates that the current framework would benefit from improvement to ensure that it is: (i) adaptive, as technologies change; and (ii) clear, so owners of amusement rides and devices and the public know what is regulated and what form of safety oversight is in place. This aligns with what we have heard from owners, operators, the public, and other agencies during our public consultation on trampoline parks.

For more information, visit engage.technicalsafetybc.ca

Boiler, Pressure Vessel, and Refrigeration

Learn about injuries, incidents, assessments, and permits in 2021.

Read more

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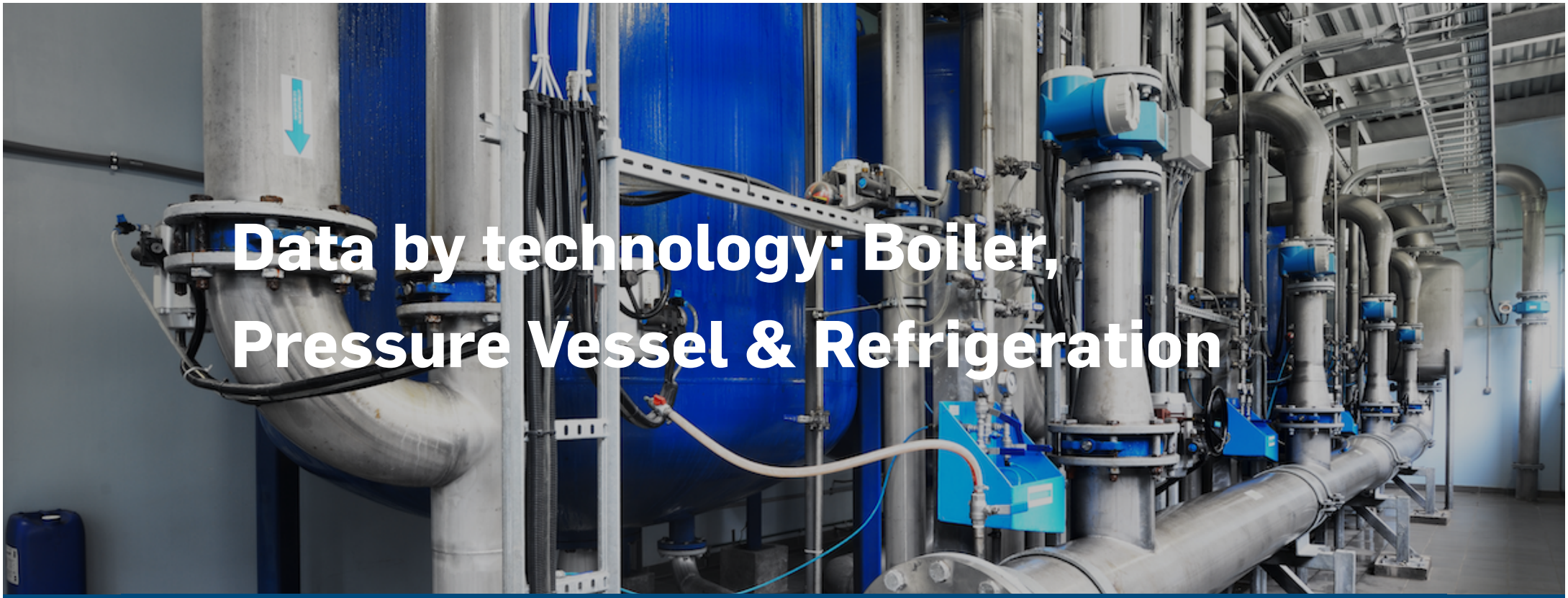


Data by technology: Boiler, Pressure Vessel & Refrigeration

In this section

Home > State of Safety 2021 > Boiler, Pressure Vessel and Refrigeration

Boiler, Pressure Vessel, and

Refrigeration

Technical Safety BC oversees the design, construction, installation and operation of boiler, pressure and refrigeration plants as well as pressure vessels, pressure piping systems, fittings and refrigeration equipment throughout British Columbia.

Key Statistics

38

Incidents reported to us in 2021

0

Injuries reported to us in 2021

6,474

Assessments completed in 2021

Incidents

In 2021, the number of Boiler, Pressure Vessel, and Refrigeration incidents reported to us decreased by five (12%) compared to 2020.

Two major incidents were reported to us including a heat exchanger releasing ammonia at indoor ice surface facility's refrigeration plant.

Note: The category under assessment refers to incidents reported to Technical Safety BC that were still under investigation at year-end.

Boiler, Pressure Vessel, & Refrigeration Incidents by Year (2017 - 2021)

Injuries

No injuries were reported to us in 2021.

Please note that we receive injury reports and descriptions from operators or first responders at the time of, or immediately following, the incident. Injuries may develop after the initial reports were made to us and the long-term effects of a resultant injury may not be recorded as part of our investigation.

Boiler, Pressure Vessel, & Refrigeration Injuries by Year (2017 - 2021)

Permits

In 2021, there were 1,611 installation permits and 64,894 operating permits in the Boiler, Pressure Vessel and Refrigeration technology.

Boiler, Pressure Vessel, & Refrigeration Permits by Year (2017 - 2021)

Assessments

Technical Safety BC safety officers completed a total of 6,474 assessments of boiler, pressure vessel, and refrigeration equipment in 2021. Of this total, 4,127 were in-person inspections and 2,347 were remote inspections.

Total assessments increased by 1,595 (33%) compared with 2021.

Assessments are rated as follows:

Assessment Ratings

Pass	The safety officer has assessed that the regulated work and/or regulated product was found to comply with the Safety Standards Act, regulations, and/or applicable technical code(s).

Fail	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the Safety Standards Act, regulations, and/or applicable technical code(s). Further regulated work on the affected system or phase of work, and/or operation of the regulated equipment must not be undertaken until the identified non-compliances have been corrected.

Note: Unlike some other technologies we regulate, BPVR does not have a Conditional Pass category.

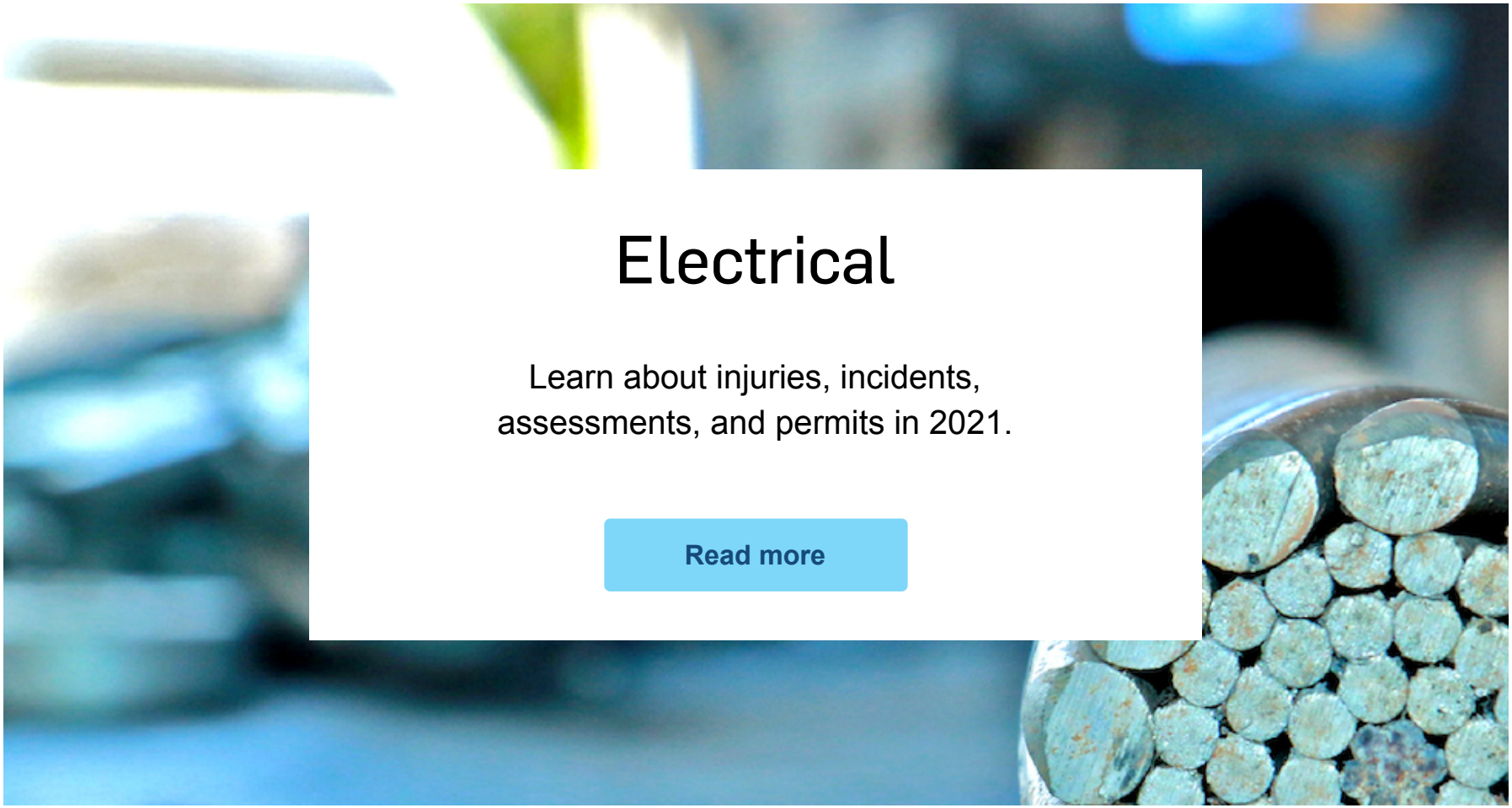
Boiler, Pressure Vessel, & Refrigeration In-Person Inspections in 2021

Boiler, Pressure Vessel, & Refrigeration Remote Inspections in 2021

Ammonia Safety

Throughout 2021, we worked in collaboration with our partners to pilot, launch, and evaluate the Ammonia Safety Awareness

Program, as well as make ongoing improvements to the content and delivery to ensure it would be accessible and impactful for industry.



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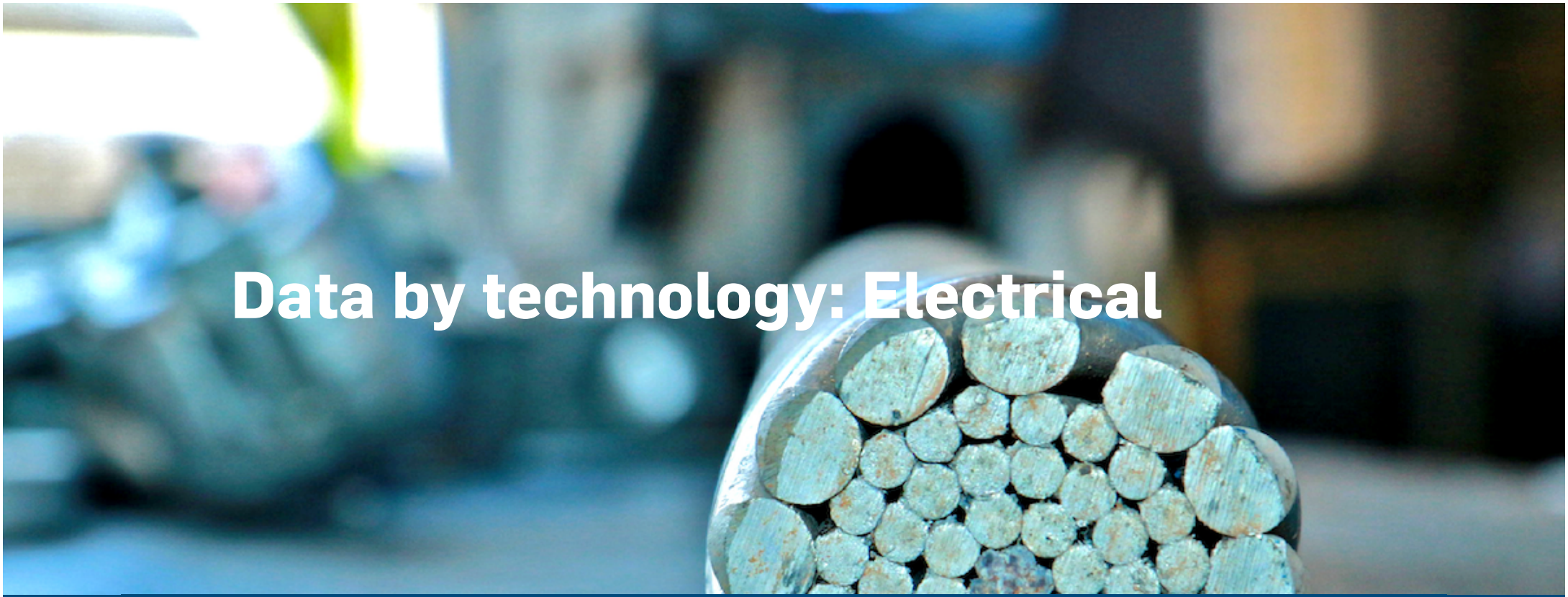


Data by technology: Electrical

Electrical

Technical Safety BC oversees electrical equipment and systems across British Columbia in accordance with the *Safety Standards Act* and the Electrical Safety Regulation. The exception are those municipalities that have separate administrative agreements with the provincial government.

Key Statistics

74

Incidents reported to us in 2021

7

Injuries reported to us in 2021

29,267

Assessments completed in 2021

Incidents

In 2021 the number of electrical incidents reported to us increased by 11 (17%) compared to 2020.

The majority of the incidents were rated insignificant to moderate, ranging from arc flash burns to the hand, to injuries sustained when working energized. There were two *severe* incidents reported to us.

Note: The category *under assessment* refers to incidents reported to Technical Safety BC that were still under investigation at year end.

Electrical Incidents by Year (2017-2021)

Injuries

Seven injuries related to the electrical technology were reported in 2021, which represents a decrease of one compared to 2020.

Please note that we receive injury reports and descriptions from operators or first responders at the time of, or immediately following, the incident. Injuries may develop after the initial reports were made to us and the long-term effects of a resultant injury may not be recorded as part of our investigation.

Electrical Injuries by Year (2017-2021)

Permits

In 2021, a total of 98,888 electrical permits were issued, which included 87,042 installation permits and 11,846 operating permits.

Electrical Permits by Year (2017-2021)

Assessments

Technical Safety BC safety officers completed 29,267 assessments of electrical equipment and systems in 2021. This included 11,828 in-person inspections and 17,439 remote inspections.

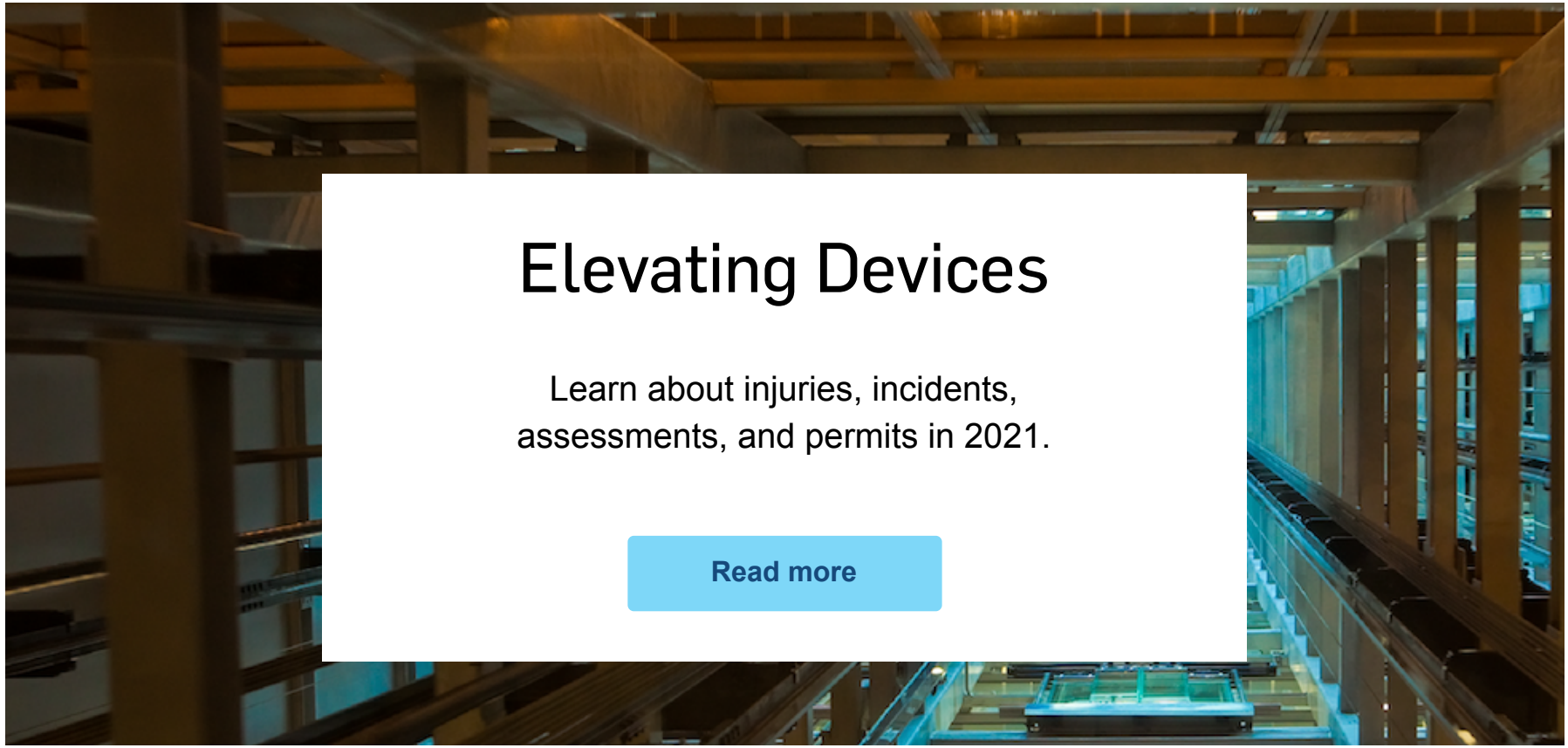
Assessments are rated as follows:

Pass	The safety officer has assessed that the regulated work and/or regulated product was found to comply with the *Safety Standards Act*, regulations, and/or applicable technical code(s).
Fail	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations, and/or applicable technical code(s). Further regulated work on the affected system or phase of work, and/or operation of the regulated equipment must not be undertaken until the identified non-compliances have been corrected.

Note: Unlike some other technologies we regulate, electrical does not have a Conditional Pass category.

Electrical Inspections (Remote) in 2021

Electrical Inspections (In-Person) in 2021



Elevating Devices

Learn about injuries, incidents, assessments, and permits in 2021.

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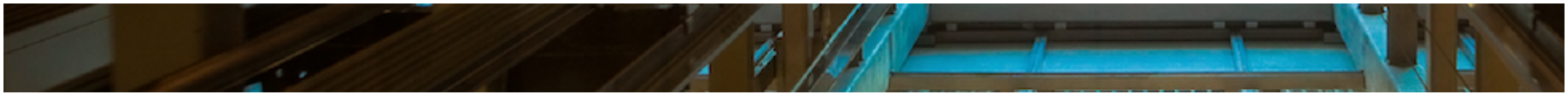

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Data by technology: Elevating Devices

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Elevating

Technical Safety BC oversees the safety of elevators, escalators, moving walkways, dumbwaiters, lifts, and construction hoists in accordance with the *Safety Standards Act* and the Elevating Devices Safety Regulation.

Key Statistics

55

Incidents reported to us in 2021

19

Injuries reported to us in 2021

3,099

Assessments completed in 2021

Incidents

In 2021, the number of incidents reported to us increased by 25 (83%) compared to 2020, which saw a decrease of 62% compared to 2019.

Note: The category *under assessment* refers to incidents reported to Technical Safety BC that were still under investigation at year end.

Elevating Device Incidents by Year (2017 - 2021)

Injuries

In 2021, 19 injuries were reported to Technical Safety BC, which is a 90% increase compared with 2020. This increase in injuries is likely due to the decrease in usage of elevating devices in 2020 as a result of COVID-19 restrictions. In 2020, six injuries were reported to Technical Safety BC, an 85% decrease compared with 2019.

Elevating Devices Injuries by Year (2017 - 2021)

Permits

The number of permits increased in 2021 to 28,714. In 2021, there were 1,751 installation permits issued, a decease of 25% compared to 2020. Operation permits increased by 7% in 2021.

Elevating Device Permits by Year (2017 - 2021)

Assessments

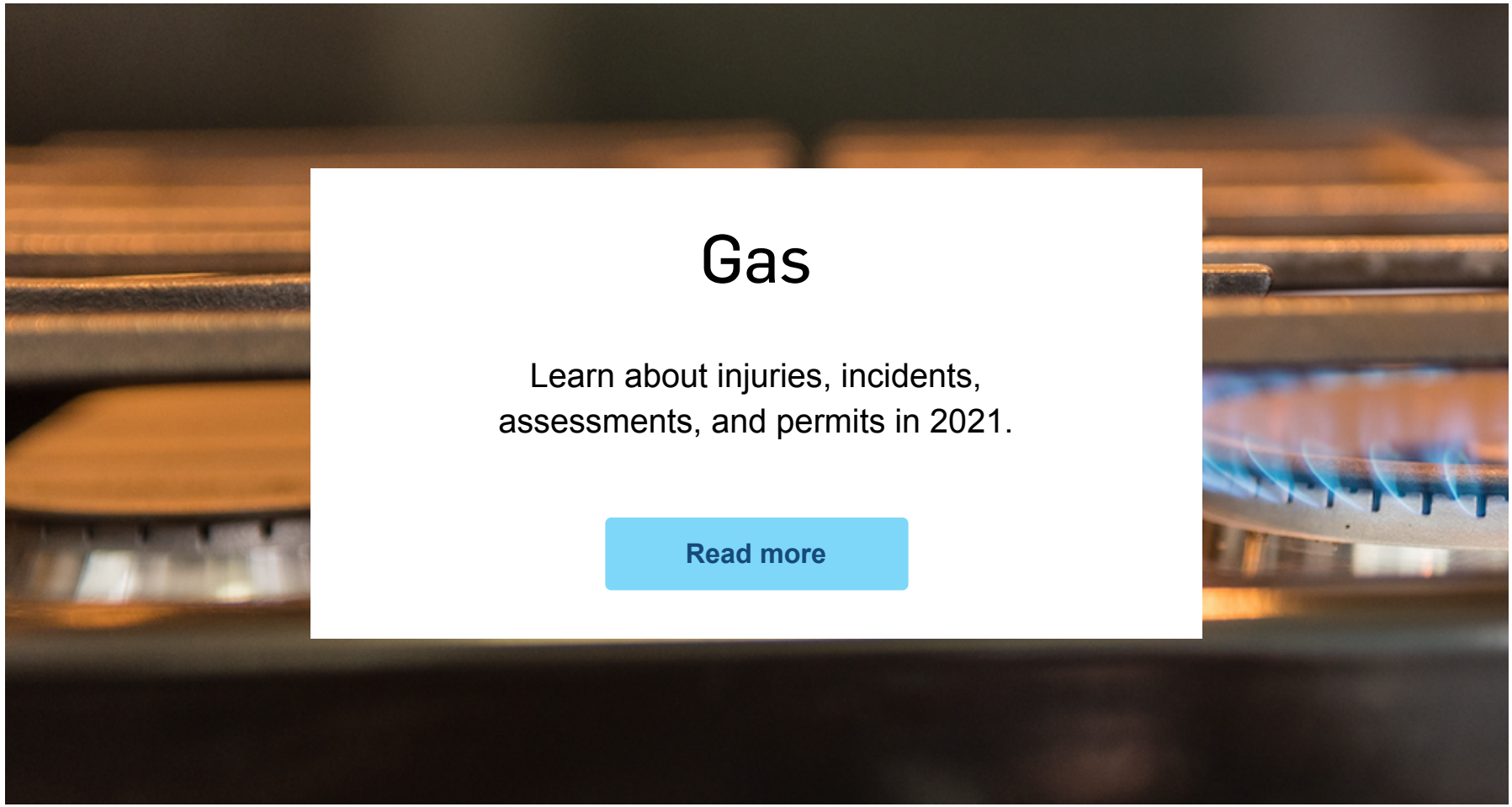
Technical Safety BC safety officers completed a total of 3,099 assessments in 2021. Of this total, 2,550 were in-person inspections and 549 were remote inspections.

Assessments are rated as follows:

Pass	The safety officer has assessed that the regulated work and/or regulated product was found to comply with the *Safety Standards Act*, regulations and/or applicable technical code(s).
Conditional Pass	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations and/or applicable technical code(s). Further regulated work may only be undertaken as directed on the certificate of inspection, while the identified non-compliances are being corrected.
Fail	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations and/or applicable technical code(s). Further regulated work on the affected system or phase of work, and/or operation of the regulated equipment must not be undertaken until the identified non-compliances have been corrected.

Elevating Device Physical Inspections in 2021

Elevating Device Remote Inspections in 2021



Gas

Learn about injuries, incidents, assessments, and permits in 2021.

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Data by technology: Gas

Gas

Technical Safety BC oversees industrial and commercial use of natural gas, propane, biogas, digester gas, manufactured gas, liquified petroleum gas, landfill gas and hydrogen throughout British Columbia in accordance with the *Safety Standards Act* and the Gas Safety Regulation.

Key Statistics

73

Incidents reported to us in 2021

16

Injuries reported to us in 2021

11,793

Assessments completed in 2021

Incidents

In 2021 the number of gas incidents reported to us increased by 18 (33%) compared with 2020.

In 2021, Technical Safety BC released the results of a comprehensive investigation into commonly used Carrier Gas furnaces, and found that a design flaw resulted in numerous dangerous carbon monoxide (CO) exposures in recent years. Technical Safety BC carried out this investigation following multiple incidents in which eight people were hospitalized across BC due to carbon monoxide exposures caused by failures in a common product line of residential gas burning furnaces.

The category under assessment refers to incidents reported to Technical Safety BC that were still under investigation at year-end.

Gas incidents by Year (2017 - 2021)

Injuries

In 2021 injuries decreased by three compared to 2020. The majority of injuries reported were related to carbon monoxide leaks and exposure.

Please note that we receive injury reporting and descriptions from operators of first responders at the time of, or immediately following, the incident. Injuries may develop after the initial reports were made to us and the long-term effects of a resultant injury may not be recorded as part of our investigation.

Gas Injuries by Year (2017 - 2021)

Permits

In 2021, there were 71,219 gas permits issued. 69,641 were installation permits and 1,578 operating permits.

Gas Permits by Year (2017 - 2021)

Assessments

Technical Safety BC safety officers completed 11,793 assessments of gas equipment in 2021. Of this total, 4,455 were in-person inspections and 7,338 were remote inspections.

Assessments are rated as follows:

Pass	The safety officer has assessed that the regulated work and/or regulated product was found to comply with the *Safety Standards Act*, regulations and/or applicable technical code(s).
Conditional Pass	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations and/or applicable

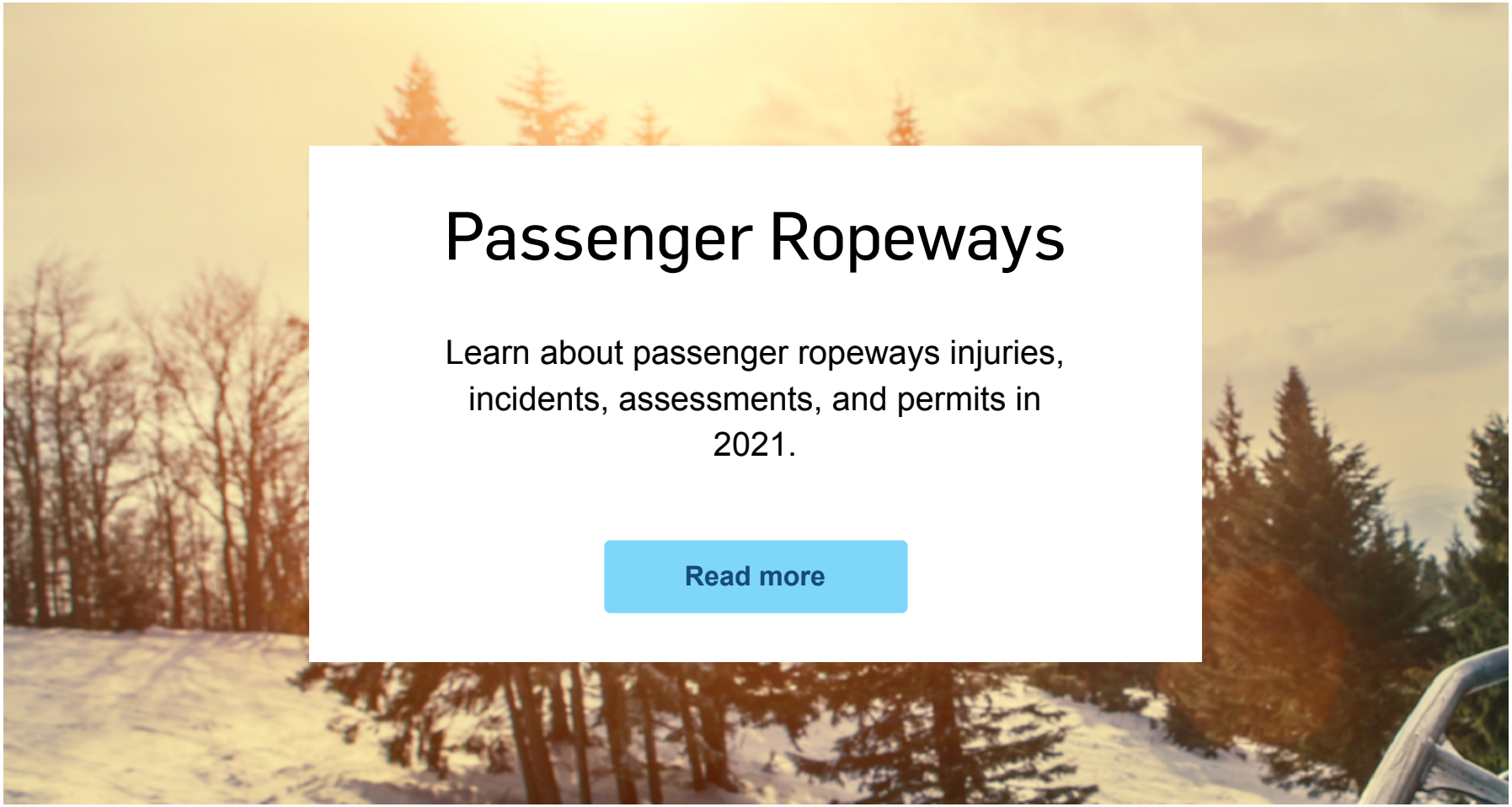
	technical code(s). Further regulated work may only be undertaken as directed on the certificate of inspection, while the identified non-compliances are being corrected.
Fail	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations and/or applicable technical code(s). Further regulated work on the affected system or phase of work, and/or operation of the regulated equipment must not be undertaken until the identified non-compliances have been corrected.

Gas Physical Inspections in 2021

Gas Remote Inspections in 2021

Sharing safety knowledge

Carbon monoxide exposures continue to be a persistent risk to our safety system. While the effects of CO poisoning can be devastating, they can be prevented. We are committed to providing continuous education on CO safety.



Passenger Ropeways

Learn about passenger ropeways injuries, incidents, assessments, and permits in 2021.

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Data by technology: Passenger ropeways

Passenger ropeways

Technical Safety BC oversees the safety of passenger ropeways throughout British Columbia in accordance with the *Safety Standards Act* and the Elevating Devices Safety Regulation. These include tramways, gondolas, chairlifts, rope tows and passenger conveyors.

Key Statistics

97

Incidents reported to us in 2021

42

Injuries reported to us in 2021

208

Assessments completed in 2021

Incidents

In 2021 there were 97 passenger ropeway related incidents, which is equal to the number of incidents reported in 2020. The majority of the incidents that occur on passenger ropeways or conveyors happen while loading, unloading or riding the ropeway or conveyor, and can be attributed to passenger actions or lack of competencies, operational factors, or a combination of both.

Note: The category under assessment refers to incidents reported to Technical Safety BC that were still under investigation at year’s end.

Passenger Ropeways Incidents by Year (2017 - 2021)

Injuries

Injuries in 2021 increased by 17% compared to 2020. This increase can be attributed to the increased number of skiers in 2021 as COVID-19 restrictions decreased, as well as a longer ski season in 2021, compared to when the ski season ended early in March 2020.

One incident resulted in a moderate injury. The majority of injuries attributed to patron actions or operational factors such as falls from carriers were rated as insignificant. However, these all had potential for more significant injuries

Passenger Ropeways Injuries by Year (2017 - 2021)

Permits

In 2021, there were a total of 233 passenger ropeway permits: 22 installation permits and 211 operating permits. Overall total permits increased by 14% compared to 2020.

Passenger Ropeways Permits by Year (2017 - 2021)

Assessments

In 2021, Technical Safety BC safety officers completed 208 inspections: 175 in-person and 33 remotely.

Assessments are rated as follows:

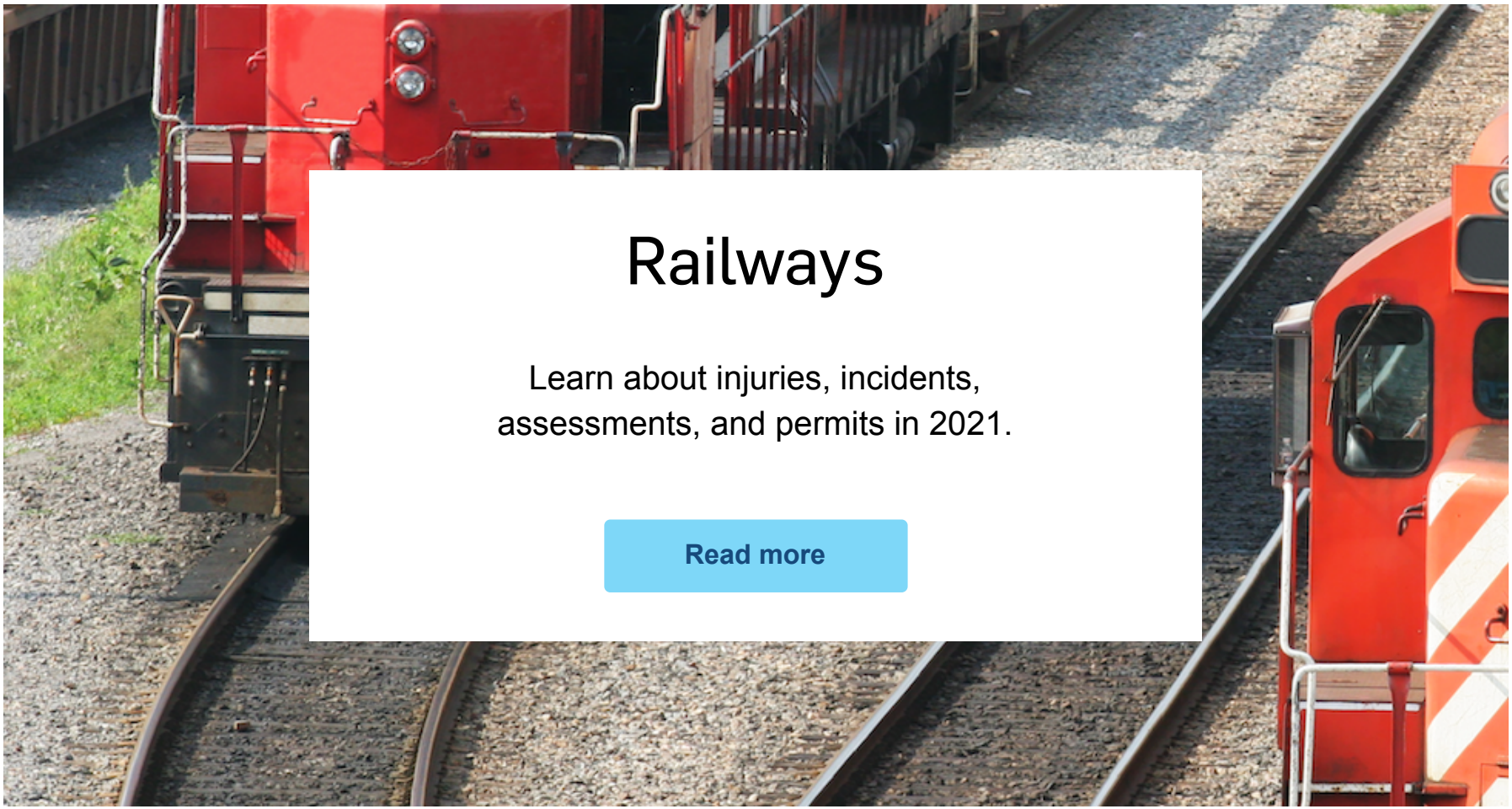
Pass	The safety officer has assessed that the regulated work and/or regulated product was found to comply with the *Safety Standards Act*, regulations and/or applicable technical code(s).
Conditional Pass	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations and/or applicable technical code(s). Further regulated work may only be undertaken as directed on the certificate of inspection, while the identified non-compliances are being corrected.

Fail	The safety officer has assessed that the regulated work and/or regulated product was found to NOT comply with the *Safety Standards Act*, regulations and/or applicable technical code(s). Further regulated work on the affected system or phase of work, and/or operation of the regulated equipment must not be undertaken until the identified non-compliances have been corrected.

Passenger Ropeways In-Person Inspections in 2021

Industry partnerships

We continue to work with the BC passenger ropeways industry to improve training and knowledge of passenger ropeway maintenance personnel. This partnership with industry resulted in a Safety Order that was issued in January of 2021.



Railways

Learn about injuries, incidents, assessments, and permits in 2021.

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Office locations

Data by technology: Railways

Railways

Technical Safety BC regulates railways that operate solely within British Columbia and have a Ministers Certificate and Operating Permit issued by the BC Ministry of Transportation and Infrastructure. Provincial railways are subject to the British Columbia Railway Act, Railway Safety Act, and adopted federal railway safety legislation. We regulate five different classes of railways: common carrier, heritage, commuter, industrial, and industrial sidings and spurs.

Key Statistics

132

Incidents reported to us in 2021

9

Injuries reported to us in 2021

166

Completed audits

Incidents

Railways are responsible for ensuring all hazards are properly managed for safe railway operations. Continuing our education efforts, Technical Safety BC provides operational information detailing the consequences of unsafe conditions that can impact the safety of railway employees, the public and the environment.

In 2021, the number of incidents relating to railways decreased by 42 (24%) compared to 2020, with 132 reported incidents.

Railways Incidents by Year (2017 - 2021)

Injuries

In 2021, 9 injuries were reported to us, an 18% decrease from 2020.

Please note that we receive injury reports and descriptions from operators or first responders at the time of, or immediately following, the incident. Injuries may develop after the initial reports were made to us and the long-term effects of a resultant injury may not be recorded as part of our investigation.

Railways Injuries by Year (2017 - 2021)

Permits

Technical Safety BC does not issue railway installation permits.

Assessments and audits

As part of regular oversight, our railway safety officers assess and audit all operating railways. It is through assessments and audits that railways are sometimes found to be non-compliant with Acts, regulations, rules, and guidelines. Railway operations are also audited against their safety management systems, which are required for all railways.

In 2021, Technical Safety BC performed onsite inspections of approximately 50% of our certified clients, while other inspections were performed remotely due to COVID-19 health and safety

restrictions. Those facilities selected for inspection were determined based on risk/hazard.

Assessments are rated as follows:

Non-compliance	The safety officer has assessed the regulated work and/or regulated product and found it to be non-compliant with the *British Columbia Railway Act*, *Railway Safety Act,* and adopted federal railway safety legislation.
Recommendation	The safety officer has assessed the regulated work and/or regulated product and recommended that there are opportunities to better align with the *British Columbia Railway Act*, *Railway Safety Act*, and adopted federal railway safety legislation. A recommendation is not a fail, but rather an opportunity for improvement.

Note: Unlike some other technologies, Railways does not have a Conditional Pass category.

Emerging risks

Technical Safety BC's rail program annually audits certified railways to verify that all safety critical employees are compliant

with the training qualifications set out in their safety management system. In addition, all audits consist of an evaluation performed by a safety officer to validate a facilities' ability to operate their equipment in a safe and compliant manner.

Proficiency tests

Despite internal proficiency tests being a requirement of all certified railways, many facilities often do not possess the knowledge to assess or perform proficiency tests effectively. As a result, Technical Safety BC encourages industrial railways to leverage professional third-party consultants to conduct rail crew testing on their behalf. To further mitigate this risk, the rail program has increased its system capability to analyze rail incidents and compliance data to isolate those clients that are underperforming and focus greater program resources to aid those clients as required.

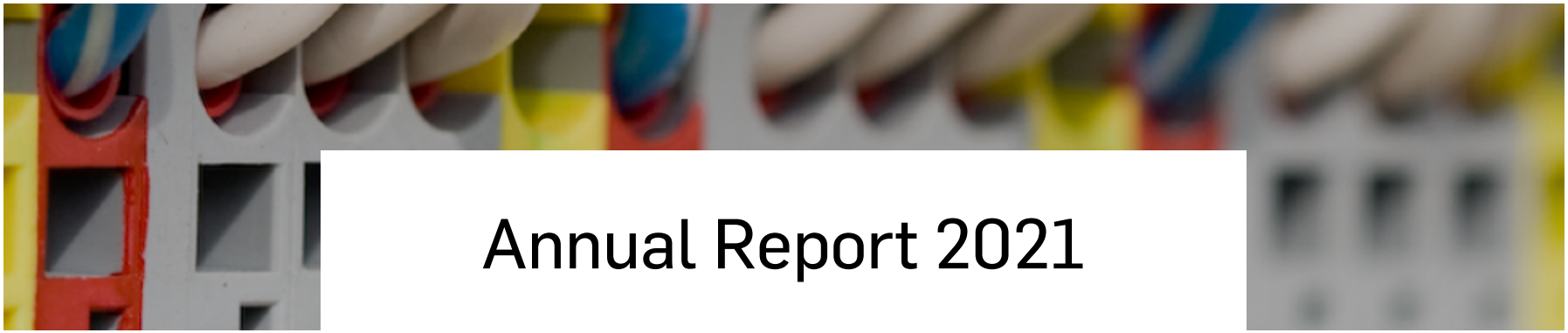
Insufficient train crew competency on industrial sites

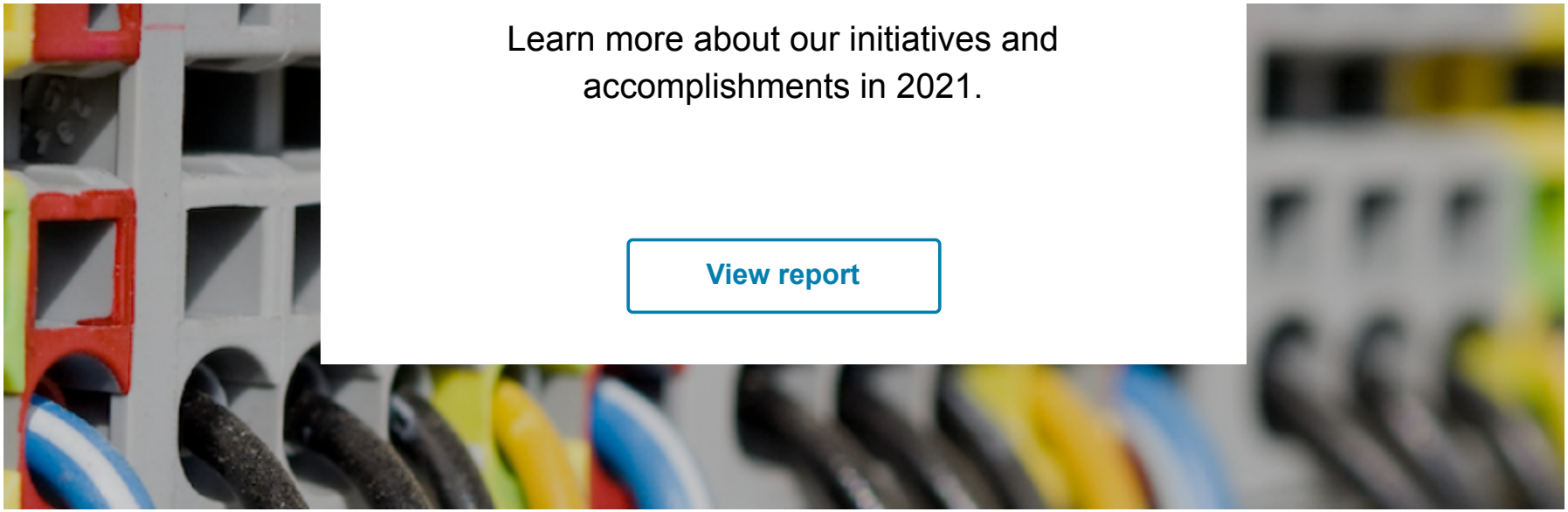
Due to the part time nature of the industrial railway sector, inexperienced train crews present a risk to safe rail operations. This is especially important when dangerous goods or substances (e.g., ammonia or chlorine) are transported within a facility as these goods present a greater hazard to workers, the public, and environment if employees lack the necessary training and support.

Safety Advisories issued

In 2021, two Safety Advisories were issued by Technical Safety BC:

- A Safety Advisory was issued to regarding the Railway Employee Qualification Standards Regulations, in which all provincially-regulated railways must train and certify their employees that participate in the movement of railway equipment.
- Extreme heat and fire danger conditions may be present in BC where provincially regulated railways are undertaking operations. Following events in Lytton BC, Transport Canada issued Ministerial Order MO 21-06. That Order requires that certain actions be taken by impacted railways during periods of extreme heat and/or when fire risk dangers are high.





Learn more about our initiatives and accomplishments in 2021.

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