

2017

LEADERSHIP IN SAFETY

SAFETY FIRST





Becoming the safest railway in North America

In 2016, we made progress in our goal of being the safest railway in North America with marked improvements in several of our safety metrics. The results reflect how hard CN railroaders worked to improve our performance over 2015. I want to thank our employees for their commitment and effort.

A top initiative that will surely help is the training in *Looking Out For Each Other*, a safety mindset that empowers employees to speak up in a positive way if they spot any unsafe behaviour at work. We will also look to the continued good work of over 100 joint union-management health and safety committees, safety summits, and other employee engagement initiatives to strengthen our safety culture.

Delivering safely and responsibly drives how CN conducts its business every day. We make significant investments every year to maintain a safe operation, through our top-notch training, technology and infrastructure improvements. CN's plans for track infrastructure in 2017 will be consistent with last year's investment, to maintain a safe and efficient network. The planned work includes the replacement of wood cross ties and installation of new rail, plus work on bridges, branch line upgrades and other general track maintenance.

Investments are expected to be made on equipment, expansion projects and information technology initiatives to serve growing business, improve service for customers and advance safety. This includes safety technology investments such as wayside inspection systems and track testing vehicles.

Pursuing our goal of being the safest railway in North America will take hard work, constant vigilance and teamwork – all qualities that are integral to CN's culture. I encourage you to read through our latest report, which documents our safety programs and achievements, and how we are strengthening our commitment to safety.

Luc Jobin
President and Chief Executive Officer



Each year, we are presented with many opportunities and challenges, each one requiring us to work together. CN has led the industry in so many aspects of the railroad business and we are determined to also be the safest in North America.

One of the best opportunities to enhance our safety culture at CN is the use of peer-to-peer communication and engagement. Since the fall of 2016, over 15,000 Mechanical, Engineering, Transportation and Intermodal employees received their third annual training on *Looking Out For Each Other*.

We believe *Looking Out For Each Other*, this vital safety mindset, must become instinctive and integrated into our daily job duties. The reflex to automatically keep an eye on our co-workers, to spot lapses in attention that can do us harm, or to intervene quickly with a life-saving word, must become as natural in our workplace as it is at home with our families. Combined with a proactive approach to safety, *Looking Out For Each Other* is our best defense against accident and injury, and helps everyone end their day as safely as it started. At CN, safety is more than a priority; it's a core value.

In 2017, our opportunity is to work well as a team, do it safely, and embed a strong safety mindset across the railroad. Our actions on the ground go a long way to ensure we all go home safe.

Let's always *Look Out For Each Other*.

Michael Cory

Executive Vice-President and Chief Operating Officer

**Making safety a
first instinct**



Safety metrics



FRA train accident ratio*

accidents per million train miles

2015
2.06

2016
1.42

2017 Target
1.50



2015 2016 2017 Target

CN reduced its FRA train accidents by 31%.

FRA personal injury ratio

injuries per 200,000 person hours

2015
1.63

2016
1.70

2017 Target
1.50



2015 2016 2017 Target

FRA injuries increased by 4%.

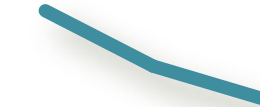
TSB (Canada) train accident ratio

accidents per million train miles

2015
8.69

2016
7.81

2017 Target
7.30



2015 2016 2017 Target

CN reduced its TSB train accidents by 10%.

Crossing accidents

2015
193

2016
194



2015 2016

The number of crossing accidents remained flat in 2016 versus the previous year.

Trespassing accidents

2015
52

2016
59



2015 2016

The number of trespassing incidents increased by 13%.

* The FRA ratio includes only accidents with a cost in excess of US\$10,700/CA\$14,100 while the TSB ratio includes all accidents.

Accidents and Injuries

Safety metrics

Accident ratio

2016 initiatives

- Focused on the root causes of main track accidents through Engineering and Mechanical initiatives.
- Deployed leading-edge technologies that inspect track and equipment.
- Implemented Engineering controls for more complete, quality track work. The controls allowed for a structured process and greater accountability.
- Focused on key learnings from risk assessments and incidents.
- Worked with customers to educate them about safety.
- Continued multi-functional safety task force to address top safety issues to improve our safety performance.
- Carried out Corridor Risk Assessments.

Key 2017 initiatives to reach targets

- Implement the recommendations of CN's Safety Task Force, which was established to reduce accidents and injuries.
- Have each division of the railroad continue to focus on seven critical switching rules, which account for the majority of non-main track accidents.
- Renew existing Corridor Risk Assessments using improved methodology.
- Invest with a focus on advancing safety, service and productivity through infrastructure maintenance and new technology.
- Maintain the focus on employee safety engagement to further advance a safety culture:
 - Continue the work of the CN Technology Working Group, a multi-functional team that looks at safety technologies and data to drive improvement.
 - Continue to focus on roll-by inspections.



New TSB regulations

Recently, the TSB modified the reporting criteria for accidents and incidents, which are both reportable to the agency. The primary difference between these two types of occurrences is that “incidents” are not included in the calculation of the accident rate (i.e., accidents per million train miles).

CN’s current reporting information approach is consistent with the TSB proposed change. All CN employees involved in contributing information to the reporting log must fully understand the regulatory change.

The following types of occurrences will now be considered as “incidents” rather than “accidents”:

- Derailments of one to two cars where there is:
 - No damage to track
 - No damage to equipment
 - No equipment was set aside / removed / bad ordered
 - No injuries
 - No fire
 - No release of dangerous goods
- Minor collisions
 - Same criteria as above, and not occurring on the main track and/or the rolling stock involved did not foul or damage the main track.



Safety metrics

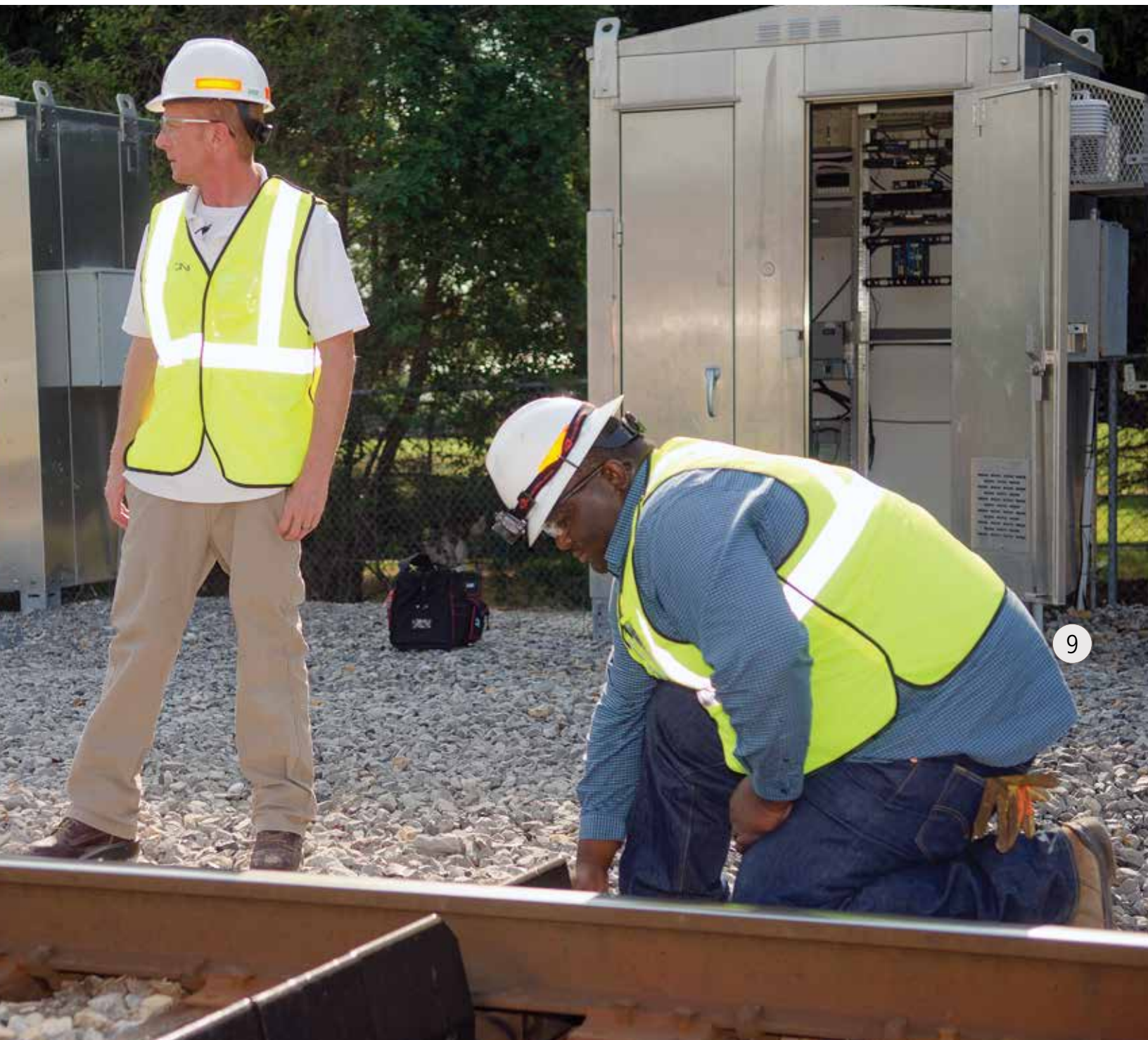
Injury ratio

2016 initiatives

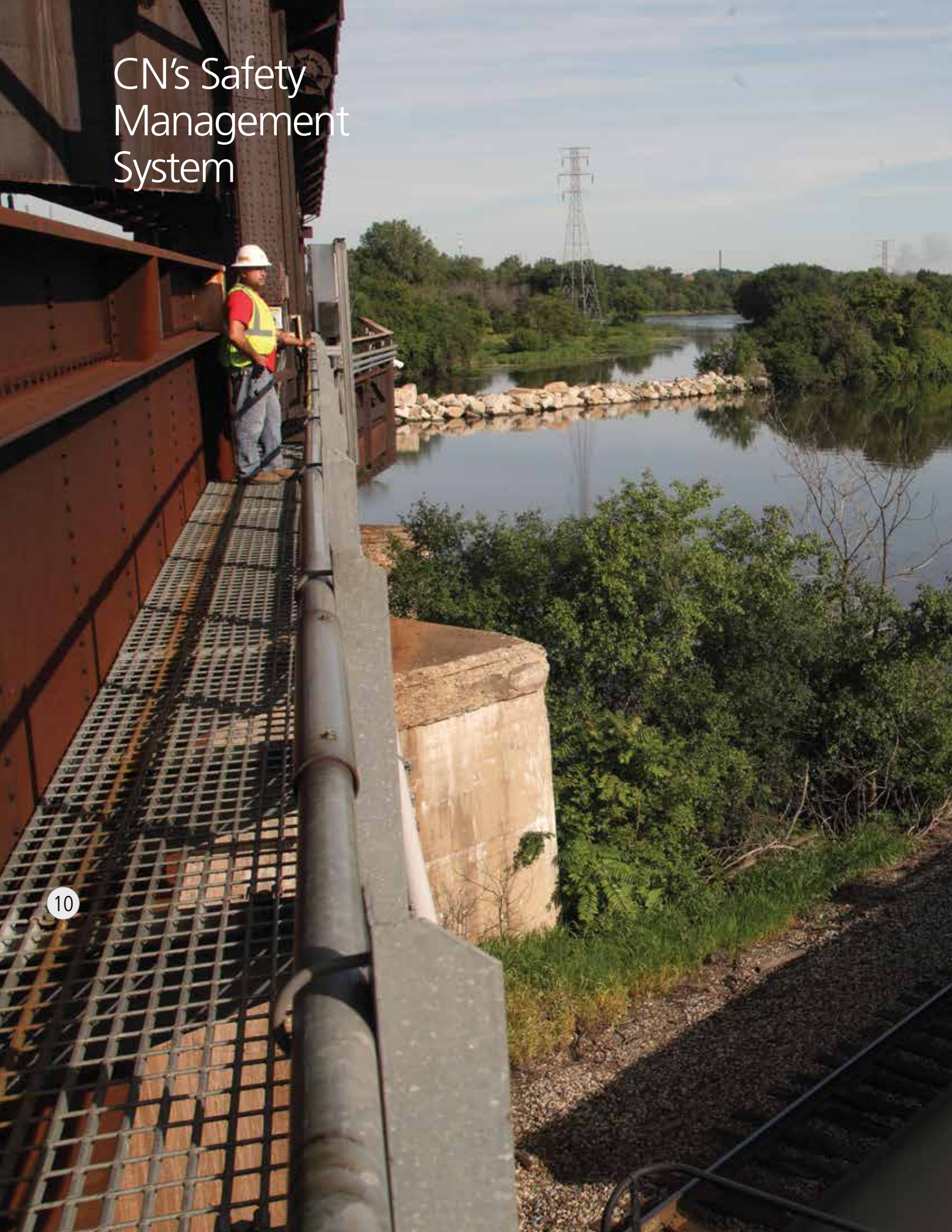
- Focused regional/divisional safety action plans on local injury causes.
- Action plans developed by Health and Safety Committees to help address top injury causes.
- Continued to strengthen CN's safety culture through *Looking Out For Each Other*.

Key 2017 initiatives to reach targets

- Continue to enhance CN's safety culture through *Looking Out For Each Other*, Safety Summits, communications, education and cause-finding.
- Develop and implement specific initiatives to sustain *Looking Out For Each Other* in each Region and Function.
- Leverage CN Campus to meet the learning needs of CN's current and future railroaders.
- Continue to address top injury causes at a local level through employee engagement and safety culture initiatives.
- Continue the work of CN's Safety Task Force, which develops initiatives to address top safety issues such as ergonomic injuries as well as injuries related to entraining and detraining.
- Improve the investigation process to further drill down on the root causes of injuries.



CN's Safety Management System



To incorporate safety into daily operations, CN's Safety Management System (SMS) focuses on initiatives in the following key areas: People, Process, Technology and Investments.

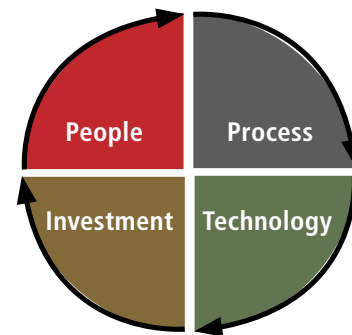
A Safety Management System (SMS) is "a formal way to make safety part of day-to-day railway operations. It includes safety goals and performance targets, risk assessments, responsibilities and authorities, rules and procedures, monitoring and evaluation processes, and developing a strong safety culture."*

All federally regulated railway companies must implement and maintain an SMS and report to Transport Canada on their safety performance, safety goals, and new safety efforts every year. CN will continue to enhance its SMS in 2017.

CN's SMS provides the company with a focused approach to building a safety culture throughout the network. CN's Plan helps supervisors understand the specific components of the SMS that they are responsible for implementing or communicating at the local level. The Plan, which has been enhanced every year since its release in 2008, describes concrete initiatives such as employee involvement in safety, risk assessment and auditing. With this information, regional/functional leaders are able to develop detailed action plans for their operations.

* Defined by Transport Canada. For information on how CN's SMS is aligned with Transport Canada's regulations, please see page 43 of this brochure.

SMS: A Multi-Faceted Continuous Improvement Approach



Investing in people and improving our safety culture



Risk Management Processes focusing on prevention and mitigation



Employing a wide range of inspection and detection technologies



Over \$1 billion in annual capital to maintain network safety and integrity

CN's Safety Management System mitigates risk through People, Process, Technology and Investment

People



“We work in an environment that can be unforgiving. It is imperative that we understand and follow our rules and procedures, ensuring all hazards are top of mind.

Our *Looking Out For Each Other* initiative brings all of us together with the intent of ensuring those hazards are known and understood between teammates and appropriate actions are in place to prevent injury or incident.

The goal is to work together to ensure we all go home safe to our families at the end of the day.”

MICHAEL CORY

Executive Vice-President and Chief Operating Officer

CN invests significantly in training, coaching, recognition and employee engagement initiatives in order to strengthen our safety culture. The Company has taken a systematic approach to training and developing the new railroaders it hires every year, with activities such as *Looking Out For Each Other*, intensive field training, Onboarding and Safety Summits.

Safety is a core value

CN continues to measure and strengthen its safety culture, in accordance with Transport Canada’s guidelines. Several of its initiatives have been recognized by Transport Canada and working groups that were formed as a result of the last Railway Safety Act Review that are addressing safety culture in railroads.

Looking Out For Each Other

Looking Out For Each Other is an integral part of CN’s safety culture. It’s a vital safety mindset employees are taught and encouraged to integrate into their daily practices to ensure everyone goes home safely at the end of the day.

- CN initiated *Looking Out For Each Other* in 2014, with the support of its Joint Union-Management Policy Health and Safety Committee. The successful peer-to-peer engagement strategy is designed to:
 - Raise awareness among employees of the top causes of incidents and injuries.
 - Identify and review safe work procedures for those activities.
 - Train employees to be aware of their surroundings and to recognize potential at-risk work practices or situations in the field.
 - Teach employees how to provide constructive feedback to their peers.
 - Learn from past incidents to prevent a reoccurrence of the same event and help each other stay safe.



In 2016:

The CN Joint Union-Management Policy Health and Safety Committee was engaged in Phase 3 of this peer-to-peer program, with training for thousands of employees to promote safe work procedures.

Over 15,000 Mechanical, Engineering, Transportation and Intermodal employees received specialized training that included interactive learning scenarios on the importance of safety to family life, being hyper vigilant of work surroundings and making life-saving decisions. In addition, employees learned how to effectively communicate with their co-workers when observing an unsafe act and how to support them in working safely.

In 2017, *Looking Out For Each Other* will continue to be an important aspect of CN's safety culture to help keep all our railroaders safe.

Training

CN's two state-of-the-art training centres in Winnipeg, MB, (the CN Claude Mongeau National Training Centre) and Homewood, IL, provide CN students with hands-on and classroom training for all key railway jobs.

Employees receive training in ultra-modern indoor labs with equipment such as locomotive simulators. Outdoor labs are equipped with dedicated rolling stock, track and wayside equipment, as well as field training equipment. Experienced mentors deliver a robust curriculum.

Since the opening of the campuses, over 15,000 employees have received training.

Recognizing Excellence

The CN Joint Union-Management Policy Health and Safety Committee recognizes the top three Health and Safety Committees in the company for improving safety in the workplace with an award program.

Congratulations to the following Committees for having taken safety to the next level in 2016:

Taschereau Yard

Montreal, QC

Transcona Complex

Winnipeg, MB

Edmonton Intermodal

Edmonton, AB

Customer Partnership Program

In an effort to align our customers' safety philosophy with ours, CN also welcomes customers to both the Winnipeg and Homewood campuses to participate in a set of free safety-focused classes. Customers are given a hands-on experience on state-of-the-art rail safety training equipment such as locomotive simulators and indoor tracks, in addition to a mix of theoretical classroom learning. Over 300 students representing 100 customers attended almost 60 classes in 2016.

The unique learning experiences will continue to be offered at both campus locations in 2017 and will be

enhanced based on customer feedback. CN will also expand the program to other stakeholders, including shortline railroads in Canada and the United States, as well as regulatory bodies and supply chain partners.

Onboarding

The Company's Onboarding program is designed to ensure new employees are equipped with the resources and knowledge they need to work safely and efficiently and to respond to their needs. With a sizeable proportion of CN's workforce having less than three years of service, the Onboarding program continues to be important to guide and develop newer employees. After they successfully complete their initial training, CN continues to focus on refining new railroaders' skills and to build solid relationships with each one of them. Supervisors and coaches connect regularly with the new hires and provide feedback and coaching as needed.

Employee Involvement

Employee involvement is a fundamental part of CN's Safety Management System and is strengthened through a number of initiatives.

Safety Summits

Local management led 63 summits in 2016. These sessions are an opportunity to engage employees in strengthening safety and culture. Summits promote effective two-way communications and the sharing of best safety practices. Of particular importance is the opportunity to listen to employees about their ideas, opportunities and challenges that can be addressed jointly. Safety Summits will continue in 2017 to reinforce CN's positive safety culture.

Health and Safety Committees

CN has 103 joint union-management committees across the system which are empowered to improve local culture and engage the entire workforce in safety initiatives.

In 2016:

- CN continued to deliver systematic support to the committees by teaching risk assessments and providing assistance in developing annual action plans to address top causes of accidents and injuries.
- CN's Health and Safety Committee's Intranet page contains the minutes of each committee meeting, all safety action plans, templates for various surveys, and more. Regions / functions continue to make good use of the site as a resource to address workplace accidents and injuries.



Process





Process initiatives aim to make safety a systematic part of all railroad activities and to focus on the top causes of accidents and injuries.

Engaging with Communities on Safety

Our Corporate Services staff members play an integral role in keeping CN connected to the communities in which we operate. Working with our Dangerous Goods team and other colleagues, Corporate Services members, led by our community affairs staff and CN Police, have an ongoing community engagement program reaching municipal officials and local emergency responders along CN's North American rail network. Through this program, CN representatives regularly share information on crossing safety, corridor risk assessments, proximity guidelines, dangerous goods traffic, and emergency response training opportunities. CN Police officers work with communities to reduce grade crossing and trespassing incidents across our network through targeted enforcement and education initiatives. Our outreach program reaches hundreds of communities every year.

CN is actively engaged and is cooperating fully in the Rail Safety Act Review that is currently evaluating the state of rail safety in Canada.

Involving Employee Representatives

CN values the input of its employees and labour representatives in running a safe operation.

In 2016:

At the 12th annual Safety Management System/Hazard Prevention Program conference, CN and the Company's Canadian Labour Policy Health and Safety representatives discussed key safety issues such as injury prevention, continuing to strengthen safety culture through CN's peer engagement initiative, *Looking Out For Each Other*, and employee engagement. Many key recommendations from the conference are being followed through and progress is being monitored in policy committee meetings.

Fatigue Management

A joint TCRC-CN initiative is addressing fatigue issues at the railroad. The team's collaborative approach has enabled the development of "call windows" and a Train Service Employee scheduling model where possible. Call windows provide employees with a forward-looking view of the daily windows in which they may be called for work while scheduling creates operating windows through which employees and managers know when employees are available for work.

CN and the unions have launched a pilot project to track and record the sleep patterns of running trade employees, both on duty and off, using a specialized motion tracking device called a Readiband®.

Dangerous Goods and Emergency Response

Every year, CN's Dangerous Goods (DG) group takes steps to enhance the Company's emergency preparedness and system protection, with a strong focus on safety, regulatory compliance and effective emergency response. CN's DG response team consists of:

- Dangerous Goods Officers strategically located across Canada and the US.
- Employees from various departments across the network trained as Dangerous Goods Responders.
- Specialized emergency response contractors.
- Shippers' emergency response teams.
- DG specialists from the Railway Association of Canada.

CN strengthened its incident response capability by acquiring specialized equipment such as five foam trailers and four response trailers equipped with transfer equipment.

CN's DG team delivers Railroad Emergency Response courses and other presentations, using CN's 911 training car and training trailers. The team also holds several training events at the Security and Emergency Response Training Center (SERTC) in Pueblo, Colorado. These include a one-week CN-sponsored Tank Car Specialist training course for

firefighters from across North America, a one-week course for emergency response contractors, and a three-day Crude-By-Rail course for firefighters. An important component of the group's work is supporting TransCAER® (Transportation Community Awareness and Emergency Response), an outreach effort to train community emergency personnel situated near rail lines where dangerous goods are transported.

In 2016 the Dangerous Goods team:

- Participated in over 400 TransCAER® events across the system, bringing critical training to over 8,400 participants who might face dangerous goods issues. Since 1988, CN has participated in nearly 4,400 TransCAER® events, reaching over 97,400 first responders.
- Earned the prestigious TransCAER® National Achievement Award from the American Chemistry Council.
- Actively participated in CN's Structured Community Engagement Program across the network.

Corridor Risk Assessments

CN continues to examine the key corridors on its network to assess risk and determine what technologies and processes could be used to mitigate risk. A multifunctional team considers a number of risk factors, including the proximity of communities along CN's right-of-way, environmentally sensitive areas and the volume of dangerous goods transported along those corridors. The assessments to date have identified opportunities to use technology to further reduce the frequency and severity of potential derailments, some of which are being addressed through CN's special Capital Technology Fund.

In 2016, CN began the three-year renewal process for existing Corridor Risk Assessments, completing two that were due for update. In addition, CN completed an all-new assessment of over 200 miles of secondary track in the United States. All assessments completed in 2016 used a new risk valuation methodology, developed in collaboration with the University of Alberta's Canadian Rail Research Laboratory, that incorporates mathematical assessment techniques used by high-risk industries and infrastructure in North America.



Key Route Risk Assessments

CN performs specific risk assessments on railway lines carrying substantial amounts of dangerous goods, known as Key Routes, looking at factors such as population and emergency response capabilities. Under new Transport Canada regulations, CN has reached out to communities and will incorporate input from Canadian municipalities along these Key Routes as part of those risk assessments.

CN's website: www.cn.ca/riskassessments provides a link to contact Keyroutes@cn.ca where communities can submit their input for consideration in the key route risk assessments.

Sharing information about Dangerous Goods

Canada's major railways worked with Transport Canada and the Federation of Canadian Municipalities to build upon the existing process for providing dangerous goods reports to communities. The current practice has been to provide historical dangerous goods information to emergency response agencies that register through a Transport Canada process.

Under this newer legislation, Protective Direction 36, these reports contain more information about the dangerous goods. Registered communities now also receive an annual report which provides information on the type of dangerous goods moving through a jurisdiction which can be shared with the public. As well, CN publishes on its web site information about the DG moving through each province on its network.

CN has long shared dangerous goods information with local communities, but this new process now allows communities to designate and register an Emergency Planning Officer (EPO) through the Canadian Transport Emergency Centre. To register an Emergency Planning Official (EPO), contact information must be provided to the following address:



AskRail™ Mobile Application

Developed by the Association of American Railroads, of which CN is a member, the AskRail™ mobile app lets emergency responders – the only parties eligible to use the application – view railcar content through a simple search, and also view railway emergency contact information and reference resources to support incident response.

CN has registered more than 1,500 responders in Canada for the AskRail mobile app from nearly 300 locations.

AskRail™ provides relevant information to emergency responders at the outset of an incident, which helps them make more informed decisions about how to respond effectively to a rail emergency.

Canadian Transport Emergency Centre (CANUTEC)

Place de Ville, Tower C

330 Sparks Street, 14th Floor,

Ottawa, Ontario, K1A 0N5

Attention: Director of CANUTEC

www.tc.gc.ca/eng/canutec/menu.htm

Email: TC.ProtectiveDirection-OrdrePreventif.TC@tc.gc.ca

CN has been working in conjunction with rail industry partners, municipal leaders and government to establish a process to advance our collaboration with communities on emergency response planning and how to better share relevant information on dangerous goods traffic.

Phasing out of DOT-111 Tank Cars

CN does not own any DOT-111 tank cars, which are used to carry liquids including crude oil and ethanol. The company has long advocated for more stringent standards for tank cars and supports the accelerated phase out of legacy DOT-111s.

Responsible Care®

Responsible Care® is an ongoing performance improvement initiative established by the Chemistry Industry Association of Canada (CIAC) and the American Chemistry Council (ACC). CN has been a proud partner in Responsible Care® since 1998, committing itself to continuous improvement in the areas of environment, health, safety and security (EHSS).

CN continues its certification in Responsible Care.

Safety Audits

CN conducts three levels of safety audits.

- **Integrated system audits** assess regulatory compliance as well as operating rules and safety culture.
- **Regional/functional audits** assess compliance with a Region or Function's safety action plans. These types of focused audits may include walkabouts or technical audits of an engineering or mechanical issue.
- **Local audits** occur on a daily or weekly basis and focus on rules compliance through efficiency testing and observations.

In 2016:

- CN continued to use its integrated system audits to measure safety culture. The Company's follow-up audit process continued to ensure the actions recommended in the integrated audit were completed and effective.

Risk Assessment

Risk assessments allow CN employees to understand the potential safety hazards of railroad activities so they can prevent or minimize the risk of injury or accident. CN conducts risk assessments in a systematic and structured manner prior to changes in operations and to address activities that may pose significant risk. Field Level Risk Assessments are conducted during specific activities in the field, such as the installation of track and ties.

In 2016:

- All regions increased their sharing of safety information, including best practices and action plans for safety. There are over 200 risk assessments to review and learn from.
- CN continues to update its internal Safety and Regulatory Affairs website to provide users in the field with important safety information more easily and efficiently.

Technology and Investment



For 2017, CN is targeting \$2.6 billion in capital investments to enhance safety and support long-term growth, as follows:

- \$1.6 billion on track infrastructure to continue operating a safe railway and improve the productivity and fluidity of the network; including the replacement of rail, ties, and other track materials, bridge improvements, as well as various branch line upgrades;
- \$0.3 billion on equipment capital expenditures, allowing the Company to tap growth opportunities and improve the quality of the fleet; and
- in order to handle expected traffic increases and improve operational efficiency, CN expects to take delivery of 22 new high-horsepower locomotives and other equipment type;
- \$0.3 billion on initiatives to drive productivity, including information technology to improve service and operating efficiency; and
- \$0.4 billion associated with the U.S. federal government legislative PTC implementation.

CN also uses a wide range of technologies to monitor the condition of track and rolling stock in order to proactively minimize risks. Our industry-leading wayside detection assets are driving opportunities to improve service, safety and reliability.

CN's technology working group assembles representatives of all functions in the company to look for new lines of defense for our network. The group works to create a unified vision for CN's technology investment and deployment, ensuring we invest in the right technology and explore external connections with other Class I railroads, research facilities, suppliers and railways. In 2016, CN stepped up its external engagement, conducting deep dive sessions and benchmarking with railroads, suppliers and universities.

CN has announced a special program to acquire additional monitoring equipment to enhance its strong technological base for early detection of defects. The program is an outcome of CN's corridor risk assessments and will supplement CN's ongoing investments in technology. In 2017, CN is planning to invest about C\$10 million in new safety technologies that will include:

- 1 additional Dragging Equipment Detector, in addition to the 27 detectors already installed system-wide in 2016.
- 13 Signaled Sidings on key corridors that carry the highest traffic levels to alert crews and dispatchers to potential broken rail incidents.

- 1 hi-rail truck that measures loaded gauge and track geometry parameters to identify exceptions that exceed CN thresholds.
- 5 Vertical Track Interaction Units that use accelerometers to identify areas of potential concern and reduce the risk of main-track accidents.
- A lone worker protection system that provides an added level of safety for Engineering employees working in the field.
- 40 Collision Avoidance Systems (CAS) on select hi-rail vehicles to help decrease the risk of collisions between equipment on track.
- Continuation of predictive analytics and data management initiatives to assess mechanical trends and allow for pre-emptive maintenance work in order to reduce failures and allow Engineering forces to better understand track health and prioritize maintenance and capital programs.
- Advanced machine vision imaging technology to detect rolling stock defects that are difficult to identify on visual inspections.
- An autonomous track inspection boxcar.

Predictive Analytics and Data Management

CN's investments in Predictive Data Analytics for our Engineering and Mechanical teams are another example of leveraging our technologies. The initiative involves using data from our industry-leading network of detectors and inspection technologies to take safety to the next level. Two programs are central to the effort:

Mechanical Analytics for Rail Safety (MARS)

- CN Mechanical and IT departments have teamed up on a major initiative that is now using existing car-related data to show operational and safety-related trends. This program is called Mechanical Analytics for Rail Safety (MARS). Data is being combined from Wayside Detector readings, Car Repair Billing, and service disruptions to find trends for car types, car series and individual cars. The information is a key initiative for determining pre-emptive action to prevent failures.
- Early findings have allowed CN Mechanical to take action on initiatives regarding car repair, retrofit, modification, truck hunting, coupler and draft components, air hose separations, side bearing application policy and car structures.
- The MARS initiative has also created a more integrated database query system so that Mechanical staff investigators are not limited by legacy databases in pursuit of data to drive preventive action plans.



Engineering Reliability & Analytics (ERA)

- CN Engineering is working closely with IT on an innovative initiative that helps field users visualize track conditions and better prioritize their work. The system consolidates historical repair and upgrade records, and combines that information with data from existing and new test equipment, including the TEST cars, the autonomous track geometry measuring system, ultrasonic rail flaw detectors, the optical track inspection system, joint bar inspection vehicles and the tie rating technology system. All of this information assists field employees and capital planning personnel to objectively understand the relative health of the track across the system.
- The system provides users with both operational and planning views. The operational view uses a map-based interface with GPS tracking to assist local forces in locating conditions identified through visual and automated inspections. This allows field users to better prioritize their workload.
- The planning view provides easy-to-use reports for objectively reviewing track health and developing capital programs. It also houses models for establishing major rail and tie projects.

Engineering

Technology

Ultrasonic Rail Flaw Detections

Rail flaw detection systems are designed to catch internal rail defects that could potentially lead to broken rails.

- CN tested over 219,000 miles of track in 2016. It expects to test approximately 215,000 miles in 2017 using a risk-based approach. Testing frequencies remain in excess of regulatory requirements throughout the system.
- CN tested over 13,000 miles of non-mainline track in 2016, and expects to test approximately the same number of miles of non-mainline track in 2017.

TEST Car

A valuable tool for the inspection of track curvature, alignment and cross-level of track across the network. CN Engineering forces use the real-time reports to address any track irregularities and to assist in planning long-term rail replacement programs.

- CN tested over 84,000 miles of track in 2016 and expects to test 85,000 miles of track in 2017.
- CN began commissioning a new autonomous track geometry system (ATGMS) car in late 2015. This system is currently collecting and processing data and CN expects the ATGMS to begin final commissioning in 2017. The ATGMS car is designed to operate on any freight train and will allow for additional geometry inspections of CN's network.



Optical Track Inspection System

This system uses state-of-the-art technology to capture detailed images of the track from the TEST car. The images facilitate the review of components such as tie plates, tie fasteners, joint bars and bolts.

- CN expects to finish commissioning the Optical Track Inspection System in 2017.

Hi-Rail Geometry and Joint Bar Inspection Vehicles

- In 2016, CN purchased and installed 10 light geometry track inspection systems on engineering vehicles. The inspection vehicles are utilized for additional geometry inspections between TEST car inspections, and for training less experienced employees.
- In 2016, CN purchased one geometry and joint bar inspection vehicle capable of detecting missing bolts and cracks in joint bars. This truck also has the ability to conduct light geometry inspections.

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Deployable Gauge Restraint Measurement System

This system applies a mechanical load to the head of the rail to simulate a loaded gauge measurement. This technology has the ability to find areas of missing or broken fasteners that may not be visible during a hi-rail inspection trip.

- CN commissioned its first Deployable Gauge Restraint Measurement System as part of the new TEST consist in late 2015. The system is currently fully operational.

New Rail and Track Ties

CN continues to use head repair welds to remove certain rail defects found by the Ultrasonic Rail Flaw Detection car. The technology allows replacement of a portion of defective rail head without cutting the rail, reducing the potential for track buckles.

- CN eliminated nearly 86,000 rail joints across the system in 2016. Rail joints are created when a short segment of rail is replaced to remove a defect found via rail flaw detection or visual inspection. Dynamic loads at rail joints lead to premature wear on track and rolling stock. CN expects to eliminate approximately 83,000 joints in 2017.
- In 2016, CN installed over 600 track miles of new rail and nearly 130 track miles of partially worn rail on the main line, branch lines and in yards.
- CN installed over two million new wood ties and over 55,000 concrete ties across the system in 2016.
- In 2017, CN plans to install more than 600 track miles of new rail and over 130 track miles of partially worn rail. The Company also plans to replace approximately 2.2 million wood track ties and over 54,000 concrete ties.
- CN surfaced over 8,300 miles of track in 2016 and expects to surface 8,500 track miles in 2017.

Rail Grinding

In addition to maintaining the rail's profile and controlling surface defects, rail grinding provides greater reliability of information to the Ultrasonic Rail Flaw Detection equipment while testing.

- CN ground over 21,500 pass miles of rail in 2016 and expects to grind over 21,500 miles in 2017.

Engineering

Equipment

Precision Engineering

Precision Engineering is a major initiative to consolidate many separate engineering processes into a single information system.

Engineering vehicles are equipped with laptop computers running the Precision Engineering application. The system enables employees to access and input critical information in real time, such as infrastructure condition, the completion of inspections and exceptions found during inspections. The end result is improved quality and execution of engineering inspections and repairs. Senior managers are provided with oversight to ensure regulatory and Company requirements are being met.

- Work is being done to further integrate the Track Information System (TIS) with the Signal and Communications Information System (SCIS) allowing Signals and Communications inspectors and maintainers to create track condition notifications.
- CN is enhancing TIS to include Critical Task checklists pertaining to the procedures and standards for rail repairs, disturbed track activities and thermite welding.
- CN is also improving the forms for recording repairs in Continuous Welded Rail, including tools to help determine the required adjustments.

Vehicle Track Interaction Unit (V/TI)

This is an initiative to reduce the risk of main track accidents. An accelerometer is mounted on a locomotive and identifies unusual movements or accelerations resulting from track impact and alignment issues. The technology produces email alerts that are sent to Engineering forces when exceptions occur.

- CN has 30 locomotives currently equipped with V/TI technology, and plans to purchase 5 additional units in 2017.



Ground Penetrating Radar (GPR)

This technology is used to provide detailed assessments of ballast and subgrade conditions. The data collected by these systems can be used to better identify potential problem areas and plan undercutting programs.

- In 2017, CN will continue to collect GPR data at specific locations to assist with undercutter programs.

Tie Rating Technology (TRT) System

The TRT system is a new technology at CN. Equipped with 3D measurement capability, the system more accurately assesses track tie conditions in an objective manner. The software analyzes the surface of ties and identifies the size, length, and location of cracks and splits.

- The images and data collected by TRT can be used to pinpoint locations that need monitoring and capital tie programs. CN believes this system enhances operational safety.
- The TRT system was installed on the CN TEST car in July 2015, and will be used to collect and assess tie condition across the CN system in 2017.

Positive Train Control

Positive Train Control (PTC) is a system for monitoring and controlling train movements to provide increased safety. In particular, PTC is designed to automatically stop a train prior to train-to-train collisions, prevent locomotives excessively speeding through slow track areas, avoid unauthorized entry onto restricted sections of track, and prevent movement of a train through a switch left in the wrong position. The US Rail Safety Improvement Act of 2008 requires Class I railroads to install PTC systems on track segments that carry passenger traffic or toxic-by-inhalation (TIH) materials or on lines that have an average annual traffic threshold of 5 million gross tons (MGT). The deadline for full compliance is December 31, 2020.

- In 2016, CN continued to work with the Association of American Railroads, vendors, regulators, and other Class I railroads to implement PTC on required track segments in compliance with the US Rail Safety Improvement Act. PTC is one of the most technologically complex initiatives the railway industry has ever undertaken. It requires building infrastructure, training employees, equipping locomotives, and testing of new technology.
- In 2017, CN will continue installing PTC capabilities across the US network. In total, CN expects to install PTC on approximately 3,563 route miles of track and 856 locomotives by 2020.
- PTC is an evolving technology and there is still much work to be done.

Broken Rail Protection

- CN extends track circuitry through designated sidings to provide a warning of a broken rail. In 2016, CN installed signal equipment on 18 dark sidings (where no signals exist) to protect against derailments.
- In 2017, CN plans to install broken rail protection on an additional 13 sidings.

Rail Bridge Safety

Bridges represent a vital component of our network infrastructure. Like all railways, CN is highly motivated to keep these structures safe. We cannot serve our customers and move North America's freight without efficient, safe bridges.

CN rail bridges vary from single timber 12-foot spans over streams in fields across the Midwest and Prairies to structures spanning more than a mile over some of the continent's largest rivers. They are all inspected, maintained and, as necessary, repaired or rebuilt by a qualified workforce led by designated CN bridge engineers in accordance with federal regulations and CN's Bridge Management Program.

- Since 2012, CN has invested \$560 million of capital to repair, upgrade or replace bridges.
- CN has close to 500 employees dedicated to bridge inspections, maintenance and construction.
- 36 certified, full-time CN bridge inspectors perform more than 7,500 comprehensive inspections per year.
- CN owns/leases six dedicated bridge inspection vehicles specially equipped to allow safe access to the various components of the bridges. These snoopers help inspectors position themselves well above and below the bridge deck. The fleet averages over 1,000 days of service annually.
- CN has been collaborating with universities and engineering firms in the development and testing of unmanned aerial vehicles and other advanced technologies to supplement bridge inspections.

Mechanical

Equipment Locomotives

Fleet renewal helps CN to improve the safety and reliability of its motive power and enhance customer service, as well as reduce fuel consumption and exhaust emissions.

- In 2016, CN added 90 new mainline locomotives using Alternating Current (AC) traction motors to its fleet, part of the Company's multi-year locomotive renewal program aimed at continuously increasing fuel efficiency, improving service reliability for customers, and reducing greenhouse gas emissions. The AC traction motors provide significantly better rail adhesion for pulling heavier and longer trains on steep grades. Three AC locomotives can pull the same number of cars as four DC locomotives. They comply with the latest EPA Tier 4 emissions standards and have Dynamic Brake capability at very low speed.
- CN will target about C\$200 million in 2017 for the acquisition of freight cars, Intermodal equipment and vehicles as well as locomotive and car refurbishments.



Wayside Inspection System (WIS): Hot Bearing Detectors

CN has the densest and most advanced wayside detection technology in North America, which comprises various detectors that monitor the network for unsafe operating conditions for trains. CN has significantly increased that capability year over year.

Hot bearing detectors sense and report unsafe wheel bearing temperature levels on moving cars or locomotives. The information from the detectors is used to prevent derailments. CN scanned almost three billion car and locomotive roller bearings on its WIS network in 2016.

- CN continued to reduce WIS spacing to the CN standard of 12- to 15-mile intervals on core routes. In 2016, the Company added 14 new WIS locations across its network. As of December 2016, CN had 910 WIS detectors on its system.

Wayside Inspection System (WIS): Hot Wheel Detectors

These detectors sense hot or warm wheels, which can create train delays and potential wheel tread damage, and reduce service life.

- CN continued to be proactive in identifying and repairing cars that recorded multiple hot or warm wheel readings from its over 650 hot wheel detectors.
- In 2016, CN performed over 44,000 single car air brake tests. The tests enable CN to diagnose air brake problems more accurately and to address service interruptions from stuck brakes. The Company implemented a new process to identify cars that have multiple occurrences of hot wheels.

Dragging Equipment Detectors

- In 2016, CN installed 17 new derailment detectors system-wide. In total, CN has over 450 stand-alone dragging equipment detectors, in addition to those that are already integrated with WIS units.
- In 2017, CN expects to install detectors in one additional location to protect key structures and waterways.

Wheel Impact Load Detectors (WILDs)

WILDs detect wheels that have surface flat spots and other imperfections that can lead to broken components or broken rails. CN uses the information provided by WILD sites to help assess wheel replacement or maintenance needs. CN has the largest and most dense network of WILDs in North America.

- In 2016, CN continued to work closely with the Association of American Railroads' research arm to develop and test practical and effective new wayside detectors for identifying broken or cracked wheels. The work is being conducted in collaboration with other Class I railroads and potential equipment vendors worldwide.
- CN currently has 41 WILDs across the system, the densest WILD network in North America.

Sharing Detector Data

- CN currently receives WILD impact data from about 170 WILD detectors from other Class I railroads in North America through the Association of American Railroads. The information provides advance notice of when a car is interchanged on CN's system. CN also receives foreign railway data for hunting detectors and acoustic bearing detectors.
- In 2017, CN plans to incorporate industry wayside detector data for bearings and brakes (cold and hot wheels, wheel dimensions).

Truck Hunting Detectors

These detectors help CN prevent derailments, excessive rail wear and damage to truck components. In addition, they provide alerts of excessive dynamic lateral oscillation at high speed. Car owners are then required to correct any truck conditions that led to the detection.

- As of December 2016, CN has seven Truck Hunting Detectors at key locations across our network.
- CN is also connected, through AAR, with the alerts from over 80 Truck Hunting Detectors of other Class I railroads.

Overload and Imbalanced Load Detectors

CN uses its 41 WILD detectors to also provide timely weight-on-rail data.

- Alerts and alarms from the detectors identify cars that have been overloaded by the customer or that have unbalanced loads. CN has used the data to identify unsafe load conditions as well as help customers comply with car loading requirements.

Cold Wheel Detectors

These detectors help CN find cars with brake systems that are experiencing problems.

- CN has four cold wheel detectors located at the bottom of long grades where train brakes are applied for an extended period. By detecting wheel heat (or the lack of heat), the detectors allow for accurate assessments of car and train brake system health. CN is working with the Association of American Railroads and other Class I railroads on a test program to take hot and cold wheel detectors to the next level in identifying brake system integrity.

Wheel Profile Detectors

Using laser-video technology, these detectors capture wheel profiles and wheel dimensions as the train passes over the sites at speeds of up to 65 miles (105 km) per hour. The technology allows CN to intercept worn or damaged wheels that need replacement.

- CN has two state-of-the-art image-based video scanners. One site is on the York Subdivision, east of Toronto, and the newest unit has been installed on the Edson Subdivision, west of Edmonton.
- CN is also continuing to improve algorithms to identify coupler securement.

Acoustic Bearing Detector

A technology that uses acoustic analysis for early detection of bearing flaws. The analysis is done in real-time and alerts are sent directly to a database which provides input and guidance to detector network monitoring staff in the Mechanical department around the clock for required action. The alerts provide accurate information as to the nature, severity and location of the fault.

- CN receives alerts from acoustic bearing detectors industry-wide.

Roll-By Inspections

Roll-bys are effective at preventing problems on CN's main track, during "meets" of passing trains and as trains pass beside employees along a right-of-way. Between Winnipeg and Chicago, for example, a train can get approximately 30 roll-by inspections, providing many opportunities to detect and prevent mechanical problems.

During roll-by inspections, CN employees monitor a train and look for cars with shifted loads or dragging equipment, listen for unusual noise or try to detect the smell of hot bearings.

- Employees maintained an intense focus on roll-by inspections last year. CN implemented a training program for all Operating employees on how to perform these inspections, which included instructional videos that were posted on CN's internal safety and regulatory website.
- Roll-by inspections will continue to be a key area of activity in 2017.

Machine Vision Detection

CN has two state-of-the-art image-based video scanners that can identify inadequate coupler securement while a train travels at speeds up to 65 mph. The deficiencies are found in real-time and a picture is sent to Mechanical detector monitoring staff around the clock for any required action. CN Mechanical continues to work with the vendor to expand the capabilities of this new technology.

Hard Coupling

Using predicted velocities during humping operations, the speed at which cars couple can be derived. CN Mechanical teamed up with Signals & Communications and IT to develop a process to identify cars that have impacted at higher than desired speeds. CN Mechanical then performs a structured inspection, ensuring the cars are safe and ready for another trip.



Transportation

Initiative Distributed Power

With Distributed Power (DP), a locomotive can be placed along the length of a freight train and remotely controlled from the lead locomotive. DP technology improves braking performance, train handling and fuel efficiency. It also reduces the likelihood of sticking brakes and eventual damaged wheels.

CN continues to expand the use of the DP "Asynchronous" mode feature that allows for the head-end and remote locomotives to be controlled independently with different throttle and/or dynamic brake settings. This form of independent train handling control provides enhanced management of in-train forces on challenging terrain.

- In 2016, CN added 90 AC locomotives with DP to its fleet, bringing the total to nearly 770 locomotives equipped with DP.



Also, CN continues to leverage the 21 LOCOTROL Distributed Braking Containers and Cars (DBC) as part of the “Taking on Winter” campaign. The DBC equipment can be placed on the tail-end or within the body of a train, and serves as a supplemental source of pressurized air to assist in maintaining efficient and safe train air brake operations under winter operating conditions. In 2017, CN will add an additional 20 cars to its fleet.

Trip Optimizer

CN has made a substantial investment in Trip Optimizer technology, an energy management system that accurately regulates the speed of a train by automatically controlling locomotive throttle or dynamic brake. The system acts like an intelligent locomotive auto-pilot control system that processes real-time information on train position, terrain, train length and weight, speed limits, locomotive performance and braking ability, and continuously computes the most efficient manner to handle the train.

Optimizer train control only requires the lead controlling locomotive to be equipped with a Trip Optimizer system. On trains operating with a Distributed Power configuration,

the Trip Optimizer system will also independently control the remote locomotives as may be required to provide optimal handling of longer trains over difficult terrain.

Beyond the environmental enhancement of reduced fuel consumption, Trip Optimizer provides consistent train handling by eliminating operator performance variability. As a result, in-train forces are managed in a predictable manner, resulting in reduced likelihood of train separation or damage to customers’ goods, all of which improve safety and increase CN’s operational efficiency.

CN started using Trip Optimizer technology in 2010 and since then the system has evolved to incorporate several new features that have enhanced the safety of operations. As just one recent example, Trip Optimizer now also manages speed restrictions applicable to crude-by-rail “key” trains.

- At the end of 2016, Trip Optimizer was operational on almost 490 GE EVO locomotives.

Locomotive Digital Video Recorders Locomotive Telemetry

Locomotive digital video recorders (LDVR) capture the image in front of a train as it moves across the network. The information is paired with locomotive performance data from Locomotive Telemetry monitoring and communications technology. The resulting snapshot allows CN to monitor locomotive fleet performance anywhere in North America, provide timely response to issues and rapidly analyze causes of critical incidents.

- At the end of 2016, CN had over 1,300 LDVRs installed on locomotives.
- At the end of 2016, CN had approximately 1,600 telemetry units installed on locomotives. Authorized personnel can now remotely access the telemetry data via a website, as well as through CN's Right-Time Business Information System. The information is being used to support fuel conservation, safety monitoring, locomotive health monitoring and incident investigation.
- CN stores most of the information from the Locomotive Telemetry systems in its data warehouse. This data is cross-referenced with data from other Transportation and Mechanical systems, and can be used to identify trends as well as opportunities for improvement.

Locomotive Video and Voice Recorders (LVVR)

An inward-facing camera and voice recorder mounted in the locomotive cab, that continuously captures images and sound inside the locomotive cab.

The technology is used by the Transportation Safety Board in accident investigations upon request.

- Bill C-49, known as the Transportation Modernization Act, will mandate LVVR use when passed. The technology will become part of CN's SMS.

Train Marshalling Rules

Train marshalling practices at CN provide a framework that allows large trains to be operated in an efficient and safe manner. Building on a strong foundation, CN will continue to progressively and methodically implement train marshalling rules across its network using industry best practices, data analysis and a risk-based approach.

- In 2016, CN implemented additional marshalling requirements to enhance safety on unit trains and maintained a strong focus on marshalling integrity and compliance across all train services. Measurable gains were made in the key areas of oversight and handling of en route marshalling issues that may occasionally arise due to trains setting out and/or picking up cars at intermediate locations. This was accomplished by raising awareness, focusing accountability and strengthening support processes to ensure that marshalling requirements are not only fulfilled at terminal locations but that marshalling rules compliance is satisfied as trains operate across the network.
- In 2017, there will be a continued strong focus on marshalling rules to ensure freight traffic is moved safely and efficiently. CN will also continue to review, adapt, and further enhance train marshalling practices to manage in-train forces and mitigate risk. Additionally, improvements are planned in the area of train marshalling support. Three key focus areas include enhanced computer automation of train marshalling based on route characteristics, streamlined access to up-to-date and user-friendly documents governing train marshalling, and strengthening escalation processes for addressing en route compliance issues.

2016 Champion Safety Awards

FRA injury ratio

Lowest ratio	Manitoba Division
Most improved ratio	Manitoba Division
Largest reduction in FRA injuries	Chicago Sub Region

FRA train accident ratio

Lowest ratio	Manitoba Division, Battle Creek Division, Southern Ontario Division, Quebec Division (4-way tie)
Most improved ratio	Manitoba Division, Battle Creek Division, Southern Ontario Division, Quebec Division (4-way tie)
Largest reduction in FRA accidents	Manitoba Division

TSB train accident ratio

Lowest ratio	Manitoba Division
Most improved ratio	Southern Ontario Division
Largest reduction in TSB accidents	Winnipeg Division



Crossing and Trespassing

Crossing Accidents

2016 initiatives

- Conducted monthly enforcement initiatives at grade crossings, including joint operations with external agencies at high-incident locations.
- Continued association with safety organizations and partnered with CN Public Affairs and CN Police for Rail Safety Week, from April 24 to April 30, 2016, and other initiatives focusing on crossing safety.
- Delivered safety presentations to high-risk groups and law enforcement agencies in communities across CN's network.
- Continued strategic use of equipment and technology to reduce risk at high-accident crossings.
- Fully engaged provincial, federal, and state officials in identifying and eliminating crossing hazards.
- Reviewed crossings system-wide to identify required upgrades or closures of specific crossings.
- Reached out to communities to exchange information to make grade crossings safer, including the requirements as outlined in PD 36 in Canada.





Key 2017 initiatives

- Reduce grade crossing incidents across our network by identifying high-risk areas and conducting regular public enforcement and education initiatives to change behaviours.
- Engage key stakeholders, including law enforcement agencies, coroners, and medical examiners, in how to effectively deal with grade crossing incidents. Using the “Rail Incident Investigation Guidelines,” we will provide stakeholders with guidance in areas such as “rail safety while at the scene” as well as “obtaining pertinent rail-related information” when investigating a grade crossing incident.
- Continue to partner with CN Public Affairs, CN Police and other stakeholders to promote crossing safety with initiatives such as Rail Safety Week to educate the public. We will also target high-risk groups, including young drivers and bus drivers, to change attitudes and behaviours.
- Identify the use of equipment and/or technology to reduce risks at high-incident grade crossings.
- Actively engage provincial, federal, and state officials in identifying and eliminating crossing hazards.
- Systematically review grade crossings across CN’s network and recommend upgrades or closures of specific sites.
- Monitor incidents across the network to identify trends and high-risk areas.



A Shared Responsibility

CN is working with communities and road authorities to meet Transport Canada's new crossing Regulations and Standards, and advance our shared responsibility. CN provided communities across its network with information about its public grade crossings by the required November 27, 2016 deadline.

The Grade Crossing Standards are mandatory engineering requirements for crossing surfaces, road geometry, sightlines, warning systems and other elements that improve safety at crossings.

Any new crossings and existing crossings undergoing upgrades or modifications must meet Transport Canada's new Regulations immediately. All crossings must meet the new Regulations and Standards by 2021.

Trespassing Accidents

2016 initiatives

- Conducted monthly enforcement initiatives, including joint operations with external agencies at high-incident locations.
- Continued association with safety organizations and partnered with CN Public Affairs in Rail Safety Week 2016 and other initiatives focusing on trespassing – e.g., posting snowmobile and ATV safety announcements in local publications.
- Delivered safety presentations to high-risk groups and law enforcement agencies in communities across CN’s network.
- Strengthened employee awareness of the importance of reporting security concerns, threats or incidents on or near CN property through the “See Tracks? Think Train!” communications campaign.
- Analyzed incidents to focus resources and network on areas with a high-incident trespass rate.
- Expanded the posting of “No Trespassing” signs in high-incident locations.

Key 2017 initiatives

- Conduct regular trespassing enforcement initiatives at high-incident locations, collaborating with other law enforcement agencies and local governments to reduce trespassing on CN’s right-of-way.
- Meet with key stakeholders, including law enforcement agencies, coroners, and medical examiners to effectively deal with trespassing incidents. Provide stakeholders with guidance in areas such as “rail safety while at the scene” as well as “obtaining pertinent rail-related information” when investigating a trespassing incident.
- Continue to partner with CN Public Affairs and other stakeholders to promote rail safety with initiatives such as Rail Safety Week to educate the public. We will also target high-risk groups, including youth, to change attitudes and behaviours.

Safety metrics

- Strengthen employee awareness of the importance of reporting security concerns, threats or incidents on or near CN property through the “See Tracks? Think Train!” communications campaign.
- Monitor trespassing incidents across our network for trends and identify high-risk areas.

The safety of CN’s operations and of the communities through which it passes is of the utmost importance to the Company. It is for this reason that CN has developed and implemented a robust Safety Management System that is based on safety culture, effective safety processes and use of technology.

Transport Canada defines a Safety Management System (SMS) as a formal framework for managing risk. It makes safety part of day-to-day railway operations. An SMS helps companies manage the safety of their operations because it requires them to:

- Identify safety concerns, assess the level of risk they represent, and take steps to reduce those risks, where required.
- Build a safety culture into their day-to-day operations at all levels of the company.
- Involve company employees in the processes of the system, including;
 - collaborating or consulting with them;
 - keeping them informed of risks and how the company has dealt with them; and
 - developing a procedure for employees to report contraventions and safety hazards to the company and a policy for protecting employees who report.



SAFETY POLICY

Safety is of the utmost importance at CN. The company strives to safeguard our employees and assets, our customers' goods, our neighboring communities, and the environment at all times.

CN is dedicated to providing the leadership, organization, training and resources necessary to help achieve its goal of being the safest transportation company in North America through a continual focus on:

A Strong Safety Culture

Where every employee is committed to their personal safety, to looking out for each other, and to safely operating through the communities we serve.

A Safe Work Environment

Where safely conducting all operations is the top priority, regardless of the nature, importance or urgency of the job.

Safe Work Practices and Training

That ensure employees have the necessary tools and training to work safely.

CN uses a wide variety of processes and initiatives to maintain a safe workplace. This includes our Safety Management System, a formal framework for integrating safety into day-to-day railway operations, which applies to all company employees and also governs CN's relationship with contractors and other stakeholders while on CN property.

CN cooperates and engages with regulatory agencies. It complies with all applicable regulations to maintain a safe, secure and healthy workplace. All employees are responsible for complying with all company safety policies, rules and procedures.

Luc Jobin
President and CEO

Mike Cory
Executive Vice-President and
Chief Operating Officer



Safety Management System Overview



LOWER & LOCK
HINGED DECK
CLOSE & LOCK
DOORS BEFORE
MOVING CAR

FXE
31058

SPECIAL NO. 24
BRAKE BEAM REQUIRED
20" WHEELS
5-0 WHEEL BASE
50000 LB MAXIMUM WEIGHT
SPECIAL BR ADAPTED
50000 LB MAXIMUM WEIGHT
8'00" X 10'0" X 10'0"

THIS CAR
EXCEEDS HEIGHT

The following provides an overview of CN's SMS, as aligned with each of the process areas stated in Transport Canada's SMS-2015 regulation:

Process for accountability

To designate an executive who is responsible for the operations and activities of the Company to be accountable for the extent to which the Company meets regulatory requirements for SMS, including the effectiveness in achieving the highest level of safety in its railway operations

- CN's Chief Operating Officer (COO) has been designated the "Accountable Executive" and has signed the necessary declaration.
- Annual reports on SMS effectiveness are provided to the COO from various designated managers.

Process with respect to a safety policy

To create a policy that reflects the Company's commitment to promoting railway safety

- CN has a safety policy signed by its President and CEO and its COO. The policy clearly states that safety is of the utmost importance to CN and that CN is committed to being the safest Class I railway in North America.
- The safety policy is shared with all employees and is widely displayed throughout CN's facilities.
- CN's Safety Policy can be found on CN's corporate website.

Process for ensuring compliance with regulations, rules, and other instruments

To provide a framework for identifying legal obligations, monitoring changes to them, and verifying compliance with them

- CN's SMS is designed to meet or exceed regulatory requirements. Applicable regulatory requirements in areas such as operating rules, track and signal standards, equipment inspections and the Canada Labour Code are communicated to employees as part of their ongoing training and certification as well as through communication vehicles such as bulletins.
- CN exceeds the regulatory requirements in many areas, including rail flaw testing (regulations require up to 4/year; CN inspects up to 18/year), track geometry car testing (regulations require up to 3/year; CN inspects up to 7/year), its integrated Wayside Detection System (not a regulatory requirement) and its safety culture measurement process (not a regulatory requirement).
- Compliance with regulatory requirements is assessed on an ongoing basis through employee compliance monitoring using CN's PMRC process as well as various audit processes.

Process for managing railway occurrences

To establish procedures for reporting and reviewing railway occurrences

- Details of all accidents and injuries must be entered into CN's recording and analysis system. All accidents and injuries are investigated and corrective action is identified through detailed analysis. Systematic detailed closeout reports are required for reportable accidents and injuries. A review of accidents and injuries takes place in weekly system, regional and functional safety calls.
- Corrective actions to address accident investigations are implemented with identification of responsible parties. These are recorded in the closeout report for the accident encompassing root cause, contributing factors and corrective actions. CN monitors the progress of these actions.

Process for identifying safety concerns

To conduct analyses to identify safety concerns, including trends or repetitive situations

- Safety issues and concerns are identified to CN management through employee communications such as hazard forms, health and safety committees, CN's Ombudsman and CN's Prevent Hotline (a joint venture with St. Mary's University), as well as through audits and trend analysis.
- Accident and injury records are also used for trend analysis reviews, which are used to implement further risk control strategies.
- CN has a wide variety of risk mitigation strategies for all aspects of its operation. These involve the use of People, Process, Technology and Investments.

- Examples of People-based initiatives include training initiatives and employee involvement initiatives that strengthen CN's safety culture. Examples of Process initiatives include CN's Safety Management Plan, emergency response, contractor safety, safety audits and risk assessments. Examples of technology include CN's integrated wayside information systems, which check for overheated bearings or wheels and high wheel impacts, mechanized track geometry and rail flaw testing, distributed power technology, that helps lower in-train forces, and risk-based train marshalling rules.
- Additional safety initiatives are continually being added through risk assessment, trend analysis and accident investigation.
- Additional detail on CN's People, Process and Technology and Investment initiatives can be found on CN's corporate website and in this Leadership in Safety brochure.

Risk assessment process

To conduct risk assessments to identify risks and required remedial action

- CN has a formal risk assessment process that is used to evaluate and classify risks, including those associated with significant changes in railway operations such as the opening of new yards and facilities, railway acquisitions, the introduction of new technology, significant changes in business (volumes or product) and changes in personal protective equipment. Special corridor route assessments are carried out to assess and reduce risk in locations such as those with high population, waterways or other environmental or topography characteristics. This process is enabling CN to reduce the risk of Dangerous Goods transportation by leveraging initiatives relating to Technology, as well as People, Process and Capital.
- Training is provided to employees tasked with performing risk assessments.

Process for implementing and evaluating remedial action

To ensure that the remedial action for treating an identified risk is implemented and that the effectiveness of the action is evaluated

- As part of CN's risk assessment process, required remedial action is identified along with a specific plan for implementation that identifies the responsible party and the required date.
- The effectiveness of remedial action is monitored and revisions made as deemed necessary.

Process for establishing targets and developing initiatives

To establish targets and develop related initiatives to achieve those targets each calendar year

- CN produces annual safety performance targets for accidents and injuries at the system, regional, functional and territorial levels. These are approved by the railway's executive and are communicated to all employees. They are monitored on a daily basis.
- CN has reports that measure safety performance on a daily basis at all levels in the organization. CN uses a variety of modern technologies including focused mapping, interconnected data systems and trend analysis to review safety data so as to assess the safety performance of the railway at the system, regional, divisional and functional level. This encompasses leading and lagging indicators and includes items such as rule violations, defective rails or wheels, and track quality index reports.



Process for reporting contraventions and safety hazards

To provide a framework for employees to report contraventions and safety hazards without fear of reprisal for having reported

- CN has established a process using the railway's Ombudsman to allow employees to report contraventions and safety hazards without fear of reprisal.
- Employees are also encouraged to report concerns to supervisors.



Process for managing knowledge

To ensure that employees and non-employees have the knowledge they need, and that employees have the skills and qualifications they need to carry out their duties or activities safely

- CN undertakes systematic technical training of all its operating employees as well as soft skill leadership training for its managers. CN has taken advantage of the unique opportunity offered by the large number of new employees recently joining the railway and has created its “CN Campus” program to enhance technical and leadership development training using modern training tools. This includes structured classroom and field training.
- CN’s Access to Workplace Policy, e-RailSafe and Contractor Orientation programs also ensure that CN’s contractors and other persons invited onto CN property have appropriate safety training.

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Process with respect to scheduling

To apply the principles of fatigue science when scheduling the work of the employees who work certain schedules

- CN’s Fatigue Management Plan for Train Crews spells out the many initiatives that CN has in place to help address fatigue.

Process for continual improvement of the SMS


To conduct internal monitoring and audit activities to monitor and evaluate the implementation and effectiveness of the SMS

- In addition to annual reviews of its SMS and the required process areas, CN ensures continual improvement of its SMS through various means.
- CN conducts three levels of safety audits. Integrated safety audits assess compliance with CN’s SMS as well as operating rules and safety culture. CN was the first railway to measure safety culture and has developed a unique assessment process that measures safety culture on a subjective and objective basis based on Leadership and Commitment, Two-Way Communication, Employee Involvement, Learning Culture and Just Culture.
- Regional/functional audits focus on safety blitzes, technical audits of operating rules compliance and compliance with track and equipment inspection requirements as well as engineering or mechanical issues throughout the year. Local audits include rules compliance tests and observations of operational activities, policies and procedures.

Outreach

In addition to the 12 process areas specifically referenced in Transport Canada’s regulations, CN has added a 13th component to its SMS, titled “Outreach.” This provides a process for meeting regulators, customers and municipalities to review rail safety and discuss concerns. Of particular importance is CN’s structured community engagement plan, which ensures that communities are engaged to support effective emergency planning and response at the local level.

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 @CNRailway

CN Public Inquiry Line
8 a.m. to 5 p.m. ET, Monday to Friday
Toll-free: **1-888-888-5909**
Email: contact@cn.ca

In case of emergency, call the
CN Police Service at: **1-800-465-9239**

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