RAILWAY INVESTIGATION REPORT
R99T0147

CROSSING ACCIDENT

VIA RAIL CANADA INC.
TRAIN NO. 642
MILE 18.13
CANADIAN PACIFIC RAILWAY BROCKVILLE SUBDIVISION
BELLAMY, ONTARIO
05 JUNE 1999

Transportation Safety Board
of Canada

Bureau de la scurit des transports

du Canada

Railway Investigation Report

Crossing Accident

VIA Rail Canada Inc.
Train No. 642
Mile 18.13
Canadian Pacific Railway Brockville Subdivision
Bellamy, Ontario
05 June 1999

Report Number R99T0147

Synopsis

On 05 June 1999 at approximately 1410 eastern daylight time, VIA Rail Canada Inc. passenger train No. 642, proceeding eastward on the Canadian Pacific Railway Brockville Subdivision, struck a motor vehicle at the public crossing at Mile 18.13 near Bellamy, Ontario. The two vehicle occupants were fatally injured. Ledcor Communications Ltd., an independent company under contract to Canadian Pacific Railway, was engaged in laying a conduit for fibre-optic cable across the roadway near the tracks and providing motor vehicle traffic control through the construction area.

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1.0 Factual Information

1.1 The Accident

On 05 June 1999, Ledcor Communications Ltd. (Ledcor) of Mississauga, Ontario, was installing a fibre-optic cable under the north lane on the east side of the public crossing on the United Counties of Leeds and Grenville Road 28, at Mile 18.13 of the Canadian Pacific Railway (CPR) Brockville Subdivision near Bellamy, Ontario. Road traffic was restricted to a single lane under the direction of two Ledcor traffic control persons, and rail traffic was under the direction of a CPR Rule 42 foreman.[1] While stopped at the Brockville Station, approximately 10 miles from the crossing, the crew of VIA Rail Canada Inc. (VIA) train No. 642 (VIA 642), destined for Ottawa, Ontario, requested and received clearance to enter the Rule 42 limits. The Rule 42 foreman then instructed the Ledcor foreman to clear equipment and personnel from the construction area. Although all construction had stopped at the site, Ledcor traffic control persons continued to flag vehicular traffic through the site, in accordance with Ledcor's standard practice. An idled equipment operator temporarily relieved the westmost Ledcor traffic control person of flagging duties at the traffic control person's request. At 1410 eastern daylight time (EDT),[2] the Rule 42 foreman cleared the train through his limits with no restrictions. At approximately 1413, the automatic warning devices activated. About this time, the relieving (westmost) traffic control person flagged three waiting vehicles through the site. The train sounded its horn and bell while approaching the crossing from the south at 82 mph. Upon entering the crossing, the train struck the lead vehicle. Both vehicle occupants were fatally injured.

1.2 Recorded Information

Event recorder information indicates that VIA 642 approached the crossing at 82 mph with the throttle in the No. 8 position (maximum setting). Recorded information also shows that the locomotive whistle was activated 14 seconds and approximately 1 700 feet (approximately 518 m) before the locomotive entered the crossing, as required by regulation. (Canadian Rail Operating Rules [CROR] Rule 140 requires whistling 1 320 feet (approximately 402 m) before occupying a crossing.) The ditch lights were on, and the headlights were on bright.

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1 The purpose of Canadian Rail Operating Rules Rule 42 is to ensure protection of workers on a portion of track. No train may enter a section of demarcated track unless the Rule 42 foreman stationed with those workers indicates verbally to the train crew that the track has been cleared of equipment and personnel. This verbal communication must be repeated and documented. The flag marking the southern boundary of the work zone was placed 3 000 yards from the construction, as required by Rule 42.

2 All times are EDT (Coordinated Universal Time [UTC] minus four hours) unless otherwise stated.

1.3 Train Information

VIA 642, a Light, Rapid, Comfortable (LRC) train, consisted of one locomotive, one club car, and three coaches. Maximum permissible track speed at County Road 28 for LRC trains was 95 mph in both directions. Five service crew members, 140 passengers, and two operating crew members were on board.

1.4 Particulars of the Crossing

1.4.1 The Roadway and Sight-lines

County Road 28 is a two-lane asphalt highway with a posted speed limit of 80 km/h. The crossing is equipped with flashing lights and a bell. The crossing angle is approximately perpendicular, with a descending road grade to the crossing of approximately 3 per cent from the east and 3.5 per cent from the west. When a driver approaches the crossing from the west, the roadway runs southward in a shallow curve for 310 m.

Sight-lines in all quadrants were poor due to obstruction by rock cuttings, vegetation, and private dwellings. A vehicle entering the crossing from the west must be within 6 m (20 feet) of the track for the driver to see 244 m (approximately 800 feet) down the track to the south. Farther than 6 m from the track, the sight-line was completely blocked. Average daily traffic volume is 500 vehicles, which is classified as low by the Ministry of Transportation of Ontario (MTO). Passenger train schedules vary from day to day. On Saturday, June 5, six passenger trains were scheduled to travel through the crossing. Between Sunday and Friday, two freight trains per day pass through the accident location. No freight trains are scheduled on Saturdays.

1.4.2 Automatic Warning Devices

The automatic warning device signal masts were on each side of the crossing (i.e., on the right side of the roadway). Each signal mast was equipped with four lights—two facing east and two facing west—providing four flashing red lights in each direction to warn traffic of approaching trains. On the day of the occurrence, the lights were functioning as designed and were visible from the location of the west traffic control person. The automatic warning device on the east side of the crossing was equipped with a bell. The activated bell was audible from both flagging positions.

By regulation, flashing lights and a bell are required to be activated at least 23 seconds before an approaching train enters a crossing. The circuits that activate the warning devices at this crossing stretch 1.1 km north and south of the crossing, giving 30 seconds of warning for a train travelling at 82 mph. The automatic warning devices activated and worked as intended as VIA 642 approached and entered the crossing.

1.5 Other Vehicle Operators

The warning devices activated at about the same time as the traffic control person flagged the drivers of the three vehicles to proceed. The drivers of the second and the third vehicles interpreted the flagging instruction to mean that they could safely proceed through the construction site and that the crossing protection had been activated by construction activity.

The first vehicle was observed to proceed onto the crossing at about 5 km/h. The driver neither attempted to increase speed nor brake before being struck.

1.6 The Fibre-optic Project

Ledcor has undertaken to construct an underground network of fibre-optic communication lines along railway rights-of-way across Canada. Considerable work has been completed, particularly in western Canada, and the expected completion is in the spring of 2002. The Ledcor crew were engaged in installing conduit under the roadway in preparation for the installation of the fibre-optic cable.

1.7 Agreement Between Canadian Pacific Railway (CPR) and Ledcor Communications Ltd. (Ledcor)

Ledcor had entered into an agreement with CPR to construct and operate a fibre-optic cable system on the CPR right-of-way. Construction on CPR property was conducted according to a supervisory agreement between Worldwide Fiber Inc. (a Ledcor subsidiary) and CPR. CPR agreed to provide site supervision (a Rule 42 foreman) to protect Ledcor equipment and crews from train movements. CPR retained the right to supply personnel to oversee the project and protect CPR operations and properties. The agreement provided that Ledcor would abide by all provincial traffic laws and regulations.

1.8 Construction Conditions at the Crossing

Most conduits are installed by drilling under the roadway. However, this roadway was on bedrock and required trenching with heavy equipment. To avoid road closure during construction at this crossing, the trenching was to be carried out in two stages. Each stage required vehicular traffic to be reduced to one lane while a trench was dug across the other lane, the conduit laid, and the road surface repaired. The process would then be repeated for the other portion of the roadway. The trench was to be approximately 1 m from the tie ends. At the time of the occurrence, traffic was restricted to the south lane, and a trench ran across the north lane. A hoe hammer[3] was parked with the engine shut down in the work zone approximately 10 m (33 feet) to the west of the crossing on the blocked north lane. It did not block approaching vehicle drivers' sight-lines to the south, and the view of the flashing lights on the west signal mast was unobstructed. The hoe hammer blocked a driver's view of the lights on the east signal mast for a short distance before the tracks, but those lights were visible from the west traffic control person location.

[3] A hoe hammer is a large truck-mounted percussion rock hammer.

The engineering office of the local road authority (United Counties of Leeds and Grenville) had denied the Ledcor foreman permission to close the road to carry out the construction work. The Ledcor foreman was instructed to complete the work in two stages to avoid traffic delay and permit emergency vehicle passage.

1.9 Motor Vehicle Traffic Control and Traffic Control Person Placement

1.9.1 Ledcor Traffic Control Person Procedures

The Ledcor traffic control persons on the roadway were positioned 68 m (approximately 223 feet) east of the crossing and 106 m (approximately 348 feet) west of the crossing. The Ledcor crew foreman and the traffic control persons chose those locations because they estimated that, when nearer to the crossing, driver sight distance for approaching road traffic was unsafely restricted by road curvature and gradient. The Ledcor traffic control persons were equipped with reflectorized vests, pole-mounted stop signs, and portable radios for communication with each other and with the Ledcor foreman. The Ledcor foreman's radio could also be tuned to the Rule 42 foreman's channel if required. Similarly, the Rule 42 foreman could tune his radio to the Ledcor radios.

One traffic control person had worked in that capacity for approximately one week and had gained some traffic control skills by on-the-job experience with another employer. The other traffic control person had only worked for two days in that capacity. Neither had been trained in flagging procedures by Ledcor. Upon arrival at the site, traffic control persons were posted to their positions for the full shift, amounting to a continuous period of approximately 14 hours on average. No traffic control person relief was scheduled. They were expected to bring their own water containers to the work site and to eat lunch at their posts. Traffic control persons who needed to leave their positions for any reason were instructed to contact the crew foreman by radio to request relief. On the day of the occurrence, the crew met at the Ledcor yard at 0600 to load equipment and arrived at the crossing at 0640.

The two initially assigned Ledcor traffic control persons were instructed to observe the crossing signals before flagging vehicles to proceed and to stop all traffic when the signals were activated. The relieving equipment operator, experienced and trained in flagging procedures, did not receive that instruction. Although the CPR Rule 42 foreman was in continuous radio contact with the crew of the approaching train, he did not communicate train arrival time or other information to the Ledcor foreman or the traffic control persons, nor was he required to do so.

1.9.2 CPR Vehicle Flagging Policies

CPR's contractual agreement with Ledcor did not mention the responsibility for traffic control at crossings. The agreement stipulated that CPR would provide Ledcor with protection against trains. CPR's policy is that CPR Rule 42 foremen act to protect trains from construction activity and to protect construction crews from train movements. Rule 42 foremen are not instructed to protect vehicular traffic from trains.

1.10 Traffic Control Regulations, Standards, and Guidelines

1.10.1 Ministry of Transportation of Ontario

Requirements for traffic control on highways in Ontario are defined by the MTO and apply to traffic control by any persons or agencies performing construction, maintenance, or utility work on provincial or municipal roadways.[4] The MTO standards specify that, on a low traffic volume highway with a speed limit over 70 km/h, such as County Road 28, traffic control persons should be 30 m to 40 m from the start of a construction site and instruct traffic control persons to "Adjust distances to suit road, weather and speed conditions . . . Stand where you can see and be seen by approaching traffic for at least 150 metres."

The MTO standards contain limited requirements and guidelines regarding traffic control person protection of vehicular traffic at construction sites that have a railway crossing. The *Manual of Uniform Traffic Control Devices* outlines that "Traffic control persons . . . shall be positioned in a manner which will not conflict with other traffic control devices such as stop signs or traffic signals" and that "Traffic signals include all electrically operated traffic control devices . . . [including] train approach signals."

1.10.2 Transport Canada

Pursuant to the *Railway Safety Act*, Transport Canada (TC) is drafting the *Grade Crossing Safety Regulations*. Subsection 36.4 would apply to work like that carried out by Ledcor and it provides:

- When work occurs on road approaches, intersecting roads, or land adjoining crossings within 8 m of the crossing surface or when work interrupts the flow of traffic over the crossing or obstructs sight-lines, the road authority, the private landowner, or any other person in charge of the work must consult with the railway company concerning train operations and ensure adequate traffic controls are in place so the work does not adversely affect safety at the crossing. The responsible authority

[4] Government of Ontario. Ministry of Transportation (December 1989). *Traffic Control Manual for Roadway Work Operations* and *Manual of Uniform Traffic Control Devices*.

> shall also ensure that a sufficient number of persons with appropriate training and equipment are stationed at the crossing to advise drivers and pedestrians whether it is safe to use the track if there is the possibility of a train operating over the work area.

Concurrent with the regulations, TC has developed a draft manual entitled *Work Protection for Grade Crossing (Safety Affected by Work, Testing, Maintenance or System Failure)*. The manual sets out best engineering practices and operating procedures for safety at crossings. The provisions of the manual will be referenced in the aforementioned *Grade Crossing Safety Regulations*.

Section 23 of TC's draft manual deals with the temporary protection of crossings. Subsection 23(1) stipulates that, when work along an active rail line interferes with the operation of automatic warning devices, a person(s) with appropriate training and equipment shall be stationed at the crossing to advise drivers or pedestrians intending to cross the railway line whether it is safe to do so. The same provisions apply when work obscures the sight-lines for crossings not equipped with automatic warning devices. The manual stipulates that, when work is carried out on the crossing surface, the requirements of the appropriate provincial department of transportation regarding control of traffic through a work zone shall be followed.

Subsection 23(5) deals with work on road approaches or land adjoining a crossing. The road authority, landowner, or any other person in charge of the work shall consult with the railway about train operations and ensure the safety of the crossing, through adequate traffic controls, when the work or activity may result in

- persons or equipment working within 8 m of the crossing surface,
- interruption of the flow of traffic over the grade crossing,
- interference with the crossing warning devices,
- obstruction of the sight-lines to warning devices or other traffic control devices, or
- obstruction of the sight-lines at a crossing without automatic warning devices.

Subsection 23(5) also stipulates that, when there is the possibility of a train at the crossing, a person(s) with appropriate training and equipment shall be stationed at the crossing to ensure that road vehicles are not blocked on the crossing and to advise drivers or pedestrians whether it is safe to cross the railway.

The draft manual and regulations have been in the drafting consulting stage for over 10 years, due in part to TC's continued consultation with affected parties. TC intends to proceed with the regulatory proposal in 2001, with publication in the *Canada Gazette Part I* by the spring of 2002.

1.10.3 Manual of Uniform Traffic Control Devices for Canada

The *Manual of Uniform Traffic Control Devices for Canada*, developed in coordination with the Transportation Association of Canada, represents the views of all provinces and territories and their governments. It sets optimum standards for the use of devices for the control of traffic and the provision of information to drivers and other road users. With respect to flagging activity, the manual outlines flag person equipment needs, desired flag person qualities, signage requirements, and traffic schemes. Railway crossing matters, with the exception of descriptions of advance warning signs, are not discussed.

1.11 Weather Information

The weather at the time of the accident was clear and sunny, with a temperature of 26 degrees Celsius. The wind was light and variable.

1.12 Training and Instruction

Upon arriving at the site, the Ledcor foreman held a pre-work safety meeting, assigned the location of the traffic control persons, and explained their duties for the day. A procedure whereby the Ledcor foreman would communicate the information provided to him by the Rule 42 foreman was not put in place, and the traffic control persons were instructed to hold traffic only when the automatic warning devices were activated.

1.13 Other Information

Just before relieving the assigned traffic control person, the equipment operator had been operating noisy heavy equipment without hearing protection. The equipment operator admitted to a minor hearing impairment, but it did not interfere with his ability to engage in normal conversation and did not play a role in the accident. Although he had been trained in flagging procedures, he had no prior instruction or experience relating to flagging at rail crossings.

The equipment operator turned to face the eastbound vehicles as a single westbound vehicle passed his location. At that time, the automatic warning devices were not operating. He then signalled the eastbound vehicles to proceed. He did not turn around to observe the moving vehicles nor did he hear the bell of the just activated automatic warning devices or the whistle or bell of approaching VIA 642.

The subject vehicle operator had no known health issues and met the physical requirements needed for the issued valid driver's licence. Post-mortem blood testing was negative for both alcohol and drugs in the driver's bloodstream.

2.0 Analysis

2.1 Introduction

The manner of operation of VIA 642 as it approached the crossing was in compliance with government regulations and company operating instructions and practices. The crew members were unaware of the exact location and nature of the construction activity and, having received a clearance to proceed without restrictions, they expected to negotiate the crossing in the usual fashion. The actions of the train crew, therefore, played no role in the accident.

With sight-lines to the south restricted until very close to the west rail of the track, the drivers of eastbound vehicles in motion, past the flagging location, had almost no opportunity to observe trains approaching from the south. The safe negotiation of the crossing depended on drivers responding correctly to the automatic warning devices. In this instance, the vehicle operator did not react to the activated warning devices.

The analysis will not only explore the circumstances that led to the ineffectiveness of the automatic warning devices, but discuss the conditions at the crossing that degraded safe vehicle passage. The risks presented by construction activity at railway crossings at grade and the manner in which these risks have been addressed by the railway companies, the contractors and the regulator will also be addressed.

2.2 Vehicular Operation

A motorist approaching a highway construction site likely understands that a traffic control person's function is to protect public safety within a work site and that an instruction to proceed will only be given when it is safe. Given conflicting instructions from a person and an automated traffic control device, people will in general accept the instruction from the person, particularly if that person appears to be a designated authority.[5] The response to proceed may be particularly compelling if, as in this case, the traffic control person's instruction is given while the crossing warning devices are already activated.

A driver may also expect that construction at a crossing may cause spurious activation of crossing warning devices and that such an activation can and should safely be ignored, as indicated by the drivers of the other two vehicles. It is therefore probable that the driver of the vehicle proceeded onto the crossing aware that the warning devices were activated, believing that the traffic control person's instructions superseded the signal.

[5] S. Milgram (1974). *Obedience to Authority*. New York: Harper & Row.

2.3 Communications

The Ledcor foreman was made aware of approaching trains as a result of his instruction to clear equipment and personnel from the construction area. However, CPR did not make available to Ledcor's traffic control system the communication link between the Rule 42 foreman and train crews. Although a Rule 42 foreman would be in radio contact with approaching trains, the train crew would not be asked for position or estimated train arrival time at a crossing. Elapsed time between granting of the clearance request and the train's arrival may vary widely. CPR and Ledcor procedures did not require that the CPR Rule 42 foreman request that information from the train crew and relay it to the radio-equipped traffic control persons. Had the Ledcor traffic control persons been informed of the train arrival time or had they been instructed to stop vehicles on the road as soon as the instruction was given to clear equipment and personnel, there would have been a greater margin of safety.

2.4 Positioning of Traffic Control Persons

Lacking guidance from any source, the Ledcor employees chose their flagging locations to ensure their own safety. They understood the danger of flagging vehicles into the work zone with the automatic warning devices activated, but they apparently did not recognize that, because of the distances involved, vehicles could be between flagging positions and tracks when the signals activated. Slow-moving vehicles (10 km/h) proceeding east from the west flagging position would take 37 seconds to reach the tracks. Considering that the signals activated about 30 seconds before the arrival of a train, the probability of motorists being past the flagging position upon signal activation and driving into the path of a train was high. Although the Ledcor employees stated that they felt motorists would and should be guided by the automatic warning devices in such circumstances, it appears that this concept was not given any consideration before the occurrence. Ledcor's traffic control methodology and traffic control person placement therefore jeopardized the safe transit of vehicles over the crossing.

2.5 Secondary Defence

Although the equipment operator had not been instructed to stop vehicular traffic when the warning devices were activated, it was his intention to do so. The accident might have been averted had the equipment operator been aware that the automatic warning devices were activated. The equipment operator was facing the oncoming cars when he signalled the three cars to proceed. Thus, he could not see the flashing lights and did not hear the activated bell or the whistle and bell of the approaching train. Despite his minor hearing impairment, his inability to hear these cues is attributable to other factors: the 100 m from the crossing considerably lessened the bell's loudness; he had possibly incurred temporary threshold shift[6] from the previously elevated noise levels while operating his machine at the crossing; and he was near three idling motor vehicles. The bell offered a level of redundancy by using a second sense to attract attention to the warning devices. This additional margin of safety was rendered ineffective in this instance.

[6] Temporary threshold shift is caused by high sound pressure; complete recovery may take up to 24 to 48 hours.

2.6 Train Operation within Canadian Rail Operating Rules (CROR) Rule 42 Limits

VIA 642 was cleared to pass through the Rule 42 area with no restrictions. While decisions respecting train speed through such locations are at the discretion of the Rule 42 foreman, the design and intent of this rule is to provide for the safe and timely passage of trains and for the safety of personnel working on or near the track. In the absence of factors relating to the physical condition of the track and with no construction equipment or personnel on the track, the Rule 42 foreman's decision to allow the train to proceed through the limits at track speed was reasonable based on past experience, training, and instruction.

2.7 CPR Vehicle Flagging Policies and Practices

As the owner of the crossing and with experience in such matters, CPR, through its employee at the site, the Rule 42 foreman, was in a position to evaluate the impact of Ledcor's flagging procedures on the safety of motor vehicles at the crossing. However, under CPR's agreement with Ledcor, the Rule 42 foreman's duties excluded the protection of vehicular traffic from trains. CPR chose not to participate with Ledcor or give direction to Ledcor regarding development of traffic control plans for such projects. CPR therefore reduced safety by relegating responsibility for vehicular traffic protection to Ledcor.

2.8 Construction Activity and Regulatory Requirements

The set-up at this construction site is typical. The roadway, restricted to one lane, was narrow and required caution. The large ditch abutting the driving lane would attract a driver's attention. A heavy piece of equipment (a hoe hammer) was partly on the road, distracting drivers and obstructing the view of the track at times.

Because train operation at the permissible track speed is the norm, occupants of motor vehicles struck by an oncoming train are likely to be seriously or fatally injured. To reduce this risk, motorists must be given clear direction as to when it is safe to proceed onto the crossing.

The current provincial and federal standards are silent on what procedures should be followed when there is construction at railway crossings at grade. The absence of requirements has resulted in the creation of *ad hoc* procedures between railway companies, contractors and road authorities. This situation has led to an increased risk to motorists. This risk is heightened in high-speed main track locations.

2.9 Ledcor Relief Practices

The Ledcor traffic control persons were required to be at their stations for up to 14 hours with no scheduled relief. If it is assumed that most of the daily average vehicle traffic occurred between 0800 and 2000, the traffic control persons would encounter approximately one vehicle every two minutes. Although this would not present a heavy workload to the traffic control persons, they would have little opportunity to attend to personal needs. Employees working in such conditions are likely to undertake *ad hoc* relief procedures that could reduce safety, as seen in this instance.

3.0 Conclusions

3.1 Findings as to Causes and Contributing Factors

1. The driver of the vehicle proceeded towards the crossing on the instructions of the traffic control person and continued onto the crossing after the signals were activated; the vehicle was struck by the train.

2. Canadian Pacific Railway (CPR) and Ledcor Communications Ltd. (Ledcor) procedures did not use available information and means of communication to exclude vehicles from the work site before the train was expected.

3. The Ledcor traffic control methodology and traffic control person positioning did not ensure the safe transit of vehicles over the crossing.

4. The secondary level of defence provided by the bell on the automatic warning devices and by the train warning whistle and bell were rendered ineffective by the positioning of the traffic control person, and the proximity of idling motor vehicles.

3.2 Other Findings

1. The Rule 42 foreman's decision to allow the train to proceed through the work limits at track speed was reasonable based on past experience, training, and instruction.

2. Safety was reduced by CPR's relegation of responsibility for vehicular traffic protection to Ledcor.

3. The current provincial and federal standards are silent on what procedures should be followed when there is construction at railway crossings at grade. This situation leads to an increased risk to motorists.

4.0 Safety Action

4.1 Action Taken

4.1.1 Transport Canada and the Railway Association of Canada

On 28 July 1999, the Transportation Safety Board of Canada (TSB) sent a Rail Safety Advisory to Transport Canada (TC). The advisory described the circumstances of the accident and outlined that the scenario encountered by motorists at the subject crossing constituted a risk to their safety. The advisory suggested that TC might wish to take remedial action concerning the protection of vehicular traffic during construction activity at or near crossings at grade.

In its response dated on 18 October 1999, TC concurred with the TSB's concerns and advised that its proposed *Grade Crossing Safety Regulations* will cover safety issues regarding the safe passage of vehicles at such locations. TC also advised that the Railway Association of Canada (RAC) is developing general guidelines for flagging procedures at grade crossings.

In January 2000, the RAC began developing a circular entitled "Recommended Practices for Manual Flagging at Railway/Road Grade Crossings." The scope of the circular is "to ensure that there are acceptable procedures and instructions in place to permit railway employees to safely perform the duties of flag-persons at railway/road grade crossings when required to do so." A draft document is now being considered by the membership. The requirements focus on the responsibilities of railway employees or contractor employees working on behalf of a railway company who are required to direct traffic. The requirements are designed to provide for the safe passage of trains and motor vehicles when automatic warning devices are not operating as intended and when construction is being carried out near a crossing. The "General Principles" outline that employees will be properly equipped, trained, and qualified and that acceptable procedures and instructions will be established. Section 3 of Appendix B of the circular deals with construction work for extended periods that involve lane closures. This section outlines that the railway supervisor must notify the road authority and that a determination must be made as to who will perform the flagging duties (i.e., the railways, the road authority, or a contractor). Furthermore, the railway supervisor must provide detailed instructions to the person(s) performing flagging duties. The section also stipulates that procedures must conform to provincial requirements and that flag person(s) will receive detailed guidelines indicating standard practices and outlining provincial deviations from "national norms."

4.1.2 Ledcor Communications Ltd. and Canadian Pacific Railway

All Ledcor Communications Ltd. (Ledcor) traffic control persons now attend a training course on traffic control procedures and receive the *Handbook for Construction Traffic Control Persons,* published by the Construction Safety Association of Ontario.

On 24 August 1999, Ledcor and Canadian Pacific Railway (CPR) implemented a new procedure for traffic control at CPR rail crossings (see Appendix A). This new procedure required in part that two additional traffic control persons be stationed within 7 m of the track, on each side, whenever the CPR Rule 42 foreman requests that the track be cleared for the expected arrival of a train.

4.2 Safety Concern

4.2.1 Continuing Risk

The TSB is investigating a similar accident which occurred near Acton, Ontario, on the Goderich & Exeter Railway Company.[7] On 28 September 2000, nine workers and six vehicles were positioned at the crossing to prepare for work on the installation of a fibre-optic cable. While the automatic warning devices were activated, three people were fatally injured when they proceeded onto the crossing and into the path of an oncoming train.

As in this (Bellamy) occurrence, the Acton investigation centres around whether conflicting messages were received by the driver and how those messages influenced the driver's behaviour. The Board is again examining whether there are adequate procedures to ensure the safety of the travelling public where there is construction at railway crossings at grade. The Board is concerned that the investigation into the Acton accident and the conclusions reached in this occurrence report mean that motorists continue to be at risk during construction activity.

4.2.2 Reduction of Risk

The particularly dangerous and unforgiving nature of collisions between motor vehicles and trains has long been recognized. To lessen this risk, reliance has traditionally been placed on the protection provided by automatic warning devices. However, when there is construction activity at a crossing, drivers may be confused by contradictory stimuli and may not view the automatic warning devices as a clear instruction to stop. Neither the Transportation Association of Canada's *Manual of Uniform Traffic Control Devices*, the Railway Association of Canada (RAC) circular nor Transport Canada's (TC) current regulations address this risk.

TC's proposed *Grade Crossing Safety Regulations* and associated manual will require the responsible authority to ensure that adequate traffic controls are in place so that the work does not adversely affect safety at crossings. However, the Board is concerned that these regulations are not yet in force and, to this end, it very recently made recommendation R01-05 regarding the need to expedite the promulgation of these regulations. Moreover, the Board is concerned that, once the regulations come into force, a variety of procedures will likely be established on a

[7] TSB occurrence No. R00T0257

site-by-site basis and a piecemeal approach may not ensure that a secondary defence to automatic warning devices is provided at all crossings under construction. The absence of an effective secondary defence has the potential to place Canadian motorists at risk.

The introduction of secondary defences is not a complicated matter but it will require a concerted effort on the part of government and industry. The Board is of the opinion that this effort could come from Direction 2006. This program, sponsored by TC and the RAC, is described as ". . . a partnership between all levels of government, railway companies, public safety organizations, police, unions and community groups whose objective is to reduce grade crossing collisions and trespassing incidents by 50 per cent by the year 2006."[8] As such, Direction 2006 is in an excellent position to work to reduce crossing collisions at crossings at which construction activity is occurring.

Because of the potential for government/industry initiatives through Direction 2006 and in anticipation of Safety Recommendation R01-05, the Board felt that an additional recommendation, at this time, was not necessary. However, the Board believes that there is an opportunity for TC and the RAC, through Direction 2006, to develop a uniform set of standard procedures which will ensure the safety of motorists approaching all grade crossings undergoing construction activity. These standards could ensure that motor vehicles are given advance warning of oncoming trains and a clear and unequivocal instruction to stop. Once developed, Direction 2006 would be able to distribute these to all railways in Canada and encourage their implementation.

The Board requests that TC and the RAC provide it with a regular update as to their progress in developing and implementing these standard procedures.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 25 September 2001.

[8] http://www.direction2006.com

Appendix A— Ledcor Communications Ltd. National Project Procedure

Traffic Control at CP Rail Crossings:

1. In situations that require traffic control flag persons at railroad crossings;

   a) The traffic sign indicated as "Ledcor RR" (on attached diagram) must be placed a minimum of 100 feet (30 meters) from the track, on both sides of the crossing,

   b) The traffic control flag person must be positioned a minimum of 30 feet (10 meters) beyond the traffic sign, on both sides of the crossing, and

   c) As per normal traffic control procedures, and when safe to do so (no oncoming traffic), allow the vehicle to pass by displaying the slow sign on the flagging paddle.

2. In addition to the foregoing, in situations that require traffic control flag persons at railroad crossings, AND our crews have been advised by the Railway Protecting Foreman (or Railway Flag Person) to begin clearing operations due to the expected arrival of a train;

   a) The Railway Protecting Foreman (or Railway Flag Person) will be present at the railroad crossing when he/she authorizes a train through the work limits.

   b) Two additional traffic control flag persons ("Crossing Guards") supplied by Ledcor will be positioned a minimum of 21 feet (7 meters) from the track, on both sides of the crossing.

   c) Once the crossing signals are activated or when visual contact of the approaching train is made by the Railway Protecting Foreman (or Railway Flag Person), he/she will direct the Crossing Guards to display the stop sign to traffic approaching the crossing from either direction.

   d) Once the train has passed by the crossing and when safe to do so, the Railway Protecting Foreman (or Flag Person) will direct the Crossing Guards to allow any detained traffic to proceed through the crossing.

   e) Once the detained traffic has proceeded through the crossing and when safe to do so, the Railway Protecting Foreman (or Flag Person) will advise the Crossing Guards that their services are no longer required.

   f) Upon release of their duties at the crossing, the Crossing Guards will resume their regular duties on the crew.

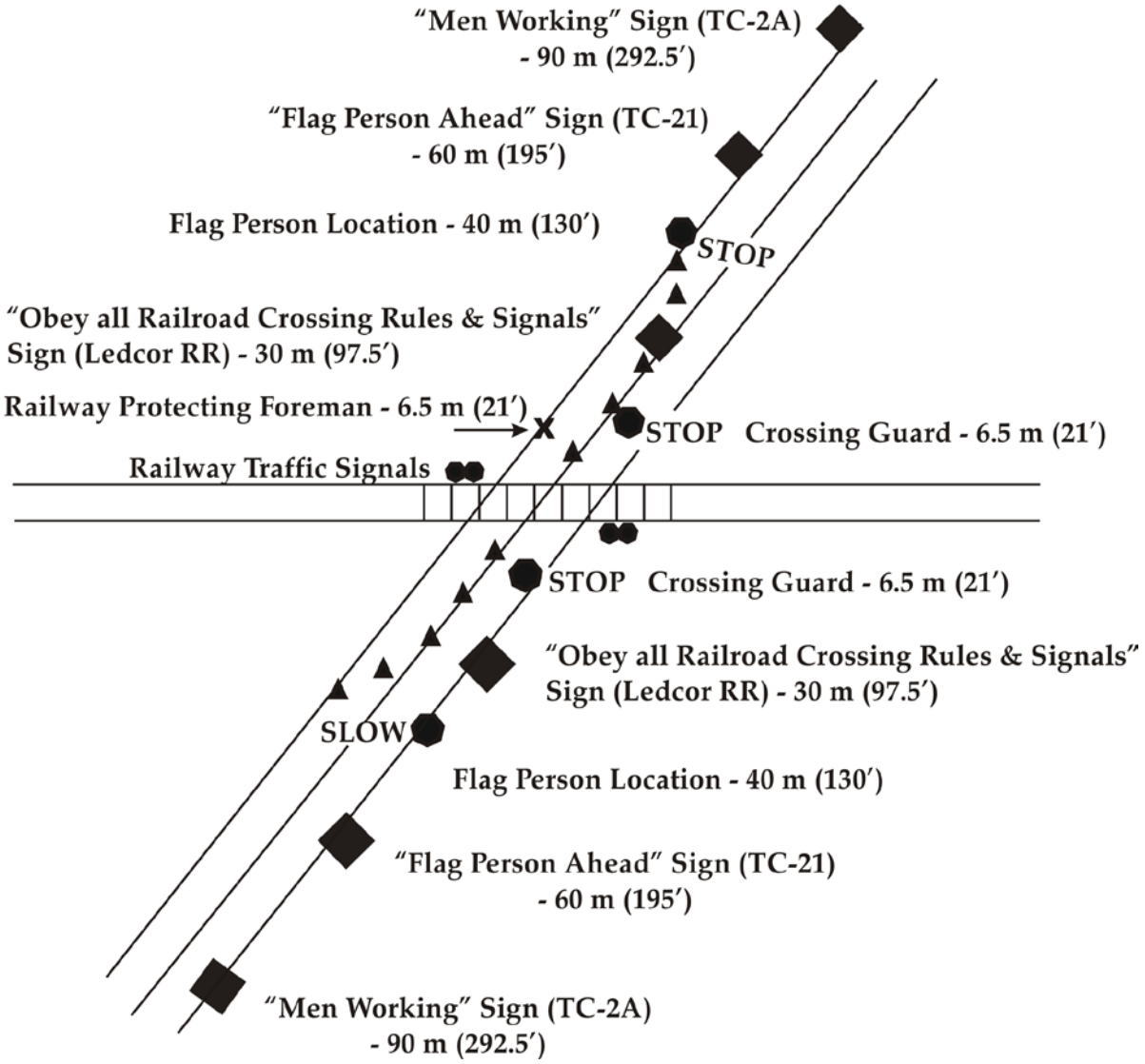
g) As per normal operations, the Traffic Control Flag persons will resume their regular duties controlling vehicular traffic.

Note: The Crossing Guards must maintain communication with each other and with the Railway Protecting Foreman (or Railway Flag Person) at all times prior to and during the passage of a train through the work limits.

Note: All other procedures/regulations governing traffic control and signage must be in compliance with Local Ministry of Transportation guidelines.

Note: In most situations where the railway crossing is equipped with gates as well as lights and bells, Crossing Guards **will not** be required. The only exception to this rule is in situations where a highway lane closure is in effect.

Diagram - Typical Lane Closure (scenario)



Appendix B—Glossary

CPR	Canadian Pacific Railway
CROR	Canadian Rail Operating Rules
EDT	eastern daylight time
km	kilometre
km/h	kilometre per hour
Ledcor	Ledcor Communications Ltd.
LRC	Light, Rapid, Comfortable
m	metre
mph	mile per hour
MTO	Ministry of Transportation of Ontario
RAC	Railway Association of Canada
TC	Transport Canada
TSB	Transportation Safety Board of Canada
UTC	Coordinated Universal Time
VIA	VIA Rail Canada Inc.
'	feet