## Chapter VI

# GOVERNMENT PROGRAMS

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Two Federal organizations have responsibility for Canadian railroad safety: the Canadian Transport Commission's (CTC) Railway Transport Committee (RTC), and the Department of Labour's Occupational Safety and Health Division.

CTC was established in **1967** by the National Transportation Act. CTC is the Federal Government's regulatory body responsible for all transportation modes. RTC is responsible for limited economic regulatory activity, safety regulatory activity, and financial assistance programs for Canada's railroads. RTC has six commissioners, some of whom have responsibility for the regulation of other transportation modes. RTC is organized around the following activities: rail systems engineering, rail safety and standards, rail services, rail economic analysis, and tariff and traffic. The CTC/RTC regulates all railroads except those that are intraprovincial. Provincial jurisdiction does not extend to railroads under CTC jurisdiction.

The Department of Labour's Occupational Safety and Health Division is a regulatory body similar to the U.S. Occupational Safety and Health Administration within the Department of Labor.

This chapter is organized as follows:



## CANADIAN TRANSPORT COMMISSION ACTIVITIES

### Regulations

A range of subjects directly or tangentially significant to railroad safety is covered by regulations in Canada and in the United States. The regulations in the United States applicable to rail safety are primarily developed and administered by the Federal Railroad Administration (FRA). Promulgation of the Canadian rail safety regulations is one of the functions of CTC. Other important regulations are those for occupational safety and health, which in the United States are issued by the Department of Labor and in Canada by Labour Canada. In both countries there are not any workplace safety and health rules applicable exclusively to the railroads. Table 46 indicates the range of rail safety regulatory subjects covered by each country.

The Canadian body of law that is comparable to title 49 of the U.S. Code of Federal Regulations, with respect to railroads, is the Revision and Consolidation of General Orders of the Board of Transport Commissioners of Canada (now CTC). This is, as the name suggests, a compilation and revision of all orders establishing regulations of general applicability issued by CTC and its predecessors since 1906. It has four parts of which two—Operating and Engineering—have safety implications. These orders, generally, were effective as of February 1965, when the consolidation occurred.

### Accident Reporting

The regulatory requirements for accident reporting are substantially more broad than the statutory requirements for accident reporting.



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**Table 46.—U.S. and Canadian Railroad Safety Regulations**

| Subject | U.S. provision | Canadian provision |
|---|---|---|
| Hazardous materials, | 49 CFR 172-174, 178-179, 209 | Gen. Order no. 0-29 to O-34 |
| Ambient noise | 40 CFR 20 (EPA), 49 CFR 210; 49 CFR 171, 211 | N/A |
| Procedural rules | 49 CFR 171, 211 | Gen. Order no. M-2 |
| State/Province participation | 49 CFR 212 | None |
| Track safety standards | 49 CFR 213 | None |
| Freight car safety standards | 49 CFR 215 | None |
| Special notice, emergency orders | 49 CFR 216 | None |
| Operating rules–general. | 49 CFR 217 | Gen. Order no. 0-8 |
| Operating rules–specific (blueflag, etc. ) | 49 CFR 218 | Gen. Order no. 0-8 |
| Two-way radios | 49 CFR 220 | None |
| Rear-end marking devices. | 49 CFR 221 | None |
| Accident reports. | 49 CFR 225 | Gen. Order no. 0- |
| Hours of service | 49 CFR 228 | None |
| Locomotive design, performance | 49 CFR 230 | Gen. Order no. 0- 1 to 0-14,0-16 to 0-19,0-21 |
| Safety appliances. | 49 CFR 231 | Gen. Order. no. 0-10 |
| Power brakes and drawbars. | 49 CFR 232 | Gen. Order no. 0-20 (air brake only) |
| Signals and related devices | 49 CFR 233-236 | Gen. Order no. E-12 and E-13 |
| Occupational Safety and Health | 29 CFR 1910 | SOR 71-30, 71-483, 71-481, 71-584, 71-605, 71-616, *72-663*, 72-13, 72-23, 72-66, 72-666, 72-171, 72-288, 73-679, and 78-559 |
| Mixed passenger/freight equipment–vestibule doors. | None | Gen. Order no. O-6 |
| Testing employees–sight, hearing | None | Gen. Order no. O-9 |
| Loading open top cars. | None | Gen. Order no. O-15 |
| Special equipment regulations (mailcars, snow plows, grain cars). | None | Gen. Order no. 0-22-0-24 |
| Air pollution and control | None applicable exclusively to railroads | Gen. Order no 0-26 |
| Fire extinguishers and emergency tools in passenger cars | None | Gen. Order no. 0-27 |
| Fire prevention from railroad causes | None | Gen. Order no. 0-28, E-16 |
| Grade crossings. | None | Gen. Order no. E-3 and E-9 |
| Railroad design (plans, profiles, etc. ) | None | Gen. Order no. E-1 and E-2 |
| Utilities on or near rail line | None | Gen. Order no. E-lo and E-12 |
| Fencing | None | Gen. Order no. E-17 |

The regulations require reports on five types of accidents to CTC:

1. accidents attended by death or personal injury or whereby any bridge, culvert, viaduct, or tunnel has been damaged;
2. accidents not attended by death or personal injury
   —at public highway crossings, or
   —collisions and derailments on main track where damage to railway property is in excess of $750;
3. obstructions on railway causing delay in operations of more than 24 hours,
4. employees suddenly stricken while on duty and death ensues, and
5. accidents involving handling of dangerous commodities.[1]

Only the first is required by statute. The information required in the report and the speed of its delivery vary depending on the nature and severity of the accident. Reports are not required for accidents that occur for reasons other than "as a result of transportation, that is to say where trains, engines, cars, or other rolling stock either while in motion or stationary are involved . . . ."[2] Accidents occurring in shops or other facilities are specifically excluded unless

'General Order O-1.
'Ibid.

they occur directly or indirectly or a result of transportation as so defined.

By comparison, the FRA accident report regulations are substantially more comprehensive with respect to casualties. They require reporting of all types of accidents involving rail operations, not just derailments and collisions, if damage to railroad property is in excess of $2,300. It also appears that the amount of detail required by FRA concerning a reported accident or casualty is substantially greater than that required in Canada. On the other hand, Canada requires accidents resulting in damage to a bridge, culvert, viaduct, or tunnel or where there is an obstruction on the track causing a delay of 24 hours or more, regardless of whether there is significant damage or casualty. This presumably is intended to give CTC notice of conditions that may impair subsequent safe transportation. Canada is considering a complete revision of its accident-reporting requirements.

## Operating Rules

CTC established by general order a uniform code of operating rules for use by all railroads subject to its jurisdiction. These are the rules that govern the continuing activities of rail employees in the conduct of rail operations. The current version of these was adopted in **1976.**[3] All employees involved in rail operations must initially pass a written examination administered by the railroads and, every 3 years thereafter, must pass an oral examination on the operating rules.

This regulation also sets forth seven additional rules that modify or extend earlier rules contained in Canada's Uniform Code. First, it states the manner and type of blue-signal display necessary to meet the requirements of Rule 26 of the Uniform Code. The blue-signal display is intended to alert railroad crews that employees are working under or between certain rail equipment and thus that equipment should not be disturbed. The special Canadian rules also require locking with special locks for all switches leading to repair track with the keys carried by the foreman or other person in charge.

The Canadian rule differs from the U.S. blue-flag rule as recently amended in a number of substantive respects. First, the Canadians require the signal to be mounted on a steel frame at a height of 5 feet. The frame is attached to the track between the switch and the first piece of rolling stock (presumably at both ends of the track if both are open to a switch). The United States has a variety of requirements as to the location of the blue signal depending on the nature and location of the equipment involved. Second, the Canadian rule does not distinguish in its requirements between main and other track, or between manually operated and remotely controlled switches as does the U.S. rule. Third, the Canadian rule does not contain most of the operational detail and alternative forms of providing protection that are contained in the proposed U.S. rule. For this reason the Canadian rule is probably one-tenth as long as the U.S. rule.[4]

The remaining special Canadian operating rules, which have no similar U.S. Government requirement, are on the following subjects and generally relate to or modify the requirements of the Uniform Code: protection of impassable or slow track, speed limits and operating procedures at crossings of one rail line by another at grades and drawbridges, speed of trains at highway-level crossings, flagging equipment on engines, signals at public crossings, and appointment of conductor to protect light engine movements on main track.

Finally, in a separate order,[5] CTC requires the testing by the company of the visual acuity, color perception, and hearing of railway employees. The tests are specified in the rule. Periodic re-examination is also required. In the United States, virtually all aspects of operating rules, including the testing of employees, are left to the separate determination of each company.

[3] General Order O-8.

[4] 44 F.R. 2174, Jan. 10, 1979.

[5] General Order o-9.

## Safety Appliances and Locomotive Inspection

For the most part the safety appliance regulations, which establish requirements for certain "appliances" to be used on rail equipment for safety purposes, are virtually identical in Canada and the United States to the extent they address the same subject. Only three provisions appear in the Canadian orders that do not appear in the comparable section of the U.S. regulation.' They address safety appliances for "boarding cars" and appliances for locomotives of special construction. The United States, on the other hand, has provisions for safety appliances not covered by Canadian rules. They pertain to certain kinds of unidirectional passenger cars, box and other house cars with high roofs, self-propelled track motorcars, road locomotives with corner stairways, and locomotives used in switching.

Canadian and U.S. requirements for locomotives, including their inspection, appear to be similar in that they address the same areas. However, design specifications, for example, cab interiors, which do not seem to receive treatment in Canada, do receive detailed treatment by the United States. In some instances many of the U.S. and Canadian regulations for identical subjects may be similar but the United States, by comparison, regulates in far greater detail than does Canada' (compare U.S. requirements for multiple-operated electric units in 49 CFR 230 D with Canadian requirements in General Order 0-21 adopted in 1970 for inspection and maintenance for motive power equipment).

## Dangerous Commodities

Dangerous commodities regulations of CTC are substantially similar to the U.S. regulations.[8] However, Canadian dangerous commodities regulations cover some areas that are not subject to Federal regulation in the United States. First, CTC established rules governing transportation of dangerous commodities in piggyback service, adopting the Interstate Commerce Commission (ICC) tariff 'requirements for the cargo tank unit. Second, the CTC rules cover the design, location, construction, operation, and maintenance of stationary bulk storage facilities for liquefied petroleum gases, flammable liquids, and anhydrous ammonia; unloading facilities for chlorine tank cars; and storage of ammonium nitrate and ammonium nitrate mixed fertilizers. CTC requires the railroad to submit the plans and specifications for each of these for approval. The U.S. Department of Transportation does not have similar specifications for such facilities. Canada also regulates design, location, construction, and operation of gas fuel systems c n railway cars. The United States does not.

## Rail/Highway Crossings

CTC has regulations governing four aspects of rail/highway crossings—grade crossings,[9] grade separations, [10] protective devices,[11] and requirements for financial accounting for grade-crossing projects.[12] In the United States, these subjects are not covered even in part by Federal regulation, but rather are administered by the States using Federal funds. CTC approves the plans of a railway line before it is constructed as well as those of any modification to the line. Thus, review of the plans of all aspects of rail/highway crossings is consistent with this regulatory scheme.

In seeking approval for new grade crossings, the crossing party must submit a detailed application to CTC. CTC regulations establish specific requirements for the incline of approach of the highway, length and width of crossing surface, fencing, and signboards. The party constructing the crossing must pay the cost of construction and maintenance unless it has senior title to the property.

Canadian grade-separation regulations (which have not been revised to account for the changes made by the 1974 Railway Relocation

'49 CFR 231.
'Compare 49 CFR 230D with General Order 0-21 regarding inspection and maintenance of motive power equipment.
'General Order O-29 thru O-36.
'General Order E-4.
[10]General Order E-5.
[11]General Order E-6.
[12]General Order E-7 thru E-9.

and Crossing Act concerning financial assistance) also require submission of detailed plans and specifications to CTC for approval. The applicant must also submit certain financial data when funds are requested. The regulations outline cost-sharing formulas of the Government, the highway authority, and the railroads for each project and for its future maintenance. Allocations vary depending on the type and size of the project.

Protective device regulations are essentially design and installation specifications for particular types of grade-crossing warning devices. They are guidelines for the railroads to follow when they install and maintain protective devices at crossings. The regulations concerning treatment of accounts in joint rail/highway crossing projects are used in those projects undertaken pursuant to CTC order. They provide detailed treatment of the subject matter, such as rental rates of 254 different types of equipment.

## Signals and Related Systems

CTC retains complete control over all aspects of the design, construction, location, and use of interlocking and signal systems. 13 Plans for the construction and modification of such systems must be submitted to CTC for review and approval. The regulations establish detailed requirements for these systems and provide, in effect, for uniformity of such systems on all railroads subject to the jurisdiction of CTC. However, the regulations do not establish requirements for inspection, maintenance, or repair of these systems. In the United States, a different approach is used. Plans and specifications for new systems are not approved although any applicable requirements for systems once installed must be observed. Discontinuance or modification of the signal system requires FRA approval. In addition, the carrier must observe certain periodic inspection requirements and report signal failures and accidents resulting therefrom. The U.S. requirements appear to be at least as detailed as those in Canada, if not more so.

## Summary

In the long established areas of railroad safety regulation, such as those for safety appliances and locomotives, there appears to be little significant difference between the requirements of the two countries, although U.S. regulations, in some respects are considerably more detailed. In matters dealing with the fixed plant of the railroads, the approach is quite different. Canada requires review and approval of initial plans and specifications and of subsequent modifications. It also establishes many design requirements. However, it does not establish maintenance standards or minimum inspection requirements. The United States, on the other hand, prescribes maintenance and inspection practices but does not require pre-installation review.

The United States and Canada also take an entirely different approach to operating rules. The United States has traditionally left operating rules to the railroads' discretion. The Association of American Railroads has produced a set of operating rules as a guide to their members. However, in recent years the United States has begun to consider piecemeal adoption of a Federal operating rule on certain matters believed to need nationwide uniformity. An example is the blue-flag rule. Canada, on the other hand, owing probably to the fact that there are only two major carriers, has established a Federal Code of Uniform Operating Rules. These rules appear to generally follow a relatively simple format and style similar to that used by many U.S. carriers. This simplicity contrasts greatly with the comparatively detailed and lengthy style used by FRA in the few rules it has established.[14]

While much of the focus of U.S. regulatory activity in the past 7 years has been on track and freight car standards, Canada does not have any rules in those areas. Moreover, it has not adopted any regulations concerning hours of service despite a statute specifically authorizing it to do so. This subject is left to collective bargaining between labor and management. On the other hand, Canada has been very active in de-

[13] "General Order E-12 and E-13.

[14] 49 CFR 218.

signing new programs for rail/highway crossings, whereas in the United States this has essentially been left to the States with matching-share Federal funding, with the addition of some federally funded studies and demonstration projects.

Finally, the Canadians use a somewhat different approach for reporting accidents. They do not report yard accidents unless they result in injury or death. They also do not collect data on occupational safety and health hazards as distinguished from operational safety. However, they do require reports of incidents that cause train delays or obstructions regardless of whether any injury or damage is incurred.

Overall, Canadian regulations suggest a closer working relationship between the railroads and CTC than exists between U.S. regulatory agencies and the railroads in this country. This is supported by the fact that CTC does not rely on collection of fines as its major enforcement tool. Also the fact that CTC has not sought to revise its regulations continually to meet changing needs seems to indicate, among other things, that it is not relying heavily on a regulatory structure to accomplish its safety objectives.

## Inspections

The Government safety inspection programs are carried out by the Rail Services Branch of RTC. The safety inspection programs implemented and planned by the Branch include track, car, locomotive, operations, dangerous commodities, fire prevention, stationary mechanical equipment, structures (including highway grade crossings), and signals. In addition, the Rail Services Branch has responsibilities that are not directly associated with railroad safety. These responsibilities include such diverse areas as monitoring the rehabilitation of grain-hauling branchlines, administering the branchlike abandonment program (including the capital expenditure fund for lines eligible for subsidies in connection with abandonment), evaluating passenger service, and monitoring station retirement and agency centralization activity.

Thus, RTC's organizational structure by combining inspections with other activities reflects the philosophy that railway safety is an integral part of all aspects of rail service delivery. Nonetheless, safety is considered an essential aspect of rail service delivery and specific attention is paid to it in the particular inspection programs, listed above, that are carried out by the Railway Services Branch. The Branch itself is organized into two divisions: the Infrastructure and Equipment Assessment Division and the Rail Systems Performance Evaluation Division, both of which have some responsibility for safety inspection. The Infrastructure and Equipment Assessment Division is responsible for monitoring compliance with track (including all aspects of the right-of-way), fixed structures, and equipment standards and regulations. The Rail Systems Performance Evaluation Branch is responsible for monitoring compliance with service, dangerous commodities, and the Uniform Code of Operating Rules.

The Rail Services Branch is authorized 29 staff in headquarters to carry out all of its responsibilities; these persons are divided approximately equally between the two Divisions. The Branch believes that almost all of the activities of the Infrastructure and Equipment Assessment Division and about half of the Rail Systems Performance Evaluation Division activities are directly linked to railroad safety. In addition to the headquarters activities associated with safety, RTC has field offices in six different locations throughout Canada .15 The field offices work in the general areas of accident investigations, quality control inspection programs, applications processing (for example, applications for abandonments), and investigation of complaints. In a field force of 84, approximately 59 persons spend some time on safety-related inspections. CTC estimates that about 35 percent of the professional person-hours available in the field are spent on safety matters. Although the headquarters Rail Services Branch does not have direct authority over the regions, it establishes the programs of work and the standards of performance for the field safety inspections.

[15]Monoton, Montreal, Toronto, Winnipeg Calgary, and Vancouver.

The top management of CTC views the inspection priorities as follows:

- accident investigation,
- grade-crossings inspection (including an informal supplement to ongoing programs administered by the Rail Services Branch), and
- safety inspection programs administered by the Rail Services Branch (of which car equipment inspection has received highest priority).

These priorities were arrived at by an informal consensus process as well as by management decisions made as a result of top management's perception of the existing problems. Some feeling was expressed by top management that the Rail Services Branch should give greater priority to the track inspection and operations (human error) problems. At this time, CTC acknowledges that the Rail Services Branch has been unable to match the priorities of the inspection program against accident data, because of inadequacies in the data collection system. With regard to the bulk of the safety inspection programs, the Rail Services Branch recognizes that with limited personnel it cannot inspect 100 percent of the railroad's plant and operations. It sees the Government's role in the inspection program as monitoring what the railroads are themselves doing. In this monitoring, Government inspectors note conditions and defects that require correction and, in this way, the Rail Services Branch sees its activities as directly related to the prevention of and the reduction of accidents. In addition, from its perspective the Rail Services Branch believes that there may be two other principal benefits stemming from the inspection activity. These are:

- The fact that Government is concerned about railroad safety and is monitoring the railroads' safety performance by means of inspection in itself tends to raise the general level of compliance.
- The fact that Government is concerned about railroad safety and is monitoring the railroads safety performance by means of inspection helps the various operating levels in the railroads' own organizations justify and receive more funds for maintenance than they might have otherwise received. The Rail Services Branch, however, acknowledges that it has no absolute measures of effectiveness for the inspection programs, although such indices are currently being developed. "

The Rail Services Branch believes that the effectiveness of an inspection effort that is based on the concept of periodic monitoring must be based also on the credibility of the inspections with the railroads—both with management and with the individual supervisor or employee at the working level. The Rail Services Branch has, therefore, followed a policy of hiring personnel who have had considerable experience in the railroad industry itself and who have achieved a certain stature within the organization of the railroad. Thus, it is not uncommon for RTC inspectors to be people who have reached the assistant superintendent level after 10 years with the railroad. In the opinion of the Rail Services Branch, however, such a policy is increasingly difficult to implement given the hiring constraints placed on RTC and the railroads' ability to compete successfully with the Government in terms of benefits.

CTC attempts to make the inspection efforts both systematic and representative. However, the individual inspectors are given latitude in devising their own inspection strategy. A description of the major inspection activities directly related to safety follows.

## Track Inspection

The goal of the track inspection program is to monitor, evaluate, and regulate the quality of track and right-of-way .17 Since there are no Government-mandated track standards, RTC inspectors check against the railroads' own standards, which approximate the American

[16] The Bureau of Management Consulting is conducting a study to develop measures of effectiveness for the inspection *program as* a whole. In the Rail Services Branch, Activity Resource Allocation forms, which describe specific program components of the Branch's work, set forth "criteria to asses effectiveness and efficiency. " These criteria do not measure the degree of impact of any given program, but rather indicate what areas should be affected if the program is having an impact.

[17] CTC Activity Resource Association, "Track and Right-of-Way Quality Control."

Railway Engineering Association (AREA) recommended standards and which RTC representatives feel are adequate. At the present time, track inspection is conducted generally in the course of other engineering inspection duties, such as inspecting drainage, fencing, or crossing problems, However, the Rail Services Branch stated that it tries to make the inspections as systematic as possible.

Recently RTC began two additional efforts that can serve as tools of the inspection program. A description of each undertaking follows:

**Comprehensive Track Inspection Effort:** RTC assigned an engineer with substantial railroad experience to inspect the entire mainlines of both CN and CP. The inspector went over both systems in a high rail car (stopping along the way to make spot checks), passenger train, and freight train. In addition, RTC obtained information from the railroads about the type of rails and ties installed during the past 5 years, the ballasting and surfacing programs undertaken, the number of inspectors and track forces (mobile and fixed) assigned, and the tonnage moved over various subdivisions. RTC also gathered information on the branchlines and conducted some inspections but it did not conduct a complete field inspection.

From the analysis of information obtained from all these activities, the Rail Services Branch's opinion was that, in general, the mainlines of both railroads are in good condition. However, the branchlines are not in as good condition as they were in the early 1950's when short section forces were responsible for manually inspecting and maintaining the road. Nonetheless, the Rail Services Branch's opinion indicated that the branchlines are not in an unsafe condition. Representatives of the Rail Services Branch indicated their belief that the condition of the lines represented policy decisions by the railroads to place primary emphasis on the mainlines.

[18] On discussions with CTC representatives, there seemed to be some difference of opinion as to the condition of the track. Some high-ranking members of CTC believe that the track may not be in as good condition as the inspection reports might indicate.

**Photographing of Mainlines: Based on a pilot study, the Rail Services Branch has proposed to photograph the mainlines at prescribed intervals (of approximately 300 feet). The photographs would be made by a camera mounted on a high rail** car. The camera would take a picture with a wide area of vision (two frames sideways would constitute one picture) and would code the section of the track photographed. RTC believes that a photographic record of the track would aid in accident investigation as well as in headquarter's analysis of any particularly difficult inspection issue that might arise. RTC proposes to update the photographic library whenever a major change in the configuration of the track might occur (e.g., installation of a new grade crossing). [19]

## Car Inspection

The goal of the car inspection program is to monitor, evaluate, and regulate the quality of railroad cars. CTC gives this program highest priority of all inspection activities. As in the track inspections, the principal activities are to: develop and update information concerning the condition of railroad cars in Canada by a systematic cyclical inspection program; to effect improvements in related railroad maintenance practices where deficiencies are identified; and to investigate complaints and ensure that necessary remedial action is taken ,[20]

The inspection program is based on a risk factor analysis developed by RTC. In this context, the term "risk" is defined as "expected severity within the system ."[21] The concept combines probability of defect occurrence with the potential severity of occurrence. RTC developed the risk factor by rating **125** typical defects on a severity scale of 1 to 20. The defects were rated in terms of potential for personal injury and property damage. The ranking was performed by various people knowledgeable in railroad

[19] The Rail Services Branch representatives indicated that the Canadian highway department has made a similar photographic record of highways; however, the purpose of the record was not safety inspection, but rather to judge efficacy of signing.

[20] CTC Activity Resource Allocation, "Car Quality Control. "

[21] "'Analysis of Defect Severity and Risk for Railway Car Equipmerit, " working paper completed for RTC, project no. 3-1265, August 1977 (draft), p. 1.

operations. The severity number finally assigned to each defect resulted from averaging the severity numbers assigned to it in the categories of personal injury and property damage.

When an inspection is carried out and a defect is discovered, the inspector enters the defect code on their inspection report. The information is computerized. By the time that the end of a quarter is reached, a "scientific random sampling" of cars has been made. RTC is then in a position to describe what the condition of the fleet is, based on the established measures. The inspectors examined a total of 11,000 cars in a representative quarter; however, the risk factor for that quarter does not mean anything in isolation. RTC believes that the significance of the risk factor lies in the comparisons that it will enable RTC to make over different time periods. The risk factor inspection of car equipment is a new program of RTC.

RTC inspectors are instructed to inspect cars at the large centers through which cars pass, and at points where there might be captive cars (cars that run only between certain points and do not go through one of the large interchange centers). Inspectors are also to inspect cars in receiving yards, on repair tracks, and in leaving yards. Inspectors inspect one side of a train only and check the brakes on every 10 cars that they inspect. They are assisted in making their inspection reports by recording equipment, from which they transcribe their findings onto a standardized form. The forms are in triplicate: one copy for the railroad supervisor, one filed with headquarters, and one retained by the inspector. The Rail Services Branch estimates that between 30,000 and 40,000 units are inspected annually.

## Motive Power Inspection

The goal of the motive power inspection program is to monitor, evaluate, and regulate the quality of motive power units. As in the car and track programs, the principal activities are: to develop and update information concerning the condition of railroad motive power units by a systematic cyclical inspection program, to effect improvements in related railroad maintenance practices where deficiencies are identified, and to investigate complaints and ensure that necessary remedial action is taken .22

The motive power inspection program is carried out in a similar way to the car inspection program. Inspectors check a sample of motive power units at various points in service, such as in the receiving yards, and the leaving yards. RTC is developing a risk factor for motive power units that will be similar in concept to that developed for cars.

## Dangerous Commodities Inspection

The goals of the dangerous commodities inspection program are twofold: to ensure the safe storage, handling, and transportation of dangerous commodities on the railroad system in Canada; and to monitor, evaluate, observe, and regulate railroad and shipper compliance with CTC regulations for the transportation, storage, and handling of dangerous commodities. The major activities of personnel in this program are the systematic inspection of various railroad facilities, the ongoing inspection of shipper and carrier facilities, and the conduct of training sessions to ensure understanding of the regulations.[23] The inspectors look primarily at the adequacy of the storage and handling of the dangerous commodities being shipped .2'

RTC has one full-time dangerous commodities officer in Vancouver. Otherwise, the dangerous commodities inspections are conducted by the car inspectors, the transportation officers, and the operations inspectors. CTC estimates that any given inspector can inspect from 40 to *80* tank cars a day. The inspector must break the seal on each car, check empty cars, and verify that the Hazardous Information Emergency Response form (HIER), giving information about action to take in the event of an accident, is present for shipments of dangerous commodities.

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[22] CTC Activity Resource Allocation, "Motive Power Quality Control. "

[23] CTC Activity Resource Allocation, "Dangerous Commodities Regulations Compliance".

[24] The Canadian Government's Bureau of Explosives has responsibility to protect carriers from committing infractions but is not a regulatory agency.

Every 30 days, the inspectors concentrate on a specific dangerous commodity activity, paying particular attention to what defects are present in the aggregate, RTC uses this information to determine whether trends might be developing. Inspectors are authorized to stop a train if a specific defect found during the course of any inspection is sufficiently serious, in the judgment of the inspector.

In addition to the inspection activities, RTC staff hold regional seminars to develop awareness among both RTC staff and railroad employees about the requirements for handling dangerous commodities. These seminars are oriented to the practicalities of handling commodities—i.e., setting up trains, re-railing cars, handling leakage, and the like—as well as to the overall requirements and enforcement policies of RTC. RTC is also beginning to conduct seminars for the shippers of dangerous commodities. Dangerous commodities are discussed in greater detail in the following section.

## Operations Inspection

The goal of the operations inspection program is to monitor, evaluate, and regulate the quality of railroad operations of trains on mainline and yard operations. The operations inspectors systematically monitor railroad operating procedures to determine the quality of railroad operations as they relate to safety and, in particular, to the Government-mandated Uniform Code of Operating Rules and other related instructions and regulations .25

All written complaints by operating crews concerning operating conditions are investigated. Two inspectors, one in headquarters and one in Calgary, concern themselves almost exclusively with operating practices, including in-cab observation of engineers. Inspectors in each of the regions conduct operations inspections in addition to their other responsibilities. The two inspectors who are concerned almost exclusively with operations inspection devote most of their time to engine handling. Other operations inspectors are concerned with the observance of the operating rules generally—both by labor and by management.

When an employee has violated an operating rule, the RTC inspector reports the violation to the employee. Depending on the nature of the violation, it may be reported also to the railroad. However, representatives of the Rail Services Branch stated that the violations do not usually warrant discipline by the railroad. Instead, the violations are usually of such a type that they relate to the system of operations.

## Other Inspection Programs[26]

Other RTC inspection programs are designed to ensure that measures taken by the railroads are adequate to prevent, detect, and suppress fires on and near the railroad right-of-way; to monitor, evaluate, and regulate the quality of railroad stationary mechanical equipment; to monitor, evaluate, and regulate the quality of maintenance of railroad structures; to ensure that the protection, safety, and convenience of the public is provided for by an adequate level of maintenance of highway/railroad crossings and ancillary installations;[27] and, to monitor, evaluate, and regulate the quality of railroad signal installations.

The inspection programs for stationary mechanical equipment, railroad structures, highway grade crossings, and signal installations are based primarily on a systematic approach to inspection and secondarily on response to complaints. However, the fire prevention inspection program, is directed by a greater responsiveness to incidence of complaints. The five inspection programs mentioned here are similar to each other and the others discussed above in that they operate from a regional base. Taken together, these five programs are intended to provide assurance that the rail operating environment does not in itself pose hazards.

[25] CTC Activity Resource Allocation, "Train Operations Quality Control."

[26] CTC Activity Resource Allocation, "F re prevention, Stationary Mechanical Equipment Quality Cent-ol, Structures Quality Control, Signal Quality Control, Crossing; Safety, and Protection Evaluation."

[27] See a subsequent section of this chapter for a full discussion of the highway grade-crossing program.

A detailed quality control program is being developed for signal and crossing inspections.[28] This program will entail compiling an inventory of signal equipment by subdivision and inspecting crossing warning devices and various signal systems in a comprehensive way. This effort is planned to take place in cooperation with the railroads. However, staff limitations have impeded the implementation of a planned structures comprehensive review similar in concept to the signal and crossing review.[29] RTC is currently reviewing the procedures and effectiveness of the fire prevention inspection programs. In the view of the Rail Services Branch, a meeting arranged by RTC between railroad officials and forestry representatives in British Columbia and Ontario resulted in greater cooperation and fewer railroad-associated fires .30

## Dangerous Commodities

The Railway Transport Committee, in its initial report of the railway safety inquiry, noted a "factor of grave concern was the rapidly increasing involvement in railroad accidents of cars carrying a wide variety of dangerous commodities whose cargo, if accidentally released, could pose a serious hazard not only to railroad employees but also to the lives and property of the public. "[31] During the inquiry, derailments occurred involving dangerous commodities that increased the inquiry panel's interest in that type of accident .32 The inquiry panel concluded that shipment of dangerous commodities confronted Canada's regulatory authority with a new dimension in destructiveness and danger of life and limb. 33

In *1974,* the Bureau of Management Consulting (BMC) concluded that very little data was available on incidents involving dangerous commodities. BMC contended that dangerous commodities incidents, although relatively infrequent, presented the potential for major catastrophes. Available data for the years *1970-73,* showed 2 fatalities and 34 injuries resulting from accidents involving dangerous commodities. Table 47 provides the information of the Bureau.

### Dangerous Commodities Safety Responses

Transportation of dangerous commodities comes under the jurisdiction of the Federal Government. Canada's Railway Act specifies that:

- No passenger shall carry, except in conformity with a CTC order, gunpowder, dynamite, nitroglycerine, or any other goods of a dangerous or explosive nature.
- Every person sending dangerous commodities shall indicate the nature of the shipment on the outside of the package and give written notice of the commodity to the employee of the company receiving the goods.
- The railway shall not carry goods of an explosive or dangerous nature except in conformity with CTC regulations. [34]

### Dangerous Commodities Task Force

During the general inquiry, RTC explored problems associated with the shipment of dangerous commodities. It examined, for example, whether new railroad technology was increasing the hazards; whether railroad practices and rules for dangerous commodities were adequate to meet the increased hazards; and whether ex-

**Table 47.—Canadian Incidents Involving Dangerous Commodities**

| Type of commodity | Total incidents for 1970-73 | Average number of incidents per year |
|---|---|---|
| Flammable solids | 14 | 3.5 |
| Flammable liquids | 53 | 13,25 |
| Oxidizing organic | 22 | 5.5 |
| Poison | 18 | 4.5 |
| Corrosive | 27 | 6.75 |
| Explosive | 0 | 0.0 |
| Radioactive | 2 | 0.5 |
| Compound gas | 8 | 2.0 |
| Total | 144 | 36,0 |

SOURCE Slat! stical Analysis 1956-73 p 75

[28] Rail Services Branch, "Status of Programs," June 30, 1978, PP. 5-6.
[29] Ibid., p. 7.
[30] Ibid., p. 15.
[31] *Initial Report of the Railway Safety Inquiry* (Canadian Transport Commission, 1972) p. 1.
[32] Ibid., p. 1.
[33] Ibid., p. 19.
[34] Railway Act, ch. R-2.

isting rules were being properly applied and monitored. RTC felt these issues about the adequacy of the research effort were not satisfactorily answered during its inquiry .35 RTC therefore proposed that CTC create a task force to examine rail transportation of dangerous commodities. In 1971, CTC created a task force with representatives from CP, CN, and the Canadian Railway Labour Association. This group was to review the hazards associated with the transportation of dangerous commodities by rail. The task force was to recommend measures to ensure the highest level of safety compatible with the economy of operation and expeditious movement of goods. The task force had available to it some of the best expertise in industry (chemical, gas and oil industries, and tank car lessors); other Government agencies (such as those dealing with the military, atomic energy, explosives, and natural hazards); other carriers (such as motor vehicle, aviation, and water); certain shippers of dangerous commodities; and health, fire, environmental, and safety specialists.

## Reporting Requirements

Canadian regulations require certain reports whenever trains, engines, cars, or other rolling stock are involved in an accident that results in the release of a pollutant or a dangerous commodity.[36]

In addition, RTC requires that each dangerous commodity shipment be accompanied by a HIER form, which is completed by the shipper of explosives or other dangerous commodities. The form, included in appendix C, contains the following information.

- designation of the commodity/explosive,
- commodity/explosive classification (e. g., flammable compressed gas),
- potential hazards (fire, explosion, and health), and
- immediate action information (general, fire, spill or leak, first aid, and emergency phone).

[35] *Railway Safety Study* (Bureau of Management Consulting)
[36] Revision and Consolidation of General Orders, General Order 0-1.

## Dangerous Commodity Program Implementation

CTC specifications for the design and/or performance of tank cars are similar to those issued by the U.S. Department of Transportation (DOT). The most recent DOT tank car standards have been adopted by CTC almost completely. However, the compliance schedule differs.

The present plan for the assurance of safety of the tank cars does not provide for retrofitting. Nor does CTC have the authority to require retrofitting. RTC officials note, however, that many of the tank car manufacturers are cooperating without regulation.

## Highway Crossings

There are about **34,210** public highway/railroad crossings in Canada. Approximately 8 percent of the public crossings are grade separated; 21 percent have some form of automatic protection, such as flashing lights or automatic gates; and the remaining have crossing signs .37

Between **1956** and **1973,** the average number of crossing accidents was 1,156, There were on the average, 160 fatalities and 618 injuries annually. Crossing accidents are the largest cause of railroad-related fatalities.[38] The Rail Systems Development Branch of RTC roted in a 1978 report that:

> At the crossings that are not grade separated there is an inherent danger to road and rail users of colliding with each other at the crossing; however, the extent of hazard is a site-specific condition and depends on the features of the crossing; one is more or less hazardous than another because the features of all crossing differ. For example, over the period 1970-75 there have been no accidents at **90.6** percent of all crossings, one accident at 7 percent of all crossings, two accidents at 1.5 percent of all crossings, three accidents at **0.5** percent of all crossings, four accidents at **0.2** percent of all crossings, five accidents at 0.1 percent of all crossings; none had more than six accidents. 39

[37] *Railway Safety Study,* op. cit., 1974.
[38] Ibid.
[39] *Rail Systems Development Branch Report* (Railway Transport Committee, 1978).

RTC representatives note a steady decrease in the number of crossing collisions over the past 5 years. Automobile mileage has increased.

The objectives of CTC regarding crossing safety are to: 1) establish the characteristics of a crossing in accordance with the regulations and standards developed by the Commission for the safety of the users of the crossing; 2) authorize or encourage road authorities or railroad companies to carry out works improving physical features or to install warning devices with or without grants in order to reduce hazard to the users of the crossing. 40

## Legislative History

The Canadian Government first addressed the highway-crossing problem in 1909 with amendments to the Railway Act. These amendments established the railway grade-crossing fund. The prior 1888 Railway Act led to interest in the crossing problem by raising the general level of consciousness of the public and the railroad industry on the issue of crossing safety. Following that 1888 Act were the beginning installations of passive protections, such as crossbucks and signs. Legislative provisions are discussed in chapter 111. The following summary includes the basic provisions of the 1909 amendments, the 1958 Act, and the 1974 Railway Relocation and Crossing Act. The basic provisions in chapter R-2 of the Act are as follows :[41]

- Railroads shall submit to CTC a plan and profile showing the portion of the railroad and highway to be affected by proposed rail construction. CTC may withhold approval of an application pending adequate railroad steps to ensure the safety.
- Where a railroad is already constructed, CTC may on its own motion or upon complaint, order the railroad to provide additional safety at a crossing.
- A railway grade-crossing fund exists to aid construction work for the protection, safety, and convenience of the public at crossings. Amounts from the fund are available only to crossings 3 years old or older.

Under the Railway Relocation and Crossing Act, up to 80 percent of the project installation cost can be funded by the Federal Government. The remaining 20 percent of the installation cost is divided between the road authorities and the railroads. The Act does not provide for Federal funding of the maintenance of the protection. Usually 50 percent of the maintenance cost is borne by the road authority and 50 percent by the railroad.

## Program Implementation

**Past Evaluation of CTC Program Effectiveness. One of the most comprehensive reviews of** CTC's grade-crossing program was conducted by BMC in 1974. The Bureau found relative to highway crossings that:[42]

- RTC has not initiated much of the activity in bringing about crossing safety, but rather is in a reactive posture. Over 90 percent of the projects originate from art external application or complaint. RTC places reliance almost entirely on the railroads and the highway authorities to identify those crossings that present the greatest hazard.
- Since there is a shared funding responsibility for the installation of crossing protection and since the responsibility for the maintenance of automatic devices is with the railroads and the highway authorities, RTC initiatives in reducing risks at hazardous crossings are sometimes difficult to achieve.
- Insufficient attempts are made to establish priorities based on risk in decisions to approve a grant.
- The criteria for fund dispersals did not appear to include an analysis of the relationship between the crossing problem and the most cost-effective protection.

### PRESENT PROGRAM STRATEGY

**Survey and Data Collection:** Data on approximately 30 typical attributes of grade crossings have been collected for a number of crossings

[40]Interviews with representatives of CTC, 1978.
[41]Railway Act, ch. R-2.
[42]*Railway Safety Study*, op. cit., 1974.

and placed in a computerized file. The data can be grouped into the following six categories:

- location and jurisdiction,
- accident history,
- protection at the crossing,
- track and train characteristics,
- road and road vehicle characteristics, and
- year of last inspection.

During **1978,** RTC conducted onsite surveys of some 12,000 of the likely most dangerous crossings. Specific attention was paid to: the annual traffic (based on the daily traffic rate), the nature of crossing physical characteristics (e.g., description of the sight lines), and the type of existing protective devices. These data supplemented other information already computerized. Following the survey, CTC officials met with many of the road authorities with jurisdiction over surveyed grade crossings. The purpose of those meetings was to come to some agreement on the most cost-effective approach to dealing with the problems on a crossing-by-crossing basis.

## Federal Government Funding of Crossing Projects

The Canadian Federal Government provides financial assistance for crossing improvement under the authority of the Railway Relocation and Crossing Act. Each application is reviewed against criteria developed by RTC. The criteria are based on protection, safety, and convenience to the public.

Six months is usually required between the time of receipt of a crossing improvement assistance application and a grant approval. Another 3 years is generally needed for funds disbursement and project implementation .[43] A large majority of the projects begin with an application from a local jurisdiction or a complaint. For those applications under serious consideration, RTC sends an engineer to make an onsite inspection to validate or alter the proposal, as necessary, from the jurisdiction applying for the grant. In 1977, 1,519 applications were received for crossing improvement work. Funding was provided for 399 of those projects, totaling over $17 million. The projects qualifying for assistance included 29 grade separations, 166 installations of new or improved automatic protection devices, and 36 improvements in approach and/or visibility at grades .44

## Present Problems With the Grade-Crossing Program

According to RTC officials, some problems of the grade-crossing program identified by BMC in 1974 still exist today. Following is a discussion of some of the grade-crossing program problems and the present efforts to deal with those problems.

**RTC uses inadequate methodology to set correction priorities by degree of hazard, or to determine the most cost-effective method of reducing existing hazards.**

The Rail Systems Development Branch of RTC is attempting to develop an objective evaluation method to determine the most cost-effective crossing improvements. A statistical analysis of crossing accident data, including physical and warning characteristics of the crossings, is being developed. The resulting mathematical model, called a hazard index, would represent in the aggregate, the average number of accidents that a typical crossing with a given set of charactistics could be expected to have. The next step in the analysis will be to determine what the effect of altering certain characteristics will be on the number of accidents. The methodology is expected to provide a means for: 1) ranking crossings by hazard, and 2) determining the relative effectiveness of one type of improvement over another.

While the research is being conducted, RTC is funding projects based on a subjective evaluation of the physical characteristics of a crossing, and the road and rail traffic.

[43] Review Committee of Railway Transport Committee, Sept. 22-23, 1975, Bureau of Management Consulting presentation, slide 6-12, Ottawa.

[44] Report of th, Canadian Transport Commission, 1977.

**Intermediate protection devices (between passive protection and automatic devices) are currently ineligible for funding.**

**Some argue that no intermediate technology exists; others argue that** such technology exists, but is not accepted for funding. RTC is exploring options, given the fact that many municipalities cannot afford the automatic devices and believe that they do not need such level of protection. The "ditch lights" now being used by CP serve as an intermediate option that some argue should be considered. Statistics (which have yet to be analyzed by RTC) show a reduction in accidents at crossings when railroads have been using ditch lights.

**An increase in the number of illegal (de facto) crossings presents a hazard to the general public.**

Agreements between the railroads and a number of private landowners have produced crossings that the landowners can use when the rail track crosses their land. Increasingly those crossings are being opened to a larger public with the acquiescence of the railroads. These crossings are not under the jurisdiction of the Federal Government, hence the public is not adequately protected.

**The fact that maintenance is not funded by the Federal Government results in inadequate protection for many of the smaller, poorer municipalities.**

Efforts are underway to amend the law to provide some level of Federal support for maintenance of automatic devices.

**It is possible that grade crossings will no longer receive the necessary attention or resources because of changes in the allocation of funds.**

Under the urban transportation assistance program, provinces can use funds formerly authorized solely for grade-crossing protection, to finance grade separations, equipment, and other highway programs. The railroads fear that broadening the discretion of the provinces will decrease the amount of money spent on grade crossings and possibly increase the number of grade-crossing accidents.

## LABOUR CANADA'S OCCUPATIONAL SAFETY AND HEALTH

The Department of Labour (Labour Canada) has responsibility for safety of some railroad employees; CTC has responsibility for others. Employees under the jurisdiction of Labour include: employees involved in maintenance-of-**way** activities, repair shop employees, freight handlers, and porters and dining car employees.

### Protections Provided

The Department of Labour has issued rules that protect employees under its jurisdiction. The rules are applicable to employees, irrespective of the industry. In other words, the Department of Labour attempts to provide the same level safety to railroad employees as it provides to employees of a steel mill. The only Canadian industry that has specific standards is the coal industry. In addition to the protections cited above according to Department officials, employees can refuse to work if the work environment presents an imminent danger.

Labour Canada requires investigation of every injury if the employee loses 1 or more day's work. In addition, the Occupational Safety and Health Division, or its agent, investigates all fatal accidents and "significant" disabling accidents. Accident investigators are used for encouraging compliance and for the training of employees.

In addition to accident investigation, the Federal Government is involved in inspection. Representatives of the provincial governments have performed the investigations under contract with the Federal Government. However, the arrangements with the provincial govern-

ments did not extend beyond February 1979. After that time the Department of Labour will conduct its own investigations relying on information from local safety committees composed of railroad and union representatives. The sanctions that can be imposed for violations of Department rules can be up to $10,000 or incarceration. The Department of Labour also has authority to close operations until there has been compliance with the rules.

### Problems Associated With Providing Occupational Safety

According to Department of Labour officials, problems in providing the necessary level of safety to railroad employees are both jurisdictional and substantive. The jurisdictional problem arises from the division of responsibility between Labour and CTC. The fact that CTC has not issued occupational safety rules appears to compound the jurisdictional problem.

The environmental hazards for railroad employees have been identified as follows:

- the potential for harm to those involved in welding because of the nitrogen dioxide fumes,
- the potential for harm from nitrogen dioxide to those employees spending long periods of time in the tunnels, and
- noise level in shops.

(The Department of Labour is, however, working with one of the railway companies to develop a pilot program of audio-metric examinations. This project may be a joint railroad/Occupational Safety and Health Division noise evaluation system. )

One other problem relates to the effectiveness of the regulations. The Department is required to conduct socioeconomic analyses when the cost of implementing a regulation has the potential of exceeding $10 million. The Department has the difficulty of obtaining the resources to conduct meaningful analyses.

## RAILWAY SAFETY ADVISORY COMMITTEE

One major initiative of RTC prompted by the safety inquiry was the establishment of the Railway Safety Advisory Committee in 1973. That committee is a tripartite committee with representation from the railroads, the unions, and RTC. Initially the committee was organized into working groups for addressing such matters as public disclosure of accident information, track inspection requirements, maintenance of signal devices and equipment, detection of rockfalls, and the development of standards for track right-of-way.

Since 1973, the committee has established four technical committees and one administrative committee: The administrative and technical committees that form part of the Safety Advisory Committee are:

- Orders and Regulations—Administrative/Legal Committee,
- Dangerous Commodities Technical Commit tee,
- Track and Structures Technical Committee,
- Crossings and Signals Technical Committee, and
- Rolling Stock and Operations Technical Committee.

Each of the technical committees has representation from the railroads, the unions, specialists as required, and RTC staff officers. The administrative committee consists of RTC staff members only since its responsibility is to translate the standards/criteria into orders and regulations. Working groups may be organized within each technical committee in order to explore specific issues in greater detail.

The technical committees operate under the principle that although they should attempt to integrate divergent points of view, they will not seek consensus.