Chapter II

CANADIAN RAILROAD SYSTEM

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A common assumption about the railroad systems in the United States and Canada is that they are directly comparable. Similarities in operational purpose, close geographic proximity, and commonality of technological systems imply that comparability. This chapter explores the validity of this assumption. It establishes a framework for the Canadian railroad system from which specific Canadian safety policies and programs are examined for their application to the United States.

The following sections describe: Canadian resources and demography; an outline history of the railroad system; and specific physical, operational, and economic characteristics of the system. The final section of this chapter summarizes the major relevant similarities and differences between the Canadian and U.S. rail systems.

BACKGROUND

Canada's population, geography, climate, and resources have played a significant role in the evolution of its transportation system. These characteristics, Government policies, and other transportation technologies continue to heavily influence the rail system.

Canada's land mass covers approximately **3,851,809** square miles.[1] Its varied terrain includes vast prairies, agricultural and forest lands, the rugged areas of the Laurentian Shield, the mountainous regions of the West, and the subarctic and arctic regions in the North. Its winter climate is more severe than many regions of the United States.

Canada's population is approximately *23* million, of which the majority *(58* percent) live between the U.S. border and a 650-mile east-west line from Sault Ste. Marie to Quebec City. Only one-third of Canada's land mass is developed. One-third of Canada's population lives in its eight largest cities, with Montreal and Toronto being the two largest metropolitan areas.[2]

Canada's railroads have been linked historically with the population settlement patterns and development of natural resources. The following briefly describes the history of the Canadian rail system.

[1] *Canada Yearbook: 1976-1977 Special Edition* (Statistics Canada, Ministry of Industry, Trade, and Commerce, December 1977), p. 3.

[2] Ibid. p. 4.

HISTORY

Canada's railroad system began in the 1830's when the lines established served primarily as portage roads. Substantial railroad construction did not begin until the 1850's with the development of the Grand Trunk.

Construction of the railroads connecting British Columbia and the Maritime Provinces to Montreal, was essential to the political union of Canada in the British North America Act of **1867.** The Intercolonial Railway was completed

in **1876** and the first transcontinental railway, the Canadian Pacific (CP), was completed in **1885.**[3]

The first transcontinental railroad, although perceived as a public enterprise, was initiated and built by private enterprise with substantial Government assistance. Its development was significant to the confederation, in part because of the potential expansionist policies of the United States at the time.' An agreement between the Canadian Government with CP for the construction and operation of the system included: a cash subsidy of *$25* million, a land grant of 25 million acres, and valuable tax and customs concessions.[5]

The railroads were perceived as tools of Canada's development. Early Government initiatives as well as the British North America Act established the central Government's jurisdiction, rather than provincial jurisdiction, for rail and water transportation services. In addition to being significant to the political union of Canada, the railroads were essential to its economic development. CP was a primary instrument of Government policy in settling the West and developing Canada's agricultural resources. Similarly the railroads were critical to the development of ports in the Maritime Provinces.

In *1897* the Crow's Nest Pass Agreement (sec. **271,** Railway Act) was signed. It established rates for shipment of grain moved by CP to certain ports. This rate stipulation was later expanded and applied to other rail operations including those of Canadian National. The Crow's Nest Pass requirements remain in effect today. Grain shipment rates are the only area in which Canadian rail rates have not been deregulated.

In addition to the transcontinental CP, two other lines connecting the western with eastern mainlines were established by 1915, the Canadian Northern and the Grand Trunk Pacific. The addition of these two lines resulted in significant financial overinvestment in terms of physical plant necessary for a country of *8* million people.[b] Too much line had been built for the amount of rail traffic available at the time.

As a result of the overinvestment in rail plant, the railroads, with the exception of CP, faced serious problems. In *1917,* the Canadian Government appointed a royal commission to investigate the problems. By **1923,** a number of railroads were consolidated to form the Canadian National (CN) Railways, a crown corporation with a Government-appointed board. The consolidation into a Government entity represented the integration of three private bankrupt railroads, four Government-owned systems, or *149* separate companies with **251** different security issues.[7]

At the outset, CN confronted significant, if not overwhelming, problems. Included among its problems were:

- an inherited debt of *$1,3 [1,448,713* (in *1922* its operating expenses were **$231.2** million and its gross revenues were **$234.1** million);
- an unnecessary duplication of line;
- deferred maintenance;
- nonstandard gauge track in areas of the system;
- fierce competition with CP which had initially offered to run the system; and
- political interference.[8]

Subsequent to the initial incorporation of CN, debts amounting to over $3 billion were backed or removed by the Canadian Government in *1936-37, 1951-52,* and in *1977.* In addition a balance of other ongoing subsidies have been met by the Government at various intervals. The 1977 Capital Revision Act removed substantial accumulated debts (approximately $2 billion) of CN. This Act placed CN in a

'"An Interim Report on Freight Transportation in Canada" (Transport Canada, June 1975), p. 1.

[4]W. K. Lamb, *History of the Canadian Pacific Railway (New* York, N. Y.: McMillian Publishing Co., Inc., 1977), pp. 73-74.

'Ibid., pp. 73-74.

[6]"An Interim Report on Freight Transportat on in Canada," op. cit., p. 2.

'Robert F. Leggett, *Railroads of Canada (New* York, N. Y.: Drake Publishers, 1973), p. 134.

[8]Leggett, op. cit., pp. 134-135; and G. R. Stevens, *History of the Canadian National Railway (New* York, N. Y.: McMillian Publishing Co., Inc., 1973), pp. 313-3]5.

significantly more favorable financial position. [9] In **1978, CN** achieved *$168* million in profits.

Between its genesis and the present, CN as a crown corporation diversified its operations. It controls several U.S. rail lines (Central Vermont; Grand Trunk Western; Duluth, Winnepeg, and Pacific), trucking lines, hotels, and other enterprises. Its air carrier operation became a separate crown corporation in the 1960's.

The Canadian Pacific Railroad, as a result of its vast landholdings and financial management, expanded and evolved into a highly diversified corporation known today as Canadian Pacific Limited. In the mid-1960's, the Canadian Pacific Railroad changed its name to Canadian Pacific Limited because the previous name did not reflect its many interests. Today CP Rail is one enterprise within CP Limited. As a conglomerate its current assets are approximately $5 billion.[10] Its enterprises include rail operations, air carriers, trucking, shipping, hotels, mining, real estate, forestry, telecommunications, and other investment holdings. CP Rail operations represented *22* percent of CP Limited's revenues in 1977.11

The transportation services of both CN and CP are not restricted to rail mode. They are multimodal transportation companies. The fact that rail companies operate trucking enterprises, however, has not prevented some erosion of rail's share of freight. Further, passenger rail service has eroded with competition provided by automobile technologies. Multimodal ownership does appear to influence the management structure and operation by providing the companies increased system flexibility to respond to new or available markets. The extent to which the companies use their flexibility is unknown. Current managements claim to maintain a competitive philosophy between the modes.

[9] *Canada Gazette*, vol. 3, no. **6,** pt. III, 26-27, Elizabeth II, ch. 34, Canadian National Railways Capital Revision Act.

[10] Canadian pacific publication supplied by E. Bradley, Director of Rules, Accidents, and Prevention, Canadian Pacific Railroad.

[11] *Annual Report, 1977* (Canadian Pacific Limited).

CANADIAN RAIL SYSTEM PHYSICAL PLANT AND EQUIPMENT

The Canadian National and the Canadian Pacific Railroads comprise the majority of the Canadian rail system. In 1975, these railroads controlled approximately 94 percent of the 43,000 miles of mainline track.[12] As indicated in table 12, most mainline track was in place by the late-1920's.[13] In **1976,** CP operated about 16,400 miles[14] of mainline and branchlike track and accounted for *38* percent of the total Canadian trackage. CN has approximately *25,000* miles of mainline and branchlike track and represents 56 percent of Canada's system.

Several other Canadian railroads operate as regional systems. These companies control the remaining 6 percent of Canada's rail trackage. Included among these companies are: the British Columbia Railway, which operates from North

Table 12.—Railway Trackage*

Year	Total miles in operation*
1900	17,657
1910	24,731
1920	38,805
1925	40,350
1930	42,047
1935	42,916
1940	42,565
1945	42,352
1950	43,979
1955	44,444
1960	43,029
1965	45,157
1970	44,983
1971	44,153
1972	44,025
1973	44,232
1974	44,260
1975	43,941

*Mainline track–defined as single track extending the entire distance between terminals on which the length of road is based

NOTE From 1971101975 Canada averaged 16000 miles of track of her than mainline

SOURCE *Canada Yearbook, 1976-77*

[12] *Canada Yearbook. 1976-77,* op. cit., p. 760.

[13] Ibid. p. 760.

[14] Data furnished by Canadian Pacific Rail, Sept. 29, 1978.

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V F N B h C mb p g g E h g m g
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N h Sh d b d R w p d
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p n B 960 h C d m h d
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CN d CP m p w d m T b d 4 d
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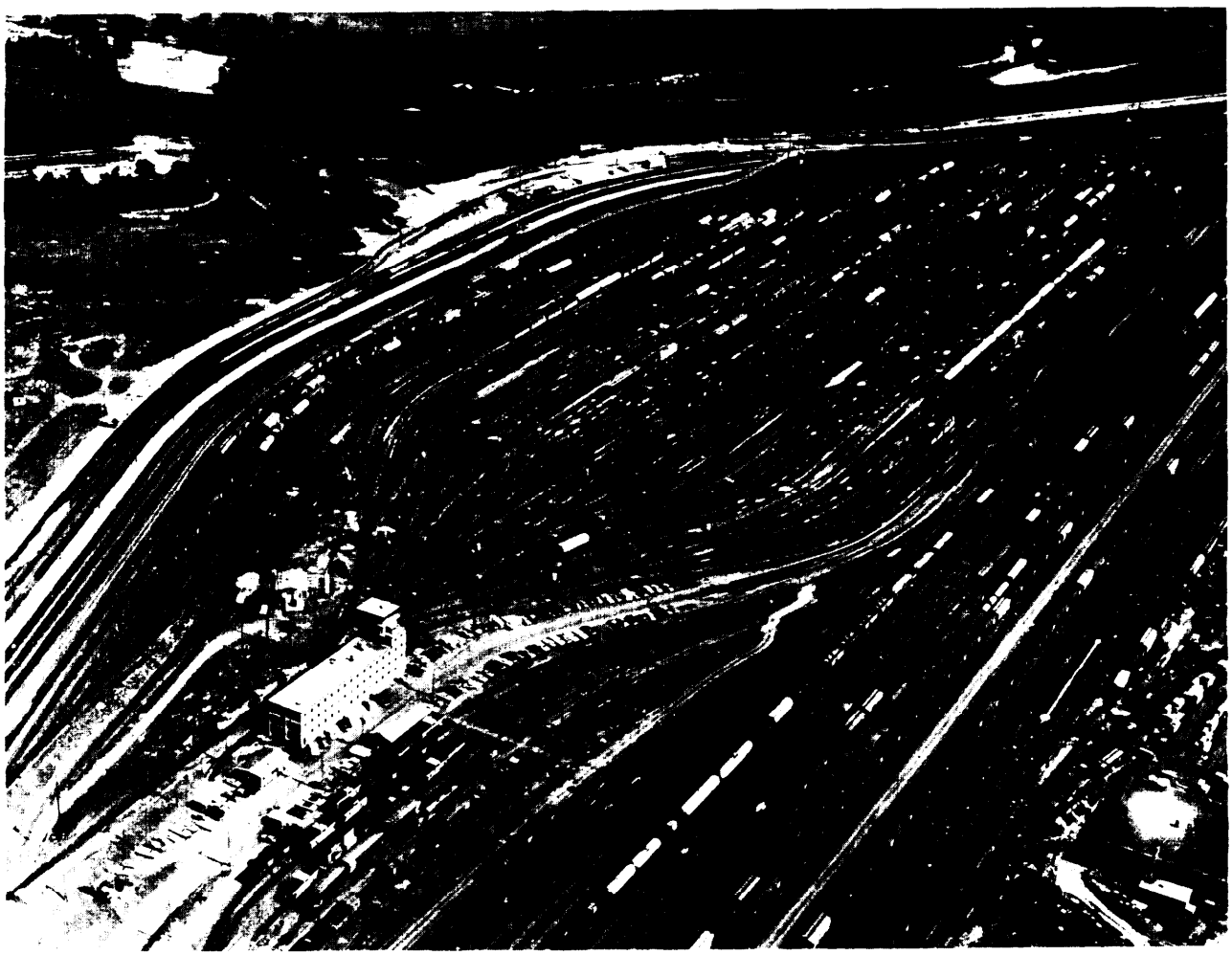

Photo CP Rail

Sorting —CP Rail's Alyth Yard in Calgary, Alta., is one of the most modern in Canada. Located on the railway's mainline, the yard contains sorting and hump yards, maintenance facilities for cars and locomotives, and repair facilities.

Table 13.—Locomotive Equipment

Year	Steam	Diesel-electric	Electric	Total
1960	403	3,308	41	3,752
1970		3,399	18	3,417
1971		3,449	14	3,463
972	—	3,598	14	3,612
1973	—	3748	14	3,762
1974		3870	16	3,884
1975		3963	16	3.877

SOURCE Canada Yearbooks.

ownership. The number of Canadian rail-owned freight equipment remained a relatively constant size between 1960 and 1975. As the table also indicates, the number of tank cars increased from 5,000 in 1960 to 14,700 in 1975, an increase of 194 percent. This increase is one clear indicator of an increase in the amount of hazardous commodities shipped by rail in Canada, although not all tank cars are used to ship dangerous commodities.

Canadian rail officials indicated that the Canadian fleet evolved to heavier axle loadings on freight equipment (100-ton cars) by the late-1960's.-'" Today the average freight car capacity in Canada is 64.6 tons.

"Interviews with Canadian National and Canadian Pacific Railroads Oct 10-11 1978

In addition to the evolution of the freight equipment fleet, the decline in number of passenger service cars indicated in table 14, demonstrates the declining rail passenger market.

The average employment for Canadian railroads in *1977* was over *107,000.* As in the United States, employment has dropped over the last two decades .17

'Letter, Canadian Railway Labour Association.

Table 14.—Freight Rolling Stock

Type	1960	1970	1971	1972	1973	1974	1975
Auto	7,249	2,178	2,280	2,607	2,579	2,617	2,776
Ballast	3,128	2,639	2,408	2,383	2,363	2,296	2,199
Box	111,217	101,746	99,904	97,162	95,239	95.538	92,669
Flat	12,645	18,043	19,738	20,414	22,010	24,898	25,733
Gondola	20,310	20,975	20,354	20,450	20,464	20,414	21,370
Hopper	15,578	24,496	25,175	25,539	26,464	27,398	29,287
Ore	5,930	6,735	6,819	7,241	7,371	7,151	7,731
Refrigerator	10,076	6,673	5,403	5,292	4,955	4,772	5,016
Stock	4,917	2,827	2,687	2,583	2,503	2,463	2,359
Tank	472	487	468	474	484	494	379
Other	31	1,938	2,080	2,320	2,320	2,851	3,689
Total	191,553	188,737	187,316	186,465	186,752	190,892	193,208
Tank	4,999	14,957	14,207	14,296	14,324	14,426	14,699
Other	32	1,254	1,353	3,778	3,384	4,504	7,301
Total	5,031	16,211	15,560	18,074	17,705	18,930	22,000
Passenger cars	5,119	2,801	2,516	2,383	2,175	2,056	1,936

SOURCE *Canada Yearbooks, /970-75*

RAILROAD FINANCIAL PICTURE

Agricultural, forestry, and mineral resources are among the most important natural resources in Canada and represent a significant part of rail freight tonnage. Historically rail, as a shipper of bulk commodities, has been important to the political and economic well-being of Canada. While rail was once the only freight transportation mode, trucking became a dominant transportation growth area and carrier of nonbulk commodities. However, in ton miles in Canada, rail has remained the dominant carrier with 55 percent of all intercity freight. Table 15 shows the modal split of the freight transport market between **1944** and **1968.** Table 16 shows the split among commodities carried in **1969** and 1974. As indicated by the first table, though still dominant, rail's share of the freight market declined from 1944 to 1968 by 20 percent. Truck and water transportation increased by 10 percent during that time period. As shown by the types of commodities in the second table, a large percentage of current rail freight is bulk commodities.[18]

Of 397.4 million tons of freight carried by rail and truck in **1972,** rail accounted for *57* percent of the tons shipped. However, of the *$4.26* billion in gross revenues earned by the two modes, truck claimed *52* percent of the revenues or $2.23 billion. " This combination of factors indicates the growth of trucking (competition for higher valued nonbulk freight in Canada. Rail depends heavily on bulk raw materials transport. However, it faces great competition from trucking for the transport of manufactured goods. [20] As Canada increases production of

[18]T.D. Heaver and J. C. Nelson, *Railway Pricing Under Commercial Freedom: The Canadian Experience* University of British Columbia, 1977), p. 24.

[19]Ibid., p. 23.

[20]ibid,, p.23.

Table 15.—Intercity Freight by Mode of Transportation in Canada (excluding pipelines), 1944-68

(billions of ton miles and percent of total by each mode)

Year	Rail		Road		Water	
	"on-miles	Percent	[on-males	Percent	Ton-miles	Percent
1944	'65 93-'	74	267	3	2031	23
1948	5908	68	519	5	2320	27
1952	6843	63	890	8	3087	29
1956	7883	61	1061	8	3941	31
1960	6545	56	1384	12	3687	32
1961	6583	54	1610	13	3938	33
1962	6794	53	1658	13	4295	34
1963	7580	53	1670	12	5012	35
1964	8503	52	1747	11	5919	37
1965	8719	53	1820	11	5782	36
1966	9510	53	1895	11	6441	36
1967	9410	55	1954	11	5715	34
1968	9686	55	21 13	12	5811	33

SOURCE Calculated from the Dominion Bureau of Statistics *Special Release* April 1969

Table 16.—Commodities Accounting for More Than 2 Percent of Rail Ton-Miles in 1969 and 1974 in Canada

Commodity	Rank in 1974	1974 ton-miles		1969 ton-miles	
		Millions	Percent	Millions	Percent
Wheat	1	1245	136	926	144
Bituminous coal	2	978	107	425	66
Potash	3	572	63	361	56
Sulfur	4	519	5.7	14.8	23
Barley	5	344	38	267	4.2
TOFC	6	33.3	36	247	38
Lumber	7	247	27	19.2	30
Freight forwarder and shipper associations	8	21	2 23	123	19
COFC	9	186	20	02	—
Total of commodities above		4636	507	2691	41 8
Total of all rail traffic		9155	100	6436	100

SOURCE Canadian Transport Commission Waybill *Andy s/s* 1974 and 1969

manufactured goods and nonbulk freight, historical trends indicate that truck competition with rail will also increase. Trucking regulation has historically been the jurisdiction of the provinces. Although the 1967 National Transportation Act gave some power to the central Government, the power has never been implemented so that jurisdiction is still exercised at the provincial level.

The declining number of passenger cars (cited in table 14) in the Canadian rail equipment fleet indicates a decline in rail passenger traffic. As in the United States, the rapid growth of the automobile and air passenger services were two dominant factors leading to the decline of rail passenger service. In October 1978, Transport Canada officially assumed full control and management of rail passenger services in Canada. A crown corporation called VIA Rail Canada Limited, purportedly similar to AMTRAK in the United States, has been established to provide rail passenger services. VIA Rail is responsible for the operation of all long-distance and intercity passenger services in Canada. It owns all passenger equipment and is completely responsible for the management and marketing of rail passenger services. VIA Rail trains run on CN and CP track on a leased basis.

From the annual reports and other available financial data, CP has shown steady growth in net income for the .5-year period 1973-77, with the exception of 1975, a recession year. Table *17* displays CP financial data. In 1975, CP Rail had a rate of return on net investment of 4.9 percent, compared to 6.3 percent in 1976 and 6.7 percent in 1977. Of total CP Rail revenues for 1977, Government subsidies for unprofitable branchlines and passenger services represented *8* percent.[2]1

In *1977, 15.7* percent or *$193* million of CP Rail's operating expenses was spent on track and facilities maintenance compared to *$108.6* million or 14.4 percent for 1973 as shown in table *18.* For CP, expenditures for track maintenance adjusted for inflation* increased approximately 25 percent over the 1973-77 time period. CP spent approximately $259 million on equipment maintenance in 1977 compared to *$158.2* in 1973, an increase of 15 percent in operating expenses. When viewed in constant dollars, total maintenance expenditures increased by 19 percent between 1973 and 1977 for CP. The ratio of track maintenance expenditures v. equipment maintenance expenditures remained constant over the time period.

Capital expenditures of CP for- roadway increased steadily from 1973 to 1977, with the exception of 1975. Table 19 shows the CP capital expenditures for the 1973-77 period. By 1977,

[2] *Annual Report* (Canadian Pacific Rail publications Sept 29, 1978)

*Canadian Consumer Price Index

Table 17.—Canadian Pacific Rail Financial Fact Sheet

Year	CPR net income (in millions)	Total CP limited net income	Percent rail	Year	Rate of return CPR
1973	"35 2	125	28	1 9 7 5 ,	4.9
1974	446	194	23	1 9 7 6 ,	6 3
1 9 7 5	31 7	175	18	1 9 7 7 .	6 7
1976	51 1	190	27		
1 9 7 7	548	247	22		

Year	CPR operating expenses including tax	CPR operating revenues		Revenue distribution 1975	1976	1977
1975	990,262	1,021,953	Freight	887,666	1,006,624	1,112,094
1976	1,111,849	1,162,946	Passenger. .,	21,497	21,708	21,541
1977	1,231,600	1,286,392	Other railway	26,188	29,862	35,878
			Coastal steamships	16,486	16,690	14,763
			Gov't. subsidy	70,116	88.062	102,111
				1,021,953	1.162,946	1,286,387

SOURCE Canadian Pacific annual reports.

Table 18.— Maintenance Expenditures for the Canadian Pacific Railroad, 1973.77 (dollars in thousands)

Year	Road	Percent of total operating expense	Equipment	Percent of total operating expense	Total	Percent of total operating expense
1 9 7 3	$108,600	14.4	$158,200	21.0	$266,800	354
1 9 7 4	130,100	141	188,500	20.5	318,600	34.6
(in 1973 constant $).	(117,300)		(170,000)		(287,300)	
1975	141.700	143	195,300	19.5	337,000	34.0
(in 1973 constant $)	(1 15,300)		(158,900)		(274,200)	
1976	167,600	15.3	216,800	19.5	386.400	348
(in 1973 constant' $).	(1 26,900)		(164.100)		(292,500)	
1 9 7 7		157	258,900	210	452,000	36.7
(in 1973 constant $) :	(135,300)		(181 ,400)		(316,700)	
Percent increase in 1973 constant $ from 1973-77	+ 24.6		+ 147		+ 18.7	

SOURCE Canadian Pacific Rail general publication

Table 19.–Capital Expenditures for the Canadian Pacific Railway, 1973-77 (dollars in thousands)

Year	Rolling stock	Percent of total	Diesel units	Percent of total	Road*	Percent of total	Maintenance shops	Percent of total	Total
1 9 7 3	$7,973	13	$23,476	39	$25,362	43	$2,682	5	$59$793
1 9 7 4	17,592	24	19,139	26	34,457	47	2,204	3	73,392
(1973 $)	(15,900)		(1 7,200)		(31,100)		( )		(66, 179)
1 9 7 5	30,441	32	24,509	26	36,184	39	2,556	3	93,690
(1973 $)	(24,700)		(19,900)		(29,400)		(2,100)		(76,233)
1 9 7 6	31,199	32	12.145	13	48,450	50	4,955	5	96,749
(1973 $)	(23,600)		(9,200)		(36,700)		(3,800)		(73,239)
1 9 7 7	13,130	13	16,134	16	61,406	61	10,771	10	101,441
(1973 $).	(9,200)		(11,300)		(43,000)		(7,500)		(71 ,087)
Percent Increase (+) or decrease (-) in 1973 $ from 1973 -77	+ 15		- 5 2		+ 70.0		+ 180		+ 18.9

*Includes rail ties ballast and road maintenance machines
SOURCE Canadian PacificRail generalpublication

CP's capital expenditures for track accounted for roughly *60* percent of its total capital expenditures budget. Rolling stock accounted for *30* percent (rolling stock and diesel units combined). According to CP officials, the shift in capital expenditures for track "was a conscious management decision in response to a perceived need. The introduction of the 100-ton nominal capacity freight car and the six-axle diesel electric locomotive led to the realization that the existing track structure was simply not strong enough."[22] The capital expenditures budget for CP from *1973* to **1977** increased by *18.9* percent when measured in constant dollars .23

In the aggregate, the U.S. railroads ratio of capital expenditures for track v. equipment for the 1973-77 period was roughly *30* percent for track and *70* percent for equipment as shown in table *20.* In comparing the U.S. aggregate with the CP data, the difference in ratios of capital expenditures for track v. equipment may have several possible explanations: a difference in the availability of capital for railroads in the two countries, differences in management philosophy, a difference in industry accounting mechanisms, and Government tax structures. According to rail officials "Canadian corporate income tax laws tend to lead to economic evaluation which, as a whole, strongly favors rebuild (maintenance) as opposed to renewal (capital) particular] y for equipment. "[24]

Table 20.—Capital Expenditures—U.S. Class I Carriers (dollars in thousands)

Year	Equipment	Percent of total	Road/ structures	Percent of total	Total
1973	$ 892,700	67	449.400	33	$1.342.100
1974	1,038,100	66	527.300	34	1.505.400
(1973 $)	(935.200		475.000)		(1.410.270)
1975	1,303300	73	486.400	27	1.789.700
(1973 $)	(1,076,200		401.700)		(1.477.870)
1976	1,174,800	68	549.900	32	1.734.700
(1973 $)	(917, 100		454.100)		(1.354.176)
1977	1,540300	67	750.900	33	2.291.200
(1973 $)	(1, 128,400		550.100)		(1.678.535)
Percent Increase in 1973 $ from 1973-77	+ 26		+ 22		+ 25 11

SOURCE: *Railroad Factbook, 1977.* Association of American Railroads. Consumer Price Index

[22]Review comments letter on preliminary draft of (IT A: *Railroad Safety AUS (Canadia)* 1 Compan●, ,ireceived from Char-1(+ Pike, Chief Mechanical Officer Canadian Pacific Rail, Jan. 23, 1979

[23]Data turnished by Canadian Pacific Rail, Sept 29 1978

[24]Letter from Charles Pike op cit Jan 23 1979

COMPARISON BETWEEN U. S.= CANADIAN RAIL SYSTEMS

Several comparisons can be made between U.S. and Canadian railroad systems. These comparisons may influence safety directly or indirectly.

a. As a result of the severe Canadian winter, Canadian rails may require somewhat different maintenance procedures and practices than required by many U.S. carriers. It appears that Canadian climate does influence the number of accidents and may also adversely affect employees working in this environment.

b. Due to the considerably smaller Canadian population, and fewer miles of rail, there is statistically less exposure of the Canadian population to rail safety hazards (dangerous commodities, hazards, etc.). In size, the Canadian mainline rail trackage is *43,000* miles compared to *200,000* in the United States. Canada's population is *23* million whereas the U.S. population is *220* million people. The general ratio of population to rail trackage is 535 people to 1 mile of track in Canada, compared to 1,075 people to 1 mile of track in the United States. This comparison should be considered only in a general context as population density and traffic volume are two variables necessary to determine specific exposure rates.

c. Because of the smaller population base, and the fewer and smaller urban areas, Canada may be expected to have a less severe "trespassing" safety problem than that potentially associated with congested urban areas in the United States. One-third of Canada's population is located in eight large cities. Of these cities Montreal and

Toronto are the largest, with populations of 1,214,352 and 712,786 respectively as of 1971. It is assumed that a majority of trespasser fatalities occur near populated areas. No data or correlations have been made to determine this assumption.

d. The existence of only two major rail carriers in Canada may have facilitated Government and railroad formulation of operational and other policies. A specific example of this is the Uniform Code of Operating Rules, which has been a Government standard for all railroads in Canada since *1958.*

e. In *1976,* the United States had approximately 56 class I carriers that accounted for *99* percent of the revenue traffic and *96* percent of rail mileage. Of the 56 carriers, approximately 10 accounted for 80 percent of the operating revenues.[25] In contrast, Canada has only two major rail carriers, CN and CP. These railroads account for 94 percent of Canada's rail trackage and *90* percent of its revenue traffic.

f. The transcontinental nature of the Canadian system may allow its rail managements greater flexibility in freight traffic control and also in scheduled maintenance and repair of freight equipment.

g. Canada, like the United States, introduced diesel locomotives which subsequently allowed for increases in the size and capacity of freight cars. Increased productivity resulted, However, these factors appear to also increase track wear and may influence safety. Railroad maintenance procedures could offset the impact of increased track wear.

h. From limited data, CP appears to be increasing capital expenditures in track and facilities more significantly than increases in its expenditures for equipment. In contrast, while aggregate U.S. expenditures (in constant dollars) for track have increased 22 percent, the percentage ratio of total capital expenditures for track v. equipment is remaining the same. These ratio's appear to have occurred for several reasons: 1) the Canadian railroad may have available more cash for track investment; 2) in Canada, though the average capacity per freight car has not increased as much as in the United States, the effect of changes in technology were recognized and the pace of mainline plant replacement and upkeep was considered significant to the overall operation; 3) Canadian plant lifecycle was such that replacements may have been needed; and 4) tax structures and other financial incentives were different in Canada than in the United States.

i. As in the United States, the introduction of the automobile and increase in its usage brought greater exposure to rail-highway grade-crossing risks. Similarly the rise in auto and air transportation led to the decline in rail passenger traffic, a factor that naturally reduced the number of people exposed to rail-related hazards.

j. Both countries are experiencing increases in rail transportation of dangerous commodities. This results in an increased exposure level of both populations to the potential hazards of these commodities.

[25] "A Prospectus for Change in the Freight Railroad Industry," October 1978, A Preliminary Report, U.S. Department of Transportation.