Newsletter

INCORPORATED 1952 NUMBER 196 MAY, 1962

5300's Arrive

UPPER CANADA RAILWAY SOCIETY
BOX 122 TERMINAL "A" TORONTO, ONTARIO

There is a greater use of stanchions with these cars, and the retracting hand-holds of the older equipment have been replaced by horizontal grab bars. The carbody interior is decorated in shades of blue, grey and yellow in an eye-pleasing combination. Rounded corners have been used wherever possible to facilitate interior cleaning.

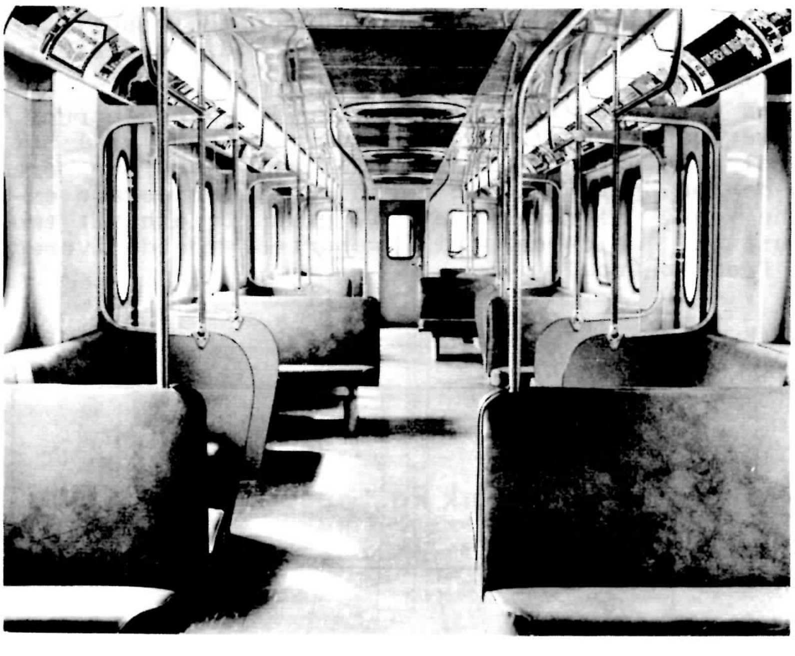
The carbody is constructed largely of aluminum alloys. Various extrusions of aluminum are used for body rails, posts, louvre frames and trim. Low alloy steel has been used for the underframe ends including centre and side bearings, coupler anchors and anticlimbers. The main longitudinal underframe members are aluminum extrusions, while the cross-members are steel. Body side sheets are corrugated below the belt rail for enhanced appearance and strength.

TRUCKS: An inboard bearing truck frame is used, this having been made possible by the adoption of lightweight traction motors as well as hypoid gearing (as used on all PCC cars). Truck frames and bolsters are of cast steel fabrication. Combined coil and air springs are provided to solve close clearance problems, and hydraulic shock absorbers stabilize the body in the horizontal plane. A newly designed traction motor by CGE, rated at 125 hp., is required to meet the performance requirements of the long cars.

The pneumatic element of the multiple braking system employs one composition brake shoe per wheel. The current collectors and trip cocks are mounted on a wooden beam which is attached to the truck frame through the brake cylinder units.

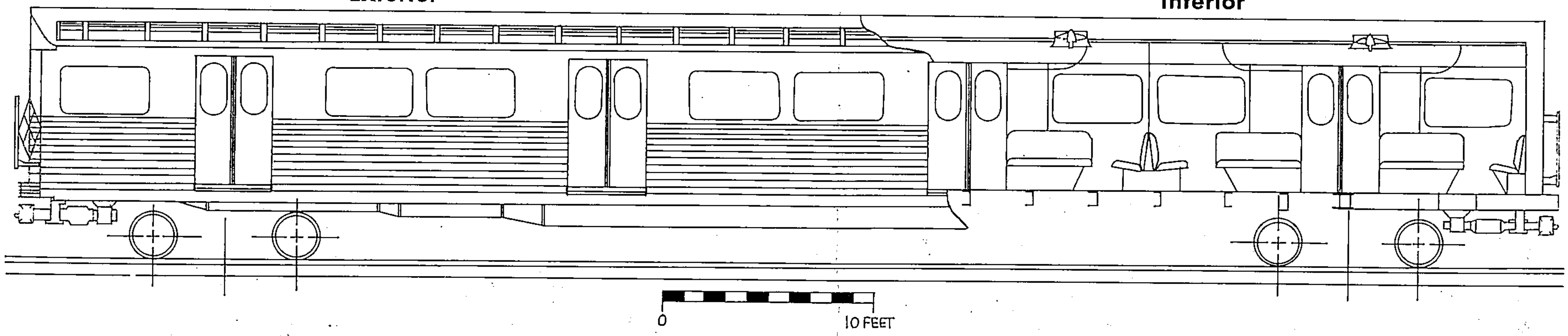
CONTROL: A motor driven camshaft and magnetic contactor propulsion control is used on the new cars. The 29 position drum controller is used for all functions including dynamic braking. The cars can be operated on the same schedule as the older cars by means of a performance selector switch that sets the acceleration rate to either 1.9 mph/sec. or 2.5 mph/sec. The use of air springs allows car loading to be measured and this information used by the motor and braking controls to maintain constant acceleration and braking rates regardless of the load on the car. This is accomplished by an air operated variable resistance type of transducer.

BRAKING: The system for controlling the dynamic and air brakes is essentially electro-pneumatic. Air brakes are applied automatically as the dynamic brake fades at very low speed or if it fails completely. A complete pneumatic system is supplied for use in the case of a failure of the power supply, for use of the passengers' emergency train stop, and for the signal system (trip cock) train stop. If the dynamic brake fails on a single car, the electro-pneumatic brakes take over on that car only. All three brake systems are matched as closely as possible so that equal retardation is provided by a given controller position regardless of the system in use.



Interior of 5300

ELEVATION



Specifications

Length over coupler faces	- 74' 5 5/8"
Width over sill sheets	- 10' 3 7/16"
Height	- 11' 11 1/2"
Weight Empty	- 64,500 lbs.
Weight Crush Load	- 109,000 lbs.
Seating Capacity	- 84
Total Capacity	- 310
Trucks	- Dofasco cast steel inboard
Truck Centres	- 54' 0"
Truck Wheelbase	- 6' 10"
Wheel Diameter	- 28"
Gear Ratio	- 7.14:1
Traction Motors	- CGE 125 h.p.
Traction Control	- CGE simplified cam magnetic
Acceleration Rates	- 2.5/1.9 mphps aver. to 20 mph.
Brake System	- West. electro-pneumatic controlling dynamic with standby pneumatic
Compressor	- Vertical 2 cyl. 2 stage, motor driven
Door Openings	- 3' 9"
Couplers	- Can. Ohio Brass Tomlinson automatic
Heat	- Dynamic brake waste heat recovery with auxiliary electric heat (Vapour Heating Co.)
Motor Alternator Set	- Motor- 600 V.D.C. 14 hp. Alternators- Brushless Output 1- 600 V. 400 cycle 2 phase (lighting) Output 2- 37½ V.D.C. 3 phase Blowers- 2 fans each delivering 1500 c.f.m.
Exterior Finish	- Aluminum alloy sheet with air brushed finish

Part 2

The Economic Results of Diesel Electric Motive Power on the Railways of the United States of America

by H. F. BROWN, Ph. B., Fellow A.I.E.E.,
Consulting Engineer, Gibbs & Hill, Inc., New York, N.Y.

THE BASIC DIFFERENCES

What then, are the basic differences in the two types of motive power and was the right thing done in the mass conversion that took place? Prior to 1939, there were only 90 diesels in road service and, because they were used in preferred service on long runs, they could be used to the limit of their availability, which was high, and hence produced apparently great savings over comparable steam operations. The basic differences in the two prime movers is shown in Fig. 18, where two locomotives with equal weight on their drivers are compared. It can be seen that the diesel has a higher tractive effort at low speed and hence is less likely to stall with a given load than is the steam engine with its limited tractive effort at low speeds. However, at operating speeds, the higher horsepower, and hence the ability to maintain higher speeds with the same load, is obvious. It should be clear from the foregoing too, why three diesel units are often assigned to high speed trains in this area that formerly used only one Northern type engine. The high starting tractive effort is not required, but the high horsepower is necessary to maintain the operating speed. As a result, it is not surprising to see that the average locomotive in 1957 consisted of 2.4 diesel units and consulting Fig. 3, one sees that steam locomotives of equal horsepower had already been developed for over 20 years. Thus, had modern steam locomotives been used in 1957, only 7870 of them might have done the work of the 18,959 diesels actually used.

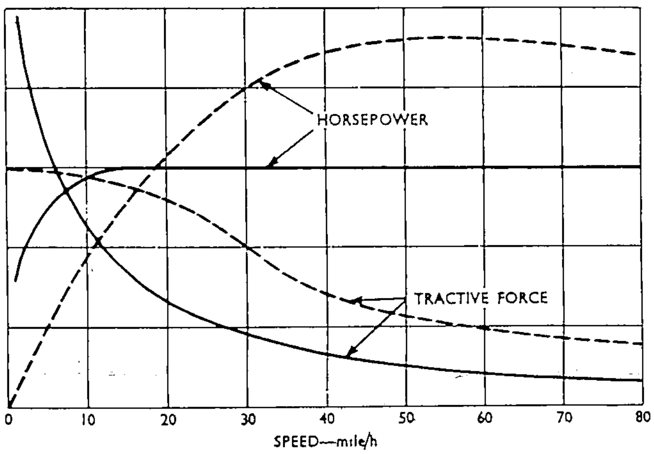


Fig. 18. Comparative horsepower and tractive force, steam and diesel locomotives of same weight on drivers

— — — — Steam.
———— Diesel.

AVAILABILITY

One of the more desirable attributes of the diesel is its 90% availability when new. Similarly, modern steam locomotives would have an availability of 60% when new, but the availabilities of both types of motive power reduce as the units age. To establish a fairer basis of comparison of operating costs of diesel locomotives (not units) versus modern steam power, it should be assumed that the number of serviceable engines is inversely proportional to their availabilities. Thus 90/60 x 7870, or 11,800, steam locomotives would be the hypothetical equivalent of the 18,959 diesel units of 1957.

THE EFFECT ON THE NUMBER OF TRAINS AND TRAIN-MILES

Next, author Brown considers the effects of diesel operation on the number of trains, and hence the number of train-miles, operated from 1953 to 1957. Fig. 7 shows that train-miles declined drasticly after 1946. Did the diesel have anything to do with this? Diesel manufacturers claim that the principle of multiple-unit operation enabled the scheduling of fewer but longer and faster trains, thereby making great savings in labour costs. However, Fig. 3 shows that from 2 to 5 diesel units are necessary to equal the horsepower of the available steam power, hence, multiple-unit operation is not a virtue but a necessity.

This drop in train-miles must be explained in either of two ways. First, the tonnage of two trains could have been combined into one longer train and the number of diesel units increased. This would decrease the number of train-miles but increase the number of diesel units per train in proportion to the reduction in train-miles. Or, secondly, the same increase in cars-per-train and tons-per-train, as well as the reduction in train-miles, could be accomplished by withdrawing any remaining short-haul runs. The long-haul traffic remaining would show the characteristics of Fig. 8 due to the elimination of the shorter trains that decrease the average train length, and the number of diesel units per locomotive would need rise only slightly.

Statistics on diesel operations alone have been available only from 1953 on and these figures show that train-miles decreased from 492 to 447 million, or 10% from 1953 to 1957. Meanwhile, gross tons per train rose from 2870 to 3220 (12%) and cars per train rose from 64 to 70 (9.3%). However, units per locomotive rose only 5.3% indicating improved operating skills, rather than superior motive power, was responsible for the utilization of train-miles. Thus, the second explanation best fits the observed data.

ANALYSIS OF OPERATING EXPENSES

When one compares repair costs on an equivalent basis, it is not surprising to see the diesel, with its multitude of complex wearing parts, far outstrip steam and electric locomotive costs. Fig. 21 shows the equivalent costs as the units age. Graph "A" is a calculated cost for a locomotive with an economic life of 15 years, if such were possible. Irregardless, repair costs have decreased, and the reason for this is shown in Fig. 19, where the repair costs and the product of number of locomotives and their age is shown. Both curves follow each other closely.

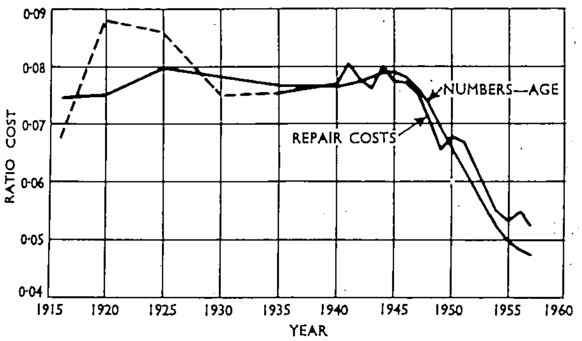


Fig. 19. Road locomotive repair costs, all class I railways compared with the numbers–age graph

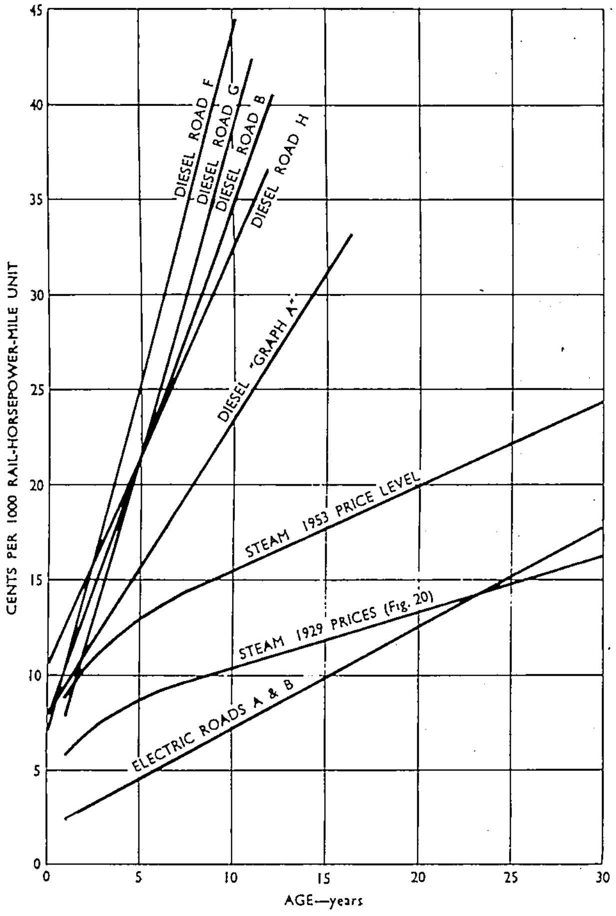


Fig. 21. Comparison of steam, diesel, and electric locomotive repair costs on basis of 1953 price level

OVERALL COMPARISON

As a final consideration, it is interesting to compare actual costs of dieselized operation in 1957 with hypothetical costs had steam traction been retained, but the overall traffic patterns been allowed to develop as they did. These comparative costs are shown in Table 4.

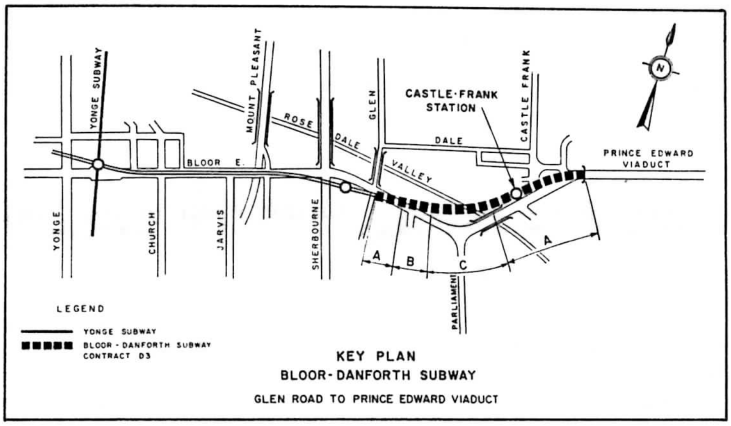
Summarising the main details of the above table, it may be seen that diesel locomotives, in toto, would have made operating savings of $137 million over steam operation, on the basis of 1957 costs. However, the total investment would be $1800 million greater for diesels, and fixed charges would also be $165.5 million greater, or the operating savings are exceeded by costs by $28.5 million. Further reference to the table reveals that savings realised in yard operation are not realised in road service by diesels. There is nothing to justify the hollow claim that diesels will produce a 30% return on their investment. If this were so, lower operating ratios and increased earnings would immediately result, but, in fact, earnings in the 1950's were less, in spite of higher traffic volume, than in 1925 to 1930 when all motive power was either steam or electric.

INDIRECT CONSIDERATIONS

Although diesels are generally cleaner, they still require expensive ventilation equipment in long tunnels and should be excluded from built-over

ENCLOSED BRIDGE over Rosedale Valley, designed by De Leuw Cather & Co., forms part of D-3 subway contract

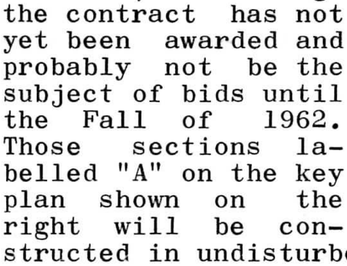
Soundproof span for subway



Certain basic construction details on the Bloor Subway contract D - 3 (Glen Road to the west end of the Prince Edward Viaduct) have been released, although the contract has not yet been awarded and probably not be the subject of bids until the Fall of 1962. Those sections labelled "A" on the key plan shown on the right will be constructed in undisturbed soil using standard single and double track reinforced concrete box sections. The easterly section will also include the structural elements of Castle Frank Station and the bus loop at this location.

Section "B" involves unstable earth (filled ground placed on the sidehill of the Rosedale Ravine to accommodate Bloor Street) and would have double track reinforced concrete box sections supported on vertical and battered foundation piles which penetrate to the undisturbed earth beneath.

Section "C" is an elevated structure used to cross the Rosedale Valley ravine. The diagram illustrates how the alignment of the rapid transit line will ease the "V"-bend in Bloor Street, with a curve of 1000 foot radius on this elevated structure. The elevated section will be 522 feet in length, involving a 206-foot reinforced concrete open spandrel arch bridge (mentioned previously in the Newsletter) and seven continuous, reinforced concrete approach spans, each of 48 feet, four to the west of the arch, and three to the east. A thin reinforced concrete shell will enclose the tracks (see cross section on left) for the full length of the above-ground section, having a curved outline chosen for its external aesthetic appeal only. The purpose of the shell, of course, is to avoid visibility of the subway trains for residents of the nearby apartment buildings (and vice versa), although the wall of the enclosure will create a visible block at least from certain floors of these buildings, and there is room for doubt that all residents thereof will necessarily welcome it.



The approach spans have been chosen in lieu of fill in order to preserve trees and the vista along the Rosedale Valley - another concession to the aesthetic appeal of the

Timetable Changes

* With the spring change from Standard to Daylight Saving Time comes a new set of passenger timetables from the C.N. and C.P. Besides the usual seasonal adjustments, there are several major changes.

In Quebec, the C.N. has added one run in each direction between Quebec and Montreal while deleting trains 171 and 172 between Quebec and Riviere a Pierre.

On the Montreal - Toronto service, nos. 18 and 19 now leave 15 minutes after nos. 16 and 17 respectively, except on Sundays when they follow their former schedules carrying the numbers 118 and 119. In addition to those listed in Newsletter 195, other changes have been made in the Toronto - London service. Nos. 83, (183), 75, 80 and 82 have been cancelled, while no. 77 now provides local service to points where the accelerated no. 17 no longer stops. Between London and Windsor nos. 18 (118), 83 (183) and 12 have been cancelled but no. 106 replaces 12 as the Intercity Limited service.

On the Niagara Peninsula, No. 83 has been cancelled while 694 now leaves Hamilton at 2:30 pm. rather than 7:05 pm., having originated at Dundas where it connects with no. 6. No. 695 now leaves Niagara Falls at 5:20 pm. rather than 8:15 pm., while a new (sic) train, no. 89-90 leaves Niagara Falls at 6:15 pm. and arrives in Toronto at 8:55 pm. Since this is the third set of changes in as many timetables, it seems that the C.N. is still looking for the right combination of services for this area.

On the Brampton Subdivision, no. 34 has been cancelled, but a new train, no. 26 provides another early morning service from London (4:00 am.) to Toronto (7:50 am.)

Two other changes strike the eye on glancing through the new folder. Gone are the tiny "read up" or "read down" instructions; their function is now served by bold arrows at the top of each table. For the first time ever, the C.N. folder is completely bilingual. Former tables gave French notes only for services in the province of Quebec.

Few differences are evident in the latest C.P. system folder which carries the same cover as it has for the last four consecutive summers. With the withdrawal of the gas-electric car from the 22-mile Fredricton Junction to Fredricton (N. B.) run goes the last operation of this type of rolling stock on Canada's major railways.

5300-01 show off, May 2nd.