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Vehicle Weight Regulations Across Canada: A Technical Review with Respect to the Capacity of Highway Systems

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Abstract

The diversity in Vehicle Weight Regulations among provinces in Canada seems to deter the interprovincial highway carrier activities; however, a recent technical evaluation of these regulations indicates that the regulations do not, in fact, greatly differ in terms of their force effects on the highway structures. Because Canadian highway systems are designed, by and large, to the same load-carrying capacity and geometric standards, the interprovincial differences in the vehicle weight regulations may be unnecessary from a technical point of view.

Contents

1/Introduction

In accordance with the British North America Act, highway matters are under provincial jurisdiction in Canada. Regulations concerning the control of heavy commercial vehicles vary from one province to another and reflect the different economical, geographical and political conditions of the individual province. Until recent years railways were considered to be the primary freight carrier; but now the trucking industry, due to its greater mobility, ever-increasing payload capacity and speed, is apparently adopting this role. Naturally, it is in the best economic interest of the country as a whole to promote an increased volume of interprovincial highway carrier activities. However, the diversity in regulations between adjacent provinces seems to deter such activities.

The load-carrying capacity of the highway system depends upon highway structures, such as bridges and pavement, which are primarily designed to the same load-carrying capacity and geometrical standards throughout the country. In light of this fact two questions arise. The first one is whether interprovincial differences in the vehicle weight regulations are necessary. The second is whether these differences are real from a technical point of view. While it is perhaps prudent to leave the first question unanswered, our interest is focused on the second.

In this report the vehicle weight regulations in a number of provinces are reviewed on a technical scale and results are compared. It is concluded that although the regulations in these provinces are seemingly worlds apart, the force effects on highway structures caused by the loads permitted by these regulations do not differ widely.

The purpose of this report is not to suggest or propose any modification to the vehicle weight regulations in various provinces but to initiate a dialogue between the provincial authorities to help define an acceptable common ground for vehicle weight control.

2/Basis of Comparison

The concept of "Equivalent Base Length", a load transformation procedure, permits a relatively simple comparison between various load regulations. Equivalent base length, B_m, as illustrated in Figure 1, is defined as the length over which the total weight on a group of axles can be uniformly distributed to cause force effects in a bridge structure similar to those caused by the group of axles. This transformation makes it easier to determine the force effects caused by a vehicle or a part thereof.

Through an in-depth study, an operational level of the load-carrying capacity of bridge structures in Ontario, designed in accordance with the existing AASHTO standards, was established. This load level, commonly known as the "Ontario Bridge Formula", is shown in Figure 2 and forms the basis of heavy vehicle weight control in the Province of Ontario.

An "Acceptance Test Diagram" similar to Figure 2 is an excellent tool to evaluate a loaded vehicle, and hence, the vehicle weight regulations, against the technical capability of the highway system. An example truck is displayed on the acceptance test diagram in Figure 3 in which the full truck or any of its subconfigurations is represented by a single point. If the point lies below the Bridge Formula curve, the subconfiguration is considered to be safe for regular operation on the highway. The subconfigurations above the Bridge Formula curve are unacceptable for safe regular operation.

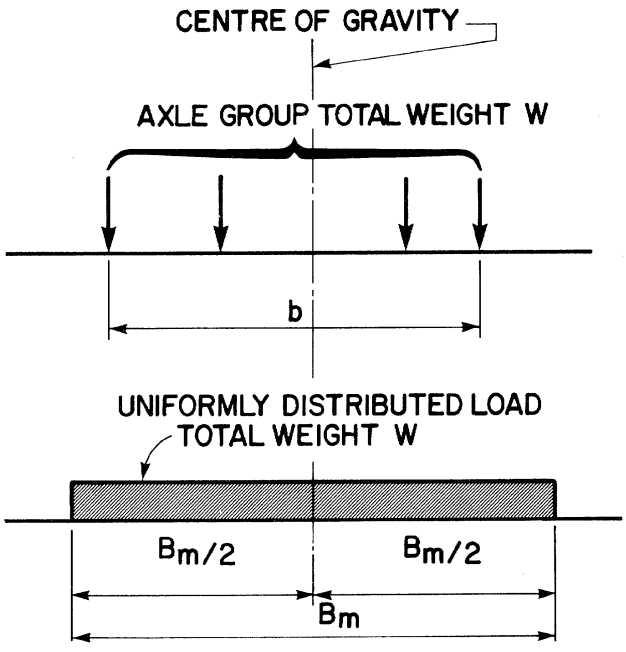

Figure 1, Equivalent Base Length Concept

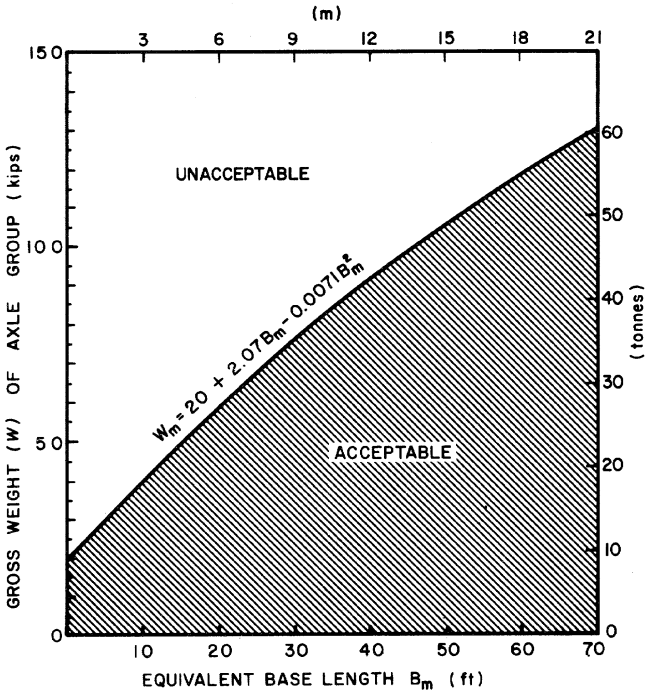

Figure 2, Acceptance Test Diagram

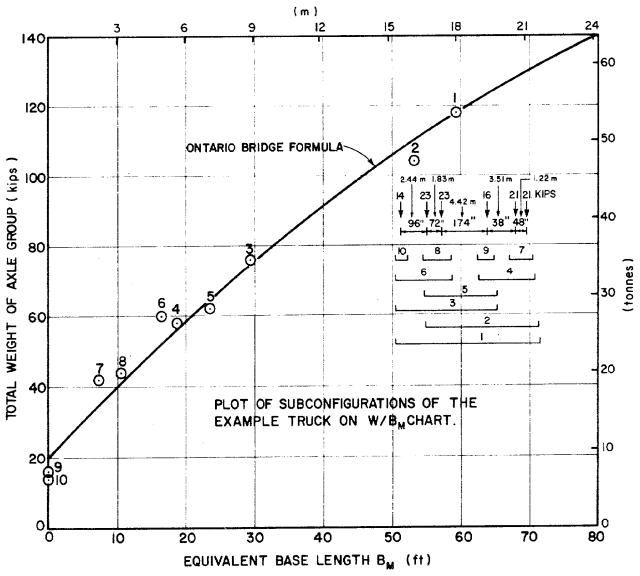

Figure 3, Plot of Subconfigurations of the Example Truck on the Acceptance Test Diagram

3/Vehicle Weight Regulations for Regular Operation

The information used in the following study was extracted mainly from the Highway Traffic Acts and Regulations from various provinces in effect during the year 1974. During the spring session of the RTAC Vehicle Weights and Dimensions Committee in June 1977, only a few modifications were suggested and this study has been updated accordingly.

The vehicle weight regulations for regular operation on the primary road systems of various provinces are summarized in Table 1. These regulations have apparent differences which are important for normal interprovincial truck movement. Western provinces generally permit a greater overall length of vehicle combinations but restrict the maximum gross weight to a lower limit compared to most of the eastern provinces. The maximum permissible gross weight is lowest in the Province of Nova Scotia at 80 kips (36 287 kg), and highest in Ontario at 140 kips (63 503 kg).

Permissible axle weights are fairly uniform across the country. All provinces permit 20 kips (9 072 kg) on a single axle except for 22 kips (9 979 kg) in Quebec and 18 kips (8 165 kg) in Newfoundland.

The International Road Transport Union (IRU) resolution made in 1970 for the European countries is also included in Table 1. The IRU resolution permits heavier axle weights but restricts the gross weight below 100 kips (45 359 kg). This effectively discourages the use of long vehicle trains.

Table 1, Length and Weight Requirements for Commercial Vehicles

Province	Maximum Axle Weight Kips		Maximum Gross Weight Kips	Maximum Length of Combination Ft.
	Single	Tandem		
Newfoundland	18.0 (8 165 kg)	32.0 (14 515 kg)	112.0 (50 802 kg)	65 (19.8 m)
Nova Scotia	20.0 (9 072 kg)	35.0 (15 876 kg)	80.0 (36 287 kg)	65 (19.8 m)
New Brunswick	20.0 (9 072 kg)	40.0 (18 144 kg)	125.0 (56 699 kg)	65 (19.8 m)
Prince Edward Island	20.0 (9 072 kg)	35.0 (15 876 kg)	110.0 (49 895 kg)	65 (19.8 m)
Quebec	22.0 (9 979 kg)	38.0 (17 237 kg)	126.0 (57 153 kg)	65 (19.8 m)
Ontario	20.0 (9 072 kg)	40.0 (18 144 kg)	140.0 (63 503 kg)	65 (19.8 m)
Manitoba	20.0 (9 072 kg)	35.0 (15 876 kg)	110.0 (49 895 kg)	65 (19.8 m)
Saskatchewan	20.0 (9 072 kg)	35.0 (15 876 kg)	110.0 (49 895 kg)	70 (21.3 m)
Alberta	20.0 (9 072 kg)	35.0 (15 876 kg)	110.0 (49 895 kg)	70 (21.3 m)
British Columbia	20.0 (9 072 kg)	35.0 (15 876 kg)	110.0 (49 895 kg)	72 (21.9 m)
Yukon Territory	20.0 (9 072 kg)	40.0 (18 144 kg)	132.0 (59 874 kg)	70 (21.3 m)
IRU Resolution 1970	28.7 (13 000 kg)	46.2 (21 000 kg)	99.2 (45 000 kg)	59 (18.0 m)

3.1/Ontario Regulations

Figures 4 and 5 display the heaviest axle combinations permitted by the Ontario Bridge Formula, and therefore, represent the vehicle weight regulations in Ontario. The maximum overall vehicle combination length permitted is 65 feet (19.81 m) which would accommodate vehicle base lengths up to about 60 feet (18.29 m). It may be noted that with a proper vehicle design it is possible within Ontario regulations to carry up to 140 kips (63 503 kg) gross weight on a base length of 60 feet (18.29 m) using eight axles. Although vehicles with nine or more axles are also in operation, but under the Bridge Formula regulations, they are generally not capable of carrying heavier weights than the eight axle vehicles.

The axle combinations taken from Figures 4 and 5 are displayed on the acceptance test diagram in Figure 6. The Ontario Bridge Formula curve completely envelopes all the axle combinations and their subconfigurations.

3.2/Regulations of Other Provinces

Figures 7 to 15 display the vehicles permitted by the regulations in various provinces. Following is a summary of observations of these diagrams:

1. Newfoundland
   - Low permissible weight on axle and tandem.
   - Axle group weights generally close to the Ontario Bridge Formula.
   - Low maximum limit to permissible gross weight.
2. Nova Scotia
   - Heavy tandem.
   - Axle group weights generally close to the Ontario Bridge Formula.
   - Very low maximum limit to permissible gross weight.
3. New Brunswick
   - Excellent agreement with the Ontario Bridge Formula.
   - Reasonable limit to maximum permissible gross weight.
4. Prince Edward Island
   - Heavy tandems.
   - Axle group weights generally close to the Ontario Bridge Formula.
   - Low limit to maximum permissible gross weight.
5. Quebec
   - Heavy permissible weights on single axle and axle units.
   - Heavy gross weights on short and intermediate size trucks.

- Truck trains generally close to the Ontario Bridge Formula.
- Reasonable limit to maximum permissible gross weight.

6. Manitoba
   - Axle and tandem weight in agreement with the Ontario Bridge Formula.
   - Heavy permissible weights on axle groups.
   - Low limit to maximum permissible gross weight.
7. Saskatchewan
   - Heavy tandems.
   - Gross weight on short trucks close to the Ontario Bridge Formula.
   - Gross weight on other trucks about 10 kips (4 536 kg) less than the Bridge Formula.
   - Low limit to maximum permissible gross weight.
8. Alberta
   - Tandem weights close to the Ontario Bridge Formula.
   - Gross weights generally about 15 kips (6 804 kg) less than the Bridge Formula.
   - Low limit to maximum permissible gross weight.
9. British Columbia
   - Tandem weight close to the Ontario Bridge Formula.
   - Gross weights generally about 15 kips (6 804 kg) less than the Bridge Formula.
   - Low limit to maximum permissible gross weight.

In the Yukon Territory, the Ontario Bridge Formula appears to be the basis of vehicle weight control.

It is clear that Ontario allows the largest gross weights within the regular permits by selecting a higher cut-off point on the Bridge Formula curve. Other provinces permit higher gross weights than given in Table 1, but only under a special permit.

3.3/IRU Resolution, 1970

Figure 16 displays the International Road Transport Union Resolution on the acceptance test diagram. For tandems, axle groups and gross, the permissible weights on the resolution appear to be about 10 kips (4 536 kg) higher than the Ontario Bridge Formula with a low cut-off level in gross weight at 99.2 kips (45 000 kg).

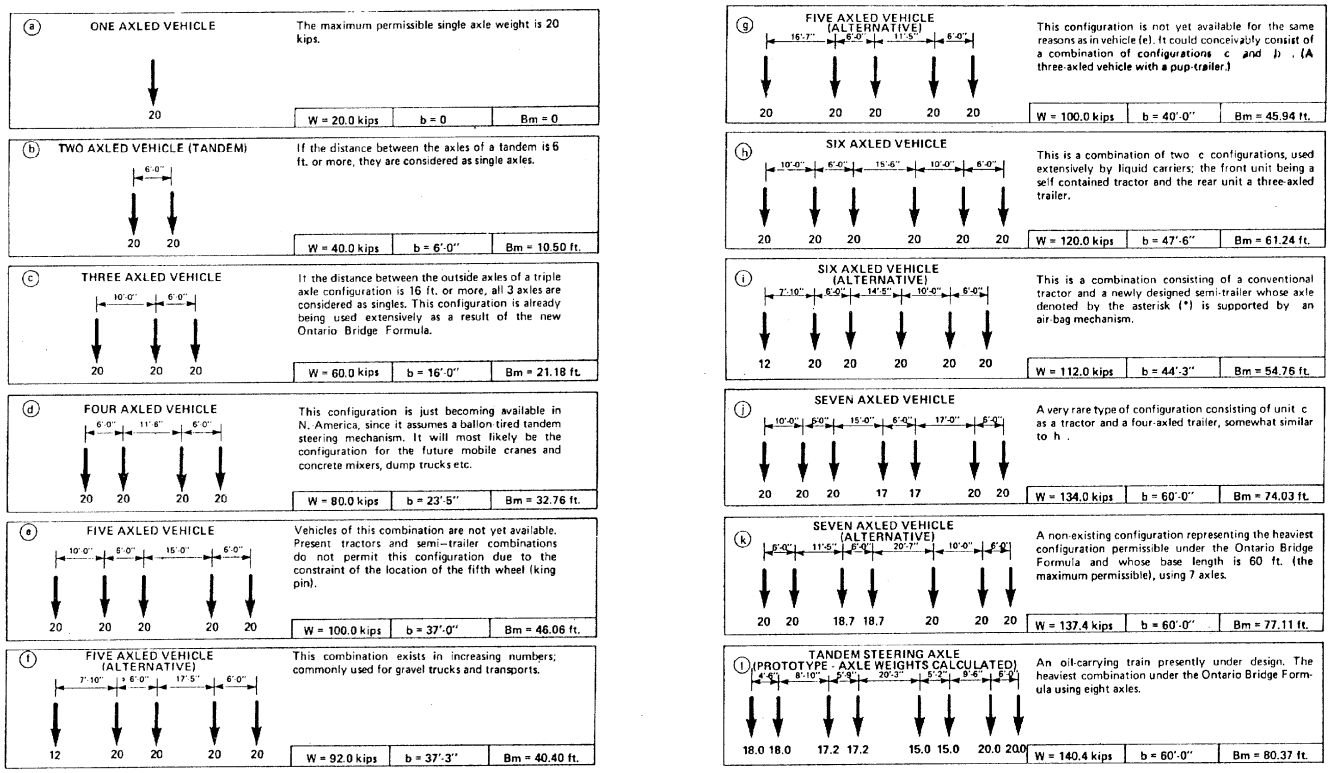

Figure 4 & 5, Heaviest Axle Combinations Permissible by the Ontario Bridge Formula

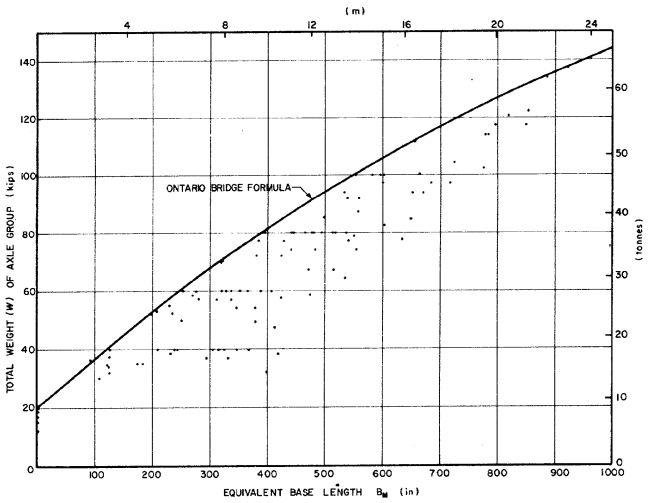

Figure 6, Plot of Heaviest Axle Combinations Permissible by the Ontario Bridge Formula on the Acceptance Test Diagram

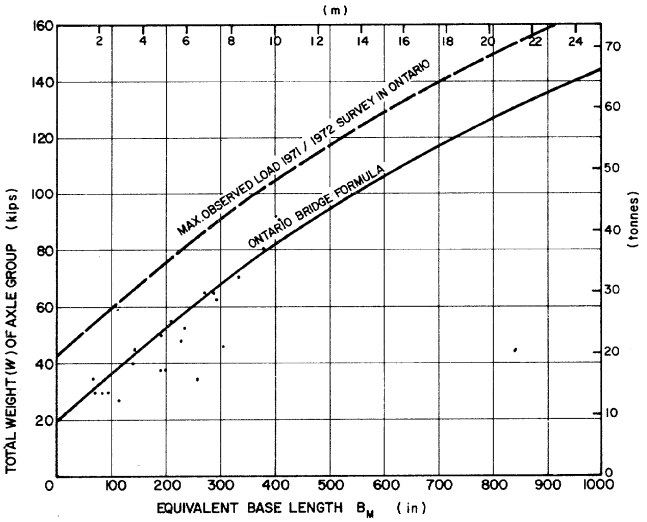

Figure 8, Nova Scotia Axle Weight Control Regulations

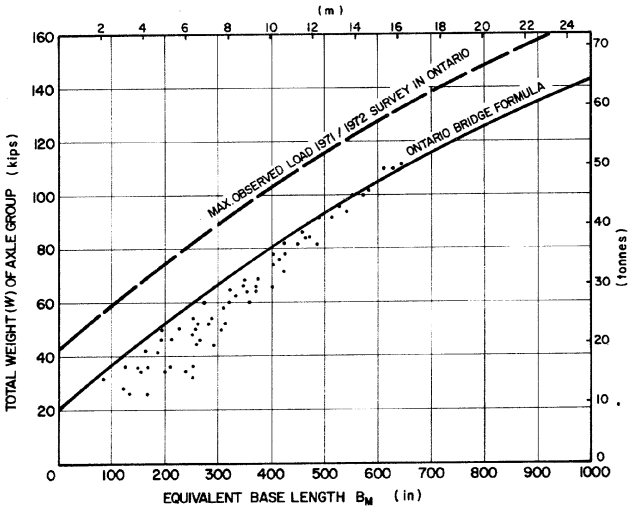

Figure 7, Newfoundland Axle Weight Control Regulations

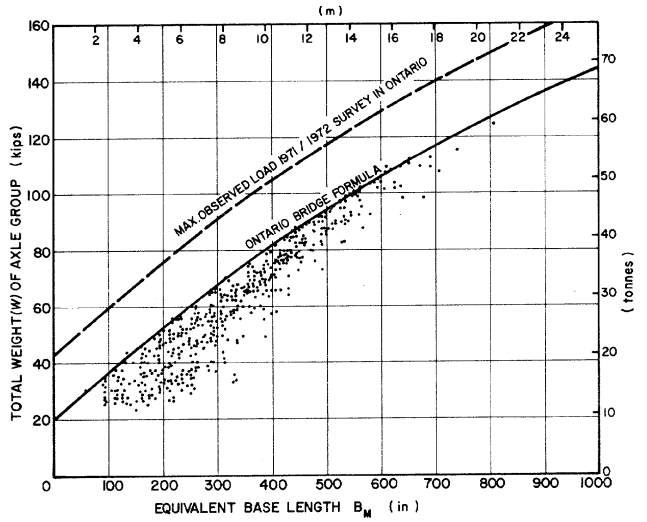

Figure 9, New Brunswick Axle Weight Control Regulations

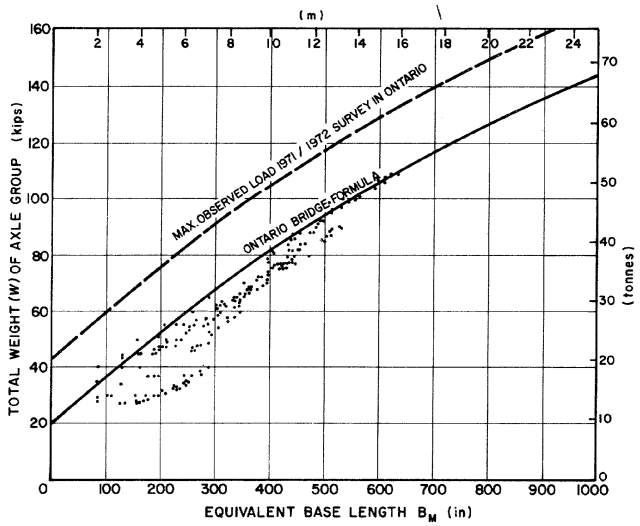

Figure 10, Prince Edward Island Axle Weight Control Regulations

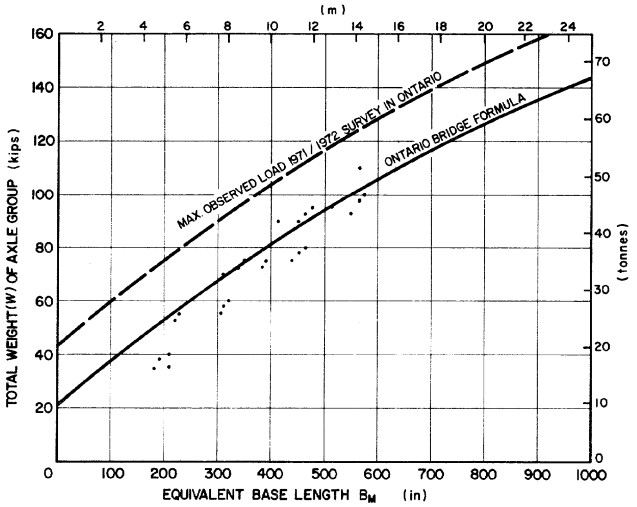

Figure 12, Manitoba Axle Weight Control Regulations

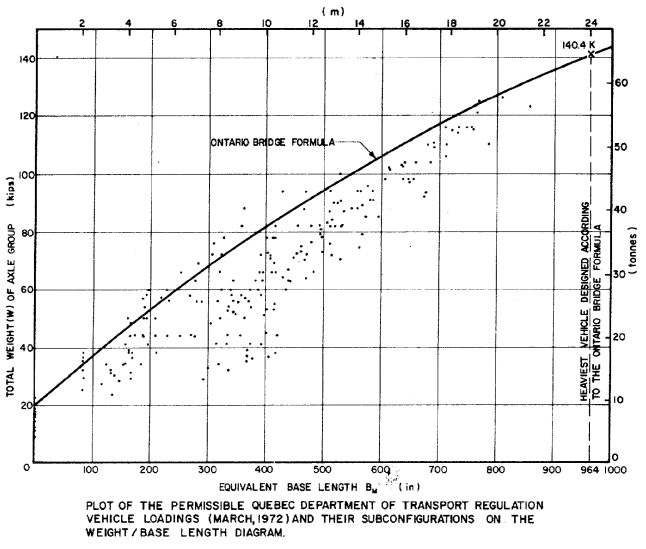

Figure 11, Quebec Axle Weight Control Regulations

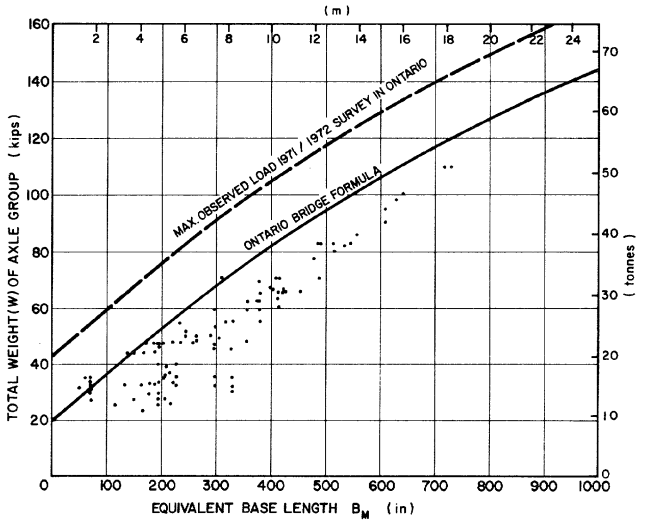

Figure 13, Saskatchewan Axle Weight Control Regulations for Roads Specified in Section 5

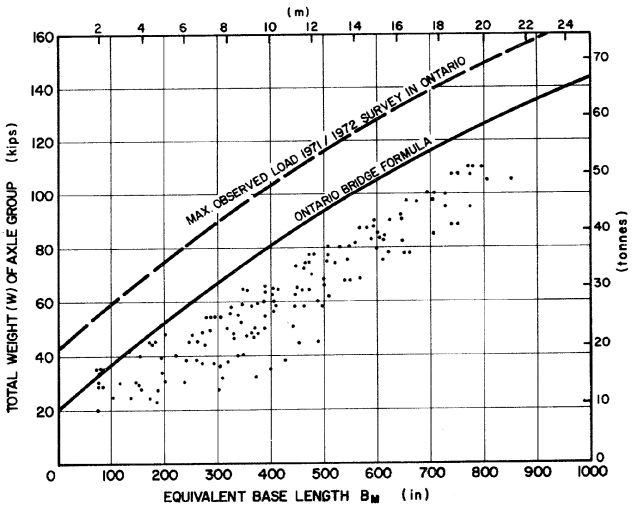

Figure 14, Alberta Axle Weight Control Regulations

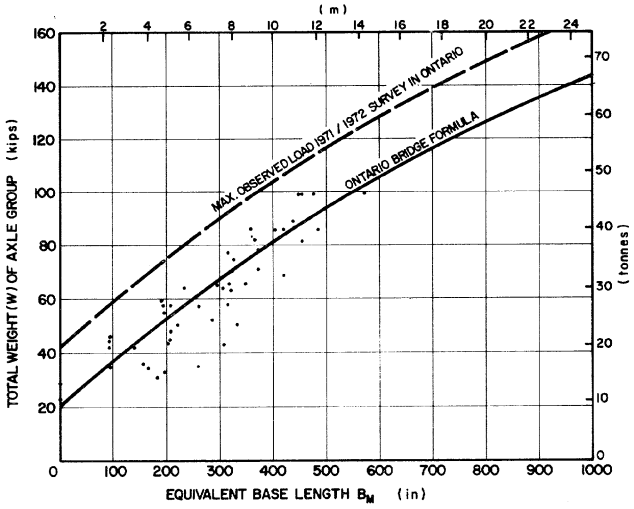

Figure 16, International Road Transport Union Resolution, 1970

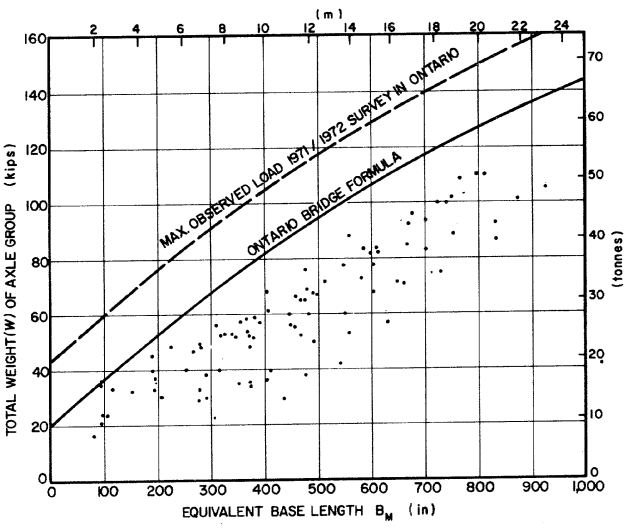

Figure 15, British Columbia Axle Weight Control Regulations

4/Special Overload Permits

Based on a commercial vehicle weight survey conducted during 1971/72 in Ontario, a level of maximum observed load (MOL) was established. This level is about 22.5 kips (10 206 kg) higher than the Ontario Bridge Formula and now serves as the basis for the special overload permits in Ontario for gross weights in excess of 140 kips (63 504 kg).

Data on some special overweight permits issued in Ontario during 1977 was analyzed and is displayed on the acceptance test diagram in Figure 17. Weight on dual and triple axle units exceeds the MOL level quite frequently. This is because the current practice in Ontario allows special permits for gross weights up to 140 kips (63 504 kg) to be issued irrespective of weight distribution on various axles. Extending the control of axle loading to all special overweight permits in Ontario is presently under consideration.

Data on special overload permits issued in some other provinces was analyzed and is displayed on the acceptance test diagram in Figures 18 to 22. The regulations for special overload permits in Newfoundland and British Columbia appear to be surprisingly close to the Ontario MOL level. Higher weights were permitted for only one type of vehicle in British Columbia.

Regulations for special overload permits in Nova Scotia are in excess of the MOL level by up to 18 kips (8 165 kg). On the other hand, the limited data from Saskatchewan is indicative of very restrictive regulations.

Data on special overload permits issued in the Province of Quebec are displayed in Figure 22. These loads are considerably higher than the MOL level — in some cases, almost twice the Bridge Formula level. These vehicles were permitted to travel on the Quebec roads with regular traffic without any escort. Some of these permits may have been issued for a designated route during the construction of Olympic facilities.

At the time of the writing of this report data for special overload permits from other provinces were not available.

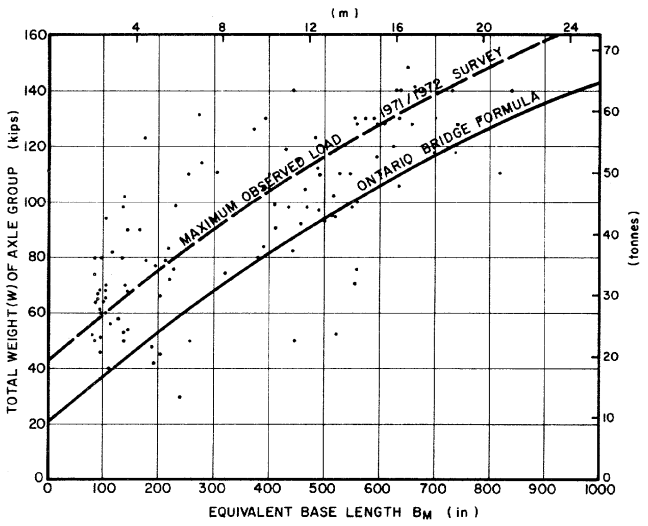

Figure 17, Special Permit Vehicles in Ontario

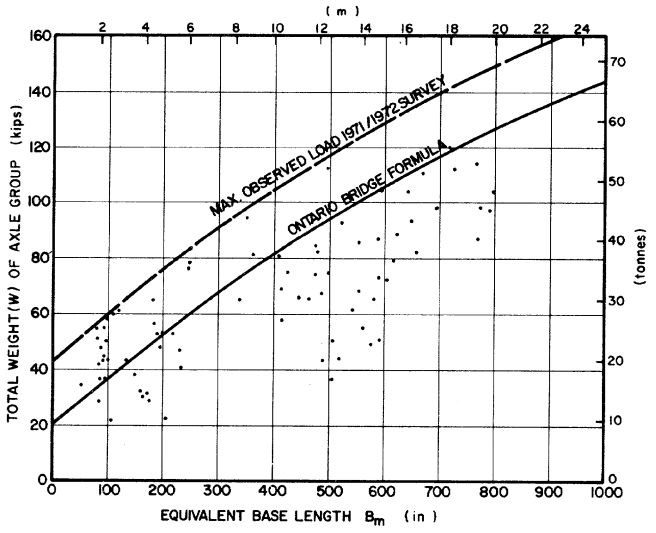

Figure 18, Special Permit Vehicles in Newfoundland

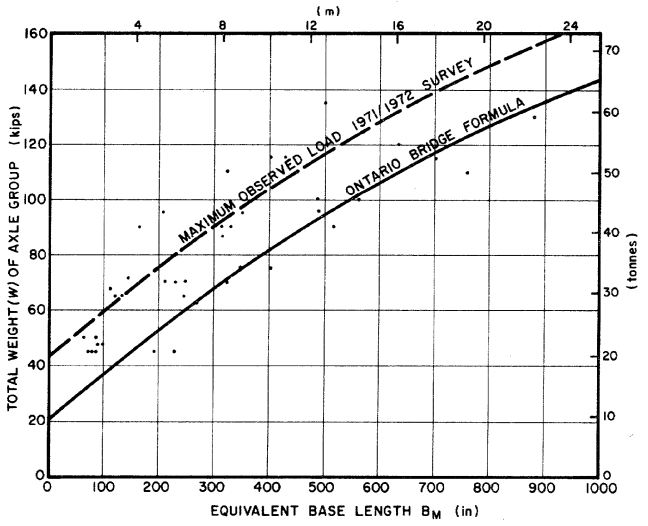

Figure 19, Special Permit Vehicles in Nova Scotia

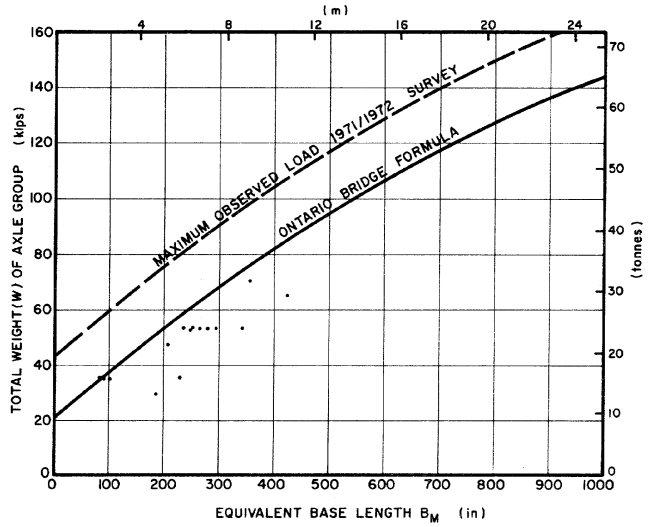

Figure 20, Special Permit Vehicles in Saskatchewan

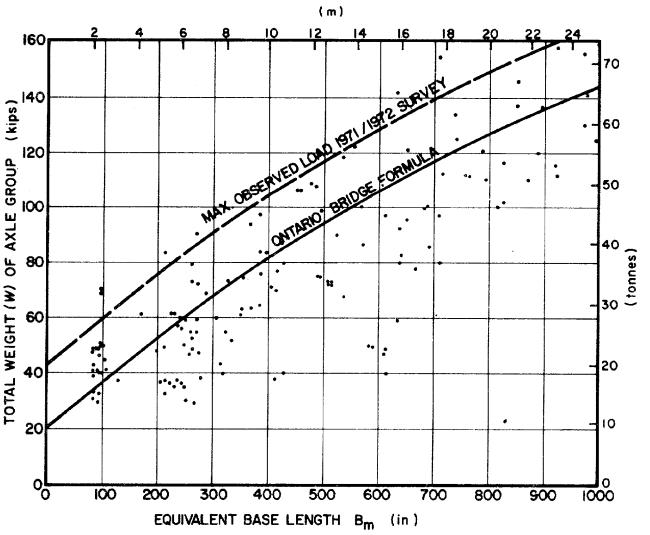

Figure 21, Special Permit Vehicles in British Columbia

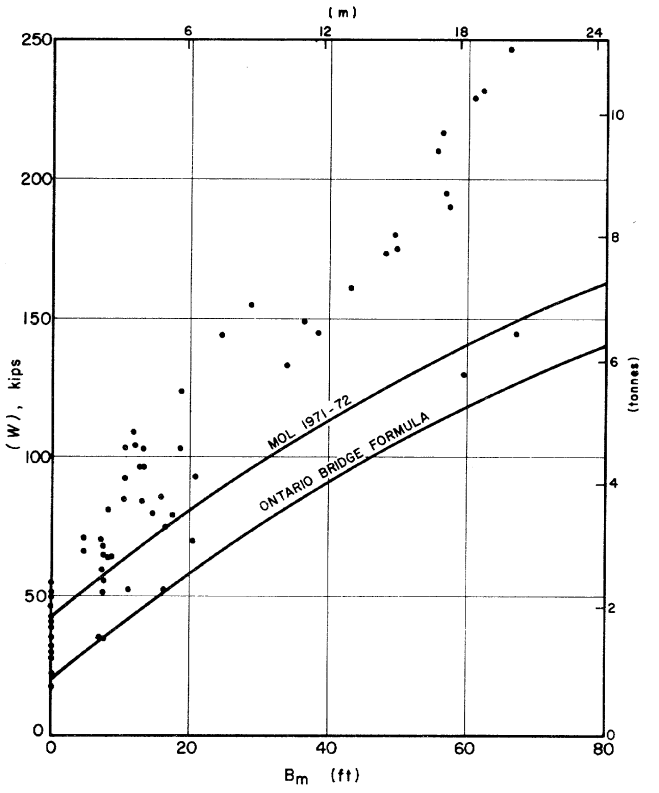

Figure 22, Special Permit Vehicles in Quebec

5/Conclusions

In order to encourage greater interprovincial highway carrier activities, there is a need for modifications in the vehicle weight regulations of various provinces across Canada. Greater uniformity is desirable particularly in those regulations which would require a truck driver to make necessary changes in the geometry and loading of his truck as he crosses a provincial border. Such changes are inconvenient and time-consuming. This report demonstrates that such modifications in the vehicle weight regulations may be possible since, on a technical scale of evaluation, these regulations are not as different as they are from an operational point of view.

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