

**OVERWEIGHT/OVERDIMENSION TRUCKING IN MANITOBA  
AND WESTERN CANADA**

A Thesis

Presented to

The Faculty of Graduate Studies

The University of Manitoba

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Civil Engineering

by

© Robert Richard Girling

September 1988

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AND WESTERN CANADA

BY

ROBERT RICHARD GIRLING

A thesis submitted to the Faculty of Graduate Studies of  
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MASTER OF SCIENCE

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## ABSTRACT

Overweight/overdimension (OW/OD) trucking is an important and growing segment of the trucking industry, especially in Western Canada. However, some provincial and municipal policies governing OW/OD trucking are not rational or consistent, due in part to the lack of available information. This thesis consolidates existing Western Canadian OW/OD policy information and presents new information on the extent and characteristics of OW/OD trucking in order to assist OW/OD policy makers in making better policy decisions. The new information is generated from the Manitoba Highways truck weight survey data base and by sampling internal government files. In addition, a comparative engineering and administrative evaluation of selected Western Canadian OW/OD policies is made, with specific recommendations for improvement to Manitoba OW/OD policy.

## CONTENTS

ACKNOWLEDGEMENTS.....	ii
ABSTRACT.....	iii

<u>Chapter</u>	Page
<b>1. INTRODUCTION.....</b>	<b>1</b>
1.1 The Research Need.....	1
1.2 Research Objectives and Scope.....	6
1.3 Research Approach and Methodology.....	7
1.4 Thesis Organization.....	8
<b>2. OVERWEIGHT-OVERDIMENSION TRUCKING.....</b>	<b>10</b>
2.1 Legal OW/OD Trucking.....	11
2.1.1 Regulatory Exemptions.....	13
2.1.2 Indivisible Permits.....	13
2.1.3 Divisible Load Permits.....	19
2.2 Illegal Overweight-Overdimension Trucking.....	21
<b>3. WEIGHT AND DIMENSION REGULATIONS IN MANITOBA AND WESTERN CANADA...27</b>	
3.1 Introduction.....	27
3.2 Summary of Weight and Dimension Developments in Manitoba and Western Canada: 1970 - 1988.....	30
3.3 Basic Weight and Dimension Regulations.....	32
3.3.1 Dimensional Limits.....	33
3.3.2 Weight Limits.....	36
3.4 Development Prospects.....	38
3.4.1 The RTAC Proposals.....	38
3.4.2 Manitoba Road Classification Changes.....	40
<b>4. LEGAL OW/OD TRUCKING: INDIVISIBLE OW/OD PERMIT POLICIES.....42</b>	
4.1 Introduction.....	42
4.2 Manitoba.....	42
4.3 Saskatchewan.....	47
4.4 Alberta.....	49
4.5 Ontario.....	55

4.6	Comparative Analysis of OW/OD Policies.....	58
4.6.1	Maximum Allowable Tire and Axle Loads.....	58
4.6.2	Maximum Allowable GVW.....	61
	Differences in Overweight Permit Policy:An Example.	61
4.6.3	Overweight Permit Fee Structures.....	66
4.7	Observations.....	67
<b>5.</b>	<b>LEGAL OW/OD TRUCKING: DIVISIBLE OW/OD PERMIT POLICIES.....</b>	<b>70</b>
5.1	Introduction.....	70
5.2	OW/OD Divisible Permits in Manitoba.....	72
5.2.1	Raw Forest Product Permits.....	72
5.2.2	Long Combination Vehicle Permits.....	73
5.2.3	Interim RTAC Permits.....	77
5.2.4	Other OW/OD Operations Under Divisible Permit.....	79
5.3	OW/OD Divisible Permits in Saskatchewan.....	79
5.3.1	Timber and Woodchip Permits.....	80
5.3.2	Overlength Vehicle Operating Agreement.....	80
5.3.3	Transportation Agreement Permits.....	86
5.3.4	Interim Vehicle Weight and Dimension Program.....	89
5.4	Divisible OW/OD Permits in Alberta.....	91
5.4.1	Log and Rough Lumber Permits.....	91
5.4.2	Extended Length Permits.....	92
5.4.3	Extended Weight Program.....	93
5.5	Other Jurisdictions of Interest.....	93
5.6	Observations.....	98
<b>6.</b>	<b>WEIGHT AND DIMENSION ENFORCEMENT IN MANITOBA.....</b>	<b>100</b>
6.1	Introduction.....	100
6.2	Organization.....	100
6.3	Fines and Warnings.....	102
6.4	Weight Enforcement: Some Practical Aspects.....	103
<b>7.</b>	<b>THE CHARACTERISTICS OF ILLEGAL OW/OD TRUCKING IN MANITOBA.....</b>	<b>105</b>
7.1	Introduction.....	105
7.2	Characteristics of Illegal Overweight Trucks Based on Manitoba Highway's Annual Truck Weight Survey.....	106
7.2.1	The Database.....	106
7.2.2	Database Modifications.....	106
7.2.3	Assumptions and Calculations Used in Determining the Characteristics of Illegal Overweight Trucks.....	107
7.2.4	Limitations and Qualifications to the Results.....	112
7.2.5	The Extent of the Illegal Overweight Problem in Manitoba.....	114
	General.....	114
	Overweight Characteristics by Road Class.....	115
	Overweight Characteristics by Commodity.....	121
	Overweight Characteristics by Truck Type.....	121
	Overweight Characteristics by Location.....	126

7.2.6	Comparison of Relative Pavement Damage of Observed versus Legalized Truck Fleet.....	127
7.3	Characteristics of Illegal Overweight Trucking Based on Manitoba Highway's Offence Notice Files.....	130
7.3.1	The Database.....	130
7.3.2	Analysis of Overweight Offense Notices.....	132
	By Violation Type.....	131
	Fine Distribution.....	134
	By Commodity.....	134
	Origin-Destination Pairs.....	136
	By Location.....	136
	By Month.....	136
	By Truck Type.....	139
<b>8.</b>	<b>OBSERVATIONS, CONCLUSIONS, AND RECOMMENDATIONS.....</b>	<b>141</b>
8.1	Limitations.....	141
8.2	Observations and Recommendations.....	142
8.2.1	Weight and Dimension Regulations.....	142
8.2.2	Indivisible OW/OD Policy.....	143
8.2.3	Divisible OW/OD Policy.....	145
8.2.4	Illegally Overweight Trucks in Manitoba.....	146
8.3	Further Research Possibilities.....	147
8.4	Commentary.....	148
8.4.1	General Comments.....	148
8.4.2	Comments on OW/OD Policy.....	149
<b>REFERENCES.....</b>		<b>150</b>

Appendix

page

<b>A.</b>	<b>MANITOBA WEIGHT AND DIMENSION REGULATIONS: 1972-1988.....</b>	<b>154</b>
A.1	Introduction.....	155
A.2	Changes in Dimensional Limits.....	155
A.3	Changes in Weight Limits.....	157
A.3.1	Changes in Tire Loads and Axle Weights.....	157
A.3.2	Changes in Axle Spacing Requirements.....	162
A.3.3	Changes in Gross Vehicle Weights.....	163
A.4	Changes in Tolerances.....	164
A.5	Recommendations for Changes in Manitoba Weight and Dimension Regulations.....	166
<b>B.</b>	<b>MANITOBA INDIVISIBLE OW/OD PERMIT POLICIES AND PROCEDURES.....</b>	<b>169</b>
B.1	Introduction.....	170
B.2	Legal Authority.....	170



B.3	Manitoba Department of Highways and Transportation.....	171
B.3.1	OW/OD Permit Application and Enforcement Procedure.....	173
B.3.2	Overweight Permits: Conditions, Limits and Fees.....	175
	Tire and Axle Load Limits.....	175
	Maximum G.V.W. Limits.....	177
	Overweight Fee Structure.....	180
B.3.3	Overdimension Permits: Conditions, Limits and Fees..	183
B.4	City of Winnipeg.....	183
C.	<b>MANITOBA OW/OD PERMIT SAMPLE.....</b>	<b>188</b>
C.1	Introduction.....	189
C.2	The Data Base.....	189
C.3	Sample Size and Accuracy.....	193
C.4	The Results.....	194
C.4.1	Statistics on All OW/OD Moves.....	195
	Number of Moves Authorized: 1984-1987.....	195
	By Place of Issuance, Permit Type and	
	Type of Overweight or Overdimension.....	196
	By Month.....	197
	By Trip Length.....	197
	By O-D Patterns.....	197
	By Commodity.....	198
C.4.2	Statistics on Overweight Moves Only.....	198
	By Requested G.V.W.....	198
	By Vehicle Type.....	199
	By Commodity.....	200
D.	<b>DETAILED PROVINCIAL AND MUNICIPAL WEIGHT REGULATIONS.....</b>	<b>201</b>
E.	<b>VEHICLE DEFINITIONS, DIAGRAMS AND DESCRIPTIONS.....</b>	<b>209</b>
	<b>GLOSSARY OF TERMS.....</b>	<b>217</b>

## LIST OF FIGURES

<u>Figure</u>		<u>page</u>
2.1	Classification of OW/OD Trucking.....	12
2.2	Examples of Illegally Overweight Eight Axle A-Trains in Manitoba.	22
4.1	Allowable Axle Group Weight and G.V.W. Under Manitoba and Ontario Overweight Permit Policy vs. Equivalent Base Length.....	63
4.2	59,990 kg G.V.W. Overweight 4-S3.....	65
4.3	Overweight Vehicle Pavement Damage and Permit Fees in Manitoba..	67
5.1	Designated Overweight RTAC Routes In Manitoba.....	78
5.2	Designated Overweight Log and Pulp Haul Routes in Saskatchewan..	81
5.3	Saskatchewan Overweight and Overdimension Timber Haul Vehicles..	82
5.4	Saskatchewan Overweight Chip Haul Vehicles.....	83
5.5	Saskatchewan Overlength Vehicle Routes.....	85
5.6	Schematic of Saskatchewan Overweight Liquid Bulk Tanker.....	90
5.7	Designated North Dakota State Highways for Vehicle Combinations Exceeding 75 Feet in Overall Length.....	96
7.1	Manitoba OW Trucks (% of Trucks OW by Year).....	116
7.2	Manitoba OW Trucks (% of Axles OW by Year).....	117
7.3	Distribution of 1987/88 Manitoba Overweight Notices by Commodity.....	135
7.4	Distribution of 1987/88 Manitoba Overweight Notices by Survey Location.....	137
7.5	Distribution of 1987/88 Manitoba Overweight Notices by Month...	138
7.6	Distribution of 1987/88 Manitoba Overweight Notices by Truck Type.....	140
B.1	Manitoba Overweight Calculation Example.....	182
C.1	Example Manitoba Overweight Permit Form.....	190
E.1	Heavy Haul Truck Configuration.....	211
E.2	16 Wheel Tandem Jeep Axle Group.....	215
E.3	Single Axle Booster Axle.....	215
E.4	Premay Heavy Haul Equipment.....	216
E.5	Premay Heavy Haul Equipment.....	216

## LIST OF TABLES

Table	page
3.1 Provincial Weights and Dimensions, 1973.....	31
3.2 Provincial Weights and Dimensions, 1987.....	31
3.3 Allowable Dimensions.....	34
3.4 Allowable Loads.....	37
3.5 RTAC/CCMTA Proposals for Future Interprovincial Weights and Dimensions, 1987.....	40
4.1 Manitoba Maximum Axle Loads Under Permit (kgs).....	44
4.2 Manitoba Overweight Configurations.....	46
4.3 Saskatchewan Maximum Axle Loads Under Permit (kgs).....	48
4.4 Alberta OW/OD Permit Counts, 1986/87.....	50
4.5 Maximum Gross Vehicle Weight (tonnes) for Permit Issuers.....	52
4.6 Alberta Maximum Axle (kgs) and Tire Loads (kgs/mm) Under Permit (Tire Width of 255 mm).....	53
4.7 Distribution of Alberta Overweight Truck Configurations.....	54
4.8 Ontario Maximum Axle Loads Under Single Trip Permits (kgs).....	56
4.9 Maximum Tire (kgs/mm) and Axle Loads (kgs) and G.V.W. (kgs) Under Single Trip Overweight Permit by Province.....	60
4.10 Number of Primary Road Bridges by Design Load and Province.....	62
4.11 Minnesota Damage Assessment Cost Factors per Mile.....	76
5.1 Manitoba Long Combination Vehicle Statistics, 1984: Triple Trailer (TT) and Rocky Mountain Double Trailer (RMD) Combinations.....	76
5.2 Manitoba Long Combination Vehicle Statistics, 1987: Triple Trailer (TT) and Rocky Mountain Double Trailer (RMD) Combinations.....	76
5.3 Hours That LCVs May Operate on Saskatchewan's Two Lane Highways...	84
5.4 Saskatchewan Bulk Haul Tonnage Summary, 1986/87.....	88
5.5 Number of Trucks Under Alberta's Extended Weight Program by Configuration Type.....	94
7.1 Manitoba Truck Overweight Type by Road Class, 1975-85.....	118
7.2 Manitoba Truck Overweight Axles by Road Class, 1975-85.....	120
7.3 Manitoba Overweight Trucks by Commodity and Overweight Type.....	122
7.4 Manitoba Overweight Trucks by Commodity and Axle Overweight.....	123
7.5 Manitoba Overweight Trucks by Truck Type.....	124
7.6 Observed and Legalized ESALs Truck Type.....	128
7.7 Observed and Legalized ESALs by Commodity.....	129
7.8 Manitoba Prosecution Statistics.....	130

A.1	Manitoba Dimension Regulation History.....	156
A.2	Manitoba Weight Regulations, Jan. 1/70 to Dec. 31/78.....	158
A.3	Manitoba Weight Regulations, Jan. 1/79 to Aug. 12/82.....	159
A.4	Manitoba Weight Regulations, Aug. 13/82 to Feb. 12/82.....	159
A.5	Manitoba Weight Regulations, Feb. 13/82 to Present.....	160
B.1	Manitoba Absolute Maximum Axle Weights Under Special Permit, Class A1 and B1 Highways (kgs).....	176
B.2	Manitoba Absolute Maximum Axle Weights Under Special Permit and Required Authorization Class A1 and B1 Highways.....	179
B.3	Manitoba Overdimension Permit Conditions.....	184
B.4	Additional Requirements and Conditions for Mobile Homes.....	185
B.5	Maximum Weights and Dimensions of Routine Permits Issued by the City of Winnipeg Police Department.....	187
C.1	OW/OD Moves in Manitoba, 1984/85 to 1986/87.....	195
C.2	Number of Sampled OW/OD Moves by Location, Permit Type and OW/OD Class.....	196
C.3	Requested Overweight Permit G.V.W. Distribution.....	199
E.1	Profile and Description of Selected Trucks and Truck Combinations Complying with Manitoba Basic Weight and Dimension Limits.....	212
E.2	Profile and Description of Selected Truck Combinations Requiring Divisible OW/OD Permits.....	213
E.3	Profile and Description of Selected Vehicles Used Under Indivisible Permit.....	214

## Chapter 1

### INTRODUCTION

#### 1.1 THE RESEARCH NEED

The weight and dimension limits of most trucks operating in Canada are governed by provincial statutes and regulations. These statutes and regulations define the envelope of possible physical characteristics that trucks can assume without special permits. In many countries, Canada included, weight and dimension envelopes have been changing in order to allow the use of larger, heavier, and more productive trucks.

Not all trucking takes place within these basic regulatory weight and dimension envelopes. First, all jurisdictions allow trucks to operate beyond the basic regulations under the authority of special permits. Second, trucks can also exceed these envelopes illegally. Both of the above cases are referred to as overweight, overdimension (OW/OD) trucking.

The extent, nature and importance of OW/OD trucking is generally poorly documented. Many highway agencies have little or no information on the following subjects:

- the extent of illegal overloading of trucks on the highway network;
- the vehicle types and commodities that are most prone to illegal overloading;
- the extent to which illegal overweight trucks contribute to pavement and bridge damage;
- the extent and nature of legally authorized OW/OD trucking;
- the opportunities that exist for further use of OW/OD trucking in order to realize improvements in transport efficiency and perhaps safety.

These economic and technical issues associated with OW/OD trucking have important implications for industry, governments and the public.

A better understanding of OW/OD trucking is important in order to improve decisions on transportation policy. OW/OD trucking may have a substantial and growing impact on economics and highway safety. OW/OD trucking affects many groups including governments, carriers, shippers, and the general public. Finally, it is particularly important to understand OW/OD trucking in Western Canada because the permitting of large and heavy trucks hauling both divisible and indivisible loads has been increasing steadily.

The impacts of OW/OD trucks can be positive or negative and can affect different groups to varying degrees. On the positive side, special permitting OW/OD trucks has the potential to reduce transportation rates of divisible freight through reduced truck operating costs and increased intermodal competition. As an example, the Province of Saskatchewan has allowed overweight moves of potash since the late

1960's in order to reduce transportation costs and increase the marketable area for potash.

...the province made it possible for International Minerals and Chemical Corporation to haul potash ... with vehicles having weights in excess of the legal maximum in return for a road fee. The move allowed IMC ... some efficiencies in its truck haul and assisted the potash industry in negotiating lower freight rates from the railways.

(Churko and Hurst, 1985, 315)

Another positive effect of OW/OD trucking is that allowing the movement of large and heavy indivisible loads under permit can reduce the costs of construction projects and certain industries by allowing labour specialization and movement of larger, more efficient machinery to a project site. Examples of the positive impacts and importance of allowing indivisible OW/OD moves include (NCHRP, 1969, 7):

1. Enables production of larger, more marketable goods (.ie larger mobile homes)
2. Enables savings through less field assembly.
3. Gives heavy industries a greater latitude in site selection.
4. Enables movement of larger, more efficient machinery, thus increasing general productivity.
5. Extends the flexibility of the total inter-modal transportation system and its ability to serve the public.

On the negative side, overweight trucks can increase the cost of maintaining and repairing roads and bridges. In the case of illegally overweight trucks, governments are uncompensated for increased road and bridge damage. A Saskatchewan study estimated that illegally overweight

trucks are causing about 1.8 million dollars damage per year on Saskatchewan highways, representing about 6% of annual expenditures on pavement rehabilitation and maintenance (Wyatt and Hassan, 1984).

The impacts of heavy trucks on roads and bridges can be severe. Haas (1984) of the North Dakota Highway Department said the following about the effect of overweight trucks on highways:

One of the problems with pavement rutting...is loads and the loads they were really concerned about were the overloads, especially those that aren't permitted. Nobody ... had a handle on how many overloads their system was carrying. The people who issue the permits have the information, but apparently their information wasn't being used....  
...One of the things that came out of that conference is that you can destroy an asphalt pavement with one single overload.  
.... It could also be a permitted overload.

The magnitude and number of heavy loads and the resulting damage to roads and bridges is increasing and is of concern internationally. Overweight trucks shorten the service life of bridges and can result in damage and sometimes collapse. The Organization for Economic Cooperation and Development (OECD) expressed its concern for overweight trucks in a report on bridge evaluation (OECD, 1979, 9).

In many countries the increase in heavy traffic is a serious problem because of the resulting more rapid deterioration of existing highways and, in particular, of bridges. Overloads are, in particular, one of the most important reasons for bad and unsafe traffic situations and road and bridge conditions.

Also on the negative side of OW/OD trucking is the possible reduced level of safety with overdimension trucks. The safety and stability of



long combination vehicles (LCV) is currently being debated. The Ontario Commission on Truck Safety (Uffen Commission) felt that these overlength vehicles were unsafe and should not be allowed on Ontario highways (OCTS, 1982). In addition, RTAC has recently recommended that triple trailer combinations should not be considered for special permitting because of stability and controllability problems (RTAC, 1987, 39). However, the safety of LCV's is a controversial issue because of the good safety records these trucks have in Alberta and in many other jurisdictions.

OW/OD trucking is an important transportation issue, about which little is known. For the Canadian situation concerning weight and dimension regulations and related research programs, Nix (1987) observed that:

...special permitting is probably such a complex subject covering so much trucking that attention has to be drawn to the fact that little is known about it: in ... research germane to weight and dimension regulations, special permitting has been neglected.

..in terms of the number of trucks operating under special permits, there are no good data sources...

(pg.20)

...there are two areas where not enough is known. The first is special permitting. ...special permits control a large amount of trucking activity in Canada and ... is growing in importance. The second area is enforcement... some aspects of enforcement require greater examination.

(pg. 86)

Cooperation among the impacted groups is important for further improvements in transportation policy and efficiency. With proper

cooperation, the benefits of larger and more efficient trucks can be split among all interest groups.

In order to make better use of existing infrastructure through changes in technology and regulations, development of close liaison and cooperation between the motor vehicle and trailer manufacturing industry, trucking companies and the regulating agencies in research, development and setting of regulations is of utmost importance... (examples include)... i) Saskatchewan's winter weight policy (in effect blanket permitting higher axle loadings during periods where the roadbed is frozen) ii) Saskatchewan's bulk commodity policy.

(Sutherland, 1983)

The development of more rational and productive policies, procedures and regulations governing OW/OD trucking, and the basic weight and dimension envelopes which define OW/OD trucking, could be assisted by the development of a more objective and systematic understanding of OW/OD trucking. It is towards this end, within the Manitoba and Western Canada context, that this research is directed.

## 1.2 RESEARCH OBJECTIVES AND SCOPE

The principal goal of this research is to provide an objective assessment of selected OW/OD trucking policies in Manitoba and Western Canada. Where possible, recommendations for policy change are provided. In addition, new information of interest to OW/OD policy makers is presented on the various characteristics of OW/OD trucking.

The research has focussed on three sub-objectives:

1. To describe, compare and critically evaluate the policy, practices and procedures governing OW/OD trucking in Western Canada and adjoining jurisdictions, both legal and illegal.
2. To describe and compare the characteristics, extent and nature of OW/OD trucking in Manitoba and Western Canada, both legal and illegal.
3. To formulate and generally evaluate ideas for more rational and productive policies, procedures and regulations concerning OW/OD trucking in Manitoba and between Manitoba and Western Canada.

The scope of the research into policy and procedures (Objective 1) is divided evenly between the three western provinces and their major urban centres, with less attention given to the bordering provinces and states. The characterization and analysis of existing OW/OD trucking (Objective 2) is focussed on Manitoba with some reference to the other prairie provinces depending on the availability of data. The formulation and evaluation of ideas for improvements in policies and procedures (Objective 3) is directed principally at the Manitoba situation.

### 1.3 RESEARCH APPROACH AND METHODOLOGY

In conducting this research, data from a variety of sources was gathered, developed and analyzed. A literature search was conducted on weight and dimension regulations; policies and regulations governing

OW/OD trucking; and the impacts of OW/OD trucking on roads and bridges. Information on OW/OD policies, procedures and regulations from the various provincial, municipal and state governments were obtained through library searches, personal visits, phone interviews and correspondence. Personal contact was important in determining the "de facto" realities of the regulatory environment and technical considerations concerning OW/OD trucking.

Several data bases were used to determine the characteristics of OW/OD trucking in Manitoba. These included the Manitoba Department of Highways and Transportation (Manitoba Highways) truck weight survey data tape and random samples of the Department's offence notice and OW/OD permit files.

Information on permit filing systems and permit statistics from Saskatchewan and Alberta was gathered in anticipation of further research in those provinces. The complexity of the filing systems, and sheer volume of permits (especially in Alberta), limited the scope of the research in these jurisdictions.

#### **1.4 THESIS ORGANIZATION**

OW/OD trucking in Manitoba and Western Canada is described and classified in Chapter 2. This is followed in Chapter 3 by a review of the weight and dimension regulations in Manitoba and Western Canada. Selected indivisible OW/OD policies of Ontario, Manitoba, Saskatchewan

and Alberta are compared and analyzed in Chapter 4, while the divisible OW/OD policies of Manitoba, Saskatchewan and Alberta are compared in Chapter 5. The enforcement of the weight and dimension regulations and policies is examined in Chapter 6. In Chapter 7, the characteristics of illegal overweight trucking in Manitoba are analyzed based on the Manitoba truck weight surveys and random sample of Manitoba offence notices. The study concludes with a summary of observations and recommendations for Manitoba Highways.

## Chapter 2

### OVERWEIGHT-OVERDIMENSION TRUCKING

The purpose of this chapter is to classify and define OW/OD trucking. The different categories of OW/OD trucking are described and some of the problems and opportunities they present are discussed.

The weights and dimensions of vehicles in Canada are regulated and limited by provincial government statutes and regulations. Overweight-overdimension (OW/OD) trucking is defined here as the operation of vehicles beyond these basic regulations.

What constitutes OW/OD trucking can be difficult to determine because the statutes and regulations are complex and subject to change. To this effect, because the basic regulations are subject to change, what was considered overweight or overdimension yesterday, may be considered normal trucking today. Because of seasonal differences in road weight limits, what is considered overweight in the spring is not in the summer and what is considered overweight in the summer is not in the winter. Because of regional and road class differences, what is considered overweight or overdimension in one area is not in another. Because of different approaches and philosophies regarding tolerances,

what is considered overweight or overdimension changes with, and sometimes within, jurisdictions.

Despite the problem of defining OW/OD trucking, it is possible to classify it into two main categories and several subcategories. The two main areas are legal and illegal OW/OD trucking. Legal OW/OD trucking can be further divided into the subcategories of regulatory exemptions, indivisible permits and divisible permits. In addition, a vehicle may be overdimension, overweight or both overweight and overdimension in each of the above categories. Figure 2.1 shows the main and subcategories of OW/OD trucking.

## 2.1 LEGAL OVERWEIGHT-OVERDIMENSION TRUCKING

All provinces allow trucking beyond their standard weight and dimension regulations by issuing special permits. Legal OW/OD trucking can be divided into three categories; regulatory exemptions; indivisible permits; and divisible permits.

Special permitting provides a legal framework in which OW/OD trucking can occur, which can take into account regional differences and other factors effecting weight and dimension limits. Such permitting not only allows moves of irreducible, large and heavy equipment that could not otherwise travel, but also has the potential, and is being used, to lower freight transport costs of reducible loads through the use of larger, more efficient trucks.

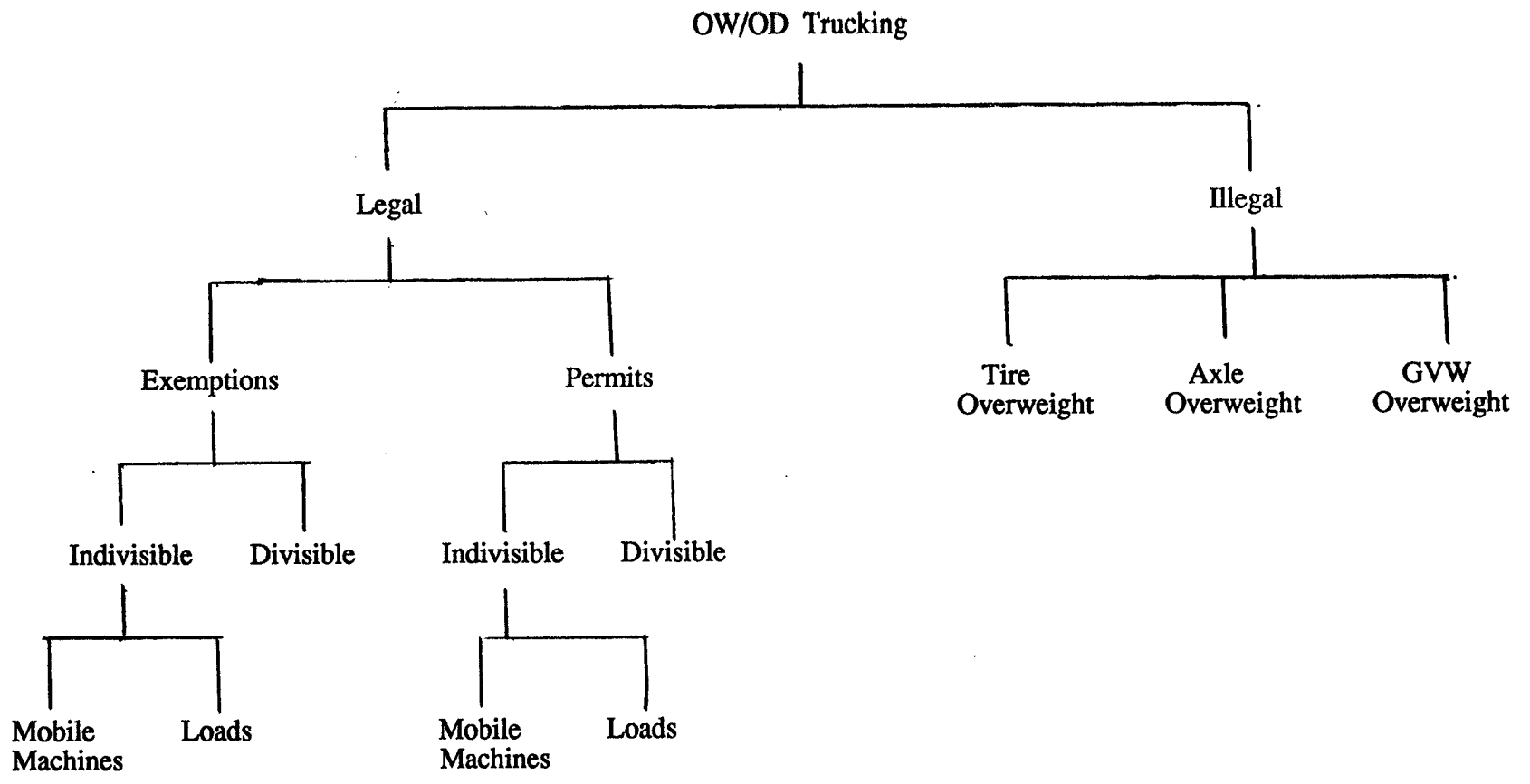


Figure 2.1  
OW/OD Trucking Classification



The following sections define and describe each of the categories of legal OW/OD trucking in more detail and discuss some of the problems and opportunities OW/OD trucking presents.

#### 2.1.1 Legal OW/OD Trucking: Regulatory Exemptions

Regulatory exemptions are granted legislatively and require no administrative effort other than enforcement of conditions of movement (if specified). Weight and dimension exemptions are usually granted to certain commodities, vehicles types, or special interest groups. Examples include dimensional or weight exemptions for snow clearing equipment, farm equipment, farm trucks and loads of loose fodder. As a further example, Saskatchewan weight limits do not apply to farm equipment (including single unit trucks) being used for the purpose of farming.

Regulatory exemptions offer the opportunity to reduce the administrative burden and cost of handling everyday OW/OD moves that are currently issued permits automatically. Conditions of movement can be set in regulations, eliminating the need for permits.

#### 2.1.2 Legal OW/OD Trucking: Indivisible Permits

Indivisible OW/OD permits are issued to move large, heavy and irreducible loads and equipment that exceed normal weight and dimension

limits. Examples of these OW/OD irreducible loads and equipment include transformers, mobile homes, mobile cranes and construction equipment. Appendix E includes some diagrams and descriptions of this equipment. Indivisible OW/OD permits are issued at the discretion of the appropriate traffic authority allowing movement of overweight, overdimension loads and vehicles under special conditions. The objective of indivisible permit operations is to (NCHRP, 1980):

1. Control damage of roads and bridges resulting from overweight loads.
2. Govern movements of overdimension equipment so that safety and traffic capacity is not compromised.

As was stated in the introduction, indivisible OW/OD permits can be economically important to a region for several reasons. For example, in Alberta, oil companies can reduce their oil project construction costs by building large modules in Edmonton or Calgary, and transporting them north on OW/OD trucks, where they are assembled. This is more efficient than sending the raw materials north to be assembled in the field, where the cost of labour is higher and quality is more difficult to control.

Allowing the movement of indivisible OW/OD loads allows heavy industry greater choice in selecting plant locations and the movement of larger, more efficient construction machinery to project sites.

The definition of an indivisible load is not always clearly defined and can change from situation to situation and from place to place.

Some authorities consider containers indivisible in some situations (e.g., Saskatchewan in the case of imported containers), and therefore are allowed overweight permits. Other authorities consider containers divisible (e.g., Alberta, Manitoba) and will not issue overweight permits for them. One definition of an indivisible load is (Pearson 1981) "an item which cannot, without disproportionate effort, expense or risk of damage, be divided into two or more loads for the purpose of transport on public roads." The definition of what is divisible or indivisible can have important implications for the movement of certain commodities (i.e., containers). Containers are of special interest because defining containers as indivisible would, in effect, allow the hauling of almost all freight at higher weight limits under special permit.

There are two situations where an indivisible OW/OD permit is required. They are:

1. OW/OD because of the size and weight of the indivisible load carried or towed by a vehicle.
2. OW/OD because of the size and weight of the vehicle itself.

In the first situation, the vehicle is temporarily OW/OD because of the large or heavy indivisible load the vehicle is hauling. Included in this category would be moves of construction equipment, transformers, bridge beams as well as buildings and mobile homes. In the second situation, the vehicle is permanently OW/OD and is moving only itself,

not a load. These permanently OW/OD vehicles are usually referred to as special mobile machines. A special mobile machine is defined here as a vehicle that is not designed or used primarily for the transportation of persons or property. Examples of special mobile machines include motor scrapers, front-end loaders, mobile cranes and permanently mounted well boring equipment.

For the two situations above, OW/OD indivisible permits can be overweight, overdimension or both. In addition, multi-trip permits are often issued for an extended period of time providing the load or vehicle is not overly large or heavy. These multi-trip permits are sometimes referred to as blanket permits.

Overweight indivisible permits are issued at the discretion of a traffic authority when vehicles exceed maximum normal axle loads or licenced gross vehicle weight (G.V.W.). The primary concern of overweight permits is to control and limit the damage to pavements and bridges.

Overdimension permits are issued to loads and equipment exceeding legal height, width or length. The primary concern of overdimension permits is to maintain highway safety and traffic capacity. Overwidth vehicles can reduce safety and traffic capacity when they encroach on adjacent lanes. Overlength vehicles can reduce safety and traffic capacity when passing maneuvers have to be made around them on two lane highways. Overlength vehicles can damage structures and reduce highway

safety and capacity because of overhang and offtracking during turns. Overheight moves can be potentially damaging to overhead structures and power lines. Generally, conditions of movement and restrictions increase with the amount overdimension.

Fees charged for OW/OD permits vary significantly. Some governments charge fees in excess of costs in order to generate revenue and discourage OW/OD moves. Others governments charge fees to cover administrative costs and only those incremental costs incurred from the movement of a vehicle over normal weights and dimensions. This is done under the assumption that costs due to vehicle movements up to normal weights and dimensions are fully recovered through road user taxes. Some governments charge only administrative costs or do not charge at all because it is believed that the movement of OW/OD vehicles is part of the reason for a highway network.

The significance of trucking under indivisible permit in Western Canada has yet to be quantified. The number of movements of large and heavy indivisible loads by truck is likely small relative to all trucking. Based on 1985 revenues received by for-hire trucking firms west of Ontario, special industrial machinery shipments represented the 4th highest revenue generating commodity of all commodities shipped within Western Canada (Statistics Canada, 1987). Because many indivisible OW/OD moves consist of special industrial machinery, this suggests that indivisible OW/OD trucking may be important in terms of revenues generated. In other countries, as will be described below,

previous research has found indivisible OW/OD trucking to be a fairly small, but growing segment of the trucking industry.

Federal Highway Administration (FHWA) truck weight data in the United States suggested that approximately three percent of all trucks (including empty and light trucks) in 1975 were legally over their G.V.W. with a permit (USDOT, 1981, III-19). This three percent figure includes overweight trucks with divisible permits. Based on an analysis of commodity and body type information from the FHWA data source the report concluded that indivisible loads do not account for a high percentage of overloads (USDOT, 1981, III-22).

Studies by the United States and the Organization for Economic Co-operation and Development (OECD) have shown that the number of OW/OD permits issued per year is increasing. In the United States, the number of overweight permits issued increased an average of 86 percent between 1966 and 1977 (NCHRP, 1980, 41). Various European countries have also seen an increase in the number of OW/OD permits issued (OECD, 1979, 30).

There are several issues facing indivisible OW/OD trucking, both in Western Canada and elsewhere. Some examples are:

1. The differences in permit policy between jurisdictions and the importance of these differences. Differences in policy are creating difficulties for interprovincial (and inter-city) commerce.

2. Whether permit fee structures are encouraging proper use of roads, covering incremental road, bridge and administrative costs and providing proper incentives to encourage legal loads where possible.
3. The difficulty in determining the maximum acceptable load on bridges and determining vehicle weight at which a bridge requires an engineering evaluation.

Some of the more significant indivisible permit policy differences between the provinces will be discussed in Chapter 4.

### 2.1.3 Legal OW/OD Trucking: Divisible Load Permits

Divisible load permits are permits for hauling reducible loads using OW/OD trucks. Examples of trucking under these permits are overlength triple trailer combinations and turnpike doubles; and overweight bulk commodity hauls of pulpwood or potash at higher than normal G.V.W.. Appendix E contains diagrams and descriptions of some of this equipment.

These permits usually have the objective of reducing transport costs for economically important resources and, sometimes, to increase competition in areas where rail appears to have a strong market position. Reducible load permits allow carriers to haul freight at higher G.V.W, or dimension limits, or a combination of both, in order to reduce operating costs. In return, the carrier will sometimes be asked to pay for the incremental road damage and necessary bridge strengthening costs. A divisible load permit system allows a reasonable compromise between weight and dimension standardization on one hand, and recognition of regional differences on the other (Hurst and Churko,

1985). Divisible permits are basically an extension of legal weights and dimensions.

There are two general areas in divisible load permitting. There are permits allowing overdimension long combination vehicles (LCV's) as well as transportation agreements allowing trucks to operate over normal G.V.W.'s, and sometimes over dimension.

Western Canada, especially Alberta and Saskatchewan, have been leaders in allowing substantial amounts of freight to move under divisible load permits. In the late 1960's, Saskatchewan started a program that allowed trucks over legal G.V.W. to haul potash from Esterhazy, Saskatchewan to Northgate, North Dakota. At about the same time, Alberta started permitting triple trailer combinations between Calgary and Edmonton. Today, all three prairie provinces allow LCV's and trucks over legal G.V.W. on certain routes under permit. There no published information on the amount of freight moving under divisible permit in Western Canada.

Some issues with respect to divisible truck permitting are:

1. The economic significance and extent of OW/OD trucks operating under divisible special permit. Larger and heavier trucks, properly configured, have potential to improve transportation efficiency.
2. The proper philosophy and methodology of determining permit fees. Costing is a difficult and grey area, often open to debate. To be equitable to competitors (i.e., railroads) costing should be done carefully and fairly.



3. The safety and stability of multi-trailer vehicle combinations and LCVs. A sensitive and political topic. Determining when and where these vehicles should be allowed to operate requires more study.

Chapter 5 provides information on the extent of divisible OW/OD trucking in Western Canada.

## 2.2 ILLEGAL OVERWEIGHT-OVERDIMENSION TRUCKING

Illegal OW/OD trucking is the operation of vehicles beyond standard weight and dimension regulations without a permit or exemption.

Generally, vehicles can be over legal weight limits in six different ways. They are:

1. Tire load overweight
2. Axle or axle group overweight
3. Exceed bridge formula weight or weight reduction formula based on axle spacing and axle weights
4. Over maximum highway gross vehicle weight
5. Over the gross vehicle weight allowed on a posted bridge
6. Over registered gross vehicle weight

It is possible for a vehicle to exceed one or all of these weight limits at one time and in any combination. Figure 2.2 illustrates three ways an eight axle 3-S2-3 truck can be overweight in Manitoba. Manitoba weight regulations are described in more detail in Appendix A and Chapter 3.

Weight regulations are necessary to protect the highways system from excessive damage. Exceeding tire load (1) or axle weight (2) limits results in increased pavement and bridge deck damage. Exceeding

Figure 2.2 Examples of Illegally Overweight Eight Axle A-Trains in Manitoba

1. Exceeds Maximum Highway Gross Vehicle Weight

	o   o o	o o   o	o o	
Axle Weights (tonnes)	4.5   15.0	15.0   9.1	15.0	= 58.5

Tire width:	10" (255 mm)	Season:	Summer
Licensed Weight:	56,500 kg	Axle Spacing:	Sufficient
Road Class:	A1		

Comments: The G.V.W. of this truck (58,500 kg) exceeds the maximum allowable G.V.W. of 56,500 kg on Class A1 Highways. The load limits for tires, steering axles, single axles and tandem axles are all met. Axle spacing is sufficient.

2. Exceeds Axle Weight

	o   o o	o o   o	o o	
Axle Weights (tonnes)	4.0   17.0	14.0   7.0	14.0	= 56.0

Tire Width:	10" (255 mm)	Season:	Summer
Licensed Weight:	56,500 kg	Axle Spacing:	Sufficient
Road Class:	A1		

Comments: The truck is within load limits for tires, steering axles, single axles and maximum allowable G.V.W., but exceeds the Class A1 Highway allowable tandem axle weight of 16,000 kg on the drive tandem.

3. Exceeds Tire Load

	o   o o	o o   o	o o	
Axle Weights (tonnes)	5.0   14.0	14.0   8.0	14.0	= 55.0

Tire Width:	10" (255 mm)	Season:	Summer
Licensed Weight:	56,500 kg	Axle Spacing:	Sufficient
Road Class:	A1		

Comments: The truck is within load limits for steering axles, single axles, tandem axles and maximum allowable G.V.W., but exceeds the allowable tire load on the steering axle of 4,590 kg (i.e., 2 tires x 255 tire width x 9 kg per mm = 4,590 kg).

axle spacing weight formulas (3), maximum highway G.V.W. (4) or allowable G.V.W. on a posted bridge (5) can cause bridge superstructure damage or failure. Theoretically, if registration fees are properly linked to pavement and bridge costs, exceeding the registered gross vehicle weight (6) causes road and bridge damage costs in excess of what was paid for.

Determining what is illegal is difficult because it is not always clear what the weight and dimension limits actually are. The weight and dimension limits as specified in regulations (De Jure) can be quite different from the limits enforced in the field (De Facto). This is because the the De Jure regulations must be interpreted, enforceable and finally enforced to become the De Facto weight and dimension limits.

A strict interpretation of written regulations do not always match the intentions of the regulators. For example, the Manitoba regulations as written allow only A-Trains and exclude B-Trains from a maximum length of 23 m. In addition, the written regulations do not always cover all possible situations. In Saskatchewan and Manitoba, the regulations specify that the combined weight of two axle groups must be reduced when the axle group spacing is less than a specified minimum distance. The regulation offers no guidance as to weight reduction and distribution when there are three or more consecutive axle groups with less than the minimum spacing.

Once the regulations are interpreted, they are not always easy or possible to enforce due to complexity, lack of information or lack of time. For example, in most cases, the tire width is required to determine the allowable weight on steering axles. The tire width is difficult, if not impossible, to determine by an inspector from within a scale house.

Finally, enforcing the regulations at all is at the discretion of the enforcement agency and staff. For example, the City of Winnipeg does not enforce or issue overweight permits for steering axles over the maximum axle weight of 5,500 kg. This is despite the fact that most loaded dump trucks, concrete mixers, and garbage trucks operate with overweight steering axles.

Illegal overweight trucking is a common problem to all jurisdictions. The incidence of illegal operations have been found to vary with enforcement effort (Wyatt, Hassan and Massood, 1985) (NCHRP, 1980). In the United States, overweight trucks have been found to range from a low of 0.5% to a high of 41% of all trucks (USDOT 1981).

From a government perspective, illegally overweight trucks are a problem for maintaining roads and bridges. For example, the Saskatchewan Government estimated that overweight trucks cost 1.8 million dollars in extra road damage a year, representing about 6% of its annual expenditure on rehabilitation and surface maintenance (Wyatt and Hassan, 1984). Illegally overweight trucks consume pavements and

bridges at a faster rate without compensating the government for extra costs. The government and inter/intra modal competitors lose. The illegal truckers, and perhaps their customers, benefit.

However, from the view of society as a whole, given the existing weight and dimension regulations, the benefits of overloading to illegal truckers and their customers could outweigh the costs to government. This situation would occur when existing legal weights and dimension limits are set below the level for an "optimum" tradeoff between truck operating costs and infrastructure costs. An analysis of overweight trucks in Texas estimated that reductions in operating costs of overweight truckers were over five times the increased pavement damage costs to the government (Walton and Yu, 1983). Increased consumption of roads and bridges by overweight trucks is not in itself, necessarily bad. It is consumption without proper compensation to road authorities that is the problem.

The number of illegal overweight trucks, their characteristics, and the damage they are doing is largely unknown. De facto enforcement practices and fines are important in determining the operations, costs and configurations of truck fleets (Nix, 1987).

Some major issues pertaining to Illegal Overweight trucking are:

1. The extent and cost of illegal overweight trucking to Provincial Highway agencies.

2. Developing policies and enforcement practices that effectively and efficiently reduce illegal overweight trucking.

Chapter 6 discusses De Jure and De Facto weight and dimension enforcement and fines in Manitoba. Chapter 7 investigates the extent of illegal overweight trucking in Manitoba.

## Chapter 3

### WEIGHT AND DIMENSION REGULATIONS IN MANITOBA AND WESTERN CANADA

#### 3.1 INTRODUCTION

The purpose of this chapter is to describe the past, present and prospective future of weight and dimension limits in Manitoba and Western Canada in order to define what was, is and might be considered overweight/overdimension (OW/OD) trucking. The elements of weight and dimension regulations and their administration are described, followed by a brief history of weight and dimension limits in Manitoba and Western Canada. A detailed description of current weight and dimension regulations follows in section 3.3 and Appendix D. Finally, future changes in weight and dimension regulations are discussed referencing the RTAC proposals and the Manitoba Road Classification report.

In order to define and understand OW/OD trucking, it is necessary to describe the basic weight and dimension regulations governing trucking. To this effect, OW/OD trucking is defined here as truck operations beyond these basic regulations, both legal and illegal.

Basic regulations are those rules governing the normal, maximum dimensions and weights of vehicles and vehicle combinations. Weight regulations are not always constant and can vary by season, road class and truck type in some provinces. Weight and dimension regulations govern and limit the following 13 elements of a truck (Nix, Clayton and Bisson, 1986):

#### Vehicle Dimensions

vehicle height  
 vehicle width  
 vehicle length-trucks & tractors  
 vehicle length-trailers  
 vehicle length-semitrailers  
 vehicle length-combinations

#### Vehicle Weights

Tire load  
 axle loads-single front steering  
 axle loads-other front steering  
 axle loads-other front steering  
 axle loads-tandem  
 axle loads-triple  
 gross vehicle weight

Vehicle weights and dimensions are regulated in order to protect the safety and quality of the highway system. The level of safety and quality necessary is often debatable. Also debatable is the technical and engineering basis for certain weight and dimension limits and regulations (Nix, Clayton and Bisson, 1986).

The establishment of maximum vehicle weights and dimension limits is a complex task involving many considerations. This applies to determining "normal" maximum weights and dimension limits as well as the absolute maximum weights and dimension limits allowed under permit. The goal when setting these weight and dimension limits is an acceptably safe and efficient transport system.



Infrastructure capacity, safety, economics, the feasibility of enforcement and administration and political considerations all effect the setting of maximum weight and dimension limits. In turn, each of these variables are affected by the existing weight and dimension limits as well as by each other.

Ultimately, maximum weights and dimension limits are a political decision, where tradeoffs among the various impacted interest groups are decided. In the past, tradeoffs were often not fully known or understood, leading to decisions which were in conflict with the goal of a safe and efficient transport system. With a better understanding of the technical issues involved in the tradeoffs, better decisions should be possible.

Most of the major highways in Canada are under provincial or territorial government jurisdiction. Each provincial or territorial government establishes and administers the weight and dimension regulations governing their respective highways. The authority to set weight and dimension regulations is also sometimes delegated to municipal authorities for roads under their jurisdiction. As a result, twelve different sets of provincial weight and dimension regulations have evolved, sometimes compounded by multi-level road class regulations and municipal regulations. Some improvements in regulatory uniformity were made in the 1970's due to highway strengthening programs. As well, the Roads and Transportation Association of Canada (RTAC) has completed research into vehicle stability and pavement response culminating in

proposals for recommended interprovincial weight and dimension regulations (RTAC, 1987). These proposals were accepted by the Western provinces of Manitoba, Saskatchewan, Alberta and B.C. in February 1988 and are being implemented.

### **3.2 SUMMARY OF WEIGHT AND DIMENSIONS DEVELOPMENTS IN MANITOBA AND WESTERN CANADA: 1970 - 1988**

In 1973, vehicle weight and dimension limits were similar across Manitoba, Saskatchewan and Alberta. British Columbia and Ontario had higher allowable axle weights and G.V.W. than the prairie provinces, but all provinces had the same dimensional limits. These differences in the 1973 provincial weight and dimension limits are shown in Table 3.1. Although there were exceptions, the weights and dimensions shown are representative of the regulatory regime in effect on major highways at the time.

One of the important implications of these regulations was that effective use of double trailer combinations was impossible on the prairie region in 1973. The standard five axle tractor-semitrailer (i.e., 3-S2) was, for the most part, the heaviest and largest truck operated without a special permit.

In 1974, the Federal-Provincial Western Canada Highway Strengthening program was initiated. This program resulted in increased axle weights and G.V.W. on primary highways in the Prairies. Single

Table 3.1 Provincial Weight and Dimensions, 1973 (Clayton, 1984)

	Dimensions (m)			Weights (kg)		G.V.W.
	Height	Width	Length	Single	Tandem	
Ontario	4.11	2.6	19.8	9,071	18,144	61,235
Manitoba	4.11	2.6	19.8	8,165	14,515	33,566
Saskatchewan	4.11	2.6	19.8	8,165	14,515	33,566
Alberta	4.11	2.6	19.8	8,165	14,515	33,566
B.C.	4.11	2.6	19.8	9,071	15,876	49,895

Table 3.2 Provincial Weight and Dimensions, 1987 (Clayton, 1987)

	Dimensions (m)			Weights (kg)		G.V.W.
	Height	Width	Length	Single	Tandem	
Ontario	4.15	2.6	23.0	10,000	19,100	58,700
Manitoba	4.15	2.6	23.0	9,100	16,000	56,500
Saskatchewan	4.15	2.6	23.0	9,100	16,000	53,500
Alberta	4.15	2.6	23.0	9,100	16,800	53,500
B.C.	4.15	2.6	23.0	9,100	17,000	63,500

## Notes to tables:

1. Maximum axle weights shown must meet minimum tire width, axle spacing and axle spread requirements. Allowable axle weights also vary by season and road class.

axle weights were increased to 9,100 kg, tandem axle weights were increased to 16,000 kg and G.V.W. was increased to 50,000 kg. The G.V.W. increases allowed A and B-Train doubles of six and seven axles to be used more effectively.

In 1982, primary highway G.V.W.s were further increased to their present levels of 53,500 kg in Saskatchewan and Alberta and 56,500 kg in

Manitoba. Secondary highway G.V.W.s were also increased from 33,635 kg to 47,630 kg and 49,000 kg in Manitoba and Saskatchewan respectively (Alberta did not and does not have weight restrictions by road class). The increase in G.V.W. on primary highways allowed 7 axle combinations to be loaded to their axle weight limitations. G.V.W. increases on the secondary highways allowed doubles to be more effectively used in Manitoba and Saskatchewan. Combination length increases from 65 feet (19.81 m) to 21.5 m in 1979 and from 21.5 m to 23.0 m in 1980 in all provinces also allowed trucks to expand their cubic capacity.

Some of the current weight and dimension limits in Western Canada are shown in Table 3.2. Appendix A contains a more detailed description and discussion of changes in Manitoba weight and dimension regulations over the period 1973 to 1988.

### 3.3 DETAILED BASIC WEIGHT AND DIMENSION REGULATION PROVISIONS

This section provides details of the most important aspects of the current weight and dimension regulations in Manitoba, Saskatchewan and Alberta and the bordering provinces/states of Ontario, B.C., NWT, Minnesota, North Dakota and Montana. See Nix, Clayton and Bisson (1986) and the respective jurisdictions regulations for more detail.

### 3.3.1 Dimensional Limits

The maximum dimension limits of the various provinces and states of importance to Western Canada are listed in Table 3.3. Except in isolated cases, these dimensional limits apply throughout the province or state, including within any municipalities or local governments.

Two of the more important differences in dimension limits within Canada are the kingpin to rear limits and combination length limits. The kingpin to rear limits of 16.75 m are important because they make operation of double 28 foot pups difficult, if not impossible. The kingpin to rear restrictions in Ontario, Alberta and B.C. are either not enforced or are being dropped from their respective regulations (Nix, 1987, 15). Manitoba allows a kingpin to rear limit of up to 18 m, but only under special permit.

Combination length limits differ between provinces for truck trailers and tractor semitrailers. Manitoba allows truck trailer combinations a maximum length of 21.5 m; truck trailer combinations with two points of articulation are allowed up to 23 m under special permit. Ontario and the remaining western provinces allow 23 m. The other major difference is the tractor semitrailer lengths allowed in Ontario (23.0 m) and the western provinces (20.0 m).

In the United States, the Surface Transportation Assistance Act (STAA) of 1982 requires that all states allow the operation of 48 foot

Table 3.3 Allowable Dimensions (m) as of January 1, 1988

Province/State	Height	Width	Length	Combinations								
				Truck	Full Trailer	Semi Trailer	Tractor -Semi	Truck + Trailer	A Train	B Train	Rocky Mntn Doubles	Triples
Ontario	4.15	2.6	12.5	12.5	14.65	23.0	23.0	23.0 <sup>1</sup>	23.0 <sup>1</sup>	N/A	N/A	N/A
Manitoba	4.15	2.6	12.5	12.5	none	20.0	21.5	23.0 <sup>1</sup>	23.0 <sup>1</sup>	SP	SP	N/A
Saskatchewan	4.15	2.6	12.5	12.5	15.85	20.0	23.0	23.0	23.0	SP	SP	SP
Alberta	4.15	2.6	12.5	12.5	none	20.0	23.0	23.0 <sup>1</sup>	23.0 <sup>1</sup>	SP	SP	SP
B.C.	4.15	2.6	12.5	12.5	14.65	20.0	23.0	23.0 <sup>1</sup>	23.0 <sup>1</sup>	N/A	N/A	N/A
NWT	4.2	3.05	12.5	12.5	none	21.5	21.5	24.4	24.4	SP	N/A	N/A
Minnesota	4.11	2.6	12.19	13.72 <sup>2</sup>	14.63 <sup>2</sup>	19.81	19.81 <sup>3</sup>	none <sup>3</sup>	none	N/A	N/A	N/A
North Dakota	4.11	2.6	15.24	15.24	none	22.86 <sup>5</sup>	22.86 <sup>4</sup>	22.86 <sup>4.5</sup>	22.86 <sup>4</sup>	33.53 <sup>4</sup>	33.53 <sup>4</sup>	33.53 <sup>4</sup>
Montana	4.11	2.6	12.19	none	14.63 <sup>2</sup>	none	22.86	none	22.86	N/A	SP	N/A

Notes:

- Distance from kingpin to rear must be less than 16.75 m  
 Ontario: Rear of cab to rear must be  $\leq$  19.0 m  
 Manitoba, Alberta: Otherwise combination may not exceed 21.5 m  
 B.C.: Drawbar (where applicable) must be  $\leq$  5.0 m
- Semi-Trailers and Trailers in Doubles combinations may not exceed 8.69 m
- Tractor semi-trailer combinations up to 25.99 m and tractor, semi-trailer, trailer combinations are only allowed on designated highways
- Long combination vehicles up to 33.53 m are only allowed on, or within 10 miles of exits on, designated highways
- Tractor semi trailer and tractor, semi trailer, trailer are not restricted on interstates or Federal Aid Primary system

Abbreviations: N/A Not Allowed  
 SP Special Permit

Source: Nix, 1987 and State and Provincial Regulations

semitrailers and double 28s on Interstate and federally assisted state highways. The overall length of tractor semitrailers; and of tractor, semitrailer, trailer trains are not restricted. This ruling is reflected in the state dimensional limits in Table 3.3.

There are some instances where United States dimensional limits might restrict movement from Canada to the U.S. For example, length limits in the U.S. are generally less than Canada for various vehicles and combination lengths. The differences in length are generally small, however, and are probably due to Canada rounding up dimensions when converting to metric. Whether or not U.S. vehicle inspection stations strictly enforce these length limits is not known.

The most striking difference in allowable length limits is the legal operation, without a permit, of 33.53 m (110 ft) long combination vehicles (LCV's) on designated highways in North Dakota. Manitoba, Saskatchewan, Alberta and the Northwest Territories allow LCV's under permit, but North Dakota is the only province/state in which LCV operation is normal practice.

LCV operation in North Dakota started in October 1983 and is subject to various conditions. Some of the conditions placed on LCV operation include a "Long Load" sign on the last trailer, restricted operation during poor weather or road conditions and proper weight distribution between trailers.

### 3.3.2 Weight Limits

The current maximum tire load, axle and G.V.W. limits for the provinces and states of particular importance to Western Canada are listed in Table 3.4. The effects of tolerances, if any, are not included in the Table. The maximum allowable G.V.W. for the vehicle combinations was derived through a combination of bridge formulas, a summing of maximum legal axle loads for summer conditions and maximum allowable highway G.V.W. These G.V.W.s represent maximum possible G.V.W.s under summer conditions and may not be typical. The maximum G.V.W. shown for some combinations can increase or decrease depending on axle spacing, axle spread, seasonality and tire sizes.

Table 3.4 is not sufficient to fully describe the variations in allowable weights with seasons, axle spread and axle spacing and tire sizes. Nonetheless, Table 3.4 makes it clear that weight regulations are complex and vary considerably between some jurisdictions. To add to the variation between jurisdictions, major municipalities and local governments often are given the power to set their own weight limits, but do not necessarily exercise that power.

The weight regulations encourage the operation of certain types of equipment in different regions. For example, Manitoba encourages the operation of eight axle A trains by allowing a maximum G.V.W. of 56,500 kg. Seven Axle B Trains can register to a maximum of only 53,500 kg G.V.W. given existing axle weight limits. Saskatchewan and Alberta do



Table 3.4 Allowable Loads<sup>2</sup> (kgs, except tire loads) as of January 1, 1988

Province/State	Highway Type	Tires (kg/mm)	Single Axle		Tandem Axle	Tridem	Maximum G.V.W.			
			Front Steer	Non Front			Truck	Truck + Trailer	Tractor Semi	Train
Ontario <sup>1</sup>	Primary	11	9,000	10,000	19,100	30,000	47,500	63,500	63,500	63,500
	Secondary	11	8,200	8,200	16,400	24,600				
Manitoba	Class A1	9	7,300	9,100	16,000	16,000	32,000	55,300	37,500	56,500
	Class B1	9	7,300	8,200	14,500	14,500	29,000	47,630	34,500	47,630
Saskatchewan	Primary	9	5,500	9,100	16,000	16,000	27,000	53,500	37,500	53,500
	Secondary	9	5,500	8,200	14,500	14,500	25,500	49,000	34,500	49,000
Alberta	All	9	7,300	9,100	16,800	16,800	30,400	53,500	40,900	53,500
B.C.	All	11	9,100	9,100	17,000	26,100	34,000	60,100	52,500	63,500
NWT	All	8	6,500	8,128	16,256	16,256	29,256	54,500	39,012	54,500
Minnesota <sup>3</sup>	State	10.72	9,072	9,072	15,423	19,050	BF	BF	BF	36,288
	Interstate	10.72	9,072	9,072	15,423	19,050	BF	BF	BF	36,288
North Dakota <sup>3</sup>	State	9.82	9,072	9,072	15,423	21,772	BF	BF	BF	47,856
	Interstate	9.82	9,072	9,072	15,423	BF	BF	BF	BF	36,288
Montana <sup>3</sup>	State	10.72	8,165	8,165	14,454	BF	BF	BF	BF	34,837
	Interstate	10.72	9,072	9,072	15,423	BF	BF	BF	BF	36,288

Notes:

1. Maximum G.V.W. governed by Ontario Bridge Formula

2. Maximum tire loads, axle weights and G.V.W's can change with axle spacing and/or seasons (see text)

3. Maximum G.V.W and axle group weights governed by Bridge Formula B.

Abbreviations: BF Governed by Bridge Formula B

Source: Nix, 1987 and Provincial/State Regulations

not differentiate between A trains and B trains by keeping their maximum G.V.W.s at 53,500 kg.

In the United States, most interstates have a maximum G.V.W. of 35,289 kg (80,000 lbs) which discourages the operation of doubles for weight out freight within the U.S.A. With a G.V.W. cap of 80,000 lbs, heavier payloads can be carried in tractor semitrailers because they have a lower tare weight than doubles. Appendix F describes and expands on the provincial and municipal weight limits of Manitoba, Saskatchewan and Alberta not shown in Table 3.4.

### **3.4 DEVELOPMENT PROSPECTS**

There are frequent changes in vehicle weight and dimension regulations. One of the biggest changes in the near future is the implementation of the RTAC proposals for minimum uniform interprovincial vehicle weight and dimension regulations. Other changes affecting vehicle weights and dimensions include road classification changes. These changes and their possible effects on OW/OD trucking will be discussed in the following sections.

#### **3.4.1 The RTAC Proposals**

In June 1987, RTAC released a draft report on recommended regulatory principles for uniform interprovincial heavy vehicle weights and dimensions. The recommendations in the report were partially based on a

three year joint study of vehicle and pavement behaviour by RTAC and the Canadian Conference of Motor Transport Administration (CCMTA). After much debate across Canada between provinces, trucking associations, railways and others, a memorandum of understanding was signed by the Council of Ministers Responsible for Transportation and Highway Safety at its meeting on February 15, 1988.

The resulting weight and dimension recommendations did not include full uniformity. Provinces east of Manitoba restricted combination lengths to 23 m and semitrailer lengths to 14.65 m (48 feet). The Western provinces are to allow 25 m combination lengths and 16.15 m (53 foot) semitrailers as originally proposed by RTAC. All Western provinces now allow interim permitting of the RTAC vehicles.

The original RTAC/CCMTA proposals for future interprovincial weight and dimension regulations are shown in Table 3.5. RTAC recommends a maximum G.V.W. increase to 62,500 kg for B trains with a tridem axle group. King pin to rear trailer limits for this configuration (indirectly controlled through the maximum boxlength and kingpin setback length) would be increased from 16.75 m to 18 m with an overall length of 25 m. A-Train and C-Train configurations would have a maximum G.V.W. of 53,500 kg. Thus, B-Trains would be favoured for weight out loads. Tridems, which were previously not recognized in the prairies (i.e., restricted to the same load as a tandem), would be allowed up to 24,000 kg on tractor-semis and 23,000 kg on B-Train configurations, providing there is sufficient axle spread and tire width.

Table 3.5 RTAC/CCMTA Proposals for Future Interprovincial Weights and Dimensions, 1987 (RTAC, 1987)

	Dimensions (m)			Weights (kg)			G.V.W	
	Height	Width	Length	Tire	Single	Tandem		Tridem
Semi	4.15	2.6	25.0	10	9,100	17,000	24,000	46,500
A-Trains	4.15	2.6	25.0	10	9,100	17,000	N/A	53,500
B-Trains	4.15	2.6	25.0	10	9,100	17,000	23,000	62,500
C-Trains	4.15	2.6	25.0	10	9,100	17,000	N/A	53,500

Note:

1. Maximum axle weights shown must meet minimum tire width, axle spacing and axle spread requirements. Allowable axle weights also vary by season and road class.
2. N/A: Not applicable

### 3.4.2 Manitoba Road Classification Changes

Manitoba Highways completed a highway classification study in March 1986 that resulted in a functional classification of all existing and future highways into expressways, primary arterials, secondary arterials and collectors A, B and C. This functional classification system, used in design and planning, is in addition to the existing statutory classification system of Class A1 and B1 highways. The relationship between the two systems is that all highways classified in the recent study as arterials or expressways are, or will be converted into Class A1 highways.

In general, the study recommended lower standards of design for low traffic routes and the same or higher standards of design for high

traffic routes. The study did not result in any immediate changes, but serves as a long term planning guide for the upgrading, design and construction of existing and future highways.

Therefore, it can be concluded that the road classification study will not result in any sudden or drastic effects on vehicle weight or dimension limits on the roads of Manitoba.

## Chapter 4

### LEGAL OW/OD TRUCKING: INDIVISIBLE OW/OD PERMIT POLICIES

#### 4.1 INTRODUCTION

The purpose of this chapter is to review and compare some of the indivisible OW/OD policies and procedures of the three western provinces and other jurisdictions of interest. The OW/OD permit policies reviewed are at the provincial level only. In the first section, the different permit types, their weight and dimension limits and the conditions for movement are discussed. Where possible, statistics on the number of permits issued and the characteristics of trucks operating under permit are described. The last section makes selected comparisons and summarizes major differences between OW/OD permit policies in Western Canada.

#### 4.2 Manitoba

Under Manitoba's Highway Traffic Act, permits may be issued to a vehicle which exceeds the normal maximum weights and dimensions. Permits are issued by the appropriate highway authority, namely the province and the municipalities. The following section describes Manitoba Highways OW/OD permit policy.

Manitoba Highways issues three types of indivisible permits:

1. **Single Trip Permits:** allow a single move of an indivisible OW/OD vehicle or load along a specified route; may be issued from District or Head Offices; very large and heavy moves are issued from Head Office only.

**Example:** A heavy transformer is moved under a single trip OW permit from Winnipeg to Limestone by a 6 axle tractor-semitrailer.

2. **Extended Permits:** Blanket permits allowing any number of moves of an indivisible OW/OD vehicle or load on Class A1 and B1 highways for up to a one year period; may be issued from District or Head Offices.

**Example:** A dump truck with wide tires runs overweight on the steering axle under an annual overweight Extended Permit.

3. **Extended Transportation Permits (ETP):** Self-recording blanket permits allowing any number of moves of indivisible OW/OD construction and industrial equipment within certain weight and dimension limits. The permits allow movement on Class A1 and B1 highways for up to a one year period and are issued from Head Office only.

**Example:** A bulldozer is moved several times on an overweight 5 axle tractor-semitrailer with a G.V.W. of less than 60,000 kg under an Extended Transportation Permit. The contractor records the moves on a report and submits it to Manitoba Highways two weeks later.

Manitoba Highways authorized 16,152 OW/OD moves under Single Trip and Extended Transportation Permits in fiscal year 1986/1987. Moves made under the Single Trip Permits are the most common (12,926 or 71 percent), followed by OW/OD movements made under Extended Transportation

Permits (3,226 or 29 percent). In addition to the 16,152 OW/OD moves under Single Trip and ETP's, 1,963 Extended Permits were issued allowing an unknown number of OW/OD moves over extended periods of time.

Manitoba overweight policy allows permit clerks to issue permits to vehicles up to 60,000 kg G.V.W., subject to a maximum tire load of 9 kg per mm of tire width and the maximum axle loads in Table 4.1.

Table 4.1 Manitoba Maximum Axle Loads  
Under Permit (kgs)

Steering Axles	8,190
Single Axles	9,100
Tandem Axle Groups	21,960
Tridem Axle Groups	27,500
Tandem Axle Groups (16 wheel)	27,500

Source: Manitoba Department of Highways  
and Transportation, 1987.

There are legal tolerances of five percent of axle weight on portable scales and two percent of axle weight on permanent scales on overweight axles while under overweight permit. Permit clerks cannot route overweight vehicles over posted bridges. There is no provision to allow greater than posted weights on these bridges. The maximum axle and tire loads under permit do not apply on roads with spring weight restrictions. There is no increase in the allowable tire or axle loads allowed under permit during winter months.

The maximum G.V.W. under overweight permit may be increased over 60,000 kg to 81,700 kg subject to bridge department approval or greater



if no structures are enroute. Minimum axle spacing requirements and weight penalties between overweight axles and axle groups under permit are the same as the normal weight regulations. That is, the combined maximum weight permissible on axles or axle groups is reduced by 330 kg per 0.1 m short of the minimum inner axle spacing of:

- 3.0 m between steering and drive axles
- 3.5 m between single axles
- 3.5 m between single axles and axle groups
- 5.0 m between axle groups

Overweight tridem axles are included under the definition of axle groups. In addition to these spacings, a spacing of 4.3 m is allowed between tractor drive tandems and tandem axle jeeps without weight penalty.

Vehicles greater than 60,000 kg G.V.W. require approval from the bridge department. Bridge and structure evaluation is done by the Senior Bridge Design engineer or the Chief Bridge Engineer. On heavier vehicles, the bridge department may impose bridge crossing restrictions requiring the vehicle to travel alone along the centre of the bridge at crawl speed. In some cases, an escort is required as well. Except under unusual circumstances, a maximum G.V.W. of 81,700 kg is allowed in Manitoba. No additional insurance or insurance coverage is needed for tractors hauling overweight loads under permit.

Based on a three percent sample of 18,115 1986/87 Manitoba OW/OD permits (see Appendix C), the most common overweight truck configuration

was the 3-S3 with an average G.V.W. of 45,117 kg. Table 4.2 shows the distribution of Manitoba overweight truck configurations and their average G.V.W. Tridem axle groups were part of 50 percent of the overweight configurations in Manitoba.

Table 4.2 Manitoba Overweight Configurations

Profile	Average GWW (kgs)	No. Sampled	Percent
3-S3	45,118	74	37
3-S2	40,601	36	18
4-S3	53,220	25	13
3-S2-S2	-	4	2
Other (Mobile Machines, etc.)	-	47	25
	Total	186	100

Note: 95% confidence interval = 10%  
Source: Manitoba Permit Sample, Appendix C

Manitoba Highways overdimension policy allows overdimension loads to be moved under certain conditions. As the amount overdimension increases, restrictions and other requirements increase. These include:

- Restricted travel on certain days and times of the day.
- Overdimension signs may be required at the front and rear of the vehicle
- Escort vehicle/s may be required
- Clearance lights for night travel

### 4.3 Saskatchewan

Under the Saskatchewan's Highways and Transportation Act, permits may be issued to a vehicle which exceeds the normal maximum weights and dimensions. Saskatchewan issues three types of permits; Single Trip Permits, Annual Permits, and Special Transportation Permits. These permits are equivalent to Manitoba's Single Trip, Extended and Extended Transportation permits, respectively. The major difference is that Saskatchewan allows vehicles moving under Special Transportation Permits a maximum G.V.W. of 65,000 kg instead of 60,000 kg allowed in Manitoba. However, Saskatchewan restricts overweight movements only to certain bridges under their Special Transportation Permit.

Saskatchewan Highways issued permits allowing 51,822 OW/OD moves under Single Trip and Special Transportation Permits (STPs) in 1986. 37,101 (72 percent) of these moves were under Single Trip permits; 14,721 (28 percent) of these moves were under Special Transportation permits. In addition to the 51,822 OW/OD moves under Single Trip and STP permits, 7,013 Annual Permits were issued allowing an unknown number of OW/OD moves over a period of time.

Saskatchewan overweight policy allows permit clerks to issue permits to vehicles up to 63,500 kg G.V.W., subject to a maximum tire load of 9 kg per mm of tire width and the maximum axle loads shown in Table 4.3.

Table 4.3 Saskatchewan Maximum Axle Loads Under Permit (kgs)

Steering Axles	5,500
Steering Axles (mobile machines)	tire load limit
Single Axles	11,000
Tandem Axle Groups	22,000
Tridem Axle Groups	27,000
Tandem Axle Groups (16 wheel)	27,000

Source: Saskatchewan Highways and Transportation, 1987.

Tires are subject to a maximum width of 330 mm. Allowable tire loads are increased to 10 kg per mm of width during December, January and February. Maximum axle loads under permit are not increased in winter. Axle spacing requirements and weight penalties between overweight axles and axle groups are the same as the normal eight regulations. These minimum spacings are the same as Manitoba and shown below:

- 3.0 m between steering and drive axles
- 3.5 m between single axles
- 3.5 m between single axles and axle groups
- 5.0 m between axle groups

In Saskatchewan, additional insurance must be purchased in addition to the overweight fee when applying for the overweight permit.

Saskatchewan overdimension policy has restrictions and conditions of movement that varies with the amount overdimension. Some of the common restrictions and requirements include:

- Restricted travel on certain days and times of the day.
- Overdimension signs may be required at the front and rear of the vehicle
- Escort vehicle/s may be required
- Clearance lights for night travel
- Flags on extremities
- Amber flashing lights

#### 4.4 Alberta

Permits may be issued under Alberta's Motor Transport Act to allow the movement of OW/OD vehicles and loads. In 1986, Alberta issued Fee and Non-Fee permits. In general, Non-Fee permits included single trip overdimension, annual overdimension and annual steering axle overweight permits. As the name suggests, there was no charge for these permits. Fee permits include overweight single trip, self-recording and self-issuing permits. In Alberta, Self-Recording Permits are reserved for special mobile machines and oil rig equipment only. Each overweight vehicle has a monthly activity report filled out by the vehicle owner which is then submitted to Motor Transport Services for fee assessment. Self-Issuing Permits are pre-numbered permits which are used by carriers with frequent overweight moves. The permits are filled out by the carrier and are submitted to Motor Transport Services for fee assessment.

As of January, 1988, all OW/OD permits, including overdimension, are charged a fee. OW/OD permits are issued from the Support Services Department in Red Deer and from 24 Vehicle Inspection Stations under the Transport Field Operations Department. Starting October 1, 1988, all

OW/OD permits will be issued by a computer system based at the central office in Red Deer.

Alberta's permit and filing system makes it difficult to determine the number of OW/OD permits issued and whether they were single trip or blanket permits. This is because pre-1988 Fee, Non-Fee permit system mixes non-OW/OD permits such as temporary operating authorities, temporary registered weight increases in with OW/OD permits. In addition, both the Support Services Department and the Transport Field Operations Department keep separate statistics on permits issued. Table 4.4 shows OW/OD statistics for the 1986/87 fiscal year developed from internal records in both departments and from counting permits.

Table 4.4 Alberta OW/OD Permit Counts, 1986/87

	Fee Permits (OW)			Non-Fee Permits (OD)		Total
	Single Trip	Self Recording	Self Issuing	Single	Annual	
Transport Field Operations	52,518	N/A	N/A	7,926	N/A	60,444
Support Services, Red Deer	3,094	?	6,695	1,612	9,409	20,810
Total	55,612	?	6,695	9,538	9,409	81,254

Source: Internal Records, Alberta Transportation and Utilities

In general, annual permits are only issued from the Support Services department in Red Deer. From these statistics, Alberta

approved 71,845 (+Self-Recording) OW/OD movements in 1986/87. In addition, Alberta issued 9,409 annual permits in which the number of OW/OD moves are unknown. The large number of annual overdimension permits issued by the Support Services Department is probably because there was no charge for either annual and single trip overdimension permits.

Alberta overweight policy allows clerks to issue overweight permits to vehicles up to 70,000 kgs G.V.W., subject to certain maximum axle loads, the number of wheels, and a minimum tire width of 255 mm. Overweight vehicles under permit are not directly limited by tire loads. Overweight vehicles from 70,000 kg G.V.W. up to 170,000 kg may be approved by permit clerk supervisors. The maximum gross vehicle weight that permit clerk supervisors may approve without consulting Overload Control (bridge department) is shown in Table 4.5.

Permit Clerks may not issue overweight permits over routes with posted bridges. However, overweight permits over posted bridges can be approved by Overload Control. The only operational restrictions on overweight permits authorized by permit clerks is a maximum speed of 80 km/h for some equipment and 70 km/hr for loads with a high centre of gravity.

Table 4.5 Maximum Gross Vehicle Weight (tonnes) for Permit Issuers

Tractor Plus	Field Staff Can Issue Permits Subject to Seasonal Axle Loads	Permit Issuers to Check with Overload Control	Trucker is to Supply a Loading Diagram to Overload Control
32 Wheels	Under 90	90 to 105	
48 Wheels	Under 130	130 to 143	
64 Wheels	Under 140	140 to 165	Over 165
96 Wheels	Under 170	170 to 200	Over 200

Source: Alberta Transportation and Utilities, 1987.

Maximum axle loads under permit varies seasonally in five increments, with lower allowable axle loads in spring and higher allowable axle loads in winter. Table 4.6 shows the spring, summer, and winter maximum allowable axle loads under permit and the derived tire loads based on a minimum tire width of 255 mm. In addition, maximum axle weights are reduced when spacing is less than the required minimums. Under Alberta's Motor Transport Act, there are no weight tolerances allowed to vehicles operating under an overload permit.



Table 4.6 Alberta Maximum Axle (kg) and Tire Loads (kg/mm)  
Under Permit (Tire Width of 255 mm)

	Spring		Summer		Winter	
	Axle Ld	Tire Ld	Axle Ld	Tire Ld	Tire Ld	Axle Ld
Steering Axles	4,600	9.0	4,600	9.0	4,600	9.0
Single Axles	9,100	9.0	10,500	10.3	12,500	12.3
Tandem Axle Grps	16,000	7.9	20,500	10.0	25,000	12.3
Tridem Axle Grps	18,500	6.1	23,000	7.5	27,500	9.0
Tandem Axle Grps (16 wheel)	27,000	6.6	30,800	7.5	37,600	9.3

Source: Alberta Transportation and Utilities, 1987.

Maximum axle loads under permit must meet certain minimum axle spacings requirements or the maximum allowable axle loads are reduced.

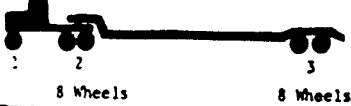



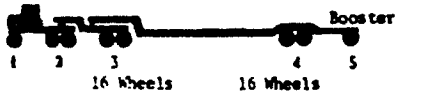
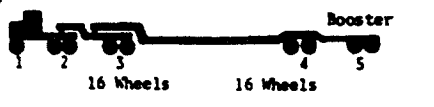
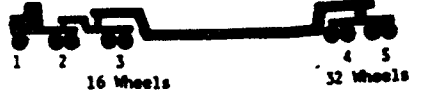

These spacing requirements are:

- 3.5 m between single axles
- 3.5 m between single and tandem axles
- 4.3 m between tandem axle groups
- 4.3 m between tandem and 16 wheel tandem axle groups
- 5.5 m between tridems and tandems

Overweight permit applicants must have at least \$500,000 public liability and damage insurance in order to receive a permit.

Based on a one percent sample of 54,613 1981/82 overweight permits (Mak 1981), the most common overweight truck configuration in Alberta was the 3-S2, with an average G.V.W. of 45,679 kg. Table 4.7 shows the distribution of overweight truck configurations in Alberta and their average G.V.W.s. The 16 wheel tandem axle group was part of 44% of all overweight configurations. On the other hand, the tridem axle group,

Table 4.7 Distribution of Alberta Overweight Truck Configurations, 1981/82

Truck Profile	Average G.V.W. (kgs)	No. Sampled	Percent
1  1 2 3 8 Wheels 8 Wheels	45,679	164	30
2  1 2 3 8 Wheels 16 Wheels	51,063	156	28
3  1 2 3 4 8 Wheels 16 Wheels	59,502	27	5
4  1 2 3 4 16 Wheels 16 Wheels	65,339	48	9
5  1 2 3 4 5 16 Wheels 16 Wheels Booster	84,624	4	1
6  1 2 3 4 5 16 Wheels 16 Wheels Booster	73,972	5	1
7  1 2 3 4 5 16 Wheels 32 Wheels	94,842	5	1
8  1 2 3 4 5 6 32 Wheels 32 Wheels	-	0	0
9 Other Types (includes mobile machines)	-	144	26
Total		553	100

Source: Mak, 1982.

Note: 95% confidence interval =  $\pm 6\%$

popular in Manitoba, was almost non-existent in Alberta. The permit sample also showed that the favoured truck configuration changed with the seasonal overweight capacity limits. For example, the most common overweight truck type during the spring ban period was the 3-S2, with a tandem axle jeep and 16 wheel tandem axle trailer.

Alberta overdimension policy has restrictions and conditions of movement that varies with the amount overdimension. Some of the common restrictions and requirements include:

- Restricted travel on certain days and times of the day.
- Overdimension signs may be required at the front and rear of the vehicle
- Escort vehicle/s may be required
- Clearance lights for night travel
- Flags on extremities
- Amber flashing lights

#### 4.5 Ontario

Under Ontario's Highway Traffic Act, OW/OD permits may be issued to vehicles in excess of normal weights and dimensions. Ontario's special permit policy is outlined in Guidelines No.2 for the Special Overweight Permits (Agarwal, 1981a). The Guidelines are based on bridge and pavement considerations. For bridge considerations, permits are issued to vehicles that comply to the Ontario Bridge Formula (OBF) plus 10,000 kg (called the Maximum Observed Level (MOL)). For pavement considerations, for single trip moves, axles and axle groups must be within 5,000 kg per axle in excess of the legal weight limits. For multi-trip moves,

axles and axle groups must be within 2,500 kg per axle in excess of the legal weight limits. In addition, tire loads must not exceed 11 kg per mm.

Ontario issues permits under 5 categories. The categories are:

- Category A - Single Trip Permits
- Category B - Annual and Project Permits
- Category C - Two Vehicle Concept Permits
- Category D - Mobile Homes
- Category E - All other Special Permits

For Single Trip Permits, permit clerks may issue permits to vehicles up to 70,000 kg G.V.W., subject to a maximum tire load of 11 kg per mm width of tire, certain maximum axle loads, and the vehicle must comply with the MOL formula. The maximum allowable axle loads under Single Trip Permits are shown in Table 4.8. The axle group weight variation is for axle groups of different interaxle spacing (i.e., wider spacing, higher loads). Overweight permits are not issued on any road during spring restriction season. There is no increase in allowable tire or axle loads during the winter season.

Table 4.8 Ontario Maximum Axle Loads under Single Trip Permits (kg)

Steering Axles	15,000
Single Axles	15,000
Tandem Axle Grps	25,400 - 29,100
Tridem Axle Grps	29,500 - 38,600
Tandem Axle Grps (16 wheels)	25,400 - 29,100
Four Axle Grps	33,500 - 48,000

Source: Agarwal, 1981a

In the case of Annual or Project Permits (Category B) there are lower maximum axle weights, and lower maximum G.V.W. limits (64,000 kg) for Annual Permits. Permit clerks may issue overweight permits for up to 120,000 kg G.V.W. for vehicles that comply with Category C. Category C is meant for the transport of long prefabricated beams and pressure vessels. Because of the large distance between the front and rear axle groups, an overweight vehicle hauling long loads is treated as two vehicles under the Two Vehicle Concept (Agarwal, 1981b). This concept allows greater G.V.W. In addition to the normal tire, axle and MOL formula checks for each axle group, the clerk must check that each axle group is within a maximum G.V.W. of 64,000 kg and that the distance between the centers of gravity between the two axle groups is greater than the minimum required distance.

Category E covers all Special Permits to move very heavy loads that cannot be classified under any of the other categories. The routes of vehicles that exceed 11 kg per mm tire width and 15,000 kg per axle must have the structural capacity of the pavements evaluated by an engineer. If bridges are on the route and if the MOL level, or maximum allowable G.V.W. is exceeded, the permit applicant must:

1. Hire a Consulting Engineer to evaluate the structures on the route. The Engineer must specify conditions of passing and design temporary supports and strengthening of structures as required.
2. Submit the Consulting Engineers calculations and plans to the Ministry of Transportation and Communication for approval.

3. Bear the cost of engineering services and that of temporary support and strengthening of the structure.
4. Place a bond for the fully estimated value of the bridges enroute.
5. Bear the cost of escorting the move which shall be made under the supervision of the Ontario Provincial Police.

There are no weight or dimensional limitations under Category E, except those dictated by the load carrying capacity, geometry and traffic conditions of the segment of the highway system involved.

The Ontario Government does not, therefore, do any bridge or route evaluations for heavy vehicles. It is done by Consulting Engineers and the cost of route evaluation is born by the carrier.

#### 4.6 Comparative Analysis of OW/OD Policies

The following sections compare and illustrate the often considerable differences between provincial OW/OD policies presented in the previous section.

##### **4.6.1 Maximum Allowable Tire and Axle Loads**

Maximum allowable tire and axle loads vary widely under provincial OW/OD policies. Table 4.9 demonstrates the range in maximum allowable tire loads and axle loads for single trip overweight permits. Also shown is the range in the maximum G.V.W. allowed before a bridge evaluation by an

engineer is needed. The tire and axle loads shown are maximums and assume winter weight premiums with axle spreads of 1.35 m and sufficient axle spacing.

Not shown in Table 4.9 is the difference in allowable tire and axle loads between provinces during different seasons of the year. On one extreme, Ontario does not issue any overweight permits at all during spring restrictions and has a constant maximum tire and axle loads for the rest of the year. On the other hand, Alberta has maximum axle weights (and indirectly, tire loads) that vary during 5 periods of the year. During summer periods, tire loads range from 9 kg/mm in Manitoba and Saskatchewan to 11 kg/mm in Ontario. In winter, tire loads range from 10 kg/mm in Manitoba and Saskatchewan to 12.3 kg/mm in Alberta.

Ontario has the highest maximum axle and axle group loads of all four provinces with the exception of 16 wheel tandem groups. Tandem axle groups are allowed 24 percent more weight in Ontario than in Manitoba or Saskatchewan. In Ontario, 16 wheel tandem groups are allowed no more weight than an ordinary tandem groups. On the other hand, Alberta allows about 40% more on 16 wheel tandems than any other province.

Table 4.9 Maximum Tire (kg/mm), Axle Loads (kgs) and G.V.W. (kgs) under Single Trip Overweight Permit by Province (During Winter Weight Premiums)

	Ont	Man	Sask	Ab
Tire Load	11	9	10	12.3
Steering Axle (Tractors)	15,000	5,500	5,500	7,300
Steering Axle (Permanently Mounted Equipment)	15,000	8,190	tire cap	11,000
Single Axle	15,000	10,010	11,000	12,500
Tandem Group	27,200	21,960	22,000	25,000
Tridem Group	31,300	27,500	27,000	27,500
16 Wheel Tandem Group	27,200	27,500	27,000	37,600
Max. G.V.W. approved without Bridge Evaluation by Engineers	70,000	60,000	62,500	170,000

Source: Provincial Highway Departments.

The reason for the wide disparities is not clear, especially for allowable weight for 16 wheel tandem groups in Alberta in comparison to the rest of the provinces. From the viewpoint of pavement damage, it would make sense to allow more weight on 16 wheel tandems than on 8 wheel tandems or 12 wheel tridems. One explanation given by Manitoba Highways for limiting 16 wheel tandem weights was that more weight would cause unacceptable overstress to the decks and superstructures of bridges. Given that most bridges in Canada have been built to the same design loads (see following section), it would seem that Alberta Highways does not agree with this explanation.



#### 4.6.2 Maximum Allowable G.V.W.

Table 4.9 shows that provincial overweight permit policies differ widely on what G.V.W. is required before a bridge evaluation is needed. Yet, most Canadian bridges on primary roads have been built to the same AASHTO H20 and HS20 design loads. Table 4.10 shows the distribution of bridge design loads on Primary Roads by province (RTAC, 1978). The RTAC study defined Primary Roads as:

a minimum public road network mainly of provincial, inter-provincial or international significance that serves all population centres in excess of 2,000 by using the most direct existing roads. It does not necessarily include the entire numbered highway system.

For the provinces shown, a 100% sample was taken. It is clear from this Table that the large majority of primary road bridges have been built to AASHTO H20 and HS20 standards.

In some cases, the same overweight truck over bridges with the same design load will be authorized to move by a permit clerk in Alberta, will require a bridge evaluation by a consulting engineer in Ontario and will not be allowed to move at all in Manitoba.

#### Differences in Overweight Permit Policy: An Example

The following section is intended to illustrate the difference in Manitoba and Ontario overweight policies. Figure 4.1 is a G.V.W. vs.

Table 4.10 Number of Primary Road Bridges by Design Load and Province

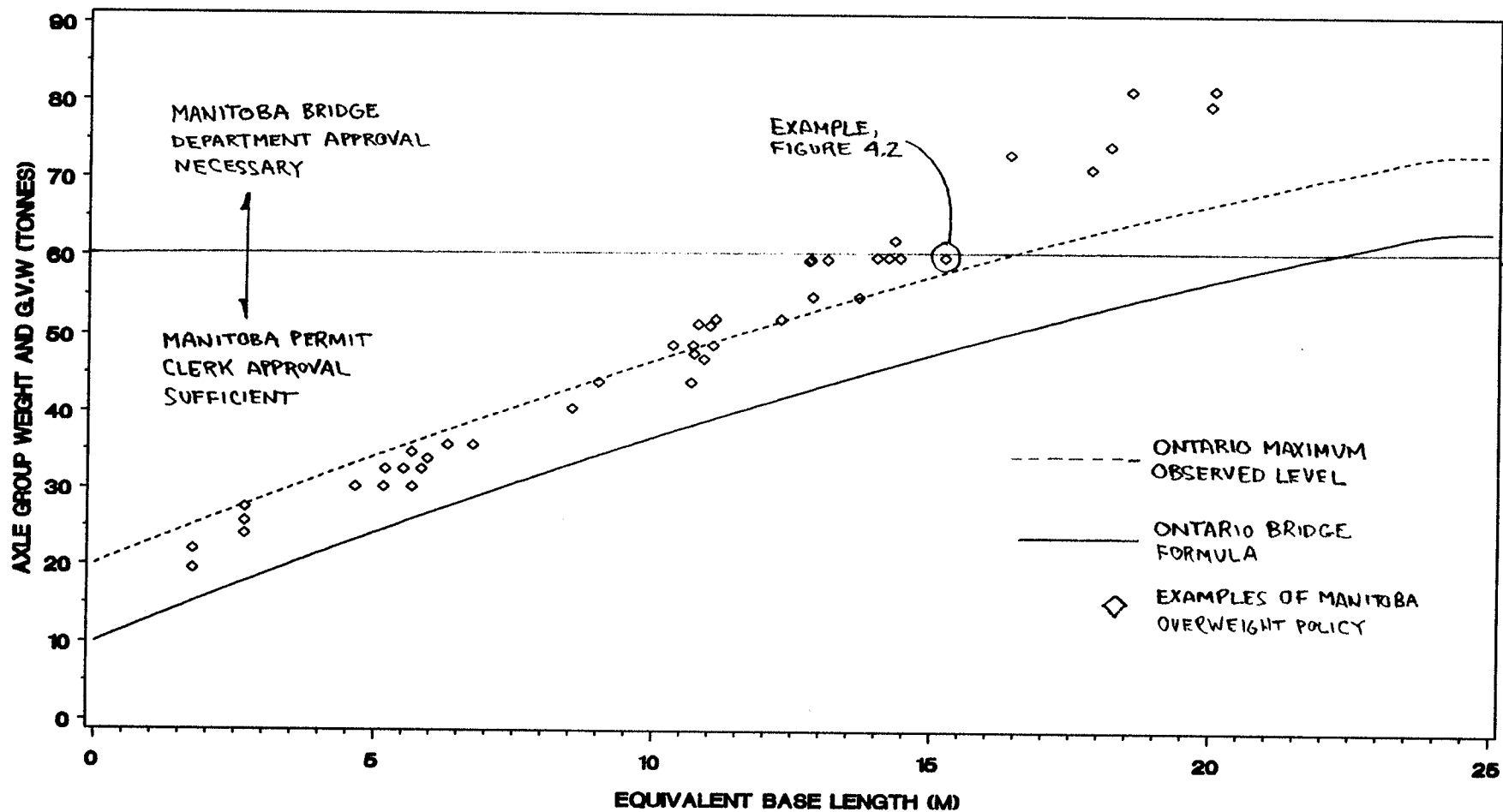
Design Load	BC	AB	Sask	Man	Ont
H10					13 (1.0)
H15	35 (6.7)	7 (1.0)	26 (11.3)		13 (1.0)
H20	257 (49.0)	507 (75.8)	203 (88.6)	221 (92.9)	1283 (97.1)
H25	180 (34.4)	21 (3.1)			1 (0.1)
H30	2 (0.4)				
Other	10 (1.9)	7 (1.0)		5 (2.1)	2 (0.2)
Unknown	40 (7.6)	126 (18.9)		12 (5.0)	9 (0.7)
Total	524	668	229	238	1321

Source: RTAC, 1978

Note: The numbers in the parenthesis represent the percentages.

HS design loads are included in H design load categories.

equivalent base length (EBL) plot of hypothetical truck combinations possible under current Manitoba overweight permit policies. This plot allows direct comparison of allowable weights under Manitoba and Ontario overweight policy. The diamond symbols represent various possible overweight vehicle configurations under Manitoba overweight policy. The solid line is the Ontario Bridge Formula and the dashed line is the Maximum Observed Level (MOL) which is used to limit the G.V.W. of most single trip overweight vehicles under permit in Ontario.



**FIGURE 4.1**  
 ALLOWABLE AXLE GROUP WEIGHT AND G.V.W. UNDER MANITOBA  
 AND ONTARIO OVERWEIGHT PERMIT POLICY VS. EQUIVALENT BASE LENGTH

The equivalent base length concept is defined as a length on which the gross vehicle or axle group weight must be continuously and uniformly distributed to cause the same moment or shear in the bridge structure as the actual vehicle or axle group (Jung and Witecki, 1971).

Figure 4.1 shows that it is possible for Manitoba overweight truck configurations in excess of about 50,000 kg G.V.W. to exceed Ontario's Maximum Observed Level (MOL) line. Vehicles that exceed the MOL level fall under permit Category E, which means that to receive an overweight permit, the carrier must hire a Consulting Engineer to evaluate the structure and specify the conditions of passing (i.e., centre of bridge, maximum speed, exclusive presence, etc.), place a bond for the estimated value of the bridges enroute, and bear the cost of a police escort (Agarwal, 1982).

The following example illustrates the considerable difference between Manitoba and Ontario overweight permit policies. Figure 4.2 shows a 59,990 kg G.V.W., 7 axle 4-S3 (i.e., tridem drive tractor) vehicle which exceeds Manitoba minimum axle spacing requirements and meets or is within the maximum allowable axle weight limits in Manitoba and Ontario. In Manitoba, this vehicle would be automatically approved by a permit clerk without consulting the bridge department. There would be no restrictions in speed, position on bridge, etc. In Ontario, the same truck would exceed the MOL and fall under Category E, requiring

Figure 4.2 Man/Ont Permit Policies for 59,990 kg G.V.W. Overweight 4-S3

	o	o o o		o o o
Axle Spacing (m)	4	1 1	5.5	1 1
Axle Wt (tonnes)	4.99	27.5		27.5 = 59.99 t

**Manitoba:** Within maximum weights and minimum axle spacing. Permit may be issued by permit clerk without consulting bridge department

**Ontario:** Equivalent Base Length: 15.23 m  
 $MOL\ GVW = 20 + 3*(15.23) - 0.0325*(15.23)^2$   
 $= 58.5\ t$

59.99 t > 58.5 t, therefore Ontario Permit Category E. Route must be evaluated by Consulting Engineer before overweight permit is given.

evaluation by a Consulting Engineer before Ontario Highways would give approval for movement.

If we assume that Ontario's overweight policy is not overly conservative, the examples given above suggest that Manitoba might want to reevaluate minimum spacing requirements between some overweight axle groups. For example, the current minimum spacing between 27,500 kg tridem axle groups of 5 m would have to be increased to about 5.5 m in order to agree with Ontario's MOL line.

### 4.6.3 Overweight Permit Fee Structures

Manitoba and Saskatchewan have overweight fee structures that encourage pavement damage. Both Saskatchewan and Manitoba Highway Departments charge an overweight fee of \$0.03 for every tonne-kilometre over registered tractor weight. Consider the following Manitoba example, based on an AASHTO 18 kip equivalent single axle load analysis.

A construction company wants to move a 35,000 kg bulldozer 100 kilometers on an overweight permit. The company has two vehicle combinations it can use; a five axle 3-S2 with a tare weight of 13,600 kg and G.V.W. of 48,600 kg; or a seven axle 4-S3 with a tare weight of 18,000 kg and G.V.W. of 53,000 kg. For each case, the tractor registered weight is 36,500 kg G.V.W. Figure 4.3 shows that the 5 axle 3-S2 causes three times the pavement damage and yet pays 27 percent less overweight fees than the 7 axle 4-S3. Clearly, it is cheaper for the construction company to move the bulldozer on the more damaging 3-S2 combination.

The current overweight fee structure encourages truckers to minimize their permit fee for a given load by reducing tare weight. Minimizing tare weight requires maximizing axle weight, and therefore results in maximum pavement damage.

Figure 4.3 Overweight Vehicle Pavement Damage and Permit Fees in Manitoba

	5 Axle 3-S2			7 Axle 3-S3		
Profile	o	o o	o o	o	o o o	o o o
Axle Loads (t)	4.6	+ 22.0	+ 22.0 = 48.6	4.6	+ 24.2	+ 24.2 = 53.0
E.S.A.L.s	0.5	+ 5.4	+ 5.4 = 11.3	0.5	+ 1.6	+ 1.6 = 3.7
Overweight Fee	(48.6 - 36.5) x100x0.03 = \$36.30			(53-36.5) x100x0.03 = \$49.50		

A more rational overweight fee structure would be based on the distance travelled and the relative pavement damage done by different axle groups at a given weight. This fee system is not without precedent. For example, the Minnesota Department of Transportation charges truckers a cost-based overweight fee based on axle group type, axle group weight and distance travelled. Table 4.11 shows the Minnesota damage assessment cost factors per mile used in calculating overweight fees.

A damage based overweight fee system would be easy to implement and administer and would go a long way to encourage the rational and efficient use of the highway system.

#### 4.7 OBSERVATIONS

In reviewing the overweight policies of the four provinces, it would seem that Alberta's overweight policy is "pavement oriented" and

Table 4.11 Minnesota Damage Assessment Cost Factors per Mile

Total Axle Group Weights (lbs)	Two Axles Spaced Within 8' or Less	Three Axles Spaced Within 9' or Less	Four Axles Spaced Within 14' or Less
0-34,000	0.00	0.00	0.00
34,001-36,000	0.10	0.00	0.00
36,001-38,000	0.124	0.00	0.00
38,001-40,000	0.150	0.00	0.00
40,001-42,000	N/A	0.00	0.00
42,001-44,000	N/A	0.04	0.00
44,001-46,000	N/A	0.05	0.00
46,001-48,000	N/A	0.062	0.00
48,001-50,000	N/A	0.078	0.00
50,001-52,000	N/A	0.094	0.036
52,001-54,000	N/A	0.116	0.044
54,001-56,000	N/A	0.140	0.050
56,001-58,000	N/A	0.168	0.056
58,001-60,000	N/A	0.200	0.070
60,001-62,000	N/A	N/A	0.078
62,001-64,000	N/A	N/A	0.094
64,001-66,000	N/A	N/A	0.106
66,001-68,000	N/A	N/A	0.128
68,001-70,000	N/A	N/A	0.140
70,001-72,000	N/A	N/A	0.168
72,001-80,000	This Axle Group Combination Weight N/A		

Note: N/A - Not Available  
 Single Axle = 20,000 Pounds No Fee  
 The cost factors listed are accumulative for total vehicle group weights.

Example: Three tandem axle groups at 40,000 pounds each equal a cost factor of 0.45 per mile. Cost factors listed above are multiplied times the distance in miles.

Ontario's is "bridge oriented". That is, Alberta's primary concern seemsto be the preservation of pavement, Ontario's the preservation of bridges.

Alberta's pavement slant is evident in encouraging the use of 16 wheel tandem groups to the benefit of pavements and to the possible



detriment of bridges, the five seasonal changes in allowable axle loads, and through making it fairly simple to run vehicles up to 170,000 kg G.V.W. over bridges. That Ontario's overweight policy is bridge oriented is evident in their discouragement of overweight vehicles over 70,000 kg, and the high tire, single, tandem and tridem axle loads allowed through all seasons except spring.

The reason for the different policy slants could be technical, political and perhaps historical. Historically, Ontario has been a leader in bridge research. It is possible that judgmental decisions (as opposed to technical decisions) on Ontario overweight policy have been made sympathetic to preserving bridge life. Politically, Alberta had and still has a high demand for the movement of heavy oil equipment. As a result, overweight policy has been driven to facilitate the passage of heavy vehicles over bridges. Technically, there could be differences in climate, soil conditions or other factors that explain some of the difference between Alberta and Ontario overweight policy. Nevertheless, the gap is wide and deserves further study.

## Chapter 5

### LEGAL OW/OD TRUCKING: DIVISIBLE OW/OD PERMIT POLICIES

#### 5.1 INTRODUCTION

The purpose of this chapter is to describe and compare divisible OW/OD policies and procedures of the prairie provinces and other jurisdictions of interest. The different types of permits available in Manitoba, Saskatchewan and Alberta and the weight and dimension limits and conditions of movement are described. Where possible, statistics on the number of permits issued and the characteristics of trucks operating under permit are described. The last section makes selected comparisons and summarizes major differences between OW/OD permit policies in Western Canada.

Divisible load permits allow trucks to operate beyond normal weights and dimensions in order to lower the cost of transporting certain commodities. Low population and traffic densities and the need to move large volumes of bulk commodities has acted as an incentive to allow the use of larger, heavier trucks in Western Canada. As of the beginning of 1988, all three prairie provinces allow OW/OD trucks to haul divisible commodities under permit in four general categories:

1. **Forest Product Haul Permits:** All three prairie provinces allow trucks hauling forest products to operate at higher than normal axle weights and G.V.W. during the winter months. Saskatchewan allows higher than normal weights year round. Saskatchewan and Alberta allow trucks hauling forest products to operate in excess of normal dimensions.
2. **L.C.V. Permits:** Various multi-trailer truck combinations are allowed to operate overlength (and in Saskatchewan, over normal G.V.W) on certain routes under certain conditions.
3. **Transportation Agreement Permits:** Truck combinations are allowed to haul certain commodities (usually bulk commodities) at higher than normal G.V.W.s, and sometimes at higher than normal axle weights, width and length. In some cases, the permit owner must make a contribution towards incremental pavement and bridge costs resulting from an overweight movement.
4. **Interim RTAC Permits:** Permits allowing the transport of any commodity on approved OW/OD RTAC truck configurations on selected routes. These permits are being issued until the regulations can be changed to allow the larger and heavier RTAC configurations.

In addition to the above permits, all prairie provinces issue overdimension permits to vehicles carrying hay, loose fodder and culverts. They also issue overweight steering axle permits to vehicles carrying any divisible load (e.g., garbage trucks, concrete mixers), providing tire load and axle capacity limits are met. In some cases, overweight permits are issued allowing trucks to exceed tire load limits on spring weight restricted roads. The details of divisible permit policy and, where possible, the characteristics of trucks operating under these permits in terms of vehicles, routes, commodities and volumes will be described in the following sections for each of the prairie provinces.

## 5.2 OW/OD DIVISIBLE PERMITS IN MANITOBA

Manitoba Highways allows OW/OD trucks to haul divisible loads under permit. Examples include trucks hauling Raw Forest Products during winter and Rocky Mountain Doubles, Triple Trailers and RTAC configurations on certain highways.

### 5.2.1 Manitoba: Raw Forest Product Permits

Raw Forest Product permits date back to the early 1970s when the first overweight permits were issued. Today, trucks hauling raw forest products during winter months are allowed maximum weights of 9,200 kg on single axles, 18,000 kg on tandem axles and 59,000 kg G.V.W. on Class A1 or Class B1 roads (Manitoba Regulation 260/82). On Class A1 highways, the effective maximum weight for single axles is 10,010 kg because Regulation 198/83 allows a ten percent winter weight premium on single axles and tandem axle groups for all trucks. Trucks must comply with the nine kg/mm width of tire requirement for both raw forest product permits and winter weight premiums. Raw forest product permits are subject to a minimum distance between axle groups of five m and must have Manitoba Highways Bridge Office approval.

Permit holders must pay a fee of \$42.50 per 1000 kg over the vehicles allowable legal weight for the 3 month period. Tractors must be registered at their maximum legal weight to apply for a forest

products permit. For each additional month, the permit costs \$15.00 per 1,000 kg overweight.

191 tractors in Manitoba had raw forest product permits for the winter season 1987/1988 of which 92 (48%) were tractor-semitrailers and 96 (50%) were seven axle B trains. The remaining two percent were three axle tandem trucks. Most trucks were hauling to either the Abitibi-Price plant in Pine Falls (at least 53 or 28%) or the Manitoba Forest Industries (ManFor) plant in The Pas (at least 67 or 35%).

#### 5.2.2 Manitoba: Long Combination Vehicle Permits

Manitoba Highways allows triple trailer combinations on specified four lane highways during any time of the day. Points served by these four lane highways include Brandon, Winnipeg, Oak Lake and Steinbach. Most of the current LCV traffic is between Winnipeg and Brandon. In addition to the four lane highways, Rocky Mountain Doubles are allowed to travel overnight on the two lane Trans-Canada Highway between Brandon and the Saskatchewan border between 11:00 p.m and 6:30 a.m. Manitoba Highways is investigating the possibility of allowing Rocky Mountain Doubles on two lane highways, subject to certain design criteria (i.e., good alignment and two meter shoulders). Turnpike Double combinations are not allowed in Manitoba.

On provincial highways, Rocky Mountain Doubles are allowed a maximum semitrailer length of 14.6 m (47.9') and a maximum trailer

length of 8.5 m (28') within an overall maximum length of 29 m (95.1'). Triple Trailer combinations are allowed a maximum semitrailer length of 8.6 m (28.2'), with a maximum overall length of 31.25 m (102.5'). Trailers within a Triple combination must be substantially the same length with a maximum of 1 m variation in trailer lengths permitted. Maximum G.V.W. remains at 56,500 kg for both Triples and Rocky Mountain Doubles.

In addition to the constraints on dimensions, Triples and Rocky Mountain Doubles must meet various temporal, operational, safety and equipment requirements. These include:

1. The heaviest trailer must be first, followed by lighter trailers in succession.
2. Operation is prohibited on weekends between 4:00 p.m. Friday to 12:01 a.m. the following Monday. On holidays, operation is prohibited from 4:00 p.m. on the day prior to the holiday to 12:01 on the day following.
3. Drivers must be approved by the province and be well trained and experienced.
4. Certain Mud Flaps and amber clearance lights are required.
5. A safety supervisor must be employed to oversee LCV operations.
6. The permit applicant must have insurance against Public Liability and Property Damage of at least three million dollars.

The City of Winnipeg also issues LCV permits allowing operation of the overlength vehicles into the city. The LCV permit fee is \$200 per

tractor per year. The City's permit is similar to the Province's except that it restricts the kingpin to rear dimension to 23.0 m (75.5') for Rocky Mountain Doubles and 26.0 m (85.3') for Triple Trailers. The City also has additional requirements imposed on LCV operation. These include:

1. Operation is prohibited between the hours of 7:00 a.m. to 9:00 a.m., and 3:30 p.m. and 5:30 p.m., Monday to Friday inclusive.
2. General Merchandise freight only, no dangerous goods.
3. Trip records must be kept with information on the date, time of departure and arrival, destination, driver's name, gross vehicle and maximum axle group weights, road condition and comments. Trip records must be submitted monthly to the director of Streets and Transportation.

In 1987/88, there were six companies holding LCV permits in Manitoba. Tables 5.1 and 5.2 show the LCV statistics for these carriers by type of permit held, number of tractors registered, and number of trips reported for the years 1984 and 1987. These statistics are based on City of Winnipeg Permit trip reports and carrier interviews. These Tables show that the number of trips by LCVs have more than tripled since 1984, from 931 trips to 2,830 trips. Since 1984, the number of trips by Rocky Mountain Doubles has more than doubled from 621 to 1,379 trips, and the number of trips made by triples has increased more than four times from 310 trips to 1,451 trips. Safeway has recently started operation of Rocky Mountain Double combinations from Winnipeg to Brandon and Winnipeg to Steinbach. To allow full utilization of trailers,

Table 5.1 Manitoba Long Combination Vehicle Statistics, 1984  
Triple Trailer (TT) and Rocky Mountain Double Trailer (RMD)  
Combinations

Company	Permits Issued		Number of Tractors		Number of Trips		
	TT	RMD	TT	RMD	TT	RMD	Total
Beverage Services Ltd.	0	1	0	2	0	168	168
CP Express and Transport	1	0	1	0	169	0	169
Motorways (1980) Ltd.	1	1	4	4	18	143	161
Sears Canada Inc.	1	0	3	0	50	0	50
Transx Ltd.	1	1	7	7	73	310	383
Total	4	3	15	13	310	621	931

Source: City of Winnipeg permit trip records

Table 5.2 Manitoba Long Combination Vehicle Statistics, 1987  
Triple Trailer (TT) and Rocky Mountain Double Trailer (RMD)  
Combinations

Company	Permits Issued		Number of Tractors		Number of Trips		
	TT	RMD	TT	RMD	TT	RMD	Total
Beverage Services Ltd.	0	1	0	2	0	768	768
CP Express and Transport	1	0	1	0	152	0	152
Kindersley Transport Ltd.	0	1	0	1	0	173	173
Motorways (1980) Ltd.	1	1	15	15	170	113	283
Sears Canada Ltd.	1	0	6	0	952	0	952
Transx Ltd.	1	1	6	6	177	325	502
Total	4	4	28	24	1451	1379	2830

Source: City of Winnipeg permit trip records

Note: Beverage Services Ltd. did not have a Winnipeg Permit or submit trip reports in 1987. The Number of Trips was estimated by the fleet manager.

Safeway owns 46.5 foot semitrailers and 26.5 foot pup trailers which allows an integer number of pallets to be placed within the trailers.

Other new LCV operations include CP Express and Transport with an



expansion of their LCV operation to include Rocky Mountain Doubles. Reimers has also started operating Triple Trailers.

### 5.2.3 Manitoba: Interim RTAC Permits

Both Manitoba Highways and the City of Winnipeg are allowing RTAC B-Trains and tridem axle tractor semitrailers to operate under permit on designated routes throughout the province. Figure 5.1 shows the allowable routes in Manitoba. After a brief period of restricting tandem axle groups to 16,000 kg, Manitoba Highways now allows RTAC vehicles the full weights and dimensions originally proposed by RTAC. Manitoba Highways fee structure for RTAC permits is \$50 a year for overlength plus \$0.036 per tonne kilometer over the licenced G.V.W.

The City of Winnipeg restricts tandem axle groups of RTAC configurations to 16,000 kg, instead of 17,000 kg. As a result of this, the maximum G.V.W. is limited to 60,500 kg for the RTAC B-Train (instead of 62,500 kg) and 45,500 kg for the tridem tractor-semitrailer (instead of 46,500 kg). In addition, the City restricts the maximum number of RTAC permits to five percent of the tractor power units operated by the carrier. The City of Winnipeg RTAC permit fee is \$200 per vehicle per year. As of July 1988, four companies have purchased Winnipeg RTAC permits for 33 tractors. In contrast, 149 companies have purchased RTAC fleet permits from the Province.

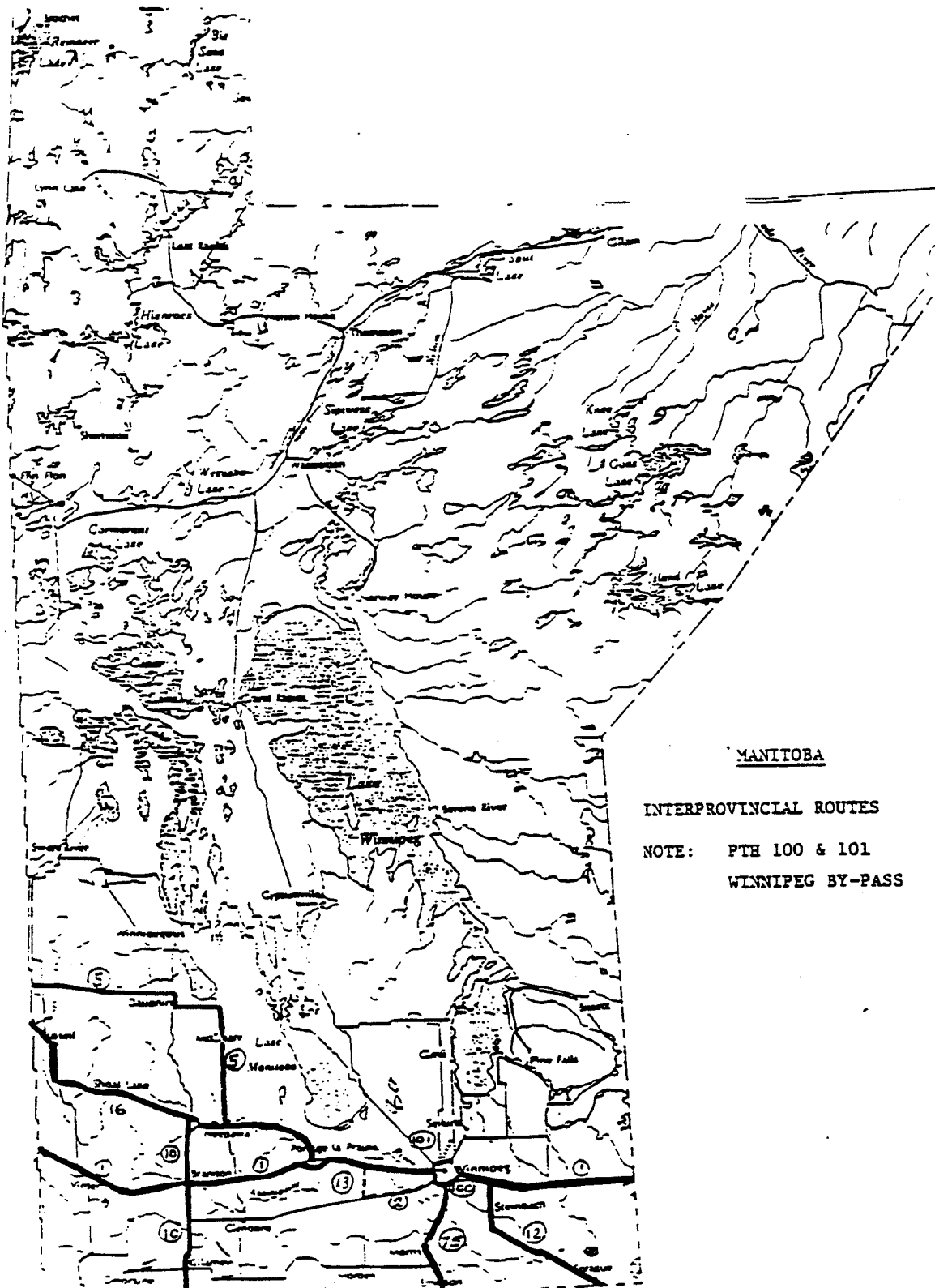


FIGURE 5.1 DESIGNATED OVERWEIGHT RTAC ROUTES IN MANITOBA

Source: Manitoba Highways and Transportation, 1988

#### 5.2.4 Manitoba: Other OW/OD Operations Under Divisible Permit

The only other OW/OD operations under divisible permit in Manitoba is a copper concentrate haul in Northern Manitoba. There are four mines in the Flin Flon area and six in the Snow Lake region. Every month, trucks haul 11,500 tonnes of ore about 30-40 km from Centennial Mine near Athapapaskow to Hudson Bay Mining and Smelting's ore processing plant in Flin Flon (Kimantas, 1988, 53). Copper concentrate is hauled from Chisel Lake mine to Snow Lake and from the Spruce Point mine to Flin Flon in overlength (25.7 m) nine axle 3-S2-4s. These vehicles are allowed a maximum of 56,500 kg G.V.W. Six trucks are operated by Northern Bulk Hauling Ltd., 24 hours a day, five and one-half days a week. This operation started in 1986, when a CN branchline was closed. Northern Bulk Hauling also transports gold ore and concentrates on private roads in nine axle, 70,000 kg G.V.W. trucks.

#### 5.3 OW/OD DIVISIBLE PERMITS IN SASKATCHEWAN

Saskatchewan was the first province to allow large volumes of bulk commodities to move under a transportation agreement. The Esterhazy-Portal Potash haul of the late 1960's was the precursor to the current Bulk Commodity Policy which was formally introduced in January 1980 (Churko, 1985). Saskatchewan also has a Timber Transportation Policy, an overlength vehicle operating program and an Interim Weight and Dimension program that allows the use of RTAC and other equipment under permit.

### 5.3.1 Saskatchewan: Timber and Woodchip Permits

Saskatchewan Highways issues permits allowing overweight and overwidth trucks to haul logs and woodchips on designated 'overweight highways' at up to 75,000 kg G.V.W. in winter and 73,600 kg G.V.W. during the rest of the year (Oliver, 1986). Practically, however, the maximum G.V.W. is sometimes limited to 62,200 kg by restricted bridges. Higher than normal axle loads (i.e., 11,500 kg on singles, 25,000 kg on tandems and 31,800 kg on tridems) are allowed with maximum tire loads ranging from nine to 10 kg per mm of tire width. The designated overweight highways for log hauls are shown in Figure 5.2.

The overweight log haul trucks consist of five and seven axle tractor semitrailers as well as seven axle B-Trains. Woodchips are hauled in overweight seven and eight axle B trains. Schematics of these vehicles and their allowable weights by season are shown in Figures 5.3 and 5.4. Saskatchewan Highways issued 680 pulphaul permits in 1986/87.

### 5.3.2 Saskatchewan: Overlength Vehicle Operating Agreements

Saskatchewan allows Rocky Mountain Doubles, Triples and Turnpike Doubles to operate under permit on designated highways. Turnpike Doubles may operate with two 16.2 m (53') trailers, Rocky Mountain Doubles may operate with a 16.2 m (53') and a 8.5 m (29') trailers, and Triples may operate with 3 8.5 m (29') trailers. There are no overall restrictions on length for any configuration. Turnpike Doubles and Rocky Mountain

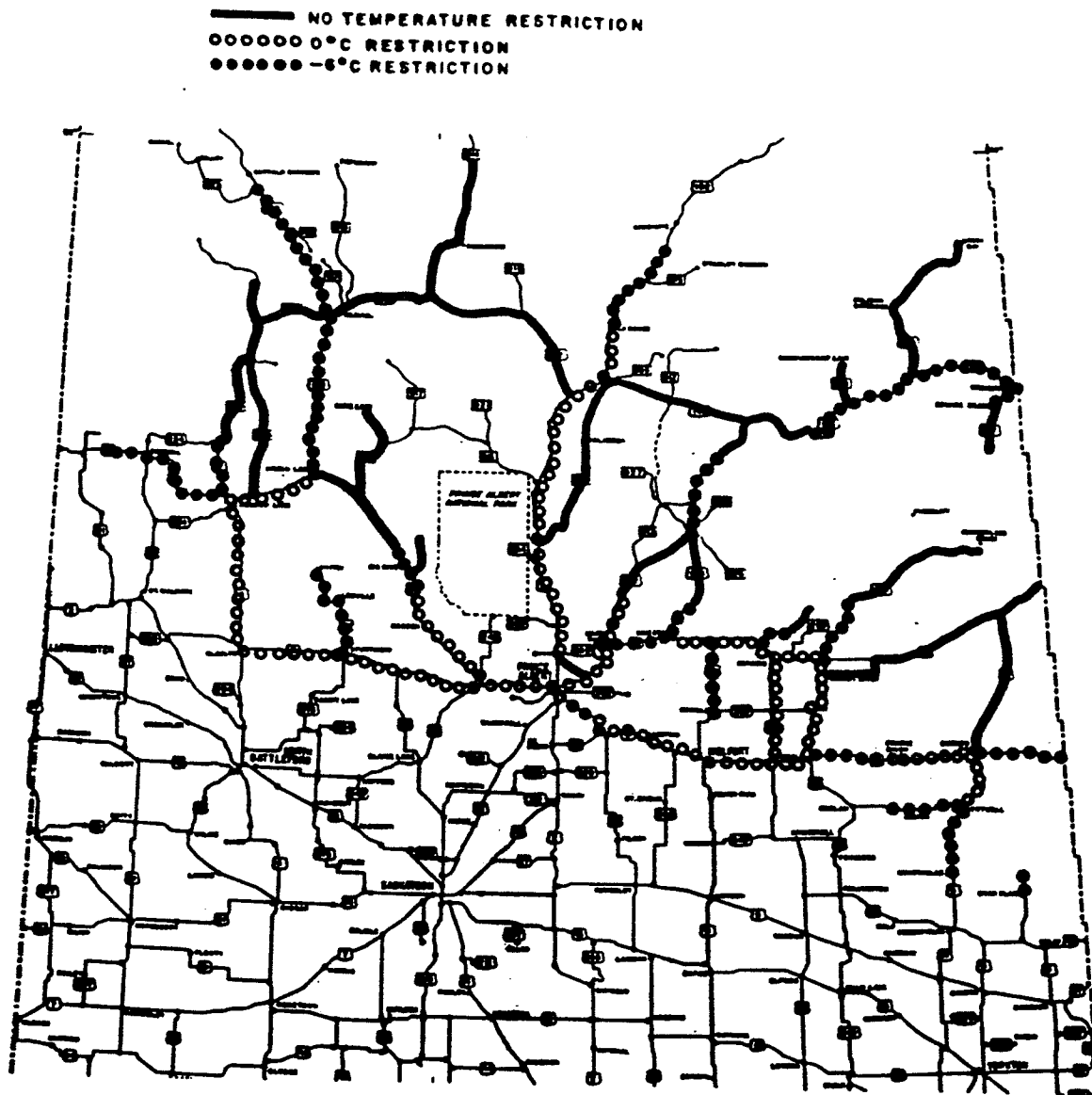
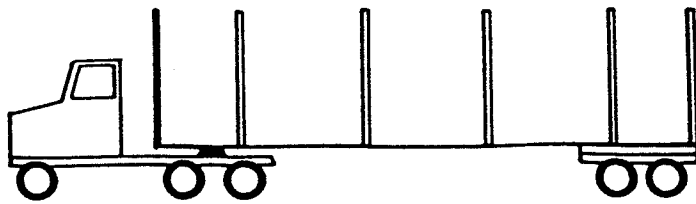


FIGURE 5.2 DESIGNATED OVERWEIGHT LOG AND PULP HAUL ROUTES  
IN SASKATCHEWAN (Oliver, 1986)

## 5-AXLE SEMI-TRAILER



TEMPERATURE BELOW RESTRICTION  
5500 kg    25000 kg

25000 kg

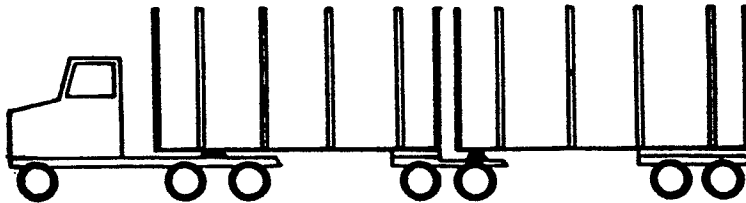
G.V.W.  
55500 kg

TEMPERATURE ABOVE RESTRICTION  
5500 kg    22700 kg

22700 kg

50900 kg

## 7-AXLE B-TRAIN



TEMPERATURE BELOW RESTRICTION  
5500 kg    25000 kg    25000 kg

25000 kg

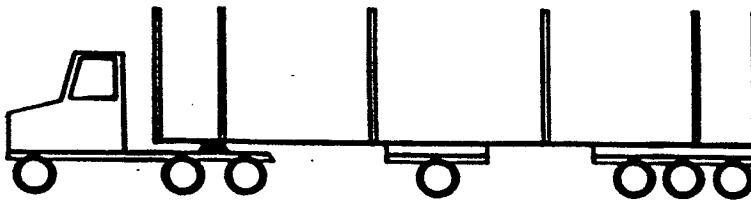
G.V.W.  
75000 kg

TEMPERATURE ABOVE RESTRICTION  
5500 kg    22700 kg    22700 kg

22700 kg

73600 kg

## TIMBER VEHICLE



5500 kg    25000 kg

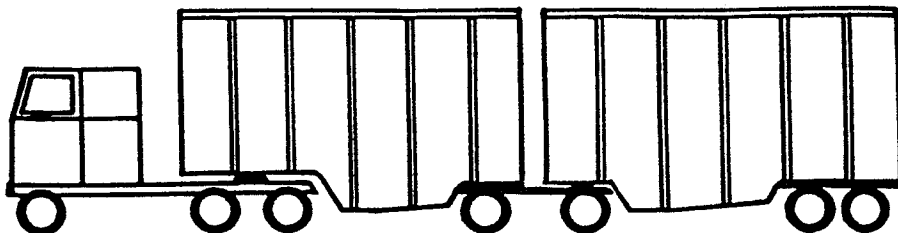
11300 kg

31800 kg

G.V.W.  
73800 kg

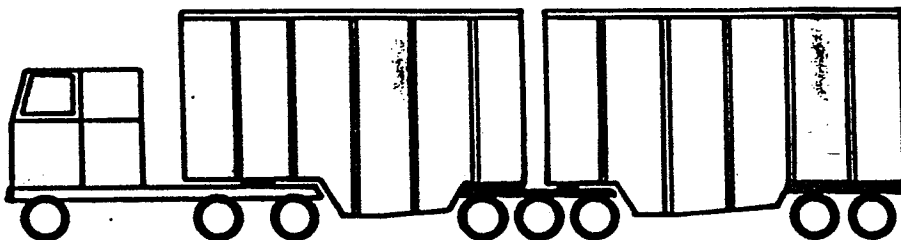
FIGURE 5.3 SASKATCHEWAN OVERWEIGHT AND OVERDIMENSION TIMBER HAUL VEHICLES (Oliver, 1986)

## 7-AXLE B-TRAIN



				G.V.W.
TEMPERATURE BELOW 0°C				
5500 kg	25000 kg	25000 kg	25000 kg	75000 kg
TEMPERATURE ABOVE 0°C				
5500 kg	16000 kg	16000 kg	16000 kg	53500 kg

## 8-AXLE B-TRAIN



				G.V.W.
TEMPERATURE BELOW 0°C				
5500 kg	25000 kg	31700 kg	25000 kg	75000 kg
TEMPERATURE ABOVE 0°C				
5500 kg	17600 kg	25000 kg	17600 kg	65700 kg

FIGURE 5.4 SASKATCHEWAN OVERWEIGHT CHIP HAUL VEHICLES  
(Oliver, 1986)

Doubles may operate at up to 62,500 kg G.V.W. and Triple Trailers may operate at up to 53,500 kg G.V.W.

Triples and Turnpike Doubles can operate on four lane highways between Swift Current, Regina and Saskatoon. In addition to these highways, LCVs within the overall length of 29 m (e.g., Rocky Mountain Doubles) may operate at night on designated two lane highways during certain restricted hours. Table 5.3 has the hours of operation for LCVs less than 29 m on designated two lane highways. LCVs are allowed to operate on four lane highways at any time, except on Sundays and holidays.

Table 5.3 Hours that LCVs May Operate on Saskatchewan's  
Two Lane Highways

	Morning Hours	Evening Hours
Monday to Thursday	12 a.m.- 6:30 a.m.	9:00 p.m.- 12 a.m.
Friday	12 a.m.- 6:30 a.m.	
Saturday	2:00 a.m.- 6:30 a.m.	
Sunday	no operation	
Statutory Holidays	no operation	
Day preceding a statutory holiday	12 a.m.- 6:30 a.m.	

The LCVs may only be operated on two lane highways with 3.7 m driving lanes and at least two m shoulders. The designated routes for Rocky Mountain Doubles are shown in Figure 5.5. The rationale for allowing night travel only is to reduce passing conflicts by restricting Rocky Mountain Doubles to times of low traffic volumes (Stobbs, 1986).



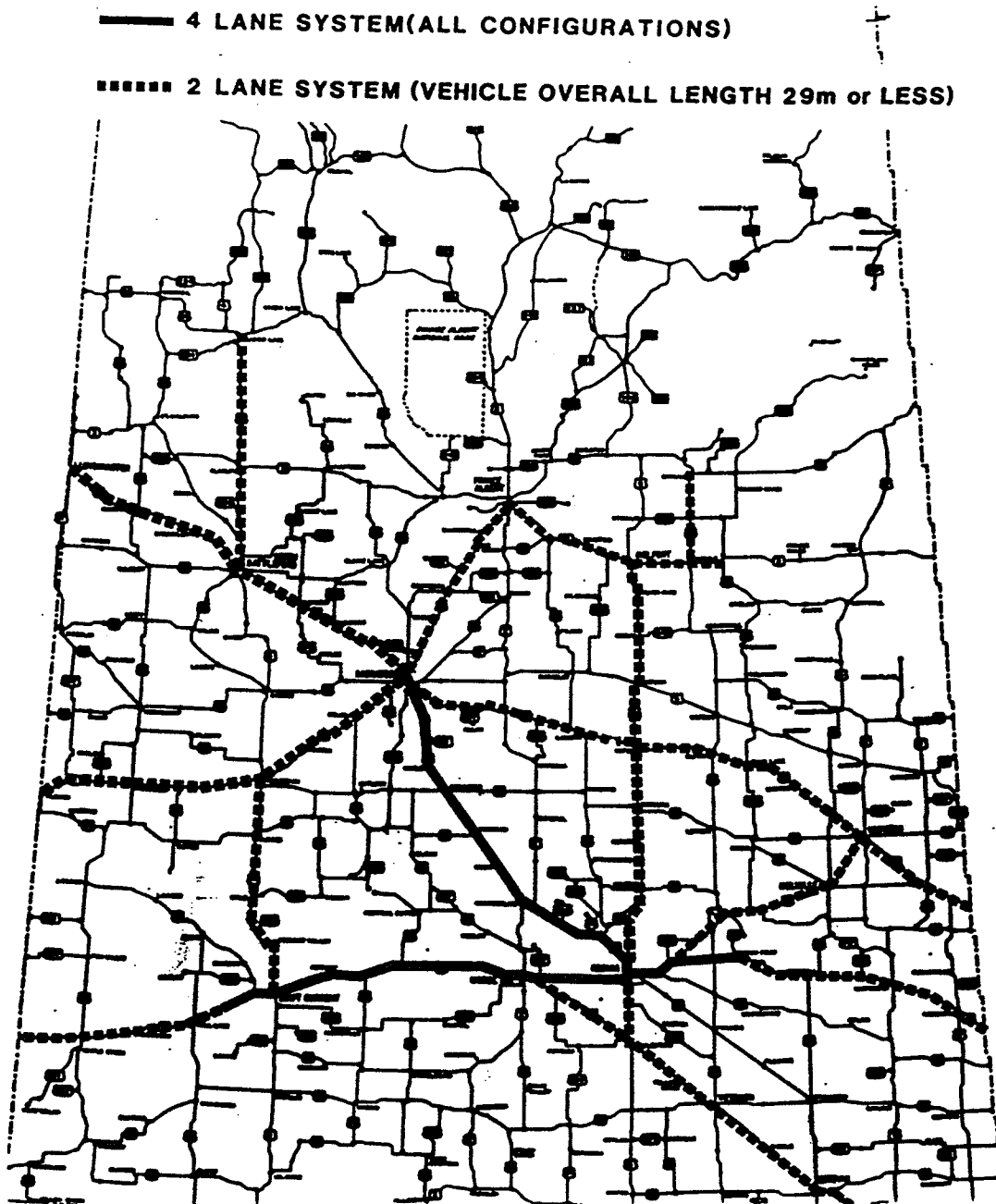


FIGURE 5.5 SASKATCHEWAN OVERLENGTH VEHICLE ROUTES

Source: Saskatchewan Highways and Transportation, 1988

It is estimated that LCVs are running up about six million vehicle miles per year in Saskatchewan (Hurst, 1987). As of June, 1988 there were 11 carriers with about 70 tractors registered under the overlength operating agreements (Stobbs, 1988).

### 5.3.3 Saskatchewan: Transportation Agreement Permits

Saskatchewan has a bulk commodity policy that allows industries (not carriers) to apply for permission to transport commodities with vehicles that exceed normal weights and dimensions (Saskatchewan Highways, 1986). The applicant must reimburse the province for all net incremental road and bridge costs associated with any particular bulk commodity movement in return for weight and dimension concessions.

Where there is no rail alternative, the incremental road and bridge costs are calculated as the difference between the road and bridge costs associated with moving the required volume of commodity at normal weights and dimensions, and the road and bridge costs associated with moving that volume of commodity at the requested weights and dimensions. In the case where rail service is available, 60 percent of the total road and bridge costs that would result from the total movement of tonnage at legal weights and dimensions is the responsibility of the applicant. In both cases where rail service is or is not available, the applicant is responsible for the agreement administration costs. In addition to the incremental road and bridge costs as mentioned above, the applicant must purchase OW/OD permits and

increase the registered weight and insurance of each vehicle to the proper levels.

The incremental costing studies are conducted by people approved by the Department of Highways and Transportation. The cost of the feasibility/costing study is shared equally by the shipper and the provincial government. The cost of Engineering studies to assess the operating and safety characteristics of the proposed new vehicle is also shared equally between the province and the applicant.

By using an OW/OD vehicle configuration with more axles, it is sometimes possible to reduce both the road damage costs and the truck operating costs compared with trucks hauling the same volume of payload at normal weights and dimensions. In situations like this, there would be no incremental road damage cost paid by the shipper to the Saskatchewan Government.

Table 5.4 gives a summary of 1986/87 tonnages moved under the Bulk Commodity Policy by company, commodity and carrier. Trucks under the

Bulk Commodity Policy moved the equivalent of 43,495 3-S2 truckloads in 1986/87 based on a payload of 22,500 kg. This is an average of 124 trucks a day. In 1985, the estimated total tonnage of potash leaving Saskatchewan was estimated at 10.2 million tonnes (DelCan, 1988). If the volume remained roughly the same for 1986, trucks under the bulk commodity policy moved roughly nine percent of all potash transported from Saskatchewan.

Table 5.4 Saskatchewan Bulk Haul Tonnage Summary, 1986/87

Company	Commodity	Carrier	Tonnes	3-S2 Loads
International Minerals Corp.	Potash	Kleysen	656,750	29,188
Potash Corporation of Sask.	Potash	Various	250,000	11,111
Key Lake Mines	Lime	NRT	23,514	1,045
Key Lake Mines	Sulphur	Bulk Systems	9,653	429
Key Lake Mines	Propane	NR	25,000	1,111
Key Lake Mines	Petroleum	NR	8,718	387
Canadian Liquid Air	CO2	Trimac	30,000	1,333
Wellings Construction	Gravel	Wellings	60,000	2,666
Total			978,635	43,495

Source: Saskatchewan Highways and Transportation

The vehicles used to haul bulk commodities vary in configuration. All these vehicles reduce both pavement damage and operating costs per ton payload in comparison to trucks of normal weights and dimensions. One potash haul uses nine axle 3-S2-4s with 16,300 kgs on the drive and lead trailer tandems, 14,500 kgs on the rear trailer tandems, and a total G.V.W. of 66,200 kg. A more recent and innovative vehicle currently being tested is a nine axle 3-S3-S3 liquid bulk tanker with inset stub axles. The intention of the inset stub axles is to

distribute the pavement damage across the whole lane. A schematic of this configuration is shown in Figure 5.6. This truck is hauling aviation fuel between Regina and Moose Jaw.

#### 5.3.4 Saskatchewan: Interim Vehicle Weight and Dimension Program

Saskatchewan's Interim Vehicle Weight and Dimension Program allows overweight and overlength RTAC configurations to operate under permit until the weight and dimension regulations are changed. In addition, this program allows increased lengths, G.V.W.s and axle group weights for Non-RTAC seven and eight axle A and C-Trains. The Interim program was started in August 1987 and was expanded and modified in February 1988. There is no limit on the number of permits available to each company. Truck configurations under permit are limited to 90 km/h when loaded and 100 km/h when empty. Carriers must submit operating and accident reports to the Highways Department while under permit.

With the proper equipment, eight axle A, B or C-Trains are all allowed a maximum G.V.W. of 62,500 kg. Seven axle A or C-Trains are allowed a maximum G.V.W. of 55,600 kg. For all configurations, some tandem axle groups are allowed up to 17,000 kg and the allowable overall length is 25 m.

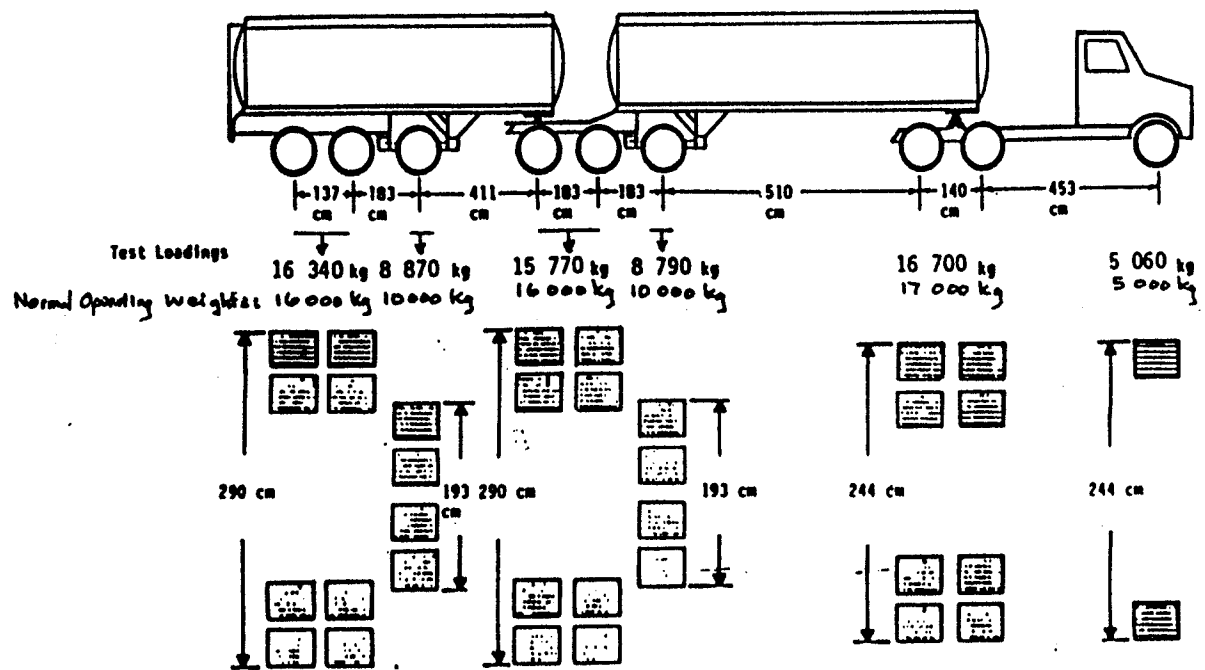


FIGURE 5.6 SCHEMATIC OF SASKATCHEWAN OVERWEIGHT LIQUID BULK TANKER

Source: Saskatchewan Highways and Transportation, 1988

## 5.4 DIVISIBLE OW/OD PERMITS IN ALBERTA

Alberta has policies that allows OW/OD trucks to carry Logs and Rough Lumber, long combination vehicles and an extended weight program.

### 5.4.1 Alberta: Log and Rough Lumber Permits

Alberta allows trucks hauling logs and rough lumber to operate overweight on certain routes during winter months. In addition, trucks hauling logs and rough lumber are permitted to operate overwidth and overlength year round. Logging trucks that operate on Licence of Occupation roads are exempt from weight and dimension regulations.

Tandem axle groups on log haul trucks under winter weight permits are allowed 22,700 kg plus 2,300 kg tolerance for a total of 25,000 kg. Maximum G.V.W., including tolerances and based on 16" tires on the steering axle, is as follows (Alberta Transportation and Utilities, 1987):

Truck Type	Maximum G.V.W. (kgs)
SU2	32,300
3-S2	57,300
Seven Axle B-Trains or A-Trains	61,200
Eight axle B-Trains	65,000

On eight axle B-Trains, the middle tridem group is allowed 25,000 kg. The fee for a timber haul overweight permit is \$25 (1987). A count of

Log Haul winter permits for the winter of 1986/87 found 36 companies with 1,027 trucks operating overweight in Alberta.

Year round over-dimensional permits are also available to timber haulers allowing a maximum width of 3.2 m, height of 4.8 m and length of 25 m and 30.5 m for logs loaded crosswise and lengthwise respectively (Alberta Transportation and Utilities, 1987).

#### 5.4.2 Alberta: Extended Length Permits

Alberta allows Turnpike Doubles, Rocky Mountain Doubles and Triple Trailers on highways with four or more lanes. Turnpike Doubles must be of the C-Train configuration, Triple Trailers and Rocky Mountain Doubles may be of the A-Train or C-Train Configuration. Alberta also allows Rocky Mountain doubles of C-Train, and in some cases, A-Train configuration to operate on designated two lane highways. A-Train Rocky Mountain Double configurations may be used on two lane highways as long as the lead trailer is longer than 13.7 m (45') and the rear trailer is longer than 7.9 m (25.9'). All LCV vehicles, including Rocky Mountain Doubles on two lane highways, may operate at any time except between four p.m. of the day preceding a weekend or holiday to 12:01 a.m. of the day following a weekend or holiday.

Alberta does not limit the overall length of Turnpike Doubles and Triple Trailers. Instead it limits only the length of each trailer. Each Turnpike Double Trailer may be no longer than 15.2 m (50') long,



and each Triple Trailer may be no longer than 8.6 m (28.2') long with no more than 1 m variation in trailer lengths permitted. Rocky Mountain Doubles may be up to 29 m in overall length with the length of any trailer not exceeding 15.2m (50').

As of October 1987, Alberta had 68 companies holding extended length vehicle permits. No fee was charged for overlength permits until January 1st, 1988 when a fee of \$200 per permit type was put into place. More than one tractor may be registered under the overlength permit at no extra cost.

#### 5.4.3 Alberta: Extended Weight Program

Alberta allows OW/OD RTAC configurations, eight axle A and C-Trains and Turnpike Doubles up to 62,500 kg G.V.W. to operate under permit on certain routes and under certain conditions. Seven axle A and B-Trains are allowed up to 56,500 kg G.V.W. The number of trucks under Alberta's Extended weight program by configuration type (as of May 31, 1988) is shown in Table 5.5.

#### 5.5 OTHER JURISDICTIONS OF INTEREST

In addition to the prairie provinces, Minnesota, North Dakota, Montana and the Northwest Territories allow OW/OD trucks to haul divisible loads. The Northwest Territories intended to allow the operation of Rocky Mountain Doubles by the end of October, 1987 (Schauerte, 1987).

Table 5.5 Number of Trucks under Alberta's Extended Weight Program by Configuration Type

Configuration	Typical Maximum G.V.W.	Trucks
7 Axle A-Trains	56,500	96
7 Axle B-Trains	56,500	15
7 Axle C-Trains	56,500	24
8 Axle A-Trains	62,500	19
8 Axle B-Trains	62,500	240
8 Axle C-Trains	62,500	29
6 Axle Tractor Semi	46,500	24
Turnpike Doubles	62,500	10
Total		457

Source: Alberta Transportation and Utilities

They would be permitted on Highway #1 from the Alberta Border to kilometers 84 and on Highway #2 between kilometers 0 and kilometers 37.

Minnesota does not allow the use of LCVs on its highways. However, it does issue overweight permits allowing trucks a 10 percent weight increase when carrying sugar beets or potatoes from October 1 to November 30. Minnesota also issues annual permits to refuse compactor trucks allowing increased axle weights.

North Dakota allows trucks hauling divisible loads to operate overweight or overdimension under permit. Overweight Single Trip Interstate permits are available allowing trucks to increase their G.V.W. on Interstate Highways I-29 and I-94 from 80,000 lbs (36,290 kg) to 110,000 lbs (49,900 kg) G.V.W. These trucks must conform to the tire load, axle and bridge formula B weight regulations. This permit allows trucks to match the 110,000 lb G.V.W. limit on North Dakota State

highways. Approximately 30,000 overweight Interstate permits are issued every year (Erickson, 1988).

North Dakota also allows the operation of overlength LCVs and is unique in that as of October 1, 1983 the operation of LCVs up to 110 ft (33.53 m) has been legally allowed on designated highways without permit (North Dakota, 1987). All possible configurations of LCVs within 110 feet, including Turnpike Doubles, Triples, Rocky Mountain Doubles, and others are allowed on designated highways. North Dakota is also unique in that many of the designated highways for 110 foot LCVs are two lane. However, the operation of Triple Trailers and Turnpike Doubles on these two lane highways is not common (North Dakota, 1987). Figure 5.7 shows the designated highways for LCV operation in North Dakota.

The overlength trucks may operate up to 110,000 lbs (49,900 kg) G.V.W. on State highways and may also operate at this same weight on interstate highways if they obtain an Interstate overweight single trip permit. Conditions for the operation of LCV trucks in North Dakota are the following:

1. Trucks combinations must travel on designated highways and may travel up to 10 miles on a non designated highway.
2. Power units must have adequate power and traction to maintain a minimum speed of 15 mph on all grades.
3. Trailers of a three unit combination must be arranged so that the lighter trailer is last except when the weight differential with the other trailer is no more than 5000 lbs. In a four unit combination, the lightest trailer

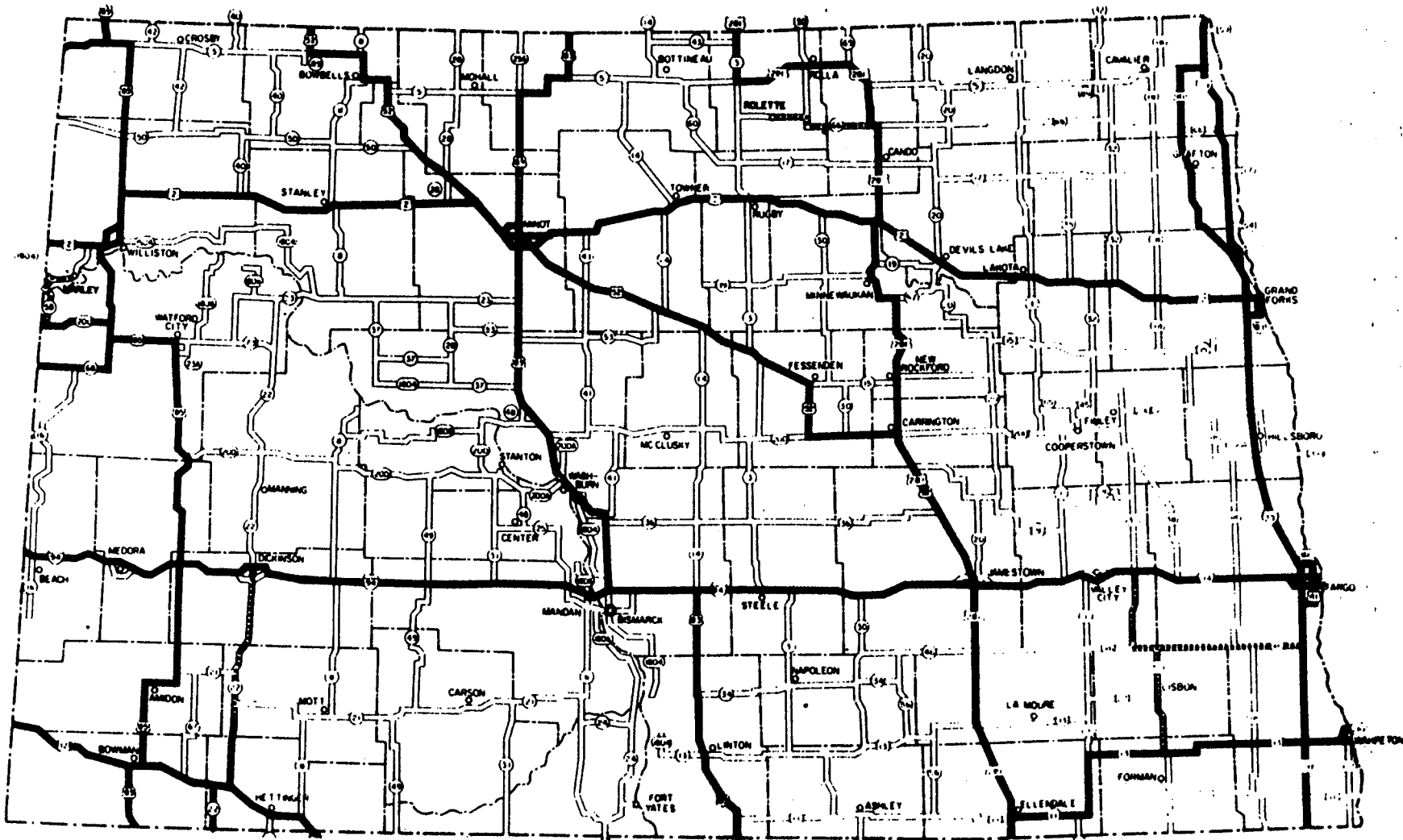


FIGURE 5.7 DESIGNATED NORTH DAKOTA STATE HIGHWAYS FOR VEHICLE COMBINATIONS EXCEEDING 75 FEET IN OVERALL LENGTH

Source: North Dakota Highway Patrol, 1987

must be last, with the other two trailers arranged as stated above.

4. The last trailer in the combination must have a Long Load sign mounted on the rear.
5. Combinations may not operate when 1) Road surfaces, due to ice, snow, slush, or frost present a slippery condition which may be hazardous to the operation of the unit or to other highway users; 2) wind or other conditions may cause the unit or any part thereof to swerve, to whip, to sway, or fail to follow substantially in the path of the towing vehicle; 3) when visibility is reduced due to snow, ice, sleet, fog, mist, rain, dust or smoke. The North Dakota highway patrol may restrict or prohibit operation during periods when in its judgement traffic, weather or other safety conditions make travel unsafe.

Rocky Mountain Doubles are the most common LCV in North Dakota, followed by Triples and Turnpike Doubles (Erickson, 1988). Consolidated Freightways operates more Triples than all other companies in North Dakota combined. Approximately 8,000 single trips by Triple Trailers are made per year by Consolidated Freightways out of Montana to Bismark and Fargo, North Dakota. North Dakota has had only a couple of LCV accidents since 1983 and those were attributed to driver error. However, there have been problems enforcing operation on LCV's during poor weather conditions.

Montana also allows OW/OD trucks hauling divisible loads to operate on highways. Montana has a restricted route load permit that allows G.V.W.'s up to 131,060 lbs (59,450 kg). Truck configurations must meet tire, axle and Bridge Formula B weight regulations. As of July 1st, 1987, Montana has allowed the use of Triple Trailer combinations on designated routes under permit. Conditions and requirements for

operation are similar to other jurisdictions. Several times during the winter of 1987/88, triple operations were suspended due to road and weather conditions.

## 5.6 OBSERVATIONS

In general, Saskatchewan is the most lenient prairie province with respect to operating conditions and weight and dimension limits under divisible permit. Saskatchewan allows the trucks with forest product permits to operate under heavier weights and wider dimensions than any other prairie province. These trucks may operate all year at heavier weights and wider dimensions, not just during winter months.

Saskatchewan allows Rocky Mountain Doubles and Turnpike Doubles to operate over at higher G.V.W.'s and with longer semitrailers than Manitoba or Alberta. Finally, Saskatchewan allows 7 and 8 axle combinations of all types (not just B-Trains) to operate at the highest G.V.W.s of any prairie province under their Interim Vehicle Weight and Dimension program.

There are some interesting differences between jurisdictions with respect to LCV operation. Most noticeable is that all LCVs in North Dakota may operate on designated two and four lane highways without a permit whereas Manitoba does not allow Turnpike Doubles at all, even under permit. Allowable G.V.W. for Rocky Mountain Doubles and Turnpike Doubles varies from 62,500 kg in Saskatchewan, 56,500 kg (for Rocky Mountain Doubles) in Manitoba to 53,500 kg in Alberta. As an exception

to this, Alberta has recently allowed some Turnpike Doubles to operate at 62,500 kg G.V.W. under their Extended Weight Program.

Dimensional limits and controls for LCVs vary between provinces. Manitoba limits the overall length of Rocky Mountain Doubles and Triple Trailers; Alberta limits the overlength of Rocky Mountain Doubles only; and Saskatchewan doesn't limit the length of LCVs at all. Semi-Trailers within Rocky Mountain Doubles and Turnpike Doubles may be 16.2 m (53') in Saskatchewan as opposed to 15.2 m (50') in the other provinces. Alberta allows Rocky Mountain Doubles to operate on two lane highways at any time except weekends. Manitoba and Saskatchewan allow them to operate on two lane highways only at night.

The forthcoming weight and dimension changes in accordance with the RTAC proposals will result in the dropping of the RTAC permits and will likely greatly reduce the need for forest product and other overweight permits as well.

**Chapter 6**  
**WEIGHT AND DIMENSION ENFORCEMENT PRACTICES**  
**IN MANITOBA**

**6.1 INTRODUCTION**

The purpose of this chapter is to describe weight and dimension enforcement practices, tolerances and fines in Manitoba. Enforcement and fines are both important in influencing the behaviour of truckers with respect to operating overweight. To discourage overweight operation, a truck operator must perceive that the probability of being caught times the fine is greater than the gain made from operating overweight.

**6.2 ORGANIZATION**

Enforcement of vehicle weights and dimensions on Manitoba Highways is primarily done by the Transport Compliance Section of Manitoba Highways and Transportation. In addition to weight and dimension enforcement, the section also enforces economic regulations (i.e., operating authorities), equipment safety, driver and vehicle licenses, placarding and documentation of dangerous goods. Enforcement of weight and dimension limits within the City of Winnipeg is done by a dedicated police department truck unit. On roads within the jurisdiction of rural



police department truck unit. On roads within the jurisdiction of rural municipalities, the R.C.M.P. are responsible for enforcing vehicle weight and dimension limits, but rarely exercise their authority.

The Manitoba Highways Transport Compliance Section has 56 staff and operates 11 weigh stations on a permanent basis. One of these stations, West Hawk Lake, operates twenty four hours a day, five days a week, while the other stations operate between eight and sixteen hours a day on a Monday to Friday basis. There are 27 staff employed at the permanent stations. During spring weight restrictions, engineering aides are temporarily transferred to transport compliance, increasing the number of inspectors to about 140. Transport inspectors enforce these weight regulations through permanent weigh scales, portable scales, and third party scales. When the truck is weighed, the weights are generally recorded on a weighing information form and the overloads calculated.

Weight tolerances are used when enforcing and calculating the amount overweight. Appendix A describes the weight tolerances in more detail. In Manitoba, the effective (de facto) tolerances are:

Steering Axles:	5% of steering axle weight on Portable Scales, 2% of steering axle weight on Permanent Scales
Single Axles:	450 kg
Tandem Axles:	500 kg
G.V.W.:	500 kg

### 6.3 FINES AND WARNINGS

The overweight fine in Manitoba is \$10 per 50 kg overweight (\$0.20 per kg). The amount overweight calculated for the fine is the overload subtract the scale tolerance of 5%/2% or 500 kg, whichever is less. A vehicle is only charged for one overweight (the worst), even though it may be exceeding several overweight regulations at one time. In some cases, the fine can be reduced or totally forgiven by the judge.

All motor carriers are allowed one overweight warning per year before being charged. Sometimes the overloads that receive warnings are quite large. The following are some examples of warnings given to significantly overweight tandem groups given by Manitoba Highways for fiscal year 1987/1988:

Tandem Overload Given Warning	Commodity
3,600 kg	Beans
3,725 kg	Barley
2,025 kg	Livestock

It is interesting to observe that for short span bridges that the sum of the vehicles axles weights that were on the bridge at one time must exceed the posted bridge G.V.W. before being charged for being overweight on a bridge.

#### 6.4 WEIGHT ENFORCEMENT: SOME PRACTICAL ASPECTS

Some of the more interesting problems and observations brought out through discussion with Traffic Inspectors follows:

**Determining Allowable Steering Axle Weights:** Allowable steering axle weights are normally governed by tire loads. Thus, the allowable load on the steering axle is dependent on tire width. It is sometimes difficult for inspectors to determine the tire width of trucks passing through the traffic inspection stations.

**Shifting Loads:** Certain commodities shift loads in transit or can be shifted by the truck driver to deliberately redistribute axle loads on the scales. Some examples:

**Cattle:** It is believed that some truckers purposely put more cattle on a truck knowing that the scales can be defeated by:

- i) Quickly accelerating before weighing the drive tandem, causing the cattle to shift to the rear of the trailer
- ii) Quickly braking when weighing the trailer tandem, causing the cattle to shift to the front of the trailer.

**Hanging Meat:** Hanging meat in refrigerated vans is suspended from tracks on the ceiling. Using the same procedure described above for cattle, the driver can shift his load to reduce his load on the axle group being weighed.

**Liquid Products:** Liquid products in non-baffled tanks can often take several minutes to settle down before weighing can proceed. Axles groups can move from considerably overweight to within tolerance as the liquid shifts back and forth.

**Moveable Axle Groups:** Trailers with air slide rear tandems allow the driver to change the position of the rear tandem with respect to the drive tandem, thereby changing the load distribution on the drive and trailer tandems. A driver could approach the scale with the trailer tandem as close to the drive tandem as possible. Once the drive tandem is weighed, the driver applies the rear tandems brakes only and pulls forward, sliding the trailer tandem axle group to the rear of the trailer.

**Overweight Empty Trucks:** During spring weight restrictions, empty trucks can be overweight on roads restricted to 45 kg per mm tire width.

**Overweight Steering Axles:** The City of Winnipeg traffic bylaw restricts all steering axles to no more than 5,500 kg. In addition, no permits are issued by the City of Winnipeg to trucks with overweight steering axles. In this situation, it is often impossible for loaded garbage trucks, concrete mixers and dump trucks to operate at legal weights on their steering axles.

**Intermodal Terminals:** Intermodal terminals are a frequent source of overweight trucks. Trailers which meet Ontario weight regulations often exceed Manitoba regulations. Import/Export containers from Europe are frequently overweight because of more permissible weight regulations in those countries.

## Chapter 7

### THE CHARACTERISTICS OF ILLEGAL OW/OD TRUCKING IN MANITOBA

#### 7.1 INTRODUCTION

The purpose of this chapter is to analyze the extent and characteristics of illegal overweight trucking in Manitoba. In particular, the characteristics and equivalent single axle loads (ESALs) of illegal overweight trucks by road class, commodity, truck type, and location are determined. The analysis is based on the Manitoba Department of Highways and Transportation's (Manitoba Highways) annual truck weight surveys from 1972 to 1985.

In addition, the characteristics of illegal overweight trucking by overweight violation type, fine distribution, commodity, origin-destination pairs, month, and truck type are determined through an analysis of Manitoba overweight offence notices.

## **7.2 CHARACTERISTICS OF ILLEGAL OVERWEIGHT TRUCKS BASED ON MANITOBA HIGHWAY'S ANNUAL TRUCK WEIGHT SURVEY**

### **7.2.1 The Database**

The analysis of illegal overweight trucks is based on data from Manitoba Highway's truck weight surveys from 1972 to 1985. Four times every year, Manitoba Highways conducts a truck weight survey at various locations throughout the province. The survey locations can change from year to year, and use both permanent and portable scales in gathering weight data. The nature and scope of this program and the types of data collected in it are discussed in Clayton and Lai (1985).

The information gathered from the truck survey includes the weights, dimensions, origins, destinations, permits, commodities and configurations of trucks with 6 or more tires. The surveys are generally conducted at highway intersections from 8 a.m. to 3 p.m., from Monday to Friday. During periods of peak flow, empty trucks are sometimes allowed to pass through unsurveyed. It should be kept in mind that the results of this research must be qualified by the reliability and representativeness of the truck weight survey.

### **7.2.2 Database Modifications**

SAS (Statistical Analysis System) programs were used to normalize the truck weight survey data and to calculate statistics on overweight trucks in Manitoba. Because of changes in survey methods and coding in

1979, it was necessary to modify pre-1979 data in order to allow comparisons over time. The data modifications involved the metrification of weights and dimensions and the collapse of over 300 commodity code classifications into 35 (Plett, 1988).

In addition to the modifications, Plett also developed a new variable that described the applicable road class weight regulation for each truck surveyed. This was based on the survey station intersection location, the truck entry and exit direction from the intersection and a search of Manitoba regulations and road maps to determine the road weight classes in effect at the time. Trucks which moved through intersections between roads with different weight classes were assumed to be governed by the lowest weight class. In practice, there is an administrative tolerance (although no legal tolerance) allowing trucks to travel short distances on secondary highways at primary highway weights while moving to and from primary highways.

### 7.2.3 Assumptions and Calculations Used in Determining the Characteristics of Illegal Overweight Trucks

The truck weight survey database as modified by Plett was used as a base for further modification and for the calculation of statistics on the characteristics of overweight trucks in Manitoba from 1972 to 1985. The Manitoba weight regulations and tolerances as described in Appendix A, were used in determining whether a truck was overweight.

In developing the overweight truck statistics, the following database modifications were made:

1. All empty truck observations were removed. Therefore, all overweight statistics given are in terms of loaded trucks.
2. Observations that occurred during periods of spring weight restrictions or winter weight premiums (where applicable) were removed. Observations during spring restrictions were removed because it was unknown to what degree or for how long roads were restricted. Observations during winter premiums were removed to allow comparison over time. Spring weight restrictions were assumed to apply during the months of April and May for all years, winter premiums apply during the months of December, January and February from 1983 on.
3. Rare truck types were removed from the database to simplify the SAS program. Over the period 1975-1985, the removed trucks represent 0.63 % of all truck types surveyed, and should not significantly affect results.

Once these modifications were made, the database was scanned for overweight trucks that: i) exceeded its allowable G.V.W. and ii) exceeded any one or more its allowable tire loads, axle loads or G.V.W. This was done with and without weight tolerances in effect.

Trucks that exceed their allowable G.V.W. are of interest to engineers who estimate vehicle loads for bridge design (Navin, 1982). Trucks that exceed tire loads, axle loads or allowable G.V.W. are generally of interest to engineers and planners who design highways and administer weight enforcement programs. Not included in the analysis



were trucks that were overweight due to axle spacing weight penalties, exceeding registered G.V.W. or exceeding posted bridge weights.

Overweight truck observations were divided into legally overweight and illegally overweight. It was assumed that an overweight truck with a permit had an overweight permit authorizing it to be legally overweight. (i.e., It is possible for a truck with an overweight permit to illegally exceed even its permit conditions. However, to determine this required unavailable information on overweight permit policy history). Overweight trucks without permits were assumed to be illegally overweight.

For case i), a truck was considered over allowable G.V.W. if one or both of the following conditions were true:

- i) The truck G.V.W. exceeded the sum of allowable axle loads (plus applicable tolerances, if included in the analysis). The Steering axle loads were governed by tire loads, where applicable.
- ii) The truck G.V.W. exceeded the maximum highway G.V.W.

For case ii), a truck was considered overweight if one or more of the following conditions were true:

- i) The steering axle exceeds the allowable tire loads
- ii) Any axle or axle group exceeds its allowable axle load (plus applicable tolerances, if included in the analysis). Axles and axle groups other than steering axles were assumed to have sufficient tire.
- iii) The truck exceeds its allowable G.V.W.

In addition to the statistics developed on the extent of illegal overweight trucking by various categories, an analysis was done to quantify the relative pavement damage done by the observed truck fleet (which includes overweight trucks) compared to the damage done by an all-legal truck fleet hauling the same amount of payload. This was accomplished by using the AASHO 18 kip equivalent single axle load (ESAL) analysis, a method which allows quantification of the relative damage sustained by pavement for any specified combination of axle type, axle load, and pavement structure. Axle ESAL's were calculated based on the following AASHO equations and summed to determine each truck's ESAL:

Axle Group	ESAL Formula	Reference
Steer	$(\text{STEER} * 2.20462E-3/12)^4$	(ADI, 1987)
Single	$(\text{SINGLE} * 2.20462E3+1)^{4.79}/1.334E8$	(Yoder and Witczak, 1975)
Tandem	$(\text{TANDEM} * 2.20462E-3+2)^{4.79}/2.6892E7$	(Yoder and Witczak, 1975)
Tridem	$(\text{TRIDEM} * 2.20462E-3+3)^{4.79}/1.553E8$	(after Yoder and Witczak, 1975)

These equations are based on a structural number (SN) of 1 (thin pavement) and a terminal serviceability index ( $p^t$ ) of 2 (pavement is allowed to deteriorate to a low quality before it is considered failed). These particular equations and pavement parameters were chosen because of their simplicity and their standard use in many references.

Trucks exceeding legal axle weights cause more pavement damage than trucks complying with axle weight limits. However, an overweight truck requires less trips to move a given amount of payload. Thus, to determine the amount of ESALS produced by a legal fleet of trucks (LESALS), the following two scenarios were used, assuming that the total amount of payload moved remained the same:

**Case I:** If Truck G.V.W. is over either the sum of legal axle weights or the maximum road G.V.W., the LESALS were calculated by:

- i) Reducing the truck G.V.W. to the maximum legal G.V.W. and distributing the weight in proportion to the legally allowable axle loads
- ii) Calculating the ESALS of the truck at the maximum legally allowable G.V.W. and axle loads
- iii) Multiplying the ESALS of the legal truck by the number of legal trucks required to haul the payload of the overweight truck.

**Case II:** If Truck is over axle weight only, LESALS are calculated assuming the G.V.W. is redistributed on the truck axles in proportion to legal axle weights.

Tare weights used in calculation of payloads were based on the average empty truck weights for each truck type as determined by Plett (1988) from the Manitoba truck weight surveys. In general, the assumption that excess axle weight or G.V.W. would be distributed in proportion to legal axle weights is not very good. This is because it allocates too much weight to the steering axle than would normally be the case. This assumption overestimates the pavement damage caused by legalized truck loads, and therefore makes the difference in pavement

damage between overweight operation and legal operation smaller than it should be. A better assumption would have been to proportion excess weight on axles based on typical, historical axle weight distribution.

#### 7.2.4 Limitations and Qualifications to the Results

When interpreting the statistics on illegal overweight trucks, it should be remembered that the results are not exactly representative of the actual overweight situation for several reasons. First, the original weight survey will underestimate illegal overweight trucks because operators of these trucks will avoid the survey scales. This will occur to some degree despite Manitoba Highways policy of not issuing overweight violations during weight surveys (Plett 1988). On the other hand, for those truckers who are aware of this policy, it is possible that they will operate at higher than normal weights, resulting in an overestimate of illegal overweight trucks.

Second, the permit information recorded during the surveys may be unreliable (Lai 1988). For example, in the 1979 survey there were no trucks recorded with permits. This will result in an overestimate of illegally overweight trucks. In addition, permit coding patterns are unknown for earlier years. Current truck survey permit codes are 0 (no permit) and 1 (permit). Surveys conducted in the middle 1970's included permit code numbers of 0, 1 and 2. The meaning of these early code numbers is unknown, although inspection of the data shows trucks with codes of either 1 or 2 are overweight. The assumption made in the SAS

program was that if the permit code was not equal to zero and a truck was overweight, an overweight permit existed allowing the truck to be legally overweight.

Third, illegally overweight trucks will be underestimated by the SAS program because weight penalties due to axle spacing rules were not included in determination of overweight trucks.

Conclusions on the amount of pavement damage done by the various categories of overweight trucks cannot be reached based on the results of this analysis alone. That is, it cannot be concluded that because 3-S2's represent 68 percent of the entire ESAL's of all trucks observed that 3-S2's cause 68 percent of the pavement damage. Information on vehicle trip distances (which is not directly available from this survey) is required to make proper comparisons in terms of pavement damage. Trucks and commodities that make short, frequent trips (.ie gravel, raw forest products) will be over represented compared with trucks that make long distance trips less frequently (.ie inter-provincial freight carriers). It is possible to make conclusions from the following results on the severity of pavement damage on a per mile basis (i.e., on a per mile basis this commodity or that truck type is most damaging to pavement in Manitoba).

Caution should be used when interpreting statistics based on small numbers of observations. Statistics based on small samples assume a range of values at a given confidence level. For example, between 1975

and 1985, there were 5,023 observations of gravel trucks. Of these gravel trucks, 2,520 of or 50.2 percent exceeded one or more weight limits. This figure of 50.2 percent is subject to a possible error of 2.1 percent at a confidence level of 99.7 percent (three standard deviations). The true answer is almost certainly between 48.1 and 52.3 percent. See Appendix C for further description of the methodology used in determining the possible percentage errors for various sizes of samples.

Despite the inability to quantify the Manitoba illegal overweight truck situation exactly, or even to set a lower bound, it is felt that the results given in the following sections are sufficiently representative to be of interest.

#### 7.2.5 **THE EXTENT OF THE ILLEGAL OVERWEIGHT PROBLEM IN MANITOBA**

##### General

Only the overweight statistics calculated without tolerances are quoted below in order to simplify the task of describing the overweight problem in Manitoba. Overweight statistics calculated with tolerances are generally of a lower magnitude and follow the same trends as statistics calculated without tolerances. In addition, most of the statistics described in the text are pooled statistics over a ten year period from 1975 to 1985.

Over a ten year period in Manitoba from 1975 to 1985, 26% (9,396 out of 36,150) of loaded trucks surveyed were illegally overweight and 10% (3,684 out of 36,150) illegally exceeded their allowable G.V.W. An overweight truck as defined here is a truck which exceeds one or more tire, axle or G.V.W. weight limits.

For the same time period, 12% of steering axles, 4% of single axles, and 16% of tandem axle groups on loaded trucks illegally exceeded their allowable weight limits. The mean overweight for these axles were 397, 701 and 859 kgs respectively. Thus, although single axles are overweight less often than other axles, when they are overweight, they are overweight to a greater extent relative to their legal weight than other axle groups.

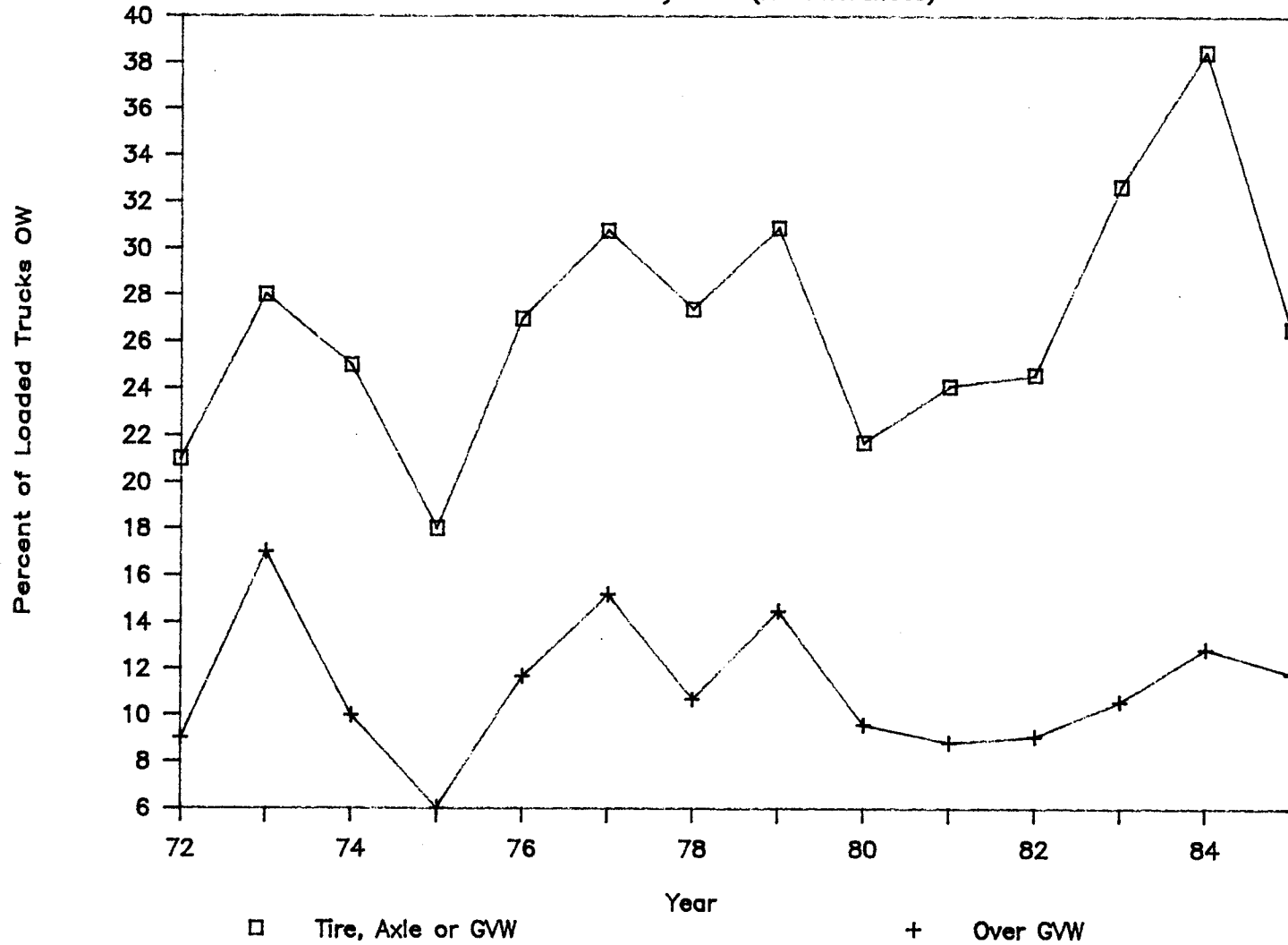
Figures 7.1 and 7.2 shows no significant trends in the percentages of illegal overweight trucks or axles with time, except perhaps a gradual increase in the percentage of overweight trucks. Generally, Figure 7.2 shows that tandem axle groups are the most frequent overweight offenders, followed by steering axles and single axles.

#### Overweight Characteristics by Road Class

Table 7.1 shows truck overweight type by road class for the years 1975 to 1985, without tolerances. Generally, secondary roads have a significantly higher percentage of trucks that are overweight or exceed the G.V.W. than trucks on primary roads.

# Figure 7.1 Manitoba OW Trucks

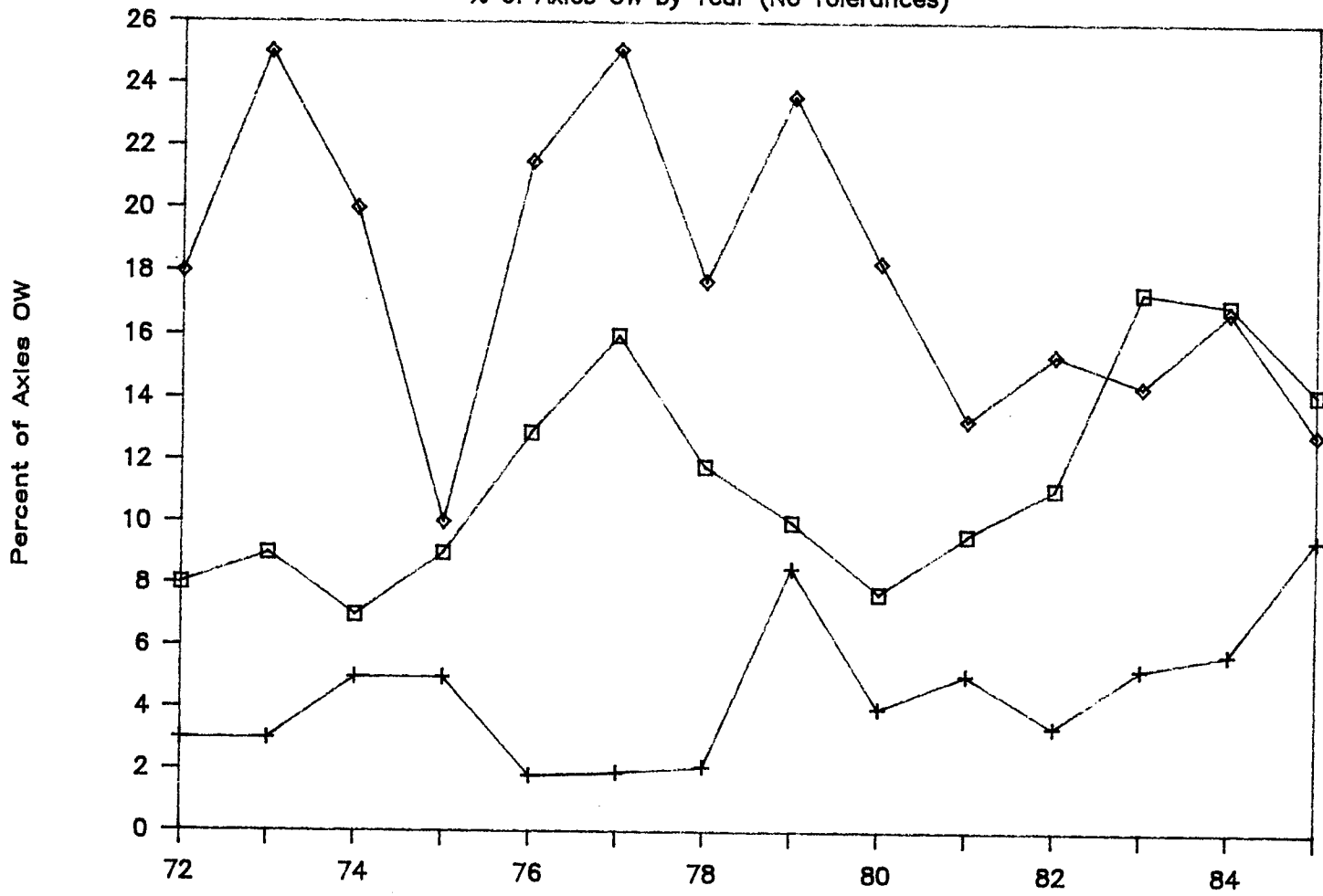
% of Trucks OW by Year (No Tolerances)





# Figure 7.2 Manitoba OW Trucks

% of Axles OW by Year (No Tolerances)



□ steering Axles

+ OW Single Axles

◇ OW Tandem Axles

Table 7.1 Manitoba Overweight Trucks without Permits: 1981-1985  
Source: Manitoba Highways Truck Weight Surveys

Year	Road GVW Limit (Kg)	Number of Loaded Trucks Surveyed	No Tolerances			
			Number of Trucks Exceeding Allowable GVW	% of Loaded Trucks	Number of Overweight Trucks	% of Loaded Trucks
1985	56500	852	21	2	166	19
	47630	357	122	34	155	43
	All Roads	1209	143	12	321	27
1984	56500	1220	86	7	414	34
	47630	148	90	61	112	76
	All Roads	1368	176	13	526	38
1983	56500	2805	260	9	912	33
	47630	374	77	21	128	34
	All Roads	3179	337	11	1040	33
1982	56500	2244	84	4	457	20
	47630	687	184	27	265	38
	All Roads	2931	268	9	722	25
1981 Sept-Dec	56500	1618	37	2	264	16
	47630	167	29	17	55	33
	All Roads	1785	66	4	319	18
1981 Jan-July	50000	1423	45	3	283	20
	36500	476	36	8	78	16
	33600	691	148	21	264	38
	All Roads	2590	229	9	625	24
1980	50000	401	38	9	102	25
	36500	1502	39	3	161	11
	33600	1410	242	17	455	32
	All Roads	3313	319	10	718	22
1979	50000	1067	65	6	275	26
	36500	1425	96	7	306	21
	33600	1541	424	27	667	43
	All Roads	4033	585	15	1248	31
1978	49895	2130	84	4	516	24
	36287	1309	86	7	204	16
	33566	977	301	31	491	50
	All Roads	4416	471	11	1213	27
1977	49895	235	3	1	63	27
	36287	1428	102	7	329	23
	33566	1085	314	22	454	42
	All Roads	2748	419	15	846	31
1976	49895	-	-	-	-	-
	36287	2052	169	7	503	25
	33566	814	167	21	271	33
	All Roads	2866	336	12	774	27
1975	49895	2077	22	1	297	14
	36287	1509	44	3	212	14
	33566	2126	269	13	537	25
	All Roads	5712	335	6	1046	18

A dramatic example of this are the 3-S2's that ran on secondary roads in 1972 and 1973. At that time, primary roads had a maximum G.V.W of 33,600 kg and secondary roads had a maximum G.V.W. of 20,000 kg. In the 1972 weight survey, 92% of 3-S2's were exceeding their G.V.W. on secondary roads by an average of 12,731 kg (64% over allowable G.V.W.). In 1973, 98% of 3-S2's exceeded the secondary road G.V.W. by an average of 13058 kg (65% over allowable G.V.W.). These trucks were running at full primary weights on secondary roads.

Table 7.1 shows that even in the more recent years of 1982 to 1985, 21 to 61% of all trucks on secondary roads exceeded their G.V.W. This compares with only 4 to 9% of trucks exceeding their G.V.W. on primary roads.

These results contrast with Hassan and Wyatt's (1984) results based on a Saskatchewan Highways 1981 truck weight survey. Hassan and Wyatt found that approximately 13% of trucks exceeded their G.V.W. in Saskatchewan, with little difference between road classes.

Axles and axle groups also show a high frequency of overweights on secondary roads. Table 7.2 shows that overweight single axles and tandem axle groups on secondary roads are more severe and four to five times more common than the same axle groups on primary roads.

Table 7.2 Manitoba Overweight Trucks without Permits: 1981-1985  
 Overweight Axles by Road Class (No Tolerances)  
 Source: Manitoba Highways Truck Weight Surveys

Years	Road Class	Number Steer	Number Single	Number Tandem	Number Steer OW	Number Single OW	Number Tandem OW	% Steer OW	% Single OW	% Tandem OW	Mean Steer OW	Mean Single OW	Mean Tandem OW	% Mean Steer OW	% Mean Single OW	% Mean Tandem OW
1981-1985	56500	8739	2661	13264	1285	71	1174	14.7	2.7	8.9	627	439	592	12.5	4.8	3.7
	47630	1733	792	2145	170	98	920	9.8	12.4	42.9	510	843	1373	10.1	10.3	9.5
1975-1981	50000+ 36500	17034	5488	23282	1777	107	2173	10.4	1.9	9.3	276	659	656	5.5	7.3	4.1
	33600	8644	3180	9650	951	254	3560	11.0	8.0	36.9	294	737	942	5.8	9.0	6.5
All Roads		36150	12121	48341	4183	530	7827	11.6	4.4	16.2	397	701	859	7.9	8.3	5.8

1. Percent mean overweight for steering axles is calculated based on 11" tire size, for a maximum allowable steering axle load of 5030 kg for all highways. This is conservative, as most steering axles have 11" or smaller tire widths.

2. Percent mean overweight for singles and tandems was calculated assuming the following legal loads:

		Single	Tandem
1981-1985	Primary	9100	16000
	Secondary	8200	14500
1975-1981	Primary	9072	15875
	Secondary	8165	14515

### Overweight Characteristics by Commodity

From 1975 to 1985, 50% (2,520 out of 5,023) of trucks hauling gravel in Manitoba were illegally exceeding one or more weight limits. Of these overweight gravel trucks, 62% were 3-S2's and 35% were SU3's. Gravel trucks had the highest incidence of overweight steering axles (23%) and the second highest incidence of overweight tandem axle groups (26%).

Some of these figures are shown in Tables 7.3 and 7.4 along with the statistics for other commodity types. Gravel is followed by timber (46%); petroleum products (39%); mining products and paper products (32%); and fuel, chemicals and building products (31%) as the most common overweight offenders.

Construction equipment had the highest average G.V.W. overweight (5,455 kg), followed by other equipment (3,657 kg), timber (2,314 kg), fuel (2,125 kg), chemicals (2,118 kg) and general freight (1,889 kg).

### Overweight Characteristics by Truck Type

Statistics on overweight trucks by truck type over the 10 year period, 1975-1985 are shown in Tables 7.5. The majority of all overweight trucks were 3-S2's (66%), followed by SU3's (20%) and SU2's (6.5%). This is a reflection of the predominance of these truck types on the highway system.

Table 7.3 Manitoba Overweight Trucks without Permits: 1975-1985  
 By Commodity and Overweight Type  
 Source: Manitoba Highways Truck Weight Surveys

## No Tolerances

Commodity	Number of Loaded Trucks Surveyed	Number of Trucks Exceeding Allowable GVW	% of Loaded Trucks	Number of Overweight Trucks	% of Loaded Trucks
Gravel	5023	1056	21	2520	50
Timber	1616	506	31	751	46
Fuel	2986	402	13	939	31
Grain	2154	231	11	590	27
Petroleum Products	148	17	11	57	39
Chemicals	382	50	13	119	31
Building Materials	3408	417	12	1050	31
Paper Products	280	42	15	89	32
Animal Food	1340	156	12	400	30
Human Food	2799	75	3	372	13
Construction Equip	829	86	10	203	24
Equip-Other	764	32	4	115	15
General Freight	3733	73	2	483	13
Livestock	2020	48	2	239	12
Farm Crop-Other	1296	140	11	349	27
Mining Products	152	21	14	49	32
Scrap	209	9	4	37	18
Beverages	1750	58	3	207	12
Other	5261	265	5	827	16
Total	36150	3684	10	9396	26

Table 7.4 Manitoba Overweight Trucks without Permits: 1975-1985  
 By Commodity and Axle Overweight Type  
 Source: Manitoba Highways Truck Weight Surveys  
 (No Tolerances)

Commodity	N Steer	N Single	N Tandem	N Steer OW	N Single OW	N Tandem OW	% Steer OW	% Single OW	% Tandem OW	Mean Steer OW	Mean Single OW	Mean Tandem OW
Gravel	5023	308	8218	1141	23	2165	23	7	26	561	605	728
Timber	1616	200	2855	180	11	1081	11	6	38	267	870	1225
Fuel	2986	1738	3591	415	101	801	14	6	22	235	567	642
Grain	2154	1002	1937	238	160	351	11	16	18	282	815	803
Petroleum Products	148	35	275	18	3	56	12	9	20	260	400	741
Chemicals	382	87	661	33	0	120	9	0	18	333	0	904
Building Materials	3408	621	5370	476	20	873	14	3	16	562	672	755
Paper Products	280	40	489	35	0	100	13	0	20	204	0	850
Animal Food	1340	347	1561	247	16	256	18	5	16	517	913	620
Human Food	2799	1395	2873	171	23	252	6	2	9	270	668	689
Construction Equip	829	101	1394	76	1	199	9	1	14	328	100	2800
Equip-Other	764	208	1098	68	6	72	9	3	7	300	773	2066
General Freight	3733	1584	5590	209	29	315	6	2	6	226	654	583
Livestock	2020	1010	1910	131	16	153	6	2	8	332	739	485
Farm Crop-Other	1296	245	1964	175	14	289	14	6	15	241	596	734
Mining Products	152	24	300	18	0	45	12	0	15	436	0	709
Scrap	209	93	207	18	3	23	9	3	11	372	567	935
Beverages	1750	1070	1186	116	45	66	7	4	6	327	667	692
Other	5261	2013	6862	418	59	610	8	3	9	273	680	863
Total	36150	12121	48341	4183	530	7827	12	4	16	397	701	859

Table 7.5 Manitoba Overweight Trucks without Permits: 1975-1985  
By Truck Type (No Tolerances)  
Source: Manitoba Highway's Truck Weight Surveys

Truck Type	Loaded Trucks Surveyed	% of Loaded Trucks	Number Overweight	% of Type Overweight	% of All Overweight Trucks	Number Over G.V.W.	% of Type Over G.V.W.	% of All Trucks Over G.V.W.
3-S2	19327	53.5	6236	32.3	66.4	2323	12.0	63.1
SU2	8385	23.2	543	6.5	5.8	178	2.1	4.8
SU3	5664	15.7	1894	33.4	20.2	856	15.1	23.2
2-S2	922	2.6	65	7.0	0.7	2	0.2	0.1
3-S2-2	488	1.3	233	47.7	2.5	95	19.5	2.6
2-S1	312	0.9	20	6.4	0.2	4	1.3	0.1
3-S3	238	0.7	113	47.5	1.2	74	31.1	2.0
Other	183	0.5	65	35.5	0.7	22	12.0	0.6
3-S2-S2	175	0.5	100	57.1	1.1	67	38.3	1.8
3-S1-3	173	0.5	60	34.7	0.6	27	15.6	0.7
3-S1-2	172	0.5	17	9.9	0.2	4	2.3	0.1
3-S2-3	111	0.3	50	45.0	0.5	32	28.8	0.9
All Types	36150	100.0	9396	26.0	100.0	3684	10.2	100.0



Seven and eight axle trains are the most likely truck types to exceed one or more weight limits, with over 57% of all 3-S2-S2's being illegally overweight. This figure is probably too high, because permits have not been properly recorded for forest hauls in some years. The 3-S2-S2 is followed by 7 and 8 axle trains with 35 to 47% of these trains overweight.

The 3-S3 is also frequently illegally overweight at about 47%. This combination is commonly used to haul overweight indivisible loads. There are two possible reasons for the high illegal overweight rate for this vehicle. One is that many moves of heavy indivisible loads are moving without permit. The other possibility is that the overweight permit was not properly recorded during the weight survey. It is unknown which one of the two reasons is more likely, due to the unreliability of the permit information.

About 32% of all 3-S2's, 33% of SU3's and 7% of SU2's were overweight on Manitoba highways. This compares with 25% of loaded 3-S2's (including permits) that were found overweight in the United States based on 1975 FHWA weight data (GAO, 8, 1979). In terms of G.V.W. only, 12, 15 and 2%, respectively, of the above truck types were overweight. This is considerably lower than the 20% over the G.V.W. for 3-S2's and 19% over the G.V.W. for SU3's found in Hassan and Wyatt's (1984) paper on Saskatchewan overweight trucks.

### Overweight Characteristics by Location

About 21% of loaded trucks passing through the permanent weigh scale sites of Westhawk, Emerson and Headingley from 1975 to 1985 were overweight. All other scale sites had an average of 27% of loaded trucks overweight. As expected, the permanent scale sites had a lower percentage of overweight trucks than the temporary survey sites. The survey stations with the highest occurrences of illegal overweight trucks were station number 879 (Location unknown) (76%), PTH 59 & PR 201 (70%), PTH 11 & PR 304 (61%) and PTH 59 at Birds Hill Scale (46%).

The intersection of PTH 11 & PR 304 is close to a pulp mill at Pine Falls, where forest products are hauled for processing. During winter months, trucks hauling raw forest products in Manitoba are allowed to haul overweight under permit. Again, it is hard to determine how much of this traffic is actually illegally overweight due to the unreliability of the permit information recorded during the survey. It is likely that the actual percentage of illegal overweights at this location is somewhat lower than 70%.

Birds Hill Scale has a high volume of gravel traffic moving from north of Winnipeg into the city. It is clear that the predominance of gravel traffic is causing the high rate of illegal overweights at this location.

#### 7.2.6 COMPARISON OF RELATIVE PAVEMENT DAMAGE OF LEGAL TRUCK FLEET AND OVERWEIGHT TRUCK FLEET

In general, the results show that there is little difference in the pavement damage between the observed Manitoba 1975-85 truck fleet and a legalized 1975-85 Manitoba truck fleet. Although this may seem surprising, it agrees with results from a similar analysis done on overweight trucks in New Jersey (Barros, 1984).

Table 7.6 shows the observed and legalized ESALs by truck type and Table 7.7 shows the observed and legalized ESALs by commodity. Both Tables indicate that the total number of ESALs would have dropped by 4.6 percent if all of the observed trucks had complied with weight regulations. The Total Observed ESALs are obtained by summing the ESALs of trucks within weight limits plus the ESALs of overweight trucks with permits plus the ESALs of illegally overweight trucks. The Total Legalized ESALs is obtained by summing the ESALs of trucks within weight limits plus the ESALs of observed trucks with permits plus the ESALs of legal trucks carrying the same amount of payload that was formerly moved on illegally overweight trucks.

Table 7.6 shows that if the truck fleet was forced to comply with weight regulations between 1975 and 1985, the greatest relative reduction in ESALS would come from the 2-S2 (24%) and SU2 (23.8%) truck types. On a per mile basis, these illegally overweight truck types caused more unnecessary pavement damage than any other type.

Table 7.7 shows that if the truck fleet was forced to comply with weight regulations between 1975 and 1985, the greatest relative reduction in ESALS would come from the equipment (19.5%) and paper products (19%) commodity categories. On a per mile basis, trucks

Table 7.6 Observed and Legalized ESALS of Manitoba Truck Fleet, 1975-85  
By Truck Type

Truck Type	Observed ESALS			Total Observed	Legalized Esals	
	Within Limits	Overwght Permit	Illegal Overwght		Legalzed Overwght	Total Legalzed
3-S2	19,927	336	16,078	36,340	14,876	35,139
SU2	2,709	6	976	3,691	743	3,458
SU3	3,451	11	4,459	7,921	3,708	7,170
2-S2	701	4	139	844	105	810
3-S2-2	763	4	969	1,735	886	1,653
2-S1	196	-	55	252	48	241
3-S3	58	258	300	616	270	586
Other	92	4	180	276	175	271
3-S2-S2	182	17	342	541	298	497
3-S1-3	318	13	232	563	220	550
3-S1-2	258	8	66	333	55	321
3-S2-3	122	2	180	304	138	262
Total	28,777	662	23,976	53,415	21,518	50,958

Source: Manitoba Truck Weight Surveys, 1975-1985

hauling these commodities in illegally overweight trucks caused more unnecessary pavement damage than any other commodities.

Barros determined that the net loss in pavement service life attributable to New Jersey detected overweight violations is 1.5 percent. This research shows that Manitoba may also have a small (4.6 percent) reduction in service life due to overweight trucks.

Table 7.7 Observed and Legalized ESALS of Manitoba Truck Fleet, 1975-85  
By Commodity

Commodity	Observed ESALS			Total Observed	Legalized Esals	
	Within Limits	Overwght Permit	Illegal Overwght		Legalzed Overwght	Total Legalzed
Other	3,622	50	1,883	5,555	1,653	5,325
Gravel	4,772	3	6,697	11,471	6,071	10,845
General Frt	3,150	24	1,071	4,244	967	4,141
Blding Matrls	3,347	12	2,998	6,357	2,678	6,034
Fuel	2,725	6	2,503	5,234	2,317	5,048
Human Food	1,708	-	850	2,559	771	2,479
Grain	1,549	-	1,290	2,839	1,111	2,659
Livestock	1,261	-	548	1,809	499	1,760
Beverages	947	-	383	1,331	331	1,279
Timber	1,110	197	2,255	3,561	1,973	3,280
Animal Food	1,047	-	959	2,006	842	1,889
Crops - Other	1,270	4	810	2,084	750	2,024
Constrctn Eq	615	304	549	1,467	484	1,403
Equipment, Oth	490	65	245	800	198	753
Chemicals	440	-	326	766	300	740
Paper Products	257	-	217	474	198	455
Scrap	129	-	86	214	73	202
Mining Products	181	-	147	327	140	320
Petrlum Prdcts	157	-	160	317	162	320
Total	28,777	662	23,976	53,415	21,518	50,958

Source: Manitoba Truck Weight Survey, 1975-85

### **7.3 CHARACTERISTICS OF ILLEGAL OVERWEIGHT TRUCKING BASED ON MANITOBA HIGHWAY'S OFFENCE NOTICE FILES**

#### **7.3.1 The Database**

A 7.5% random sample of overweight offence notices was taken from Manitoba Highways Transport Compliance section's prosecutions file for fiscal year 1987/1988. This file includes offence notices for various violations under the Highway Traffic Act, including overdimension, faulty equipment and safety, driver and vehicle licencing, public service vehicle, dangerous goods as well as weight violations. Table 7.8 shows breakdowns of Manitoba prosecution statistics by violation type for fiscal years 1986/1987 and 1987/1988. Only overweight violations were drawn for the random sample.

Table 7.8 Manitoba Prosecution Statistics

	1986/87	1987/88
Overweight	2134	2314
Overdimensional	148	310
Public Service Vehicle	385	73
Faulty Equipment & Safety	901	1005
Driver & Vehicle Licencing	274	380
Dangerous Goods	39	108
Total	3881	4190

Source: Manitoba Highway and Transportation Department

Overweight violations under the Highway Traffic Act can be broken down into six categories. They are:

1. Exceed allowable tire load of 9 kg/mm of tire width (HTA 68). During spring weight restrictions on some roads, the allowable tire load is reduced to 6 kg/mm or 4.5 kg/mm of tire width (HTA 86).
2. Exceed allowable axle loads (HTA 68).
3. Exceed allowable combined weight on two axles or axle groups due to inadequate axle spacing (HTA 68).
4. Exceed maximum allowable highway G.V.W. (HTA 68).
5. Exceed registered G.V.W. (HTA 318).
6. Exceed allowable G.V.W. on a restricted bridge (HTA 92).
7. Exceed allowable weights as allowed under permit (HTA 87 or HTA 68).

Violations of registered gross vehicle weight (number 3 above) are included in the overweight statistics in Table 7.8, but were not included in the sample.

Overweight offence notices originate from Manitoba Highway's Transport Compliance Inspectors who are at permanent scale sites or patrol territories throughout the province with portable scales. Each offence notice includes information on the registered truck owner, the truck driver, the time and place of the offence, the nature of the offence, the fine and the court location and action. The offender is charged only with one overweight offence (the worst one), even though he may be exceeding several weight regulations at one time.

The offence notice also shows the final disposition of the notice, with either a full fine being paid or a reduced fine or a reprimand as

determined by the judge or magistrate. On the back of the notice there are usually comments on the commodity carried, origin and destination, and whether or not the truck was required to legalize its load on site. Overweight offence notices usually have a weight information scale ticket attached showing the truck type, as well as the actual, allowable and overload weights. Sometimes a second scale ticket is included showing the truck weights after offloading.

The offence notices are filed alphabetically by the registered truck owner. Every 15th overweight offence notice was drawn from the file and the information it contained entered into a Lotus 123 spreadsheet. Once the sample was entered into the spreadsheet, the sample was uploaded to a mainframe computer for analysis by SAS.

### 7.3.2 Analysis of Overweight Offence Notices

#### **Violation Type**

The most common overweight offence notice was overweight on drive tandems representing 46% of all overweight violations. This was followed by trailer tandem overweights (26%), steering axle overweights (14%) and single axle overweights (7%). Only a couple of examples for each of the G.V.W. overweights, axle spacing overweights and permit overweights were drawn from the file. No examples of bridge overweights were drawn.



If the single example of an overweight tridem is ignored, the most severe overweight types and fines were for axle spacing overweights (3,330 kg mean overweight, \$410 mean fine), followed by single axles, trailer tandems, steering axles and drive tandems. In comparing these results to a New Brunswick study (Bisson, 1987), it was found that the average drive tandem overweights were very similar (around 1,290 kg), but that average single axle and trailer tandems overweights in Manitoba (1,852 kg and 1,511 kg, respectively) were over twice the average overweights for the same axle groups in New Brunswick. However, with only 8 observations of single axle overweights in the Manitoba sample and 13 observations in the New Brunswick sample, the average overweights may not be statistically significant.

88% of all tandem overweight offence notices were for trucks on Class A1 roads, with an average overweight of 196 kg. 7% of tandem overweight offence notices were on Class B1 roads with an average overweight of 405 kg. The remainder of the tandem overweights were on roads with spring weight restrictions with an average overweight of 333 kg.

About 8% of the overweight offence notices were violations of spring weight restrictions, the majority being issued to trucks on 4.5 kg/mm roads. Several trucks were overweight on their steering axles on 4.5 kg/mm roads, even though they were empty.

## Fines

Overweight fines ranged from \$60 to \$1,140 with an average fine of \$237 and an average overweight of 1,451 kg. This is an average fine of \$0.16 per kg overweight, which is lower than the fine set out in the HTA of \$10 per 50 kg overweight (\$0.20 per kg). The average fine is lower because the amount of overload for each offence is reduced by the scale tolerance of 5%/2% or 500 kg, whichever is less. Manitoba's average overweight fine is over five times as great as the \$0.03 per kg average overweight fine found in a New Brunswick study (Bisson, 1987).

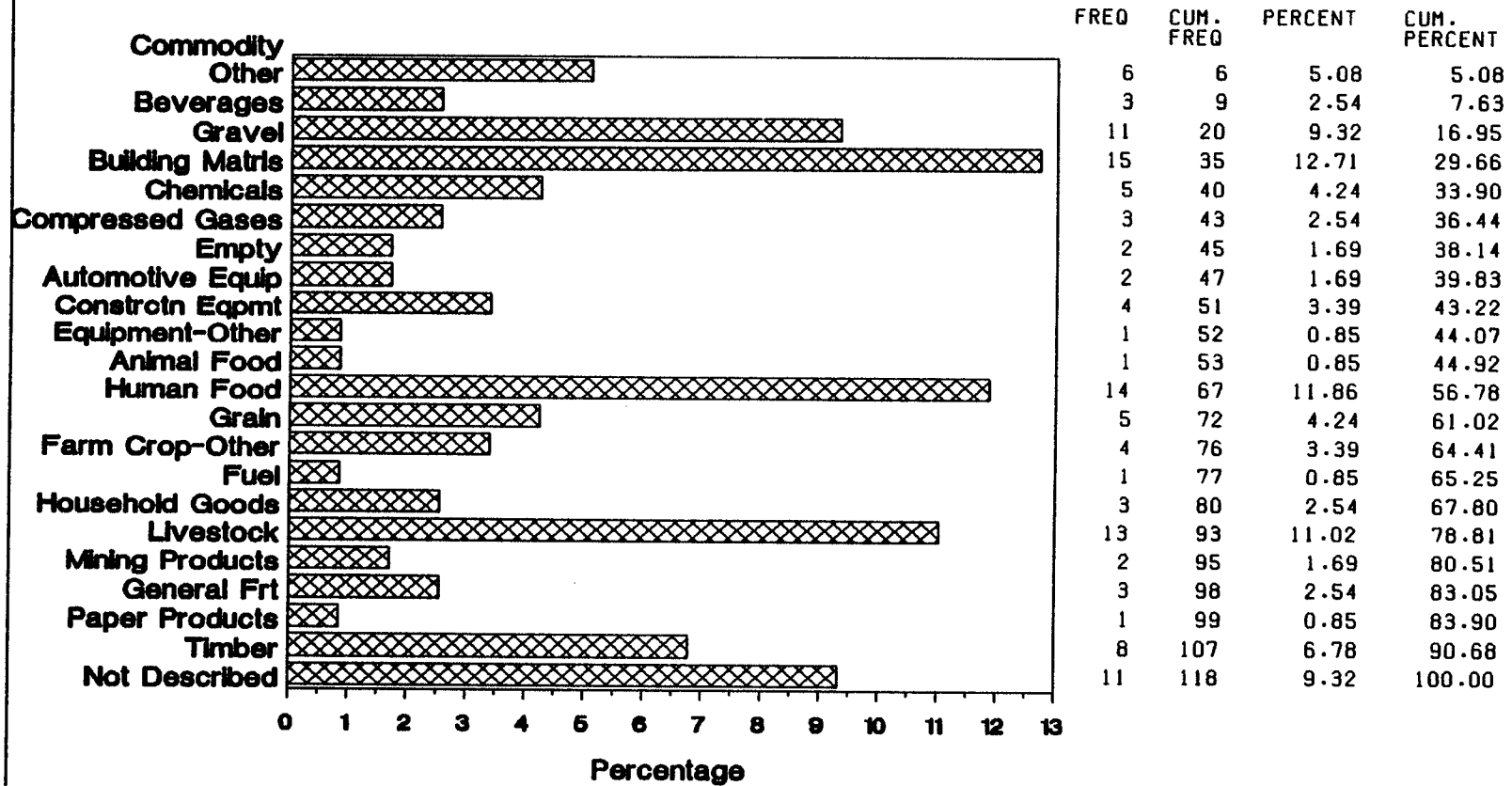
## Commodities

Figure 7.3 shows breakdowns of overweight offence notices by commodity. Building Materials was the most common (13%) overweight commodity found in the sample, followed by human food (12%), livestock (11%) and gravel (9%). Typical building materials included lumber, concrete, steel and bricks. 64% of the human food consisted of frozen, boxed or hanging meat. In terms of amount overweight, grain was the worst offender, followed by construction equipment, animal food and general freight. Most (85%) cattle shipments were allowed to proceed overweight due to the nature of their loads. The frequency of overweight cattle trucks suggests that these truckers may be taking advantage of the policy allowing overloaded cattle trucks to proceed to Winnipeg for load adjustments.

**Figure 7.3**

**Distribution of 1987/88 Manitoba Overweight Notices  
By Commodity**

**95% Confidence Interval = + 6%**



### Origin - Destination Pairs

The most common overweight OD pair was from Saskatchewan to Ontario (17%), followed by other Manitoba to Winnipeg (16%) and other Manitoba to other Manitoba (16%). Interestingly, loads destined for Saskatchewan and west represented less than 1% of overweight offenses.

### Location

Permanent scales sites collected most of the overweight offenses, led by Headingley with 37% and Westhawk with 27%. Roving inspectors caught about 15% of all overweight offenses using portable and third party scales. Rosser and Oak Bluff and Emerson were the next common locations for offence notices. Figure 7.4 shows the distribution of overweight offenses by location.

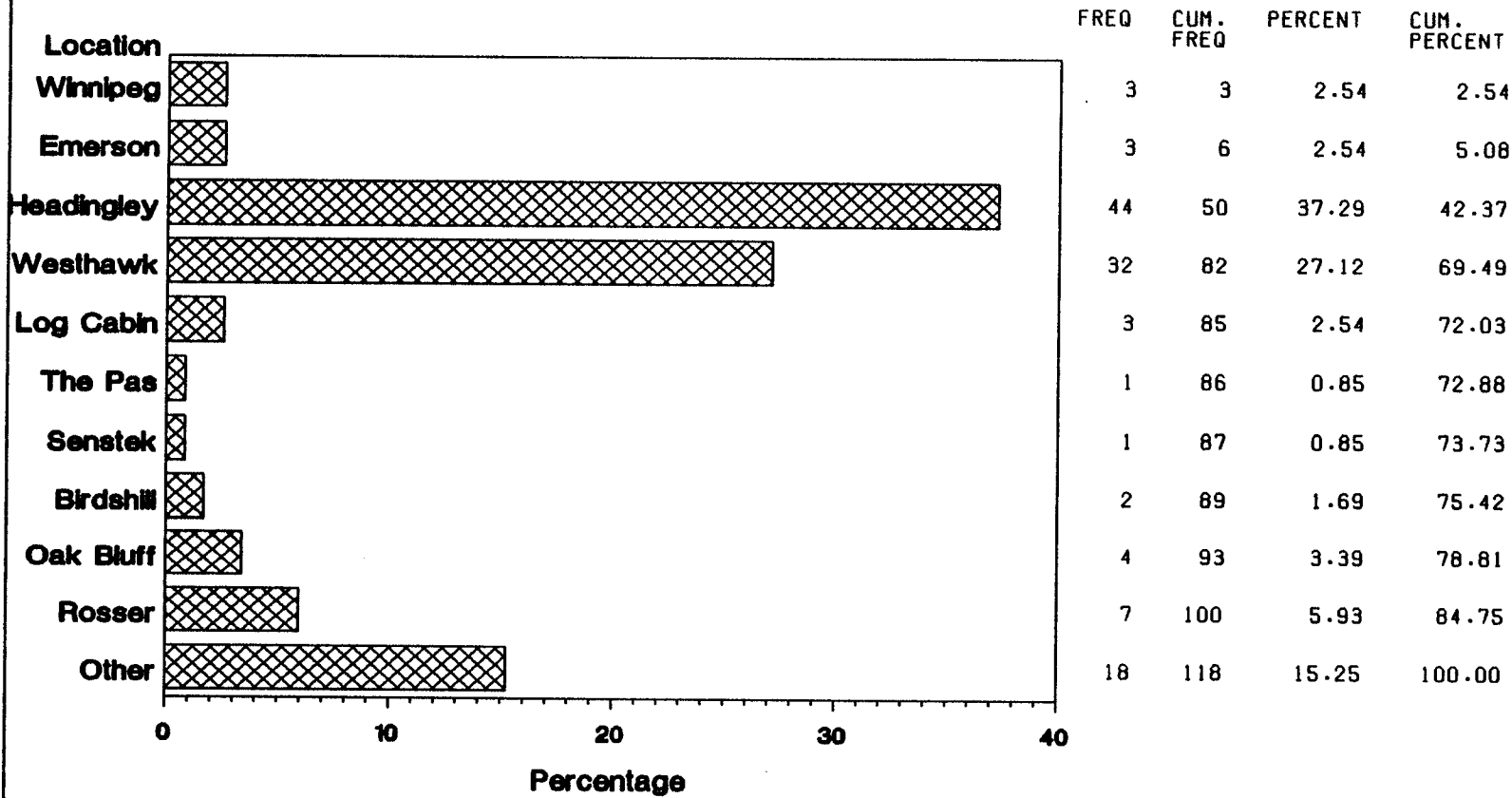
### Month

The most common month for overweight offenses was August (14%), followed by April (13%), September (13%) and May (12%). December, January and February combined had about 5% of the years overweight offenses, with no samples drawn for January. The low occurrences of overweights during these months suggests that truckers may not be taking full advantage of the winter weight premiums allowed during December, January and February. The distribution of overweight offenses by month is shown in Figure 7.5.

**Figure 7.4**

**Distribution of 1987/88 Manitoba Overweight Notices  
by Location**

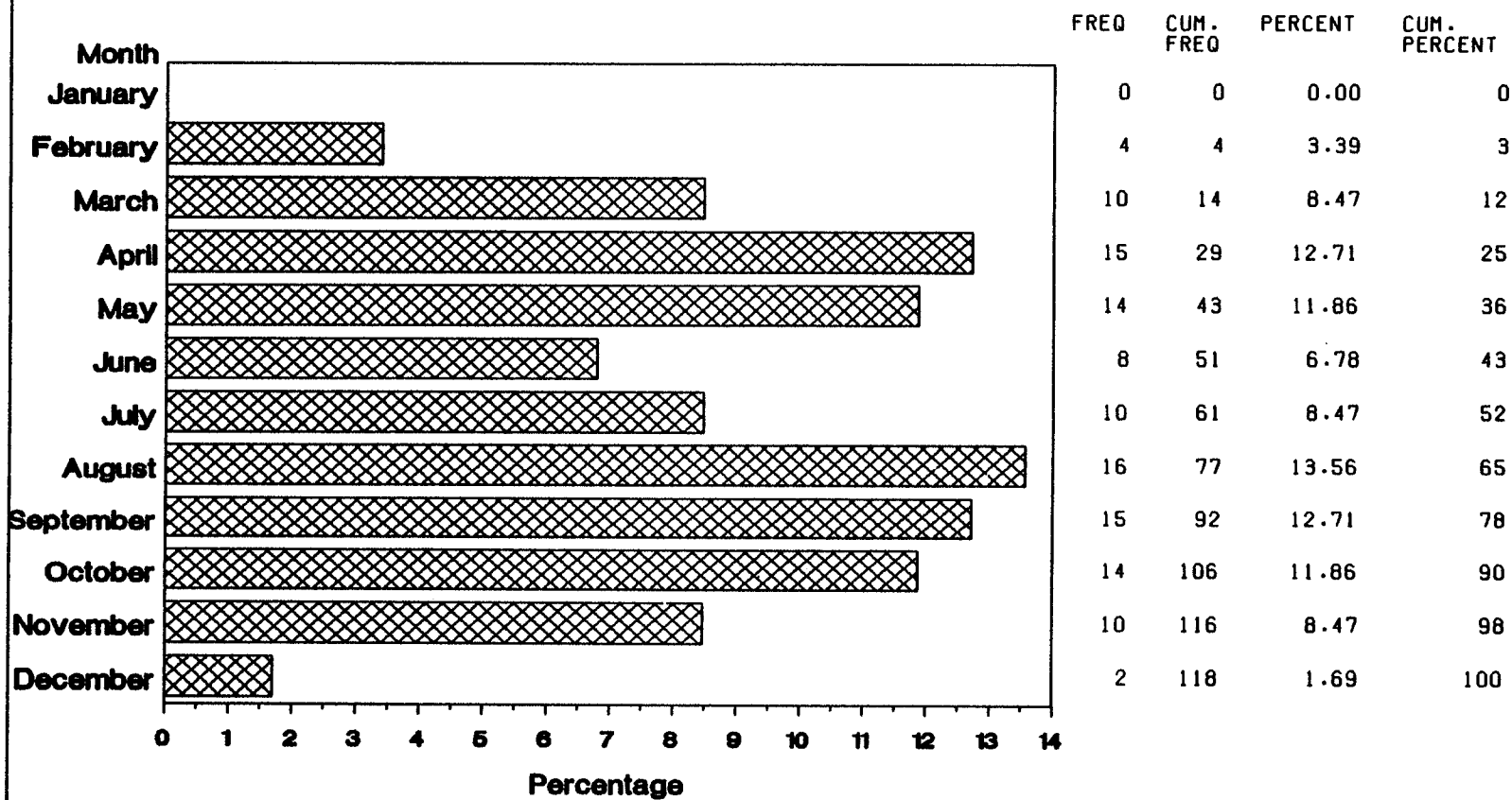
**95% Confidence Interval = + 9%**



### Figure 7.5

#### Distribution of 1987/88 Manitoba Overweight Notices by Month

95% Confidence Interval = + 6%.



## Truck Type

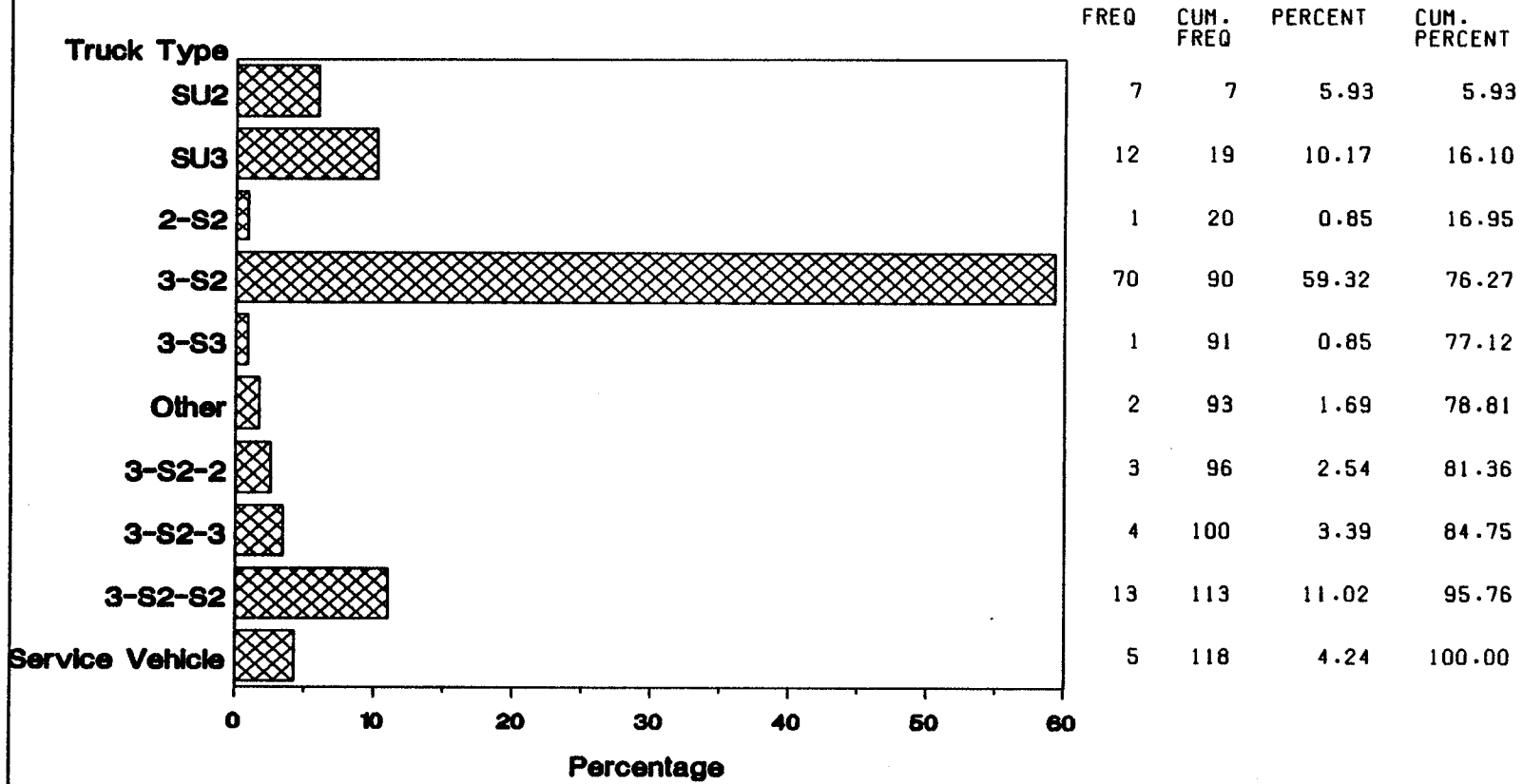
The most common truck type found in the overweight offence notice sample was the 3-S2 (59%), followed by the 3-S2-S2 B train at 11% and the SU3 at 10%. Many of the B trains were overweight on the centre tandem.

Figure 7.6 shows the distribution of overweight offenses by truck type.

**Figure 7.6**

**Distribution of 1987/88 Manitoba Overweight Notices  
By Truck Type**

95% Confidence Interval = + 9%





## Chapter 8

### OBSERVATIONS AND RECOMMENDATIONS

This Chapter describes study limitations; summarizes some important observations; and gives recommendations for action by Manitoba Highways. This is followed by suggested topics for further research and some comments on the OW/OD policy situation in Manitoba and Western Canada.

#### 8.1 LIMITATIONS

Because of the changing nature of weight and dimension policy, some of the information in this document will be quickly out of date. For example, as this is written, the weight and dimension regulations in Alberta and Saskatchewan have changed, allowing the longer and heavier RTAC vehicles to operate without permit. Most of the weight and dimension policy in this document is valid until January 1, 1988. After this date, the weight and dimension policy presented here must be verified by the appropriate authority before it can be considered accurate.

The results on illegal overweight trucks in Manitoba are based on the Manitoba Highways Truck Weight Survey between 1972 and 1985.

Because the survey is not truly random in time or space, some unpredictable bias may exist in the results. However, the results are based on the best available information.

## 8.2 OBSERVATIONS AND RECOMMENDATIONS

In the review of the policies and characteristics of OW/OD trucking in Manitoba and Western Canada, it became apparent that there are several opportunities for improvements in Manitoba provincial and municipal weight and dimension policy. The following are some general observations on the policies and characteristics of OW/OD trucking in Western Canada with recommendations for action by Manitoba Highways.

### 8.2.1 Weight and Dimension Regulations

The following observations were made with respect to the existing weight and dimension regulations in Manitoba.

1. It was observed that many of the existing Manitoba weight and dimension regulations have technical, legal and administrative problems as has been pointed out in previous studies (Nix, Clayton and Bisson, 1986). The technical basis for limiting certain dimensions or weights is not clear, and most regulations have evolved over time without full evaluation.

2. It was observed that the City of Winnipeg weight and dimension regulations are restrictive in comparison with other prairie cities. Many, if not most, of the bridges are limited to a maximum of 36,500 kg G.V.W. In addition, there is no other prairie city that restricts trucks to a maximum G.V.W. of 36,500 kg for moves on primary routes within the city, but allows full highway G.V.W. for moves in or out of the city.
  
3. It was observed that because the City of Winnipeg maximum steering axle weight is 5,500 kg and the City doesn't issue overweight steering axle permits, it is impossible for most loaded garbage trucks, concrete mixers and dump trucks to operate legally on their steering axles.

### 8.2.2 Indivisible OW/OD Policy

The following observations were made with respect to indivisible OW/OD policy in Manitoba and Western Canada:

1. It was observed that there is a wide variation between provinces in the allowable axle loads and G.V.W. allowed under overweight permit. The differences could not be explained from a technical point of view only. Most noticeable was the large difference in allowable loads on 16 wheel tandem groups in Alberta compared with other provinces. Also noticeable was the wide difference in maximum allowable G.V.W. before route

evaluation and approval by an engineer was considered necessary.

2. It was observed that Ontario has a "bridge oriented" overweight policy, and Alberta has a "pavement oriented" overweight policy, resulting in considerable differences in allowable weights between the two provinces.
3. It was determined that Manitoba and Saskatchewan have overweight fee structures that encourage pavement damage.
4. It was observed that the 3-S3 truck is the most common truck operating under overweight permit in Manitoba. Sixty percent of Manitoba overweight permit requests were for 46,500 kg G.V.W. or less. Because the allowable G.V.W. of the new RTAC 6 axle tractor-semitrailers is 46,500 kg, many of these trucks will not require overweight permits in the future. This will result in an eight percent drop in all permits issued and greater than eight percent drop in permit revenue.

For the Manitoba situation, it is recommended that the following actions should be taken:

1. The higher axle weights allowed on 16 wheel groups in Alberta be investigated further to determine whether their use should be encouraged in Manitoba.

2. That the overweight fee structure be modified so that it discourages pavement damage. The Minnesota Department of Transportation fee structure could be used as a model.
3. That the overweight issuing procedures for high G.V.W. vehicles in Alberta and Ontario be studied in order to resolve the vast difference in what is considered safe and acceptable weights for overweight vehicles on bridges in Manitoba and elsewhere.

### 8.2.3 Divisible OW/OD Policy

The following observations were made with respect to indivisible OW/OD policy in Manitoba and Western Canada:

1. It was observed that there is considerable difference between the provinces and states in the magnitude and number of dimension, weight and operational controls on LCVs.
2. It was observed that Manitoba is generally the most restrictive province with respect to allowing the operation of more efficient large and heavy trucks.

For the Manitoba situation, the following actions are recommended:

1. That Manitoba consider allowing the operation of the more stable (than the Triple Trailer combinations) Turnpike Doubles at a G.V.W. of 62,500 kg under special permit.
2. That Manitoba consider implementing a policy similar to Saskatchewan's Bulk Commodity Policy in which the efficiencies gained through the use of large and higher G.V.W. trucks are split between the carriers and the Province.

#### 8.2.4 Illegally Overweight Trucks in Manitoba

The following observations were made with respect to illegally overweight trucks in Manitoba.

1. Pavement damage caused by illegally overweight trucks was less than expected. If all trucks complied with weight regulations between 1975 and 1985, only six percent less ESALs would have occurred.
2. Based on the Manitoba Highways weight survey from 1975 to 1985, 26 percent of all loaded trucks surveyed were illegally overweight. 38 percent of the illegally overweight trucks exceeded their allowable G.V.W. 50 percent of all trucks hauling gravel were illegally overweight.

### 8.3 FURTHER RESEARCH POSSIBILITIES

The following topics are suggested for further study/development:

1. A comparison and evaluation of conditions required by provincial and municipal highway authorities for movement under overdimension permit.
2. A more streamlined and rational method of determining the maximum allowable G.V.W. on bridges of various designs.
3. Improved survey methodology for collecting representative truck weight and dimension data.
4. An evaluation of the City of Winnipeg By-Law restricting intra-city truck moves to a maximum G.V.W. of 36,500 kg.
5. An analysis of the operating savings to Manitoba carriers and the additional pavement cost to Manitoba Highways as a result of illegally overweight trucks.
6. Exploration and development of a framework for a Manitoba Bulk Commodity Act.

## 8.4 COMMENTARY

### 8.4.1 General Comments

Establishing "ideal" weight and dimension limits in order to allow safe and efficient use of the highway system is a complex and difficult problem. The policies and characteristics of OW/OD trucking presented in this document is a subset of the weight and dimension limit issue, which is a subset of the goal of creating a safe and efficient highway system, which is a subset of the goal of a safe and efficient transport system. This research has only concentrated on the OW/OD issue within the overall transportation problem. Consideration must be given to the impacts of changes in weight and dimension limits on all modes in order to properly optimize the transport system.

The role of the transport system in Manitoba and Western Canada is changing and from regional development and expansion to making the best and most efficient use of existing transport facilities. The policy of most provincial governments seems to be the support of the highway system through general tax revenue, rather than making the highway system accountable and self-supporting through user taxes. In some cases the policy and goals of provincial governments with respect to role and purpose of the highway system is not stated or is unclear. Until those goals and policies are formulated or stated more clearly, there will be no framework for further evaluation of the weight and dimension issue. The time has come for a clarification or change in



provincial highway policy that will reflect the change in the role of the highway and transport system.

#### 8.4.2 Comments on OW/OD Policy

With respect to illegal overweight trucks in Manitoba, it was found that the additional pavement damage was relatively small. It is possible that the operating savings resulting from overweight trucks in Manitoba could exceed the pavement damage costs, as it was found in a study of overweight trucks in Texas (Walton and Yu, 1983). This has potentially important implications for both the setting of weight limits and weight enforcement in Manitoba (i.e, reduced weight enforcement, higher weight limits).

With respect to OW/OD indivisible permit policy, it was found that it often has evolved over many years, has been borrowed from other jurisdictions, and has only been adjusted when problems appeared. As a result, much of the OW/OD policy has ended up irrational and sometimes inequitable. It would be in the interest of the province to make a careful evaluation of this policy, using the information presented here as a starting point.

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**APPENDIX A**

**MANITOBA WEIGHT AND DIMENSION REGULATIONS**

**1972 - 1988**

**MANITOBA WEIGHT AND DIMENSION REGULATIONS  
1972 - 1988**

**A.1 INTRODUCTION**

The purpose of this Appendix is to describe Manitoba weight and dimension regulations from 1972 to 1988. Where possible, problems with the intent or clarity of the regulations are pointed out.

Recommendations for changes in the current regulations are made where there are obvious problems.

Detailed research into the history of Manitoba weight, dimension and tolerance regulations was necessary in order to determine the legality of trucks weighed during Manitoba Highway's truck weight surveys from 1972 to 1986. Once the legality of the observed trucks were determined, it was possible to generate statistics on the characteristics of overweight trucks in Manitoba. The following descriptions of Manitoba vehicle weight and dimension changes over time are derived from Manitoba statutes and regulations from 1970 to 1987.

**A.2 CHANGES IN DIMENSIONAL LIMITS**

Vehicle dimensional limits in Manitoba from July 1971 to the present are shown in Table A.1. The only major changes are increases in combination lengths from 65 feet (19.81 m) to 21.5 m during metrification on January 1, 1979 and a further increase to 23 m (subject to the 16.75 m rule) on July 29, 1980. These increases were made in order to facilitate the use

Table A.1 Manitoba Dimension Regulation History

Date in Effect	Height		Width		Length			Tractor Semi		Combination	
	Imp	SI	Imp	SI	Imp	SI	Imp	SI	Imp	SI	
July/71	13' 6.0"	(4.115)	8' 6.0"	(2.591)	40' 0.0"	(12.192)	65' 0.0"	(19.812)	65' 0.0"	(19.812)	
Jan. 1/1979	(13' 7.4")	4.15	(8' 6.4")	2.600	(41' 0.1")	12.500	(65' 7.4")	20.000	(70' 6.5")	21.500	
July 29/1980	(13' 7.4")	4.15	(8' 6.4")	2.600	(41' 0.1")	12.500	(65' 7.4")	20.000	(75' 5.5")	23.000	

1. 23 m combination length allowed only if kingpin to rear distance is  $\leq$  16.75 m.

2. Numbers in brackets ( ) are the metric or imperial conversion (0.3048 m = 1 ft) of the regulations in effect at the time.



of 7 and 8 axle trains as G.V.W. limits increased. The current 23 m combination length regulation is written as applying only to tractor-semitrailer-trailer combinations (i.e., A-Trains). For this regulation to conform with actual enforcement practice, it must also refer to tractor-semitrailer-semitrailers (i.e., B-Trains).

### **A.3 CHANGES IN WEIGHT LIMITS**

Tire load, axle load and G.V.W limits in Manitoba from January 1970 to present are shown in Tables A.2, A.3, A.4 and A.5. The most notable changes over this time are the fluctuation in axle weight limits, the steady increase in allowable G.V.W. and the introduction of axle spacing weight penalties in 1975, followed by required minimum axle spacing in 1981.

#### **A.3.1 Changes in Tire Loads and Axle Weights**

Tire loads in Manitoba have been constant at 500 lbs/in or its hard metric equivalent of 9 kg/mm with only one exception. From Oct 11, 1972 to Dec 13, 1973 on the Trans-Canada Highway from Winnipeg to the Manitoba/ Ontario border, the tire load was decreased to 400 lbs per inch. Manitoba has not and does not increase tire loads in winter.

Allowable axle weights have fluctuated since 1970, but generally have increased. The first increase of tandem and single axle weights of

Table A.2 Manitoba Weight Regulations: January 1/1970 to December 31, 1978

Date in Effect	Road Class	Tire Load		Steering Axle		Single Axle		Tandem Axle		G.V.W.	
		lbs/in	kg/mm	lbs	kgs	lbs	kgs	lbs	kgs	lbs	kgs
Jan 1/1970	Class A	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	74,000	(33,566)
	Class B	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	44,000	(19,959)
	Class C	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	28,000	(12,701)
Oct 11/1972 Reg 173/72	PTH #1, Wpg to ONT	400	(7.14)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	90,000	(40,823)
	Class A	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	74,000	(33,566)
	Class B	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	44,000	(19,959)
	Class C	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	28,000	(12,701)
Dec 14/1973 Reg 289/73	PTH #1, Wpg to ONT	500	(8.93)	20,000	(9072)	20,000	(9072)	35,000	(15,875)	90,000	(40,823)
	PTH #1, Wpg to SK	500	(8.93)	20,000	(9072)	20,000	(9072)	35,000	(15,875)	80,000	(36,287)
	Class A	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	74,000	(33,566)
	Class B	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	44,000	(19,959)
	Class C	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	28,000	(12,701)
Sept 11/1974 Reg 234/74	Specified Class A	500	(8.93)	20,000	(9072)	20,000	(9072)	35,000	(15,875)	110,000	(49,895)
	Class A	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	74,000	(33,566)
	Class B	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	44,000	(19,959)
	Class C	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	28,000	(12,701)
Nov 18/1974 Reg 278/74	Specified Class A	500	(8.93)	20,000	(9072)	20,000	(9072)	35,000	(15,875)	110,000	(49,895)
	Specified Class A	500	(8.93)	20,000	(9072)	20,000	(9072)	35,000	(15,875)	80,000	(36,287)
	Class A	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	74,000	(33,566)
	Class B	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	44,000	(19,959)
	Class C	500	(8.93)	18,000	(8165)	18,000	(8165)	32,000	(14,515)	28,000	(12,701)

1. Starting January 29/1975, weight tolerances allowable with respect to the maximum gross weight on each axle assembly (single axles) for the purposes of section 230(2) of the Highway Traffic Act shall be: 1000 lbs (454 kg) for each axle assembly. However, tire loads may not exceed 500 lbs per inch of tire (Reg 14/75).
2. Starting Feb. 12/1975, tractor semitrailers were restricted to a maximum of 82,000 lbs (37,195 kg) G.V.W. on specified Class A highways (Reg 30/75).
3. Starting July 25/1975, for every foot or fraction thereof that an axle or any axle of a group of axles is less than 10' (3.098 m) from the next closest axle, there is a corresponding reduction in the maximum load of 2000 lbs (907 kg), on that group of axles (Reg 151/75).
4. Specified Class A road networks were continually added to from July 25/1975 until August 13, 1981
5. Numbers in brackets ( ) represent the metric conversion (2.20462 lbs = 1 kg) of the imperial regulations.

Table A.3 Manitoba Weight Regulations: January 1/1979 to August 12/1981

Date in Effect	Road Class	Tire Load		Steering Axle		Single Axle		Tandem Axle		G.V.W.	
		lbs/in	kg/mm	lbs	kgs	lbs	kgs	lbs	kgs	lbs	kgs
Jan 1/1979 Reg 221/78	Specified Class A	(504)	9.00	(19,841)	9000	(19,841)	9000	(35,273)	16,000	(110,231)	50,000
	Specified Class A	(504)	9.00	(19,841)	9000	(19,841)	9000	(35,273)	16,000	(80,469)	36,500
	Class A	(504)	9.00	(17,636)	8000	(17,636)	8000	(31,967)	14,500	(74,075)	33,600
	Class B	(504)	9.00	(17,636)	8000	(17,636)	8000	(31,967)	14,500	(44,092)	20,000
	Class C	(504)	9.00	(17,636)	8000	(17,636)	8000	(31,967)	14,500	(27,999)	12,700

- For every 0.311 m (1' 2.9") or fraction thereof that an axle or any axle of a group of axles is less than 3 m (9' 10.1") from the next closest axle, there is a corresponding reduction in the maximum load of 850 kg (1873 lbs), on that group of axles.
- Tractor semitrailers are restricted to a maximum of 37,500 kg (82,673 lbs) G.V.W. on specified Class A highways.

Table A.4 Manitoba Weight Regulations: August 13/1981 to February 18/1982

Date in Effect	Road Class	Tire Load		Steering Axle		Single Axle		Tandem Axle		G.V.W.	
		lbs/in	kg/mm	lbs	kgs	lbs	kgs	lbs	kgs	lbs	kgs
Aug. 13/1981 Reg 177/81	Class A	(504)	9.00	(12,125)	5500	(20,062)	9100	(35,274)	16,000	(124,561)	56,500
	Class B	(504)	9.00	(12,125)	5500	(18,077)	8200	(31,967)	14,500	(105,006)	47,630
	Class C	(504)	9.00	(12,125)	5500	(18,077)	8200	(18,077)	8200	(27,999)	12,700

- Subject to the H.T.A. Section 83 (permits), no vehicle shall be operated on any Class A,B or C highways when the minimum distance between axles is less than shown below:

Steering Axle to Drive Axle	3.0 m
Single Axle to Single Axle	3.5 m
Single Axle to Axle Group	3.5 m
Axle Group to Axle Group	5.0 m

If spacings are less than these minimums the combined maximum weight permissible on adjacent axles or adjacent axle groups is reduced by 330 kg for every 0.1 m short thereof

Table A.5 Manitoba Weight Regulations: February 19/1982 to Present

Date in Effect	Road Class	Tire Load		Steering Axle		Single Axle		Tandem Axle		G.V.W.	
		lbs/in	kg/mm	lbs	kgs	lbs	kgs	lbs	kgs	lbs	kgs
Feb 19/1982 Reg 37/82	Class A1	(504)	9.00	(12,125)	5500	(20,062)	9100	(35,274)	16,000	(124,561)	56,500
	Class B1	(504)	9.00	(12,125)	5500	(18,077)	8200	(31,967)	14,500	(105,006)	47,630
	Class A	(504)	9.00	(12,125)	5500	(18,077)	8200	(31,967)	14,500	(74,075)	33,600
	Class B	(504)	9.00	(12,125)	5500	(18,077)	8200	(31,967)	14,500	(44,092)	20,000
	Class C	(504)	9.00	(12,125)	5500	(18,077)	8200	(18,077)	8200	(27,999)	12,700

- The tolerance allowable with respect to the maximum gross weight on each axle assembly (single axle) is 450 kg (992 lbs) for each axle assembly. However, tire loads may not exceed 90 kg per 10 mm of tire.
- Subject to the H.T.A. Section 83 (permits), no vehicle shall be operated on any Class A, A1, B, B1 or C highways when the minimum distance between axles is less than shown below:

Steering Axle to Drive Axle	3.0 m
Single Axle to Single Axle	3.5 m
Single Axle to Axle Group	3.5 m
Axle Group to Axle Group	5.0 m

If spacings are less than these minimums the combined maximum weight permissible on adjacent axles or adjacent axle groups is reduced by 330 kg for every 0.1 m short thereof

- Starting Nov. 8/1982, minimum tandem axle to tandem axle spacing for end dump bulk trailers was reduced from 5.0 m to 4.0 m (Reg 228/82).
- Starting Jan 7/1983, tandem axles were allowed a 10% increase from Dec. 15 to Feb. 28 on Class A1 and B1 roads (Reg 9/83).
- Starting Sept 23/1983, single and tandem axles were allowed a 10% increase from Dec. 1 to last day in February (Reg 198/83).

18,000 lbs and 32,000 lbs to 20,000 lbs and 35,000 lbs respectively occurred on the TransCanada Highway on December 15, 1973. Starting on September 11, 1974, these increased axle weights were gradually introduced to most of Manitoba's major highways as part of the designated Class A highway system.

Metrification of axle weights on January 1, 1979 resulted in a reduction of steering and single axle weights from 20,000 lbs (9,072 kg) to 9,000 kg (19,841 lbs) for designated Class A highways and from 18,000 lbs (8,165 kg) to 8,000 kg (17,636 lbs) for highway classes A, B and C. Tandem axle weights were not changed substantially by metrification.

On August 31, 1981, single axle weights were increased back up to their pre 1979 weights of 9,100 kg and 8,200 kg on Class A and B highways respectively. Tandem axle weights on Class C highways were decreased from 14,500 kg to 8,200 kg, which made sense considering the maximum G.V.W. on Class C roads was 12,700 kg. As well, for the first time, steering axle weights were reduced from the single axle limits of 9,100 kg to 5,500 kg for all highway classes.

Starting January 7, 1983, tandem axles were allowed an increase of 10% on Class A1 and B1 highways during December, January and February. On September 23, 1983 the 10% winter weight increase was extended to single axles as well. The winter weight increases do not apply to steering axles, tire loads or the maximum highway G.V.W.'s of 56,500 kg and 47,630 kg on Class A1 and B1 roads respectively.

### A.3.2 Changes in Axle Spacing Requirements

There were no restrictions on axle spacing until July 25, 1975, when axles had their combined allowable axle weights reduced by 2,000 lbs for every foot short of 10 feet (2,976 kg per m). Metrification on January 1, 1979 changed this to a reduction of 850 kg for every 0.311 m short of 3 m (2733 kg per m).

Finally, on August 31, 1981, vehicles with axle spacings less than 5 m between two sets of tandems, 3.5 m between a tandem and a single, 3.5 m between singles or 3.0 m between steering axles and drive axles were subject to a weight reduction penalty of 330 kg per 0.1 m short of the minimum spacing (3,300 kg per m). The regulation is actually written suggesting that vehicles less than the minimum required spacings are not allowed to operate on any highway without a permit. However, according to Manitoba Highway's officials, this was not the intent of the regulation (Catteeuw, 1988).

On November 8, 1982, the minimum allowable spacing between tandems on end dump bulk trailers was reduced from 5.0 m to 4.0 m. This was done because of stability problems while dumping semi-trailers with 5.0 m spread between tandems and because of pressure applied by lobby groups.

Manitoba Highways has grandfathered all equipment (including end dumps) built before April 1st, 1982 for ten years (Catteeuw, 1985).

This allows all equipment built before April 1st, 1982 to operate at weights that were legally allowable at the time. In other words, the axle spacing weight penalty of 850 kg for every 0.311 m short of 3 m (instead of the 5, 3.5 and 3 m penalty) currently applies to all vehicles built before April 1st, 1982, up to a maximum of 50,000 kg G.V.W. Current axle spacing weight penalties apply to equipment exceeding the 50,000 kg limit.

### **A.3.3 Changes in Gross Vehicle Weights**

G.V.W.'s were first increased from 74,000 lbs to 80,000 and 90,000 lbs on portions of the TransCanada Highway between October 11, 1972 and December 14, 1973. Starting on September 14, 1974, the G.V.W.'s of certain designated Class A highways (including the TransCanada) were increased to 110,000 lbs. Other Class A highways had their G.V.W. increased to 80,000 lbs. The network of designated Class A highways was added to over the next few years, until the majority of the major highways (Provincial Trunk Highways) were at G.V.W. limits of either 80,000 or 110,000 lbs. Metrification of weight and dimension regulations occurred on January 1, 1979, with no major changes to G.V.W.'s.

On August 13, 1981, the 5 road classes (2 designated Class A, Class A, B and C) were combined into Road Classes A, B and C. The designated Class A highways (mostly Provincial Trunk Highways and some Public Roads) with G.V.W.'s of 36,500 and 50,000 kgs became Class A highways

with G.V.W.'s of 56,500 kg. Class B highways (mostly Public Roads) had their G.V.W.'s raised from 20,000 kg to 47,630 kg. Class C highways retained their 12,700 kg G.V.W. limit.

On February 19, 1982, the road classes A, B, and C were split into the current road classes A1, B1, A, B and C. Class A roads became A1 with G.V.W.'s of 56,500 kg, Class B roads became B1 with G.V.W.'s of 47,630 kg, Class A, B and C were classified with G.V.W.'s of 33,600, 20,000, and 12,700 kg respectively.

#### **A.4 CHANGES IN TOLERANCES**

Legally, there were no weight tolerances in Manitoba until Regulation 14/75 under H.T.A Section 230(2) came into effect on January 29, 1975. Section 230(2) allowed a judge to acquit the accused if:

1. The accused was not wholly responsible for being overweight.
2. The amount overweight did not exceed the tolerances specified in Regulation 14/75.

Regulation 14/75 allowed tolerances of 1,000 lbs per axle as long as tire loading did not exceed 500 lbs per inch of tire width. On January 1, 1979, the tolerances were metrified to 450 kg per axle and 9 kg per mm of tire width.

In practice, there were no tolerances for steering axles (because they are normally governed by tire loads), 1,000 lbs or 450 kg for



single axles and 2,000 lbs or 900 kg for tandems. These tolerances did not allow a truck to exceed maximum highway G.V.W.

On June 26, 1985, H.T.A. Section 68(14) came into effect. This section specified that for certified permanent scales, a tolerance of 2% or 500 kg, whichever is less, would be applied in the calculation of the amount overweight. For portable scales, a tolerance of 5% or 500 kg, whichever is less, would be used. At the same time Section 68(14) came into effect, old Section 230(2) was added to and renumbered to Section 254(2). The new Section 254(2) was the same as old Section 230(2), except a provision was added allowing the judge to acquit the accused if clay or mud is being hauled from an excavation of a highway or building where there are no scales easily available.

The tolerances enforced in the field from January 29, 1975 until June 26, 1985 were based on old Section 230(2) and Regulation 14/75. The regulation, as stated before, effectively allowed no tolerance on steering axles, 1,000 lb or 450 kg on single axles, 2,000 lb or 900 kg on tandem axles and no tolerance on maximum highway G.V.W.

Tolerances enforced in the field from June 26, 1985 to the present are based on a combination of Section 68(14) and new Section 254(2), depending on the situation in which they govern. The current effective field tolerances are 5% or 2% on steering axles, depending on what type of scale they are weighed on (Section 68(14) governs), 450 kg on single axles (Section 254(2) governs), 500 kg on tandems (Section 68(14)

governs) and 500 kg on maximum highway G.V.W. (Section 68(14) governs). The field tolerance on tandems of 500 kg seems low considering that it seems possible to interpret Section 254(2) as allowing a legal tolerance of 450 kg per axle assembly, or  $2 \times 450 = 900$  kg for tandems under most situations. Section 254(2) is to be repealed in the near future, which will leave the 5%/2% scale rule as the only applicable legal tolerance.

There is no legal tolerance allowing trucks operating on Class A1 Highways at Class A1 Highway weights to move onto Class B1 Highways and still remain at Class A1 Highway weights. However, there is an unwritten administrative tolerance of up to eight km for access roads which lead to communities which are adjacent to Class A1 Highways. Regulations are currently being drafted in which the access tolerance will be explicitly stated.

#### **A.5 Recommendations for Changes in Manitoba Weight and Dimension Regulations**

1. Manitoba weight regulations should explicitly specify that the maximum G.V.W. of a vehicle cannot exceed the sum of allowable axle weights as modified by the axle spacing weight penalty. Otherwise, there doesn't seem to be any legal basis to charge vehicles in excess of these weights.
2. The regulation specifying the maximum allowable weight on a steering axle should be increased to allow the same weight as

a single axle (as it was before August 31, 1981), subject to tire and axle capacity. Currently, any single unit truck that needs one may obtain an annual steering axle overweight permit up to 8,190 kg, subject to tire and axle capacity, with no restrictions on travel. As such, there is no point in restricting the steering axle weight in the regulations to anything less than 8,190 kg (except for revenue reasons). This action will reduce administrative burden; will make Manitoba more consistent with most other provinces and states (Nix, Clayton and Bisson, 1986); and will not adversely effect roads.

3. The definition of a tandem axle group should be changed to allow a spread of greater than two meters. Currently, tandem axles with a spread greater than two meters are not allowed to operate in Manitoba at any weight. Manitoba is the only jurisdiction in Canada, (Nix, Clayton and Bisson, 1986) and perhaps North America, that doesn't allow tandem axle groups with a spread greater than two meters. Enforcement of this regulation is pointless and impossible, and therefore the regulation should be changed.
4. The definition of vehicle combinations allowed 23 m overall length subject to the 16.75 m kingpin to rear rule should explicitly include B-Trains (tractor, semitrailer, semitrailer).

5. A better and less ambiguous formula for reducing the G.V.W. of vehicles with closely spaced axles and axle groups.

**APPENDIX B**

**MANITOBA INDIVISIBLE OW/OD PERMIT POLICIES AND PROCEDURES**

## **MANITOBA INDIVISIBLE OW/OD PERMIT POLICIES AND PROCEDURES**

### **B.1 INTRODUCTION**

This appendix describes the OW/OD permit policies and procedures in Manitoba. This includes the policies and procedures of both the Manitoba Department of Highways and Transportation (Manitoba Highways) and the City of Winnipeg. The legal authority, allowable dimensions and weights, conditions for movement, fee structures and where possible, the rationale behind the limits, conditions and fees are described.

### **B.2 LEGAL AUTHORITY**

Section 68(4) of Manitoba's Highway Traffic Act requires that a vehicle or combination of vehicles in excess of the specified maximum weights and dimensions must be moved only under the authority of a permit. This applies to vehicles or vehicle combinations operating on, or across, Class A, B and C Highways or industrial roads. Class A1 and B1 highways are included within Class A and B highways under H.T.A. 68(3)e. These highway classes cover all roads governed and administered by the Province of Manitoba, City of Winnipeg and the various rural municipal governments.

The authority to issue permits for overweight and overdimension vehicles comes under Manitoba's Highway Traffic Act section 87(1).

Section 87(1) states:

87(1) If the owner complies with The Manitoba Public Insurance Corporation Act ..., the traffic authority may, in its discretion, issue a special permit authorizing the driving of a vehicle or the moving of an object over, upon, or along, the highway although such driving or moving is not otherwise permitted by this Act or the regulations.

The traffic authority for most Class A1 and B1 roads in Manitoba is the Minister of Highways. The traffic authority for most of the remaining roads are the respective municipal governments (H.T.A., 1987).

Section 87(2) states that the traffic authority can impose whatever conditions it deems necessary to ensure a load arrives safely at its destination.

In Manitoba, there is no additional insurance required when moving under a temporary OW/OD permit. The regular registration fee covers any damage to the vehicle or third parties. However, there is a requirement for additional cargo insurance.

### **B.3 OW/OD PERMITS: MANITOBA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION**

In Manitoba, OW/OD permits are issued by the Maintenance Branch of the Manitoba Department of Highways and Transportation (Manitoba Highways). Manitoba Highways issues single trip and blanket OW/OD permits from their head office in Winnipeg and 17 district offices throughout Manitoba.

There are three types of indivisible OW/OD permits issued by Manitoba Highways. These are:

1. **Single Trip Permits:** allow a single move of an indivisible OW/OD vehicle or load along a specified route; may be issued from District or Head Offices; very large and heavy moves are issued from Head Office only.
2. **Extended Permits:** Blanket permits allowing any number of moves of an indivisible OW/OD vehicle or load on Class A1 and B1 highways for up to a one year period; may be issued from District or Head Offices.
3. **Extended Transportation Permits (ETP):** Self-recording blanket permits allowing any number of moves of indivisible OW/OD construction and industrial equipment on Class A1 and B1 highways for up to a one year period; issued from Head Office only.

Extended Transportation Permits were introduced to reduce the administrative burden of issuing permits for routine OW/OD moves in the construction industry. OW/OD moves are recorded by the carrier and submitted bi-weekly to Manitoba Highways for billing.

The following sections describe indivisible OW/OD permit policies, practices and procedures, as well as the conditions that Manitoba Highways requires permit holders to meet under authority of H.T.A. section 87.



### B.3.1 OW/OD Permit Application and Enforcement Procedures

Special permits are issued by Manitoba Highway's head office in Winnipeg, as well as by 17 other district offices throughout Manitoba. Permits can be obtained over the phone or in person at the head or district offices. When applying for a permit, the required information on the requested weights and dimensions of the vehicle and/or load is given, along with licence number and the name and address of the applicant. If the requested weights and dimensions are within certain limits, the permit is made up and signed by the issuing officer. If the permit request is over the phone, the permit number is given to the hauler and the signed, original copy is mailed to the hauler for his records or use. If the permit request is in person, the issuing officer gives the original copy directly to the person.

An exception to this procedure are railways and some pipeline companies who have special emergency blanket permits that allow overweight, overdimension equipment to move in emergency situations (e.g., derailments, pipeline leaks) without initial approval from the permit office. Emergency moves must be reported as soon as possible the next business day.

If the hauler's load is within certain dimensions and weight, the hauler may move his load under the authority of the permit number alone. Very large and heavy loads as well as blanket permits require that the hauler carry the actual permit document while making a movement.

If the requested route for the movement passes an open scale location, the hauler must take his vehicle to the scale to be checked against a duplicate copy of the permit received at the scale site by telecopier. The hauler is then given the duplicate copy of the permit.

If the vehicle does not pass a scale on the requested route, the hauler may be stopped on the highway by a roving inspector. The inspector will then take the hauler to the nearest telephone and phone the issuing office, at the haulers expense, to verify the conditions of the move.

If the load is found in excess of the dimensions or weight stated on the permit by either the scale or roving inspector, the movement is stopped and charged with violation of the terms of the permit (H.T.A. 87(4)). In addition, the appropriate charges are given for overweight or overdimension in excess of the permitted weight and size.

If the vehicle has the capacity and can meet the conditions required for the actual load, a new permit is made up showing the correct information from the point stopped by the inspector. The vehicle may then continue to its destination. Otherwise, the vehicle is stopped or moved at the discretion of the inspector and cannot continue until the vehicle meets the conditions of movement stated on the permit.

### B.3.2 Overweight Permits - Conditions, Limits and Fees

#### Tire and Axle Load Limits

Overweight permits in Manitoba are issued based on a tire load capacity of 90 kg per 10 mm of tire, up to the axle weight limits listed in Table B.1. Tire loads in excess of 90 kg per 10 mm of tire are not allowed. Minimum axle spacing requirements must be met (see Appendix A), or the combined maximum weights of adjacent axles or axle groups is reduced by 330 kg per 0.1 m short of minimum axle spacing. The maximum tire load and axle weight limits in Table B.1 apply to all roads administered by the Manitoba Department of Highways, including the secondary Class B1 roads. The maximum axle group weight is limited to 27,500 kg by the bridge department because of bridge deck and superstructure strengths. This is based on the AASHTO HS25 design truck in which the maximum single axle load is 20,000 lbs (i.e., half of the 40,000 lb simplified tandem axle point load). The rationale given for this limit is that a tridem axle group should not exceed 3 times the 20,000 lb design axle load giving 60,000 lbs or approximately 27,275 kg (Lautens, 1988).

Table B.1 Manitoba Absolute Maximum Axle Weights (kg)  
Under Special Permit, Class A1 and B1 Highways

Single Axle, Steering	8,190
Single Axle, other	9,100
Single Booster Axle	9,100
Tandem Steering Axles	16,000
Tandem Axles	21,960
Tandem Axles (16 tires)	27,500
Tandem Axles (Mobile Cranes)	24,500
Tandem Booster Axle	21,960
Tridems	27,500

- Notes: 1. Maximum Tire Load, 90 kg/10mm of Tire  
 2. Axle spacing restrictions apply (see A.3.2)  
 3. Not applicable during spring restrictions.  
 Winter weight premiums not allowed  
 4. Axle group weights > 27,500 kg not allowed  
 5. Hydraulic Booster Axles are not recognized  
 in Manitoba due to unreliability

Booster axles with hydraulic lifts are banned from use because of the unreliability of hydraulic boosters in properly distributing and maintaining axle loads.

Normally, weight distribution must be correct so that all axles of a vehicle combination must be at least their legal limit before applying for an axle overweight permit. However, this requirement may be waived at the discretion of the Director of Maintenance or the Manager of the Transport Compliance Section in some situations.

During the spring weight restriction period, tire overloads and axle overweights are not normally allowed, with the exception of following axle types on roads without spring weight restrictions:

tandem axle (16 tire)	22,700 kg
tridem	22,700 kg

In Manitoba, maximum allowable tire load and axle weights under permit do not increase in the winter.

Another exception to the rule is that tire overload permits are allowed on weight restricted roads for most reducible loads (.eg milk, general freight, feed, fuel) and are issued at the discretion of the district offices only. These permits allow tire loads of 60 kg per 10 mm on roads restricted to 45 kg per 10 mm under the condition that gravel roads are used as much as possible.

#### **Maximum G.V.W. Limits**

The maximum G.V.W. and sometimes axle group loads that can be permitted on a route is usually limited by bridge strength. Providing the vehicle meets the tire load, axle weight and axle spacing restrictions and if the vehicle is not on a route restricted by posted bridges or roads, the maximum G.V.W. and the level of authorization required is shown in Table B.2. The maximum G.V.W. under permit of 81,700 kg originates from the AASHTO HS 25 loading used in bridge design (Lautens 1988). The maximum G.V.W. of 81,700 kg (180,000 lbs) is derived from twice the G.V.W. of the AASHTO HS 25 bridge design truck. Special conditions (e.g., travel at 15 kmh, travel down centre-line of structure, no other vehicles on structure, etc.) may apply with the permit approval.

Most of Manitoba bridges are designed based on the working stress method in the AASHTO Standard Specifications for Highway Bridges. The working stress method is conservative relative to the more recent limit states design method. Many, if not most, of existing bridges in Manitoba are made of timber and designed to HS 20 loadings (RTAC, 1978). The majority of bridges were designed to HS 20 loading until the early 1970's, after which the HS 25 loading was used. During the 1970's, bridges for Class A1 and B1 highways were designed to HS 25 and HS 20 design loads respectively. Then in the early 1980's, bridges on both highway classes were designed for HS 25 loadings in recognition that trucks were often running on secondary highways at primary highway G.V.W.'s. Recently, three bridges have been built for HS 30 loadings. The HSS 25 loading is being used on a trial basis as a new standard to cover the effects of the 62,500 kg G.V.W. RTAC B-Trains. Further review of upcoming C.S.A. and AASHTO design codes will be undertaken along with consultation with other jurisdictions.

Table B.2 Manitoba Absolute Maximum G.V.W. Limits (kg)  
under Special Permit and Required  
Authorization Class A1 and B1 Highways

Maximum GVW (kgs)		Authority and Approval
From	To	
less than	60,000	District Office or Head Office approval
60,001	81,800	Head Office and Bridge Dept. approval required
greater than	81,700	Maintenance and Bridge Dept. approval required

- Notes: 1. Tractors must be registered to a minimum of 36,500 kg G.V.W.  
2. Weight penalties apply to vehicles with less than minimum axle spacing.  
3. Maximum 60,000 kg G.V.W. under Extended Transportation Permit

Bridges in Manitoba are evaluated using working stress methods according to the "Manual for Maintenance Inspection of Bridges" (AASHTO 1978). Load restricted steel bridges are posted with a single maximum G.V.W. somewhere between their inventory rating (55% of yield stress) and operating rating (75% of yield stress). The posted G.V.W. is determined using the AASHTO HS 20 design truck. Permission to exceed posted bridge limits is not given.

Overweight permits are issued only to truck combinations with tractors registered at 36,500 kg G.V.W. or greater. Practically, the 3-S2 is the smallest truck combination that is allowed an overweight permit because of the minimum required licenced weight of 36,500 kg (It would be difficult to carry an indivisible load on a truck-trailer).

Manitoba's permit manual also states that truck tractors should also be registered at the maximum licenced weight that the truck combination can legally carry on a highway. In practice, this is not required. (i.e., a tractor, tandem jeep, and tandem semitrailer combination could be legally registered at up to 53,500 kg G.V.W., but is only required to be registered at 36,500 kg when obtaining an overweight permit)

### **Overweight Fee Structure**

The amount overweight is determined by subtracting from the actual gross vehicle weight either the maximum allowable licensable G.V.W. or the actual licensed G.V.W. (called the registration rating factor (RRF)), whichever is less. Because the weight is supposed to be distributed so that all axles of a vehicle combination must be at least their legal limit, a truck applying for an overweight permit will always be overweight on one or more axles as well as over G.V.W. The maximum licensable gross vehicle weight is calculated as if all travel is on primary Class A1 highways, even if travel is mostly on Class B1 highways. Because of the method used in calculating amount overweight, this results in situations where a tractor semitrailer is not charged an overweight fee on a Class B1 highway until its G.V.W. exceeds 36,500 kg. Maximum legal G.V.W. on Class B1 highway for a semi trailer with 255 mm tires is 33,590 kg.

The charge for single trip overweight permits in Manitoba is \$0.036 times the amount overweight in kilograms times the distance travelled in



kilometers. Minimum fee for an overweight permit is \$6.00. An example of a Manitoba overweight fee calculation for an overweight 3-S3 truck hauling an indivisible load is given in Figure B.1.

Blanket overweight permits are available in Manitoba as either Extended Permits or as Extended Transportation Permits. In general, blanket overweight permits are not valid on roads with spring weight restrictions.

Extended Permits allow mobile cranes, truck mounted drilling rigs and steering axle overweights up to 24,500 kg on axle groups, 8,190 kg on single axle steering axles and 16,000 kgs on tandem steering axles. The above vehicles may be issued overweight Extended Permits from either District or Head Offices for up to 1 year and may travel anywhere using Class A1 and B1 roads. Extended Permits have also been issued for axle overloads on weight restricted roads for trucks carrying various reducible commodities. At present, there is no charge for Extended Overweight permits, although this is under review (Catteeuw, 1987).

Extended Transportation Permits are available from head office to haulers of construction and industrial equipment for up to a 1 year period for an annual fee of \$74. OW/OD moves are recorded bi weekly by the carrier and are submitted to Manitoba Highways. In addition to the

### Figure B.1 Manitoba Overweight Calculation Example

A heavy haul carrier wants to carry an indivisible load on the following 3-S3 truck combination. The route includes 50 km on Class A1 Highway and 50 km on Class B1 Highway. There are no posted bridges along the route. The requested G.V.W. for the vehicle and load is 50,000 kg. The tractor is registered for 36,500 kg.



Tires	2 x 255	8 x 305	12 x 255	
Class B1	4572	14,500	14,500	33,572 GW
Class A1	4572	16,000	16,000	36,572 GW
OW Permit	4572	21,960	27,500	54,032 GW

- Maximum axle weights under special permit are based on a maximum of nine kg per mm of tire width, up to maximum axle weights of:

8,190 kg	Steering axle
21,960 kg	Tandem axles
27,500 kg	Tridem axles
27,500 kg	16 wheel tandem axles

- An overweight permit may be issued for the above configuration for the given route because:

- The tractor is registered for the minimum required G.V.W. of 36,500 kg
- The requested G.V.W. of 50,000 kg G.V.W. is less than the maximum allowable G.V.W. under permit of 54,032 kg G.V.W.
- The truck weight does not exceed any load restricted bridges.

- The amount overweight is calculated as the requested G.V.W. of 50,000 kg minus either the maximum licensable legal G.V.W. in Manitoba (36,572 kg) or the registered weight (36,500 kg), whichever is less.

For this example:  $50,000 \text{ kg} - 36,500 \text{ kg} = 13,500 \text{ kg}$

- The overweight fee is calculated as the amount overweight in tonnes times the distance in km times \$0.036.

For this example:  $\frac{13,500 \text{ kg}}{1,000 \text{ kg/tonne}} \times 100 \text{ km} \times \$0.036 = \$46.60$

annual fee, each overweight trip recorded is charged at the same rate as single trip overweight permits. Overweight moves under these permits are subject to the same conditions and weight limits as single trip overweight permits, except that the maximum allowable G.V.W. is 60,000 kg.

### **B.3.3 Overdimension Permits - Conditions, Limits and Fees**

Manitoba's conditions, limits and fees for overdimension permits, both single trip and extended, are summarized in Tables B.3 and B.4. Additional restrictions apply for House Trailers and Buildings.

Overdimensional Permits up to 9.0 m wide (4.4 m for mobile homes) and 29.3 m long may be issued by district offices. All other overdimensional permits are issued from Head Office. Overlength permits are only issued to tractor semitrailers or other vehicle combinations.

### **B.4 City of Winnipeg**

The City of Winnipeg issues both single trip and annual OW/OD permits for irreducible loads and vehicles under the authority of H.T.A section 87(1). Permits are available from both the City of Winnipeg Police Department and the Streets and Transportation department at 100 Main Street. As of February 15, 1988, the Winnipeg Streets and Transportation Department began issuing OW/OD permits by telephone (Manitoba Highway News, 5, 1988). Truck operators are required to

Table B.3 Manitoba Overdimension Permit Conditions and Fees  
as of January 1, 1988

CONDITIONS	DIMENSIONS (m)							Length	Height	CONDITIONS					
	Width														
	>2.60	>3.05	>3.40	>3.70	>4.60	>6.00	>9.00	>20.0	>23.0	>29.3	>4.15	>4.60	>4.87	>5.20	
Travel on Friday from 3:00 p.m to Midnight or Days Preceding Holidays	Yes	No	No	No	No	No	No	Yes <sup>6</sup>	No	No	Yes	Yes	Yes	Yes	Travel on Friday from 3:00 p.m to Midnight or Days Preceding Holidays
Travel on Saturdays	Yes	Yes <sup>10</sup>	No <sup>1</sup>	No <sup>1</sup>	No	No	No	Yes	No <sup>1</sup>	No <sup>1</sup>	Yes	Yes	Yes	Yes	Travel on Saturdays
Travel on Sundays and Holidays	No	No	No	No	No	No	No	No <sup>5</sup>	No <sup>5</sup>	No <sup>5</sup>	Yes	Yes	Yes	Yes	Travel on Sundays and Holidays
Night Travel (Extremities Must be Lighted)	Yes	Yes <sup>2</sup>	No	No	No	No	No	Yes	No	No	Yes	No	No	No	Night Travel (Extremities Must be Lighted)
Travel During Spring Restrictions	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Travel During Spring Restrictions
D or Overwidth Sign Front and Rear	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	D or Overwidth Sign Front and Rear
Escorts <sup>10</sup>	No	No	No	Yes <sup>3</sup>	Yes	Yes	Yes	No	No	Yes	No	No	No	No	Escorts
Permit Document Required in Cab	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Permit Document Required in Cab
Movement by Timbers and Dollies Only	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	Movement by Timbers and Dollies Only
Utility Approval	No	No	No	No	No	No	No	No	No	No	No	MTS	MTS	MTS/MH/WH	Utility Approval
Extended Permits Available Document Required in Cab	Yes	Yes	Yes	No <sup>4</sup>	No	No	No	Yes	Yes <sup>7</sup>	No <sup>8</sup>	Yes	Yes	No <sup>4</sup>	No	Extended Permits Available Document Required in Cab
PERMIT FEES															
Single Trip Permit Fees	Nil	12.00	12.00	30.00/60.00/60.00 <sup>9</sup>	60.00	60.00	60.00	Nil	5.00	10.00	Nil	Nil	Nil	Nil	Single Trip Permit Fees
Extended Trip Permit Fees	10.00	24.00	24.00	N/A	N/A	N/A	N/A	5.00	50.00	100.00	Nil	Nil	N/A	N/A	Extended Trip Permit Fees

Notes:

- Daylight travel on Saturdays is permitted from May 16 to October 14 on all highways, EXCEPT highways #1 and #75
- Escorts required front and rear for night travel, all highways
- Escorts are required only on Highways 280, 373, 394, 398 and North of Cranberry Portage on 10
- Extended Permits are available to carry Granaries, Storage Tanks and Fertilizer Bins up to 4.25m wide and 5.20 m high
- Overlength structural steel may travel on Sundays and Holidays
- Overlength moves may run before 3:00 p.m. on days preceding holidays

- Extended Permits for Steel and implements of husbandry are limited to 23 m in length  
Extended Permits for Conveyors are limited to 24.3 m in length  
Extended Permits for Saw logs are limited to 25.9 m in length
- House movers may obtain Extended Permits for empty timber and dolly moves up to 32 m in length
- 60.00 for widths greater than 4.30 m
- Manitoba Escort Policy:  
Lead and trail escorts required on all highways  
Exceptions: 1. Lead escort not required for moves less than 6.10 m in width on 4 lane divided highways  
2. Trail escort not required on #1E between Falcon Lake and MB/ONT border  
3. Trail escort not required on #1W between Headingly and #100

Table B.4 Additional Requirements and Conditions  
for Mobile Homes and Buildings

CONDITIONS	Width (m)				
	Mobile Homes			Buildings	
	>2.60	>3.65	= 5.00 <sup>3</sup>	>4.6	>7.5 <sup>2</sup>
Travel on Saturdays, Sundays and Holidays	No	No	No	No	No
Travel when wind > 32 kmh Wind gusts > 40 kmh	Yes	No	Yes	No	No
Maximum Speed (kmh)	Speed Lmt	72	72	60	60
30 cm <sup>2</sup> Flourescent Orange Flags on Four Lower Corners	No	No	Yes	No	No
2 Amber Flashing Lights, 15 cm Diameter, on Rear of Trailer > 2 m from road surface	No	No	Yes	No	No
Trailing Escort Required	No	Yes	Yes <sup>1</sup>	Yes	Yes
May Overhang Centerline	No	No	No	Yes	Yes

Notes:

- Trail escort not required if Length of House Trailer is less than 29.3 m.
- Buildings greater than 7.5 m in width require RCMP approval  
and may not use PTH 100 or 101 before 9:00 am or after 4:00 pm.
- Must use approved 16 wheel dolly system.

submit the same information over the telephone that they normally would if they applied in person. For overheight vehicle moves, the necessary clearances (i.e., police, utilities, etc.) must be obtained prior to permit issuance. An authorizing permit number will be quoted to the truck operator when the necessary conditions have been met. This number will be quoted to the enforcement authorities when requested to do so.

The Police Department handles four classes of routine single trip and annual permits for trucks and special mobile machines. The four Classes consist of :

- Class A: Vehicle combinations up to 52,000 kg G.V.W
- Class B: Small Special Mobile Machines up to 18,000 kg G.V.W.
- Class C: Intermediate Special Mobile Machines up to 27,000 kg G.V.W.
- Class D: Large Special Mobile Machines up to 52,000 kg G.V.W.

The weight and dimension limits of the four classes are shown in Table B.5. Non-routine permits for vehicles and irreducible loads in excess of the weights and dimensions limits in Table B.5 are issued by the Streets and Transportation Division. These are normally single or return trip permits and the applicant must submit a vehicle diagram form at least 2 working days in advance of the intended move. Vehicles with a G.V.W. greater than 60,000 kg must be approved by the bridge engineer before crossing bridges.

Overweight vehicles with permits cannot exceed posted bridge weights with the exception of the Maryland and Disraeli Freeway bridges. These bridges are posted at 36,500 kg G.V.W. The city allows vehicles with

Class A and D overweight permits to cross these bridges with a G.V.W. of 52,000 kg at a maximum speed of 30 kmh. In addition, Class D vehicles must travel in the median lane of the bridge. City of Winnipeg permits fees are as follows (Manitoba Highway News, 5, 1988):

- overdimension annual or individual	\$20
- overweight annual	\$200
- overweight individual up to 52,165 kg	\$20
- over 52,165 kg up to 60,000 kg	\$50
- over 60,000 kg	\$90

The city restricts Class D vehicles to 27,000 kg G.V.W. on bridges posted for 36,500 kg G.V.W. except for the Maryland and Disraeli Freeway bridges (where class D vehicles are allowed 52,000 kg G.V.W.), and the Nairn Avenue and Osborne Street bridges (where class D vehicles are allowed 36,500 kg G.V.W.).

Table B.5 Maximum Weights and Dimensions of Routine Permits Issued by the City of Winnipeg Police Department

Class	Dimensions (m)				Weights (kgs)			G.V.W.
	Height	Width	Length	Tire Load	Single Axle	Tandem Axle	Tridem Axle	
A	4.15	2.60	27.40	90	9,000	22,000	27,000	52,000
B	-	-	-	115	9,000	-	-	18,000
C	4.15	4.60	18.30	90	12,000	24,500	-	27,000
D	4.15	4.60	18.30	90	12,000	24,500	27,000	52,000

There were 350 OW/OD permits issued by the City of Winnipeg in 1986. The revenue collected by these permits at \$5.00 a permit was \$1,750. In contrast, Manitoba Highways issued about 18,000 permits.

**APPENDIX C**

**MANITOBA OW/OD PERMIT SAMPLE**



## MANITOBA OW/OD PERMIT SAMPLE

### C.1 INTRODUCTION

A random sample of Manitoba Highways permit files from March 1986 to February 1987 was taken to determine the characteristics of vehicles operating under OW/OD indivisible permit in Manitoba. This appendix describes the Manitoba permit forms, the information they contain and how they are filed. The assumptions and accuracy of the sample are then discussed. Finally, the results from a random three percent sample are described in terms of all OW/OD permit moves and by overweight permit moves only.

### C.2 THE DATA BASE

One permit form is used for most types of indivisible OW/OD moves. Figure C.1 is an example of a typical Manitoba Highways permit form, completed for an overweight single trip move of a backhoe. This form is used for both single trip OW/OD permits and for extended OW/OD permits allowing unlimited trips of overdimension and (in some cases) overweight vehicles over a period of time.

The permit form includes information on the applicant, vehicle registration, load, number of tires and their width, origin, destination, route, date in effect and the requested G.V.W. The permit forms are filed chronologically by issuing office in the stores

# Special Permit

OVERWEIGHT

Manitoba  
Highways and  
Transportation



EXAMPLE

Special permit issued under authority of Section 87 of the Highway Traffic Act authorizing the driving of a vehicle or the moving of any object along Provincial Trunk Highways and Provincial Roads.

Applicant <u>Doc's Motors Limited</u>		NO REQ	MAX REQ	ALLOWABLE WEIGHT	
Address <u>13 St. James Street, Winnipeg, Manitoba</u>	TRUCK	<u>2</u>	<u>255</u>	<u>4,950</u>	kg
Licence # <u>612 PAA</u> Prov. <u>Manitoba</u> rwt <u>36,500 kg</u>	TRAILER	<u>8</u>	<u>255</u>	<u>18,360</u>	kg
To Move <u>backhoe</u> Model <u>Koehring 475</u>					kg
Stripped of: _____					kg
How to Move <u>low bed</u>	TOTAL			<u>41,310</u>	kg
Origin and Destination <u>Brandon to Dauphin</u>					
Route <u>1A, 10, 16, 5</u>					

During the Period JANUARY 3, 1986

The Highway Traffic Act Chapter 160 S.M. 1985 shall apply except that authority is granted for:  
Width 4.0 (m) Length 1898 (m) Height 1898 (m) Approx. Gross Weight 39,915 kg

Axle Overload (subject to Section 68 (1)) YES

This permit is granted subject to the applicant agreeing to comply fully with the conditions as shown on reverse, and any special conditions as shown below.

Public Highway Project  
 Yes  No

Date JANUARY 2, 1986 Time 14:45

Signed AUTHORIZED SIGNATURE  
 For Director of Operations

Single Trip Permit  
 Yes  No

SPECIAL CONDITIONS

Office Use
Distance _____
Net/Tare Weight _____ kg

department at Manitoba Highway's Head Office for the current fiscal year only. Permits from earlier years are stored in a provincial government warehouse.

The same form is also used for single trip permits authorizing a temporary increase in registered weight to the maximum legal registered weight and/or to allow a truck with a Manitoba "T" plate to operate beyond its 20/30 km radius limit. These single trip permits with respect to increasing registered weight or licensed operating radius should not be confused with single trip permits allowing vehicles to exceed normal weight and dimension limits. However, in terms of the OW/OD permit sampling, these type of single trip permits were not an issue because no examples were found.

The following example is given to illustrate when a single trip permit would be required to increase registered G.V.W.: A three axle tandem truck with 10" tires is registered with a G.V.W. of 16,000 kg. The owner wants to make a single trip with a divisible load on a Class A1 Highway that results in a G.V.W. of 19,000 kg. On a Class A1 Highway, this truck would be allowed a maximum of 19,572 kg G.V.W. The owner requests and gets a single trip permit increasing the truck's registered weight to 19,000 kg G.V.W. because he is within the maximum legal G.V.W. The truck does not exceed any allowable tire, axle or G.V.W. limits.

OW/OD moves that are not made under single trip or extended permits are made under Extended Transportation Permits. Under an Extended Transportation Permit, a carrier submits a bi-weekly report on all OW/OD moves that have occurred over a two week period. The report includes information on number of axles, G.V.W., origin, destination, route and distance travelled for each OW/OD move. The bi-weekly reports are filed chronologically by company name in filing cabinets within the Maintenance Branch at Manitoba Highways Head Office.

Because information on each move under an Extended Transportation Permit is recorded, they were treated as single trip permits for the purpose of classification and analysis. Because the Extended Transportation Permit Bi-weekly reports only record the number of axles on a vehicle, it was sometimes impossible to exactly determine the vehicle configuration. For those cases when the configuration was not known, the following assumptions were made when recording the vehicle type of moves made under ETP's:

< 5 Axles	not overweight
5 Axles	3-S2
6 Axles	3-S3
7 Axles	3-S2-S2

In addition, the G.V.W. of overweight vehicles under permit was recorded as the requested G.V.W. as predicted by the permit applicant. It is possible that the actual G.V.W. of the vehicle was greater or lower than the requested G.V.W. On the occasions where the truck was weighed, the actual G.V.W. was recorded instead of the requested G.V.W.

Overweight permit forms often did not distinguish between the truck types 3-S1-S3 (tractor, single axle jeep and tridem semi-trailer) and 4-S3 (tridem drive tractor and tridem semi-trailer). Thus, both of these configurations were combined into one truck type category.

### C.3 SAMPLE SIZE AND ACCURACY

A three percent random sample consisting of 529 OW/OD moves was taken from both the single trip/extended permit files and from files for each carrier who submitted Extended Transportation Permit bi-weekly reports. Carriers who reported less than 33 moves for the year were pooled with other carriers with less than 33 moves. A three percent random sample was then drawn from this pool. A three percent sample size as used by NCHRP Report #80 was chosen as being sufficient for characterization of indivisible OW/OD permits.

The degree of accuracy of a percentage derived from a sample may be determined using the following equation (Cleveland, 1964):

$$\sigma_p = \sqrt{\frac{pq}{N}}$$

where:

- $\sigma_p$  = standard deviation of the percentage
- p = the percentage obtained in the study (should be at least 10 percent)
- q = 100 - p
- N = total observations in the sample (a number larger than 30)

A 95.5 percent confidence interval would require a percentage range of two standard deviations about the quoted percentage. Thus, for this sample of 529 permits, a quoted percentage of 50 percent is subject to a possible error of plus or minus 4.3 percent at a 95 percent confidence level. The true answer is almost certainly between 45.7 and 54.3 percent. The confidence interval actually varies from a minimum at low and high percentages (e.g., plus or minus 2.6 percent at 10 or 90 percent) to a maximum at 50 percent. Thus, using a confidence interval of 4.3 percent will be somewhat conservative in most cases.

#### **C.4 THE RESULTS**

Statistics on Manitoba OW/OD moves were broken into an analysis of all OW/OD moves and of an analysis of overweight moves only. Statistics on all OW/OD moves are presented for administrative reasons, whereas statistics on overweight moves only are presented for engineering reasons (i.e., pavement and bridge damage).

Some divisible loads (i.e., overdimension hay, steering axle overweights) were included in the statistics below. Extended overdimension permits are also included in the statistics, thus underestimating the number and relative proportions of OW/OD moves made under permit.

### C.4.1 Statistics on All OW/OD Moves

All statistics quoted in this section are based on a sample size of 529 permit moves. Therefore, quoted percentages can vary a maximum of plus or minus 4.3 percent at a 95 percent confidence level.

#### Number of Moves Authorized: 1984/1985 to 1986/1987

In general, the following statistics will be quoted in terms of number of moves authorized instead of number of permits issued because many OW/OD moves can be authorized under a single Extended Transportation Permit. Table C.1 lists the number of OW/OD moves authorized by Manitoba highways for fiscal years 1984/1985 to 1986/1987. The number of single trip OW/OD permits issued has not increased much, but the number of OW/OD moves is known to have increased due to increased use of Extended Transportation Permits.

Table C.1 OW/OD Moves in Manitoba, 1984/1985 to 1986/1987

Location Issued	1984/85	1985/86	1986/87
Head Office	9,055	9,724	9,457
ETP Permits	?	?	3,226
District Offices	5,418	5,115	5,432
Total	14,473	14,839	18,115

- Notes: 1. ETP Permits are issued by Head Office. No statistics are kept of the number of separate moves made under ETP.  
 2. Number of 1986/87 moves determined through actual count

**OW/OD Moves by Place of Issuance, Permit Type and Type of  
Overweight or Overdimension**

Table C.2 shows the breakdown 526 randomly sampled OW/OD moves authorized in 1986/1987 by where they were issued, permit type, and whether they were overweight only, overdimension only or overweight and overdimension.

Table C.2 Number of Sampled OW/OD Moves by Location Issued, Permit Type and OW/OD Class

Location Issued	Permit Type	Overdimension Only	Overweight Only	OW and OD	Total
Head Office	Single	165	10	84	259
	Extended	7	13	6	26
	ETP	44	8	43	95
District Office	Single	83	3	29	115
	Extended	26	5	0	31
Total		325	39	162	526

Source: Manitoba Permit Sample

62 percent of all OW/OD moves were overdimension only, eight percent were overweight only and 31 percent were both overdimension and overweight. From these figures, 38 percent of all permit moves were overweight and 62 percent were overdimension. The most common OW/OD move was a single trip, overdimension only, handled from head office (31 percent of all OW/OD moves).

Head Office administered 72 percent of all moves under permit (including moves under ETP's), with the 15 District Offices handling the



remaining 28 percent of OW/OD moves. Of the OW/OD moves handled at the Head Office, 7 percent were extended permits, 25 percent were ETP moves, and 68 percent were single trip permits. At District Offices, 21 percent of permits issued were extended permits and 79 percent were single trip permits.

#### **OW/OD Moves by Month**

October was the busiest month of the year for OW/OD moves (13 percent), followed by August and June (12 percent). February was the slowest month with only 2 percent of the years OW/OD moves.

#### **OW/OD Moves by Trip Length**

Only moves recorded under ETP's (18 percent of sample) had information on trip length available. Based on these ETP moves, 63 percent of trips were less than 120 km, 23 percent were from 120 to 200 km, six percent were from 200 to 280 km, four percent were from 280 to 360 km and two percent were greater than 360 km. Average trip length was 110 km.

#### **OW/OD Moves by OD Patterns**

70 percent of single trip OW/OD moves were within Manitoba, 20 percent extra provincial and 10 percent (Saskatchewan-Ontario) through the province. The extra provincial moves (in both directions) of Manitoba-

US, Manitoba-Ontario and Manitoba-Saskatchewan consisted of two, six and 12 percent of all permit moves, respectively.

#### **OW/OD Moves by Commodity**

Construction equipment was the most common commodity (38 percent), followed by industrial equipment (11 percent), mobile homes (10 percent), buildings (seven percent), Hay (six percent) and agricultural equipment (five percent).

#### **C.4.2 Statistics on Overweight Moves Only**

Most statistics quoted in this section are based on a sample size of 201 permit moves. Therefore, quoted percentages may vary a maximum of plus or minus 7.5 percent at a 95 percent confidence level.

#### **Overweight Moves by Requested G.V.W.**

Table C.3 shows the requested sample G.V.W. distribution of the overweight permits. Extended overweight permits were removed from consideration (i.e., steering axle overweights). Approximately 60 percent of overweight requests were less than 46,500 kg G.V.W., the new allowable weight for tractor semitrailers with tridem groups under the RTAC proposals. The mean requested G.V.W. is 45,392 kg. Even though the proposed RTAC vehicles are limited to certain routes, there should

still be a dramatic drop in overweight moves authorized (and revenue) by the Highway's Department in the coming years.

Table C.3 Requested G.V.W. Distribution

Requested G.V.W. (kgs)	Frequency	Percent
<12,000 - 20,000	4	2
20,000 - 28,000	5	3
28,000 - 36,000	8	5
36,000 - 44,000	69	39
44,000 - 52,000	51	29
52,000 - 60,000	30	17
60,000 - 68,000	8	5
68,000 > 76,000	2	1
	177	100

Note: 95% Confidence Interval = 7.3%

### Overweight Moves by Vehicle Type

The most common vehicle moving under overweight permit was the 3-S3 (37 percent), followed by the 3-S2 (18 percent), 3-S1-S3 (tractor, single axle jeep and tridem semi-trailer) and 4-S3 (tridem drive tractor and tridem semi-trailer) (12.5 percent), two and three axle straight trucks (9.5 percent) and special mobile machines (seven percent). The tridem axle semi-trailer was used in almost 50 percent of vehicle configurations making overweight moves. This is not surprising as tridems are allowed up to 27,500 kg under permit, whereas tandems are only allowed a maximum of 21,960 kg. Sixteen wheel tandems, which in Manitoba are allowed the same maximum weight under permit as tridems, were very rare.

Overweight permits for two and three axle straight trucks consisted mostly of permits allowing overweights on weight restricted roads in spring or extended permits allowing steering axle overweights.

#### **Overweight Moves by Commodity**

Of all overweight moves, 65 percent were construction equipment, eight percent industrial equipment, eight percent extended permits allowing divisible loads on spring weight restricted roads and seven percent special mobile machines.

**APPENDIX D**

**DETAILED PROVINCIAL AND MUNICIPAL WEIGHT REGULATIONS**

## Manitoba Regulations: Provincial Highways

Additional regulatory and policy considerations which govern the applicability of the Manitoba weight limits shown in Table 3.4 are:

1. **Axle Spacing:** Axle loadings must meet the following minimum axle spacings (as well as the minimum tire width), otherwise, spacings less than minimum reduces the combined axle weights by 330 kg per 0.1 m short.

From	To	Distance (m)
Steering	Drive	3.0
Single	Single	3.5
Single	Axle Group	3.5
Axle Group	Axle Group	5.0
Axle Group	Axle Group (end dump trailers)	4.0

2. **Truck Types:** End dump trucks are allowed 4.0 m instead of 5.0 m between axle groups without penalty. Also, tractors are allowed a maximum of only 5,500 kg on the steering axle.

3. **Seasonality** Winter premiums of 10% over on all axle weights, except steering, are allowed in December, January February on Class A1 and B1 highways. However, trucks must still meet tire load restrictions of 9 kg/mm and the maximum highway G.V.W cannot be exceeded. Restrictions on tire loadings of 6.5 kg and 4.5 kg per mm of tire width may be applied to some secondary roads for varying periods of time in the spring.

4. **Road Class:** In addition to Class A1 and B1 highways shown Table 4.5, there are road Classes A,B,C with lower G.V.W.'s.

5. **Tolerances:** Tolerances of 2% or 500 kg whichever is less allowed for permanent weigh scales and 5% or 500 kg, whichever is less is allowed for portable weigh scales. In practice, 500 kg is allowed on a axle group, 450 kg on a single axle, and the 5%/2% tolerances on steering axles. Steering Axles (but not tandem steering axles) on roads restricted to 6.5 kg/mm tire loads are allowed 20% tolerance.

**Manitoba Regulations: City of Winnipeg**

The Manitoba Highway Traffic Act, section 68(9) allows municipalities to increase or decrease the weight of vehicles operating on any road in which the city or town is the traffic authority. Municipalities in Manitoba have no authority to change dimensional limits and these are therefore the same as the Provincial limits. The highways in the City of Winnipeg are considered Class A highways, which have lower weight limits than Class A1 (Manitoba Regulation 198/83, 1(e)). However, under the authority of H.T.A. section 68(9), The City of Winnipeg Traffic By-Law No. 1573/77, sections 45, 46, and 47 has increased the axle and gross vehicle weights as described below.

The City of Winnipeg By-Law allows Class A1 Highway tire loads, axle weights and G.V.W. within the city in two situations (subject to bridge weight restrictions):

1. If trucks use the Perimeter Highway or Lagimodiere Boulevard.
2. If the trucks origin or destination is within the city ( but not both origin and destination) and the most direct route via truck routes is taken to the Perimeter Highway or Lagimodiere Boulevard.

Otherwise, trucks are limited to 36,500 kg G.V.W. at Class A1 axle weights and must follow truck routes as much as possible. The routes they may use are limited because most bridges in Winnipeg are limited to a maximum G.V.W. of 36,500 kg. This is unusual because other prairie cities allow full highway G.V.W. on most of their bridges. Trucks may

make pickups and deliveries off truck routes as long as they go and return by the shortest route. Winnipeg weight regulations include the same axle spacing, spring weight restrictions, winter weight premiums and truck type conditions as the provincial regulations.

### **Saskatchewan Regulations: Provincial Highways**

Additional regulatory and policy considerations which govern the applicability of the Saskatchewan weight limits shown in Table 3.4 are:

1. **Axle Spacing:** Axle loadings must meet the following minimum axle spacings (as well as minimum tire width), otherwise, spacings less than minimum reduces the combined axle weights by 1,400 kg per 0.3 m short.

From	To	Distance (m)
Single	Single	3.5
Single	Axle Group	3.5
Axle Group	Axle Group	5.0
Axle Group	Axle Group	3.35
	(End dump trailers and concrete mixers only)	

2. **Truck Types:** End Dump semitrailers and concrete mixers are allowed reduced minimum spacing (3.35 m) between axle groups before receiving a weight penalty.

3. **Seasonality:** Winter premiums of 10% over primary highway tire loads and axle weights, except steering axles, are allowed in December, January and February on primary, secondary and municipal roads. Maximum Primary G.V.W. remains the same at 53,500 kg, Secondary G.V.W. increases from 49,000 kg to 53,500 kg and the remaining G.V.W.s increase by 10%. In spring, there are some tire load reductions on oil treatment roads (Nix, 1987).

4. **Road Class:** Not mentioned in Table 4.5 is the Municipal road class which has the same weight limits as the Secondary road class except for a lower combination G.V.W. of 34,500 kg.

5. **Tolerances:** Officially, there are no tolerances. In practice, the Department of Highways have guidelines for its weight enforcement staff (Nix, 1987).



**Saskatchewan Regulations: City of Regina**

Tire load and axle weight limits within Regina are the same as the Provincial Primary highway weights. Dimensional limits are the same as the Provincial limits. There are no spring restrictions mentioned in the Regina Traffic Bylaw, however winter premiums are allowed. Minimum axle spacing requirements are identical to the Provincial requirements.

Trucks are restricted to heavy vehicle routes, on which they may travel at up to the maximum Primary highway G.V.W.'s.

**Saskatchewan Regulations: City of Saskatoon**

Saskatoon's dimensional, tire load and axle weight limits are the same as the Provincial dimensions and Primary highway axle weights (City of Saskatoon, Traffic Bylaw No. 4284, section 7-1 to 7-5). Minimum axle spacing requirements are also the same as Provincial requirements. There are no provisions in the by law for winter premiums or spring restrictions.

Trucks over 5,000 kg G.V.W. are restricted to certain truck routes within the city of Saskatoon, depending on their G.V.W. There are three G.V.W. levels of truck routes; 5,000 kg to 27,000 kg; 27,000 kg to 37,500 kg; and 37,500 kg to 53,500 kg. However, trucks up to the maximum G.V.W of 53,500 kg may make pickups or deliveries on any street as long as they return to a truck route by the shortest route when they

are finished.

Saskatoon exempts garbage trucks, concrete trucks, buses and road construction equipment from all weight restrictions.

### Alberta Regulations: Provincial Highways

Additional regulatory and policy considerations which govern the applicability of the Alberta weight limits shown in Table 3.4 are:

1. **Axle Spread:** In Alberta, allowable loads on axle groups change with axle spread. Loads allowed on tandem axle groups (which includes tridem in Alberta's definitions) are:

Axle spread (m)	Allowable Weight (kgs)
1.0	16,000
1.8	16,400
2.4	16,800

2. **Axle Spacing:** The minimum spacing between axles and axle groups and their allowable weights are the following:

From	To	Allowable Axle Spacing (m)	Weight (kgs)
single	single	$\geq 3.5$	18,200
		3.0	17,200
		2.4	16,800
		1.8	16,000
single	tandem	$\geq 3.5$	25,100
		3.2	23,700
		2.9	22,300
		2.6	20,900
		2.3	19,500

tandem	tandem	$\geq 5.0$	32,000
		4.7	30,600
		4.4	29,200
		4.1	27,800
		3.8	26,400

3. **Seasonality:** Axle weights on some roads are restricted to 80 or 90% of their normal allowable weights in spring. In addition, there are several cases where certain vehicles or commodities are exempt from weight restrictions.

4. **Tolerances:** Alberta allows a tolerance of 500 kg per axle, with a maximum of 1000 kg or 5% of maximum allowable G.V.W. Tolerances for public vehicles hauling field crops from August 15 to February 15 on gravel roads are allowed 15% of maximum G.V.W. to a maximum of 2,000 kg total and 1,000 kg per axle.

#### **Alberta Regulations: City of Edmonton**

Edmonton's weight and dimension limits are the same as the Provincial limits (City of Edmonton, Traffic Bylaw 5590, section 212(1)). Edmonton does restrict trucks that exceed 5,000 kg G.V.W. or 11 m in length to truck routes only. However, these trucks may make pickups and deliveries on any street, as long as they take the shortest route to and from a truck route. Some of the truck routes are restricted to certain days of the week and hours of the day.

There are no weight restricted bridges in Edmonton. However, there are seven locations with structural clearances below standard height. Most of these are on truck routes within the downtown area and are as low as 3.0 m.

**Alberta Regulations: City of Calgary**

Calgary's weight and dimension limits are the same as the Provincial limits. There are no load restricted bridges in Calgary.

Calgary has truck routes where trucks exceeding a G.V.W of 5,450 kg must travel. Some of these routes restrict travel to certain times of the day and some routes do not allow tandem axles. Trucks may leave truck routes to make pickups and deliveries as long as they go and return using the shortest route.

**APPENDIX E**

**VEHICLE DEFINITIONS, DIAGRAMS AND DESCRIPTIONS**

## VEHICLE DEFINITIONS, DIAGRAMS AND DESCRIPTIONS

This Appendix includes descriptions, diagrams and descriptions of the various heavy vehicles discussed in the text.

Table E.1 shows the profiles, typical maximum G.V.W. and vehicle classification code for some common Manitoba trucks. The 3-S2 is by far the most common heavy truck in Manitoba, ranging from 72 to 98 percent of trucks weighed depending on the location (Clayton and Lai, 1985). The 3-S2-S2 is currently the only common configuration allowed the maximum Manitoba G.V.W. of 56,500 kg. It is less common, representing from less than one to three percent of trucks weighed in Manitoba (Clayton and Lai, 1985).

Table E.2 shows some of the OW/OD truck configurations allowed to operate under divisible permit in Western Canada. The two RTAC vehicles will soon be allowed to operate legally without permit. The RTAC vehicles are longer and have higher allowable axle weight and G.V.W. than is currently allowed in Western Canada. The remaining three vehicles are overlength in all jurisdictions in Western Canada and may only operate under permit.

Table E.3 shows some examples of special equipment used to haul heavy indivisible loads under permit. Heavy haul equipment frequently use jeeps, boosters and multi-tire axle groups to distribute and carry heavy loads. Figure E.1 is a photograph of a heavy haul vehicle weighed at

the Headingley inspection station in Manitoba. Figure E.2 shows the 16 wheel tandem jeep and Figure E.3 shows the 16 wheel tandem semitrailer and single axle booster used within this configuration. Booster axles can change the weight distribution between axle groups by hydraulically adjusting the load on the booster axle. Some Booster axles adjust their loads through an air or mechanical mechanism. Figure E.4 and E.5 are photographs of multi-axle, multi-tire heavy haul equipment owned by Premay of Edmonton, Alberta.

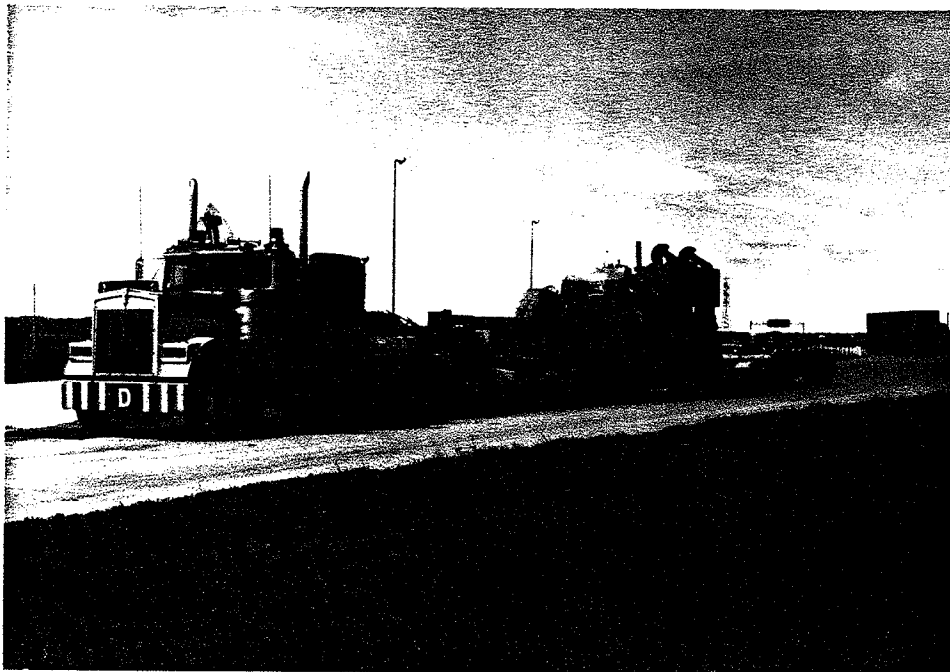


Figure E.1  
Heavy Haul Equipment at Headingley, Manitoba

Table E.1 Profile and Description of Selected Trucks and Truck Combinations  
Complying With Manitoba Basic Weight and Dimension Limits







Truck Profile	Typical Maximum GVW (kgs)	Vehicle Type	Description
	14,000	SU2	Two Axle Truck
	21,000	SU3	Three Axle Truck
	36,500	3-S2	Tractor- Semitrailer
	55,000	3-S2-2	Seven Axle A-Train
	53,000	3-S2-S2	Seven Axle B-Train
	56,500	3-S2-3	Eight Axle A-Train



Table E.2 Profile and Description of Selected Truck Combinations  
Requiring Divisible OW/OD Permits











Truck Profile	Typical Maximum GVW (kgs)	Description
	46,500	3-S3 RTAC Tractor-Smitrailer
	62,500	3-S3-2 RTAC B-Train
	56,500 (MB) 62,500 (SK) 53,500 (AB)	3-S2-3 Rocky Mountain Double
	N/A (MB) 62,500 (SK) 62,500 (AB)	3-S2-4 Turnpike Double
	56,500 (MB) 53,500 (SK) 53,500 (AB)	3-S1-2-2 Triple Trailer

Table E.3 Profile and Description of Selected Vehicles Used  
Under Indivisible OW/OD Permits

Vehicle Profile	Typical Maximum GVW (kgs)	Description
	49,000 (MB) 49,000 (SK) 54,600 (AB)	3-S2 Tractor-Semitrailer
	60,000 (MB) 60,000 (SK) 60,000 (AB)	3-S1-S3 Tractor-Semitrailer with a single axle jeep
	81,700 (MB) ? (SK) 119,000 (AB)	3-S2-S4 Tractor-Semitrailer with tandem axle jeep and tandem axle booster
	81,700 (MB) 81,700 (SK) 104,800 (AB)	3-S2-S2 Tractor-Semitrailer with 16 wheel tandem jeep and trailer
	48,000	Mobile Crane

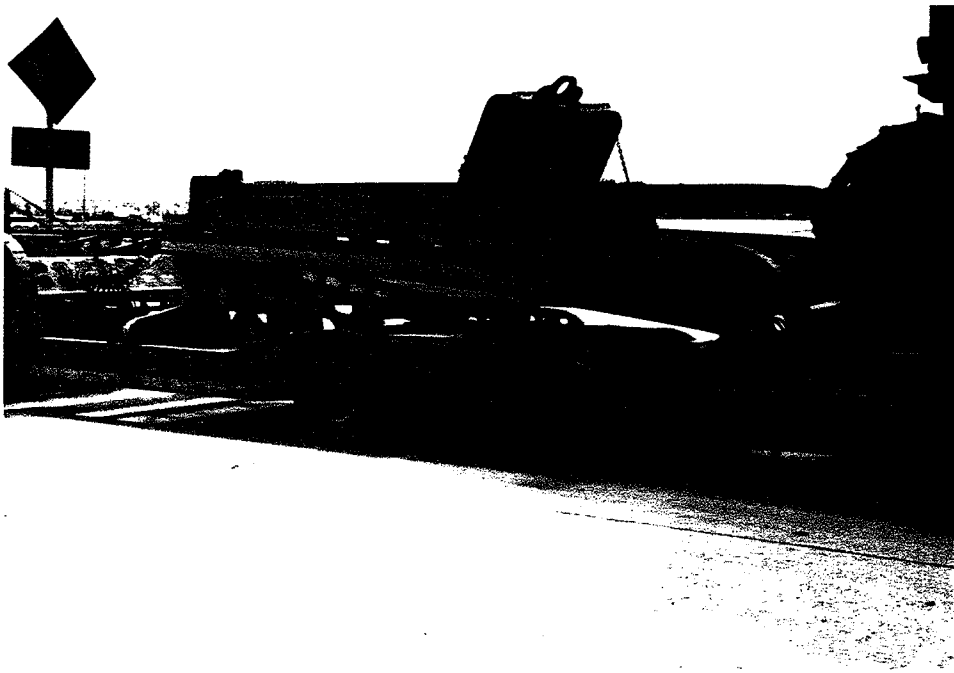


FIGURE E.2



FIGURE E.3

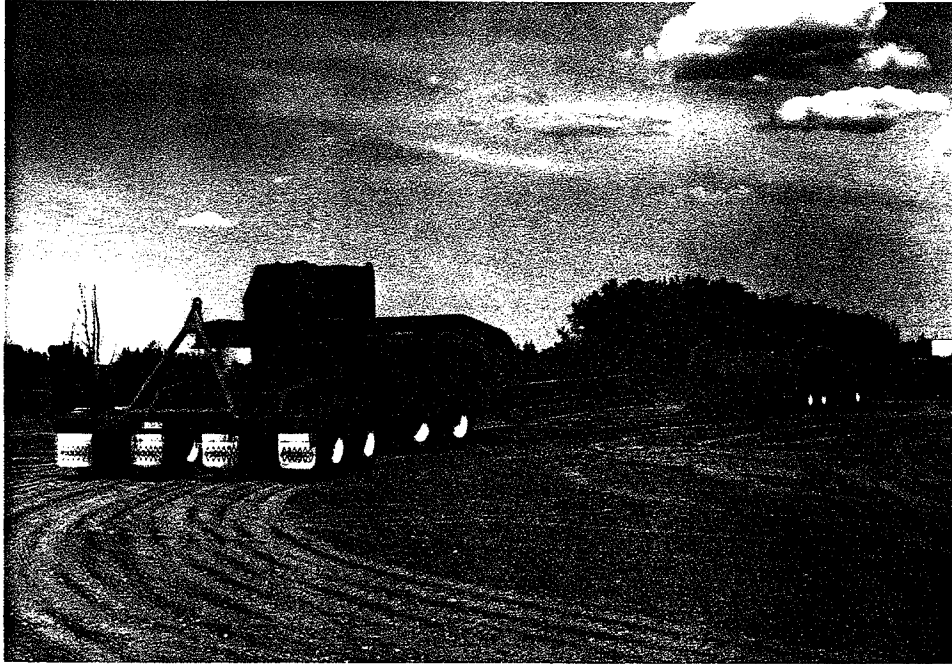


FIGURE E.4

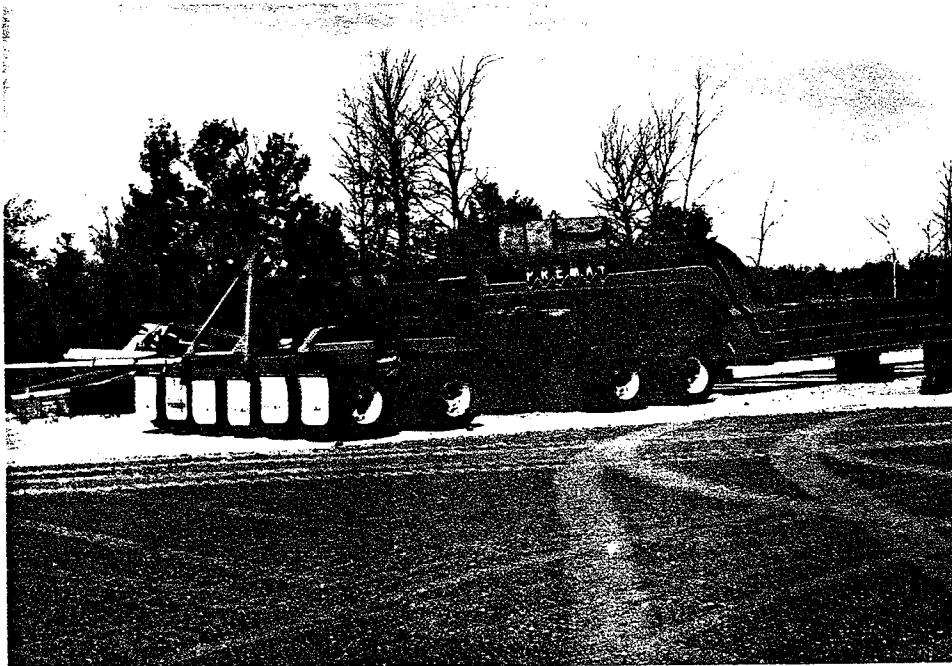


FIGURE E.5

**Glossary of Terms**  
(Taken from Nix, Clayton and Bisson, 1986)

**A-Train:** A three or four-vehicle combination consisting of a tractor, a semi-trailer, and one or two trailers. The trailers are usually attached to the lead semitrailer or trailer by means of an A-dolly converter (with a single drawbar) that has two points of articulation, one at the pintle hook and one at the dolly. The standard A-train ("doubles" or three vehicle combination) has a total of three articulation points. The special permit A-trains in some provinces ("triples") have five points of articulation.

**Axle:** A shaft and the wheels on that shaft. See also "single axle", "tandem axle".

**Axle Group:** Two or more consecutive axles. The term "axle group" may be used to refer to two or more axles connected to the same vehicle or; it may be used to refer to axles connected to different vehicles in a vehicle combination. An axle group may be a tandem axle, two single axles, a triple axle, a tandem plus single, etc.

**Axle Spacing:** See "Spacing".

**Axle Spread:** See "Spread".

**B-Train:** A Three vehicle combination consisting of a tractor and two semitrailers. The lead semitrailer has a fifth wheel permanently attached to its rear. The standard B-Train "double" has two points of articulation.

**Booster:** A rear axle or axle group which can redistribute axle loads through a hydraulic, air or mechanical mechanism.

**C-Train:** A three (sometimes four) vehicle combination consisting of a tractor, a semitrailer, and one (or two) trailers. The trailers may be either full double drawbar trailers (with self-steering front axle(s)) or more typically semitrailers converted to full trailers by means of a B-dolly converter.

**Divisible Load:** A load which can easily be divided into smaller parts.

**Dolly:** An A-dolly converter is an axle (or tandem axle) connected to a single drawbar and a fifth wheel which can be coupled with a semitrailer, thereby converting the semitrailer to a single drawbar full trailer. A B-dolly converter is an axle (or tandem axle) connected to a double drawbar and a fifth wheel which can be coupled with a semitrailer, thereby converting the semitrailer to a double drawbar full trailer.

**Double:** A truck combination with two freight-carrying bodie (platforms, tanks, etc.). "Doubles" include truck plus trailer combinations (two vehicles) as well as the standard trains (three vehicles).

**Drive Axle:** An axle that transmits tractive effort to the road surface.

**Dual-Tire:** An axle with four tires.

**Fifth Wheel:** A plate with a latching mechanism used to connect a semitrailer to a tractor or a converter dolly. The "wheel" is a (roughly) round plate, lubricated (thereby allowing articulation), with a hole allowing a kingpin to be inserted.

**Fifth Wheel Offset:** The distance from the center of the hole in a fifth wheel to the center of the axle or axle group over which the fifth wheel is positioned. If the fifth wheel is forward of the center of the axle or axle group, the fifth wheel offset is considered a negative magnitude; if to the rear, it is considered a positive magnitude.

**Indivisible Load:** A load which cannot easily be divided into smaller parts (i.e., Bulldozer, transformer, mobile home).

**Jeep:** A axle or axle group that is usually added directly behind a tractor drive tandem in order to distribute the G.V.W. over more axles.

**Kingpin:** A metal pin located on a plate mounted on the underside of the frame of a semitrailer which couples with the locking mechanism of a fifth wheel to permit towing.

**ICV:** Long Combination Vehicle. A vehicle longer than normal allowable lengths (i.e., Turnpike Doubles, Triple Trailers)

**Overhang:** The distance from the center of either the first or last axle in a vehicle or vehicle combination and the extreme front or back of the vehicle; generally referred to as either the "front overhang" or the "rear overhang".

**Primary Highway:** The major highways, usually under provincial/territorial jurisdiction (although there are some federal and local highways that qualify). For here, the major distinguishing feature of these roads is that these are almost always the "highest class" roads in terms of allowable weight and dimension regulations.

**RTAC/COMTA Study:** The major research activity of the Roads and Transportation Association of Canada and the Canadian Council of Motor Transport Administrators over the last few years into weight and dimension regulations (pavements, structures, stability, economics).

**Secondary Highway:** Those highways, other than primary highways under provincial or local government jurisdictions. For here, the major distinguishing feature of these roads is that they sometimes are subject to more restrictive weight regulations than are primary highways.

**Semitrailer:** A non-self propelled vehicle used to transport goods, supported in transit by a combination of its own axle(s) and the axle(s) of the preceding vehicle. This connection between a semitrailer and a lead vehicle (truck, tractor or another semitrailer) is made with a

kingpin (on the semitrailer) and a fifth wheel (on the lead vehicle). A semitrailer may be converted to a trailer by the use of a dolly.

**Single Axle:** An axle which is independantly connected to the body of a vehicle and which has no mechanism for equalizing loads with any other axle.

**Single-Tire Axle:** An axle with two tires.

**Spacing:** The longitudinal distance between the centres of two axles or axle groups. "Inner spacing" refers to the distance between two adjacent axles; "outer spacing" refers to the distance between non-adjacent axles (eg axles 1 and 4 where two tandem axle are involved). Note that "spacing" is not used to mean "spread".

**Spead:** The longitudinal distance between the centers of axle within an axle group (eg. a tandem axle spread or triple axle spreads). In the case of triple axles, "outer spread" means the distance between axles #1 and #3.

**Steering Axle:** An axle connected to the front of a vehicle and steered by a driver in the driver's compartment.

**Tandem Axle:** Two adjacent axles which are attached to a vehicle at a common point or which have some mechanism for approximately equalizing a load between them.

**Trailer:** A non-self propelled vehicle used to transport goods, fully supported by its own axles. The connection between a trailer and a lead vehicle (truck, tractor or semitrailer) is made with a drawbar and pintle hook(s).

**Tractor:** A self-rpelled vehicle with a fifth wheel, used primarily for the purpose of towing a semitrailer (or various combinations of semitrailers and/or trailers). Although the primary purpose of tractors is towing, they may also contain a platform or a van ("drome") which allows some freight to be carried.

**Train:** The standard train is a three vehicle combination, consisting of a tractor, a semitrailer, and either a second semitrailer or a full trailer. See "A-train", "B-train" and "C-train". In some provinces, under special permit, there are also four vehicle trains which are referred to as "triples".

**Truck:** A self-propelled vehicle with a box, tank, or platform in which or on which freight is carried, including permanently connected or mounted equipment. Trucks can be used in combination with one or more trailers (and /or semitrailers).

**Wheelbase:** On a tractor or truck, the distance from the steering axle to the drive axle or the centre of a drive-tandem axle.