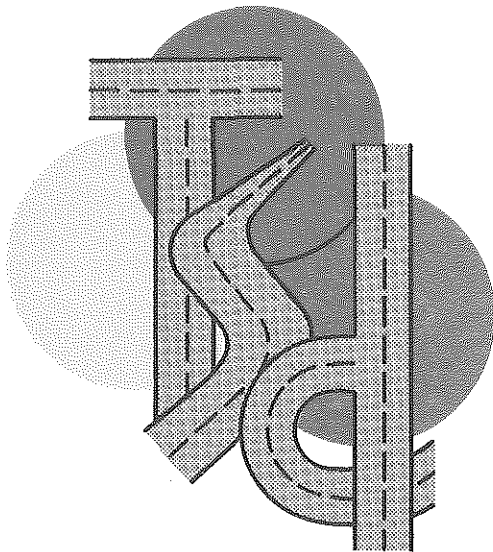


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Final Report - Operational Characteristics  
of 100-Foot Double Trailer/Tractor Combinations  
in Michigan  
TSD-279-76



**TRAFFIC and  
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OF  
STATE HIGHWAYS AND TRANSPORTATION

Final Report - Operational Characteristics  
of 100-Foot Double Trailer/Tractor Combinations  
in Michigan  
TSD-279-76

By

Engineering Standards Unit  
Traffic and Safety Division

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# Abstract

**KEY WORDS:** Turning Characteristics, Swaying, Reduction Below Minimum Speed on Grades, Axle Loading, Cost Summary.

**ABSTRACT:** Observations were made of the operational characteristics of 100-foot double trailer/tractor combinations in order to determine any necessary limitations on operation of these units on state highways. Observations indicate these longer trucks should only be allowed to operate on freeways and that truck terminals should be located adjacent to the freeway interchange.

**REFERENCE:** Engineering Standards Unit, Operational Characteristics of 100-Foot Double Trailer/Tractor Combinations in Michigan, Report TSD-279-76, Michigan Department of State Highways and Transportation, Lansing, December 1976.

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Final Report - Operational Characteristics  
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in Michigan

INTRODUCTION

House Concurrent Resolution 78 of 1975 continued the intent of House Concurrent Resolution 240 of 1972, to permit the movement of 100-foot double trailer/tractor combinations on state highways on a restricted experimental basis.



Photo 1 - Truck Tractor with two 40-foot trailers

The Department of State Highways and Transportation was charged with the responsibility of studying this operation, and this report describes the results of that study effort from June, 1975 to September, 1976.

Initially, four truck companies participated in this study: Henry Vroom & Son, Inc.; U.S. Truck Company, Inc.; Associated Truck Lines, Inc.; and Central Transport, Inc. Additionally, on November 17, 1975, a fifth company, E & L Transport, started hauling with twin automobile carriers.

During the study period, each company was allowed a maximum of two round trips per day per route during good weather and off-peak hours. However, since the majority of the trips exceeded 100 miles, sometimes inclement weather conditions occurred before arriving at the destination. This provided some opportunity to observe poor weather driving conditions. No hauls were allowed on holidays or holiday weekends. The trips were made on freeways between Detroit and the cities of Grand Rapids, Kalamazoo, Grayling, Coldwater, and Midland. After each haul a trip report was submitted to the Department listing data that included route, cargo weight, tractor make, engine horsepower rating, operational problems or accidents, and other information. In addition, a monthly report was submitted by each company detailing operational costs for the extra-length units, as well as 55- and 65-foot truck lengths. Personnel of the Department of State Highways and Transportation randomly observed movements of these units on their regular trips in order to determine their possible effect on the safety and comfort of the motoring public.

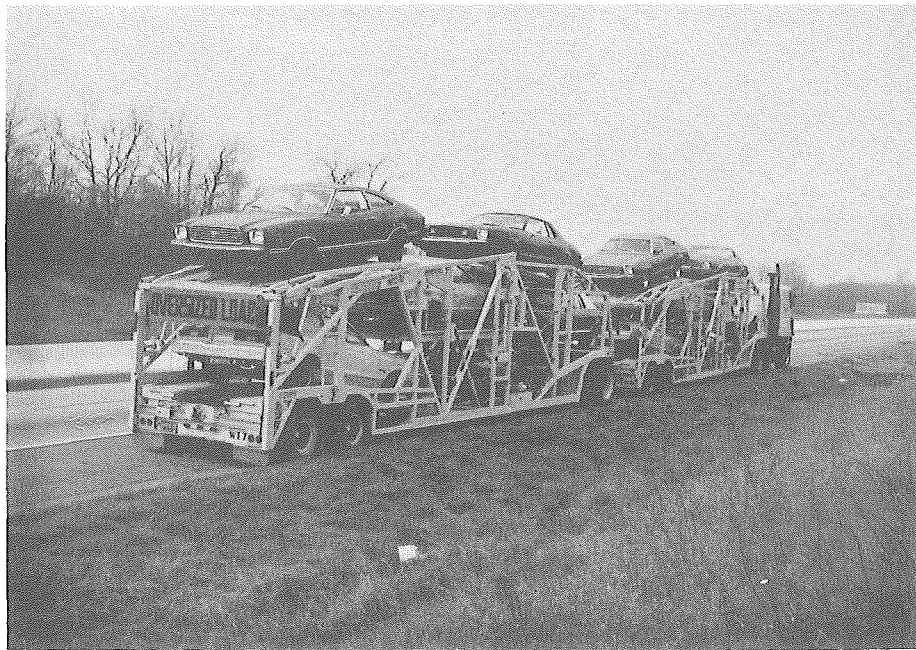


Photo 2 - 100-foot long automobile hauler

## ANALYSIS OF DATA

### 1. Turning Characteristics

The 100-foot trucks are able to negotiate ramps and loops with no apparent problem. These units remain within the 16-foot lane width on ramps and loops with very little off-tracking onto the ramp or loop shoulder. Off-tracking is the distance by which the rear wheels of a vehicle fail to follow the path of the front wheels during a turning maneuver. Occasionally, on a standard loop ramp, the right rear tires off-track onto the shoulder. This is not considered a serious problem since, for the past ten years, short-radius ramps have been constructed with full-depth, paved shoulders.



Photo 3 - 100-foot truck driving on a ramp

Observations and measurements of turning maneuvers on 2-lane, 2-way roadways indicate that the 100-foot assembly off-tracked approximately five feet greater than the semitruck with a 50-foot wheelbase (WB-50) design vehicle. This occurs when completing a 90-degree turn. The WB-50 design vehicle is used as a standard for intersection design to accommodate truck turning movements. The WB-50 turning path width is approximately 25 feet wide whereas the 100-foot truck has a turning path width of about 30 feet. This greater off-tracking makes it more difficult to negotiate a 90-degree turn. When turning onto a 2-lane, 2-way roadway, 100-foot trucks may encroach onto the opposing traffic lane or run over the curb even though the intersection meets current design standards.

The truck companies participating in this study generally have their terminals within five miles of the freeway interchange. Since Michigan has a large number of high volume intersections and because of the greater off-tracking of the longer trucks, the unlimited operation of these units on routes other than freeways is not recommended.

## 2. Traffic Conflicts

### a. Swaying

100-foot trucks have a tendency to sway when changing lanes.

It was observed that this swaying phenomenon occurred irregularly, but there was no discernible pattern as to the conditions under which it occurred most often.



Swaying was observed on straight sections and curves as well as when changing lanes. Some swaying appears to be an inherent part of the operational characteristics of double-bottom trucks made more pronounced with a longer assembly. Worn or mismatched tires, improperly balanced loads between the front and rear trailers, or even a strong crosswind have been cited as reasons causing swaying. In addition it was observed that swaying was more pronounced when the single axle converter dollie<sup>1</sup> was used and the 55 mph speed limit was violated. Swaying lasts for short intervals of several minutes over the length of a trip and is not a constantly occurring phenomenon. However, since the state trunkline system includes many miles of 10- and 11-foot lanes even these short intervals of swaying would preclude the use of longer assemblies on routes other than freeways because swaying occurring near the centerline has the potential of causing a serious accident.

---

<sup>1</sup>A converter dollie is a device equipped with a drawbar and the lower portion of a fifth wheel which permits a semitrailer and converter dollie combination to operate as a full trailer.

Referring to Section 257.721 of the Michigan Vehicle Code, it states that "Every vehicle or trailer drawn by any motor propelled vehicle must be so attached to such vehicle with such forms of coupling devices as will prevent such vehicle or trailer from being deflected more than 6 inches from the path of the towing vehicle's wheels."

To assist in stabilizing the rear trailer and to reduce swaying, the use of a tandem axle converter dollie should be standard practice.

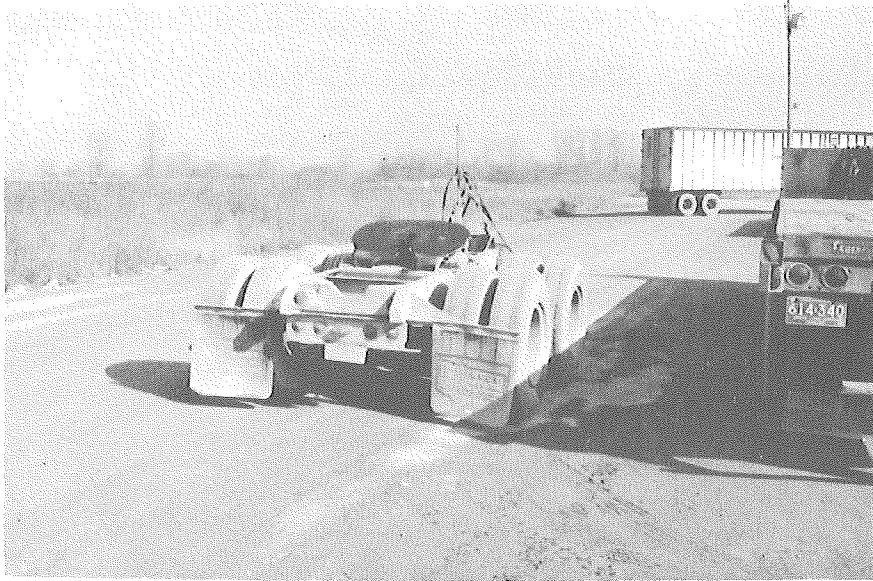


Photo 4 - Tandem Axle Converter Dollie

- b. Conflicts between a 100-foot truck and a vehicle merging onto a freeway from an entrance ramp

Although most of the hauls were made during evening or early morning hours to avoid peak-hour volumes, several instances of conflicts were observed between a vehicle merging onto the freeway from an entrance ramp and a 100-foot truck traveling on the freeway lane next to the entrance ramp. The merging vehicle had to slow down or stop until the truck passed the merge area. This disrupts the free-flow movement of traffic

onto the freeway for which the entrance ramps are designed. This type of conflict happens with all types of vehicles, but it appears more pronounced with longer trucks.

To help avoid the conflict, the driver of the 100-foot assembly should be particularly aware of vehicles on an entrance ramp that are about to merge onto the freeway. In addition, if two 100-foot trucks are dispatched at about the same time, they should not travel in close proximity to each other but should operate at least 500 feet apart as required in Section 257.643 of the Michigan Vehicle Code.



Photo 5 - An example of the merging conflict on the northbound Southfield Freeway. The auto hauler attempting to merge onto the freeway from the entrance ramp is forced onto the shoulder by 100-foot truck.

- c. Reduction below minimum speed on ascending grades and inability to accelerate to freeway speeds when merging onto freeway:



Photo 6 - Vehicle passing slow moving 100-foot truck

The inability to maintain the minimum freeway speed on ascending grades was occasionally observed. Freeways in Michigan generally have a maximum grade of 3 or 4 percent which should present no problem to trucks with adequate horsepower relative to the gross load. Section 257.719 of the Michigan Vehicle Code, states that "The total gross weight of any 65-foot combination of vehicles shall not exceed a ratio of 400 pounds per engine net horsepower delivered to clutch or its equivalent specified in the SAE test code."

Some studies have indicated that this ratio should be lower than 400; however, any ratio is difficult to enforce because a dynamometer would be required to measure the horsepower on

each individual truck. What happens then is that some of these longer trucks increase speed to 65 or 70 mph when approaching an upgrade, in order to gain enough momentum to get up the following grade without having to slow down to as low as 20 to 35 mph. Also, some of the trucks were unable to accelerate to the freeway speed at the merge point on entrance ramps which caused interruption to the free-flow movement of traffic onto the freeway.

Although there is no record of any accidents caused by slow moving, 100-foot trucks, the potential for rear-end accidents exists. For this reason, the truck companies should acquire truck tractors with adequate engine power in relation to vehicle size and loading. Increased horsepower would also provide increased acceleration capability when merging onto the freeway from an entrance ramp and on ascending grades.

d. Splash and Spray During Inclement Weather

The problem of truck-induced splash and spray is primarily related to operating speeds. Speed is the principal contributing factor to the intensity of vehicle splash and spray. Therefore, during inclement weather, 100-foot truck drivers should be particularly aware of the effect that speed has on the safety and driving comfort of passenger cars and other vehicles.

### 3. Passing Maneuver

It is more difficult to pass 100-foot trucks on 2-lane, 2-way roadways because of their additional length. The longer the vehicle to be passed, the greater the distance required to overtake and pass it; thus longer passing sight distance is necessary. Two-lane roadways with limited sight distance and no truck climbing lanes create delays to vehicles following slow-moving longer trucks. Some of the grades on 2-lane state trunklines are greater than those on freeways, thus increasing the operational problem of reduced speed on grades. Increased vehicle loading with little or no increase in the propelling force is one of the problems inherent in allowing operation of 100-foot trucks on all state trunklines.

A car passing a truck going 55 miles-per-hour is exceeding the speed limit and if the longer assembly travels at the speed limit there is no need to pass. The problem occurs on upgrades with no-passing zones when trucks experience a significant reduction in speed and there is no truck lane. This creates the potential for congestion and rear-end accidents.

Length by itself does not appear to be a problem on freeways. 100-foot trucks are usually able to maintain the speed limit of 55 mph on level sections of freeways. If a passenger vehicle chooses to obey the speed limit, there is little reason to pass. If the longer truck is traveling below the speed limit, as was observed on upgrades, there was no problem in passing the 100-foot trucks on

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the freeway. This ease of passing would not occur on a 2-lane, 2-way roadway as previously mentioned. By restricting 100-foot trucks to freeways only, this problem is avoided.

Observations did not indicate any unreasonable problems when a 100-foot long truck passed another vehicle on the freeway. A problem could occur when the long truck is completing its passing maneuver and merging back into its original lane if the driver is unable to determine when the back of his rear trailer is safely beyond the passed vehicle. The truck driver must look in his rearview mirror and determine when the back end of his rear trailer is beyond the passed vehicle. One of the drivers suggested that two lights be placed on the bottom of the back of the rear trailer, one on each side extending out three or four inches on both sides. This would give the truck driver a target or point of reference in his rearview mirror for determining when he may safely return to his original lane after passing another vehicle.



Photo 7 - 100-foot truck passing a vehicle

#### 4. Braking Characteristics

There were no observations of any situations that required emergency braking action by a 100-foot truck and there were no reported accidents caused by ineffective brakes. The driver's eye-level is higher for trucks than for passenger cars, and this provides the truck driver with greater sight distance in which to visualize an emergency situation developing, thus compensating for the longer stopping distance. A few of the trip reports sent to the Department have noted that because of slippery or icy highways, there were operational problems; however, these conditions affect all types of vehicles. Although the trucks are not supposed to operate during bad weather, snow storms can develop quickly even though the weather is good at the start of the trip. The observations during inclement weather gave no indication of braking problems specifically, possibly due to the extreme caution necessary during bad weather conditions. There have been instances of the rear trailer on other types of trucks "jackknifing" on icy roads; however, the Department has no record of this happening with the 100-foot trucks.

The Motor Carrier Safety Regulations published by the Federal Highway Administration and the Michigan Vehicle Code both contain sections on the requirements for brake equipment. The Federal Safety Standard 121 pertaining to brakes is now in effect with some modifications. All of the above are applicable to 100-foot trucks; thus no additional regulations are necessary to ensure good braking characteristics for these longer trucks.

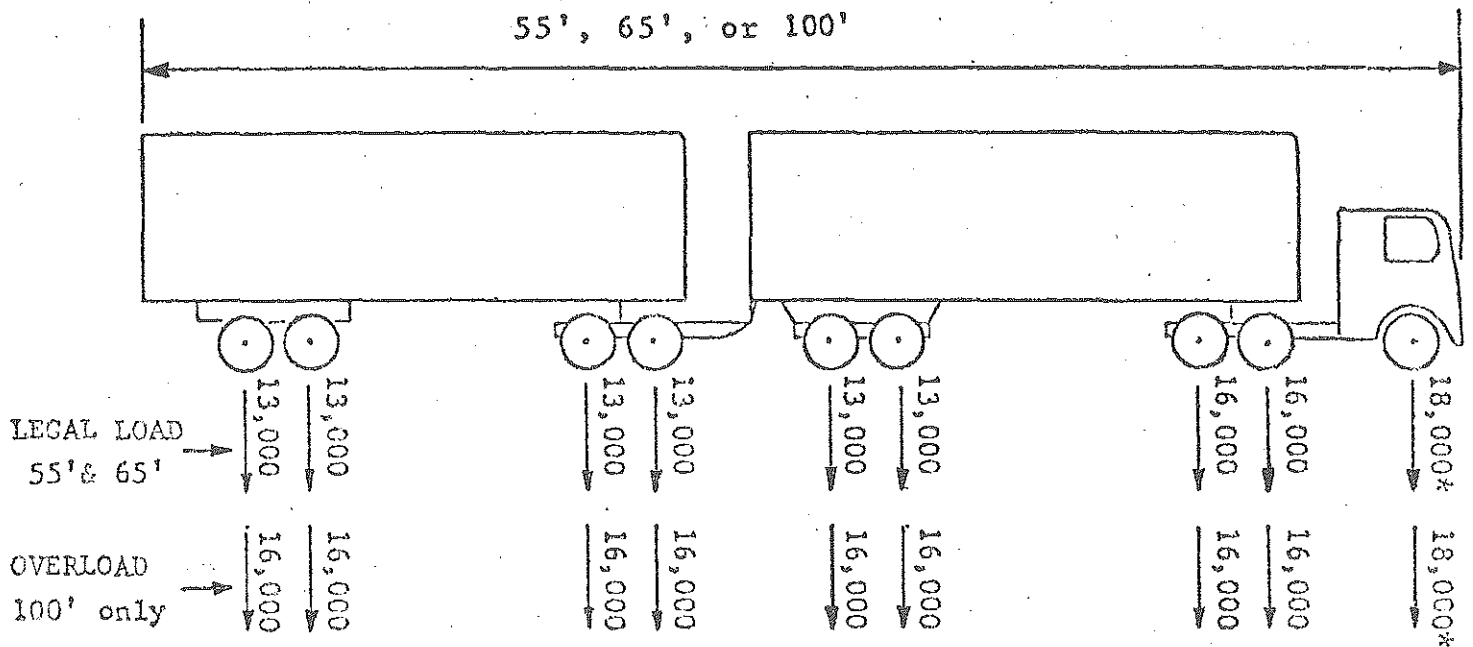


5. Environmental Impact and Noise Levels

No detailed study concerning environmental and noise problems associated with longer trucks was conducted. Section 257.707 of the Michigan Vehicle Code does have a section on excessive or unusual noise but it would appear to be difficult to enforce because there are no maximum decibel levels. Some states attempt to limit traffic noise through antinoise legislation; however this has not yet been adopted in Michigan.

6. Axle Loadings

Presently the trucks involved in the study are hauling low density, bulky commodities, such as groceries, baked goods, and light manufactured products. Because of these light loads, the truck tractor and twin trailers are utilizing eight or nine axles, as shown in Figure 1 (up to eleven axles are allowed in Michigan), and not hauling the total net weight allowed.



\* Not to exceed 700 lbs. per inch of tire width.

Figure 1 - Comparison of Legal Axle Loads and Overloading

The extended transportation permit for this 2-year study allows a maximum of 16,000 pounds loading per axle on all tandem assemblies and 18,000 pounds on the steering axle. Legal loads for 55-foot and 65-foot double-bottom trucks with up to 11 axles are 16,000 pounds per axle for one tandem assembly and 13,000 pounds on each of the axles in the remaining tandem groupings. Thus the 100-foot doubles at present can haul 3,000 pounds overweight per axle when compared with 55- and 65-foot double-bottom trucks.

Michigan is liberal regarding truck axle loadings, as compared with the Indiana Toll Road and the Ohio Turnpike Commission. The following are printed verbatim from Ohio and Indiana regulations:

(1) Ohio Turnpike Provisions

Tandem trailer combinations in excess of 65 feet in length may operate on the Ohio Turnpike under a "Tandem Trailer Permit" issued by the Commission subject to compliance by the Permittee with the following provisions:

- (a) A tandem trailer combination as hereinabove defined shall consist of a tractor, semitrailer and trailer. Neither the semitrailer nor the trailer shall be longer than 45 feet and the total length of the tandem trailer combination shall not exceed 106 feet. The number of axles of a tandem trailer combination shall be a minimum of five and a maximum of nine.

(b) The maximum gross weight for a tandem trailer combination shall not exceed 127,400 pounds. The gross load of a combination of vehicles shall not exceed the sum of the allowable gross loads on the axles, which are as follows:

Maximum gross weight on any one axle. . . . . 21,000 pounds  
Maximum combined axle load of any two successive axles, spaced four feet or less apart. . . . . 24,000 pounds  
Maximum combined axle load of any two successive axles, spaced more than four feet apart but less than eight feet apart . . . 32,000 pounds

(2) Indiana Toll Road Weights and Weight Formula

The maximum gross weight for a tandem trailer combination shall be governed by the formula - 90,000 pounds plus 1,070 pounds per foot for each foot of combination length (front bumper to end of combination) in excess of sixty (60) feet. However, any such combination of vehicles may not exceed a total maximum gross weight of 127,400 pounds.

The department is recommending that 100-foot trucks adhere to the present legal axle loadings in Michigan for the following reasons:

- a. To remain consistent with the present legal axle loadings for 55- and 65-foot truck lengths in Michigan.
- b. Since 100-foot trucks were not observed hauling loads exceeding the legal axle limit, their performance characteristics in the traffic stream can not be assessed.

c. Studies are being conducted by research organizations that will determine the effect of allowing axle loadings greater than the present legal limit on the pavement life of the freeway system. The department recommends maintaining the present axle loadings until the results of these studies are available.

These legal axle loadings would still result in a more liberal gross weight limitation than is allowed in Ohio and Indiana because eleven axles on trucks are allowed in Michigan. In addition, an annual permit will be required from the Utilities-Permits Section that will give the Department an opportunity to review applications for travel on limited-access multilane highways by 100-foot trucks and also stipulate any restrictions regarding weather conditions, type of cargo, and time periods during which no travel will be allowed.

#### 7. Driver Requirements

The drivers of 100-foot trucks have been chosen for their experience and excellent driving record. It is in the best interests of the trucking companies to continue with this policy. Any special driver qualifications applying specifically to longer trucks would seem to be extraneous considering insurance and liability questions. In addition, the Motor Carrier Safety Regulations contain several pages of qualification and disqualification of drivers. Truck companies operating between states are covered by these regulations and Michigan is in the process of adopting these regulations to take effect in 1977 for companies operating only in Michigan. The

Ohio and Indiana driver qualifications require a special driver permit and states that drivers shall possess the minimum qualifications, as required by the Interstate Commerce Commission, for drivers operating vehicles in interstate commerce. This applies in Michigan and, in addition, Ohio and Indiana state that tandem drivers must be over 26 years of age, in good health, and shall have not less than five years provable experience driving semitrailer or tandem trailer type motor vehicles. The truck companies in Michigan have been using drivers with from 15 to 30 years experience which is much more experience than the minimum qualifications in Ohio and Indiana. It is recommended that the companies continue using their drivers with the best safety record and most experience to operate 100-foot double-bottoms.

8. The location of terminals in relation to the Freeway Interchange

At this time the demand for use of 100-foot trucks appears to be between the heavily populated centers of Michigan. This has been the case during the study period with most of the trips either originating or ending in Detroit. Permits are required from the city of Detroit because some of the terminals are two or more miles from a freeway interchange and require travel on high volume city streets. This necessitates travel through heavily urbanized areas to reach the freeway. In outstate areas the truck terminals generally are located nearer the freeway interchanges. This variance of distances from a truck terminal to a freeway interchange makes it difficult to set a specific limit, beyond which 100-foot trucks

may not operate. In addition, it is not known how many truck companies would operate 100-foot trucks in the future or in what areas of Michigan. In view of the above and because of previously mentioned conflicts that would occur on free-access routes caused by a wider turning path, difficulty in passing, inability to maintain minimum speeds on steeper grades, and swaying, the truck terminals must be located adjacent to a freeway interchange.

9. Number of trips reported and accident data (including accident experience from Ohio to Indiana)

During the period covered by this report, approximately 2800 trip reports have been received with one reported accident on I-94 in Ann Arbor. This was a relatively minor accident with no injuries or fatalities. There were no citations issued, and it does not appear that this accident could be attributed to truck length. The total mileage driven by the 100-foot trucks during the study period was approximately 450,000 miles, too small a total to determine an accident rate. For comparison, data from Indiana and Ohio indicates a limited number of accidents (see Appendix 1 - pages 27 & 28).

The data for Ohio and Indiana represent toll road operation only. The Ohio Turnpike is 241 miles long with 19 interchanges and the Indiana Toll Road is 157 miles long with 13 interchanges. The toll

road length and number of interchanges are low. The toll road also has the advantage that toll collection personnel can screen drivers and equipment in addition to the policing by regular state patrolmen. Consequently, surveillance and control is more effective than if 100-foot truck travel was permitted on all freeways.

In Michigan, if 100-foot truck travel is permitted on the entire freeway system of approximately 1,100 miles and 500 interchanges, it would be difficult to provide driver and equipment screening. However, 100-foot truck travel should be limited to freeway routes-- because these generally have the best geometric features. These freeway routes would include the following at the discretion of the Utilities and Permit Section of Michigan Department of State Highways and Transportation.

I-75 from the Indiana state line to Sault Ste. Marie

I-94 from the Indiana state line to Port Huron

I-96 from Muskegon to Detroit

I-69 that is open to traffic from Indiana state line to Charlotte and further north when constructed and including the section to Port Huron

I-196 from I-94 to Grand Rapids

I-696 in the Detroit Metropolitan Area

I-275 in the Detroit Metropolitan Area (when completed)

I-475 in the Flint Metropolitan Area (when completed)

I-496 in the Lansing Metropolitan Area

I-296 in the Grand Rapids Metropolitan Area

I-675 in the Saginaw Metropolitan Area

The above include all Interstate Business Connections.

In addition, U.S. routes and M routes constructed to freeway standards as indicated on the Official Transportation Map of Michigan would be included as follows:

US-127

US-131

US-31

US-27

US-23

US-21

US-10

M-53

M-59

M-14



10. Cost summary including savings of fuel as compared with 55- and 65-foot trucks, labor, and equipment costs, etc. The following form was used by the truck companies to submit their cost data:

MONTHLY REPORTING FORM FOR  
100 FOOT LONG  
DOUBLE BOTTOM TRUCK-TRAILER  
MOVEMENT

MONTH OF \_\_\_\_\_, 197\_\_

	100 FT.	65 FT.	55 FT.	OTHER
NUMBER OF RUNS				
TOTAL TRAILER LOADS HAULED				
TOTAL NET TONS HAULED				
FUEL (GALLONS) <span style="margin-left: 2em;">DIESEL</span> <span style="margin-left: 2em;">GASOLINE</span>				
MILEAGE				
ACCIDENTS				
EQUIPMENT RENTAL AND INDIRECT COSTS				
LABOR COST				
COST/TON/MILE				

The table on page 23 is a compilation of the monthly reports submitted by each truck company. The monthly reports detail the cost per ton mile (one ton shipped one mile), diesel fuel usage, mileage, accidents, equipment rental and indirect costs (tires, fuel, insurance, licenses, and depreciation). A review of the table indicates the following highlights for 100-foot doubles:

- a. Labor costs per ton mile are reduced as much as 58 percent.

- b. The ton miles per gallon of fuel are increased as much as 34 percent.
- c. Indirect and equipment rental costs are reduced 41 percent for Truck Company 1.
- d. Total costs per ton mile show a reduction of as much as 48 percent.

In addition, there is a reduction in the number of trips and mileage.

The reduction in cost per ton mile with use of 100-foot trucks utilizing two 40-foot long trailers is substantial. The use of two trailers permits some efficiencies not possible with semitrailer units. One tractor may haul two trailers with different cargos. A double trailer can be dropped off at shipper's dock while the tractor and other trailer continue on their trip. This type of reduced cargo hauling, plus reduced labor costs, less overall fuel usage, and lowered equipment rental costs enable low density, bulky cargo to be hauled more economically than with shorter trucks.

TABLE I  
Summary of Reports by Truck Companies

TRUCKING COMPANY*	TRUCK LENGTH	NUMBER OF TRIPS	TONNAGE	MILEAGE	EQUIPMENT AND INDIRECT COSTS	LABOR COST	FUEL	TON x MILE	TOTAL COST
					TON x MILE***	TON x MILE***	(GAL)	FUEL (GAL) x TRIP	TON x MILE***
1	100'	1652	41315	244999	\$0.019	\$0.012	70075	87.4	\$0.031
	65'	703	8641	87432	\$0.029	\$0.024	18215	59.0	\$0.053
	55'	3859	43853	511896	\$0.032	\$0.024	106639	54.5	\$0.056
2	100'	173	4294	55658	\$0.009	\$0.010	13181	104.8	\$0.019
	65'	140	2030	57680	\$0.012	\$0.016	10890	76.8	\$0.028
	55'	411	5730	132342	\$0.013	\$0.024	26499	69.6	\$0.037
3	100'	731	12284	125058	\$0.008	\$0.011	35203	59.7	\$0.019
	55'	1436	13540	210643	\$0.013	\$0.019	53027	37.5	\$0.032
4	100'	26	491	17566	\$0.024	\$0.019	3003	110.5	\$0.043
**	100'	2582	58384	443281	\$0.016	\$0.011	121462	82.5	\$0.027
	65'	843	10671	145112	\$0.023	\$0.021	29105	63.1	\$0.044
	55'	5706	63123	854881	\$0.025	\$0.023	186165	50.8	\$0.048

\*This summary does not include the fifth company due to the lack of equipment and rental cost data.

\*\*Cumulative total and average of all four truck companies.

\*\*\*Ton miles is the ratio of tonnage times mileage divided by number of trips.

## Summary of Recommendations

1. 100-foot trucks can be allowed on freeways. For the following reasons, they should not be allowed on free-access routes:
  - a. They describe a wider turning path width thus encroaching on opposing traffic lanes.
  - b. The swaying that occurs during the operation of the 100-foot trucks can be detrimental to the smooth flow of traffic on free-access routes.
  - c. Two-lane, 2-way roadways with limited sight distance and no truck climbing lanes create delays to vehicles following slow moving trucks.
  - d. Passing 100-foot trucks on 2-lane, 2-way roadways would require longer passing sight distance thus creating the potential for accidents.
  - e. Truck-induced splash and spray during inclement weather can cause a severe reduction in visibility.
2. 100-foot trucks should adhere to the present legal axle loadings in Michigan of 16,000 pounds per axle for one tandem assembly and 13,000 pounds on each of the axles in the remaining tandem groupings.

3. The truck companies should use their most experienced and safety conscious drivers based on qualification requirements contained in the Motor Carrier Safety Regulations which are to be adopted by Michigan during 1977.
  
4. Truck terminals should be located adjacent to a freeway interchange on state trunklines and the truck companies must apply for an annual permit that will list restrictions regarding time of travel, type of cargo, and weather conditions under which they will not be allowed to travel.
  
5. Truck tractors should have a gross weight to horsepower ratio equal to or less than that required in Section 257.719 of the Michigan Vehicle Code in order to maintain minimum posted speeds and enable acceleration to freeway speeds at the merge area on entrance ramps.

#### Summary of Conclusions

1. The 15-month study period revealed that there was only one minor accident during approximately 450,000 miles of travel by 100-foot trucks.
  
2. The cost summary indicates the following savings for 100-foot trucks hauling the same type cargo as 55- and 65-foot trucks:
  - a. The ton miles per gallon of fuel was increased as much as 34 percent.
  
  - b. Indirect and equipment rental costs were reduced 41 percent for Truck Company 1.

c. Costs per ton mile show a reduction of as much as 48 percent.

d. There was a substantial reduction in the number of trips and mileage driven to haul an equivalent amount of cargo.

The intent of this report was to study the feasibility of the 100-foot trucks using certain selected routes within the state of Michigan. The adverse effects to the motoring public; if any, should be revealed with additional experience throughout Michigan.

APPENDIX I

Ohio and Indiana

100-Foot Truck Accident Data

INDIANA TOLL ROAD COMMISSION  
TANDEM TRAILER STATISTICS  
1960 - 1975

<u>Year</u>	<u>Trips</u>	<u>Miles</u>	<u>Tolls</u>	<u>Accidents</u>	
				<u>Total</u>	<u>Remarks</u>
1960	3,496	533,973	\$ 63,788	-0-	
1961	4,791	729,386	87,054	1	Chargeable - Driver Failure
1962	5,836	913,158	109,059	-0-	
1963	6,280	978,491	88,578	1	Chargeable - Equipment Failure
1964	6,533	1,025,681	83,316	2	1 Not Chargeable 1 Chargeable - Equipment Failure
1965	6,910	1,084,650	87,037	4	2 Not Chargeable 2 Chargeable - Driver Failure
1966	11,391	1,788,010	143,819	1	Chargeable - Equipment Failure
1967	11,018	1,728,905	138,731	2	Chargeable - Equipment Failure
1968	16,374	2,562,862	205,097	-0-	
1969	27,571	4,543,254	365,103	-0-	
1970	28,162	3,647,321	295,528	3	2 Not Chargeable (1 Fatal) 1 Chargeable - Driver Failure (Fatal)
1971	30,099	4,058,679	326,939	1	Not Chargeable - (Fatal)
1972	27,018	3,842,274	342,536	3	2 Not Chargeable 1 Chargeable - Driver Failure
1973	28,262	4,307,600	386,266	3	1 Not Chargeable 1 Chargeable - Driver Failure 1 Chargeable - Equipment Failure
1974	29,793	4,369,811	406,366	5	2 Not Chargeable 2 Chargeable - Equipment Failure 1 Chargeable - Driver Failure
1975	34,901	5,199,781	506,118	7	3 Not Chargeable 4 Chargeable - Driver Failure



OHIO TURNPIKE COMMISSION

With respect to your recent request for information regarding the Commission's safety experience with the tandem trailer combination program since the inception of the program on the Ohio Turnpike, the following summary is provided:

<u>Year</u>	<u>No. of Trips</u>	<u>No. of Miles</u>	<u>Accidents</u>
1960	3,526	676,607	None
1961	4,839	829,930	None
1962	5,039	1,067,622	None
1963	6,410	1,194,079	1
1964	6,742	1,203,589	None
1965	7,065	1,242,834	1
1966	12,895	2,197,343	7
1967	14,045	2,370,640	2
1968	16,902	2,878,226	2
1969	33,231	5,435,266	5
1970	27,542	4,346,204	2
1971	29,868	4,795,835	4
1972	30,871	5,030,305	3
1973	31,561	4,929,989	4
1974	33,101	4,965,199	2
1975(thru June)	<u>17,763</u>	<u>2,623,450</u>	<u>3</u>
Totals	<u>282,300</u>	<u>45,787,118</u>	<u>36</u>

Between January 18, 1960 (when the tandem trailer program began) and June 30, 1975, there were 36 accidents in which tandem trailer combinations operating under the program were involved. Of these, 19 were chargeable to the tandem trailer drivers. Only one of the 36 tandem trailer accidents involved a fatality.