Truck Weight Trends Related To Highway Structures

By

HENSON K. STEPHENSON
JAMES S. NOEL
and
A. DWAIN MAYFIELD

E 49-62

Bulletin No. 19

TEXAS TRANSPORTATION INSTITUTE
A. & M. College of Texas
College Station, Texas

July, 1962

Truck Weight Trends Related To Highway Structures

By

HENSON K. STEPHENSON
Research Engineer

JAMES S. NOEL
Research Assistant

and

A. DWAIN MAYFIELD
Research Assistant

Bulletin No. 19

A Publication Resulting from the
Cooperative Investigation of Bridge Types

by the

TEXAS TRANSPORTATION INSTITUTE
The A. and M. College of Texas

and the

BUREAU OF PUBLIC ROADS
United States Department of Commerce

TTI Research Project 100 July, 1962

TEXAS TRANSPORTATION INSTITUTE
A. & M. College of Texas

College Station, Texas

ACKNOWLEDGMENT

The authors wish to express their sincere appreciation to Mr. E. H. Holmes, Assistant Commissioner for Research; Mr. Harold Allen, Chief, Division of Physical Research; Mr. George S. Vincent, Chief, Bridge Research Branch; and Mr. C. F. Rogers, Special Assistant, Office of Research, Bureau of Public Roads, Washington, D. C., for their cooperation and encouragement throughout the course of the present investigation. They also wish to thank Mr. E. L. Erickson and Mr. Neil Van Eenam, Bridge Division of the Bureau, for their advice and helpful suggestions concerning the analysis of heavy vehicle loads and their effects on modern highway bridges. Further, the authors wish to thank Mr. Alexander French, Highway Research Engineer, Division of Highway Planning, for his very thorough review of the report and also for his many constructive suggestions, all of which should result in a more effective publication.

The authors are also indebted to personnel of the several state highway departments for the accurate and efficient manner in which the original loadometer data were collected and presented. It is these data that provide the basis for the present investigation.

The present investigation was conducted by staff members of the Texas Transportation Institute, and the authors would like to acknowledge the very fine work done by Mr. Thomas E. Henderson in making many of the preliminary statistical studies incident to the present investigation. They also wish to acknowledge the faithful and able assistance of M. Dean Fox, Jr., Mrs. Joanne L. Bower, Mrs. Elizabeth E. Christy, Mrs. Sue B. Green, Mrs. Frances Hinesly, Mrs. Billy McKown, Mrs. Mary Jane Priddy, Mrs. Georgia R. Salmon, Mrs. Brenda B. Sims, Miss Margaret S. Supak, and Miss Jeanne Sperry, during the present investigation and preparation of the final manuscript.

Although he was not officially connected with the investigation, the authors thank Mr. Truman R. Jones, Jr., Research Engineer, Texas Transportation Institute, for his continued interest and many helpful suggestions which have contributed toward the preparation of this report.

CONTENTS

TABLES AND ILLUSTRATIONS

Part 1
INTRODUCTION

1.1 SCOPE AND OBJECTIVES OF THE REPORT

This report presents the results of an investigation of trends in heavy truck loads on main rural roads* and certain of their effects on highway structures, based on the heavy truck and traffic data reported by the nationwide truck weight surveys during the three trend periods — 1942-43, 1948-49, and 1954. It also includes a study which undertakes to correlate the effects of certain types of legislation, governing the limitations of motor vehicle sizes and weights, with the resulting operation of heavy truck types and loadings in highway transport. Further, the report presents an approach to the very important problem of permissible vehicle weights and suggests a basic general formula for the determination of such weights which should not only tend to be in harmony with the economic principles of highway and bridge provision, but also tend to improve the pay-load opportunities for truckers through a freer choice of vehicle types for the various classes of service associated with highway transport.

The main objectives of the report are (1) to investigate trends in heavy truck operation on main rural roads, based on the frequencies of various magnitudes of axle loads and gross vehicle weights, with a view to indicating how these data may be related to certain of the problems associated with highway and bridge provision; (2) to show that the stress producing effects of heavy trucks, measured in terms of equivalent H truck loadings on various spans, not only provide an approach to problems relating to repeated stresses[9]† or fatigue, but also should furnish a basis for engineering and administrative decisions concerning design standards which otherwise would have to be based on experience and judgment alone; and (3) to investigate certain of the factors pertaining to the problem of permissible weights and develop a basic general formula that may be used for the determination of such weights.

The truck and traffic data, upon which the investigation is based, were collected during each of the three trend periods at some 500 to 600 loadometer or pitscale stations distributed somewhat uniformly among the several states. The progressive increases in both the numbers and frequencies of the heavier axle load concentrations, gross vehicle weights, and higher H-equivalencies on various spans, which have characterized heavy motor vehicle operation since the early 1940's, serve to emphasize the need for continued collection of more detailed pertinent information concerning the extent of such increases and their effects on highway structures. In response to this need, the report presents summaries and analyses derived from a vast amount of statistical data pertaining to heavy truck operation on the main rural roads of the United States. These studies should be of considerable interest to all those who are associated with highway construction or administration, with the operation or regulation of heavy motor vehicles, and with the relationship of these factors to present and future highway development.

1.2 ORGANIZATION OF THE REPORT

One of the more important considerations involved in this investigation of truck weight trends is to appraise certain of the relationships between the frequencies of various magnitudes of heavy truck loadings and the various levels of highway and bridge provision as might be indicated. For this reason, the subject of permissible vehicle weights is presented in Part II for the convenience of readers who have only a general interest in the research findings given in the body of the report. The

*For definition of main rural roads see Appendix D.

†Superscripts refer to items of corresponding number in Bibliography.

remainder of the report is organized to deal with the several subjects associated with the main objectives outlined above. Part III presents a summary and analysis of the heavy truck and traffic data reported by the truck weight surveys; it also includes a brief discussion of the trends in state legal maximum limits of motor vehicle sizes and weights and their relationships to heavy truck operation in various parts of the country. Part IV is concerned with a study of trends in single and tandem axle loads; it brings out rather clearly the effects of state legal maximum limits on the increasing frequencies of heavy axle load concentrations, particularly those in excess of the maximum recommended by AASHO policy. Other aspects of the effects of state legal limits are brought out in the comparison of eastern with western heavy truck operation given in Part V.

Although 18 different heavy truck types were reported by the truck weight surveys, it was found that the 6 major types—2D, 3, 2-S1, 2-S2, 3-S2, and 3-3—accounted for about 95 per cent of all the heavy trucks reported. The identification of these and other truck types is given in Figure 3.5 and explained in the discussion of that figure. The data reported for these vehicles provide the basis for the frequency distributions of equivalent H truck loadings discussed in Part VI. The data relating to frequencies of equivalent H truck loadings in Part VI, in turn, provide the basis for the analysis of trends in annual vehicle miles of travel at rated H-equivalencies, for main rural roads, given in Part VII. These data then lead to the discussion of permissible vehicle weights together with the suggested procedure for determining such vehicle weights presented in Part II.

This bulletin is the latest in a series of publications dealing with the stress producing characteristics of heavy truck or heavy freight vehicle loads and certain of their effects on bridges and other highway structures. For those who would like to have more information on equivalent H truck loadings, traffic and travel trends, and related subjects, a selected list of publications is given in the bibliography.

For definitions of terms see appendix D.

Part II

PERMISSIBLE VEHICLE WEIGHTS

2.1 BACKGROUND

For many years, problems relating to permissible vehicle weights have occupied the most serious and thoughtful attention of those associated with the design, construction, maintenance, use, or administration of modern highway facilities. More specifically, though, the matter of permissible vehicle weights has been and continues to be of major concern to those responsible for establishing the various levels of highway and bridge provision such that they will be commensurate with the magnitudes and frequencies of axle load concentrations, axle-group loads, and maximum gross vehicle weights expected during the useful life of a given facility.

Engineers are agreed that the cost of highway provision increases with each increase in maximum permissible axle loads and also with the anticipated frequencies of various intensities of such loads which are equal to or in excess of the permissible maximum. Likewise, they agree that the cost of bridge provision increases with each increase in permissible axle-group loads or gross vehicle weights and also with the anticipated frequencies of such loads which produce varying degrees of stress in excess of those provided for in the design. These facts together with the enormous increases in the frequencies of the heavier gross vehicle weights and higher H-equivalencies (see Tables 7.1 and 7.3) serve to emphasize the need for realistic and acceptable procedures for the determination and regulation of permissible vehicle weights. The immediate need, therefore, is for a general formula which (1) can be adjusted to fit any desired level of heavy vehicle operation; (2) will permit relatively heavy axle-group loads; (3) will encourage the use of multiple-axle vehicles; and (4) will not only be in harmony with the economic principles of highway and bridge provision, but will also improve the pay-load opportunities for truckers through a freer choice of vehicle types.

For a formula to accomplish all of these objectives, it must not only take into account the over-all wheelbase length of a vehicle but also the number of axles and the spacing of axle group loads. A perfectly general formula (the same as Equation 2.1, also discussed in Part V) that will meet these requirements may be written as follows:

$$W = A[f(NL) + BN + C] \qquad \text{Equation 2.1}$$

in which:
- W = maximum load in pounds carried on any group of two or more consecutive axles.
- L = distance in feet between the extremes of any group of two or more consecutive axles.
- N = number of axles in group under consideration.
- A, B, & C are constants which depend upon quality of highway and bridge provision and desired level of heavy vehicle operation.
- f = some function involving "N" and "L".

A number of variations of this formula have been investigated; and the one that appears to be best suited for determining and regulating permissible vehicle weights, consistent with both heavy vehicle operation and present day highway provision, is discussed in the following section.

2.2 SUGGESTED FORMULA FOR DETERMINING PERMISSIBLE VEHICLE WEIGHTS

A particular form of Equation 2.1 has been thoroughly investigated (also discussed in Section 5.5) and is suggested here in the hope that it will

be of some assistance to those who are concerned with the establishment of realistic criteria for determining and regulating permissible vehicle weights. If single axle loads are limited to 18,000 pounds, as recommended by 1946 AASHO policy, a formula, with certain limitations which will be explained presently, results in permissible axle-group loads and gross vehicle weights that are believed to be consistent with the highway and bridge provision that presently characterize the main rural roads in the United States. Except for the modifications which are explained in connection with the schedule of permissible axle-group loads given in Table 2.1 and Figure 2.1, this formula is as follows:

$$W = 500\left(\frac{N\,L}{N-1} + 12N + 32\right),$$

Modified Equation 2.2

This proposed truck weight formula (Equation 2.2) is such that the maximum stresses produced in bridges of H15 design would not exceed 125 percent of the basic design stress and the overstress in H20-S16 bridges would be negligible or not to exceed four or five percent.

Here it will be seen that the permissible axle group load or gross vehicle weight, W, not only varies with the wheel base or the distance between the extremes of any group of axles, L, but also varies with the number of axles, N, within the distance, L, under consideration.

The modifications of Equation 2.2 consist of: (1) limiting the maximum load on any single axle to 18,000 pounds; and (2) the axle-group loads for wheelbase lengths less than 14 ft., 34 ft., and 55 ft., for number of axles N = 3, 4, and 5, respectively, are not permissible for bridges of H15 design in order to avoid any undue overstress in such bridges. In any vehicle, the groups of axles from Axle 2 to and including the last axle of the vehicle govern the allowable vehicle weights. The load on Axle 1 generally does not exceed 8,000 pounds. Thus, in a 5-axle vehicle, if all the various 2-axle, 3-axle, and 4-axle groups in Axles 2 to 5 inclusive meet the requirements of the formula, Axles 2 to 5 inclusive may weigh 72,000 pounds on a wheelbase of 48 feet, and the entire vehicles including Axles 1 to 5 inclusive may weigh 80,000 pounds on a wheelbase of not less than 55 feet. All axle-group loads shown in Table 2.1, however, are permissible for bridges having design ratings in excess of H15 design.

If practical vehicle combinations consisting of no more than two units are considered and the number of axles, N, from 2 to 6, respectively, is substituted in Equation 2.2, the resulting specific formulas are as follows:

N = 2	W = 1000 (1.00 L + 28)	2.2a
N = 3	W = 1000 (.750 L + 34)	2.2b
N = 4	W = 1000 (.667 L + 40)	2.2c
N = 5	W = 1000 (.625 L + 46)	2.2d
N = 6	W = 1000 (.600 L + 52)	2.2e
N = 7	W = 1000 (.58334L + 58)	2.2f
N = 8	W = 1000 (.57124L + 64)	2.2g
N = 9	W = 1000 (.56250L + 70)	2.2h

The maximum permissible axle-group loads or gross vehicle weights indicated by these specific formulas result in the table of weights given in Table 2.1. For visual comparison, these same permissible weights are shown graphically in Figure 2.1.

Figure 2.1 shows rather clearly how the suggested formula encourages the use of multiple axle vehicles by providing increased pay-load opportunities through the use of larger numbers of axles. The typical practical maximum vehicles that would be permitted by the weights given in Table 2.1 and Figure 2.1 are shown in Figure 2.2. In the summary of vehicle data given at the bottom of Figure 2.2, it is interesting to note that the pay-load for each of the typical maximum vehicles amounts to approximately 60 per cent of the gross vehicle weight.

The suggested liberalization of certain of the permissible axle-group loads, as indicated by Table 2.1 and Figure 2.1, should encourage the operation of a wide range of practical vehicles and combinations. The use of a wide range of such vehicles can realize the vehicular economy of increased gross weight, but only by means of improved load distributions that will be beneficial to both high-

TABLE 2.1

PERMISSIBLE AXLE GROUP LOADS IN POUNDS BY FORMULA $W = 500(\frac{N}{N-1}\frac{L}{} + 12N + 32)$, MODIFIED

Wh. Base	Number of Axles—N							
L-Feet	2	3	4	5	6	7	8	9
4	32,000							
5	33,000							
6	34,000							
7	35,000							
8	36,000	40,000						
9		40,750						
10		41,500						
11		42,250						
12		43,000	48,000					
13		43,750	48,670					
14		44,500	49,330					
15		45,250	50,000					
16		46,000	50,670	56,000				
17		46,750	51,330	56,630				
18		47,500	52,000	57,250				
19		48,250	52,670	57,880				
20		49,000	53,330	58,500	64,000			
21		49,750	54,000	59,130	64,600			
22		50,500	54,670	59,750	65,200			
23		51,250	55,330	60,380	65,800			
24		52,000	56,000	61,000	66,400	72,000		
25		52,750	56,670	61,630	67,000	72,580		
26		53,500	57,330	62,250	67,600	73,170		
27		54,000	58,000	62,880	68,200	73,750		
28			58,670	63,500	68,800	74,330	80,000	
29			59,330	64,130	69,400	74,920	80,570	
30			60,000	64,750	70,000	75,500	81,140	
31			60,670	65,380	70,600	76,080	81,710	
32			61,330	66,000	71,200	76,670	82,290	88,000
33			62,000	66,630	71,800	77,250	82,860	88,560
34			62,670	67,250	72,400	77,830	83,430	89,130
35			63,330	67,880	73,000	78,420	84,000	89,690
36			64,000	68,500	73,600	79,000	84,570	90,250
37			64,670	69,130	74,200	79,580	85,140	90,810
38			65,330	69,750	74,800	80,170	85,710	91,380
39			66,000	70,380	75,400	80,750	86,290	91,940
40			66,670	71,000	76,000	81,330	86,860	92,500
41			67,330	71,630	76,600	81,920	87,430	93,060
42			68,000	72,250	77,200	82,500	88,000	93,630
43			68,670	72,880	77,800	83,080	88,570	94,190
44			69,330	73,500	78,400	83,670	89,140	94,750
45			70,000	74,130	79,000	84,250	89,710	95,310
46			70,670	74,750	79,600	84,830	90,290	95,880
47			71,330	75,380	80,200	85,420	90,880	96,440
48			72,000	76,000	80,800	86,000	91,430	97,000
49				76,630	81,400	86,580	92,010	97,560
50				77,250	82,000	87,270	92,570	98,130
51				77,880	82,600	87,750	93,140	98,690
52				78,500	83,200	88,330	93,710	99,250
53				79,130	83,800	88,920	94,290	99,810
54				79,750	84,400	89,500	94,860	100,380
55				80,380	85,000	90,080	95,430	100,940
56				81,000	85,600	90,670	96,000	101,500
57				81,630	86,200	91,250	96,570	102,060
58				82,250	86,800	91,830	97,140	102,630
59				82,880	87,400	92,420	97,710	103,190
60				83,500	88,000	93,000	98,290	103,750

Note: Axle-group loads for wheelbase lengths above the horizontal dashed lines are not permissible for bridges of H15 design. All tabulated axle-group loads are permissible for bridges having design ratings in excess of H15 design.

36,000 lb. maximum irrespective of wheelbase length.

54,000 lb. maximum irrespective of wheelbase length.

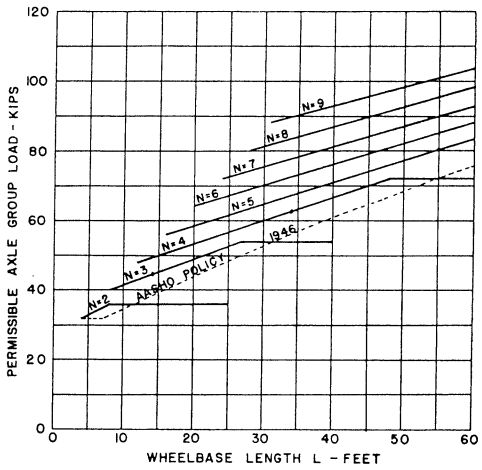
72,000 lb. maximum irrespective of wheelbase length.

ways and bridges. Operation of vehicles with longer wheelbases and increased numbers of axles would be encouraged by allowance of progressive increases in pay-load (see table at bottom of Figure 2.2) with each additional axle and with each increase in axle spacing. The incentive provided to extend the operation of multiple-axle combinations should be expected to reverse the tendency toward the operation of shorter combinations of fewer axles with gross vehicle weights which are associated with axle-load concentrations far in excess of those recommended by AASHO policy. This suggested liberalization of axle-group loads also should ultimately reduce the pressure for increased axle-loads that would be detrimental to road structures.

The gross vehicle weights that would be permitted by the suggested formula are substantially in line with those now permitted in the western states. They are somewhat in excess of the maximums now generally permitted in eastern operation where the number of vehicle types is restricted both by shorter lengths and fixed gross weight limits independent of axle spacing. It is the inability under existing laws to operate the multiple-axle vehicles of longer wheelbase in the eastern states which emphasizes the demand for increased

Figure 2.1. Permissible axle group loads by formula:

$$W = 500\left(\frac{NL}{N-1} + 12N + 32\right), \text{ Modified.}$$



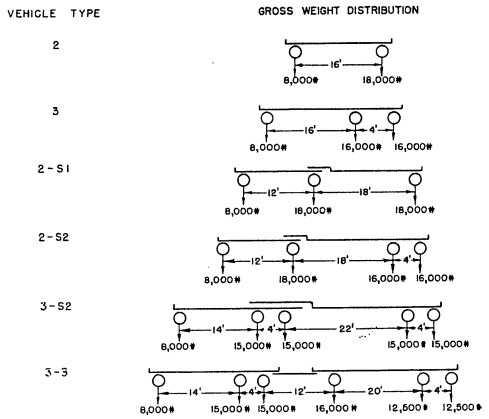
Note: Axle-group loads for wheelbase lengths less than 14 ft., 34 ft., and 55 ft. for number of axles N = 3, 4, and 5, respectively are not permissible for bridges of H15 design. All axle-group loads shown, however, are permissible for bridges having design ratings in excess of H15 design.

gross weight on the shorter combinations which can be carried only with increased axle-load concentrations.

The stresses produced by the six typical maximum vehicles, shown in Figure 2.2, in simple span bridges of H15-44 design (further explanation given below) have been thoroughly investigated. In all cases of loading on all span lengths, it was found that these stresses were well within those permitted by the overload provision (further explanation below) of AASHO standard design specifications. In fact, if these vehicles are investigated one at a time and identical vehicles are placed in each lane simultaneously, it will be found that the type 3-3 combination with full allowance for impact will produce the greatest stress on a 60-foot span. For this loading, the maximum stress in a 60-foot span of H15-44 design, consisting of concrete deck and steel stringers, would exceed the basic allowable stress by no more than about 23 per cent. Moreover, if only one of these type 3-3 combinations were on this 60-foot span at one time, the maximum stress, including full allowance for impact, would exceed the basic allowable stress by no more than about

Figure 2.2 Typical maximum vehicles permitted by table of weights based on suggested formula:

$$W = 500\left(\frac{NL}{N-1} + 12N + 32\right), \text{ Modified}$$



SUMMARY

Vehicle type	Over-all length, feet	Wheelbase, feet	G.V.W., pounds
2	22	16	26,000
3	26	20	40,000
2-S1	38	30	44,000
2-S2	44	34	58,000
3-S2	50	44	68,000
3-3	60	54	79,000

Vehicle type	Empty Weight, pounds	Payload pounds	Ratio of payload to G.V.W.
2	11,000	15,000	.578
3	16,000	24,000	.600
2-S1	18,000	26,000	.591
2-S2	23,000	35,000	.604
3-S2	28,000	40,000	.588
3-3	33,000	46,000	.582

5 per cent. The weights, indicated by Table 2.1 and Figure 2.1, corresponding with the shortest possible wheelbase for the several numbered groups of axles, do not represent practical vehicles. However, the stresses produced by these loadings on bridges of H15-44 design were also investigated, and in all cases it was found that they were well within those permitted by the overload provision of AASHO standard design specifications. If found desirable, any possible resort to these unusual loadings could be avoided, however, simply by stipulating the minimum allowable distance, L, within which N axles might be placed.

The above evidence seems to indicate that a formula of the type suggested by Equation 2.2 can be adjusted to provide a satisfactory means of determining permissible vehicle weights such that they will not be damaging to existing highway fa-

cilities and at the same time provide increased pay-load opportunities for truckers through a freer choice of heavy freight vehicle types.

Explanatory Comments:

For those who may wish to review the procedures developed for estimating the degree of overstress produced in simple span bridges by various heavy truck types and loadings, the three publications identified as items 4, 8, and 9 in the bibliography are suggested.

Bridges of H15-44 design: Prior to the publication of the 1944 AASHO design specifications, the standard design loadings had been somewhat revised from time to time. For this reason, reference to a particular design loading — such as an H15 design loading, for example — was not sufficiently precise to completely define the design loading used in a given case. These design loadings were standardized before 1944, but the AASHO decided to add the suffix "44" to the loading designations to indicate the standard design loadings defined in the 1944 AASHO specifications.

Bridge provision prior to early 1940's: Until some 15 to 20 years ago most of the bridges on main rural roads were built to standards comparable with the AASHO standard H15 design. Most of these older bridges are still in service. Consequently, the formula suggested (Equation 2.2) for the determination and regulation of permissible vehicle weights on the present main rural roads of the nation was so developed that the resulting permissible weights would not cause any undue overstress in these bridges of H15 or H15-44 design.

Overload provision of AASHO specifications: The overload provision for highway bridges is given in section 1.2.4 of the 1957 AASHO design specifications as follows:

> The following provision for overload shall apply to all loadings except the H20 and H20-S16 loadings.
>
> Provision for infrequent heavy loads shall be made by applying in any single lane an H or H-S truck as specified, increased 100 per cent, and without concurrent loading of any other lanes. Combined dead, live, and impact stresses resulting from such loading shall not be greater than 150 per cent of the allowable stresses prescribed herein. The overload shall apply to all parts of the structure affected except floor slabs.

Part III
HEAVY TRUCK LOADS

3.1 GENERAL

Comprehensive truck weight and traffic surveys on the main rural roads of the United States were first conducted between 1936 and 1940 and have been continued on an annual basis since 1942 by most of the states in cooperation with the Bureau of Public Roads. These annual truck weight surveys have been carefully planned and represent a most extensive investigation of highway traffic and heavy motor vehicle operation on main rural roads. The surveys are conducted by the states during the summer months of each year in order to provide a continuing accumulation of consistent and comparable data for the study of trends in highway traffic. Among other things, these data make possible the study of significant changes in the average volumes and compositions of traffic and the study of the types, dimensions, and frequencies of various intensities of heavy truck loads. They also furnish appropriate information for appraising the effects of divergent types of legislative regulations on the operation of heavy motor vehicles in the several geographical regions of the United States. Many of the findings resulting from analyses of the data reported by these annual truck weight surveys have been presented from time to time in **Public Roads,** a publication of the Bureau of Public Roads (see bibliography).

Early in the present investigation of trends in heavy truck loads, it was decided that changes from one year to the next would not be of sufficient magnitude to justify making a detailed study of the loadometer data reported for each and every year. The question then arose as to how many points in time would be required to evaluate such trends properly. After considering all the elements of this problem, it was decided that three points in time would be adequate for the study of the various trends associated with heavy motor vehicle operation on the main rural roads of the United States. In order to make these three points in time as meaningful as possible, it was decided to consider the combined data for 1942 and 1943 as representative of one point in time which is referred to as trend period 1942-43; similarly, the combined data for 1948 and 1949 are considered as representative of the second point in time and are referred to as trend period 1948-49. The loadometer data for 1954 are not combined with those for any other year, so the third point in time is referred to as trend period 1954.

By way of indicating the magnitude or scale on which these annual truck weight surveys are conducted, a few of the more significant items might be mentioned. For example, over 500 loadometer stations, distributed somewhat uniformly among the several states, have been operated each year since 1942. This means that these stations have been operated a total of some 4000 hours or more each year, during which time hundreds of thousands of vehicles were counted and many thousands of trucks and combinations were weighed, measured, and reported.

The traffic data reported for the five-year period covered by the present investigation of trends in heavy truck loads include a total of over 5,200,000 vehicles counted during a total of about 25,000 hours of loadometer station operation. In this total traffic there were well over one million freight vehicles, of which nearly half, both loaded and empty, were weighed and reported; and of those weighed, some 55,000 were heavy enough to be classified as heavy trucks. It is the sizes, weights, and frequencies of these 50,000-odd heavy trucks that provide the basic data for much of the investigation of trends in heavy truck loads and certain of their effects on highway structures presented in this report.

The several loadometer stations in each state were located so that the

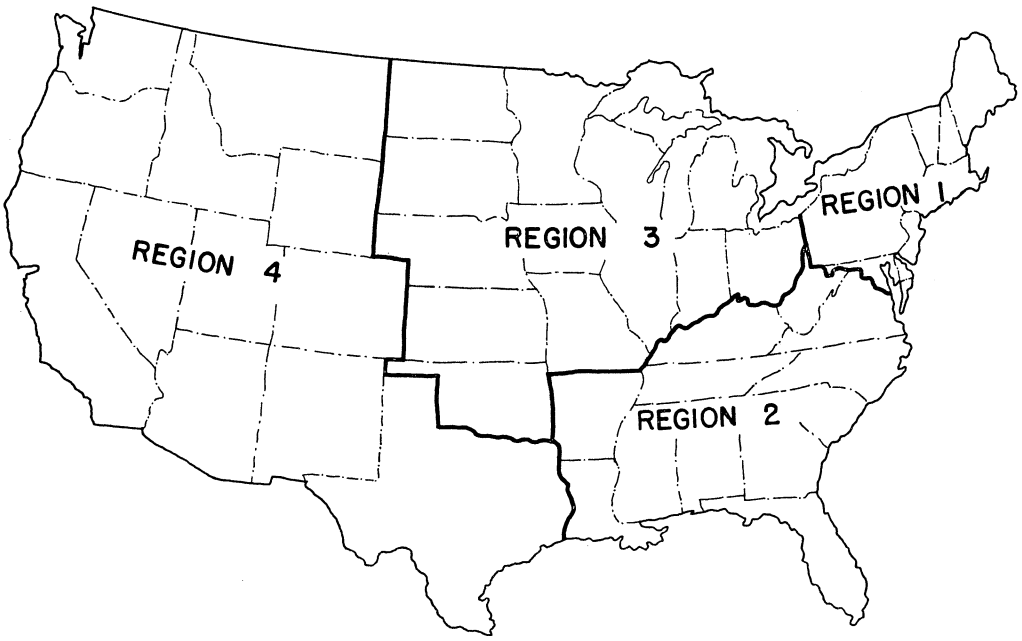


Figure 3.1. Map of United States showing the four regions of the AASHO.

data collected would be representative of the trends in traffic and heavy motor vehicle operation which obtain for main rural roads. In general, each of these stations was operated continuously for eight hours during one of the daylight periods, i.e., from 6:00 a.m. to 2:00 p.m. or from 2:00 p.m. to 10:00 p.m. During the time that such a station is in operation, all vehicles are counted and visually classified as automobiles, busses, trucks, or truck combinations of various kinds. In addition to other traffic and vehicle operating data, representative samples of each type of truck and truck combination, both loaded and empty, are weighed, measured, and reported on special forms prepared for the purpose. When a vehicle is weighed and measured, the gross weight on each axle is recorded and these weights are added to obtain the gross vehicle weight; similarly, the axle spacings and over-all wheel base lengths are measured and recorded. These axle loads, gross vehicle weights, axle spacings, and wheel base lengths are reported somewhat as shown in Table 3.5, which will be discussed later in more detail.

In general, the results of the present investigation are given in the form of weighted averages for each of the four regions of the American Association of State Highway Officials — referred to simply as AASHO regions — and for the United States as a whole. In a former study of the 1942 loadometer data, published by

TABLE 3.1
STATES INCLUDED WITHIN EACH REGION OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

Region 1	Region 2	Region 3	Region 4
Connecticut	Alabama	Illinois	Arizona
Delaware	Arkansas	Indiana	California
Maine	Florida	Iowa	Colorado
Maryland	Georgia	Kansas	Idaho
Massachusetts	Kentucky	Michigan	Montana
New Hampshire	Louisiana	Minnesota	Nevada
New Jersey	Mississippi	Missouri	New Mexico
New York	North Carolina	Nebraska	Oregon
Pennsylvania	South Carolina	North Dakota	Texas
Rhode Island	Tennessee	Ohio	Utah
Vermont	Virginia	Oklahoma	Washington
	West Virginia	South Dakota	Wyoming
		Wisconsin	

the Texas Engineering Experiment Station, the states were grouped for comparative purposes into geographical areas corresponding with each of the nine census regions.[5] Since that time, though, it has been found that regrouping the states into a smaller number of geographical areas selected on a basis of regulatory similarities and relative uniformity of heavy motor vehicle operation would not only yield larger sample sizes but would also provide a more logical basis for statistical comparisons. It was for these reasons that the geographical areas corresponding with the four AASHO regions were selected for special study and for regional comparisons. Figure 3.1 is a map of the United States that shows the four regions of the AASHO. The names of the states included in each of the four AASHO regions are given in Table 3.1.

3.2 HEAVY TRUCKS DEFINED

Heavy trucks reported by the truck weight surveys prior to 1946 were defined as all single unit trucks weighing 26,000 pounds or more and all combination vehicles weighing 34,000 pounds or more. In 1948, however, the definition was changed. For 1948 and succeeding truck weight surveys heavy trucks were defined as those weighing 26,000 pounds or more, or those having at least one axle weighing 18,000 pounds or more. From this it will be seen that the heavy truck data for 1948-49 and 1954 included combination vehicles weighing between 26,000 and 34,000 pounds, whereas similar combination vehicles within that range were not reported in the heavy truck data for 1942-43. Similarly, the heavy truck data for 1948-49 and 1954 included any vehicle weighing less than 26,000 pounds provided one of its axles weighed 18,000 pounds or more, whereas the heavy truck data for 1942-43 did not include any vehicle weighing less than 26,000 pounds even though it might have had an axle weighing more than 18,000 pounds.

Because the heavy truck data for 1948-49 and 1954 included vehicles of certain weights which would not qualify as heavy vehicles according to the earlier definition and, therefore, were not included in the 1942-43 data, it was necessary to compile the heavy truck data for each of the three trend periods on a uniform basis to obtain valid comparisons and influences. For purposes of the present investigation, this was done simply by classifying the heavy trucks for each of the three trend periods in accord with the first definition, i.e., all single unit trucks weighing 26,000 pounds or more and all other combination vehicles weighing 34,000 pounds or more. This procedure resulted in the elimination of a few of the lower weight trucks and combinations whose inclusion or omission would have little if any effect on trends in heavy motor vehicle operation revealed by the present investigation. The stress producing effects of the lower weight vehicles on highway structures would not be of serious consequence in any case.

3.3 TRENDS IN MOTOR VEHICLE REGISTRATION

The introduction of motor vehicles in the early 1900's marks the beginning of a new era in transportation in the United States. From a very modest beginning at the turn of the century, the use of motor vehicles has shown rapid increases over the years and still continues to increase with no sign of slackening. This is

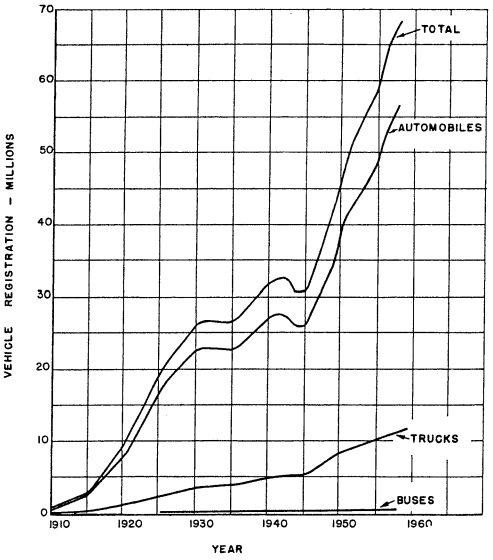


Figure 3.2 Motor vehicle registration in the United States, 1910-1958. Source: Bureau of Public Roads, Highway Statistics to 1955, Table MV-201; also Highway Statistics; 1956, Table MV-1, 1957, Table MV-1, 1958, Table MV-1.

illustrated by Table 3.2, which gives the number of motor vehicles registered in the United States from 1920 through 1958, shown separately for automobiles, buses, and trucks. Similar data for the period from 1910 through 1958 are presented graphically for visual comparison in Figure 3.2. It is striking that both the number of automobiles and total vehicle registrations more than doubled from 1945 to 1958; during this 13-year period the number of automobiles increased from about 26 million to approximately 57 million, and total vehicle registrations increased from 31 million to just over 68 million.

Since this investigation is mainly concerned with trends in heavy truck loads, a closer look at the truck registrations is in order. In Table 3.2 it will be seen that truck registrations have increased from just over 1.1 million in 1920 to a little over 11.0 million in 1958, an increase of about 900 per cent. This compares with an approximate increase of 700 per cent in automobile registrations during the same period. It is of particular interest to note that the percentage of trucks, with respect to all vehicle registrations, increased steadily from 12.0 per cent in 1920 to 18.3 per cent in 1948. After that time, though, the percentage of trucks gradually decreased until they accounted for only 16.3 per cent of the total registration in 1958. The actual number of truck registrations, however, increased during this time from 7.5 million in 1948 to 11.2 million in 1958—an increase in truck numbers of about 50 per cent. Inasmuch as a few of the larger trucks may be registered in two or more states, the actual number of trucks in the United States for a given year is undoubtedly a little smaller than the number indicated by the total registrations. Although precise data are not available, it is believed that multiple registrations represent an extremely small number as compared with total truck registrations. With such increases in the number of truck registrations, the phenomenal increases in the frequencies of heavy truck loads during the years covered by this investigation are in no sense surprising.

3.4 TRENDS IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS

For some years past, the Bureau of Public Roads has made a detailed compilation of pertinent data on state legal maximum limits of motor vehicle sizes and weights, which are compared with AASHO 1946 policy. These data have been presented from time to time in **Public Roads,** which is a publication of the Bureau of Public Roads (see bibliography). Typical of these is the table of state legal maximum limits of motor vehicle sizes and weights given on pages 256-257 of **Public Roads,** December 1957.[21] From these and related data, the Bureau has computed the averages of such legal maximum limits,

TABLE 3.2
MOTOR VEHICLE REGISTRATION IN THE UNITED STATES[1]

Year	Automobiles	Buses	Trucks		Total
			Number	Per cent	
1920	8,131,522	[2]	1,107,639	12.0	9,239,161
1925	17,481,001	17,808	2,569,734	12.8	20,068,543
1930	23,034,753	40,507	3,674,593	13.7	26,749,853
1935	22,567,827	58,994	3,919,305	14.8	26,546,126
1940	27,465,826	101,145	4,886,262	15.1	32,453,233
1941	29,624,269	119,753	5,150,112	14.8	34,894,134
1942	27,972,837	135,957	4,894,862	14.8	33,003,656
1943	26,009,073	152,324	4,726,737	15.3	30,888,134
1944	25,566,464	152,592	4,760,250	15.6	30,479,306
1945	25,793,493	162,125	5,079,802	16.4	31,035,420
1946	28,213,336	173,585	5,986,081	17.4	34,373,002
1947	30,845,350	187,457	6,808,691	18.0	37,841,498
1948	33,350,894	196,726	7,537,911	18.3	41,085,531
1949	36,453,351	208,929	8,028,016	18.0	44,690,296
1950	40,333,591	223,652	8,604,448	17.5	49,161,691
1951	42,682,591	230,461	9,000,913	17.3	51,913,965
1952	43,817,580	240,485	9,207,341	17.3	53,265,406
1953	46,422,443	244,251	9,554,395	17.0	56,221,089
1954	48,461,219	248,346	9,800,688	16.8	58,510,253
1955	52,135,583	255,249	10,302,987	16.5	62,693,819
1956	54,200,784	258,764	10,694,262	16.4	65,153,810
1957	55,906,195	264,062	10,960.814	16.3	67,131,071
1958	56,870,684	270,163	11,158,561	16.3	68,299,408

[1]Source: U.S. Bureau of Public Roads.
[2]Registration of buses not recorded separately.

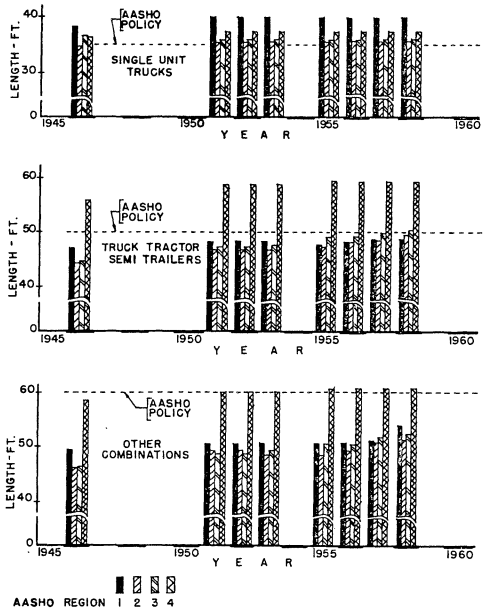


Figure 3.3 Regional legal maximum vehicle lengths compared with AASHO 1946 policy recommendations.

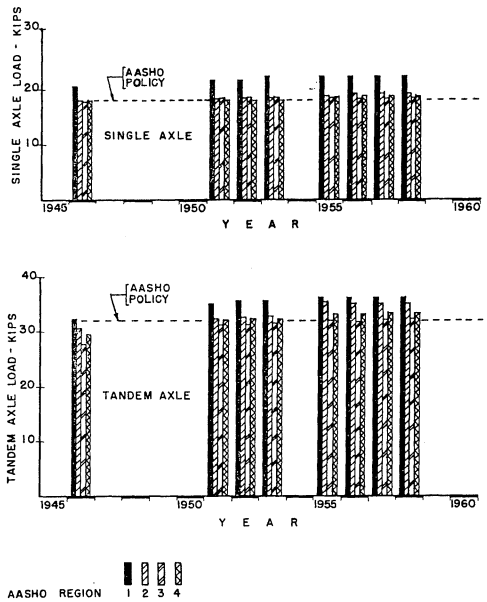


Figure 3.4. Regional legal maximum axle loads compared with AASHO 1946 policy recommendations.

from 1946 through July 1, 1958, for each of the AASHO regions and the United States. It is these data that provide the means for a study of trends in legal maximum limits of motor vehicle sizes and weights on a regional and national basis, and that show how these averages compare with AASHO 1946 policy.

A complete set of tables covering trends in legal maximum limits of motor vehicle sizes and weights, by years, by AASHO regions, and for the United States is given in Appendix A for convenient reference. These tables give the average permitted width and height of vehicles; the average permitted length of buses, single unit trucks, truck tractor semitrailers, and other combinations; the average permitted single and tandem axle loads; and the average practical maximum gross weights for various types of trucks and combination vehicles.

The data given in Appendix A on trends in legal maximum limits of motor vehicle sizes and weights are discussed briefly here because of the very profound effects of legislative limitations on heavy motor vehicle operation in the several regions of the nation. The data given in Appendix A will be used and referred to from time to time throughout the remainder of the report.

A summary of the average permitted vehicle lengths, by years and by AASHO regions given by Tables A-3.1, A-3.3 and A-3.4 in Appendix A, for single unit trucks, truck tractor semitrailers, and other combinations, respectively, are presented graphically in Figure 3.3 for visual comparison. Similarly, a summary of the average permitted single and tandem axle loads, by years and by AASHO regions given by Tables A-4.1 and A-4.2, respectively, in Appendix A, is presented graphically in Figure 3.4 for visual comparison.

Although the contrasts in heavy truck operation in the eastern and western parts of the United States are discussed at some length in Part V, it is of more than passing interest to note here that the eastern and western states, respectively, represent the extremes in legal maximum limits on motor vehicle sizes and weights. This conclusion can be verified by even a casual inspection of the average regional limitations given in Appendix A, a part of which is summarized in Figures 3.3 and 3.4. For example, it will be seen in Figure 3.3 that average maximum permitted lengths of truck tractor semitrailers

and other combinations are considerably less in Region 1 than in Region 4. Also note in Figure 3.3 that the permitted lengths of these two classes of vehicles are less than AASHO policy in Region 1 and greater than AASHO policy in Region 4. Similarly, in Figure 3.4 it will be seen that permitted loads for both single and tandem axles are greater in Region 1 than in Region 4; and at present both are in excess of AASHO 1946 policy.

3.5 SOURCE OF INFORMATION

As previously mentioned in Section 3.1, the data upon which this investigation of trends in heavy truck loads and certain of their effects on highway structures is based were collected in annual nationwide truck weight and traffic surveys by the several states acting in cooperation with the Bureau of Public Roads. In each of these surveys, every effort was made to obtain data that would be representative of state, regional, and national traffic conditions on the main rural highways of the United States. The extent to which these objectives have been accomplished is evidenced by the fact that over 500 loadometer stations — an average of about 12 per state — have been operated eight hours or more during the summer months of each year since 1942. The traffic and heavy truck data reported by the surveys of 1942-43, 1948-49, and 1954 represent three points in time and provide the basic information for the present investigation of trends in heavy motor vehicle operation on main rural roads.

The annual loadometer data reported by each state were summarized on forms identified as Tables W-1 through W-6. Of these, only the W-1, W-2, and the W-6 tables included data required for the present investigation. Although complete sets of these original tables would have no place in this report, it might be informative to reproduce certain typical portions of them here to illustrate the form in which the original data were presented. Typical W-1, W-2, and W-6 tables are shown on Tables 3.3, 3.4, and 3.5, respectively. The data included in these tables, relative to the average volumes and compositions of traffic, the types, dimensions, and frequencies of heavy vehicle loads and axle loads, provide the basic information for the investigation of trend in heavy truck or heavy vehicle operation presented herein.

The W-1 table included all pertinent information relative to the location and limit of operation of each loadometer station, and the number of vehicles counted and weighed for each type together with similar data recorded at the same station during the loadometer survey of the preceding year. The W-2 table presents a summary for each year of the vehicles of each type and class counted at all loadometer stations within a given state, together with a summary of similar data for the preceding year. Then, the data relative to vehicle weights, axle loads, axle spacings, and vehicle type designation were reported on forms identified as a typical W-6 table, as shown in Table 3.5.

The system of vehicle identification adopted by the truck weight surveys for reporting heavy trucks of various types in the W-6 tables—such as shown in Table 3.5 — can be explained rather simply by reference to the typical freight vehicle types shown in Figure 3.5. In this figure, the numbers indicate the number of axles in a single unit truck or in other units of a vehicle combination and the letter "S" indicates a semitrailer. For example, a 2-axle single unit truck* is shown as a Type 2D; a 3-axle single unit as a Type 3; and a 2-axle truck tractor with a 1-axle semitrailer is shown as a Type 2-S1. Similarly, if a vehicle is identified as a Type 2-S2-2 combination, it would mean the vehicle consisted of a 2-axle truck tractor, a 2-axle semitrailer, and a 2-axle full trailer as shown in the lower right hand corner of Figure 3.5. It will also be noted in Figure 3.5 that the axles for each vehicle are identified in sequence from front to rear by the letters A, B, C, D, etc., and the spacings between axles are identified by the letter combinations AB, BC, CD, etc.

Table 3.5 shows a typical W-6 table. The left hand column shows the loadometer station number at

TABLE 3.3

A PARTIAL W-1 TABLE—STATE OF TEXAS

LOCATION OF EACH LOADOMETER STATION, SHOWING NUMBER OF VEHICLES COUNTED AND WEIGHED AT EACH BY TYPE DURING THE PERIOD FROM JUNE 1, 1955, TO AUGUST 31, 1955, COMPARED TO CORRESPONDING DATA FOR 1954

Station Number	Route Number	Description Of Station Location	Year	Vehicles Counted											Vehicles Weighed					
				Passenger Cars		Buses	Single-Unit Trucks			Tractor-Semitrailers			Other Combinations		Single-Unit Trucks			Tractor-Semitrailers		
				Local	Foreign		Panel & Pickup	Other 2-Axle	3-Axle	3-Axle	4-Axle	5-Axle Or More	4-Axle Or Less	5-Axle Or More	Panel & Pickup	Other 2-Axle	3-Axle	3-Axle	4-Axle	5-Axle Or More
1) L3	US 80	5.9 Mi. W. of	1955	3,764	581	49	486	257	15	189	514	61	9	1	29	117	4	84	236	29
		Sweetwater	1954	1,887	268	35	283	116	3	148	245	22	2	1	8	42	2	59	94	16
2) L7	US 84	2.2 Mi. S.E. of	1955	1,890	123	10	308	149	5	119	153	11	8		28	56	3	50	63	7
	US 183	Coleman	1954	1,189	87	10	156	74	3	43	89	9	2	2	7	29	1	24	41	8
2) L16	US 87	8.8 Mi. N. of	1955	3,523	213	14	607	312	7	109	231	2	6		35	126	5	42	98	
		Lubbock	1954	3,284	287	18	616	242	4	94	203	2	2		31	89		42	106	
2) L20	US 287	9.5 Mi. N.W. of	1955	4,786	895	29	571	241	11	145	302	67		4	29	91	8	62	130	30
		Wichita Falls	1954	3,630	773	21	535	367	12	131	321	10		2	16	38	8	24	49	1
1) L31	US 80	8.0 Mi. W. of	1955	8,773	1,110	53	1,122	480	9	223	335	53	4		30	174	5	104	131	23
		Ft. Worth	1954	6,373	838	50	879	431	4	277	411	35			30	114	3	84	115	11
2) L42	US 82	2.0 Mi. W. of	1955	2,247	404	13	330	144	6	87	80	4	2		32	60	1	43	29	1
		Bonham	1954	1,971	313	7	395	187		65	74	5			28	72		34	25	4
2) L72	US 59	8.5 Mi. S. of	1955	2,812	493	21	484	337	7	166	296	23	1	1	25	119	2	62	134	13
		Nacogdoches	1954	3,142	461	13	534	244	3	178	256	22			26	100	1	93	115	15
1) L75	US 90	0.8 Mi. W. of	1955	8,773	1,143	31	821	167	21	61	167	8			12	62	10	25	68	4
		Orange	1954	1,905	1,960	72	1,709	458	28	139	264	17	1		27	140	6	64	101	9

TABLE 3.4

A PARTIAL W-2 TABLE—STATE OF TEXAS

NUMBER OF VEHICLES OF EACH TYPE COUNTED AT 21 LOADOMETER STATIONS DURING THE PERIOD FROM JUNE 1, 1955, TO AUGUST 31, 1955, COMPARED TO DATA FOR 1954

Type of Vehicle	Number Counted During Period			Percentage of Total Number of Vehicles			Percentage of Total Number of Trucks and Combinations			Single-Unit Trucks and Tractor-Semitrailers Weighed		Percentage Weighed of Total Counted by Types	
	1955	1954	1955:54	1955	1954	1955:54	1955	1954	1955:54	1955	1954	1955	1954
PASSENGER CARS													
Local	81,685	74,541	1.096	66.51	65.56	1.014							
Foreign	13,209	13,081	1.010	10.75	11.51	0.934							
Sub-total Passenger Cars	94,894	87,622	1.083	77.26	77.07	1.002							
TRUCKS, SINGLE-UNIT													
Panel and Pickups	10,960	10,596	1.034	8.92	9.32	0.957	40.27	41.68	0.966	563	438	5.14	4.13
Other 2-Axle	5,870	5,913	0.993	4.78	5.20	0.919	21.57	23.26	0.927	2,071	1,752	35.28	29.63
3-Axle	304	188	1.617	0.25	0.17	1.471	1.12	0.74	1.514	133	66	43.75	35.11
Sub-total Single-Unit Trucks	17,134	16,697	1.026	13.95	14.69	0.950	62.96	65.68	0.959	2,767	2,256	16.15	13.51
TRACTOR SEMITRAILER COMBINATIONS													
3-Axle	3,099	2,901	1.068	2.52	2.55	0.988	11.39	11.41	0.998	1,304	1,204	42.08	41.50
4-Axle	6,436	5,537	1.162	5.24	4.87	1.076	23.65	21.78	1.086	2,644	2,212	41.08	39.95
5-Axle	545	288	1.892	0.45	0.25	1.800	2.00	1.13	1.770	264	152	48.44	52.78
Sub-total Tractor-Semitrailer Combinations	10,080	8,726	1.155	8.21	7.67	1.070	37.04	34.32	1.079	4,212	3,568	41.79	40.89
Sub-total Single-Unit Trucks and Tractor Semitrailer Combinations	27,214	25,423	1.070	22.16	22.36	0.991	100.00	100.00		6,979	5,824	25.64	22.91
TRUCK-TRAILER COMBINATIONS	81	32	2.531	0.06	0.03	2.000							
BUSES	636	615	1.034	0.52	0.54	0.963							
TOTAL VEHICLES	122,825	113,692	1.080	100.00	100.00								

TABLE 3.5

A PARTIAL W-6 TABLE—STATE OF MASSACHUSETTS

A LISTING SHOWING TOTAL WEIGHT, AXLE LOADS, AND AXLE SPACING OF TRUCKS AND TRUCK COMBINATIONS WITH ONE OR MORE AXLES WEIGHING 18,000 POUNDS OR MORE; ALSO SINGLE-UNIT TRUCKS AND TRUCK COMBINATIONS WEIGHING 13 TONS OR MORE AT TEN LOADOMETER STATIONS DURING PERIOD FROM AUGUST 16 TO AUGUST 27, 1954

Station At Which Weighed	Vehicle Type Designation	Commodity Carried	Operation, Private or For Hire	Total Weight, Pounds	Axle Loads (Pounds)				Axle Spacing (Feet)			Wheel Pase, Feet	Percentage Over State Law				Percentage Over AASHO Recommendation					
													Axle Load			Gross Weight	Axle Load			Gross Weight	Max. Axle Group	
					A	B	C	D	A-B	B-C	C-D		B	C	D		B	C	D		Grp	%
66	2D	Cement Blocks	P	29,600	8,000	21,600			16.8			16.8					20.00					
66	2D	Roofing Supplies	H	23,800	5,200	18,600			12.2			12.2					3.33					
50	3	Cinder Blocks	P	58,600	14,400	22,600	21,600		17.4	4.2		21.6	25.56	20.00		17.20	25.56	20.00		28.23	B-C	38.13
4	3	Lumber	P	41,400	4,200	18,600	18,600		13.2	4.0		17.2	3.33	3.33			3.33	3.33		.58	B-C	16.25
73	2-S1	Miscellaneous	H	43,600	9,200	20,000	14,400		12.0	21.3		33.3					11.11					
73	2-S1	Milk	P	39,000	6,000	19,200	13,800		12.4	17.3		29.7					6.67					
73	2-S1	Meat	H	63,200	10,200	24,000	29,000		12.0	21.5		33.5	7.14	29.46		26.40	33.33	61.11		12.90	B-C	15.95
73	2-S1	Freight	H	45,600	8,200	18,000	19,400		12.3	20.1		32.4						7.78				
73	2-S1	Wire	H	45,000	6,800	20,400	17,800		12.0	24.4		36.4					13.33					
50	2-S2	Poultry	P	46,800	7,000	19,000	9,200	11,600	12.2	19.8	4.5	36.5					5.56					
50	2-S2	Paper	H	59,400	5,600	16,200	19,200	18,400	11.0	18.2	4.0	33.2		6.67	2.22	18.80		6.67	2.22	7.69	C-D	17.50
1	2-S2	Freight	P	57,600	7,600	12,800	17,800	19,400	12.3	18.2	4.7	35.2			7.78	15.20			7.78	1.41	C-D	16.25

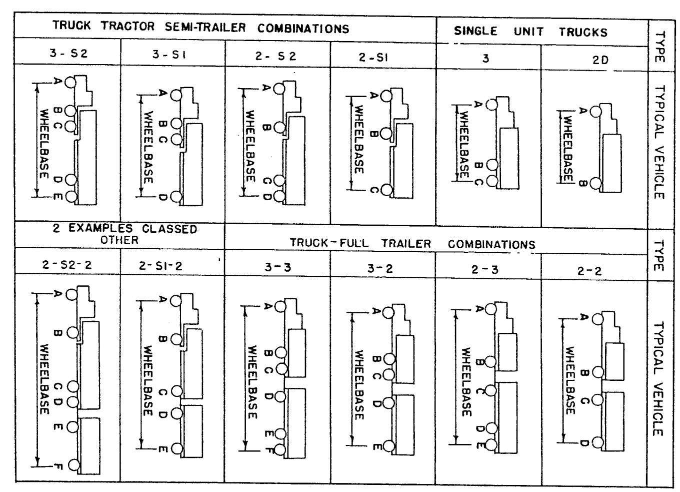


Figure 3.5. Identification of freight vehicle types.

which each truck or combination was measured and weighed. The second column shows the vehicle type designation, and the next two columns indicate the commodity carried and whether the vehicle was privately operated or was hired. The fifth column shows the gross vehicle weight, which is the sum of the axle loads identified as A, B, C, D, etc., in the following columns. Then, the axle spacings AB, BC, CD, etc., are followed by the wheel base lengths, which are given in the last column on the right of the table.

3.6 DISTRIBUTION OF TRAFFIC

Summaries of the loadometer station data for each of the three trend periods — 1942-43, 1948-49 and 1954 — by AASHO regions and for the United States are given in Table 3.6. It presents summaries of all vehicles broken down into the following classes: automobiles, buses, miscellaneous vehicles,** and trucks. The last two columns on the right show the estimated number of heavy trucks and the estimated number of heavy

*Single unit 2-axle trucks are identified as 2P, 2S and 2D trucks; for definitions see Appendix D.

**In general, the miscellaneous vehicles were military vehicles that were not stopped or weighed.

trucks per hour. It also shows the number of loadometer stations operated and the total hours of observation during each trend period for each AASHO region and for the United States.

In general, the same loadometer stations are operated in each state year after year. Thus, the number of loadometer stations shown in Table 3.6 for each region during the 1942-43 and 1948-49 trend periods represents the number operated each of the two years of each trend period, respectively, as indicated. For example, the 1942-43 data show an average of 554 loadometer stations operated each year of the two-year trend period. However, the number of hours of station operation and the number of vehicles counted represents the totals for the two-year period. That is, there was an average of 554 loadometer stations operated each year of the 1942-43 time period for a total of 8135 hours or an average of about 4000 hours per year. Similarly, there was a total of nearly one million vehicles of all kinds counted during the 1942-43 surveys or an average of about half a million vehicles counted per year.

Since the present study is mainly concerned with trends in heavy truck operation, the heavy truck data given in the last two columns on the right of Table 3.6 will be of particular interest. These two columns give the **estimated number of heavy trucks** and the **estimated number of heavy trucks per hour,** respectively, by AASHO regions and for the United States, for each of the three trend periods included in the present study. These estimated numbers of heavy trucks are the same as those given in Table 3.8, and the basis on which they were determined is explained in the discussion relating to Table 3.8.

Perhaps the most important observation to be derived from the loadometer data in Table 3.6 has to do with the enormous increases in the frequencies of heavy trucks indicated by the estimated number of heavy trucks per hour given in the last column on the right. These data show that the number of heavy trucks per hour on main rural roads has increased continuously with time and without exception in each of the four AASHO regions of the United States. For the United States as a whole, it will be seen that the frequency of heavy trucks at an average loadometer station increased from 2.73 per hour in 1942-43 to 6.12 per hour in 1954; in other words, heavy truck frequencies in 1954 were 224 per cent of those found 12 years earlier in the 1942-43 period.

Table 3.7 presents the same basic data as that given in Table 3.6. Table 3.7, however, converts these basic

TABLE 3.6
SUMMARY OF LOADOMETER STATION DATA BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	Station Data		Vehicles Counted					Heavy Trucks	
	No.	Hours	Autos	Buses	Misc. Vehicles	Trucks	All Vehicles	Est. Number	Est. No./Hr.
1942-1943									
Region I	131	1,912	234,471	6,031	12	80,318	320,832	9,870	5.162
II	124	1,782	117,317	3,365	451	43,267	164,400	1,697	.952
III	158	2,433	231,413	2,615	44	59,762	293,834	5,712	2.348
IV	141	2,008	166,953	3,149	0	46,430	216,532	4,905	2.443
U. S.	554	8,135	750,154	15,160	507	229,777	995,598	22,184	2.727
1948-1949									
Region I	102	1,646	542,561	6,686	0	129,652	678,899	20,611	12.522
II	118	1,888	252,228	4,558	0	91,908	348,694	7,469	3.956
III	199	3,931	588,446	4,712	0	147,143	740,301	15,931	4.053
IV	152	2,224	363,539	4,062	0	87,816	455,417	11,667	5.246
U. S.	571	9,689	1,746,774	20,018	0	456,519	2,223,311	55,678	5.747
1954									
Region I	71	1,043	473,641	4,808	0	108,055	586,504	13,311	12.762
II	123	1,526	270,868	2,783	0	85,082	358,733	6,429	4.213
III	178	2,828	542,295	2,564	0	127,975	672,834	13,729	4.855
IV	144	1,424	342,966	2,441	0	83,112	428,519	8,255	5.797
U. S.	516	6,821	1,629,770	12,596	0	404,224	2,046,590	41,724	6.117

Note: In general, each truck or loadometer station was operated continuously for eight hours during one of the day-light periods, i.e., from 6:00 a.m. to 2:00 p.m. or from 2:00 p.m. to 10:00 p.m. Occasionally, certain stations were not able to operate continuously for a full eight-hour period owing to bad weather, mechanical difficulties, or other reasons. Many of the stations were operated on each of two different days during a given year. In such cases as much as sixteen hours or more of operation might be indicated for a single station.

data into composite traffic patterns for each of the three trend periods, by AASHO regions and for the United States. It shows the percentage of total traffic represented by automobiles, buses, miscellaneous vehicles, and trucks. It also shows a breakdown of all trucks into the estimated numbers of light and heavy trucks, with two percentages under each number. The first percentage refers to all vehicles or total traffic, and the second percentage refers to all trucks or total truck traffic. The basis on which these estimated numbers of heavy trucks were determined is explained in the discussion relating to Table 3.8.

3.7 DISTRIBUTION OF FREIGHT VEHICLES

Table 3.8 gives a summary of all freight vehicles for each of the three trend periods, by AASHO regions and for the United States. It shows the total number of trucks counted, the number weighed, the average percentage weighed, the number of heavy trucks found among those weighed, and the estimated number and percentage of heavy trucks among all of the trucks counted. The estimated number of heavy trucks among all trucks counted is based on the premise that the trucks which were weighed constituted a representative sample of the total truck traffic. The last column on the right gives the number of heavy trucks on which complete data were reported. In connection with this table, the magnitude of these surveys is evidenced by the fact that, during the three trend periods indicated, well over one million trucks of all types were counted, nearly half of which

TABLE 3.7
COMPOSITE TRAFFIC PATTERNS BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region		Number and Percentage of Vehicles in Each Class						
		All Vehicles	Autos	Buses	Misc. Vehicles	All Trucks	Estimated Light Trucks	Estimated Heavy Trucks
1942-1943								
Region I	No.	320,832	234,471	6,031	12	80,318	70,448	9,870
	%	100.00	73.09	1.88	.00	25.03	21.95	3.08
	%					100.00	87.71	12.29
II	No.	164,400	117,317	3,365	451	43,267	41,570	1,697
	%	100.00	71.36	2.05	.27	26.32	25.29	1.03
	%					100.00	96.08	3.92
III	No.	293,834	231,413	2,615	44	59,762	54,050	5,712
	%	100.00	78.76	.89	.01	20.34	18.40	1.94
	%					100.00	90.44	9.56
IV	No.	216,532	166,953	3,149	0	46,430	41,525	4,905
	%	100.00	77.11	1.45		21.44	19.17	2.27
	%					100.00	89.44	10.56
U. S.	No.	995,598	750,154	15,160	507	229,777	207,593	22,184
	%	100.00	75.35	1.52	.05	23.08	20.85	2.23
	%					100.00	90.35	9.65
1948-1949								
Region I	No.	678,899	542,561	6,686	0	129,652	109,041	20,611
	%	100.00	79.92	.98		19.10	16.06	3.04
	%					100.00	84.10	15.90
II	No.	348,694	252,228	4,558	0	91,908	84,439	7,469
	%	100.00	72.33	1.31		26.36	24.22	2.14
	%					100.00	91.87	8.13
III	No.	740,301	588,446	4,712	0	147,143	131,212	15,931
	%	100.00	79.48	.64		19.88	17.73	2.15
	%					100.00	89.17	10.83
IV	No.	455,417	363,539	4,062	0	87,816	76,149	11,667
	%	100.00	79.83	.89		19.28	16.72	2.56
	%					100.00	86.71	13.29
U. S.	No.	2,223,311	1,746,774	20,018	0	456,519	400,841	55,678
	%	100.00	78.57	.90		20.53	18.03	2.50
	%					100.00	87.81	12.19
1954								
Region I	No.	586,504	473,641	4,808	0	108,055	94,744	13,311
	%	100.00	80.76	.82		18.42	16.15	2.27
	%					100.00	87.68	12.32
II	No.	358,733	270,868	2,783	0	85,082	78,653	6,429
	%	100.00	75.50	.78		23.72	21.93	1.79
	%					100.00	92.44	7.56
III	No.	672,834	542,295	2,564	0	127,975	114,246	13,729
	%	100.00	80.60	.38		19.02	16.98	2.04
	%					100.00	89.27	10.73
IV	No.	428,519	342,966	2,441	0	83,112	74,857	8,255
	%	100.00	80.03	.57		19.40	17.47	1.93
	%					100.00	90.07	9.93
U. S.	No.	2,046,590	1,629,770	12,596	0	404,224	362,500	41,724
	%	100.00	79.63	.62		19.75	17.71	2.04
	%					100.00	89.68	10.32

TABLE 3.8
SUMMARY OF ALL FREIGHT VEHICLES BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Freight vehicles classified as light trucks (L.T.) and heavy trucks (H.T.)

Region	Freight Vehicles							
	Number Counted	Number Weighed	Avg. % Weighed	No. H.T. Weighed	Est. No. H.T.	H.T. Per cent	Est. No. L.T.	H.T. w/comp. Data
				1942-1943				
Region I	80,318	26,656	33.19	3,273	9,870	12.29	70,448	3,260
II	43,267	25,049	57.89	887	1,697	3.92	41,570	886
III	59,762	34,192	57.21	3,182	5,712	9.56	54,050	2,969
IV	46,430	26,027	56.06	2,268	4,905	10.56	41,525	2,242
U. S.	229.777	111,924	48.71	9,610	22,184	9.65	207,593	9,357
				1948-1949				
Region I	129,652	35,149	27.11	5,892	20,611	15.90	109,041	5,887
II	91,908	47,174	51.33	5,046	7,469	8.13	84,439	5,042
III	147,143	76,198	51.78	9,579	15,931	10.83	131,212	9,277
IV	87,816	44,356	50.51	6,801	11,667	13.29	76,149	6,654
U. S.	456,519	202,877	44.44	27,318	55,678	12.20	400,841	26,860
				1954				
Region I	108,055	20,269	18.76	3,204	13,311	12.32	94,744	3,193
II	85,082	42,465	49.91	4,174	6,429	7.56	78,653	4,121
III	127,975	53,908	42.12	6,047	13,729	10.73	114,246	6,036
IV	83,112	30,949	37.24	4,865	8,255	9.93	74,857	4,836
U. S.	404,224	147,591	36.51	18,290	41,724	10.32	362,500	18,186

were weighed and among which more than fifty-five thousand heavy trucks were found and reported. On the average, it will be noted that heavy trucks constitute from about 8 to 12 per cent of all the trucks counted, but trends are not clearly indicated by these freight vehicle data as they are arranged in this table.

Table 3.9 shows the observed traffic volumes for each of the three trend periods, by AASHO regions and for the United States. The loadometer station data, the number of vehicles counted, and the estimated number of heavy trucks, all represent a recapitulation of certain of the data given in Tables 3.6, 3.7, and 3.8. The important trends indicated by the data in Table 3.9 are the increased volume of all vehicle classes. The volume of all vehicles increased from 122.4 per hour in 1942-43 to 300.0 per hour in 1954; the volume of all vehicles in 1954, therefore, was 245 per cent of that found for the 1942-43 period. During the same 12-year period, the frequency of freight vehicles increased from 28.2 to 59.3 per hour or 210 per cent of the corresponding frequency found in 1942-43. Similarly, the frequency of heavy trucks increased from 2.73 per hour in 1942-43 to 6.12 per hour in 1954; the heavy truck frequency for 1954, therefore, was 225 per cent of the corresponding frequency during the 1942-43 period. From these data it will be seen that in 1954 the frequency of all freight vehicles was 210 per

TABLE 3.9
AVERAGE OBSERVED TRAFFIC VOLUMES BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	Station Data		All Vehicles		Trucks		Est. Heavy Trucks	
	Number of Stations	Hours of Observation	Number of Vehicles	Vehicles Per Hour	Number of Trucks	Number of Trucks Per Hr.	Number Heavy Trucks	H.T. Per Hour
				1942-1943				
Region I	131	1,912	320,832	167.8	80,318	42.0	9,870	5.16
II	124	1,782	164,400	92.3	43,267	24.3	1,697	0.95
III	158	2,433	293,834	120.8	59,762	24.6	5,712	2.35
IV	141	2,008	216,532	107.8	46,430	23.1	4,905	2.44
U. S.	554	8,135	995,598	122.4	229,777	28.2	22,184	2.73
				1948-1949				
Region I	102	1,646	678,899	412.5	129,652	78.8	20,611	12.52
II	118	1,888	348,694	184.7	91,908	48.7	7,469	3.96
III	199	3,931	740,301	188.3	147,143	37.4	15,931	4.05
IV	152	2,224	455,417	204.8	87,816	39.5	11,667	5.25
U. S.	571	9,689	2,223,311	229.5	456,519	47.1	55,678	5.75
				1954				
Region I	71	1,043	586,504	562.3	108,055	103.6	13,311	12.76
II	123	1,526	358,733	235.1	85,082	55.8	6,429	4.21
III	178	2,828	672,834	237.9	127,975	45.3	13,729	4.85
IV	144	1,424	428,519	300.9	83,112	58.4	8,255	5.80
U. S.	516	6,821	2,046,590	300.0	404,224	59.3	41,724	6.12

cent of that for 1942-43; and the frequency of heavy trucks in 1954 was 225 per cent of that for 1942-43. It would appear, therefore, that both the numbers and frequencies of heavy trucks increased during this 12-year period at a slightly more rapid rate than for all freight vehicles.

In this connection it may be of interest to compare the numbers of annual vehicle miles on main rural roads generated by heavy trucks and combinations with those generated by all trucks and combinations as shown in Figure 7.1.

3.8 DISTRIBUTION OF HEAVY TRUCKS

Table 3.10 gives a summary of heavy trucks weighed and reported for each of the three trend periods, by vehicle types, by AASHO regions, and for the United States. It also gives the number of heavy trucks weighed, the number omitted for lack of some pertinent information, and the number with complete data. The last two columns on the right give the total number of axles and the average number of axles per vehicle for each trend period by AASHO regions and for the United States. Perhaps the most significant thing revealed by these data is the contrast between Region 1 and Region 4 with respect to the average number of axles per vehicle for each of the three trend periods. In each case, the average number of axles per vehicle is greater in Region 4 than in Region 1. It is interesting to note also that the average number of axles per vehicle increases from East to West and in order of Regions 1, 2, 3, and 4, respectively. Similarly, it is of some considerable importance to note that the trend with time is toward the use of more axles per vehicle in each of the four AASHO regions.

TABLE 3.10
SUMMARY OF HEAVY TRUCKS WEIGHED BY TYPES, BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	Distribution of Vehicles by Types											
	2	3	2-S1	2-S2	2-S3	3-S1	3-S2	3-S3	2-2	2-3	3-2	3-3
1942-1943												
Region I	351	433	2,462	23					2		1	
II	4	48	801	29		1	3		1			
III	18	151	2,523	297		17	6		31	4	11	
IV	28	161	434	598	1	9	269	38	148	41	108	378
U. S.	401	793	6,220	947	1	27	278	38	182	45	120	378
1948-1949												
Region I	838	366	4,105	571		1	5		5		1	
II	299	146	3,245	1,342		7	5			1	1	
III	300	243	4,225	4,238	1	13	244		37	2	12	1
IV	284	545	828	1,395	1	34	1,631	21	162	20	355	1,145
U. S.	1,721	1,300	12,403	7,546	2	55	1,885	21	204	23	369	1,146
1954												
Region I	357	106	1,278	1,447			12		4			
II	268	134	902	2,830	1	3	34				2	
III	96	120	793	3,699		5	959		43	1	46	1
IV	206	279	265	1,033		10	1,980	5	42	2	603	189
U. S.	927	639	3,238	9,009	1	18	2,985	5	89	3	651	190

Region	Distribution of Vehicles by Types						Heavy Trucks				
	2-S1-2	2-S1-3	2-S2-2	2-S2-3	2-S3-2	3-S2-2	Weighed	Omitted	No. with Comp. Data	Total Axles	Axles Per Truck
1942-1943											
Region I	1						3,273	13	3,260	9,497	2.901
II							887	1	886	2,694	3.037
III	105		10	9			3,182	213	2,969	10,191	3.203
IV	24	3	20	6	1	1	2,268	26	2,242	9,766	4.306
U. S.	130	3	30	15	1	1	9,610	253	9,357	32,148	3.345
1948-1949											
Region I							5,892	5	5,887	17,427	2.958
II							5,046	4	5,042	16,202	3.211
III	203		50	10			9,579	302	9,277	33,842	3.533
IV	325	7	46			2	6,801	147	6,654	30,039	4.886
U. S.	528	7	96	10		2	27,318	458	26,860	97,510	3.679
1954											
Region I							3,204	11	3,193	10,730	3.349
II							4,174	53	4,121	15,161	3.632
III	159		106	16		3	6,047	11	6,036	24,519	4.055
IV	240		9	1		1	4,865	29	4,836	21,741	4.469
U. S.	399		115	17		4	18,290	104	18,186	72,151	3.945

TABLE 3.11
ESTIMATED NUMBER OF HEAVY TRUCKS BY TYPES, BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	Distribution of Vehicles by Types											
	2	3	2-S1	2-S2	2-S3	3-S1	3-S2	3-S3	2-2	2-3	3-2	3-3
						1942-1943						
Region I	1,033	1,038	7,714	71					5		6	
II	8	82	1,545	54		1	6		1			
III	38	293	4,350	571		28	11		75	8	24	
IV	74	378	806	1,132	4	16	741	144	258	76	239	831
U. S.	1,153	1,791	14,415	1,828	4	45	758	144	339	84	269	831
						1948-1949						
Region I	2,539	1,520	14,289	2,234		3	8		14		4	
II	539	300	4,672	1,932		12	10			2	2	
III	531	490	6,701	7,067	1	21	403		87	4	28	1
IV	582	992	1,429	2,357	2	54	2,643	46	239	34	604	1,791
U. S.	4,191	3,302	27,091	13,590	3	90	3,064	46	340	40	638	1,792
						1954						
Region I	1,557	405	5,419	5,880			24		26			
II	525	221	1,520	4,087	2	4	65				5	
III	253	277	2,080	8,226		7	1,588		124	5	140	1
IV	461	569	508	1,981		19	2,892	9	71	3	166	285
U. S.	2,796	1,472	9,527	20,174	2	30	4,569	9	221	8	1,111	286

Region	Distribution of Vehicles by Types						Estimated Number H. T.	H. T. w/Comp. Data
	2-S1-2	2-S1-3	2-S2-2	2-S2-3	2-S3-2	3-S2-2		
				1942-1943				
Region I	3						9,870	3,260
II							1,697	886
III	261		28	25			5,712	2,969
IV	91	12	71	24	4	4	4,905	2,242
U. S.	355	12	99	49	4	4	22,184	9,357
				1948-1949				
Region I							20,611	5,887
II							7,469	5,042
III	478		101	18			15,931	9,277
IV	763	16	109			6	11,667	6,654
U. S.	1,241	16	210	18		6	55,678	26,860
				1954				
Region I							13,311	3,193
II							6,429	4,121
III	593		370	55		10	13,729	6,036
IV	469		19	2		1	8,255	4,836
U. S.	1,062		389	57		11	41,724	18,186

Although Table 3.10 shows that 18 heavy truck types were reported, it will be seen that over 90 per cent of them are included within the following six major types: Types 2, 3, 2-S1, 2-S2, 3-S2, and 3-3. The remaining 12 truck types were not included in the study of trends because they did not occur in each of the four AASHO regions in sufficient numbers to obtain representative samples or to contribute anything significant to the investigation. Consequently, it is the data reported for the six major heavy truck types which provide the basis for the present investigation of trends in heavy truck loads. Most of the remaining portions of this report, therefore, are concerned with analyses and interpretations of the loadometer data reported for these six vehicle types which account for most of the heavy trucks.

Table 3.11 gives the estimated number of heavy trucks for each trend period, by vehicle types, by AASHO regions, and for the United States. The estimated numbers of heavy trucks of each type given in this table were arrived at for each state on the basis of the total number of trucks counted, the average per cent weighed, and the numbers of heavy trucks found among those weighed. The estimated numbers of each type were then accumulated by trend period and AASHO region, as shown.

In Table 3.11 it is significant to note the high incidence of heavy single unit trucks in Region 1 as compared with the other regions. Of even more significance perhaps are the very great increases in the incidence of heavy type 2-S2 trucks in all regions. In the 1942-43 period, for example, heavy type 2-S2 vehicles

accounted for only about 8.2 per cent of all freight vehicles classified as heavy, but by 1954 they accounted for nearly 50.0 per cent of all heavy trucks reported. It will be noted also that a considerable increase in the incidence of the heavy type 3-S2 vehicles took place during this 12-year period. The increased incidence of these two vehicle types has been compensated for to some extent by the decreased incidence of the heavy type 2-S1 vehicle. The 2-S1 vehicle accounted for about 65 per cent of all the heavy trucks in 1942-43, but by 1954 it accounted for only about 23 per cent.

Table 3.12 gives the number and per cent of all the heavy trucks weighed during each of the three trend periods, by regions and for the United States, broken down into single unit trucks, truck tractor semitrailers, and other combinations. The number of vehicles given in this table represents a recapitulation of the heavy truck data presented in Table 3.10 but arranged by vehicle classes for easy comparison. Perhaps the most important trend indicated by Table 3.12 is the relative increases in the incidence of heavy truck tractor semitrailers and the relative decreases in the incidence of heavy single unit trucks and other combinations, respectively.

Table 3.13 presents a summary of the six major heavy truck types reported with complete data for each trend period, by AASHO regions and for the United States. As mentioned above, these six major heavy truck types for which complete data were reported provide the basis for most of the analyses and interpretations of the loadometer data given in the remaining parts of this report.

Table 3.14 gives the average frequencies of heavy trucks per hour at a typical loadometer station for each of the six major heavy truck types for each trend period, by AASHO regions and for the United States. **The very great increase in the frequencies of all heavy trucks from 2.73 to 6.12 per hour at an average location on main rural roads during the 12-year period from 1942-43 to 1954 represents one of the most important trends revealed by these data. Perhaps more significant still is the**

TABLE 3.12
NUMBER AND PERCENT OF HEAVY TRUCKS, CLASSIFIED AS SINGLE UNIT, TRUCK TRACTOR SEMITRAILER, AND OTHER COMBINATIONS, BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Based on data reported for all heavy trucks weighed

Region		Total	Single Unit	Truck Tractor Semitrailer	Other Combinations
1942-1943					
Region I	No.	3,273	784	2,485	4
	%	100.00	24.0	75.9	0.1
II	No.	887	52	834	1
	%	100.00	5.9	94.0	0.1
III	No.	3,182	169	2,843	170
	%	100.00	5.3	89.4	5.3
IV	No.	2,268	189	1,349	730
	%	100.00	8.3	59.5	32.2
U. S.	No.	9,610	1,194	7,511	905
	%	100.00	12.4	78.2	9.4
1948-1949					
Region I	No.	5,892	1,204	4,682	6
	%	100.00	20.4	79.5	0.1
II	No.	5,046	445	4,599	2
	%	100.00	8.8	91.1	0.1
III	No.	9,579	543	8,721	315
	%	100.00	5.7	91.0	3.3
IV	No.	6,801	829	3,910	2,062
	%	100.00	12.2	57.5	30.3
U. S.	No.	27,318	3,021	21,912	2,385
	%	100.00	11.1	80.2	8.7
1954					
Region I	No.	3,204	463	2,737	4
	%	100.00	14.5	85.4	0.1
II	No.	4,174	402	3,770	2
	%	100.00	9.6	90.3	0.1
III	No.	6,047	216	5,456	375
	%	100.00	3.6	90.2	6.2
IV	No.	4,865	485	3,293	1,087
	%	100.00	10.0	67.7	22.3
U. S.	No.	18,290	1,566	15,256	1,468
	%	100.00	8.6	83.4	8.0

TABLE 3.13
SUMMARY OF THE SIX PREDOMINANT HEAVY TRUCK TYPES BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Based on data reported for the six predominant heavy truck types weighed

Region	The Six Predominant H.T. Types						Total No. With Complete Data	No. With Incomplete Data Omitted	Total Number Weighed
	2	3	2-S1	2-S2	3-S2	3-3			
1942-1943									
Region I	350	429	2,454	23			3,256	13	3,269
II	4	48	800	29	3		884	1	885
III	18	141	2,371	258	3		2,791	204	2,995
IV	25	152	434	593	266	377	1,847	21	1,868
U. S.	397	770	6,059	903	272	377	8,778	239	9,017
1948-1949									
Region I	838	366	4,105	571	5		5,885		5,885
II	298	146	3,245	1,342	5		5,036	1	5,037
III	300	243	4,225	4,238	244		9,250	1	9,251
IV	284	545	828	1,395	1,631	1,145	5,828		5,828
U. S.	1,720	1,300	12,403	7,546	1,885	1,145	25,999	2	26,001
1954									
Region I	356	105	1,276	1,440	12		3,189	11	3,200
II	228	130	901	2,825	32		4,116	52	4,168
III	94	120	790	3,698	956		5,658	10	5,668
IV	192	279	265	1,031	1,973	185	3,925	27	3,952
U. S.	870	634	3,232	8,994	2,973	185	16,888	100	16,988

TABLE 3.14
ESTIMATED NUMBER OF HEAVY TRUCKS PER HOUR BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	The Six Predominant H.T. Types						All Other Infrequent H.T. Types	Total All H.T. Types
	2	3	2-S1	2-S2	3-S2	3-3		
1942-1943								
Region I	.553	.683	3.881	.036			.007	5.16
II	.004	.051	.858	.031	.003		.003	.95
III	.013	.112	1.863	.219	.005		.138	2.35
IV	.030	.173	.467	.643	.289	.407	.431	2.44
U. S.	.114	.225	1.767	.269	.079	.107	.169	2.73
1948-1949								
Region I	1.780	.777	8.723	1.194	.010		.036	12.52
II	.235	.114	2.547	1.042	.004		.018	3.96
III	.127	.103	1.786	1.786	.103	.000	.145	4.05
IV	.219	.421	.639	1.061	1.259	.884	.767	5.25
U. S.	.362	.274	2.611	1.576	.397	.242	.288	5.75
1954								
Region I	1.421	.422	5.090	5.762	.047		.018	12.76
II	.270	.135	.910	2.854	.035		.006	4.21
III	.077	.096	.636	2.967	.769	.001	.304	4.85
IV	.245	.332	.316	1.231	2.361	.225	1.090	5.80
U. S.	.310	.214	1.083	3.015	.999	.064	.435	6.12

TABLE 3.15
ANALYSIS OF TYPE 2D HEAVY TRUCKS WEIGHED BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	No. H.T. With Complete Data	Average Axle Load, lbs.		Average GVW, lbs.	Average Wheel Base, feet	Maximum GVW Reported, lbs.	MGVW / AGVW	Min. & Max. Wheel Base Lengths, feet
		A	B					
1942-1943								
Region I	350	8,400	20,800	29,200	15.57	39,400	1.35	10.4-21.2
II	4	9,900	18,350	28,250	14.55	30,400	1.08	13.2-17.8
III	18	8,600	19,100	27,700	13.63	36,200	1.31	9.3-18.6
IV	25	7,600	21,000	28,600	14.59	34,000	1.19	11.6-17.5
U. S.	397	8,400	20,700	29,100	15.41	39,400	1.35	9.3-21.2
1948-1949								
Region I	838	7,700	21,500	29,200	14.44	49,200	1.68	10.0-21.6
II	298	5,000	18,100	23,100	13.89	38,700	1.68	10.6-21.0
III	300	5,800	16,300	22,100	15.81	34,400	1.56	10.0-26.9
IV	284	6,200	20,400	26,600	14.14	50,460	1.90	10.3-20.5
U. S.	1,720	6,600	19,800	26,400	14.53	50,460	1.91	10.0-26.9
1954								
Region I	356	7,500	21,200	28,700	14.00	46,000	1.60	10.0-22.0
II	228	5,200	19,600	24,800	13.61	58,800	2.37	10.0-22.6
III	94	5,500	18,900	24,400	13.37	31,400	1.29	10.0-22.0
IV	192	5,500	19,200	27,700	14.05	33,200	1.20	11.0-31.4
U. S.	870	6,200	20,100	26,300	13.84	58,800	2.24	10.0-31.4

phenomenal increase in the frequency of the heavy type 2-S2 vehicles. The frequency of these heavy type 2-S2 vehicles increased from 0.27 to 3.02 per hour, or about a 1000 per cent increase during this same 12-year period. It should be noted that the frequency of the heavy type 3-S2 vehicles also experienced a phenomenal increase — from 0.08 to 1.00 per hour during the same 12-year period, which represents a 1150 per cent increase.

3.9 AVERAGE HEAVY TRUCKS

Tables 3.15 through 3.20 give an analysis for each of the six major heavy truck types selected for special study in the present investigation of trends in heavy truck loads. These six tables correspond with the six major heavy truck types as follows: Types 2D, 3, 2-S1, 2-S2, 3-S2, and 3-3, respectively. For each vehicle type these tables give the average axle loads and gross vehicle weights; the average axle spacings and wheel base lengths; maximum gross vehicle weights and the ratio of maximum to average gross vehicle weights; and the minimum and maximum wheel base lengths reported. These data are given for each of the three trend periods, by AASHO regions and for the United States.

Table 3.15 gives the analysis of the average type 2D heavy trucks. This table indicates that the average gross weight of these heavy trucks decreased by about twenty-eight hundred pounds during the 12-year period from 1942-43 to 1954. It also appears that the average wheel base length decreased by about 1.6 feet during this same 12-year period. In spite of the fact that the average weights of these vehicles seem to have decreased somewhat, it also appears that the maximum gross weights reported have steadily increased. It appears further that even though the average wheel base lengths decreased a little, the maximum wheel base lengths increased by some 10.0 feet during the 12-year period.

Table 3.16 gives the analysis of the average type 3 heavy trucks. This table shows that the average

TABLE 3.16
ANALYSIS OF TYPE 3 HEAVY TRUCKS WEIGHED BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	No. H.T. With Complete Data	Average Axle Load, pounds			Average GVW, pounds	Average Axle Spacing, feet		Average Wheel Base, feet	Maximum GVW Reported, pounds	MGVW / AGVW	Min. & Max. Wheel Base Lengths, feet
		A	B	C		A-B	B-C				
1942-1948											
Region I	429	6,700	14,600	11,900	33,200	14.3	4.2	18.5	56,040	1.69	11.9-25.0
II	48	5,200	14,700	11,400	31,800	13.3	4.2	17.5	42,600	1.36	14.8-21.5
III	141	6,500	14,000	12,100	32,600	13.7	4.1	17.8	58,200	1.79	12.0-24.8
IV	152	6,000	14,000	12,300	32,300	14.1	3.9	18.0	56,400	1.75	14.3-23.4
U. S.	770	6,400	14,400	12,000	32,800	14.1	4.1	18.2	58,200	1.77	11.9-25.0
1948-1949											
Region I	366	6,900	15,400	13,700	36,000	13.9	4.2	18.1	74,700	2.08	14.1-22.7
II	146	6,400	14,000	12,700	33,100	13.3	4.3	17.6	54,800	1.66	14.3-29.8
III	243	6,300	13,800	12,500	32,600	13.1	3.9	17.0	60,200	1.85	13.3-27.0
IV	545	7,100	12,800	12,100	32,000	14.6	4.0	18.6	56,840	1.78	12.7-31.0
U. S.	1,300	6,800	13,900	12,700	33,400	14.0	4.1	18.1	74,700	2.24	12.7-31.0
1954											
Region I	105	9,400	18,900	18,100	46,400	13.2	4.2	17.4	79,300	1.71	15.0-28.0
II	130	7,100	16,400	15,100	38,600	13.4	4.3	17.7	51,800	1.34	13.0-28.8
III	120	7,900	14,200	13,800	35,900	13.1	4.1	17.1	50,800	1.42	13.0-24.0
IV	279	8,600	13,700	13,100	35,400	15.0	4.2	19.2	57,400	1.62	13.8-24.0
U. S.	634	8,300	15,200	14,500	38,000	14.0	4.2	18.2	79,300	2.09	13.0-28.8

TABLE 3.17
ANALYSIS OF TYPE 2-S1 HEAVY TRUCKS WEIGHED BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	No. H.T. With Complete Data	Average Axle Load, pounds			Average GVW, pounds	Average Axle Spacing, feet		Average Wheel Base, feet	Maximum GVW Reported, pounds	MGVW / AGVW	Min. & Max. Wheel Base Lengths, feet
		A	B	C		A-B	B-C				
1942-1943											
Region I	2,454	6,000	18,200	17,900	42,100	12.0	18.0	30.0	70,880	1.68	19.0-56.5
II	800	4,600	16,600	16,800	38,000	11.8	18.6	30.4	66,280	1.74	22.4-43.7
III	2,371	4,900	16,300	16,700	37,900	10.7	16.5	27.2	75,600	1.99	18.2-41.6
IV	434	5,100	17,000	16,700	38,800	12.6	17.6	30.2	59,150	1.52	20.5-42.5
U. S.	6,059	5,300	17,200	17,200	39,700	11.5	17.5	29.0	75,600	1.90	18.2-56.5
1948-1949											
Region I	4,105	6,400	18,900	18,300	43,600	12.2	20.0	32.2	84,000	1.93	20.2-48.1
II	3,245	5,300	17,500	17,400	40,200	12.0	20.7	32.7	65,620	1.63	19.8-56.3
III	4,225	5,100	17,200	17,300	39,600	11.7	19.4	31.1	64,000	1.62	17.0-45.4
IV	828	5,300	17,400	17,500	40,200	12.6	18.5	31.1	61,400	1.53	19.5-50.1
U. S.	12,403	5,600	17,900	17,700	41,200	12.0	19.9	31.9	84,000	2.04	17.0-56.3
1954											
Region I	1,276	6,900	19,900	19,500	46,300	12.1	20.6	32.7	74,760	1.61	21.0-48.0
II	901	5,500	17,400	18,000	40,900	11.8	20.4	32.2	66,080	1.62	21.8-61.0
III	790	5,600	16,800	17,000	39,400	11.6	21.1	32.7	50,200	1.27	18.8-42.0
IV	265	5,700	17,500	17,800	41,000	12.8	19.7	32.5	60,400	1.47	22.1-49.5
U. S.	3,232	6,100	18,200	18,300	42,600	12.0	20.5	32.5	74,760	1.75	18.8-61.0

TABLE 3.18
ANALYSIS OF TYPE 2-S2 HEAVY TRUCKS WEIGHED BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	No. H.T. With Complete Data	Average Axle Load, pounds				Average GVW, pounds	Average Axle Spacing, feet			Average Wheel Base, feet	Maximum GVW Reported, feet	MGVW / AGVW	Min. & Max. Wheel Base Lengths, feet
		A	B	C	D		A-B	B-C	O-E				
1942-1943													
Region I	23	7,500	19,800	13,600	14,400	55,300	12.1	17.2	4.0	33.3	64,080	1.20	27.5-41.4
II	29	5,300	17,500	13,200	13,000	49,000	11.9	16.8	4.0	32.7	64,000	1.31	26.5-40.8
III	258	5,300	15,400	12,400	12,100	45,200	11.2	14.8	4.0	30.0	66,400	1.47	22.8-48.0
IV	593	5,600	16,300	13,300	12,900	48,100	12.9	16.6	3.7	33.2	70,000	1.46	26.4-47.0
U. S.	903	5,500	16,200	13,100	12,700	47,500	12.4	16.1	3.8	32.3	70,000	1.47	22.8-48.0
1948-1949													
Region I	571	7,200	19,600	15,500	15,600	57,900	12.5	18.3	4.2	35.0	104,000	1.80	23.9-48.0
II	1,342	6,300	17,200	13,500	13,600	50,600	12.3	18.1	4.1	34.5	91,800	1.81	23.5-47.7
III	4,238	6,300	17,200	14,000	14,000	51,500	12.1	17.9	4.1	34.1	85,000	1.65	21.8-51.4
IV	1,395	6,500	17,100	13,300	13,300	50,200	13.3	18.3	4.1	35.7	88,000	1.75	23.0-53.2
U. S.	7,546	6,400	17,300	13,900	14,000	51,600	12.4	18.0	4.1	34.5	104,000	2.02	21.8-53.2
1954													
Region I	1,440	7,100	17,200	14,000	14,000	52,300	12.1	18.9	4.0	35.0	87,620	1.68	25.0-57.0
II	2,825	6,600	16,700	14,300	14,600	52,200	12.2	18.4	4.1	34.7	80,660	1.55	23.2-58.0
III	3,698	6,800	17,100	14,200	14,400	52,500	12.1	18.3	4.1	34.5	75,600	1.44	21.5-48.0
IV	1,031	7,000	17,400	14,800	15,100	54,300	12.9	18.6	4.0	35.6	74,780	1.38	26.0-66.9
U. S.	8,994	6,800	17,000	14,300	14,500	52,600	12.2	18.5	4.1	34.8	87,620	1.67	21.5-66.9

TABLE 3.19
ANALYSIS OF TYPE 3-S2 HEAVY TRUCKS WEIGHED BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	No. H.T. With Complete Data	Average Axle Load, pounds					Average GVW, pounds	Average Axle Spacing, feet				Average Wheel Base, feet	Maximum GVW Reported, pounds	MGVW / AGVW	Min. & Max. Wheel Base Lengths, feet
		A	B	C	D	E		A-B	B-C	C-D	D-E				
1942-1943															
Region I															
II	3	6,700	11,300	11,000	14,100	14,300	57,400	12.7	3.7	17.4	3.8	37.6	60,700	1.06	36.1-36.1
III	3	6,900	13,200	9,500	13,100	10,900	53,600	10.1	4.9	14.9	4.2	34.1	60,600	1.13	31.5-37.7
IV	266	7,800	14,400	11,300	13,100	12,900	59,500	14.1	4.0	17.8	3.9	39.8	91,800	1.54	28.3-54.3
U. S.	272	7,700	14,400	11,300	13,100	12,900	59,400	14.0	4.0	17.8	3.9	39.7	91,800	1.55	28.3-54.3
1948-1949															
Region I	5	9,100	12,500	13,600	13,800	14,300	63,300	11.7	4.3	24.2	3.6	43.8	82,700	1.31	41.8-45.6
II	5	9,200	13,900	14,400	12,300	12,600	62,400	13.3	4.4	20.7	4.0	42.4	80,880	1.30	33.8-48.8
III	244	8,200	13,800	12,500	14,100	13,700	62,300	11.7	4.2	20.2	4.1	40.2	93,700	1.50	32.6-54.3
IV	1,631	8,500	14,000	12,200	12,800	12,700	60,200	15.2	4.3	21.6	4.1	45.2	149,000	2.50	29.1-64.1
U. S.	1,885	8,400	14,000	12,300	13,000	12,800	60,500	14.7	4.3	21.4	4.1	44.5	149,000	2.46	29.1-64.1
1954															
Region I	12	7,700	13,700	12,500	13,300	12,800	60,000	11.2	4.3	20.0	4.0	39.5	74,000	1.23	34.0-48.0
II	32	8,200	13,500	13,000	14,200	14,200	63,100	12.6	4.3	20.0	4.1	41.0	84,000	1.33	35.0-49.0
III	956	8,200	13,500	13,400	13,700	13,800	62,600	10.9	4.1	20.9	4.2	40.1	87,700	1.40	25.9-52.7
IV	1,973	8,500	14,600	14,000	14,400	14,300	65,800	14.6	3.9	21.4	3.8	43.7	101,680	1.55	30.7-62.0
U. S.	2,973	8,400	14,300	13,800	14,100	14,100	64,700	13.4	4.0	21.2	3.9	42.5	101,680	1.57	25.9-62.0

TABLE 3.20
ANALYSIS OF TYPE 3-3 HEAVY TRUCKS WEIGHED BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Region	No. H.T. With Complete Data	Average Axle Load, pounds						Average GVW, pounds	Average Axle Spacing (feet)					Average Wheel Base, feet	Maximum GVW Reported, pounds	MGVW / AGVW	Min. & Max. Wheel Base Lengths, feet
		A	B	C	D	E	F		A-B	B-C	C-D	D-E	E-F				
1942-1943																	
Region I																	
II																	
III																	
IV	377	8,800	12,500	10,800	11,200	9,600	9,700	62,600	16.6	4.1	13.6	13.3	4.0	51.6	92,800	1.47	40.2-61.3
U. S.	377	8,800	12,500	10,800	11,200	9,600	9,700	62,600	16.6	4.1	13.6	13.3	4.0	51.6	92,800	1.47	40.2-61.3
1948-1949																	
Region I																	
II																	
III																	
IV	1,145	8,900	12,800	11,600	11,400	9,200	9,400	63,300	16.2	4.2	14.1	15.0	4.1	53.6	132,500	2.10	42.8-62.0
U. S.	1,145	8,900	12,800	11,600	11,400	9,200	9,400	63,300	16.2	4.2	14.1	15.0	4.1	53.6	132,500	2.10	42.8-62.0
1954																	
Region I																	
II																	
III																	
IV	185	9,200	14,300	13,200	13,700	10,500	10,700	71,600	16.0	4.3	14.2	15.8	4.1	54.4	83,300	1.16	48.0-59.9
U. S.	185	9,200	14,300	13,200	13,700	10,500	10,700	71,600	16.0	4.3	14.2	15.8	4.1	54.4	83,300	1.16	48.0-59.9

gross weight of these vehicles increased more than five thousand pounds but the average wheel base lengths remained about the same during the 12-year period from 1942-43 to 1954.

Tables 3.17 through 3.20 give the analyses for average type 2-S1, 2-S2, 3-S2, and 3-3 heavy trucks, respectively, for the three trend periods, by AASHO regions and for the United States. In the case of the type 2-S1, 2-S2, and 3-S2 heavy trucks, it will be seen that their average gross weights have increased by some 3000 to 5000 pounds, respectively; whereas, the average gross weight of the type 3-3 heavy trucks increased some 10,000 pounds during the same period. It also appears that the average wheel base lengths of these four vehicle types increased about 3 feet. This increase in wheel base is highly desirable since the greater the wheel base of vehicles of given weights, the less severe will be the stresses they produce in bridges and other highway structures. On the other hand, the longer wheel bases result in greater clearance requirements to maneuver around turns. Undoubtedly, restrictions on turning radii and other maneuvering clearances in some measure account for the shorter legal maximum wheel bases permitted in the older urban states, largely in Region 1.

Part IV

TRENDS IN SINGLE AND TANDEM AXLE LOADS

4.1 SINGLE AND TANDEM AXLE LOAD DATA

Table 4.1 gives the number of axles having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads for each of the three trend periods — 1942-43, 1948-49, and 1954 —by AASHO regions and for the United States. Parts a, b, and c of Figure 4.1 present similar data and include that given in Table 4.1 in the form of graphical comparisons of single axle load frequencies by AASHO regions for 1942-43, 1948-49, and 1954, respectively.

Table 4.2 gives the number of 2-axle tandems having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads for each trend period by AASHO regions and for the United States. Parts a, b, and c of Figure 4.2 present similar data and include that given in Table 4.2 in the form of graphic comparisons of tandem axle load frequencies by AASHO regions for 1942-43, 1948-49, and 1954, respectively.

4.2 SINGLE AXLE LOAD FREQUENCIES

Table 4.1 gives the number of axles having gross weights equal to or greater than stated values—from 18,000 to 28,000 pounds, respectively — per 1000 heavy trucks on main rural roads, for each of the three trend periods, by AASHO regions and for the United States. Only a casual inspection of Table 4.1 is required to observe that the frequencies of heavy axle loads of all weights from 18,000 to 28,000 pounds increased greatly from 1942-43 to 1948-49. The lone exception was in Region 4, where the frequencies of axles of more than 18,000 pounds continued to increase until 1954; it is highly significant to note that in Region 4 the frequencies of axle loads in excess of 20,000 pounds were materially lower in 1954 than they were in 1942-43.

Table 4.1 also brings out rather clearly some of the effects of state legal maximum limits of motor vehicle sizes and weights on heavy truck operation in the eastern as compared with the western regions of the United States. The contrasts in legal limits and their effects on heavy truck operation in the eastern as compared with the western states are discussed at some length in Part V of this report. Suffice it to say here that it is these contrasts in legal limits which account for the extremely high frequencies of the heavier axle loads in Region 1 as compared with those of corresponding weights in Region 4. For example, in 1954 there were more than 12 times as many axles of 22,000 pounds

TABLE 4.1
NUMBER OF AXLES HAVING GROSS WEIGHTS EQUAL TO OR GREATER THAN STATED VALUES PER 1,000 HEAVY TRUCKS ON MAIN RURAL ROADS BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Years	Region	Axle Weight, pounds						Maximum Single Axle Wt., pounds
		18,000	20,000	22,000	24,000	26,000	28,000	
1942-43		1,025	604	303	137	53	19	44,000
1948-49	1	1,657	1,168	677	331	150	66	38,000
1954		1,227	767	385	162	69	29	44,000
1942-43		789	241	64	16	6	1	30,000
1948-49	2	1,265	436	207	72	21	7	32,000
1954		907	286	70	19	5	2	40,000
1942-43		695	185	39	8	4	2	40,000
1948-49	3	930	304	85	24	7	3	34,000
1954		712	118	10	2	1	1	32,000
1942-43		474	140	40	15	5	3	32,000
1948-49	4	603	219	82	31	12	5	36,000
1954		667	140	31	7	2	1	36,000
1942-43		767	327	135	57	22	9	44,000
1948-49	U.S.	1,038	487	218	93	39	17	38,000
1954		834	276	95	36	14	6	44,000

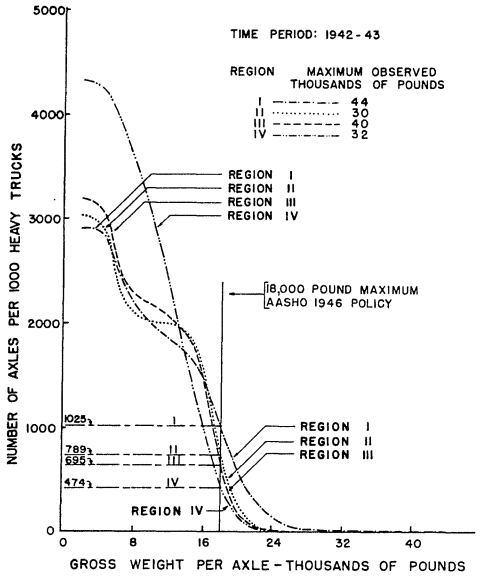


Figure 4.1a. Number of axles having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions—for 1942-43.

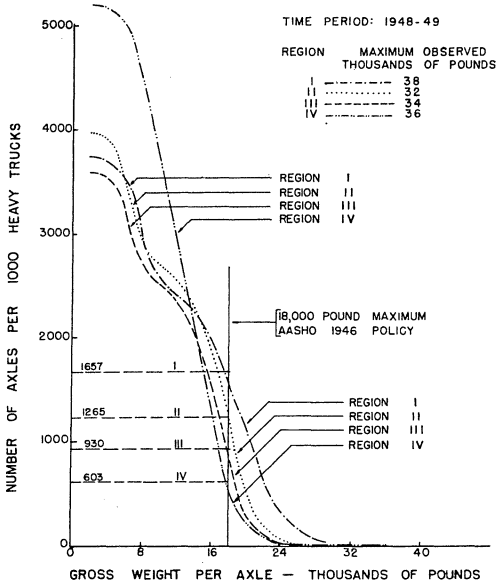


Figure 4.1b. Number of axles having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions—for 1948-49.

or more and nearly 30 times as many axles of 26,000 and 28,000 pounds or more, respectively, per 1000 heavy vehicles in Region 1 than were reported in Region 4. In connection with Table 3.1 it might be well to point out also that in 1954 the heaviest single axle loads reported by Regions 1 and 4 were 44,000 and 36,000 pounds, respectively.

For visual comparison, parts a, b, and c of Figure 4.1 give the number of axles having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions for each of the three trend periods, respectively. In each of these figures it will be noted that the 18,000-pound maximum axle load, as recommended by the 1946 AASHO policy, was exceeded quite frequently in each of the four AASHO regions. In each of the three trend periods these figures show that the highest incidence of heavy axle loads occurs in Region 1, whereas the lowest occurs in Region 4, with Regions 2 and 3 falling in between and in that order. In connection with Figure 4.1 it is interesting to note that the cumulative frequencies of single axle loads in Region 4 result in remarkably smooth ogival curves, indicating that axle loads in this region approach a normal distribution. It also is interesting to note that the

TABLE 4.2
NUMBER OF TWO AXLE TANDEMS HAVING GROSS WEIGHTS EQUAL TO OR GREATER THAN STATED VALUES PER 1,000 HEAVY TRUCKS ON MAIN RURAL ROADS BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

Years	Region	Tandem Axle Weights, pounds						Maximum Tandem Axle Wt., pounds
		32,000	34,000	36,000	38,000	40,000	42,000	
1942-43		25	14	9	4	3	1	44,000
1948-49	1	83	65	51	35	26	17	60,000
1954		162	115	74	44	25	15	64,000
1942-43		16	5	2				36,000
1948-49	2	86	64	42	28	17	11	60,000
1954		249	136	62	26	10	3	44,000
1942-43		16	11	6	3	2	1	52,000
1948-49	3	149	87	51	26	13	7	52,000
1954		276	58	17	5	2	1	46,000
1942-43		103	54	31	12	7	4	48,000
1948-49	4	164	84	42	24	14	8	70,000
1954		425	132	50	22	11	5	48,000
1942-43		40	21	12	5	3	2	52,000
1948-49	U.S.	130	78	47	28	16	10	70,000
1954		290	105	46	21	10	5	64,000

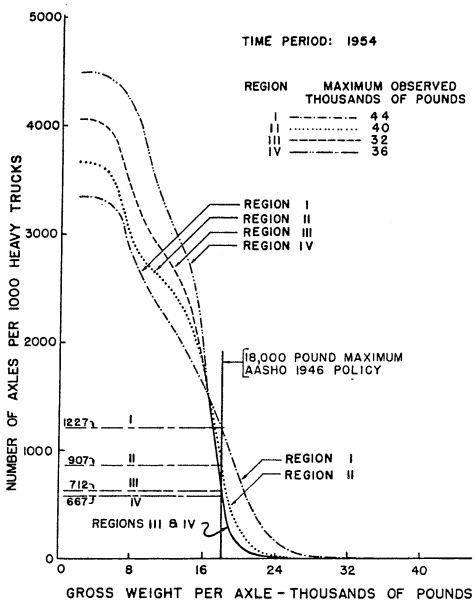


Figure 4.1c. Number of axles having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions—for 1954.

corresponding curves for Regions 1, 2, and 3 show very pronounced bumps, which indicate that the axle loads in these regions did not approach normal distributions during any of the three trend periods. This can be explained by the fact that the front axle loads in these regions are so much lighter, by comparison, than the other heavy truck axle.

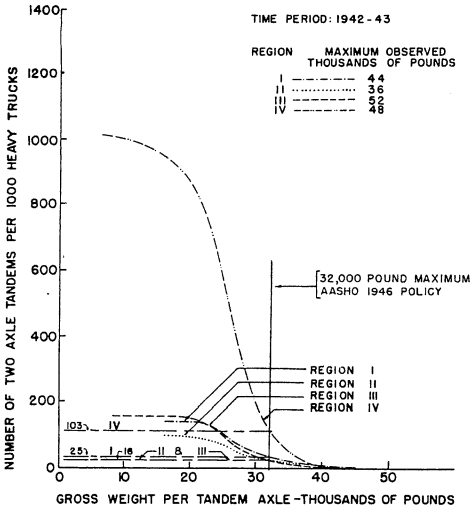


Figure 4.2a. Number of two-axle tandems having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions—for 1942-43.

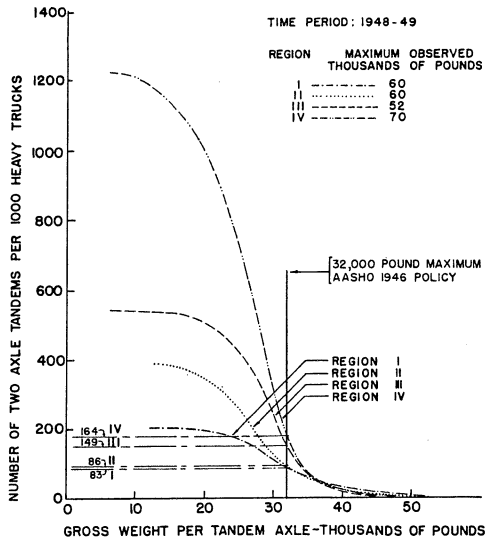


Figure 4.2b. Number of two-axle tandems having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions—for 1948-49.

4.3 TANDEM AXLE LOAD FREQUENCIES

For visual comparison, parts a, b, and c of Figure 4.2 give the number of tandem axles having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions for each of the three trend periods, respectively. In each of these figures it will be noted that the 32,000-pound

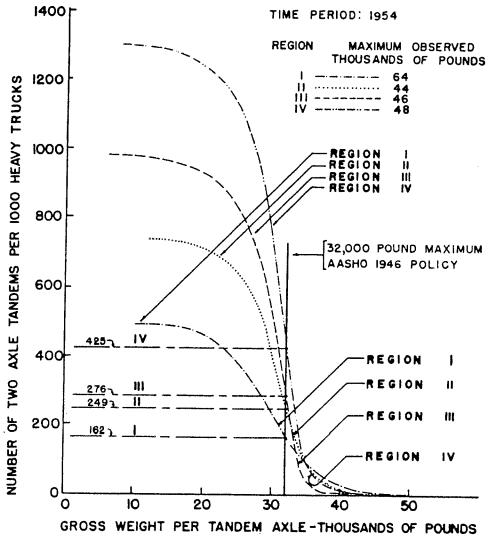


Figure 4.2c. Number of two-axle tandems having gross weights equal to or greater than stated values per 1000 heavy trucks on main rural roads by AASHO regions—for 1954.

maximum tandem axle load, as recommended by the 1946 AASHO policy, is exceeded quite frequently in each of the four AASHO regions. From these three parts of Figure 4.2, as well as from Table 4.2, it will be seen that the frequencies of tandem axle loads of 32,000 pounds or more increased continuously in each region throughout the 12-year period from 1942-43 to 1954.

4.4 TRENDS IN AXLE LOADS RELATED TO HIGHWAY PROVISION

The trends toward heavier and more frequent single and tandem axle loads indicated by Tables 4.1 and 4.2 (also by Figures 4.1 and 4.2), respectively, are extremely important in the planning of present and future highway facilities because increases in either the magnitudes or frequencies of these loads result in corresponding increases in the cost of highway provision, i.e., the planning and furnishing of highway facilities commensurate with their service requirements. This is true since both the magnitude and frequency of various intensities of such axle loads are among the more important factors considered in the establishment of design standards for pavements, base courses, and subgrades. Similarly, the frequencies of various magnitudes of axle group loads as well as the frequencies of various magnitudes of heavy truck loads are among the more important factors which determine the design standards for highway bridges.

Part V

COMPARISON OF EASTERN WITH WESTERN HEAVY TRUCK OPERATION

5.1 DIVERGENT LIMITATIONS ON MOTOR VEHICLE SIZES AND WEIGHTS

In the field of state motor vehicle regulation, there are two generally divergent types of legislation governing the limitation of motor vehicle sizes and weights. Although both of these types of limitation prohibit vehicle operation above certain specified maximum levels, they differ not only in basic concept of the relative need for load limitation on existing highways and bridges, but also in fundamental evaluation of the influence of heavy trucks upon both highway provision and traffic. The types of regulation incident to these basically divergent views not only differ in the kind of limitation prescribed but also the actual levels specified. Characteristic of the distinction between these two types of limitation is the difference in the size and weight laws of the eastern and western states.

Certain of the contrasts between motor vehicle regulation in the eastern and western states are indicated in Table 5.1, which gives the composite limitations on heavy motor vehicle maximum sizes and weights for the years 1946 and 1958 as compared with AASHO Policy of 1946. A more complete discussion of Table 5.1 is given in the following section. In the eastern group of states, size and weight legislation tends generally toward the permissible use of relatively heavy axle loads, the benefits of which, however, are restricted to a comparatively small number of vehicle types by rather low specified limits on gross vehicle weights and relatively short maximum permitted vehicle lengths. Under this type of restriction, which omits reference to axle group loads other than tandem axles, the gross weight differential between 2 and 3-axle trucks is narrowed by the heavier single axle permitted to such an extent that it greatly reduces the pay load advantage of tandem axles. Similarly, the advantages of multiple-axle combinations are largely nullified since the permitted gross weights can be readily realized by use of a limited number of heavier single-axle loads. The resulting typical heavy truck operation in the eastern states—which reflects the tendency to discourage the use of vehicles with more than one set of tandem axles and other multiple-axle vehicle combinations — is substantially confined to three rather definite classes of vehicles. These are the 2-axle trucks operating in the wheel base range under 30 feet and the 2-S1 and 2-S2 truck tractor semitrailer combinations in the wheel base range under 40 feet.

In contrast with the size and weight restriction employed in the eastern states, the western states uniformly limit axle loads to a maximum of 18,000 pounds (plus a small per cent legal tolerance in some states) but allow relatively heavy gross vehicle weights, provided the spacing of axle group loads conforms to the requirements imposed by a typical bridge type formula similar to those referred to in Notes 1 and 3 at the bottom of Table 5.1. The gross vehicle weights permitted for the multiple axle combinations, which vary with the arrangement and spacing of axles, are far in excess of those permitted in the eastern states. Also, within the greater vehicle lengths allowed the improved opportunity for better load distribution is calculated to encourage the use of tandem-axle vehicles and other multiple-axle combinations.

Another important point that might be mentioned here is that the western procedure allows more leeway for designing vehicles for heavy loads without overstressing bridges and other highway structures. In this connection, though, it might be pointed out that one reason for im-

posing the state's length limit in the East is the higher proportion of travel in crowded urban areas. This is mitigated, in part, for the truckers by allowing heavier axle loads.

5.2 COMPOSITE LIMITATIONS OF THE EASTERN AND WESTERN STATES

The trends in state legal maximum limits of motor vehicle sizes and weights are briefly discussed above in Section 3.4. A summary of the regional maximum vehicle lengths and maximum axle loads and their comparison with the AASHO 1946 policy recommendations is given in Figures 3.3 and 3.4, respectively. More complete summaries of regional average legal maximum limits of motor vehicle sizes and weights—and how they compare with the AASHO 1946 policy—are given in Appendix A.

Under the two contrasting types of size and weight legislation which obtain in the eastern and western states, respectively, the maximum heavy truck operation permitted in 1946 and 1958 is shown in Table 5.1, which compares the composite limitations of eastern with western states at those points in time. Composite limitations for other regions and other points in time are given in Appendix A.

For comparison with states which limit weight on the basis of specified amounts, calculations of practical maximum gross vehicle weights by a bridge formula of the Type W = C(L + 40), as shown for the western states, are based on permitted overall vehicle lengths less an assumed overhang of eight feet in order to arrive at the practical maximum wheel base lengths, L, for use in the formula.

Typical western operation is the logical consequence of the formula type of restriction and accentuates the contrast the operation resulting from the typical size and weight limitations which generally obtain in the eastern states. Eighteen separate vehicle types were utilized in western operation as against only six or seven in the East, as will be seen by referring to Table 3.10. Against the two or three predominant types in the East, there are six major heavy truck types in western operation, four of which are with tandem axles; these are the 3-axle truck, the 3-axle, 4-axle and 5-axle truck tractor semitrailers, the 5-axle (type 3-2) truck trailer combination, and the 5-axle type 2-S1-2 combination. In lieu of the three vehicle types to which eastern operation is largely confined, six or more are used in the West in which multiple-axle vehicles predominate: 3-axle trucks in the wheel base range under 30 feet; semitrailer combinations in the range of 30 to 50 feet; full trailer combinations in the range of 40 to 60 feet; and double combinations in the range of 50 to 60 feet.

TABLE 5.1
COMPOSITE LIMITATIONS ON HEAVY MOTOR VEHICLE MAXIMUM SIZES AND WEIGHTS
(A Comparison of Eastern with Western Heavy Motor Vehicle Operation)

	1946		1958		1946 AASHO Policy
	Eastern	Western	Eastern	Western	
			Length of Vehicle, feet		
Single Unit	38.7	36.4	40.0	37.5	35.0
Truck Tractor Semitrailer	47.1	55.9	48.8	59.2	50.0
Other Combinations	49.5	58.6	54.0	60.8	60.0
			Axle Load, pounds		
Single	20,622	18,000	22,313	18,915	18,000
Tandem	32,250	29,475	36,140	33,194	32,000
			Practical Maximum GVW, pounds		
Two-axle Truck	29,767	26,083	30,285	26,877	26,000
Three-axle Truck	40,917	38,375	43,783	40,717	40,000
3-axle Truck Tractor Semitrailer	45,883	43,500	51,562	46,062	44,000
4-axle Truck Tractor Semitrailer	47,158	52,708	61,433	59,813	55,470
5-axle Truck Tractor Semitrailer	47,313	62,400	61,991	71,737	61,490
Other Combinations	53,886	69,442	65,591	75,772	71,900

Notes on maximum vehicle weights:

1. The maximum vehicle weights recommended by the 1946 AASHO Policy are given by the equation $W = 1025 (L+24) - 3L^2$, in which L is the wheel base length or the distance in feet between the extremes of any group of axles.

2. In the eastern states, maximum vehicle weights are generally determined by flat rate allowances of specified amount for each vehicle type.

3. In the western states, maximum vehicle weights are generally determined by a formula similar to the 1946 AASHO Policy equation given above; or by a formula of the type $W = C(L+40)$, with values of C from about 700 to 850.

This use of a wide variety of multiple axle vehicle types in the West naturally results in a larger average number of axles per vehicle than that which results from the much smaller number of heavy truck types used in the East. For example, it will be seen in Table 3.10 for 1954 that the average number of axles per vehicle in the western states was 4.5 as compared with 3.3 in the eastern states.

In order to assist in the evaluation of the influence of the two divergent types of size and weight limitation upon heavy truck operation in the East and West, several analyses of the loadometer data reported for eastern and western states have been made for comparison. These studies follow immediately.

5.3 COMPARATIVE DATA ON EASTERN AND WESTERN HEAVY TRUCK OPERATION

The distributions of vehicles in total traffic in eastern and western states for each of the three trend periods — 1942-43, 1948-49 and 1954 —are given in Table 5.7. Perhaps the most significant thing indicated by these data is that in each trend period both the incidence of heavy trucks among all freight vehicles and the incidence of heavy trucks in total traffic was higher by some 15 per cent or more in the East than in the West. The higher incidence of heavy trucks in the East may be partially accounted for by the fact that more heavy trucks are required to accomplish a given amount of gross vehicle weight haulage in eastern as compared with western heavy truck operation. This is more fully explained in the discussion of the data given in Table 5.7.

Table 5.2 gives the distribution of heavy trucks by vehicle type groups for the three trend periods, based on average operation at loadometer stations in the East and West respectively. Similar data for the United States are also given in Table 3.12, in which it will be seen that the greatest contrasts are between eastern and western states. The data in Table 5.2 show that single unit trucks during the 12-year period from 1942-43 to 1954 accounted for some 15 to 24 per cent of all heavy vehicles in the East as compared with only 8 to 12 per cent in the West during the same period. It is also of interest to note that truck trailer and other combinations accounted for 22 to 32 per cent of all heavy vehicles in the West, whereas there were practically no vehicles of these types in the eastern states during that period.

Table 5.3 gives the distribution of heavy trucks by numbers of axles per vehicle for the three trend periods based on 1000 hours average operation at loadometer stations in the East and West, respectively. These data show very clearly that in spite of the trend toward an increase in the average number of axles per vehicle in the eastern states, even in 1954, nearly 100 per cent of the heavy vehicles in the East had four axles or less per vehicle, whereas some 85 per cent of such vehicles in the western states had four or more axles per vehicle.

TABLE 5.2
DISTRIBUTION OF HEAVY MOTOR VEHICLES BY TYPE GROUPS
(A Comparison of Eastern with Western Heavy Motor Vehicle Operation Based on 1,000 Hours Average Operation at Loadometer Stations)

Vehicle Type Group	Eastern States		Western States	
	Number	Per Cent	Number	Per Cent
		1942-43		
Trucks	1,236	23.95	203	8.32
Truck Tractor Semitrailers	3,918	75.93	1,452	59.51
Other Combinations	6	.12	785	32.17
All	5,160	100.00	2,440	100.00
		1948-49		
Trucks	2,557	20.42	640	12.19
Truck Tractor Semitrailers	9,950	79.47	3,018	57.49
Other Combinations	13	.11	1,592	30.32
All	12,520	100.00	5,250	100.00
		1954		
Trucks	1,844	14.45	577	9.95
Truck Tractor Semitrailers	10,901	85.43	3,927	67.71
Other Combinations	15	.12	1,296	22.34
All	12,760	100.00	5,800	100.00

TABLE 5.3
DISTRIBUTION OF HEAVY MOTOR VEHICLES BY NUMBER OF AXLES
(A Comparison of Eastern with Western Heavy Motor Vehicle Operation Based on 1,000 Hours Average Operation at Loadometer Stations)

Number of Axles Per Vehicle	Eastern States		Western States	
	Number	Per Cent	Number	Per Cent
		1942-43		
2	553	10.72	30	1.23
3	4,565	88.46	640	26.23
4	39	.76	813	33.32
5	3	.06	476	19.51
6			473	19.38
7			8	.33
All	5,160	100.00	2,440	100.00
		1948-49		
2	1,780	14.22	219	4.17
3	9,501	75.89	1,060	20.19
4	1,226	9.79	1,228	23.39
5	13	.10	1,800	34.29
6			941	17.92
7			2	.04
All	12,520	100.00	5,250	100.00
		1954		
2	1,422	11.14	245	4.22
3	5,512	43.20	648	11.77
4	5,779	45.29	1,294	22.31
5	47	.37	3,369	58.10
6			242	4.17
7			2	.03
All	12,760	100.00	5,800	100.00

Table 5.4 gives the distribution of heavy trucks by wheel base ranges for the three trend periods based on 1000 hours average operation at loadometer stations in the East and West, respectively. Perhaps the most important thing indicated by these data is that in 1954 over 98 per cent of the heavy truck operation in the eastern states was accomplished with vehicles having wheel base lengths of less than 40 feet, whereas some 63 per cent of the heavy truck operation in the West was done with vehicles having wheel base lengths of 40 feet or more. It is this concentration of the heavier vehicle loads on shorter wheel base lengths that results in the higher stress producing characteristics of the heavy trucks—measured in terms of equivalent H truck loadings on single span bridges — in the East as compared with those in the West.

Table 5.5 shows the average weight per vehicle and per axle by vehicle type groups for each of the three trend periods in the East and West, respectively. It is significant to note here that the average vehicle weights in the western states are in practically all cases heavier than in those in the eastern states. However, in spite of the heavier gross vehicle weights in the West, it is important to note that the average axle loads for all vehicle type groups in each of

TABLE 5.4
DISTRIBUTION OF HEAVY MOTOR VEHICLES BY WHEEL BASE RANGES
(A Comparison of Eastern with Western Heavy Motor Vehicle Operation Based on 1,000 Hours Average Operation at Loadometer Stations)

Wheel Base Range, feet	Eastern States		Western States	
	Number	Per Cent	Number	Per Cent
		1942-43		
Under 30	3,203	62.08	523	21.43
30-39.9	1,934	37.49	966	39.59
40-49.9	18	.34	528	21.64
50-59.9	5	.09	409	17.06
60 and over	0	0	14	.28
All	5,160	100.00	2,440	100.00
		1948-49		
Under 30	4,773	38.12	1,004	19.12
30-39.9	7,618	60.85	1,394	26.55
40-49.9	129	1.03	1,443	27.49
50-59.9	0	0	1,403	26.73
60 and over	0	0	6	.11
All	12,520	100.00	5,250	100.00
		1954		
Under 30	3,028	23.73	689	11.88
30-39.9	9,509	74.52	1,462	25.20
40-49.9	219	1.72	1,763	30.40
50-59.9	4	.03	1,875	32.33
60 and over	0	0	11	.19
All	12,760	100.00	5,800	100.00

TABLE 5.5
AVERAGE GROSS WEIGHT PER VEHICLE AND PER AXLE BY VEHICLE TYPE GROUPS
(A Comparison of Eastern with Western Heavy Motor Vehicle Operation Based on Average Operation at Loadometer Stations)

Vehicle Type Group	Eastern States		Western States	
	Vehicle Pounds	Axle Pounds	Vehicle Pounds	Axle Pounds
		1942-43		
Trucks	31,410	12,305	31,753	11,133
Truck Tractor Semitrailers	42,221	14,038	47,759	12,138
Other Combinations	55,617	12,359	57,535	10,718
All	39,647	13,664	49,573	11,513
		1948-49		
Trucks	31,266	13,571	30,152	11,345
Truck Tractor Semitrailers	45,366	14,521	52,332	12,412
Other Combinations	55,646	13,153	63,327	11,618
All	42,497	14,368	53,153	12,033
		1954		
Trucks	32,751	14,694	32,131	12,476
Truck Tractor Semitrailers	49,532	14,002	60,161	13,299
Other Combinations	51,300	12,825	72,822	14,150
All	47,109	14,067	60,201	13,470

the three trend periods were less in the West than in the East. This is accounted for by the fact that the average number of axles per vehicle in western operation has been much larger over a long period of years than that which has been characteristic of eastern operation.

Table 5.6 gives the average gross weight per vehicle and per axle by number of axles per vehicle in the eastern and western states, respectively, for each of the three trend periods. Here again it will be noted that the average vehicle weight for each trend period is greater in the West than in the East, but at the same time the corresponding average axle loads are less in the West than in the East. This is further evidence of the effects which result from the divergent types of legislation governing heavy truck operation in the East as compared with the West.

Table 5.7 gives the heavy truck operating statistics for eastern as compared with western operation based on the haulage of one million pounds of gross vehicle weights during each of the three trend periods. This is but another way of comparing eastern with western heavy motor vehicle operation based on the heavy truck data reported by the loadometer stations during each of the three trend periods. In each trend period it is significant to note that about 80 per cent as many vehicles are required in western as compared with eastern operation for the same magnitude of gross weight haulage. This results from the higher average gross

TABLE 5.6
AVERAGE GROSS WEIGHT PER VEHICLE AND PER AXLE BY NUMBER OF VEHICLES
(A Comparison of Eastern with Western Heavy Motor Vehicle Operation Based on Average Operation at Loadometer Stations)

Number of Axles Per Vehicle	Eastern States		Western States	
	Vehicle Pounds	Axle Pounds	Vehicle Pounds	Axle Pounds
		1942-43		
2	29,200	14,600	28,600	14,300
3	40,767	13,589	37,044	12,348
4	55,252	13,813	48,240	12,060
5	56,535	11,307	57,035	11,407
6			62,400	10,400
7			63,224	9,032
All	39,647	13,664	49,573	11,513
		1948-49		
2	29,200	14,600	26,600	13,300
3	42,978	14,326	36,942	12,314
4	57,856	14,464	50,576	12,644
5	62,725	12,545	62,480	12,496
6			63,024	10,504
7			93,597	13,371
All	42,497	14,368	53,153	12,033
		1954		
2	28,700	14,350	27,700	13,850
3	46,308	15,436	38,130	12,710
4	52,296	13,074	54,132	13,533
5	60,000	12,000	68,315	13,663
6			42,348	7,058
7			80,948	11,564
All	47,109	14,067	60,201	13,470

TABLE 5.7
HEAVY MOTOR VEHICLE OPERATING STATISTICS BASED ON THE HAULAGE OF 1,000,000 POUNDS OF GROSS VEHICLE WEIGHTS
(A Comparison of Eastern with Western Heavy Motor Vehicle Operation Based on Average Operation at Loadometer Stations)

Item	Eastern Operation	Western Operation	Western as Per Cent of Eastern Operation
		1942-43	
Total traffic volume	819	889	108.5
Total number of trucks and combinations	205	191	93.2
Heavy vehicle data:			
Number	25.2	20.2	80.0
Average gross weight, pounds	39,647	49,573	125.0
Average number of axles per vehicle	2.902	4.306	148.4
Total number of axles	73	87	119.2
Average load per axle, pounds	13,664	11,513	84.3
		1948-49	
Total traffic volume	774	735	95.0
Total number of trucks and combinations	148	141	95.3
Heavy vehicle data:			
Number	23.5	18.8	79.9
Average gross weight, pounds	42,497	53,153	125.1
Average number of axles per vehicle	2.958	4.417	149.3
Total number of axles	70	83	118.6
Average load per axle, pounds	14,368	12,033	83.7
		1954	
Total traffic volume	935	861	92.1
Total number of trucks and combinations	172	167	97.1
Heavy vehicle data:			
Number	21.2	16.6	78.2
Average gross weight, pounds	47,109	60,201	128.8
Average number of axles per vehicle	3.349	4.469	133.4
Total number of axles	71	74	104.2
Average load per axle, pounds	14,067	13,470	95.8

vehicle weights customary in the West. But, owing to the larger number of axles per vehicle in the West, the average axle loads are considerably smaller in western as compared with the eastern operation. In other words, these data indicate the contrast between eastern and western operation by pointing out that the movement of one million pounds of gross vehicle weights is accomplished by the use of fewer vehicles, but with more axles of lesser weight, in the West than in the East.

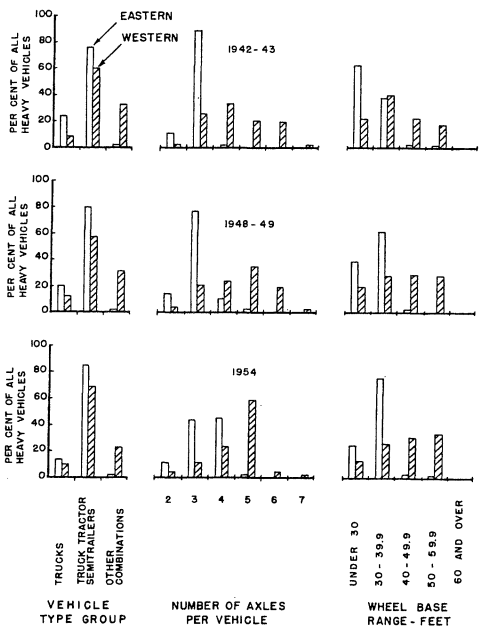


Figure 5.1. Comparison of Eastern with Western heavy vehicle operation based on vehicle type groups, number of axles per vehicle, and wheel base lengths.

Figure 5.1 gives a graphic comparison of eastern with western heavy truck operation based on the distribution of vehicles by vehicle type groups, by number of axles per vehicle, and by wheel base ranges. With respect to the vehicle type groups, it is significant to note the continued growth in use of the truck tractor semitrailer type vehicles and at the same time the relative decreases in the use of single unit trucks and other combinations in both eastern and western operation. With respect to the number of axles per vehicle, it is significant to note the relative increase with time of the 4-axle vehicles and a corresponding relative decrease in the use of 3-axle vehicles in the East. Similarly, it is important to note the relative increase with time of the 5-axle vehicles and the corresponding relative decrease in the use of 6-axle vehicles in the West. With respect to wheel base lengths, it will be noted the relative increase with time of the longer wheel base lengths in the West. And even

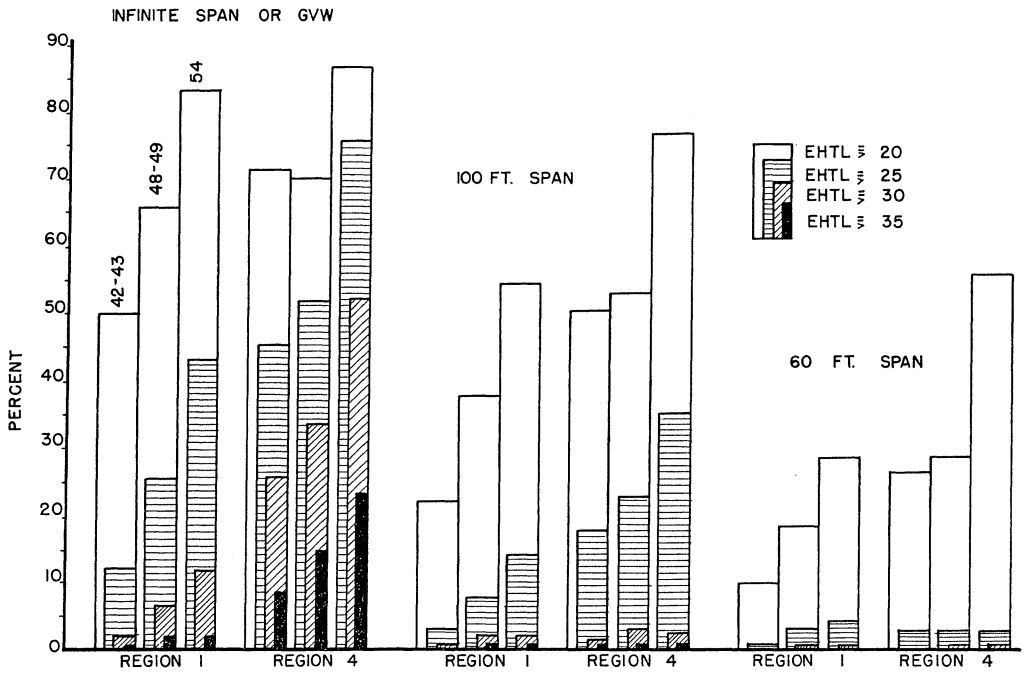


Figure 5.2. Comparison of eastern with western heavy vehicle operation based on per cent of heavy vehicles having H-equivalencies equal to or greater than stated values; by years and span lengths.

though there has been a continued increase in eastern operation of the per cent of vehicles in the 30.0- to 39.9-foot wheel base range and a corresponding decrease in the range under 30 feet, there has been practically no increase in wheel base range in excess of 40 feet.

Figure 5.2 gives a comparison of eastern with western heavy truck operation based on per cent of heavy trucks having H-equivalencies equal to or greater than stated values on spans of various lengths during each of the three trend periods selected for special study, i.e., 1942-43, 1948-49, and 1954. The bar graphs on the left show the equivalent H truck loadings on an infinite span which correspond with gross vehicle weights for each time period in the East and West, respectively, which were equal to or greater than 20, 25, 30, and 35 tons, respectively. The graphs cover each time period in Regions 1 and 4. Similar data are given for the United States in Table 7.1.

By way of comparing the distribution of gross vehicle weights in the eastern and western states, it will be noted that the percentage of heavy trucks in the heavier gross weights are considerably higher in the West than in the East. This will be seen by comparing the corresponding bar graphs at the left of Figure 5.2. For example, in 1954 some 23 per cent of all heavy vehicles reported in the West had gross weights of 35 tons or more; whereas only 1.6 per cent of those in the East weighed 35 tons or more. In spite of the fact, though, that the western states have considerably higher percentages of the heavier gross vehicle weights, it is interesting to observe in Figure 5.2 (also in Table 7.1) that the H-equivalencies—or equivalent H truck loadings—of these vehicles on a 60-foot span are no greater than those in the eastern states. It should be emphasized again here this very desirable result stems from the fact that the type of legal regulation in the West is conducive to heavier gross vehicle weights which are spread out over enough axles and sufficient wheel base length to produce less severe stresses in bridges and other highway structures.

Since heavy trucks are defined in Article 3.2 as all single unit trucks weighing 13 tons or more and all combination vehicles weighing 17

tons or more, it is quite interesting to note in Figure 5.2 (also in Table 7.1) the very large percentage increases of trucks weighing 20 tons or more in the East. In the 1942-43 trend period, for example, only about 50 per cent of the heavy trucks in this area weighed 20 tons or more, but by 1954 some 83 per cent of all the heavy trucks in the East weighed 20 tons or more. From 1942-43 to 1954 in the eastern states, it will be noted that the percentage increases for heavy trucks weighing 25, 30, and 35 tons or more, respectively, were also impressive.

Perhaps the most important thing indicated by Figure 5.2 in connection with the trends of gross vehicle weights in the West is the progressive percentage increases for the heavy trucks weighing 25, 30, and 35 tons or more, respectively. The substantial percentage increases in equivalent H truck loadings of 20 tons or more in the West from 1948-49 to 1954 for all span lengths can be accounted for by the fact that the trend toward heavier vehicle weights has been going on continuously over the entire nation for many years. And though the numbers and percentages of the heavier trucks continuously increased in the western states, it is quite interesting and highly significant to note that the per cent of these vehicles having equivalent H truck loadings of 25 tons or more for the 60-foot span remained at about 2.5 per cent during the entire time from 1942-43 to 1954.

For those who would like to make a more detailed study of equivalent H truck loadings (EHTL) for various spans by vehicle type, by years, by AASHO regions, and for the United States, the basic data are given in Appendix B.

5.4 INFLUENCE OF DIVERGENT TYPES OF REGULATION ON HEAVY TRUCK OPERATION IN EAST AND WEST

It is obvious from a study of the preceding data that one of the more important effects of the western type of vehicle size and weight limitation is to restrain to some extent the freedom of choice in the selection of the kinds and types of vehicles and combinations best adapted to transport different commodities. It is equally apparent that such freedom of choice, in the last analysis, should ideally rest upon and be determined by the relative economy and fitness of each vehicle type used for the haulage of each commodity group in each class of service.

Although the various elements of cost incident to heavy vehicle operation in the East and West are not presently available for detailed analysis, certain general and inferential conclusions can be drawn relative to the economic impact of the kind of operation induced by each type of regulation. Even without complete cost data, it is a fact that western highway transport does avail itself, extensively and persistently, of a wide area of operation which has not been available to eastern highway transport. Moreover, the heavy vehicle movement of commodities in western operation is a smaller segment of total highway travel than it is in eastern operation, and, at the same time, the western movement is accomplished with some 20 per cent fewer heavy vehicles (See Table 5.7) in considerably larger cargo unit lots.

The suggested economy of western vehicle operation inherent in the larger and heavier vehicles coincides with a probable net economy—combined road and vehicle costs considered — since both the improved load distribution to axles and the lower axle-load concentrations are conducive to a lower cost of highway and bridge provision than that required to serve the heavier axle-load concentrations of the East, despite the lesser gross weights per vehicle typical of the East. The effect of restricted vehicle length on eastern highway transport is to compress heavy truck operation into vehicles of shorter wheel base and, consequently, on fewer axles than are generally permitted and realized in western operation.

The net result of restricted vehicle length in eastern operation, therefore, is to encourage the demand for and the use of the heavier axle loads

which are quite frequently beyond the design capacity of existing highway subgrades, surfaces, and pavements. Western operation, however, which encourages the use of tandem-axle and multiple-axle vehicles is conducive to a trend in the opposite direction. For example, of the 18 vehicle types used for heavy haulage in the West, 14 types employ tandem axles and account for approximately 90 per cent of the total gross heavy truck weights. It is further evidenced that eastern length regulation limits the free selection of heavy vehicle types suited to the space and weight requirements of various commodities and different types of service by the fact that in 1954 over 98 per cent of the heavy trucks in the East had wheel bases of less than 40 feet, whereas about 63 per cent of those in the West had wheel bases of 40 feet or more. It should be noted here also that in 1954 some 99.6 per cent of the heavy trucks in the East had 4-axles or less per vehicle, whereas some 85 per cent of those in the West had 4-axles or more per vehicle, as will be seen in Table 5.3. In this connection, it will also be seen in Tables 3.10 and 5.7 for 1954 that the average heavy truck in eastern operation had 3.3 axles as compared with 4.5 axles per vehicle in western operation.

The character of size and weight limitation employed for the regulation of heavy vehicles also exercises a strong influence upon the composition and resulting behavior of traffic. In 1954, for example, it will be found from Table 5.7 that eastern operation required some 28 per cent greater number of vehicles than were required in western operation to transport the same typical one million pounds of gross vehicle weight. For that period, this is another way of saying that the average gross weight per vehicle was some 28 per cent greater in the West than in the East. The heavier average load in the West, however, was carried on an average of 4.5 axles per vehicle as compared with an average of 3.3 axles per vehicle in the East.

In general, axle load concentrations in the East exceed those in the West for every vehicle type and for every comparable wheel base length. These facts have important implications on the economics of highway and bridge provision, and strongly suggest that such vehicle operating economics as might result from the heavier axle concentrations of the East must be offset to a considerable extent, if not completely nullified, by the increased cost of highway and bridge provision adequate to the accommodation of those axle loads which are excessive as compared with AASHO policy. In addition to this, it is also important to realize that frequent applications of such heavy axle loads, which are in excess of highway provision, without question contribute greatly to increased maintenance costs.

It is agreed among engineers that the cost of highway provision not only increases with each increment of increase in maximum permissible axle load, but also with the anticipated frequencies of various intensities of axle loads which are equal to or in excess of the permissible maximum. It is quite revealing, therefore, to compare the effects of the eastern and western types of limitation of frequencies of various intensities of axle loads. The relative frequencies of various intensities of single and tandem axle loads in the East and West are given in Tables 4.1 and 4.2; they are also presented graphically in Figures 4.1a through 4.1c for single axle loads and Figures 4.2a through 4.2c for tandem axle loads. And, as was pointed out in Part IV, it is these divergent types of regulation in the East and West which account for the relatively high frequencies of the heavier axle loads in the East as compared with those in the West. For example, Table 4.1 shows that in 1954 there were 12 times as many axles of 22,000 pounds or more and nearly 30 times as many axles of 26,000 and 28,000 pounds or more, respectively, per 1000 heavy vehicles in the East than were reported in the West.

By way of recapitulation, it might be said that the foregoing data and analyses indicate that substitution of the western type of regulation for the type of size and weight limitation of heavy motor vehicles in

eastern states should be accompanied by definite and measurable advantages. It would also seem reasonable to conclude that these apparent advantages would not only accrue to those charged with the provision of highway facilities, but also to the producers of heavy motor vehicles and other transportation equipment as well as trucking companies operating in highway transport. Before closing this discussion, however, it should be emphasized that the main objective of this investigation has been to analyze the contrasting effects on heavy truck operation which result from these two divergent types of regulation rather than that of undertaking to appraise the relative merits of the actual limitations involved in either. The actual limits on heavy vehicle sizes and weights which characterize the eastern as compared with the western types of regulation are matters that are beyond the scope of the present report.

5.5 NEED OF BASIC FORMULA FOR DETERMINING PERMISSIBLE VEHICLE WEIGHTS

As previously mentioned, heavy truck operation in the East tends generally toward the permissible use of relatively heavy axle loads. The benefits of such axle loads, however, are restricted to a small number of vehicle types by the comparatively low specified limits on gross vehicle weights and the relatively short maximum permitted vehicle lengths. It was also pointed out that the cost of highway provision not only increases with each increment of increase in maximum permissible axle load, but also with the anticipated frequencies of various intensities of such axle loads which are equal to or in excess of the permissible maximum. In contrast with the eastern limitations, western regulations uniformly limit axle loads to a maximum of 18,000 pounds (plus a small tolerance in some states). However, they do allow relatively heavy gross vehicle weights, provided the spacing of axle group loads conforms to a bridge type formula similar to one of those given in the notes at the bottom of Table 5.1.

A considerable amount of work has been done on the subject of permissible vehicle weights as a part of the present investigation. The objectives of these studies were to develop realistic procedures for determining permissible vehicle weights which would not only be in harmony with the economic principles of highway and bridge provision, but would also improve the pay-load opportunities for truckers operating in highway transport.

From these studies it was found that a basic formula could be developed which would incorporate all the desirable features needed for the determination of permissible vehicle weights. This formula not only takes into account the over-all wheel base length of a vehicle but also the number of axles and the spacing of axle group loads. The formula is perfectly general and can be readily adjusted to any level of heavy motor vehicle operation as may be desired simply by adjusting the constants included in it. In its most general form this formula is as follows:

$$W = A[f(NL) + BN + C]$$

Equation 2.1

in which: W = maximum load in pounds carried on any group of two or more consecutive axles.

L = distance in feet between the extremes of any group of two or more consecutive axles.

N = number of axles in group under consideration.

A, B, & C are constants which depend upon quality of highway and bridge provision and desired level of heavy motor vehicle operation.

f = some function involving "N" and "L."

This formula can be adjusted to provide the incentive needed to encourage the use of multiple-axle vehicles. It can also be adjusted to allow relatively heavy axle group

loads that will not be detrimental to bridges and other highway structures, and at the same time provide increased pay-load opportunities for truckers through a freer choice of multiple axle vehicles.

Since the AASHO formula for permissible vehicle weights as given in Table 5.1 is essentially a straight line formula, it does not provide the incentive needed to encourage the use of the greater numbers of axles available in a wide variety of multiple-axle vehicles. By way of suggestion, the formula below is submitted for consideration since it should provide the incentive needed to encourage the use of such multiple-axle vehicles. The specific formula suggested for consideration is as follows:

$$W = 500\left(\frac{NL}{N-1} + 12N + 32\right),$$

Modified Equation 2.2

This particular form of Equation 2.1 was so developed that it would result in permissible axle-group loads and gross vehicle weights which would not cause undue overstress in the older bridges on the nation's highways, most of which are of H15 design according to AASHO specifications. In fact, one of the main considerations in the development of Equation 2.2 was that it should result in permissible loads which would produce stresses in H15 bridges that would never exceed the basic allowable design stresses by more than about 25 per cent, even if each lane were loaded simultaneously with identical permissible loads. In this connection it might be added that any independent study seeking to devise an expression for accomplishing the objectives outlined above would arrive at a formula not greatly different from Equation 2.2. Numerous variations of this formula have been investigated, but none was found that would accomplish the desirable results referred to above any better than Equation 2.2. The potential usefulness of this formula is discussed also at some length in Part II.

Part VI

FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS

6.1 RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS

The concept of converting various types and weights of heavy trucks into equivalent H truck loadings (or other equivalent design loadings) to provide a simple index for comparing the stress producing effects of any given vehicle with those of another is developed and presented in three previous publications.[1,2,3,4] A brief discussion of equivalent H truck loadings and their use as a means of rating the stress producing characteristics of heavy trucks is given below.

Before proceeding with the discussion of equivalent H truck loading frequencies, though, it might be well to emphasize again that this investigation is mainly concerned with studies of trends in heavy truck operation on main rural roads and the relationship of these trends to certain of the considerations associated with various levels of highway and bridge provision. Further, since these trends in heavy truck operation should be viewed in proper perspective, it might be emphasized here also that the heavy trucks, which provide the basis for these studies, account for only about 10 per cent of all truck traffic and but a little over 2 per cent of total traffic. However, owing to the fact that the design standards indicated for both roadway and bridges in any given situation are so largely determined by the frequencies of various magnitudes of the heavier axle group loads and gross vehicle weights, it is of the utmost importance that objective data relating to trends in these loadings become available to those responsible for the planning of present and future highway facilities.

Since it is the bending stresses that ordinarily determine the load carrying capacity of simple span highway bridges, the bending moments produced by heavy trucks on various spans provide a convenient means of measuring their stress producing effects in terms of AASHO Standard H Trucks. The discussion here, therefore, will be concerned only with equivalent H truck loadings calculated on the basis of maximum bending moments for various span lengths. For example, if it were found that a particular heavy truck produced the same maximum bending moment on a 60-foot span as a Standard H Truck weighing 45,000 pounds or 22.5 tons, it would be rated as an equivalent H 22.5 truck on a 60-foot span. Another way of saying this would be that this particular vehicle based on its capacity to produce bending moment would have an H-equivalency of 22.5 tons on a 60-foot span. Such an H-equivalency rating, therefore, provides a simple and effective index for comparing the bending stresses produced by a particular vehicle on a given span with those caused by a standard H truck of specified weight on the same span. In the above case, for example, one would know immediately that the equivalent H22.5 truck would produce 1.5 times as much bending moment as a standard H15 truck on a 60-foot span.

Another illustration should contribute toward a better understanding of the uses and meaning of the term "H-equivalency," which is synonymous with "equivalent H truck loading" or "equivalent H truck rating." In this case suppose it is desired to know the H-equivalency or equivalent H truck rating of the type 3-S2 truck shown in Figure 2.2 on a 50-foot span. The problem here is to find the weight in tons of a standard H truck that will produce the same maximum bending moment on a 50-foot span as would be produced by this type 3-S2 truck, which has a wheel base of 44 feet and a gross vehicle weight of 68,000 pounds. Appropriate computations will show that the maximum bending moment produced by this vehicle on a 50-foot span would be equal to 407,120 foot-

pounds. By similar computations, or by reference to the 1957 AASHO Standard Specifications for Highway Bridges, it will be found that the maximum bending moment produced on a 50-foot span by a standard H truck weighing one ton would be equal to 22,280 foot-pounds. From this it will be seen that a standard H truck weighing 18.3 tons would be required to produce the same maximum bending moment as the given type 3-S2 truck on a 50-foot span. Now since this given type 3-S2 truck produces the same maximum bending moment as an H18.3 truck on a 50-foot span, the given truck is said to have an H-equivalency or an equivalent H truck rating of 18.3 tons on a 50-foot span. The H-equivalency or equivalent H truck ratings for other vehicles on other spans would be determined in a similar manner.

By referring back to Table 3.8, it will be seen that nearly 55,000 heavy trucks were reported with complete data by the loadometer surveys during the three trend periods covered by the present investigation. Of these, there were 51,665 included in the six major vehicle types shown in Table 3.13 which were selected for special study. Based on maximum bending moments, these 51,665 heavy trucks were converted individually into equivalent H truck loadings on 10-, 20-, 30-, 40-, 50-, 60-, 80-, and 100-foot span lengths, respectively. The magnitude of this undertaking is indicated by the fact that the rating of these 51,665 vehicles on the several spans as shown accounts for nearly 500,000 separate H-equivalency ratings.

These H-equivalency ratings were then accumulated in relative frequency distributions by years, by vehicle types, by span lengths, by AASHO Regions, and for the United States. They are given in Appendix B for each of the six major heavy truck types under the title "Relative Frequencies of Equivalent H Truck Loadings Based on Maximum Moments in Simple Span." A detailed list of these tables is given in the index to tables and illustrations under Appendix B. These data are included as a part of this publication both for permanent references and for the benefit of those who may wish to make other or more detailed studies relating to the moment producing characteristics of heavy trucks.

By way of explaining the relative frequencies of equivalent H truck loadings given in Appendix B, suppose one is interested in the frequency distribution of H-equivalencies produced by the 1973 type 3-S2 heavy trucks reported by Region 4 in 1954 on a 60-foot span. This distribution of H-equivalencies is given by Table B-3.5 in Appendix B. In this table it will be seen that the distribution of H-equivalencies for these 1973 type 3-S2 heavy trucks on a 60-foot span varies from a minimum of H9 to a maximum of H39 with an average of H20.1. A look at this distribution will show that the most frequent H-equivalency ratings tended to cluster around the average of H20.1. For example, it will be seen that 15.41 per cent of the 1973 vehicles were rated as equivalent H-19 trucks. Similarly, 17.84 and 27.02 per cent of them were rated as equivalent H20 and H21 trucks, respectively, on a 60-foot span. It will be recalled that the heavy trucks, which provide the basis for these studies, accounted for only about 10 per cent of all truck traffic and but a little over 2 per cent of total traffic. Therefore, in order to interpret properly the frequency distributions of H-equivalencies given in Appendix B, it should be borne in mind that these frequency distributions are based on the heavy trucks which were found among the heaviest 10 per cent of all trucks weighed. The reliability of these heavy truck data is evidenced by the fact that the 500,000 vehicles weighed, of which they were a part, was a representative sample of the entire truck population, as was pointed out in the fourth paragraph of Section 3.1.

The relative frequencies of equivalent H truck loadings given in Appendix B provide the basic data for the study of trends in heavy truck operation measured in terms of rated H-equivalencies on various spans which is given in Part VII of this report. These frequency data also provide the basis for another study of trends discussed in Part VII. This is the study of trends in heavy truck

operation measured in terms of annual vehicle miles of travel on main rural roads at rated H-equivalencies on various spans. These trends are more fully discussed in Part VII, which follows.

6.2 CUMULATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS

The cumulative per cent of all heavy trucks having equivalent H truck loadings equal to or greater than stated values on 30-foot, 60-foot, and infinite spans in Regions 1, 2, 3, 4, and for the United States for the 1942-43 trend period are shown in Figures B-1.1 through B-1.5, respectively, in Appendix B. Similarly, the cumulative frequencies of H-equivalencies for the 1948-49 trend period are given in Figures B-2.1 through B-2.5, respectively, in Appendix B; and the corresponding cumulative frequencies of H-equivalencies for 1954 are given in Figures B-3.1 through B-3.5, respectively, in Appendix B. Data for plotting all of these frequency curves were obtained by accumulating the appropriate relative percentage frequencies of equivalent H truck loadings given in Tables B-1.1 through B-1.7, B-2.1 through B-2.7, and B-3.1 through B-3.7 for each of the three trend periods 1942-43, 1948-49, and 1954, respectively. So if cumulative frequencies of H-equivalencies are desired for particular vehicle types, spans, AASHO regions or trend periods, which are not included in the above mentioned cumulative frequency curves, they may be obtained by accumulating the relative percentages of H-equivalencies given by the appropriate tables of Appendix B.

These cumulative frequencies of H-equivalencies for the several spans shown in the figures of Appendix B are plotted to logarithmic normal probability scales. A variable is said to have a logarithmic normal distribution if the logarithms of the variable are normally distributed. And since these cumulative frequency distributions can be approximated reasonably well by straight lines on log-normal probability paper, it will be seen that they rather closely approximate the log-normal frequency distribution. The horizontal scale in these figures is similar to those found on any normal probability paper, and it will be seen that the vertical scale is logarithmic.

Among the more important conclusions to be drawn from the cumulative frequencies of H-equivalencies given by the figures in Appendix B is that these distributions can be approximated mathematically by the

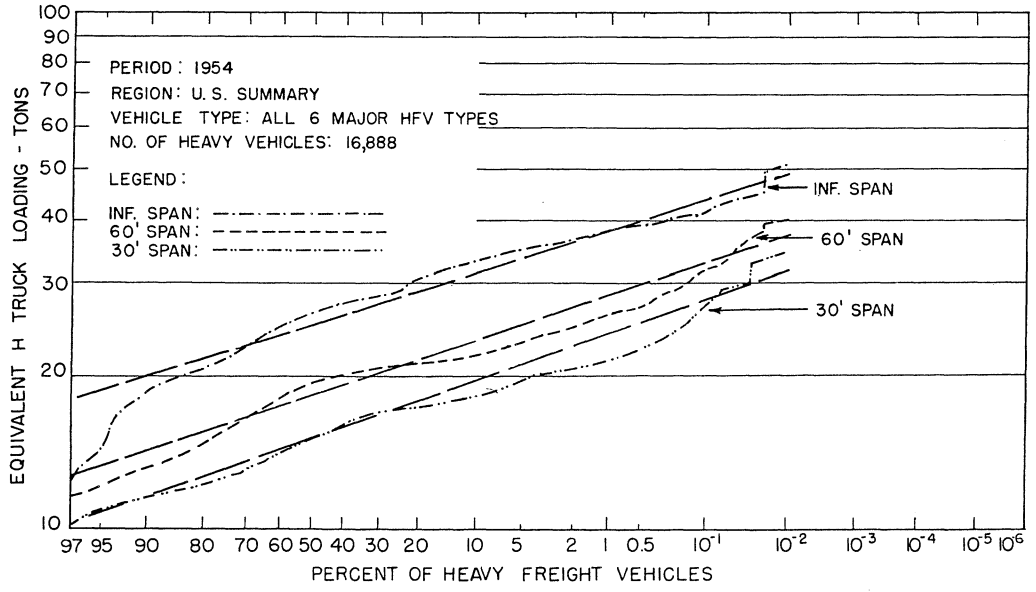


Figure 6.1. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

log-normal distribution. This means that heavy vehicle frequencies at rated H-equivalencies on various spans can be handled mathematically if the occasion required and one were so inclined.

A considerable amount of information may be obtained from a detailed study of these cumulative frequencies of H-equivalencies given by the figure of Appendix B. For example, in Figure 6.1 (which is the same as Figure B-1.3e in Appendix B) it will be seen that only about 0.5 per cent of all heavy trucks reported in 1954 had H-equivalencies equal to or greater than H30 on a 60-foot span. Similarly, it will be seen that only about one in each 100,000 heavy trucks would be expected to have an H-equivalency of H40 or more on a 60-foot span. Equivalent H truck loading frequency data such as these are quite important to the bridge engineer in connection with his analysis of fatigue stresses, since they provide him with the means for estimating the number of repetitions of various levels of stress to which a given structure might be subjected during its anticipated useful life. These loading frequency data, therefore, furnish a rational basis for making administrative decisions concerning bridge design standards for different spans and traffic conditions; such decisions otherwise would have to be made on the basis of experience and judgment alone. Although much more could be said about the cumulative distributions of H-equivalencies given by the figures in Appendix B, it is believed that the above discussion will suffice to explain how they may be used for reference or further investigation.

6.3 ESTIMATED ANNUAL FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS

The relative frequency distributions of H-equivalencies given in the tables of Appendix B, together with the heavy truck volumes data given in Table 3.9, provide the information needed for estimating the annual frequencies of various magnitudes of H-equivalencies for any given span that would have been expected at locations having heavy truck volumes corresponding with those for any particular region and trend period as may be desired. This concept gives another approach to the problem of fatigue stresses in highway bridges and may be used as a basis for estimating the annual number of repetitions of various levels of stress that

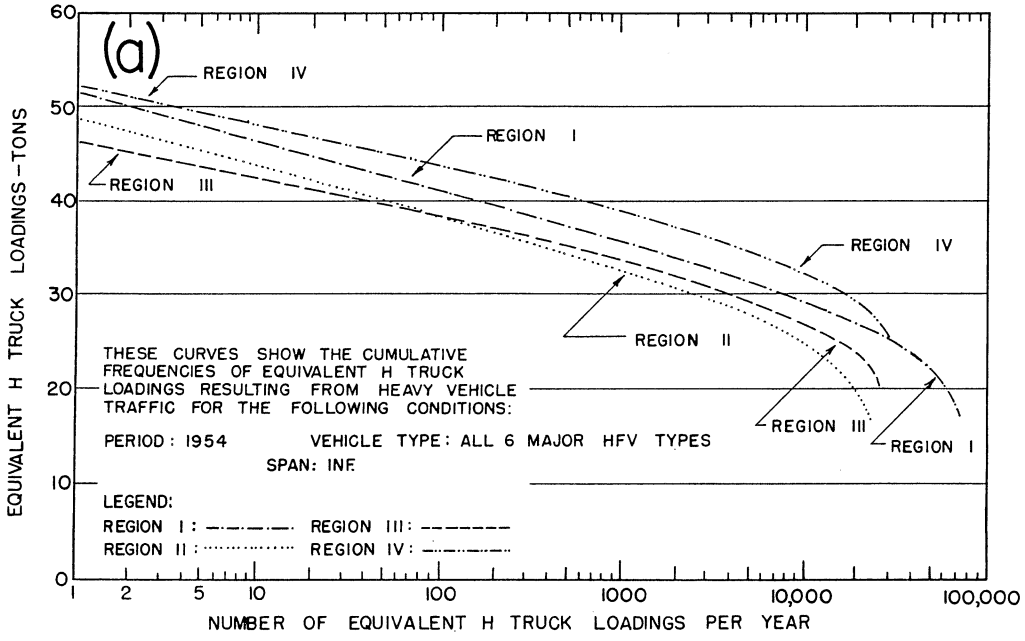


Figure 6.2a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

might be expected to obtain for a given span corresponding with anticipated traffic conditions.[4,7,8,9] Again, such loading frequency data provide a basis for administrative decisions concerning design standards which would otherwise have to be based on experience and judgment alone.

Figure 6.2a, for example, gives a comparison of the estimated annual frequencies of heavy trucks having H-equivalencies equal to or greater than stated values for an infinite span that would have been expected at locations having heavy truck volumes corresponding with the respective regional averages in AASHO regions 1, 2, 3, and 4 during the 1954 trend period. It might be mentioned here again that H-equivalencies and gross vehicle weights are identical for an infinite span. This is true because on very long spans the maximum moment is determined almost entirely by the gross weight of a vehicle while the wheel base and number of axles have little or no effect over the maximum moment. Parts b and c of Figure 6.2 give similar frequencies for the 60- and 30-foot spans, respectively, during the 1954 trend period.

In Figure 6.2a it is interesting to note that in 1954 the heavier gross vehicle weights (same as H-equivalencies for an infinite span) were considerably more frequent in Region 4 than in any of the other regions. For example, in Figure 6.2a, a study of western with eastern heavy truck operation shows that, at locations representative of regional averages, about 600 trucks weighing 40 tons or more would have been expected in Region 4 as compared with about 150 in Region 1. But in spite of the greater frequencies of trucks with heavier gross weights in Region 4, it will be noted in Figure 6.2b that the frequencies of the higher H-equivalences on a 60-foot span are greater in Region 1. In this case Region 1 shows 5 trucks per year with H-equivalencies equal to or greater than H40 on a 60-foot span as compared with none in Region 4. Similarly, in Figure 6.2c, it will be seen that Region 1 shows about 50 trucks per year with H-equivalencies of H30 or more on a 30-foot span as compared with none in Region 4.

Figure 6.3a gives a comparison of the estimated annual frequencies of heavy trucks having H-equivalencies for an infinite span (same as gross vehicle weights) that would have been expected at locations having heavy truck volumes corresponding

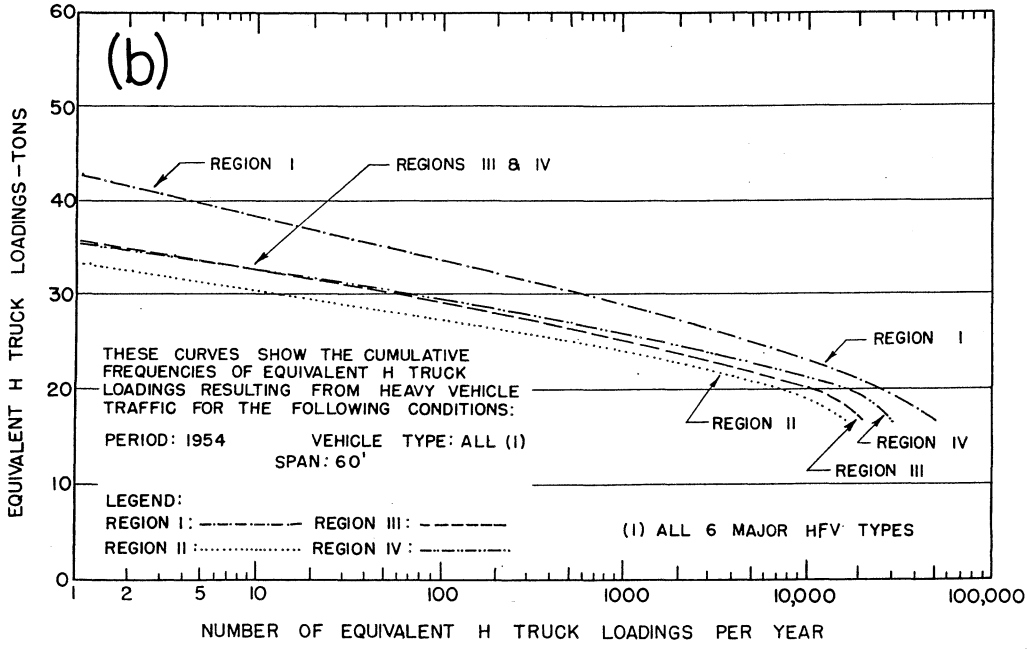


Figure 6.2b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

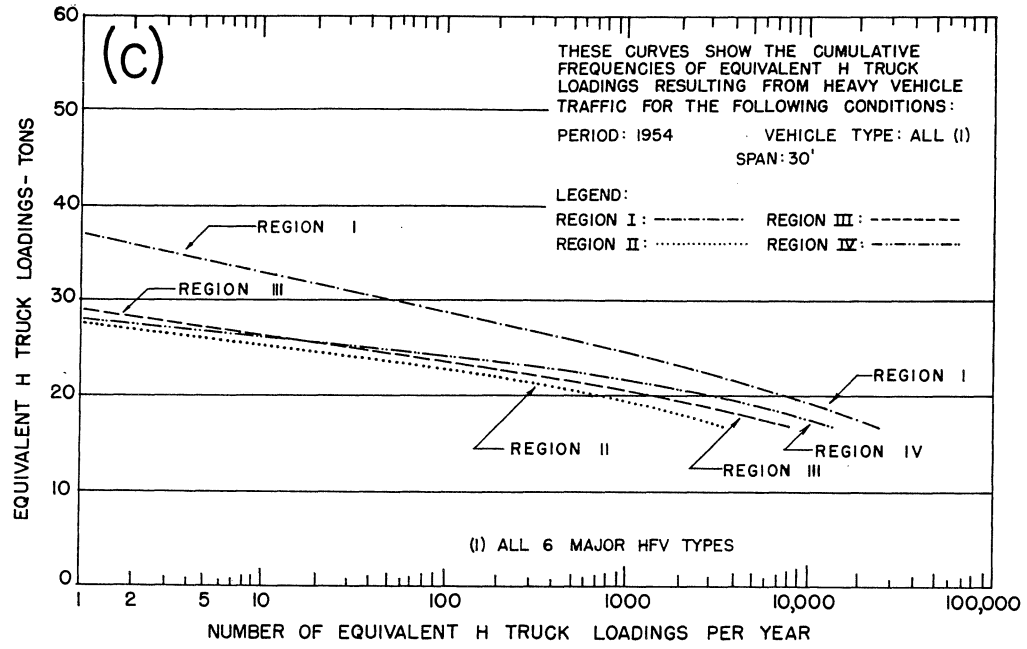


Figure 6.2c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

with national averages on main rural roads during each of the three trend periods—1942-43, 1948-49, and 1954. Figures 6.3b and 6.3c give similar frequencies for the 60- and 30-foot spans, respectively. Figure 6.3a shows that the frequencies of heavy trucks in all weight groups increased considerably from the 1942-43 to the 1948-49 trend period. It also shows that the frequencies of trucks in the heavier weight groups decreased

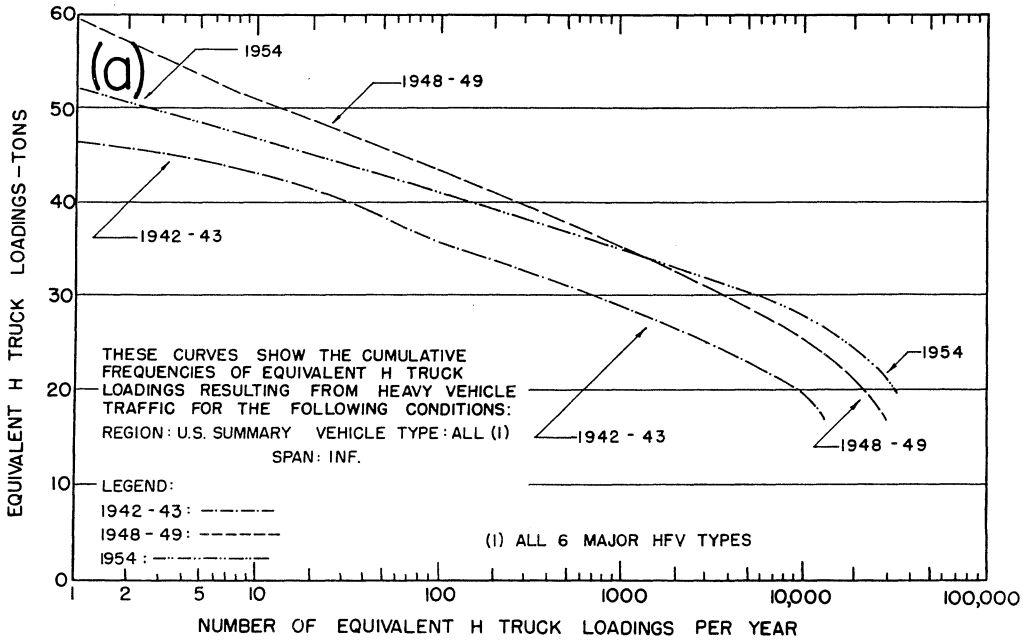


Figure 6.3a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

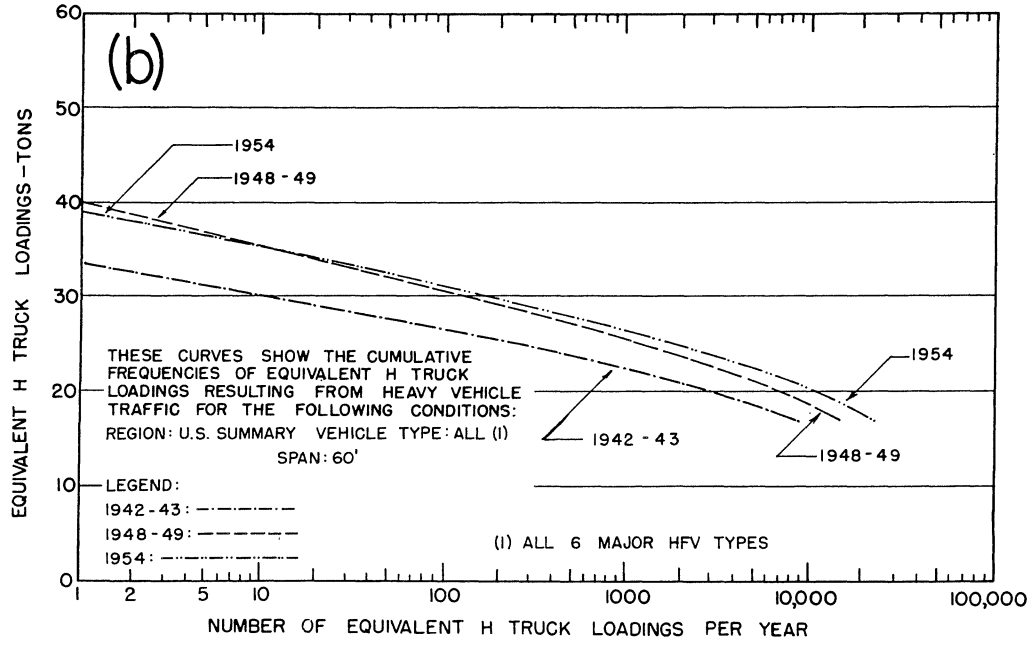


Figure 6.3b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

somewhat by 1954, but even so they were still above those for the 1942-43 trend period.

In Figure 6.3b it is interesting to note that for the United States as a whole in 1942-43 about three thousand vehicles would have been expected to pass an average station on a main rural highway having H-equivalencies on a 60-foot span equal to or greater than H20 would have been expected to pass an average station on a main rural highway annually. Then, by 1948-49 this had increased to about seven thousand per year with H-equivalencies of H20 or more; and by 1954 there were about ten thousand per year with H-equivalencies of H20 or more; and by 1954 there were about ten thousand per year with H-equivalencies of H20 or more on a 60-foot span. It is also interesting to note in Figure 6.3b that the largest H-equivalency expected on a 60-foot span once a year at an average station in 1942-43 was about an H32; and the largest 10 loadings would have had H-equivalencies from H30 to H32. Further, it will be noted that the frequencies of H30 or more increased from about 10 per year in 1942-43 to about 170 per year in 1954; also that the largest single H-equivalency expected per year in 1954 was about an H40 on a 60-foot span. Other interesting relationships are shown by these figures, but the above illustrations will be sufficient to demonstrate the use of these detailed data for analyzing repeated stresses and to provide a basis for administrative decisions concerning the establishment of design standards for particular situations.

In connection with Figures 6.2 and 6.3 it will be noted that the right ends of the curves tend to drop rather abruptly. This can probably be accounted for by the fact that only heavy trucks are included in the distribution. If all trucks were included, these curves would probably continue without the sharp downward drop.

For the benefit of those who would like more information on the estimated annual frequencies of various magnitudes of H-equivalencies applicable to regions and trend periods not given by Figures 6.2 and 6.3, a more complete set of similar charts is given in Appendix B. In fact, Figures 6.2 and 6.3 as given here in the text are the same as Figures B-2.3 and B-2.8, respectively, in Appendix B. In Appendix B, for example, Figure B-2.1 gives the estimated

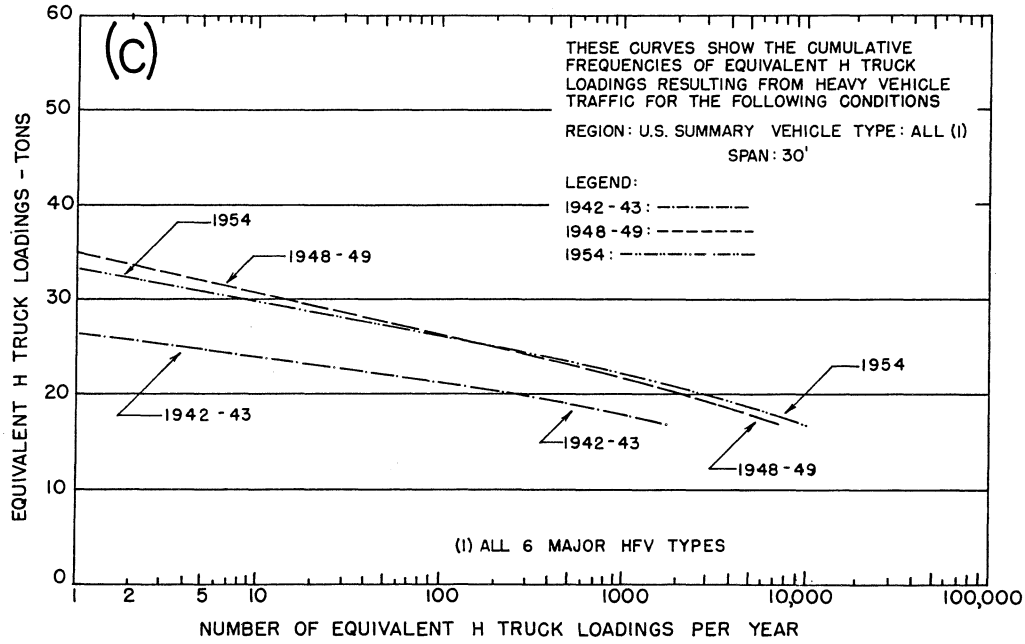


Figure 6.3c. Estimated annual frequencies of heavy vehicles having equivalent H truck loadings equal to or greater than stated values.

annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values that should have been expected at locations having heavy truck volumes corresponding with regional averages in AASHO regions 1, 2, 3, and 4 during the 1942-43 trend period. Figures B-2.2 and B-2.3 give similar frequencies of H-equivalencies for the 1948-49 and 1954 trend periods, respectively. Further, Figure B-2.4 gives similar estimated annual frequencies of H-equivalencies during each of the three trend periods in Region 1. Figures B-2.5 through B-2.8 give similar estimated annual frequencies during each of the three trend periods in Regions 2, 3, 4, and for the United States, respectively.

Part VII

TRENDS IN ANNUAL VEHICLE MILES OF TRAVEL AT RATED H-EQUIVALENCIES

7.1 TRENDS IN EQUIVALENT H TRUCK LOADINGS

For the study of fatigue stresses in highway bridges, data on the frequencies of various magnitudes of equivalent H truck loadings provide the means for estimating the number of repetitions of various levels of stress for a given bridge that would be expected to result from present or anticipated traffic conditions.[9] In addition to being useful in the study of fatigue stresses, H-equivalencies also furnish a measure of bridge use. Therefore, the trends in equivalent H truck loadings and the trends in annual vehicle miles of travel at rated H-equivalencies should provide a rational basis for both engineering and administrative decisions concerning the bridge design standards that should obtain at any particular location for given or anticipated traffic conditions. It might be well to mention also that the heavy trucks upon which these frequencies of various H-equivalencies are based account for only about 10 per cent of all truck traffic and a little over 2 per cent of total traffic. Even so, it is magnitudes and frequencies of these heavier loadings that largely determine the design standards for any particular bridge at a given location. It is highly desirable, therefore, that such data relating to trends in equivalent H truck loadings be available on a continuing basis to engineers and administrators in connection with the selection of design standards appropriate to the various levels of highway and bridge provision.

The six Tables C-1.1a through C-1.1f included in Appendix C give the per cent of heavy trucks having equivalent H truck loadings equal to or greater than H20, H25, H30, H35, and H40 for each of the three trend periods, by span lengths, by AASHO regions, and for the United States for the 6 major heavy truck types, 2, 3, 2-S1, 2-S2, and 3-3, respectively. For convenient reference, Table 7.1, which is included here in the text, gives the same information for all six heavy vehicle types combined, by trend periods, by span lengths, by regions, and for the United States.

In general, the extreme variations in these data will be found by comparing the trends in H-equivalencies in Region 4 with those in Region 1. Perhaps the most important single thing revealed by the data given in Tables C-1.1a through C-1.1f and Table 7.1 is the enormous increases in the frequencies of the heavier gross vehicle weights and the increases in the frequencies of H-equivalencies of the higher designations on the various span lengths during the 12-year period from 1942-43 to 1954. For example, in Table 7.1 it will be seen that in Region 4 gross vehicle weights (same as equivalent H truck loadings on an infinite span) of 20 tons or more accounted for about 71 per cent of all heavy trucks in 1942-43; but by 1954 over 86 per cent of them were 20 tons or more. More striking still is the increase in vehicles of 30 tons or more during that 12-year period in Region 4. In 1942-43 only 25 per cent of the heavy trucks weighed 30 tons or more, but by 1954 this had increased to over 52 per cent.

By comparison in Table 7.1 it will be noted in Region 1 that the per cent of heavy trucks weighing 20 tons or more increased from 49 to about 83 during the same 12-year period. Similarly in Region 1, it will be seen that the per cent of heavy vehicles weighing 30 tons or more increased from 1.5 to 11.5.

The effects of the contrasting types of regulation in eastern and western heavy truck operation are clearly demonstrated by the H-equivalency data given in Table 7.1. For example, of the heavy trucks re-

ported by Region 4 in 1954, 23 per cent of them weighed 35 tons or more. However, on a 60-foot span, only 0.03 per cent of these vehicles had H-equivalencies of H35 or more. By contrast, of all the heavy trucks reported by Region 1 in 1954, only 1.62 per cent weighed 35 tons or more. Yet on a 60-foot span, 0.12 per cent of them had H-equivalencies of H35 or more. In spite of the fact that in 1954 there was a vastly higher percentage of heavy trucks weighing 35 tons or more reported in Region 4 than in Region 1, they generated fewer H-equivalencies of H35 or more on a 60-foot span than the lower percentage reported in Region 1. For visual inspection, Figure 5.2 gives a comparison of eastern with western operation based on per cent of heavy trucks having H-equivalencies equal to or greater than stated values by years and span lengths. The histograms in Figure 5.2 constitute a graphic presentation of the numerical data for Regions 1 and 4 given in Table 7.1.

Although the detailed figures for each of the six major heavy truck types, given in Tables C-1.1a through C-1.1f of Appendix C, vary from one type to another, it will be seen that in general they show trends toward heavier gross vehicle weights and H-equivalencies similar to those given in Table 7.1.

TABLE 7.1

PER CENT OF HEAVY VEHICLES HAVING EQUIVALENT H TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTH, BY REGIONS, AND FOR THE UNITED STATES—FOR ALL SIX MAJOR HFV TYPES

EHTL	Years	Span, feet				Span, feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43	1.04	10.04	21.89	49.33	.23	1.59	5.89	31.00
20	1948-49	4.71	18.57	37.52	65.49	2.91	9.59	22.44	57.87
	1954	7.31	28.41	54.31	82.93	4.81	35.11	60.18	84.82
	1942-43		.40	2.57	11.61		.22	.57	2.83
25	1948-49	.58	3.09	7.45	25.33	.18	1.54	5.09	16.23
	1954	.66	4.17	13.98	42.70	.02	1.43	14.16	52.74
	1942-43			.03	1.53				.79
30	1948-49	.02	.49	1.81	6.71		.14	.94	4.16
	1954	.12	.43	1.56	11.46		.02	.58	9.23
	1942-43				.03				
35	1948-49		.02	.32	1.95				
	1954	.06	.12	.12	1.62			.02	.68
	1942-43								
40	1948-49				.43				.18
	1954		.03	.03	.12				.12
		Region 3				Region 4			
	1942-43	.83	3.12	8.40	33.00	1.90	26.03	50.30	71.21
20	1948-49	4.33	21.92	39.04	67.43	3.64	28.88	52.71	69.46
	1954	2.24	48.68	71.78	88.20	4.19	55.50	76.62	86.48
	1942-43	.07	.26	.73	3.05	.05	2.48	17.70	45.23
25	1948-49	.15	1.93	10.77	33.40	.23	2.68	22.65	51.65
	1954	.08	1.44	15.05	68.33	.11	2.47	34.92	75.45
	1942-43						.05	1.34	25.03
30	1948-49	.02	.14	.95	8.75	.04	.22	2.65	33.17
	1954		.12	.96	17.48		.14	1.91	51.78
	1942-43							.16	7.96
35	1948-49		.02	.05	1.20	.02	.04	.37	14.11
	1954		.02	.08	3.02		.03	.12	23.02
	1942-43								.70
40	1948-49			.02	.18		.02	.08	1.60
	1954				.13			.03	1.70
		U.S. Summary							
	1942-43	1.06	10.32	21.95	46.90				
20	1948-49	3.97	20.35	38.57	66.06				
	1954	4.28	43.14	66.79	85.98				
	1942-43	.03	.77	4.95	15.87				
25	1948-49	.29	2.30	11.61	32.38				
	1954	.19	2.21	19.28	61.34				
	1942-43		.01	.31	6.01				
30	1948-49	.04	.25	1.54	12.87				
	1954	.03	.17	1.22	22.31				
	1942-43			.03	1.69				
35	1948-49	.01	.04	.20	4.23				
	1954	.01	.05	.10	6.84				
	1942-43				.14				
40	1948-49		.01	.06	.84				
	1954		.01	.02	.03				

7.2 TRENDS IN HEAVY TRUCK OPERATION MEASURED IN TERMS OF ANNUAL VEHICLE MILES AT RATED H-EQUIVALENCIES

Table 7.2 gives a summary of annual vehicle miles (AVM) of travel by heavy trucks and combinations on main rural roads during each of the three trend periods — 1942-43, 1948-49, and 1954 — by vehicle types, by regions, and for the United States. This table gives the annual vehicle miles for each of the three trend periods for each of the six major heavy vehicle types, by AASHO regions and for the United States. It also shows the annual vehicle miles for all heavy vehicles by years, by regions, and for the United States. It should be noted, though, that the six major vehicle types accounted for 81.2 to 99.9 per cent of the annual vehicle miles for all heavy freight vehicles reported, the lower percentage being in Region 4 and the higher percentage in Region 1.

Among the more important things brought out by the AVM data in Table 7.2 is the threefold increase in AVM for heavy vehicles of all types in the 12-year period for 1942-43 to 1954. In the last column on the right, it will be seen for the United States that the AVM for heavy vehicles increased from some 1.70 billion in 1942-43 to about 5.21 billion in 1954. Perhaps the most significant trend shown by these data is the spectacular increase in AVM for the type 2-S2 vehicle. By 1954 the type 2-S2 vehicle accounted for 45 to 68 per cent of all AVM for heavy vehicles; and for Region 4 in 1954 the 2-S2 vehicle accounted for about 21 per cent of all AVM for heavy vehicles.

Among other things it will be noted that the AVM generated by the type 3-3 vehicles were less in 1954 than in 1942-43. And for the United States as a whole, it is significant to note that about 80 per cent of all AVM by heavy freight vehicles are generated by three vehicle types: 2-S1, 2-S2, and 3-S2. The use of the type 2-S1 vehicle in 1954, however, was largely confined to Region 1, where it accounted for about 60 per

TABLE 7.2
SUMMARY OF ESTIMATED ANNUAL VEHICLE MILES OF TRAVEL FOR HEAVY TRUCKS AND COMBINATIONS BY VEHICLE TYPES, BY YEARS, BY REGIONS, AND FOR THE UNITED STATES

Tabulated values are in thousands of annual vehicle miles

Region	Years	The Six Major HFV Types						Total AVM for the Six Major HFV Types	Per Cent of AVM for All HFV Types	Total AVM for All HFV Types
		2	3	2-S1	2-S2	3-S2	3-3			
	1942-43	46,412	57,278	325,704	3,031	0	0	432,425	99.88	432,944
1	1948-49	139,460	60,904	683,375	95,033	784	0	979,556	99.88	980,733
	1954	181,838	54,028	651,122	737,308	6,039	0	1,630,335	99.88	1,632,295
	1942-43	777	9,345	156,003	5,649	587	0	172,361	99.78	172,742
2	1948-49	39,848	19,420	432,150	178,679	672	0	670,769	99.82	671,980
	1954	54,537	27,269	183,575	575,956	6,966	0	848,303	99.86	849,493
	1942-43	3,617	30,145	503,195	59,211	1,206	0	597,374	94.13	634,626
3	1948-49	36,698	29,780	517,054	518,695	29,898	117	1,132,242	96.57	1,172,459
	1954	22,382	27,872	184,545	861,208	223,255	282	1,319,544	93.74	1,407,663
	1942-43	5,657	32,655	88,032	121,286	54,549	76,672	378,851	82.37	459,938
4	1948-49	41,713	79,934	121,448	204,775	239,403	167,951	855,224	85.70	997,930
	1954	55,956	75,799	72,095	280,972	538,530	51,326	1,074,678	81.24	1,322,845
	1942-43	56,463	129,423	1,072,934	189,177	56,342	76,672	1,581,011	92.88	1,700,250
U. S.	1948-49	257,719	190,038	1,754,027	997,182	270,757	168,068	3,637,791	95.15	3,823,102
	1954	314,713	184,968	1,091,337	2,455,444	774,790	51,608	4,872,860	93.49	5,212,296

cent of the AVM generated by the type 2-S1 vehicle for the entire United States.

Figure 7.1 shows the annual vehicle miles of travel for all vehicles on all rural roads, for all trucks and combinations on all rural roads, and for all trucks and combinations on main rural roads from 1936 to 1955; also the AVM for all heavy trucks and combinations on main rural roads from 1942-43 to 1954. This figure is included here merely to put the AVM generated by heavy freight vehicles on main rural roads in the proper perspective with the AVM generated by all freight vehicles on both main rural roads and on all rural roads.

The six Tables C-2.1a through C-2.1f, which are included in Appendix C, give the AVM on main rural roads generated by heavy trucks having H-equivalencies equal to or greater than stated values for each of the three trend periods — 1942-43, 1948-49 and 1954 — by span lengths and by regions, for each of the six major heavy truck types selected for special study, i.e., types 2, 3, 2-S1, 2-S2, 3-S2, and 3-3 vehicles, respectively. For convenient reference, Table 7.3, which is included here in the text, gives similar AVM for all heavy vehicles having H-equivalencies equal to or greater than stated values for all six major heavy truck types combined, by years, by span lengths, and by regions.

Here again, perhaps the most important thing revealed by these data on AVM is the enormous increase in AVM for heavy trucks in each of the four regions, particularly the increases in the H-equivalences of larger designation on the various span lengths. Table 7.2 shows for the United States that AVM generated by heavy freight vehicles on main rural roads increased from 1.70 billion to 5.21 billion in the 12-year period from 1942 to 1954. This represents a compound annual growth of over 10 per cent. Typical of the contrast in heavy vehicle operation in Regions 1 and 4, figures for 1954 in Table 7.3 show that Region 4 had 156.8 million AVM having gross weights of 35 tons or more; but these same vehicles generated only 0.3 million AVM having H-equivalencies equal to or greater than H35 on a 60-foot span. By comparison, it will be seen in Region 1 that there were only 11.1 million AVM produced by vehicles having gross weights of 35 tons or more; but these same vehicles generated some 2.0 million AVM having H-equivalencies of H35 or more on a 60-foot span.

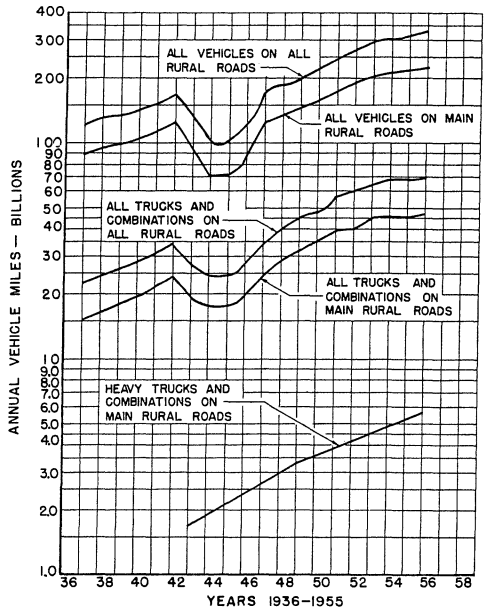


Figure 7.1. Annual vehicle miles of travel on all rural roads and on main rural roads for the United States by vehicle classes and by years. Information for curves taken from Highway Statistics Summary to 1955, Public Roads (Dec., 1958) and Annual Loadometer Survey Data.

For those who may wish to make a more thorough study of AVM travel for heavy trucks at rated H-equivalencies than can be attained from Table C-2.1a through C-2.1f and Table 7.3, a more complete compilation of the AVM data for each of the three trend periods, by vehicle types, by span lengths, and by regions is given by the several figures in Appendix C.

The very great increases in AVM by heavy trucks, particularly those with the heavier gross weights and higher H-equivalencies on various spans, point out very clearly the need of a new and realistic approach to the problem of determining permissible vehicle weights. Such an approach should result in procedures which will not only be in harmony with the economic principles of highway and

TABLE 7.3
ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY VEHICLES HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES: BY YEARS, BY SPAN LENGTHS, AND BY REGIONS—FOR ALL SIX MAJOR HFV TYPES

Tabulated values are in millions of annual vehicle miles

EHTL	Years	Span, feet				Span, feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43	4.5	43.4	94.7	213.0	.4	2.7	10.2	53.4
20	1948-49	46.1	181.9	367.5	641.5	19.5	64.3	150.5	388.2
	1954	119.2	463.2	885.4	1,352.0	40.8	297.8	510.5	719.5
	1942-43		.7	7.4	36.0		.2	1.0	3.5
25	1948-49	3.3	21.9	55.3	190.2	.7	7.4	23.9	78.5
	1954	8.2	44.5	146.6	550.9	.2	8.4	50.5	366.6
	1942-43			.1	6.6				1.4
30	1948-49	.2	4.8	17.7	65.7		1.0	6.3	27.9
	1954	2.0	7.0	25.4	186.8		.2	4.9	78.3
	1942-43				.1				
35	1948-49		.2	1.7	14.6			.3	4.0
	1954	1.0	2.0	2.0	11.1				3.3
	1942-43								
40	1948-49				4.2				1.2
	1954		.5	.5	2.0				1.0
		Region 3				Region 4			
	1942-43	5.0	18.6	50.2	197.1	7.2	98.6	190.5	269.8
20	1948-49	49.0	248.2	442.0	764.5	31.1	247.0	450.8	594.0
	1954	29.6	642.4	947.2	1,163.8	45.0	596.4	823.4	929.4
	1942-43	.4	.9	2.5	10.5	.2	4.1	47.2	153.5
25	1948-49	.7	14.2	63.5	312.8	1.1	14.7	137.6	410.6
	1954	1.1	9.0	73.9	837.5	.7	13.1	216.8	785.4
	1942-43			.5	2.2		.2	5.1	94.8
30	1948-49	.2	1.6	10.8	99.1	.3	1.9	22.7	283.7
	1954		1.6	12.7	230.7		1.5	20.5	556.5
	1942-43				.2			.6	18.1
35	1948-49		.2	.6	8.8	.2	.3	2.4	87.8
	1954		.3	.5	24.3		.3	1.3	156.8
	1942-43								2.7
40	1948-49			.2	2.0		.2	.7	13.7
	1954				1.7			.3	9.5

bridge provision, but at the same time improve the pay-load opportunities for truckers operating in highway transport. The formula proposed in Part II and Part V for the determination of permissible axle-group loads and gross vehicle weights appears to offer considerable promise in the direction of accomplishing these objectives.

BIBLIOGRAPHY

1. Stephenson, Henson K., and Kriss Cloninger, Jr. Method of Converting Heavy Motor Vehicle Loads into Equivalent Design Loads on the Basis of Maximum Bending Moments, Texas Engineering Experiment Station, Bulletin 127, 1952.
2. Stephenson, Henson K., and Kriss Cloninger, Jr. Method of Converting Heavy Motor Vehicle Loads into Equivalent Design Loads on the Basis of Maximum Shears, Texas Engineering Experiment Station, Bulletin 131, 1953.
3. Stephenson, Henson K., and Kriss Cloninger, Jr. Method of Converting Heavy Vehicle Loads into Equivalent Design Loads on the Basis of Maximum Floor Beam Reactions, Texas Engineering Experiment Station, Bulletin 135, 1954.
4. Stephenson, Henson K., and Kriss Cloninger, Jr. Stress Producing Effects of Equivalent Design Loads on Modern Highway Bridges, Texas Engineering Experiment Station, Bulletin 132, 1953.
5. Stephenson, Henson K., and A. A. Jakkula. Highway Loads and Their Effects on Highway Structures Based on Traffic Data of 1942, Texas Engineering Experiment Station, Bulletin 116, 1950.
6. Stephenson, Henson K., "Determination of Permissible Vehicle Weights on Bridges of H Loading Design," AASHO Proceedings, Washington, 1949.
7. Stephenson, Henson K., "Highway Bridge Live Loads Based on Laws of Chance," Proceedings, Structural Division, A.S.C.E., Volume 83, No. ST4, July, 1957.
8. Stephenson, Henson K., "Frequencies of Various Levels of Stress in Highway Bridges," Proceedings, Highway Research Board, Washington, Vol. 38, 1959.
9. Stephenson, Henson K., "Rapid Method for Estimating Maximum Bending Stresses in Simple Span Highway Bridges," Proceedings, Highway Research Board, Washington, Vol. 39, 1960. Also Texas Transportation Institute, Report E1-60, January, 1960.
10. Lynch, John T., and Thomas B. Dimmick, "Amount and Characteristics of Trucking on Rural Roads," **Public Roads,** Vol. 23, No. 9, Jul.-Aug.-Sep., 1943.
11. Dimmick, Thomas B., "Traffic Trends on Rural Roads in 1945," **Public Roads,** Vol. 24, No. 10, Oct.-Nov.-Dec., 1946.
12. Dimmick, Thomas B., and Mary E. Kipp, "Traffic Trends on Rural Roads in 1946," **Public Roads,** Vol. 25, No. 3, March, 1948.
13. Dimmick, Thomas B., "Traffic Trends on Rural Roads in 1947," **Public Roads,** Vol. 25, No. 7, March, 1949.
14. Dimmick, Thomas B., "Traffic Trends on Rural Roads in 1948," **Public Roads,** Vol. 25, No. 12, February, 1950.
15. Dimmick, Thomas B., "Traffic Trends on Rural Roads in 1949," **Public Roads,** Vol. 26, No. 5, December, 1950.
16. Dimmick, Thomas B., "Traffic Trends on Rural Roads in 1950," **Public Roads,** Vol. 26, No. 11, December, 1951.
17. Dimmick, Thomas B., "Trends in Traffic Volumes, Vehicle Types, and Weights," **Public Roads,** Vol. 27, No. 6, February, 1953.
18. Dimmick, Thomas B., "Trends in Traffic Volumes, Vehicle Types, and Weights," **Public Roads,** Vol. 27, No. 11, December, 1953.
19. Dimmick, Thomas B., "Traffic and Travel Trends, 1954," **Public Roads,** Vol. 28, No. 11, December, 1955.
20. Dimmick, Thomas B., "Traffic and Travel Trends, 1955," **Public Roads,** Vol. 29, No. 5, December, 1956.
21. Dimmick, Thomas B., "Traffic and Travel Trends, 1956," **Public Roads,** Vol. 29, No. 11, December, 1957.

APPENDIX A

List of Tables

TRENDS IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS BY YEARS, BY AASHO REGIONS, AND FOR THE UNITED STATES

TABLE A-1
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Vehicle Width—Inches
(AASHO 1946 Policy Recommends 96 Inches)

Date	Region				United States
	1	2	3	4	
1946	97.0	96.0	96.0	96.0	96.2
1951	97.0	96.0	96.0	96.0	96.2
March, 1952	97.0	96.0	96.0	96.0	96.2
October, 1953	97.0	96.0	96.0	96.0	96.2
November, 1955	97.0	96.0	96.0	96.0	96.2
February, 1956	97.0	96.0	96.0	96.5	96.4
July 1, 1956	97.0	96.2	96.0	96.5	96.4
July 1, 1957	97.0	96.2	96.0	96.9	96.6
July 1, 1958	97.0	96.0	96.0	96.9	96.5

TABLE A-2
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Vehicle Height—Feet and Inches
(AASHO 1946 Policy Recommends 12 Feet 6 Inches)

Date	Region				United States
	1	2	3	4	
1946	12-6	12-6	12-6	13-0	12-7
1951	12-9	12-7	12-7	13-2	12-9
March, 1952	12-9	12-7	12-7	13-2	12-9
October, 1953	12-9	12-7	12-8	13-2	12-9
November, 1955	12-9	12-8	12-9	13-2	12-10
February, 1956	12-9	12-8	12-9	13-2	12-10
July 1, 1956	12-9	12-7	12-9	13-2	12-10
July 1, 1957	12-9	12-7	12-10	13-3	12-10
July 1, 1958	12-9	12-9	13-1	13-4	12-11

TABLE A-3.1
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Length of Single Unit Truck—Feet
(AASHO 1946 Policy Recommends 35 feet)

Date	Region				United States
	1	2	3	4	
1946	38.7	34.8	36.8	36.4	36.6
1951	40.0	35.4	36.0	37.3	37.1
March, 1952	40.0	35.4	36.0	37.3	37.1
October, 1953	40.0	35.4	36.0	37.3	37.1
November, 1955	40.0	35.4	36.0	37.3	37.1
February, 1956	40.0	35.8	36.0	37.5	37.3
July 1, 1956	40.0	35.8	36.0	37.5	37.3
July 1, 1957	40.0	35.8	36.0	37.5	37.3
July 1, 1958	40.0	35.8	36.0	37.5	37.3

TABLE A-3.2
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Length of Single Unit Bus—Feet
(AASHO 1946 Policy Recommends 40 Feet)

Date	Region				United States
	1	2	3	4	
1946	38.7	34.8	36.2	36.4	36.5
1951	41.3	39.2	40.1	38.6	39.8
March, 1952	41.3	39.2	39.7	39.1	39.8
October, 1953	41.8	39.6	40.5	40.5	40.6
November, 1955	42.3	40.0	40.8	40.5	40.9
February, 1956	42.3	40.4	40.8	40.8	41.0
July 1, 1956	42.3	40.4	40.8	40.8	41.0
July 1, 1957	42.3	40.4	40.8	40.8	41.0
July 1, 1958	42.3	40.4	40.8	40.8	41.0

TABLE A-3.3
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Length of Truck Tractor Semitrailer—Feet
(AASHO 1946 Policy Recommends 50 Feet)

Date	Region				United States
	1	2	3	4	
1946	47.1	44.3	44.8	55.9	47.8
1951	48.3	46.9	47.3	58.6	50.1
March, 1952	48.3	46.9	47.3	58.6	50.1
October, 1953	48.3	46.9	47.7	58.6	50.2
November, 1955	47.9	47.3	49.2	59.5	50.8
February, 1956	47.9	47.6	49.2	59.2	50.9
July 1, 1956	48.3	48.3	49.2	59.2	51.2
July 1, 1957	48.8	48.7	50.0	59.2	51.6
July 1, 1958	48.8	49.4	50.4	59.2	51.9

TABLE A-3.4
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Length of Other Combinations—Feet
(AASHO 1946 Policy Recommends 60 Feet)

Date	Region				United States
	1	2	3	4	
1946	49.5	46.2	46.3	58.6	50.2
1951	50.5	49.3	48.8	60.0	52.2
March, 1952	50.5	49.3	48.8	60.0	52.2
October, 1953	50.5	48.3	49.2	60.0	52.0
November, 1955	50.5	48.3	50.4	60.5	52.5
February, 1956	50.5	48.6	50.4	60.8	52.9
July 1, 1956	50.5	49.1	50.4	60.8	53.0
July 1, 1957	51.0	50.8	51.7	60.8	53.8
July 1, 1958	54.0	51.3	52.1	60.8	54.7

TABLE A-4.1
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Single Axle Load—Pounds
(AASHO 1946 Policy Recommends 18,000 Pounds)

Date	Region				United States
	1	2	3	4	
1946	20,622	18,000	17,917	18,000	18,514
1951	21,855	18,167	18,192	18,000	18,977
March, 1952	21,855	18,242	18,192	18,000	18,996
October, 1953	22,313	18,417	18,192	18,000	19,040
November, 1955	22,313	18,933	18,457	18,575	19,489
February, 1956	22,313	19,045	18,380	18,915	19,568
July 1, 1956	22,313	19,120	18,380	18,915	19,586
July 1, 1957	22,313	19,120	18,380	18,915	19,586
July 1, 1958	22,313	19,120	18,457	18,915	19,607

TABLE A-4.2
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Permitted Tandem Axle Load—Pounds
(AASHO 1946 Policy Recommends 32,000 Pounds)

Date	Region				United States
	1	2	3	4	
1946	32,250	30,757	27,877	29,475	30,044
1951	35,091	32,338	31,238	32,133	32,620
March, 1952	35,778	32,821	31,238	32,417	32,847
October, 1953	35,778	32,938	31,500	32,417	32,951
November, 1955	36,140	35,517	32,005	33,127	34,068
February, 1956	36,140	35,698	31,928	33,102	34,066
July 1, 1956	36,140	35,165	31,928	33,102	33,933
July 1, 1957	36,140	35,165	32,235	33,194	34,041
July 1, 1958	36,140	35,165	32,312	33,194	34,062

TABLE A-5.1
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Practical Maximum Gross Weight of 2-axle Truck—Pounds
(26,000 Pounds Permitted by AASHO 1946 Policy)

Date	Region				United States
	1	2	3	4	
1946	29,767	26,000	25,846	26,083	26,902
1951	29,667	26,000	26,192	26,000	26,949
March, 1952	29,833	26,075	26,192	26,000	27,008
October, 1953	29,833	26,083	26,192	26,000	27,010
November, 1955	30,285	26,808	26,373	26,533	27,477
February, 1956	30,285	26,878	26,311	26,877	27,548
July 1, 1956	30,285	26,953	26,311	26,877	27,566
July 1, 1957	30,285	26,953	26,311	26,877	27,566
July 1, 1958	30,285	26,953	26,388	26,877	27,566

TABLE A-5.2
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Practical Maximum Gross Weight of 3-axle Truck—Pounds
(40,000 Pounds Permitted by AASHO 1946 Policy)

Date	Region				United States
	1	2	3	4	
1946	40,917	38,340	35,246	38,375	38,159
1951	41,833	40,171	39,238	39,800	40,240
March, 1952	43,858	40,321	39,238	40,083	40,842
October, 1953	43,125	40,438	39,592	40,083	40,785
November, 1955	43,450	42,588	39,820	40,710	41,605
February, 1956	43,450	42,919	39,743	40,717	41,648
July 1, 1956	43,450	42,886	39,743	40,717	41,640
July 1, 1957	43,450	42,886	40,051	40,717	41,720
July 1, 1958	43,783	42,886	40,128	40,717	41,820

TABLE A-5.3
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Practical Maximum Gross Weight of 3-axle Truck Tractor Semitrailer—Pounds
(44,000 Pounds Permitted by AASHO 1946 Policy)

Date	Region				United States
	1	2	3	4	
1946	45,883	43,966	43,769	43,500	44,269
1951	50,350	43,833	44,385	44,000	45,616
March, 1952	50,517	43,817	44,385	44,000	45,652
October, 1953	50,283	44,333	44,483	44,483	45,868
November, 1955	51,562	45,217	44,723	45,400	46,684
February, 1956	51,562	45,590	44,646	46,062	46,900
July 1, 1956	51,562	46,240	44,646	46,062	47,056
July 1, 1957	51,562	46,240	44,646	46,062	47,056
July 1, 1958	51,562	46,240	44,800	46,062	47,096

TABLE A-5.4
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Practical Maximum Gross Weight of 4-axle Truck Tractor Semitrailer—Pounds
(55,470 Pounds Permitted by AASHO 1946 Policy)

Date	Region				United States
	1	2	3	4	
1946	47,158	48,812	51,583	52,708	50,096
1951	55,355	52,013	54,487	56,800	54,660
March, 1952	54,421	52,707	55,809	57,508	55,128
October, 1953	55,412	54,443	56,563	57,873	56,082
November, 1955	60,570	56,224	56,973	59,147	58,203
February, 1956	60,600	57,064	56,896	59,813	58,583
July 1, 1956	60,600	59,100	56,896	59,813	59,072
July 1, 1957	61,433	59,100	57,398	59,813	59,403
July 1, 1958	61,433	59,100	57,745	59,813	59,493

TABLE A-5.5
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Practical Maximum Gross Weight of 5-axle Truck Tractor Semitrailer—Pounds
(61,490 Pounds Permitted by AASHO 1946 Policy)

Date	Region				United States
	1	2	3	4	
1946	47,313	52,133	55,362	62,400	54,323
1951	56,155	55,611	61,579	68,872	60,575
March, 1952	55,437	56,490	63,494	68,626	61,062
October, 1953	55,437	57,864	65,121	70,235	62,224
November, 1955	61,158	60,184	65,914	71,548	64,726
February, 1956	61,158	60,790	65,837	71,737	65,037
July 1, 1956	61,158	62,827	65,837	71,737	65,526
July 1, 1957	61,991	62,827	67,041	71,737	66,039
July 1, 1958	61,991	62,995	67,815	71,737	66,280

TABLE A-5.6
TREND IN STATE LEGAL MAXIMUM LIMITS OF MOTOR VEHICLE SIZES AND WEIGHTS
Average Practical Maximum Gross Weight of Other Combination—Pounds
(71,900 Pounds Permitted by AASHO 1946 Policy)

Date	Region				United States
	1	2	3	4	
1946	53,886	53,369	57,129	69,442	58,784
1951	60,086	58,348	65,415	72,180	64,443
March, 1952	63,420	59,745	69,328	73,339	66,901
October, 1953	61,340	59,105	69,824	74,077	66,620
November, 1955	64,591	61,135	69,783	76,087	68,357
February, 1956	64,591	61,863	69,699	75,772	68,577
July 1, 1956	64,591	62,543	69,699	75,772	68,577
July 1, 1957	65,591	62,543	71,388	75,772	69,401
July 1, 1958	65,591	62,745	71,888	75,772	69,579

APPENDIX B

List of Tables and Illustrations

RELATIVE FREQUENCIES OF EQUIVALENT H-TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES

CUMULATIVE PERCENT OF HEAVY FREIGHT VEHICLES HAVING EQUIVALENT H-TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES FOR ALL 6 MAJOR HEAVY FREIGHT VEHICLE TYPES; BY YEARS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES

ESTIMATED ANNUAL FREQUENCIES OF HEAVY FREIGHT VEHICLES HAVING EQUIVALENT H-TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES FOR ALL SIX MAJOR HEAVY FREIGHT VEHICLE TYPES; BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS

ESTIMATED ANNUAL FREQUENCIES OF HEAVY FREIGHT VEHICLES HAVING EQUIVALENT H-TRUCK LOADING EQUAL TO OR GREATER THAN STATED VALUES FOR ALL SIX MAJOR HEAVY FREIGHT VEHICLE TYPES; BY AASHO REGIONS, BY SPAN LENGTHS, AND BY YEARS

TABLE B-1.1

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2

Percentage distributions shown are based on 1942-43 loadometer data

Truck Type: 2 Number Reported: 350 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
9	.86	.86	1.14						
10	2.00	2.00	3.14	2.57					
11	16.57	16.29	10.29	5.71	2.86	2.29			
12	23.14	23.42	18.29	17.71	17.14	16.29	10.86	8.86	
13	26.57	26.00	30.00	36.86	29.14	26.57	27.71	24.56	20.86
14	16.85	17.42	21.71	20.29	29.14	29.71	31.71	33.14	34.57
15	7.14	7.14	6.86	7.71	10.57	13.71	17.14	19.14	23.42
16	3.43	3.43	5.43	5.14	5.14	5.14	6.29	6.86	11.14
17	2.29	2.29	1.43	2.86	4.86	4.86	4.29	4.86	6.29
18	.86	.86	1.71	.86	.86	1.14	1.71	2.29	2.86
19	.29	.29		.29	.29	.29	.29		.57
20								.29	.29
Max.	19	19	18	19	19	19	19	20	20
Avg.	12.9	12.9	13.1	13.3	13.7	13.8	14.0	14.2	14.6
Min.	9	9	9	10	11	11	12	12	13

Truck Type: 2 Number Reported: 4 Region: II

10			25.00						
11	100.00	100.00		25.00	25.00	25.00			
12			75.00	50.00	25.00	25.00	25.00	25.00	
13				25.00	50.00	25.00	50.00	50.00	50.00
14						25.00	25.00	25.00	25.00
15									25.00
Max.	11	11	12	13	13	14	14	14	15
Avg.	11.0	11.0	11.5	12.0	12.3	12.5	13.0	13.0	13.8
Min.	11	11	10	11	11	11	12	12	13

Truck Type: 2 Number Reported: 18 Region: III

10	11.11	11.11	5.56						
11	44.44	38.89	16.66	11.11	5.56	5.56			
12	22.22	27.77	27.78	22.22	22.22	22.22	16.67	16.66	
13	11.11	11.11	38.89	55.55	61.10	50.00	55.55	50.00	55.55
14	5.56	5.56	11.11	5.56	5.56	16.66	22.22	27.78	27.78
15	5.56	5.56		5.56					11.11
16					5.56	5.56			
17							5.56	5.56	
18									5.56
Max.	15	15	14	15	16	16	17	17	18
Avg.	11.7	11.8	12.3	12.7	12.9	13.0	13.3	13.3	13.8
Min.	10	10	10	11	11	11	12	12	13

Truck Type: 2 Number Reported: 25 Region: IV

10	8.00	8.00	8.00						
11	12.00	12.00	12.00	20.00					
12	24.00	24.00	16.00	8.00	28.00	28.00	8.00	8.00	
13	16.00	16.00	20.00	28.00	16.00	16.00	36.00	28.00	24.00
14	8.00	8.00	12.00	12.00	20.00	20.00	20.00	28.00	40.00
15	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
16					4.00	4.00	4.00	4.00	4.00
17	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Max.	17	17	17	17	17	17	17	17	17
Avg.	13.1	13.1	13.2	13.4	13.8	13.8	14.0	14.0	14.2
Min.	10	10	10	11	12	12	12	12	13

Truck Type: 2 Number Reported: 397 Region: U.S.

9	.76	.76	1.01						
10	2.77	2.77	3.78	2.27					
11	18.39	17.88	10.58	7.05	3.02	2.52			
12	22.92	23.43	19.14	17.63	18.14	17.38	11.08	9.32	
13	24.94	24.43	29.47	37.03	29.98	26.95	29.73	26.19	22.92
14	15.61	16.12	20.40	18.89	27.20	28.47	30.48	32.49	34.51
15	8.31	8.31	7.81	8.82	11.08	13.85	16.88	18.64	23.18
16	3.02	3.02	4.79	4.53	5.04	5.04	5.79	6.30	10.08
17	2.27	2.27	1.51	2.77	4.53	4.53	4.28	4.79	5.79
18	.76	.76	1.51	.76	.76	1.01	1.51	2.02	2.77
19	.25	.25		.25	.25	.25	.25		.50
20								.25	.25
Max.	19	19	18	19	19	19	19	20	20
Avg.	12.8	12.9	13.1	13.3	13.6	13.7	14.0	14.1	14.5
Min.	9	9	9	10	11	11	12	12	13

TABLE B-1.2
RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3

Percentage distributions shown are based on 1942-43 loadometer data

Truck Type: 3 — Number Reported: 429 — Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	.93								
8	9.32								
9	17.02	1.17	.47	.23					
10	28.91	1.63	.70	.70	.23	.23			
11	13.75	23.08	6.06	2.33	.93	.23	.23		
12	13.99	17.25	17.95	16.78	14.46	13.29	4.20	2.56	
13	8.39	13.52	18.42	18.42	18.65	19.58	21.68	18.42	14.69
14	3.96	13.28	16.08	14.45	13.99	13.52	17.49	20.05	20.75
15	1.63	13.52	10.72	10.96	12.82	11.42	10.72	11.19	11.42
16	1.40	6.53	10.72	7.93	8.86	8.63	10.49	10.49	10.03
17	.70	3.73	7.46	10.26	6.99	8.63	8.39	8.63	9.09
18		2.56	3.50	6.53	9.09	6.99	6.99	7.23	6.99
19		1.63	3.73	5.59	5.36	7.69	7.93	6.99	6.76
20		1.40	1.86	2.80	4.20	3.96	4.43	6.06	6.29
21		.47	1.17	.93	1.40	2.80	3.26	3.73	6.53
22		.23	.70	.93	.93	.47	1.40	1.86	3.03
23			.23	.70	.93	1.40	.93	.47	1.40
24			.23	.23	.70	.70	1.17	1.63	.70
25				.23	.23	.23	.23	.23	1.63
26					.23	.23	.23	.23	.23
27							.23	.23	.23
28									.23
Max.	17	22	24	25	26	26	27	27	28
Avg.	10.7	13.4	14.4	14.9	15.3	15.5	15.8	16.0	16.6
Min.	7	9	9	9	10	10	11	12	13

Truck Type: 3 — Number Reported: 48 — Region: II

8	8.33								
9	14.59								
10	31.25	4.17	2.08						
11	12.50	16.67		2.08					
12	20.83	18.75	12.50	8.33	10.41	10.40			
13	12.50	14.58	27.09	22.92	18.75	18.75	14.58	12.50	10.42
14		12.50	12.50	20.84	25.00	22.92	33.34	31.25	25.00
15		20.83	25.00	12.50	12.50	12.50	10.42	14.58	22.91
16		12.50	6.25	14.58	12.50	12.50	14.58	12.50	12.50
17			12.50	6.25	6.25	8.34	12.50	10.42	6.25
18			2.08	12.50	10.42	10.42	8.33	6.25	10.42
19					4.17	4.17	2.08	8.33	8.33
20							4.17	4.17	
21									4.17
Max.	13	16	18	18	19	19	20	20	21
Avg.	10.6	13.3	14.2	14.6	14.8	14.9	15.3	15.5	15.7
Min.	8	10	10	11	12	12	13	13	13

Truck Type: 3 — Number Reported: 141 — Region: III

7	5.67								
8	8.51	1.42	1.42						
9	17.02	4.26	2.13	2.13	1.42				
10	29.08	1.42	2.84	2.13	.71	1.42			
11	12.76	23.40	4.96	2.84	2.84	2.84	1.42	1.42	
12	12.06	12.76	17.02	12.06	13.47	12.76	7.80	4.26	
13	7.09	17.73	14.18	19.15	17.73	18.44	17.78	13.48	13.48
14	3.55	12.05	18.43	21.27	17.73	16.31	14.89	21.98	23.40
15	2.84	12.05	14.89	4.96	8.51	9.93	17.73	18.44	16.31
16	.71	4.26	7.09	12.05	12.76	8.51	7.80	5.67	8.51
17	.71	2.84	3.55	6.38	7.09	11.35	13.47	12.76	9.93
18		4.26	2.84	3.55	4.26	4.96	5.67	4.96	9.22
19		2.13	4.26	6.38	2.84	2.13	2.13	5.67	5.67
20			4.26	4.26	4.96	5.67	3.55	3.55	2.13
21		.71	.71	1.42	2.84	2.13	3.55	3.55	4.96
22			.71	.71	1.42	1.42	2.13	1.42	2.13
23					.71	1.42	.71	1.42	1.42
24							.71	.71	1.42
25									
26		.71							.71
27				.71					
28			.71		.71	.71	.71	.71	
29									.71
Max.	17	26	28	27	28	28	28	28	29
Avg.	10.4	13.2	14.2	14.7	15.0	15.2	15.6	15.8	16.3
Min.	7	8	8	9	9	10	11	11	13

Truck Type: 3 — Number Reported: 152 — Region: IV

7	.66								
8	8.55								
9	15.79	.66							
10	30.26	3.29	2.63						
11	17.76	20.39	3.95	4.61	1.97				
12	17.10	15.13	11.84	8.55	7.24	7.89	6.58	3.29	
13	4.61	15.79	21.71	19.74	17.10	18.42	11.18	11.18	7.89
14	3.95	17.76	17.76	15.79	18.42	15.79	19.74	21.71	23.68
15		17.10	19.08	21.05	21.05	21.06	17.10	11.85	10.52
16	.66	4.61	11.19	11.18	13.16	11.18	17.11	18.42	21.71
17		1.32	5.26	11.18	9.21	11.18	11.18	15.79	12.50
18		2.63	1.97	3.29	5.92	7.89	7.89	7.89	9.21

TABLE B-1.2—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
19	.66		2.63	3.29	3.29	3.29	4.61	5.26	4.61
20		.66	.66	.66	.66	1.32	1.97	1.97	6.58
21			.66		.66	.66	1.32	1.32	.66
22				.66	.66	.66	.66	.66	1.32
23									.66
24		.66							
25			.66						
26					.66				
27						.66	.66	.66	
28									.66
Max.	19	24	25	22	26	27	27	27	28
Avg.	10.6	13.3	14.3	14.7	15.0	15.2	15.5	15.7	16.1
Min.	7	9	10	11	11	12	12	12	13
Truck Type: 3				Number Reported: 770				Region: U.S.	
7	1.69								
8	8.96	.26	.26						
9	16.62	1.56	.65	.52	.26				
10	29.35	2.08	1.56	.78	.26	.39			
11	14.29	22.21	5.06	2.86	1.43	.65	.39	.26	
12	14.67	16.10	16.23	13.76	12.59	11.95	5.06	2.86	
13	7.66	14.80	18.83	19.09	18.18	19.09	18.44	15.71	12.85
14	3.64	13.90	16.62	16.36	16.23	15.06	18.44	21.42	22.08
15	1.43	14.41	14.03	11.95	13.64	13.12	13.25	12.86	12.86
16	1.04	6.10	9.87	9.74	10.65	9.35	11.56	11.30	12.21
17	.39	2.86	6.62	9.48	7.40	9.61	10.13	10.91	9.74
18		2.73	2.99	5.71	7.66	7.01	7.01	6.88	8.05
19	.13	1.30	3.38	4.81	4.42	5.58	5.84	6.49	6.23
20		.91	1.95	2.47	3.38	3.51	3.77	4.68	5.19
21	.13	.39	.91	.78	1.43	2.08	2.73	2.99	4.94
22		.13	.52	.78	.91	.65	1.30	1.43	2.34
23			.13	.39	.65	1.04	.65	.52	1.17
24		.13	.13	.13	.39	.39	.78	1.04	.65
25			.13	.13	.13	.13	.13	.13	.91
26		.13		.13	.26	.13	.13	.13	.26
27				.13		.13	.26	.26	.13
28			.13		.13	.13	.13	.13	.26
29									.13
Max.	21	26	28	27	28	28	28	28	29
Avg.	10.6	13.3	14.3	14.8	15.1	15.3	15.7	15.9	16.4
Min.	7	8	8	9	9	10	11	11	13

TABLE B-1.3

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S1

Percentage distributions shown are based on 1942-43 loadometer data

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
Truck Type: 2-S1				Number Reported: 2,454				Region: I	
7	.04	.04							
8			.04	.04					
9	5.38	4.85	1.06		.04				
10	12.96	12.35	6.52	3.22	.16	.04			
11	25.23	25.27	15.89	8.64	1.87	.20	.04		
12	17.40	18.17	23.18	14.31	7.78	2.44		.04	
13	16.71	16.87	20.01	23.68	15.57	7.70	1.26		
14	10.43	10.39	11.00	15.12	17.97	17.08	7.82	2.65	.04
15	4.65	4.69	9.54	13.61	17.08	16.26	17.36	10.11	
16	3.95	4.03	5.50	9.37	13.25	17.04	15.41	16.38	
17	1.34	1.39	3.59	4.56	9.50	13.94	15.77	19.32	6.93
18	1.18	1.22	2.08	3.59	7.13	8.76	13.82	14.06	15.53
19	.53	.53	.94	1.39	3.95	5.42	9.74	11.82	16.54
20	.12	.12	.29	1.26	1.96	4.56	5.91	7.82	13.53
21	.04	.04	.24	.77	1.71	2.49	4.28	5.09	12.88
22				.20	1.18	1.67	2.97	3.95	7.99
23			.12	.12	.49	1.30	2.24	3.02	6.48
24	.04	.04		.12	.20	.65	1.39	2.77	5.91
25					.12	.29	1.14	1.06	3.95
26						.12	.45	1.10	3.01
27					.04		.16	.37	2.28
28						.04	.20	.24	1.79
29								.16	1.39
30							.04		.65
31								.04	.53
32									.33
33									.08
34									.12
35									.04
Max.	24	24	23	24	27	28	30	31	35
Avg.	12.2	12.2	13.0	13.9	15.2	16.2	17.4	18.2	21.0
Min.	7	7	8	8	9	10	11	12	14
Truck Type: 2-S1				Number Reported: 800				Region: II	
8	.25	.25	.13	.13					
9	4.88	4.38	1.13		.13				
10	19.62	19.37	14.00	6.75	.63	.13			
11	41.37	41.12	34.24	17.87	4.75	1.25	.13		

TABLE B-1.3—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
12	17.24	18.12	26.49	19.62	17.37	5.87		.13	
13	10.62	10.62	16.37	31.75	25.24	18.12	4.63		
14	4.13	4.25	4.25	12.62	25.11	29.12	16.24	7.13	
15	1.13	1.13	2.25	8.25	15.57	19.87	32.12	23.12	.13
16	.63	.63	.75	1.75	6.75	14.99	21.87	26.87	.13
17			.13	.63	2.88	6.62	14.24	24.24	18.24
18			.13	.25	1.13	2.38	5.50	9.87	26.61
19	.13	.13	.13	.13	.13	.88	3.38	5.00	24.61
20				.25	.25	.38	1.00	2.00	14.74
21						.13	.50	.75	7.25
22					.13		.13	.38	4.13
23					.13	.13		.25	1.88
24							.13	.13	1.13
25						.13			.38
26									.38
27							.13		.13
28								.13	.13
33									.13
Max.	19	19	19	20	23	25	27	28	33
Avg.	11.3	11.3	11.7	12.6	13.7	14.6	15.7	16.4	19.0
Min.	8	8	8	8	9	10	11	12	15

Truck Type: 2-S1 Number Reported: 2,371 Region: III

9	7.17	3.37	.08						
10	24.67	23.12	10.63	1.94	.04				
11	41.00	41.93	35.85	10.76	.80	.13			
12	13.12	16.54	26.15	18.65	9.62	1.60			
13	10.16	10.33	18.22	40.70	25.89	11.73	1.43		
14	3.04	3.71	4.94	15.06	30.58	31.47	10.63	2.95	
15	.34	.46	2.61	7.97	19.15	25.05	31.85	19.70	
16	.30	.30	.76	3.04	8.56	17.97	27.54	30.46	
17	.08	.08	.51	.97	3.04	7.51	16.32	26.11	18.14
18	.04	.08	.13	.67	1.48	2.74	7.34	11.85	31.25
19	.04	.04		.08	.51	.97	2.78	5.44	21.43
20			.04	.04	.13	.55	1.27	1.86	14.85
21				.04	.04	.08	.51	.97	7.68
22					.08	.04	.13	.46	3.63
23			.04	.04		.04	.04	.04	1.77
24	.04	.04			.04	.04			.63
25						.04	.04	.04	.42
26				.04			.04		.04
27					.04		.04	.04	
28			.04			.04		.04	
29									
30							.04		
31									.04
32								.04	.08
38									.04
Max.	24	24	28	26	27	28	30	32	38
Avg.	11.1	11.2	11.9	13.0	14.1	14.9	15.9	16.6	18.9
Min.	9	9	9	10	10	11	13	14	17

Truck Type: 2-S1 Number Reported: 434 Region: IV

9	4.15	3.23	1.38						
10	20.05	20.51	12.90	5.53	1.15				
11	40.09	39.40	30.88	10.14	3.23	1.84			
12	17.05	17.74	26.96	20.51	10.37	3.23	.46		
13	11.52	11.75	17.74	35.48	22.81	11.98	2.76	.46	
14	4.84	5.07	4.61	14.29	28.11	26.27	10.14	5.30	
15	1.38	1.38	3.92	8.29	17.28	22.58	29.50	17.74	
16	.69	.69	1.15	3.46	8.99	16.13	22.12	24.89	
17	.23	.23	.46	1.38	4.15	11.29	14.29	21.89	18.43
18				.69	2.76	3.69	11.52	11.98	22.12
19				.23	.23	1.61	5.53	10.83	19.82
20					.46	.23	2.07	3.46	14.29
21					.46	.46	.23	1.84	10.37
22						.69	.46	.23	7.37
23							.46	.46	4.38
24							.46	.23	1.15
25								.69	.69
26									.23
27									.46
28									
29									
30									.69
Max.	17	17	17	19	21	22	24	25	30
Avg.	11.4	11.4	11.8	12.9	14.1	15.0	16.1	16.8	19.4
Min.	9	9	9	10	10	11	12	13	17

Truck Type: 2-S1 Number Reported: 6,059 Region: U.S.

7	.02	.02							
8	.03	.03	.03	.03					
9	5.93	4.09	.71		.03				
10	18.93	18.07	9.70	3.35	.25	.03			
11	34.59	34.89	27.99	10.79	1.93	.43	.03		
12	15.68	17.50	25.80	17.15	9.95	2.62	.03	.03	
13	12.97	13.12	18.19	32.25	21.41	10.96	1.88	.03	
14	6.32	6.60	6.85	14.72	24.57	24.94	10.17	3.55	.02
15	2.24	2.31	5.00	10.31	17.68	20.63	25.86	16.12	.02
16	1.85	1.88	2.51	5.45	10.25	17.07	21.51	23.88	.02
17	.59	.59	1.75	2.41	5.73	10.27	15.66	22.81	13.63

TABLE B-1.3—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
18	.50	.53	.79	1.78	3.81	5.20	10.04	12.50	23.61
19	.21	.21	.36	.63	1.80	2.86	5.91	8.35	19.75
20	.05	.05	.12	.56	.91	2.10	3.14	4.41	14.26
21	.02	.02	.10	.33	.74	1.06	2.03	2.67	9.92
22		.02		.10	.54	.74	1.30	1.86	5.73
23	.02	.02	.08	.07	.21	.58	.92	1.30	3.88
24	.03	.03		.05	.10	.28	.61	1.16	2.87
25					.05	.15	.50	.45	1.86
26						.05	.20	.46	1.30
27					.02		.10	.18	.99
28			.02			.03	.08	.13	.74
29	.02	.02		.02	.02			.07	.56
30							.03		.30
31								.02	.23
32								.02	.17
33									.05
34									.05
35									.02
36									
37									
38									.02
Max.	29	29	28	29	29	28	30	32	38
Avg.	11.6	11.7	12.3	13.3	14.5	15.4	16.5	17.2	19.8
Min.	7	7	8	8	9	10	11	12	14

TABLE B-1.4
RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S2

Percentage distributions shown are based on 1942-43 loadometer data

Truck Type: 2-S2 Number Reported: 23 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
9	4.35	4.35							
10			4.35						
11				4.35					
12	26.08	8.70			4.35				
13	26.08	21.73	13.04	4.35		4.35			
14	26.09	17.39	13.04	4.35	4.35				
15	8.70	13.04	26.09	21.73			4.35	4.35	
16	8.70	8.70	17.39	8.70	8.70	4.35			
17			13.04	4.35	21.73	4.35			
18		8.70	8.70	8.70	8.70	17.39	4.35		4.35
19		13.04	4.35	26.08	4.35	17.39	4.35	4.35	
20		4.35		17.39	26.08		13.04	8.70	
21					17.39	17.39	21.73	8.70	
22					4.35	13.04	8.70	21.73	
23						21.74	8.70	8.70	4.35
24							17.39	8.70	4.35
25							17.39	4.35	13.03
26								30.42	13.04
27									8.70
28									8.70
29									13.04
30									4.35
31									21.74
32									4.35
Max.	16	20	19	20	22	23	25	26	32
Avg.	13.3	15.0	15.3	17.0	18.4	20.0	21.9	22.9	27.5
Min.	9	9	10	11	12	13	15	15	18

Truck Type: 2-S2 Number Reported: 29 Region: II

9	10.34	6.90	6.90						
10	17.24	10.34		3.45					
11	17.25	3.45	10.34	3.45					
12	6.90	3.45		6.90	6.90				
13	13.79	27.58	24.13	3.45	3.45	6.90			
14	13.79	20.69	3.45	13.79	6.90	3.45	6.90	3.45	
15	13.79	13.79	24.14	17.25	10.34	13.79		3.45	
16	6.90	3.45	13.79	13.79	6.90	3.45	10.34		
17		3.45	6.90	13.79	20.68	6.90	10.34	10.34	3.45
18			3.45	10.34	13.79	20.68	3.45	10.34	3.45
19		6.90			17.24	24.13	10.34	6.90	
20			6.90	10.34		3.45	24.14	10.34	10.34
21						3.45	13.79	20.69	13.79
22					6.90		6.90	6.90	6.89
23				3.45	3.45	3.45		13.79	10.34
24					3.45	6.90			6.90
25							6.90		10.34
26						3.45	3.45	3.45	
27							3.45	6.90	6.90
28								3.45	6.90
29									6.90
30									
31									6.90
32									6.90
Max.	16	19	20	23	24	26	27	28	32
Avg.	12.3	13.4	14.4	15.8	17.3	18.2	19.8	20.8	24.4
Min.	9	9	9	10	12	13	14	14	17

TABLE B-1.4—Continued

Truck Type: 2-S2 Number Reported: 258 Region: III

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	1.55								
8	3.10								
9	15.50	5.43	.78						
10	20.16	10.08	4.26	2.71					
11	20.16	14.72	8.91	2.33	1.55				
12	20.54	21.70	12.79	6.59	2.33	1.55			
13	13.18	22.09	20.93	12.01	7.75	2.33	.78		
14	4.26	8.53	17.83	11.24	8.53	8.53	2.33	1.16	
15	1.16	9.30	10.07	23.64	15.11	10.46	8.91	5.04	
16	.39	3.10	9.30	10.85	17.05	11.62	8.52	8.14	
17		1.94	3.88	11.63	13.56	16.27	10.07	9.69	3.10
18		1.94	3.88	6.98	11.62	12.01	15.50	14.34	7.75
19		.78	3.10	4.65	9.69	17.83	17.82	10.08	8.91
20		.39	2.33	1.94	5.04	5.43	11.24	17.44	9.30
21			1.16	1.55	2.33	5.43	9.69	12.40	11.24
22				2.71	1.55	3.10	5.43	7.75	10.85
23			.39	.39	2.33	1.55	3.10	4.65	10.85
24			.39		.78	2.33	2.33	3.49	12.40
25				.78		.78	1.94	3.10	10.08
26					.39		.78	1.16	4.65
27					.39	.39	.78		3.49
28						.39	.39	.39	3.10
29							.39	.78	2.33
30								.39	.39
31									
32									.78
33									.78
Max.	16	20	24	25	27	28	29	30	33
Avg.	11.0	12.6	14.1	15.4	16.7	17.7	18.9	19.6	22.5
Min.	7	9	9	10	11	12	13	14	17

Truck Type: 2-S2 Number Reported: 593 Region: IV

7	.84								
8	2.19		.17						
9	8.77	4.22	1.01	.34	.17				
10	11.97	6.24	4.38	1.18	.17	.17			
11	16.52	9.61	4.38	4.05	1.01	.17			
12	29.01	16.69	12.99	4.72	3.37	1.01	.17		
13	16.53	16.69	14.84	9.61	4.05	3.54	.67	.17	
14	10.46	10.29	13.83	13.49	10.45	4.72	2.19	1.01	
15	1.85	12.48	12.31	16.35	11.80	8.43	5.06	4.05	
16	1.18	12.82	9.27	15.00	16.02	12.48	6.24	3.54	
17		3.71	13.49	10.46	17.03	14.50	9.44	7.25	1.85
18	.51	6.24	6.75	12.82	10.46	17.88	11.30	8.43	3.71
19	.17	.67	5.23	6.91	11.80	12.48	19.56	14.84	5.40
20		.34	.51	2.53	7.76	9.78	11.64	16.02	5.40
21			.67	1.52	2.70	8.26	12.31	9.95	6.75
22				.34	2.02	3.37	9.27	11.97	10.12
23			.17	.51	.51	1.69	6.75	9.78	11.80
24					.34	.84	3.20	7.08	8.09
25				.17	.17	.17	1.18	3.71	12.48
26					.17	.34	.17	1.01	13.32
27						.17	.51	.34	6.75
28							.34	.51	5.73
29								.34	2.70
30									4.55
31									
32									.84
33									.34
34									
35									.17
Max.	19	20	23	25	26	27	28	29	35
Avg.	11.7	13.5	14.6	15.6	16.7	17.8	19.4	20.3	24.0
Min.	7	9	8	9	3	10	12	13	17

Truck Type: 2-S2 Number Reported: 903 Region: U.S.

7	1.00								
8	2.33		.11						
9	10.63	4.65	1.12	.22	.11				
10	14.06	7.31	4.21	1.66	.11	.11			
11	17.28	10.74	5.87	3.54	1.11	.11			
12	25.69	17.50	12.29	5.32	3.21	1.11	.11		
13	15.73	18.60	16.94	9.97	5.09	3.43	.66	.11	
14	9.19	10.30	14.39	12.52	9.63	5.65	2.44	1.11	
15	2.21	11.63	12.51	18.61	12.29	8.86	5.87	4.32	
16	1.33	10.08	9.41	13.62	15.84	11.74	6.98	4.65	
17		3.10	10.52	10.74	16.28	14.51	9.53	7.97	2.21
18	.44	4.87	5.87	10.96	10.85	16.28	11.85	9.86	4.87
19	.11	.89	4.43	6.53	11.18	14.51	18.39	12.96	6.09
20		.33	1.22	2.99	7.20	8.09	11.96	16.06	6.53
21			.78	1.44	2.55	7.53	11.85	10.97	8.09
22				1.00	2.44	3.43	8.08	10.85	9.97
23			.22	.55	1.12	2.21	5.54	8.42	11.30
24			.11		.55	1.44	3.32	5.87	9.19
25				.33	.11	.33	1.88	3.43	11.74
26					.22	.33	.44	1.88	10.41
27					.11	.22	.66	.44	5.87
28						.11	.33	.55	5.09
29							.11	.44	2.99
30								.11	3.21
31									.78
32									1.11

Truck Type: 3-S2				Number Reported: 3				Region: III	
8	33.34								
9	33.33								
10									
11		33.34							
12	33.33	33.33							
13			33.34						
14				33.34					
15		33.33	33.33	33.33					
16			33.33		33.34				
17						33.34			
18				33.33	33.33		33.34		
19						33.33		33.34	
20					33.33				
21						33.33	33.33	33.33	
22									
23							33.33	33.33	
24									33.34
25									
26									33.33
27									
28									
29									
30									33.33
Max.	12	15	16	18	20	21	23	23	30
Avg.	9.7	12.7	14.7	15.7	18.0	19.0	20.7	21.0	26.7
Min.	8	11	13	14	16	17	18	19	24

Truck Type: 3-S2				Number Reported: 266				Region: IV	
6	2.63								
7	4.51	1.50							
8	6.77	1.13	1.50	.75					
9	12.03	4.51	1.13	.75	.75				
10	13.16	3.76	4.89	1.50	.75	.38			
11	12.78	9.77	3.01	3.76	1.13	1.13			
12	20.68	8.65	10.90	3.76	2.63	1.13	.38		
13	16.16	10.53	7.52	8.65	3.01	2.26	1.88	2.26	
14	6.39	11.65	10.90	7.14	6.02	1.88	.75	.75	
15	3.01	13.16	12.78	10.53	7.52	4.14	2.26	1.88	
16	1.13	18.04	12.03	11.28	6.77	6.02	2.26	2.26	
17	.75	9.40	14.66	12.40	9.40	5.26	3.01	3.01	.75
18		3.01	8.64	12.78	8.27	9.39	5.26	3.01	3.01
19		3.01	4.51	9.77	14.28	8.27	3.76	4.89	.75
20		.75	4.14	6.02	10.15	9.40	8.65	10.15	.75
21		1.13	1.13	3.76	11.28	11.27	6.02	4.51	2.63
22			1.88	4.14	7.89	13.53	8.65	9.02	1.88
23			.38	1.50	3.38	7.89	12.40	11.65	1.88
24				.38	3.76	5.64	9.77	10.52	3.76
25				1.13	1.88	7.89	12.40	12.78	2.63

TABLE B-1.4—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
33									.44
34									
35									.11
Max.	19	20	24	25	27	28	29	30	35
Avg.	11.6	13.3	14.4	15.6	16.8	17.8	19.3	20.2	23.7
Min.	7	9	8	9	9	10	12	13	17

TABLE B-1.5

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-S2

Percentage distributions shown are based on 1942-43 loadometer data

Truck Type: 3-S2				Number Reported: none				Region: I	
Truck Type: 3-S2				Number Reported: 3				Region: II	
EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
10	33.33								
11									
12	66.67								
13		33.33	33.33	33.34					
14									
15		33.33			33.34				
16		33.34	66.67	33.33		33.34			
17									
18				33.33			33.33		
19					33.33			33.33	
20					33.33	33.33			
21						33.33			
22									
23							66.67	66.67	
24									
25									33.34
30									33.33
31									33.33
Max.	12	16	16	18	20	21	23	23	31
Avg.	11.3	14.7	15.0	15.7	18.0	19.0	21.3	21.7	28.7
Min.	10	13	13	13	15	16	18	19	25

TABLE B-1.5—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
26						1.13	6.39	5.64	6.77
27					.75	1.88	9.39	7.89	6.39
28					.38	1.13	2.63	1.88	4.51
29							2.63	3.01	7.52
30						.38	.75	1.50	6.39
31								1.50	10.52
32							.38	1.13	9.77
33							.38		8.64
34								.38	6.39
35								.38	6.02
36									3.76
37									1.88
38									2.26
39									.38
40									.38
46									.38
Max.	17	21	23	25	28	30	33	35	46
Avg.	11.1	14.0	15.2	16.5	18.4	20.2	22.6	22.9	29.7
Min.	6	7	8	8	9	10	12	13	17

Truck Type: 3-S2 Number Reported: 272 Region: U.S.

6	2.57								
7	4.41	1.47							
8	6.99	1.10	1.47	.74					
9	12.13	4.41	1.10	.74	.74				
10	13.24	3.68	4.78	1.47	.74	.37			
11	12.50	9.93	2.94	3.68	1.10	1.10			
12	21.32	8.82	10.66	3.68	2.57	1.10	.37		
13	15.81	10.66	8.09	8.82	2.94	2.21	1.84	2.21	
14	6.25	11.40	11.03	7.35	5.88	1.84	.74	.74	
15	2.94	13.60	12.50	10.66	8.09	2.94	2.21	1.84	
16	1.10	18.02	12.87	11.40	6.62	6.62	2.21	2.21	
17	.74	9.19	14.34	12.13	9.19	6.25	2.94	2.94	.74
18		2.94	8.46	13.23	8.45	8.82	5.51	2.94	2.94
19		2.94	4.41	9.56	14.33	8.46	4.04	5.51	.74
20		.74	4.04	5.88	10.66	8.82	8.46	9.93	.74
21		1.10	1.10	3.68	11.03	12.87	6.25	4.78	2.57
22			1.84	4.04	7.72	13.24	8.45	8.82	1.84
23			.37	1.47	3.31	7.72	13.23	12.50	1.84
24				.37	3.68	5.51	9.56	10.29	4.04
25				1.10	1.84	7.72	12.13	12.50	2.94
26						1.10	6.25	5.51	6.98
27					.74	1.84	9.19	7.72	6.25
28					.37	1.10	2.57	1.84	4.41
29							2.57	2.94	7.35
30						.37	.74	1.47	6.98
31								1.47	10.65
32							.37	1.10	9.55
33							.37		8.45
34								.37	6.25
35								.37	5.88
36									3.70
37									1.84
38									2.21
39									.37
40									.37
46									.37
Max.	17	21	23	25	28	30	33	35	46
Avg.	11.0	14.0	15.2	16.5	18.4	20.2	22.6	22.9	29.6
Min.	6	7	8	8	9	10	12	13	17

TABLE B-1.6

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-3

Percentage distributions shown are based on 1942-43 loadometer data

Truck Type: 3-3 Number Reported: none Region: I
Truck Type: 3-3 Number Reported: none Region: II
Truck Type: 3-3 Number Reported: none Region: III
Truck Type: 3-3 Number Reported: 377 Region: IV
U.S.

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
5	4.24								
6	6.90	1.59	.53						
7	4.24	7.16	2.39	1.33					
8	5.31	2.65	5.57	3.71	1.33	.27			
9	10.61	3.71	3.18	4.24	3.71	1.06			
10	18.83	4.24	3.18	2.65	4.24	4.51			
11	31.56	6.90	4.51	2.92	2.12	3.18	1.86		
12	14.59	8.22	4.51	4.51	3.18	2.65	4.77	1.59	
13	1.33	24.67	9.02	6.10	2.92	1.86	1.86	2.92	
14	1.86	22.02	16.97	8.49	4.51	2.65	2.12	3.98	
15	.53	12.47	20.16	12.47	5.57	2.92	1.86	1.06	
16		3.45	19.36	17.51	11.14	5.04	2.39	1.86	
17		1.59	4.77	22.54	13.53	9.28	1.59	1.59	2.39
18		.80	2.92	7.16	18.04	11.14	2.92	2.65	4.24
19		.53	1.86	2.92	15.91	11.93	5.04	1.06	1.59

TABLE B-1.6—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
20			.27	2.12	6.63	13.79	5.31	3.45	.80
21			.80	.53	4.77	15.12	8.22	3.71	1.33
22				.27	1.06	7.43	12.99	5.84	1.06
23				.53	.53	4.51	14.05	8.22	1.33
24					.27	.53	13.26	11.14	1.86
25					.27	1.06	11.14	10.08	.80
26						.27	5.04	18.84	1.59
27					.27		3.18	10.61	3.45
28						.53	.80	4.24	2.12
29						.27	.53	3.98	5.04
30								1.06	3.45
31							.27	.53	7.69
32							.27	.53	10.08
33							.53		9.28
34								.53	13.79
35								.53	11.13
36									4.77
37									3.71
38									3.45
39									2.12
40									.80
41									.27
42									
43									.53
44									.80
45									
46									.53
Max.	15	19	21	23	27	29	33	35	46
Avg.	9.9	12.5	13.9	14.9	16.6	18.2	21.5	23.5	31.2
Min.	5	6	6	7	8	8	11	12	17

TABLE B-1.7

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR ALL SIX MAJOR VEHICLE TYPES

Percentage distributions shown are based on 1942-43 loadometer data

Truck Type: All Number Reported: 3,256 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	.15	.03							
8	1.23		.03	.03					
9	6.42	3.93	.98	.03	.03				
10	13.79	9.74	5.38	2.80	.15	.06			
11	22.61	23.83	13.88	7.46	1.84	.43	.06		
12	17.63	18.55	21.81	14.90	9.64	5.35	1.72	1.32	
13	16.74	17.45	20.82	24.26	17.32	11.27	6.79	5.07	4.18
14	10.38	11.58	12.84	15.51	18.55	17.85	11.61	8.20	6.48
15	4.55	6.17	9.52	12.68	15.70	15.23	16.37	11.18	4.02
16	3.59	4.33	6.27	8.72	11.76	14.56	13.67	14.47	2.52
17	1.35	1.78	3.93	5.13	8.75	12.19	13.48	16.22	7.09
18	.98	1.41	2.27	3.72	6.73	7.77	11.55	11.79	12.96
19	.43	.74	1.23	2.00	3.75	5.25	8.51	9.86	13.42
20	.09	.31	.46	1.44	2.21	3.96	5.19	6.79	11.06
21	.03	.09	.34	.71	1.60	2.37	3.72	4.39	10.56
22		.03	.09	.28	1.05	1.41	2.49	3.38	6.42
23			.12	.18	.49	1.32	1.93	2.40	5.10
24	.03	.03	.03	.12	.25	.58	1.32	2.36	4.58
25				.03	.12	.25	.89	.86	3.29
26					.03	.12	.37	1.07	2.40
27					.03		.15	.31	1.81
28						.03	.15	.18	1.44
29								.12	1.14
30							.03		.52
31								.03	.55
32									.28
33									.06
34									.09
35									.03
Max.	24	24	24	25	27	28	30	31	35
Avg.	12.07	12.48	13.24	14.01	15.10	15.89	16.89	17.52	19.81
Min.	7	7	8	8	9	10	11	12	13

Truck Type: All Number Reported: 884 Region: II

8	.68	.23	.11	.11					
9	5.54	4.19	1.24		.11	.11			
10	20.14	18.10	12.90	6.22	.57	1.24			
11	39.14	38.69	31.33	16.52	4.41	6.00	.11		
12	17.19	17.53	25.00	18.66	16.63	17.76	.11	.23	
13	10.75	11.43	17.19	30.32	24.21	27.83	5.20	.90	.79
14	4.19	5.20	4.64	13.01	24.32	19.12	16.86	8.37	1.47
15	1.47	2.71	4.19	8.71	15.04	14.48	29.64	21.83	1.47
16	.79	1.47	1.70	2.94	7.01	6.67	20.93	25.00	.79
17		.11	1.02	1.36	3.62	3.39	13.91	22.85	16.97
18			.34	1.36	2.04	1.81	5.66	9.61	24.77
19	.11	.34	.11	.11	1.02	.57	3.51	5.32	22.74
20			.23	.57	.34	.34	1.92	2.38	13.69
21							.90	1.36	7.24
22					.34	.23	.34	.57	3.96
23				.11	.23	.23	.23	.90	2.04
24					.11	.11	.11	.11	1.24

TABLE B-1.7—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
25						.11	.23		.79
26							.11	.11	.34
27							.23	.23	.34
28								.23	.34
29									.23
30									.11
31									.34
32									.23
33									.11
Max.	19	19	20	23	24	25	27	28	33
Avg.	11.29	11.50	11.94	12.86	13.88	14.69	15.78	16.49	19.00
Min.	8	8	8	8	9	9	11	12	13

Truck Type: All — Number Reported: 2,791 — Region: III

7	.43								
8	.75	.07	.07						
9	8.42	3.58	.25	.11	.07				
10	24.36	20.71	9.60	2.01	.07	.07			
11	37.62	38.44	31.64	9.56	1.00	.29	.07	.07	
12	13.83	16.91	24.43	17.20	9.21	2.29	.50	.32	
13	10.38	11.79	18.42	37.01	24.00	11.43	2.54	1.00	1.04
14	3.19	4.59	6.84	14.98	27.70	28.45	10.14	3.90	1.36
15	.57	1.93	3.94	9.28	18.09	22.75	28.77	18.13	.90
16	.32	.75	1.90	4.19	9.57	16.80	24.58	26.91	.43
17	.11	.39	.97	2.22	4.19	8.49	15.52	23.75	16.19
18	.04	.47	.61	1.43	2.58	3.69	7.99	11.64	27.77
19	.04	.21	.50	.82	1.47	2.62	4.12	5.88	19.31
20		.04	.47	.43	.86	1.25	2.29	3.37	13.58
21		.04	.14	.25	.39	.72	1.54	2.19	7.81
22			.04	.29	.29	.39	.72	1.18	4.19
23			.07	.07	.25	.25	.39	.57	2.58
24	.04	.04	.04		.11	.25	.25	.36	1.79
25				.07		.11	.21	.32	1.29
26		.04		.04	.04		.11	.11	.54
27				.04	.07	.04	.11	.04	.32
28			.07		.04	.11	.07	.11	.29
29							.04	.07	.25
30							.04	.04	.07
31									.04
32								.04	.14
33									.07
38									.04
Max.	24	26	28	27	28	28	30	32	38
Avg.	11.04	11.47	12.19	13.35	14.37	15.16	16.17	16.80	19.07
Min.	7	8	8	9	9	10	11	11	13

Truck Type: All — Number Reported: 1,847 — Region: IV

5	.87								
6	1.79	.32	.11						
7	1.84	1.68	.49	.27					
8	3.46	.70	1.41	.87	.27	.05			
9	8.99	3.57	1.46	1.08	.92	.22			
10	16.89	8.61	6.12	2.44	1.30	1.03			
11	24.63	17.00	10.50	5.47	1.84	1.30	.38		
12	21.01	14.02	14.19	8.61	5.52	2.82	1.84	.70	
13	11.21	16.19	13.91	15.92	9.31	6.39	2.92	2.38	.97
14	6.22	12.24	12.18	11.91	13.54	10.07	5.52	4.66	2.49
15	1.84	10.56	12.78	13.37	12.18	11.32	11.05	7.31	1.25
16	.76	7.96	9.85	11.75	11.64	10.67	9.48	9.26	1.84
17	.22	3.09	8.01	11.04	11.37	10.94	8.12	9.58	6.60
18	.16	2.82	4.17	7.85	9.37	10.88	8.34	7.15	8.44
19	.11	.76	2.92	4.55	9.42	8.28	9.53	8.66	7.20
20		.27	.87	2.16	5.47	7.47	6.71	8.29	5.90
21		.16	.60	1.14	3.63	7.53	6.66	5.14	5.31
22			.27	.81	2.06	4.76	7.04	6.44	5.57
23			.11	.49	.76	2.60	6.93	6.61	5.41
24		.05		.05	.70	1.19	5.25	6.12	3.79
25			.05	.22	.38	1.41	4.44	5.25	4.71
26					.11	.32	2.00	4.98	5.63
27					.16	.38	2.22	3.47	3.90
28					.05	.27	.65	1.30	2.98
29						.05	.49	1.36	2.98
30						.05	.11	.43	3.25
31							.05	.32	3.09
32							.11	.27	3.74
33							.16		3.25
34								.16	3.74
35								.16	3.19
36									1.52
37									1.03
38									1.03
39									.49
40									.22
41									.05
42									
43									.11
44									.16
45									
46									.16
Max.	19	24	25	25	28	30	33	35	46
Avg.	11.10	12.88	13.83	14.87	16.14	17.29	19.11	20.06	24.43
Min.	5	6	6	7	8	8	11	12	13

TABLE B-1.7—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
Truck Type: All				Number Reported: 8,778				Region: U.S.	
5	.18								
6	.38	.07	.02						
7	.58	.36	.10	.06	.06				
8	1.49	.19	.34	.21	.24	.01			
9	7.51	3.78	.88	.27	.41	.05			
10	18.44	13.84	7.73	2.81	1.83	.27			
11	29.48	28.54	21.13	8.62	9.34	.65	.14	.02	
12	17.08	16.98	21.89	14.69	18.47	3.91	1.20	.76	
13	12.92	14.76	17.92	27.17	20.98	10.96	4.46	2.79	2.16
14	6.61	8.86	9.66	14.33	15.65	20.59	10.38	6.11	3.51
15	2.39	5.40	7.58	11.35	10.55	17.15	20.53	13.65	2.19
16	1.68	3.71	5.01	7.35	7.35	14.46	17.01	18.39	1.54
17	.57	1.44	3.59	5.07	5.49	10.22	13.03	17.90	10.88
18	.42	1.26	1.87	3.61	3.92	6.68	9.12	10.54	17.91
19	.18	.48	1.22	1.96	2.28	4.74	6.84	7.89	14.92
20	.03	.17	.51	1.18	1.45	3.45	4.21	5.57	11.04
21	.02	.08	.30	.58	.99	2.73	3.41	3.54	8.25
22		.02	.10	.38	.44	1.65	2.67	3.05	5.29
23	.01	.01	.10	.21	.28	1.15	2.28	2.55	4.05
24	.02	.03	.02	.06	.13	.57	1.70	2.29	3.19
25			.01	.08	.05	.43	1.40	1.49	2.70
26		.01		.01	.06	.12	.60	1.51	2.28
27				.01	.02	.09	.58	.89	1.64
28			.02		.01	.10	.22	.40	1.29
29	.01	.01		.01		.01	.11	.35	1.15
30						.01	.05	.10	.90
31							.01	.08	.90
32							.02	.07	.96
33							.03		.74
34								.03	.82
35								.03	.68
36									.32
37									.22
38									.23
39									.10
40									.05
41									.01
42									
43									.02
44									.03
45									
46									.03
Max.	29	29	28	29	28	30	33	35	46
Avg.	11.46	12.14	12.86	13.87	14.96	15.83	17.02	17.72	20.46
Min.	5	6	6	7	7	8	11	11	13

TABLE B-2.1

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2

Percentage distributions shown are based on 1948-49 loadometer data

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
Truck Type: 2				Number Reported: 838				Region: I	
9	.12	.12	.12						
10	1.43	1.43	1.91	.60	.36	.36	.36	.36	.36
11	19.21	18.98	13.36	8.95	7.40	5.73	4.77	4.42	4.42
12	24.58	24.70	23.39	22.07	21.24	21.96	17.90	17.90	11.93
13	18.02	18.02	19.57	26.25	22.67	22.56	24.82	22.79	22.91
14	13.61	13.72	16.23	14.32	17.30	17.30	17.18	18.13	19.45
15	9.79	9.79	11.21	11.81	11.69	12.29	13.25	12.89	14.79
16	5.37	5.37	5.61	6.92	8.23	8.35	10.14	9.66	9.78
17	2.86	2.86	3.46	3.70	5.49	4.53	3.94	6.09	7.40
18	2.74	2.74	2.63	2.39	2.63	3.10	3.58	3.46	3.70
19	1.31	1.31	1.55	2.03	1.91	1.79	1.91	1.91	2.27
20	.48	.48	.36	.36	.48	1.43	1.31	1.55	2.03
21	.12	.12	.36	.24	.24	.24	.36	.36	.48
22	.24	.24		.12	.12	.12	.24	.24	.24
23			.12	.12					
24	.12	.12	.12	.12	.24	.24	.24	.24	.12
25									.12
Max.	24	24	24	24	24	24	24	24	25
Avg.	13.2	13.2	13.4	13.6	13.8	13.9	14.0	14.2	14.4
Min.	9	9	9	10	10	10	10	10	10
Truck Type: 2				Number Reported: 298				Region: II	
8	.34	.34	.34						
9	.34	.34		.34	.34				
10	3.02	3.02	4.70	2.68	2.01	2.35	2.35	2.35	2.01
11	40.26	40.26	35.90	31.54	29.53	28.86	27.51	26.50	26.51
12	28.19	28.19	28.19	27.52	29.87	30.53	28.86	29.53	27.18
13	17.45	17.45	18.79	25.84	22.82	22.82	24.49	23.82	24.49
14	5.70	5.70	7.38	7.38	9.40	9.40	10.07	11.07	12.75
15	2.35	2.35	2.35	2.35	2.68	2.68	3.36	3.36	3.36
16	1.68	1.68	1.68	1.68	2.68	2.68	2.68	2.35	2.68
17								.34	.34
18	.67	.67	.67	.67	.67	.34	.34	.34	.34

TABLE B-2.1—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
19						.34	.34	.34	.34
Max.	18	18	18	18	18	19	19	19	19
Avg.	12.0	12.0	12.0	12.2	12.3	12.3	12.4	12.4	12.5
Min.	8	8	8	9	9	10	10	10	10
Truck Type: 2				Number Reported: 300				Region: III	
9	.33	.33	9.33	.33					
10	11.34	11.34	14.00	22.00	9.67	1.00	.67	.67	.67
11	55.00	54.67	36.67	28.00	34.66	33.00	29.66	20.67	20.33
12	19.34	19.67	21.34	27.00	31.67	41.67	37.00	36.66	20.67
13	9.33	9.33	11.00	15.00	14.00	14.00	21.00	29.67	30.33
14	2.33	2.33	5.33	4.67	6.00	6.33	6.67	6.67	18.67
15	2.00	2.00	2.00	2.67	2.67	2.67	3.67	4.00	6.33
16					1.00	1.00	1.00	1.33	2.33
17	.33	.33	.33	.33	.33	.33	.33	.33	.67
Max.	17	17	17	17	17	17	17	17	17
Avg.	11.4	11.4	11.4	11.6	11.9	12.1	12.2	12.4	12.8
Min.	9	9	9	9	10	10	10	10	10
Truck Type: 2				Number Reported: 284				Region: IV	
10	1.06	1.06	1.76	1.06	.70	.70	.70	.70	.70
11	28.52	28.52	20.07	14.44	12.68	11.27	10.56	9.86	9.86
12	35.22	35.22	38.74	36.27	37.68	38.73	32.75	33.10	30.64
13	15.14	15.14	17.61	26.06	21.83	21.48	26.41	25.71	25.00
14	9.15	9.15	10.56	10.56	13.38	13.73	13.74	13.38	14.44
15	5.99	5.99	5.28	4.93	5.63	5.99	7.39	7.75	8.80
16	3.87	3.87	4.93	5.63	4.58	4.58	4.93	4.93	5.99
17	.35	.35	.35	.35	2.82	2.82	2.82	3.87	3.87
18	.35	.35	.35	.35	.35	.35	.35	.35	.35
19									
20									
21			.35						
22	.35	.35		.35	.35				
23						.35	.35		
24								.35	.35
Max.	22	22	21	22	22	23	23	24	24
Avg.	12.4	12.4	12.6	12.8	12.9	12.9	13.0	13.1	13.2
Min.	10	10	10	10	10	10	10	10	10
Truck Type: 2				Number Reported: 1,720				Region: U.S.	
8	.06	.06	.06						
9	.17	.17	1.68	.12	.06				
10	3.37	3.37	4.48	4.77	2.33	.87	.81	.81	.76
11	30.64	30.47	22.44	17.09	16.86	15.40	14.01	11.98	11.92
12	26.05	26.17	26.40	26.22	27.26	29.65	25.58	25.70	19.18
13	15.93	15.93	17.68	24.18	21.04	20.93	24.36	24.65	24.82
14	9.54	9.59	11.80	10.81	13.31	13.43	13.54	14.13	17.32
15	6.51	6.51	7.09	7.44	7.56	7.90	8.90	8.84	10.35
16	3.55	3.55	3.84	4.59	5.41	5.47	6.40	6.16	6.63
17	1.51	1.51	1.80	1.92	3.20	2.73	2.44	3.72	4.42
18	1.51	1.51	1.45	1.34	1.45	1.63	1.86	1.80	1.92
19	.64	.64	.76	.99	.93	.93	.99	.99	1.16
20	.23	.23	.17	.17	.23	.70	.64	.76	.99
21	.06	.06	.23	.12	.12	.12	.17	.17	.23
22	.17	.17		.12	.12	.06	.12	.12	.12
23			.06	.06		.06	.06		
24	.06	.06	.06	.06	.12	.12	.12	.17	.06
25									.12
Max.	24	24	24	24	24	24	24	24	25
Avg.	12.6	12.6	12.7	12.9	13.1	13.2	13.3	13.4	13.6
Min.	8	8	8	9	9	10	10	10	10

TABLE B-2.2

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3

Percentage distributions shown are based on 1948-49 loadometer data

Truck Type: 3 Number Reported: 366 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	1.64								
8	8.47								
9	7.10	2.19							
10	22.68	2.46	2.46	.82					
11	12.57	12.57	4.64	3.01	1.09	.82	.27	.27	
12	18.30	8.74	9.02	6.56	6.56	6.56	3.01	1.91	.27
13	8.20	14.21	10.66	12.29	11.21	10.66	10.93	8.47	5.74
14	8.47	12.30	15.30	12.84	13.12	12.57	10.65	12.85	13.12
15	4.37	18.30	15.03	12.02	13.66	13.38	14.48	11.75	12.30
16	4.10	6.28	11.75	12.84	11.75	11.20	13.39	13.94	13.39
17	1.64	5.19	5.46	10.11	11.20	9.56	10.66	12.02	11.75
18	.82	5.19	6.01	6.28	4.92	7.38	7.10	8.20	7.93
19	.55	4.37	5.46	6.01	6.56	5.74	6.28	6.56	7.65
20	.82	3.83	4.37	4.92	5.19	5.19	5.46	5.46	6.01
21		.55	5.19	3.83	4.37	5.19	5.19	5.19	4.64
22		1.64	.82	3.01	4.10	5.19	3.83	4.37	4.64
23		.82	1.37	1.91	1.91	1.37	3.01	3.28	4.92
24	.27		.55	.82	1.09	1.91	2.46	1.91	2.73

TABLE B-2.2—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
25		.82	.27	.55	1.09	.82	.55	.82	1.09
26		.27	.55	.82	.27	.27	.55	.82	1.09
27				.27	.55	.55	.27	.27	.82
28			.55		.27	.55	.55	.27	
29			.27	.55	.55		.27	.55	.27
30		.27		.27	.27	.55	.55	.55	.55
31						.27	.27	.27	.55
32			.27						.27
33				.27					
34					.27				
35						.27	.27		
36								.27	
37									.27
Max.	24	30	32	33	34	35	35	36	37
Avg.	11.6	14.6	15.7	16.3	16.6	16.8	17.1	17.3	17.8
Min.	7	9	10	10	11	11	11	11	12
Truck Type: 3				Number Reported: 146				Region: II	
6	.68								
7		.68							
8	10.28		.68	.68					
9	12.33	.68			.68				
10	32.88	4.79	2.05			.68	.68		
11	13.70	17.13	6.16	3.42	.68			.68	
12	13.70	17.82	9.59	10.28	9.59	9.59	2.74	1.37	.68
13	5.48	15.76	20.56	15.07	14.39	11.65	12.34	11.65	10.27
14	5.48	13.02	20.56	19.19	21.24	17.82	22.61	19.87	11.65
15	1.37	13.70	12.33	16.45	17.81	21.24	18.50	17.13	21.24
16	2.05	4.79	8.91	8.22	8.91	10.97	12.34	17.13	20.55
17	2.05	4.79	5.48	7.53	7.54	8.91	10.96	6.85	7.54
18		1.37	3.42	7.53	6.85	6.16	6.85	8.22	10.28
19		1.37	4.79	5.48	4.79	4.79	2.05	6.16	4.79
20		2.05	1.37	.68	1.37	2.05	4.79	4.79	6.17
21			2.74	2.05	1.37	.68	.68	.68	.68
22		2.05		1.37	2.05	2.05	2.05	1.37	.68
23			.68	1.37	1.37	2.05	.68	.68	2.05
24			.68		.68		1.37	2.05	.68
25				.68	.68	.68	.68		1.37
26						.68	.68	1.37	
27									1.37
Max.	17	22	24	25	25	26	26	26	27
Avg.	10.8	13.5	14.5	15.1	15.3	15.5	15.8	16.1	16.4
Min.	6	7	8	8	9	10	10	11	12
Truck Type: 3				Number Reported: 243				Region: III	
7	.41								
8	7.00								
9	15.23	.41	.41						
10	37.44	1.65	.41	.41	.41				
11	13.17	18.93	4.94	1.23	.41	.41	.41		
12	16.87	18.52	10.29	8.23	6.58	6.58	4.53	1.65	
13	4.94	20.58	23.87	17.70	16.05	12.76	9.47	10.70	10.29
14	1.65	13.17	18.93	24.69	24.70	22.64	25.11	24.70	19.75
15	1.65	16.46	16.47	10.70	13.59	17.70	18.52	15.64	18.10
16	.41	4.94	11.11	17.70	15.23	14.82	11.93	11.11	12.35
17	.41	.82	5.76	7.41	10.70	11.53	14.81	16.46	15.64
18		1.23	2.88	4.94	4.12	3.29	4.53	7.82	9.88
19	.82	1.65	1.23	2.88	3.70	4.94	4.94	5.35	4.12
20		.41	.82	.82	1.23	1.23	1.65	2.06	3.29
21		.41	1.65	.82		.82	.82	.82	2.06
22			.41	1.65	1.23	1.23	.82	1.23	.82
23					.82	.82	.82	.82	1.65
24		.82			.41		.41	.41	.41
25			.41	.41		.41			.41
26					.41		.41		
27			.41			.41		.41	
28				.41	.41		.41	.41	
29						.41	.41	.41	
30									1.23
Max.	19	24	27	28	28	29	29	29	30
Avg.	10.6	13.3	14.4	15.0	15.2	15.4	15.6	15.9	16.2
Min.	7	9	9	10	10	11	11	12	13
Truck Type: 3				Number Reported: 545				Region: IV	
7	9.54								
8	16.70	.37	.18						
9	15.41	9.36	2.20						
10	24.96	9.17	13.03	6.42	.18				
11	10.64	22.02	8.62	10.28	9.54	5.50	.18		
12	15.60	12.48	14.13	11.92	12.84	14.13	12.48	9.17	
13	4.40	13.58	15.42	20.00	16.15	16.87	16.88	16.15	14.13
14	1.28	10.28	15.60	15.96	19.08	18.35	19.27	20.37	20.74
15	.37	15.42	11.01	9.54	12.48	12.84	14.68	16.33	16.70
16	.73	3.30	8.99	9.36	10.28	10.83	11.93	10.83	16.34
17	.37	1.83	5.69	7.16	6.97	8.26	9.91	9.72	8.62
18		.73	2.39	4.77	6.97	7.16	7.71	6.79	8.62
19		.37	1.28	2.75	2.39	2.75	2.94	5.87	7.89
20		.18	.37	.37	1.47	1.47	1.28	1.83	2.02
21		.55		.37	.37	.55	1.28	1.28	1.83
22		.18	.73	.37	.18	.18	.18	.37	1.65
23		.18	.18	.55	.55	.37	.55	.37	.18
24			.18	.18	.37	.37	.18	.37	.37
25					.18	.37	.18	.18	.37
26							.37	.37	.18

TABLE B-2.2—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
27									.18
28									.18
Max.	17	23	24	24	25	25	26	26	28
Avg.	9.9	12.5	13.4	14.0	14.5	14.7	15.0	15.3	15.9
Min.	7	8	8	10	10	11	11	12	13

Truck Type: 3 Number Reported: 1,300 Region: U.S.

6	.08								
7	4.54	.08							
8	11.85	.15	.15	.08					
9	12.69	4.69	1.00		.08				
10	27.54	5.38	6.46	3.08	.15	.08	.08		
11	11.85	18.23	6.46	5.77	4.46	2.62	.23	.15	
12	16.30	13.16	11.46	9.46	9.54	10.08	7.23	4.85	.15
13	5.69	15.31	16.23	16.84	14.38	13.69	13.31	12.46	10.62
14	3.92	11.54	16.69	17.15	18.62	17.46	18.30	19.00	17.38
15	1.92	16.15	13.15	11.15	13.77	14.92	15.77	15.00	16.23
16	1.77	4.54	10.08	11.61	11.31	11.69	12.38	12.47	15.23
17	.92	3.23	5.54	8.00	9.00	9.15	11.00	11.16	10.69
18	.31	2.00	3.62	5.46	5.77	6.31	6.85	7.54	8.69
19	.31	1.92	3.08	4.08	4.00	4.15	4.08	5.92	6.77
20	.23	1.38	1.62	2.00	2.54	2.62	2.85	3.15	3.77
21		.62	2.00	1.46	1.77	2.15	2.31	2.31	2.46
22		.77	.77	1.54	1.54	1.85	1.77	2.00	2.31
23		.31	.62	1.00	1.08	1.00	1.15	1.15	2.23
24	.08	.15	.38	.31	.77	.62	1.00	1.08	.92
25		.23	.15	.31	.46	.69	.46	.23	.77
26		.08	.15	.23	.15	.15	.46	.69	.31
27			.08	.08	.15	.23	.08	.15	.62
28			.15	.08	.15	.15	.23	.15	.08
29			.08	.15	.15	.08	.15	.23	.08
30		.08		.08	.08	.15	.15	.15	.38
31						.08	.08	.08	.15
32			.08						.08
33				.08					
34					.08				
35						.08	.08		
36								.08	
37									.08
Max.	24	30	32	33	34	35	35	36	37
Avg.	10.6	13.4	14.4	14.9	15.3	15.5	15.8	16.1	16.6
Min.	6	7	8	8	9	10	10	11	12

TABLE B-2.3
RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S1

Percentage distributions shown are based on 1948-49 loadometer data

Truck Type: 2-S1 Number Reported: 4,105 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
8			.02						
9	5.16	5.02	2.17	.10					
10	7.36	7.38	5.87	5.33	1.68	.05			
11	17.07	16.98	8.72	7.31	6.31	1.85			
12	16.18	16.08	15.64	12.45	6.36	3.12	.24		
13	17.51	17.36	20.59	18.68	13.64	5.80	2.31	.29	
14	16.74	16.74	15.91	16.66	12.62	12.62	7.77	3.80	
15	7.53	7.55	12.65	11.99	16.08	12.55	9.77	8.31	
16	6.29	6.38	7.84	11.33	11.82	14.45	10.65	9.01	
17	2.27	2.44	4.80	5.97	11.21	14.69	12.64	11.79	6.67
18	1.92	2.00	2.83	4.75	10.06	9.77	16.06	13.01	6.85
19	1.17	1.17	1.17	1.95	4.90	8.67	11.16	14.04	8.89
20	.32	.37	.90	1.78	3.53	6.70	9.38	11.30	9.82
21	.39	.41	.56	.68	2.36	4.14	7.16	8.48	11.75
22	.07	.10	.27	.51	.83	2.41	4.92	6.50	11.40
23			.02	.32	.61	1.46	3.56	5.36	10.01
24				.12	.51	.51	1.56	4.00	9.55
25			.02	.02	.34	.49	1.07	1.22	7.60
26	.02	.02	.02	.05	.10	.46	.66	.97	5.53
27					.02	.17	.49	.78	4.02
28						.07	.34	.51	2.73
29					.02		.17	.27	1.58
30							.07	.17	1.29
31						.02		.15	.76
32								.02	.54
33							.02		.29
34									.27
35								.02	.17
36									.12
37									.10
38									.02
39									.02
40									
41									
42									.02
Max.	26	26	26	26	29	31	33	35	42
Avg.	12.9	12.9	13.6	14.2	15.6	16.7	18.1	19.0	22.4
Min.	9	9	8	9	10	10	12	13	17

TABLE B-2.3—Continued

Truck Type: 2-S1 Number Reported: 3,245 Region: II

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
8			.06						
9	6.63	6.41	2.96	.12					
10	14.11	13.99	13.50	11.59	3.14	.12			
11	33.06	32.48	20.93	18.61	8.54	3.54	.03		
12	19.41	19.75	27.43	17.94	17.14	8.51	.71	.03	
13	14.98	15.19	19.88	23.15	20.90	15.75	5.86	.74	
14	7.83	8.14	7.24	13.25	16.67	20.06	16.27	9.15	
15	2.13	2.10	4.65	8.32	16.24	18.40	20.61	18.96	
16	1.29	1.29	2.28	3.76	8.10	15.62	19.41	17.13	
17	.25	.25	.55	2.10	4.96	9.28	15.44	20.19	15.47
18	.22	.25	.22	.74	2.68	4.47	11.00	15.04	15.22
19	.06	.09	.15	.12	1.05	2.13	5.21	9.06	17.17
20			.06	.15	.28	1.45	2.84	4.68	18.24
21	.03	.06		.03	.09	.34	1.45	2.40	13.93
22					.09	.15	.71	1.36	7.98
23			.03	.03		.06	.25	.71	4.99
24			.03	.03	.03		.03	.34	2.56
25			.03		.03	.06	.06	.03	1.82
26				.03	.03		.06	.09	1.23
27				.03		.03	.03	.03	.68
28					.03			.03	.34
29						.03	.03		.22
30									.06
31								.03	.03
32									.03
33									.03
Max.	21	21	25	27	28	29	29	31	33
Avg.	11.6	11.7	12.1	12.7	13.7	14.8	16.1	16.9	19.9
Min.	9	9	8	9	10	10	11	12	17

Truck Type: 2-S1 Number Reported: 4,225 Region: III

8			.02						
9	5.02	4.47	1.63	.09					
10	17.40	16.62	12.92	8.76	2.18	.14			
11	38.18	37.59	24.19	13.80	5.70	2.37			
12	18.70	19.29	30.66	20.83	13.09	5.73	.64		
13	13.71	14.13	18.37	27.18	19.72	13.09	3.93	1.18	
14	4.80	5.49	6.65	13.75	21.68	21.63	12.43	6.72	
15	1.09	1.23	2.91	9.00	19.31	19.43	23.85	16.50	
16	.64	.62	1.40	3.50	9.82	19.60	19.79	18.77	
17	.28	.28	.85	1.87	4.66	11.01	18.79	23.70	14.72
18	.12	.17	.21	.78	2.56	3.83	12.43	16.69	16.95
19	.02	.07	.07	.24	.85	1.85	4.78	10.04	19.41
20	.02	.02	.05	.09	.24	.95	1.73	3.43	21.06
21	.02	.02	.05	.02	.07	.21	.83	1.44	14.04
22			.02	.07		.05	.50	.59	6.77
23				.02	.12	.07	.17	.54	3.41
24						.02	.09	.33	1.61
25						.02	.02	.05	.73
26									.50
27							.02		.45
28								.02	.21
29									.07
30									.05
31									
32									.02
Max.	21	21	22	23	23	25	27	28	32
Avg.	11.4	11.5	12.0	12.8	14.0	14.9	16.1	16.9	19.6
Min.	9	9	8	9	10	10	12	13	17

Truck Type: 2-S1 Number Reported: 828 Region: IV

8			.24						
9	8.33	7.97	2.66	.85	.12				
10	16.31	15.82	12.56	9.54	1.93	.24			
11	29.83	30.32	22.10	12.44	6.64	2.42			
12	18.72	18.84	22.95	16.43	14.01	6.52	.72		
13	13.89	13.65	19.69	25.36	16.91	14.86	5.80	.72	
14	8.94	9.18	9.30	13.65	18.00	19.44	12.56	8.33	
15	1.81	1.81	5.43	11.71	18.72	14.61	22.83	17.64	
16	1.21	1.45	2.66	4.23	10.03	17.27	13.17	18.72	
17	.60	.60	1.57	3.26	6.52	11.71	15.95	14.50	17.75
18	.24	.24	.60	1.45	4.47	6.04	13.77	15.46	18.24
19	.12	.12	.24	.72	1.33	4.11	8.09	11.84	12.56
20				.24	.72	1.45	3.74	7.00	14.49
21				.12	.48	.85	1.81	2.54	14.61
22						.12	.72	1.81	10.03
23					.12	.36	.48	.72	5.19
24							.24	.36	3.02
25							.12	.24	1.21
26								.12	1.57
27									.85
28									.24
29									.12
30									
31									.12
Max.	19	19	19	21	23	23	25	26	31
Avg.	11.6	11.6	12.2	13.0	14.2	15.1	16.3	17.1	19.9
Min.	9	9	8	9	9	10	12	13	17

TABLE B-2.3—Continued

Truck Type: 2-S1 Number Reported: 12,403 Region: U.S.

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
8			.05						
9	5.71	5.39	2.23	.15	.01				
10	13.14	12.82	10.71	8.42	2.25	.11			
11	29.30	28.94	18.07	12.83	5.72	2.51	.01		
12	18.05	18.32	24.32	17.00	11.98	5.64	.53	.01	
13	15.31	15.45	19.58	23.18	17.82	11.49	4.02	.74	
14	9.82	10.15	10.04	14.58	17.12	18.10	11.91	6.50	
15	3.54	3.59	6.76	9.99	17.40	16.56	18.28	14.51	
16	2.72	2.76	3.85	6.21	10.04	16.68	16.22	15.10	
17	.95	1.01	2.14	3.38	7.03	11.80	15.67	18.21	12.45
18	.75	.80	1.10	2.14	5.21	6.14	13.36	14.93	13.24
19	.42	.44	.47	.79	2.27	4.34	7.22	11.26	14.88
20	.11	.13	.33	.69	1.37	3.01	4.68	6.60	16.16
21	.15	.16	.20	.25	.86	1.59	3.16	4.09	13.29
22	.02	.03	.09	.19	.30	.86	2.03	2.83	8.84
23			.02	.11	.25	.55	1.34	2.19	6.13
24			.01	.05	.18	.18	.56	1.55	4.58
25			.02	.01	.12	.19	.39	.44	3.32
26	.01	.01	.01	.02	.04	.15	.23	.35	2.43
27				.01	.01	.06	.18	.27	1.72
28					.01	.02	.11	.19	1.08
29					.01	.01	.06	.09	.61
30							.03	.06	.46
31						.01		.06	.27
32								.01	.19
33							.01		.10
34									.09
35								.01	.06
36									.04
37									.03
38									.01
39									.01
40									
41									
42									.01
Max.	26	26	26	27	29	31	33	35	42
Avg.	12.0	12.0	12.6	13.2	14.5	15.5	16.8	17.6	20.6
Min.	9	9	8	9	9	10	11	12	17

TABLE B-2.4

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S2

Percentage distributions shown are based on 1948-49 loadometer data

Truck Type: 2-S2 Number Reported: 571 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	1.23								
8	2.28								
9	3.68	3.50	2.63	.35					
10	6.30	2.80	1.58	3.15	.53				
11	8.23	4.90	4.38	1.58	2.98	.53			
12	10.51	5.43	3.85	3.50	.88	2.45			
13	11.90	12.09	7.70	5.25	2.98	1.58	2.80	.53	
14	14.01	10.51	10.33	7.53	4.73	3.15	1.40	2.28	
15	12.25	11.04	12.08	12.09	6.48	3.68	2.10	1.75	
16	9.81	10.86	8.93	8.93	9.98	5.78	2.80	1.58	
17	7.18	4.90	10.33	9.98	9.10	6.30	2.98	2.98	3.15
18	5.78	9.63	7.01	6.30	8.93	13.13	5.60	2.98	1.58
19	3.15	6.48	6.30	8.06	6.65	7.70	8.05	6.13	.88
20	1.93	3.15	5.95	7.18	8.75	5.78	8.58	6.48	1.93
21	1.05	5.08	3.33	5.60	6.13	8.93	9.10	9.11	2.28
22	.53	4.03	5.43	4.73	8.05	7.00	6.83	7.35	4.55
23		1.40	2.63	4.90	4.55	6.13	7.36	6.83	3.68
24	.18	2.10	3.15	3.50	4.55	7.01	9.80	7.53	5.08
25		1.05	2.10	2.63	4.38	4.55	4.20	9.28	5.43
26		.70	1.23	2.10	2.45	3.15	4.38	5.95	8.05
27			.53	.88	3.15	4.20	7.18	4.73	7.35
28		.35	.18	.53	1.58	3.50	3.50	5.60	5.95
29			.35	.53	1.23	1.23	2.98	3.85	8.40
30				.70	.53	1.58	3.33	3.85	6.30
31					.88	.70	2.63	2.28	5.08
32					.53	.88	1.05	3.85	5.08
33						.53	1.23	1.05	4.55
34						.53	.53	1.05	4.55
35							.53	1.40	3.50
36							.53	.35	2.80
37							.53	.35	2.28
38								.18	2.10
39								.70	1.40
40									1.05
41									1.58
42									.35
43									.18
44									.18
45									
46									.35
47									
48									.18

TABLE B-2.4—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
49									
50									
51									
52									.18
Max.	24	28	29	30	32	34	37	39	52
Avg.	13.9	16.0	16.8	17.9	19.5	20.8	22.8	24.0	28.7
Min.	7	9	9	9	10	11	13	13	17
Truck Type: 2-S2				Number Reported: 1,342				Region: II	
7	1.49								
8	3.50		.15						
9	9.54	5.44	3.20	.75	.07				
10	10.80	6.93	4.25	3.65	.89	.07			
11	13.71	11.26	9.02	7.23	3.58	.67			
12	23.85	15.28	13.86	10.06	4.40	3.43	.15		
13	14.61	15.80	16.32	10.81	9.17	5.22	2.91	.52	
14	9.54	8.57	9.24	10.28	10.51	8.27	3.35	2.68	
15	5.29	10.81	9.99	13.12	10.14	8.35	6.63	4.92	
16	3.58	8.27	7.68	9.31	12.15	12.15	7.38	4.25	
17	2.31	2.76	8.20	8.35	12.07	10.28	6.86	8.20	3.80
18	.75	5.74	4.77	7.30	7.68	12.22	11.70	7.45	3.20
19	.52	3.95	3.50	4.84	8.12	9.61	14.15	12.66	3.65
20	.37	1.56	4.17	3.87	4.62	6.11	10.58	11.55	5.67
21	.07	2.01	1.86	3.80	3.50	6.48	8.87	11.55	6.04
22	.07	.97	2.16	2.46	5.14	3.73	5.59	8.27	7.90
23		.07	.60	2.01	3.06	2.91	4.77	4.99	10.06
24		.22	.45	.75	1.94	5.29	5.07	4.77	10.14
25		.15	.22	.75	1.19	1.42	2.98	5.59	12.37
26		.07	.15	.30	.82	1.34	2.68	3.43	8.28
27		.07	.07	.15	.37	.97	2.46	2.76	6.26
28		.07	.07	.07	.15	.89	1.34	2.01	4.17
29			.07		.22	.15	.67	1.04	3.50
30				.07	.07	.07	.97	1.42	3.95
31				.07		.15	.37	.75	2.76
32					.07	.07	.07	.60	2.01
33					.07		.15	.15	1.86
34						.15	.15	.15	.82
35								.15	1.49
36									.60
37							.15		.52
38								.07	.22
39								.07	.15
40									.22
41									.15
42									.07
43									
44									.07
45									
46									.07
Max.	22	28	29	31	33	34	37	39	46
Avg.	12.0	13.8	14.5	15.5	16.9	18.0	19.8	20.8	24.8
Min.	7	9	8	9	9	10	12	13	17
Truck Type: 2-S2				Number Reported: 4,238				Region: III	
7	1.37								
8	1.86		.02						
9	4.22	3.75	1.65	.54	.02				
10	7.69	4.81	4.01	2.64	.61	.02			
11	11.99	6.82	5.59	4.25	2.48	.52			
12	26.69	8.80	7.60	4.79	2.38	2.27	.09		
13	22.73	14.12	11.33	7.27	5.14	2.93	1.70	.38	
14	12.69	9.70	10.22	7.55	6.11	4.70	2.50	1.75	
15	6.37	13.38	11.54	13.01	7.53	4.67	4.01	3.33	
16	2.90	16.80	8.90	10.25	10.50	8.57	3.99	2.62	
17	.85	6.25	15.86	13.45	12.53	7.79	4.44	4.32	2.10
18	.45	8.12	9.80	12.58	11.23	13.00	7.76	4.81	2.62
19	.14	4.46	5.10	9.30	13.50	13.07	10.95	8.94	2.57
20	.05	1.34	4.51	5.64	10.60	8.94	11.26	8.66	3.63
21		.92	1.65	3.96	5.99	15.24	13.17	11.89	3.96
22		.50	.97	1.91	5.62	6.61	10.60	11.75	5.47
23		.07	.59	1.42	2.36	3.52	11.42	10.41	6.14
24		.12	.42	.66	1.25	4.74	7.96	10.48	7.55
25			.14	.42	1.21	1.23	3.21	10.29	11.78
26			.02	.17	.42	.73	2.97	3.63	13.60
27		.02	.02	.09	.17	.87	1.77	2.76	10.57
28			.02	.02	.24	.21	.90	1.56	8.90
29		.02		.02		.09	.61	.83	6.21
30				.02	.05	.17	.38	.78	5.43
31					.02	.02	.09	.38	3.04
32			.02			.05	.14	.21	2.74
33							.02	.09	1.60
34			.02	.02			.02	.07	.83
35				.02	.02			.02	.38
36						.02			.38
37					.02		.02		.21
38						.02		.02	.09
39							.02		.02
40								.02	.14
41									.02
42									.02
Max.	20	29	34	35	37	38	39	40	42
Avg.	12.3	14.5	15.3	16.3	17.7	18.9	20.6	21.7	25.7
Min.	7	9	8	9	9	10	12	13	17

TABLE B-2.4—Continued

Truck Type: 2-S2 | Number Reported: 1,395 | Region: IV

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	2.22								
8	3.51		.14						
9	7.53	6.45	2.87	.93	.22				
10	12.12	8.67	7.17	4.87	1.22	.29			
11	13.26	8.39	7.24	6.95	4.30	1.00	.14		
12	21.00	11.11	10.68	7.89	5.09	4.01	.36		
13	17.49	14.12	11.68	8.46	7.89	5.81	2.65	.65	
14	10.97	10.83	11.54	9.46	8.24	7.17	4.95	3.01	
15	5.66	11.76	11.61	13.19	9.53	7.38	6.59	6.16	
16	3.37	11.76	7.53	9.89	10.75	9.39	6.31	5.09	
17	1.43	4.95	11.76	11.33	12.11	9.18	6.59	6.24	3.58
18	.86	5.73	8.39	9.25	8.67	13.34	8.89	6.38	4.30
19	.22	2.87	2.58	6.74	11.26	10.18	11.40	9.75	5.16
20	.22	1.08	2.80	4.80	7.89	8.24	10.18	9.32	5.45
21	.07	1.36	1.15	2.01	4.30	10.11	11.25	10.54	4.87
22	.07	.57	1.36	1.51	3.87	4.44	9.10	9.75	6.45
23		.07	.72	.93	1.36	3.58	8.03	10.68	6.38
24		.07	.50	.57	1.15	2.51	5.23	7.17	7.39
25		.07	.07	.72	.72	.86	2.58	6.09	9.68
26		.14	.07	.36	.57	.72	1.79	2.44	9.68
27			.14	.07	.43	.86	1.51	2.44	10.83
28				.07	.22	.43	.79	1.36	6.95
29					.14	.14	.65	1.00	6.45
30					.07	.22	.43	.86	3.73
31						.07	.22	.36	2.22
32						.07	.07	.36	2.01
33							.07		1.51
34							.22	.07	1.22
35								.14	.79
36								.14	.57
37									.22
38									.14
39									
40									.14
41									.07
42									.07
43									.07
44									.07
Max.	22	26	27	28	30	32	34	36	44
Avg.	12.0	13.8	14.6	15.5	16.8	18.0	19.7	20.8	25.0
Min.	7	9	8	9	9	10	11	13	17

Truck Type: 2-S2 | Number Reported: 7,546 | Region: U.S.

7	1.54								
8	2.49		.07						
9	5.74	4.51	2.23	.64	.07				
10	8.96	5.78	4.45	3.27	.77	.08			
11	12.24	7.75	6.41	5.08	3.05	.64	.03		
12	23.91	10.12	9.00	6.20	3.13	2.81	.15		
13	19.49	14.26	12.00	7.96	6.20	3.76	2.17	.46	
14	11.91	9.77	10.30	8.39	7.18	5.66	3.02	2.19	
15	6.49	12.44	11.33	12.99	8.28	5.71	4.81	4.02	
16	3.63	13.90	8.42	9.91	10.80	9.17	4.93	3.29	
17	1.70	5.29	13.32	11.89	12.12	8.39	5.16	5.26	2.76
18	.98	7.37	8.42	10.55	9.96	12.95	8.51	5.43	2.96
19	.45	4.23	4.45	7.94	11.61	11.51	11.38	9.54	3.11
20	.28	1.47	4.24	5.29	8.89	8.07	10.72	9.13	4.20
21	.11	1.51	1.72	3.70	5.25	12.26	11.74	11.37	4.37
22	.07	.86	1.59	2.15	5.39	5.72	9.14	10.43	6.01
23		.17	.77	1.62	2.46	3.62	9.30	9.22	6.69
24	.01	.28	.65	.95	1.60	4.60	7.08	8.63	7.79
25		.12	.29	.70	1.35	1.44	3.13	8.60	11.01
26		.09	.15	.37	.68	1.02	2.81	3.55	11.50
27		.03	.09	.16	.48	1.14	2.25	2.85	9.61
28		.04	.04	.08	.32	.62	1.15	1.91	7.47
29		.01	.04	.05	.16	.20	.81	1.13	5.94
30				.08	.09	.27	.72	1.14	4.92
31				.01	.08	.11	.86	.58	2.99
32			.01		.05	.12	.19	.58	2.65
33					.01	.04	.15	.16	1.86
34			.01	.01		.07	.12	.16	1.18
35				.01	.01		.04	.17	.89
36						.01	.04	.05	.64
37					.01		.08	.03	.42
38						.01		.04	.28
39							.01	.07	.15
40								.01	.23
41									.17
42									.07
43									.03
44									.04
45									
46									.04
47									
48									.01
49									
50									
51									
52									.01
Max.	24	29	34	35	37	38	39	40	52
Avg.	12.3	14.4	15.2	16.2	17.5	18.7	20.5	21.5	25.6
Min.	7	9	8	9	9	10	11	13	17

TABLE B-2.5

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-S2

Percentage distributions shown are based on 1948-49 loadometer data

Truck Type: 3-S2 Number Reported: 5 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	20.00								
8	20.00								
9		20.00							
10		20.00	20.00	20.00					
11	20.00		20.00		20.00	20.00			
12				20.00	20.00				
13						20.00	20.00	20.00	
14	20.00	20.00	20.00	20.00			20.00	20.00	
15					20.00				
16	20.00					20.00			
17									20.00
18		20.00							
19			20.00				20.00	20.00	20.00
20				20.00	20.00				
21		20.00		20.00					
22			20.00		20.00				
23									
24						20.00			
25						20.00			
26									
27									20.00
28							40.00		20.00
29									
30								20.00	
31								20.00	
32									
33									
34									
35									
36									
37									
38									
39									20.00
40									
41									20.00
Max.	16	21	22	21	22	25	28	31	41
Avg.	11.2	14.4	15.2	15.4	16.0	17.8	20.4	21.4	28.6
Min.	7	9	10	10	11	11	13	13	17

Truck Type: 3-S2 Number Reported: 6 Region: II

5	16.66								
6	16.67	16.66							
7									
8		16.67	33.33	16.66					
9					16.66				
10	16.67			16.66		16.66			
11									
12					16.66		16.66	16.66	
13	33.33	16.67				16.67			
14	16.67								
15			16.66	16.67			16.66	16.66	
16					16.67	16.67			16.66
17		33.33							
18		16.67	16.67				16.67	16.67	
19			16.67	16.67	16.67				
20				16.67					16.66
21					16.67				
22			16.67			33.33			
23									
24									
25							16.67	16.67	16.67
26				16.67			16.67		
27									
28								16.67	
29					16.67				
30									
31						16.67			
32									
33							16.67		16.67
34									
35								16.67	
36									
37									16.67
38									
39									
40									
41									
42									
43									16.67
Max.	14	18	22	26	29	31	33	35	43
Avg.	10.2	13.2	15.0	16.3	17.7	19.0	21.5	22.2	29.0
Min.	5	6	8	8	9	10	12	12	16

Truck Type: 3-S2 Number Reported: 224 Region: III

5	2.05								
6	2.05								
7	6.56	2.05							
8	3.69	2.05	1.64						
9	6.56	5.74	2.87	2.05	.82				
10	7.38	2.87	5.33	6.56	.41				

TABLE B-2.5—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
11	5.74	5.33	2.46	1.23	6.15	2.05			
12	22.54	3.28	4.10	2.87	4.10	4.92	.82		
13	20.90	6.15	3.28	3.69	2.87	4.51	5.33	5.74	
14	14.33	6.56	6.15	5.74	2.87	1.64	2.46	2.87	
15	3.69	16.80	6.56	5.33	3.69	2.46	3.89	3.28	
16	1.64	17.21	13.93	12.70	7.38	2.87	1.64	1.64	
17	1.64	15.57	17.62	16.80	7.38	4.92	.41	.82	6.15
18	.82	8.19	10.24	13.52	9.01	5.33	3.69	2.46	1.64
19	.41	2.87	13.52	12.70	12.29	6.56	2.46	3.28	3.28
20		2.05	4.92	5.33	16.39	7.37	4.10	2.87	.82
21		1.23	4.10	3.69	9.42	14.75	7.38	6.96	1.23
22		1.64	1.23	4.10	5.33	12.70	4.51	5.33	1.23
23			1.23	2.46	3.69	10.65	7.78	6.97	1.23
24		.41	.41	.82	4.51	6.97	13.11	11.06	.82
25			.41		.41	3.69	13.11	15.98	1.23
26					2.87	4.10	11.88	9.01	2.46
27						2.05	6.56	5.74	4.10
28				.41		1.23	3.69	3.28	3.28
29						.82	3.69	4.51	2.46
30							.82	2.46	7.79
31							1.64	1.23	5.33
32					.41		.82	1.23	12.29
33								2.46	12.29
34						.41			8.60
35								.41	9.42
36									3.28
37									3.69
38							.41		2.05
39									1.64
40								.41	.82
41									.41
42									1.23
43									.41
44									.41
45									
46									
47									.41
Max.	19	24	25	28	32	34	38	40	47
Avg.	11.7	14.9	16.2	16.8	18.3	20.3	22.9	23.3	30.5
Min.	5	7	8	9	9	11	12	13	17

Truck Type: 3-S2 Number Reported: 1,631 Region: IV

5	.55								
6	2.27								
7	6.07	1.16	.25						
8	8.95	1.66	1.96	.67	.12				
9	9.20	6.01	3.13	1.53	.86	.18			
10	11.28	6.38	6.01	5.03	2.39	.61			
11	11.40	7.85	6.81	5.40	5.15	2.70	.18		
12	21.83	7.42	7.73	4.78	4.84	3.92	1.16	.43	
13	14.72	8.83	6.93	7.36	6.01	4.05	2.82	3.68	
14	8.46	10.30	10.24	8.03	5.82	4.60	3.49	2.82	
15	3.07	14.29	10.97	13.49	8.28	5.39	3.74	3.49	
16	1.53	17.17	15.20	15.03	11.04	6.44	3.56	3.49	
17	.25	8.53	14.35	14.90	11.23	6.87	3.98	3.31	2.70
18	.12	5.15	5.33	8.71	12.70	9.45	4.97	4.48	2.08
19	.18	3.00	5.33	6.13	11.59	10.73	6.50	4.60	2.76
20	.06	1.16	3.13	4.05	6.50	9.02	5.82	7.54	2.39
21		.55	1.23	1.96	4.90	13.80	8.03	6.68	1.66
22		.12	.67	1.53	4.23	7.42	9.50	9.02	2.45
23		.12	.18	.55	1.16	5.70	10.55	12.33	2.88
24		.18	.12	.25	1.29	3.49	12.88	9.63	3.00
25		.06	.31	.18	.67	2.21	7.73	10.43	2.70
26				.18	.67	1.35	5.33	3.86	3.13
27			.06	.12	.25	.92	4.17	3.56	4.72
28				.06	.12	.67	1.84	2.64	5.03
29						.18	1.47	2.94	5.64
30	.06				.06	.12	1.29	1.47	7.54
31					.06		.43	1.53	7.36
32						.06	.25	.92	9.51
33							.06	.61	9.32
34						.06	.12	.18	7.36
35								.06	5.70
36								.12	4.17
37		.06					.06	.06	2.82
38					.06				1.59
39			.06	.06				.06	1.35
40									.49
41						.06			.92
42									.12
43									.95
44									.06
45									
46									.06
47							.06		.06
48									.06
50									.06
51									
52								.06	
74									.06
Max.	30	37	39	39	38	41	47	52	74
Avg.	11.1	14.1	14.8	15.5	16.8	18.7	21.5	22.1	29.6
Min.	5	7	7	8	8	9	11	12	17

TABLE B-2.5—Continued

Truck Type. 3-S2 Number Reported: 1,885 Region: U.S.

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
5	.74								
6	2.28								
7	6.15	1.27	.21						
8	8.28	1.75	1.96	.58	.11				
9	6.81	5.99	3.08	1.59	.85	.16			
10	10.77	5.94	5.94	5.31	2.12	.53			
11	10.67	7.48	6.26	4.83	5.31	2.65	.16		
12	21.81	6.90	7.21	4.56	4.83	4.03	1.11	.37	
13	15.49	8.44	6.42	6.84	5.57	4.19	3.18	3.98	
14	9.29	9.81	9.76	7.75	5.41	4.19	3.40	2.86	
15	3.18	14.54	10.34	12.41	7.75	4.99	3.77	3.50	
16	1.59	17.08	14.96	14.64	10.50	6.05	3.29	3.24	
17	.42	9.44	15.07	15.07	10.66	6.58	3.55	2.97	3.18
18	.21	5.57	5.94	9.28	12.15	8.86	4.77	4.19	2.02
19	.21	3.08	6.53	7.00	11.62	10.13	5.99	4.51	2.86
20	.05	1.33	3.29	4.30	7.85	8.75	5.57	6.79	2.23
21		.69	1.33	2.28	5.52	13.85	7.90	6.84	1.59
22		.27	.80	1.80	4.46	8.17	8.81	8.33	2.28
23		.16	.32	.80	1.43	6.31	10.13	11.36	2.65
24		.16	.16	.32	1.70	3.98	12.84	9.98	2.76
25		.05	.32	.16	.64	2.44	8.44	11.25	2.49
26				.21	.95	1.70	6.21	4.51	3.02
27			.05	.11	.21	1.06	4.46	3.82	4.67
28				.11	.11	.74	2.18	2.76	4.78
29					.05	.27	1.75	3.18	5.20
30	.05				.05	.11	1.06	1.59	7.54
31					.05	.05	.74	1.54	7.06
32					.05	.05	.32	.95	9.82
33							.11	.85	9.71
34						.11	.11	.16	7.48
35								.16	6.15
36								.11	4.03
37		.05					.05	.05	2.97
38					.05		.05		1.64
39			.05	.05				.05	1.43
40								.05	.58
41						.05			.90
42									.27
43									.27
44									.11
45									
46									.05
47							.05		.11
48									.05
49									
50									.05
51									
52								.05	
74									.05
Max.	30	37	39	39	38	41	47	52	74
Avg.	11.1	14.2	15.0	15.7	17.0	18.9	21.7	22.2	30.0
Min.	5	7	7	8	8	9	11	12	17

TABLE B-2.6

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-3

Percentage distributions shown are based on 1948-49 loadometer data

Truck Type: 3-3 Number Reported: none Region: I
Truck Type: 3-3 Number Reported: none Region: II
Truck Type: 3-3 Number Reported: none Region: III
Truck Type: 3-3 Number Reported: 1,145 Region: IV
Region: U.S.

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
4	.44								
5	8.30								
6	9.96	.52	.17						
7	4.19	10.92	4.28	.35	.09				
8	3.41	6.29	9.52	8.65	.44	.09			
9	4.98	4.10	4.63	6.11	8.56	.70			
10	11.26	2.79	2.79	4.10	6.03	9.17	.17		
11	24.01	4.19	3.32	2.36	3.23	5.50	3.67	.09	
12	28.38	5.33	2.97	3.06	2.88	3.58	7.42	3.14	
13	3.58	13.89	5.15	2.97	2.45	1.83	4.02	5.94	
14	.61	18.51	11.27	4.54	2.53	2.27	3.32	5.68	
15	.26	25.67	21.31	8.21	4.37	2.62	1.75	2.88	
16	.26	4.72	17.73	15.55	6.46	3.32	1.48	1.75	
17	.09	1.75	11.71	24.19	8.91	4.89	2.01	1.66	7.42
18	.09	.44	2.62	12.31	22.71	7.51	1.83	1.31	2.88
19		.26	1.31	4.54	17.81	18.69	2.53	2.36	3.93
20	.09	.26	.35	1.66	6.55	17.73	4.10	1.66	2.88
21	.09	.09	.35	.35	1.92	10.31	5.68	2.18	1.48
22		.09	.17	.44	.52	5.68	8.12	3.58	1.40
23			.17	.09	2.53	4.02	18.17	5.59	1.48
24				.17	.52	.87	14.85	6.81	.96
25				.17	.87	.52	9.35	10.91	1.57
26		.09			.17	.09	6.46	18.77	1.31

TABLE B-2.6—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
27		.09	.09		.09	.17	2.36	11.79	1.40
28				.09	.09	.09	1.40	5.94	1.57
29						.17	.26	4.28	2.45
30					.09		.44	1.75	2.97
31			.09		.09			.79	3.58
32						.09	.09	.09	4.98
33				.09			.17	.35	5.77
34								.09	8.12
35							.17		10.48
36							.09	.17	13.80
37								.09	6.99
38						.09		.09	5.24
39								.17	2.79
40									1.92
41					.09				.79
42									.70
43									.17
44									.17
45									
46							.09		.09
47									.09
48									.09
49									
50								.09	.17
51									.09
52									.09
53									
54									
55									.09
66									.09
Max.	21	27	31	33	41	38	46	50	66
Avg.	9.9	12.6	13.8	14.9	16.4	17.7	21.0	23.0	31.1
Min.	4	6	6	7	7	8	10	11	17

TABLE B-2.7
RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR ALL SIX MAJOR VEHICLE TYPES

Percentage distributions shown are based on 1948-49 loadometer data

Truck Type: All Number Reported: 5,885 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	.24								
8	.76		.02						
9	4.42	4.01	1.78	.10					
10	7.36	5.74	4.69	4.18	1.27	.08	.05	.05	.05
11	16.24	15.81	8.72	6.71	3.74	2.23	.70	.65	.63
12	16.94	15.81	15.17	12.59	7.97	5.95	2.91	2.67	1.72
13	16.45	16.75	18.56	18.05	13.73	8.09	6.12	4.05	3.62
14	15.51	15.44	15.38	15.21	12.54	12.35	8.68	6.27	3.59
15	8.11	8.88	12.52	11.96	14.38	11.69	9.81	8.53	2.87
16	6.37	6.66	7.87	10.55	11.11	12.54	9.97	8.68	2.22
17	2.79	2.91	5.18	6.29	10.18	12.10	10.33	10.13	6.76
18	2.34	3.06	3.40	4.66	8.56	8.99	12.69	10.37	5.95
19	1.34	1.90	2.00	2.81	4.74	7.41	9.24	11.08	7.10
20	.53	.87	1.53	2.31	3.72	5.76	7.90	9.07	7.70
21	.39	.85	1.09	1.31	2.55	4.11	6.25	7.17	8.76
22	.14	.60	.78	1.02	1.65	2.70	4.37	5.56	8.71
23		.19	.37	.83	.99	1.70	3.38	4.60	7.65
24	.05	.22	.36	.49	.90	1.21	2.23	3.67	7.34
25		.15	.24	.31	.73	.85	1.19	1.80	5.91
26	.02	.10	.17	.29	.32	.65	.92	1.31	4.71
27			.05	.10	.36	.56	1.05	1.02	3.58
28		.03	.05	.05	.17	.42	.65	.92	2.48
29			.05	.08	.17	.12	.42	.59	1.94
30		.02		.08	.07	.19	.41	.54	1.55
31					.08	.10	.27	.36	1.05
32			.02		.05	.08	.10	.39	.38
33				.02		.05	.14	.10	.65
34					.02	.05	.05	.10	.63
35						.02	.07	.15	.46
36							.05	.05	.36
37							.05	.03	.31
38								.02	.22
39								.07	.17
40									.10
41									.17
42									.05
43									.02
44									.02
45									
46									.03
47									
48									.02
52									.02
Max.	26	30	32	33	34	35	37	39	52
Avg.	12.96	13.37	14.02	14.59	15.76	16.72	17.96	18.72	21.59
Min.	7	9	8	9	10	10	10	10	10

TABLE B-2.7—Continued

Truck Type: All — Number Reported: 5,037 — Region: II

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
5	.02								
6	.04	.02							
7	.40	.02							
8	1.25	.04	.16	.04					
9	7.19	5.62	2.76	.30	.08				
10	13.12	11.18	10.16	8.62	2.38	.28	.16	.14	.12
11	27.73	26.80	18.18	15.88	8.22	4.17	1.65	1.59	1.57
12	20.92	18.98	23.31	16.16	14.27	8.48	2.30	1.83	1.63
13	14.77	15.50	18.86	19.75	17.67	13.24	6.35	2.36	1.75
14	8.10	8.24	8.16	12.27	14.71	16.20	12.63	7.84	1.09
15	2.96	4.76	6.17	9.49	13.84	14.85	15.80	14.23	.81
16	1.95	3.27	3.87	5.24	8.89	13.80	14.99	12.80	.77
17	.83	1.07	2.70	3.79	6.63	8.97	12.09	15.41	11.22
18	.38	1.79	1.57	2.68	4.01	6.33	10.44	11.95	10.98
19	.18	1.15	1.19	1.55	3.00	4.09	7.21	9.41	12.19
20	.10	.48	1.19	1.17	1.45	2.62	4.78	6.23	13.46
21	.04	.58	.58	1.09	1.05	1.96	3.32	4.64	10.60
22	.02	.32	.60	.69	1.49	1.19	2.00	3.12	7.26
23		.02	.20	.60	.85	.87	1.45	1.81	5.95
24		.06	.16	.22	.56	1.41	1.41	1.55	4.37
25		.04	.08	.22	.36	.44	.87	1.53	4.53
26		.02	.04	.12	.24	.38	.79	1.01	3.00
27		.02	.02	.06	.10	.28	.68	.75	2.14
28		.02	.02	.02	.06	.24	.36	.58	1.33
29			.02		.08	.06	.20	.28	1.07
30				.02	.02	.02	.26	.38	1.09
31				.02		.06	.10	.22	.75
32					.02	.02	.02	.16	.56
33					.02		.06	.04	.54
34						.04	.04	.04	.22
35								.06	.40
36									.16
37							.04		.16
38								.02	.06
39								.02	.04
40									.06
41									.04
42									.02
43									.02
44									.02
45									.02
46									
Max.	22	28	29	31	33	34	37	39	46
Avg.	11.74	12.32	12.80	13.47	14.54	15.52	17.96	17.64	20.67
Min.	5	6	8	8	9	10	10	10	10

Truck Type: All — Number Reported: 9,250 — Region: III

5	.05								
6	.05								
7	.81	.05							
8	1.14	.05	.06						
9	4.81	3.94	1.89	.36	.03				
10	13.02	10.28	8.35	6.11	1.61	.11	.02	.02	.02
11	25.21	22.70	14.99	9.22	5.04	2.45	.97	.67	.66
12	22.43	14.05	18.55	12.88	8.38	5.31	1.68	1.23	.67
13	17.66	13.93	14.65	16.79	12.31	8.23	3.64	2.11	1.25
14	8.51	7.55	8.55	10.69	13.62	12.88	7.76	4.81	1.13
15	3.62	7.63	7.29	10.57	12.81	11.63	13.44	9.69	.68
16	1.68	8.56	5.37	7.09	9.93	13.37	11.25	10.15	.40
17	.58	3.44	8.28	7.66	8.36	9.04	11.03	13.27	8.28
18	.28	4.04	4.93	6.61	6.66	7.93	9.45	10.10	9.24
19	.11	2.20	2.76	4.78	6.99	7.13	7.39	8.91	10.24
20	.03	.69	2.24	2.79	5.43	4.76	6.10	5.66	11.40
21	.01	.48	.93	1.95	3.03	7.49	6.63	6.31	8.31
22		.27	.50	1.06	2.75	3.42	5.22	5.83	5.65
23		.03	.30	.72	1.25	1.95	5.54	5.22	4.44
24		.09	.21	.32	.70	2.37	4.04	5.25	4.23
25			.09	.21	.56	.68	1.83	5.16	5.77
26			.01	.08	.28	.44	1.69	1.90	6.52
27		.01	.02	.04	.08	.46	.99	1.43	5.16
28			.01	.03	.12	.13	.52	.82	4.26
29		.01		.01		.08	.39	.51	2.94
30				.01	.02	.08	.19	.42	2.75
31					.01	.01	.09	.21	1.54
32			.01		.01	.02	.09	.13	1.59
33							.01	.11	1.06
34			.01	.01		.01	.01	.03	.61
35				.01	.01			.02	.42
36						.01			.26
37					.01		.01		.19
38						.01	.01	.01	.10
39							.01		.05
40								.02	.09
41									.02
42									.04
43									.01
44									.01
45									
46									
47									.01
Max.	21	29	34	35	37	38	39	40	47
Avg.	11.83	13.02	13.67	14.55	15.82	16.80	18.23	19.06	22.35
Min.	5	7	8	9	10	10	10	10	10

TABLE B-2.7—Continued

Truck Type: All | Number Reported: 5,828 | Region: IV

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
4	.09								
5	1.78								
6	2.59	.10	.03						
7	3.94	2.47	.91	.07	.02				
8	5.58	1.73	2.51	1.89	.12	.02			
9	7.98	6.04	3.05	1.97	1.99	.19			
10	12.97	7.57	7.04	5.39	2.47	2.11	.07	.03	.03
11	17.71	12.78	9.21	7.07	5.56	3.48	1.34	.50	.48
12	22.54	11.34	11.77	9.04	8.17	6.90	4.74	3.21	1.49
13	12.13	12.53	10.84	11.41	9.03	7.62	5.90	5.22	2.54
14	6.95	11.82	11.14	9.35	9.09	8.60	7.07	6.37	2.64
15	2.85	13.85	12.10	11.34	9.56	7.36	7.94	7.42	1.99
16	1.72	9.25	11.00	11.37	9.54	8.39	6.02	6.44	4.34
17	.57	4.19	9.90	12.78	9.51	7.65	6.42	5.90	6.66
18	.31	3.02	4.34	7.74	11.39	8.85	6.57	5.89	4.79
19	.12	1.63	2.52	4.58	9.85	9.95	6.47	6.31	5.58
20	.09	.65	1.65	2.67	5.23	8.32	5.52	5.83	4.80
21	.03	.55	.70	1.15	2.88	8.47	6.43	5.30	3.52
22	.03	.22	.62	.93	2.25	4.29	6.55	5.85	3.40
23		.07	.27	.45	1.22	3.34	8.58	7.23	3.07
24		.07	.17	.26	.77	1.78	7.82	5.85	3.02
25		.03	.10	.26	.55	.96	4.65	6.56	3.64
26		.05	.02	.14	.36	.57	3.23	5.41	3.59
27		.02	.07	.05	.19	.50	1.99	3.90	4.24
28				.05	.10	.31	.98	2.23	3.41
29					.03	.12	.62	1.90	3.60
30	.02				.05	.09	.55	.96	3.60
31			.02		.03	.02	.17	.67	3.29
32						.05	.10	.36	4.12
33				.02			.07	.24	4.10
34						.02	.09	.09	3.95
35							.03	.05	3.84
36							.02	.10	4.02
37		.02					.02	.03	2.21
38					.02	.02		.02	1.51
39			.02	.02				.05	.93
40									.55
41					.02	.02			.43
42							.02		.19
43							.02		.12
44								.02	.07
45								.02	
46							.02		.03
47							.02		.03
48									.03
49									
50								.02	.05
51									.02
52								.02	.02
53									
54									
55									.02
66									.02
74									.02
Max.	30	37	39	39	41	41	47	52	74
Avg.	11.10	13.15	13.94	14.77	15.94	17.16	19.22	20.17	25.19
Min.	4	6	6	7	7	8	10	10	10

Truck Type: All | Number Reported: 25,999 | Region: U.S.

4	.02								
5	.42								
6	.61	.02	.01						
7	1.30	.58	.20	.01	.01				
8	2.07	.41	.61	.42	.02	.01			
9	5.89	4.74	2.29	.65	.47	.04			
10	11.74	8.84	7.58	6.00	1.87	.58	.07	.05	.05
11	21.98	19.71	12.89	9.46	5.48	2.96	1.12	.80	.79
12	20.92	14.80	17.19	12.58	9.38	6.42	2.76	2.11	1.28
13	15.58	14.55	15.50	16.44	12.93	9.03	5.23	3.29	2.17
14	9.67	10.41	10.60	11.72	12.57	12.44	8.76	6.08	2.01
15	4.34	8.75	9.33	10.84	12.64	11.30	11.83	9.80	1.50
16	2.80	7.26	6.90	8.47	9.89	12.15	10.50	9.50	1.20
17	1.13	3.04	6.89	7.75	8.69	9.40	10.03	11.31	8.13
18	.78	3.14	3.79	5.66	7.64	8.08	9.73	9.56	8.01
19	.40	1.81	2.25	3.66	6.34	7.24	7.56	8.93	8.80
20	.17	.68	1.73	2.36	4.23	5.37	6.12	6.57	9.47
21	.11	.60	.82	1.45	2.51	5.89	5.86	5.97	7.93
22	.04	.34	.61	.95	2.14	3.01	4.71	5.24	6.31
23		.08	.30	.64	1.10	2.00	4.93	4.85	5.23
24	.01	.10	.22	.35	.74	1.78	3.97	4.33	4.74
25		.05	.12	.24	.56	.74	2.14	4.01	5.08
26	.01	.04	.05	.15	.30	.50	1.68	2.39	4.79
27		.01	.04	.06	.17	.46	1.17	1.76	4.04
28		.01	.02	.04	.11	.26	.62	1.11	3.10
29		.01	.02	.02	.06	.09	.41	.80	2.50
30	.01	.01		.03	.04	.09	.33	.56	2.34
31			.01	.01	.03	.04	.16	.35	1.67
32			.01		.02	.04	.08	.25	1.80
33				.01	.01	.01	.06	.12	1.55
34			.01	.01	.01	.03	.04	.06	1.28
35				.01	.01	.01	.02	.07	1.19

TABLE B-2.7—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
36						.01	.02	.03	1.10
37		.01			.01		.03	.02	.67
38					.01	.01	.01	.02	.43
39			.01	.01			.01	.03	.27
40								.01	.19
41					.01	.01			.15
42							.01		.07
43							.01		.03
44									.03
45									
46							.01		.02
47							.01		.01
48									.01
49									
50								.01	.01
51									.01
52								.01	.01
55									.01
56									.01
74									.01
Max.	30	37	39	39	41	41	47	52	74
Avg.	11.91	13.00	13.64	14.41	15.57	16.62	18.13	18.97	22.53
Min.	4	6	6	7	7	8	10	10	10

TABLE B-3.1
RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2

Percentage distributions shown are based on 1954 loadometer data

Truck Type: 2 Number Reported: 356 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
10	.28	.28	.28						
11	15.45	15.17	9.55	7.30	5.62	3.65	3.65	3.37	3.37
12	29.49	29.21	22.76	19.10	19.10	20.51	15.17	15.17	13.48
13	21.07	21.63	23.04	29.50	23.32	21.91	26.97	23.88	20.79
14	16.57	16.57	21.07	19.10	23.31	23.04	20.22	20.23	20.51
15	5.62	5.62	9.55	10.11	12.36	12.36	14.61	16.85	18.54
16	5.06	5.06	5.62	5.34	5.62	7.30	8.15	8.43	10.39
17	1.69	1.69	3.93	4.50	5.62	5.34	4.78	5.62	4.78
18	2.25	2.25	.84	1.69	1.69	1.69	2.25	2.25	3.37
19	1.12	1.12	1.40	1.40	1.12	1.40	1.40	1.40	1.12
20	.56	.56	1.12	.56	.84	1.40	1.12	1.12	1.69
21	.28	.28	.28	.84	.84	.84	.56	.56	.84
22	.56	.56	.28	.28	.28	.28	.56	.56	.28
23			.28	.28	.28	.28	.56	.56	.84
Max.	22	22	23	23	23	23	23	23	23
Avg.	13.2	13.2	13.6	13.7	13.9	14.0	14.1	14.2	14.4
Min.	10	10	10	11	11	11	11	11	11

Truck Type: 2 Number Reported: 228 Region: II

10	.44	.44	.44	.44	.44	.44	.44	.44	.44
11	32.45	32.45	27.19	23.68	22.81	22.37	22.37	22.37	22.37
12	44.74	44.74	44.30	41.23	42.98	43.42	40.79	39.47	39.03
13	11.40	11.40	14.47	21.49	19.30	18.86	20.17	21.49	20.61
14	6.58	6.58	7.90	7.46	8.77	9.21	10.53	10.53	10.53
15	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	3.51
16	.88	.88	2.19	2.19	1.75	1.75	1.75	1.75	1.75
17	.44	.44	.44	.44	.88	.88	.88	.88	.88
21	.44	.44		.44	.44	.44	.44	.44	.44
22			.44						
23			.44	.44					
24	.44	.44			.44				
25						.44			
26							.44		
27								.44	
29									.44
Max.	24	24	23	23	24	25	26	27	29
Avg.	12.1	12.1	12.3	12.4	12.4	12.4	12.5	12.5	12.5
Min.	10	10	10	10	10	10	10	10	10

Truck Type: 2 Number Reported: 94 Region: III

10	2.13	2.13	3.19	2.13	1.06	1.06	1.06	1.06	1.06
11	50.01	50.01	30.85	24.47	23.41	23.41	23.41	23.41	23.41
12	39.36	39.36	50.00	54.25	59.58	58.51	54.26	53.19	48.94
13	6.38	6.38	10.64	13.83	6.38	6.38	10.64	11.70	12.76
14	1.06	1.06	4.26	4.26	8.51	9.58	9.57	9.58	10.64
15	1.06	1.06							2.13
16			1.06	1.06	1.06	1.06	1.06	1.06	1.06
Max.	15	15	16	16	16	16	16	16	16
Avg.	11.6	11.6	11.9	12.0	12.0	12.0	12.1	12.1	12.2
Min.	10	10	10	10	10	10	10	10	10

Truck Type: 2 Number Reported: 192 Region: IV

11	45.32	45.32	35.94	25.00	23.96	21.35	21.36	21.36	21.36
12	38.02	38.02	40.10	44.79	44.27	46.88	39.58	39.58	39.06

TABLE B-3.1—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
13	14.06	14.06	17.19	23.44	23.96	23.96	29.69	27.08	25.52
14	1.56	1.56	5.73	5.73	5.73	5.73	7.29	9.90	11.46
15	.52	.52	.52	.52	1.56	1.56	1.56	1.56	1.04
16	.52	.52	.52	.52					1.04
17					.52	.52	.52	.52	.52
Max.	16	16	16	16	17	17	17	17	17
Avg.	11.8	11.8	12.0	12.1	12.2	12.2	12.3	12.3	12.4
Min.	11	11	11	11	11	11	11	11	11
Truck Type: 2				Number Reported: 870				Region: U.S.	
10	.46	.46	.57	.34	.23	.23	.23	.23	.23
11	30.23	30.12	22.30	17.36	6.21	14.60	14.60	14.48	14.49
12	36.44	36.32	35.18	34.37	35.17	36.44	31.50	31.04	29.65
13	15.41	15.64	18.16	24.37	20.58	19.89	24.02	22.65	20.92
14	8.97	8.97	12.42	11.50	14.02	14.14	13.68	14.26	14.83
15	3.10	3.10	4.60	4.83	5.98	5.98	6.90	7.82	8.97
16	2.41	2.41	3.11	2.99	2.88	3.57	3.91	4.02	5.06
17	.80	.80	1.72	1.95	2.65	2.53	2.30	2.64	2.30
18	.92	.92	.34	.69	.69	.69	.92	.92	1.38
19	.46	.46	.57	.57	.46	.57	.57	.57	.46
20	.23	.23	.46	.23	.34	.57	.46	.46	.69
21	.23	.23	.11	.46	.46	.46	.34	.34	.46
22	.23	.23	.23	.11	.11	.11	.23	.23	.11
23			.23	.23	.11	.11	.23	.23	.34
24	.11	.11			.11				
25						.11			
26							.11		
27								.11	
28									
29									.11
Max.	24	24	23	23	24	25	26	27	29
Avg.	12.4	12.4	12.7	12.8	12.9	13.0	13.1	13.1	13.2
Min.	10	10	10	10	10	10	10	10	10

TABLE B-3.2
RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3

Percentage distributions shown are based on 1954 loadometer data

Truck Type: 3 Number Reported: 105 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
9	.95								
10	.95								
11	2.86								
12	11.43	.95							
13	23.81	.95	.95	.95	.95	.95	.95	.95	.95
14	17.14	2.86	.95	.95	.95	.95			
15	15.24	10.48	2.86	.95			.95		.95
16	5.72	16.19	6.67	2.86	1.90	.95	.95	1.90	
17	8.57	10.48	10.48	13.34	5.72	6.67	3.81	2.86	.95
18	2.86	15.24	13.33	6.67	13.34	12.38	11.43	12.38	7.62
19	2.86	15.24	15.24	15.24	11.43	8.58	9.53	8.57	10.48
20	.95	3.81	7.62	13.34	16.20	12.38	11.43	11.43	9.53
21	2.86	9.53	14.29	5.72	6.67	13.34	15.24	14.29	10.48
22	1.90	.95	6.67	13.34	9.53	8.57	5.72	6.67	13.34
23		4.76	5.71	5.71	10.48	9.53	11.43	11.43	6.67
24	.95	.95	2.86	5.71	1.90	3.81	5.72	5.72	10.48
25	.95	.95	2.86	2.86	6.67	5.71	6.67	5.72	4.76
26			1.90	2.86	4.76	3.81	.95	1.90	5.72
27		2.86	.95	1.90	.95	2.86	5.71	5.72	1.90
28		1.90		.95	.95	1.90	.95	1.90	4.76
29			3.81		.95	.95	.95	.95	2.86
30				1.90			.95	.95	
31		.95		1.90	1.90	.95			1.90
32		.95			1.90	2.86	.95	.95	
33			.95				2.86	2.86	.95
34			.95						.95
35			.95	1.90					1.90
36				.95	1.90	.95			
37					.95	1.90	.95	.95	
38							1.90	1.90	.95
39									.95
40									.95
Max.	25	32	35	36	37	37	38	38	40
Avg.	14.8	18.7	20.4	21.1	21.6	21.9	22.3	22.4	23.2
Min.	9	12	13	13	13	13	13	13	13
Truck Type: 3				Number Reported: 130				Region: II	
8	2.31								
9	.77								
10	6.15								
11	10.77	3.08	1.54						
12	18.46	3.08	1.54	2.31	1.54	1.54	.77		
13	33.08	3.08	3.08	1.54	2.31	2.31	2.31	2.31	1.54
14	17.69	10.77	3.85	3.08	1.54	1.54	2.31	2.31	2.31
15	6.15	18.46	9.23	6.15	6.15	4.62	3.08	3.08	2.31
16	3.08	18.46	13.08	7.69	6.92	6.15	5.38	3.85	4.62

TABLE B-3.2—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
17	1.54	20.00	14.61	15.38	11.54	10.77	8.46	8.46	6.15
18		12.30	19.23	20.77	19.23	18.46	17.69	14.61	10.00
19		6.15	19.23	21.54	16.92	17.69	19.23	24.61	20.00
20		2.31	6.92	11.54	21.54	23.84	20.77	18.46	17.69
21		2.31	5.38	6.15	3.85	4.62	10.77	12.31	19.23
22			2.31	3.08	6.15	5.38	4.61	5.38	7.69
23				.77	1.54	2.31	3.08	3.08	4.61
24					.77	.77	.77	.77	2.31
25							.77	.77	.77
26									.77
Max.	17	21	22	23	24	24	25	25	26
Avg.	12.7	16.1	17.4	18.0	18.4	18.5	18.8	19.0	19.5
Min.	8	11	11	12	12	12	12	13	13
Truck Type: 3				Number Reported: 120				Region: III	
7	1.67								
8	6.67								
9	4.17	2.50							
10	11.67		.83	.83					
11	29.16	10.00	4.17	1.67	.83				
12	32.50	3.33	4.17	3.33	4.17	5.00	3.33	1.67	
13	12.50	11.67	6.67	5.83	6.67	6.67	5.00	5.00	4.17
14	.83	25.84	11.67	10.83	6.67	5.83	8.33	8.34	7.50
15	.83	31.67	13.33	10.00	11.67	9.17	9.17	8.33	7.50
16		10.83	28.33	7.50	6.67	10.00	9.17	9.17	9.17
17		2.50	17.50	33.34	26.66	20.00	11.67	8.33	7.50
18		.83	10.00	18.33	24.16	20.84	21.67	24.17	15.00
19		.83	2.50	6.67	7.50	15.00	21.67	22.50	21.67
20			.83	16.7	4.17	5.83	5.83	8.33	15.83
21					.83	.83	3.33	3.33	7.50
22						.83			3.33
23							.83	.83	
24									
25									.83
Max.	15	19	20	20	21	22	23	23	25
Avg.	11.2	14.1	15.5	16.2	16.5	16.8	17.1	17.3	18.0
Min.	7	9	10	10	11	12	12	12	13
Truck Type: 3				Number Reported: 279				Region: IV	
7	10.04								
8	26.52								
9	6.45	10.39	1.08						
10	2.51	15.06	21.86	3.94	.36				
11	4.30	17.56	12.54	16.12	10.04	3.23	.36		
12	16.48	1.43	7.53	18.63	16.84	16.12	10.39	3.94	
13	18.28	1.79	1.43	5.02	12.54	14.69	16.85	15.41	3.94
14	8.96	3.58	2.15	1.08	5.02	10.39	12.90	16.13	15.77
15	3.23	16.13	3.58	2.87	1.43	1.08	4.66	9.32	13.26
16	2.51	12.19	10.04	5.38	3.23	2.51	1.43	1.79	11.82
17	.72	11.83	12.19	11.11	10.04	9.68	7.17	4.66	3.23
18		3.58	12.90	11.47	12.54	11.47	12.90	11.83	7.53
19		3.23	5.73	13.26	13.26	12.53	12.54	14.70	13.98
20		2.51	4.66	5.02	6.09	7.89	9.32	8.60	10.39
21		.72	3.23	3.23	4.30	5.38	5.02	5.73	8.24
22			.72	1.79	2.51	2.51	3.23	4.30	5.73
23			.36	.36	.36	1.08	1.79	1.43	3.23
24				.72	.72	.36	.36	1.08	.72
25					.72	1.08	.36	.36	1.08
26							.72	.36	.36
27								.36	
28									.36
29									.36
Max.	17	21	23	24	25	25	26	27	29
Avg.	10.7	13.6	14.5	15.3	15.8	16.2	16.5	16.9	17.7
Min.	7	9	9	10	10	11	11	12	13
Truck Type: 3				Number Reported: 634				Region: U.S.	
7	4.73								
8	13.40								
9	3.94	5.05	.47						
10	4.73	6.62	9.78	1.89	.16				
11	10.09	10.25	6.62	7.41	4.57	1.42	.16		
12	19.09	2.05	4.42	9.31	8.51	8.36	5.36	2.05	
13	21.14	3.79	2.68	3.79	7.41	8.36	8.99	8.36	2.99
14	10.73	9.15	4.10	3.31	3.94	6.15	7.73	9.15	8.83
15	5.21	18.60	6.47	4.57	4.10	3.15	4.57	6.46	7.88
16	2.68	13.87	13.57	5.84	4.42	4.42	3.63	3.47	7.88
17	2.05	11.51	13.41	16.56	12.77	11.36	7.73	5.84	4.26
18	.47	6.94	13.72	13.88	16.24	14.82	15.30	14.82	9.46
19	.47	5.21	9.62	14.19	12.62	13.40	15.14	17.19	16.09
20	.16	2.21	4.73	6.94	10.72	11.52	11.35	11.04	12.77
21	.47	2.37	4.89	2.63	3.47	5.52	7.57	8.04	10.73
22	.32	.16	1.89	3.62	4.26	3.94	3.15	3.79	6.94
23		.79	1.10	1.26	2.21	2.52	3.63	3.63	3.47
24	.16	.16	.47	1.26	.79	.95	1.26	1.58	2.52
25	.16	.16	.47	.47	1.42	1.42	1.42	1.26	1.58
26			.32	.47	.79	.63	.47	.47	1.26
27		.47	.16	.32	.16	.47	.79	1.10	.32
28		.32		.16	.16	.32	.32	.32	.95
29			.63		.16	.16	.16	.16	.63
30				.32			.16	.16	
31		.16		.32	.32	.16			.32

TABLE B-3.2—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
32		.16			.32	.47	.16	.16	
33			.16				.47	.47	.16
34			.16						.16
35			.16	.32					.32
36				.16	.32	.16			
37					.16	.32	.16	.16	
38							.32	.32	.16
39									.16
40									.16
Max.	25	32	35	36	37	37	38	38	40
Avg.	11.9	15.0	16.3	17.0	17.4	17.7	18.1	18.3	19.1
Min.	7	9	9	10	10	11	11	12	13

TABLE B-3.3

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S1

Percentage distributions shown are based on 1954 loadometer data

Truck Type: 2-S1 Number Reported: 1,276 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
8	.16	.16							
9	1.10	1.10	.24	.24	.08	.08			
10	5.17	4.62	3.29	1.41	.24				
11	12.77	13.01	4.15	6.27	1.49	.24	.16	.08	
12	21.08	20.93	16.46	12.54	4.78	1.49	.16	.08	
13	21.24	20.45	23.74	19.20	13.32	3.91	.31	.31	
14	18.26	18.18	16.85	15.99	11.75	10.73	3.21	.31	.16
15	7.92	7.99	13.87	13.09	17.32	12.07	7.76	4.08	.16
16	7.05	7.21	8.93	10.18	12.85	15.12	9.64	7.45	.16
17	2.19	2.90	5.09	8.30	10.58	15.91	14.34	10.26	.63
18	1.65	1.57	3.68	6.11	11.05	11.44	16.30	14.34	3.13
19	.55	.86	1.18	1.88	6.82	9.64	13.08	16.29	4.86
20	.31	.31	1.02	2.04	3.21	8.70	11.67	13.79	9.56
21	.39	.31	.63	1.02	2.90	3.21	8.86	10.66	14.03
22		.08	.31	.71	1.25	3.37	5.25	7.05	13.40
23	.16	.24	.24	.31	.71	1.72	3.84	6.11	12.69
24			.08	.31	.78	.63	1.49	3.61	11.76
25					.31	.63	1.41	1.72	9.32
26		.08	.08	.16	.08	.55	1.10	1.18	7.36
27			.08	.08	.08	.08	.63	1.10	3.45
28				.08	.24	.08	.31	.78	2.66
29			.08		.08	.24	.16	.24	2.12
30				.08		.08	.16	.24	1.41
31					.08	.08	.08	.16	.94
32							.08	.16	1.10
33									.47
34									.39
35									.16
36									
37									.08
Max.	23	26	29	30	31	31	32	32	37
Avg.	13.2	13.2	14.0	14.6	16.0	17.2	18.7	19.6	23.2
Min.	8	8	9	9	9	9	11	11	14

Truck Type: 2-S1 Number Reported: 901 Region: II

9	1.89	1.89	.55	3.88					
10	10.76	9.21	6.44	13.99	1.66				
11	30.96	31.30	10.54	24.97	3.44	1.66			
12	27.64	28.08	43.06	25.42	11.21	3.66	.33	.11	
13	19.53	18.98	22.09	12.55	21.76	11.88	2.44	.55	
14	6.22	7.10	8.22	9.21	20.31	19.65	7.22	2.77	.22
15	2.11	2.44	4.77	4.99	20.09	20.87	18.87	9.32	
16	.67	.67	2.55	2.11	9.44	20.53	23.75	17.43	.33
17	.11	.22	.89	1.78	5.77	10.77	20.20	24.87	1.89
18			.67	.55	3.55	5.88	14.43	22.09	8.66
19			.11	.55	1.66	2.33	7.11	12.54	15.54
20			.11		.67	1.78	3.00	5.33	27.31
21	.11	.11			.22	.55	1.55	2.89	23.75
22					.22	.44	.55	1.22	10.43
23							.44	.33	6.33
24								.44	2.77
25							.11		1.22
26								.11	1.00
27									.22
28									.11
29									
30									.11
31									
32									
33									.11
Max.	21	21	20	20	22	22	25	26	33
Avg.	11.8	11.9	12.5	13.1	14.2	15.2	16.6	17.4	20.5
Min.	9	9	9	10	10	11	12	12	14

Truck Type: 2-S1 Number Reported: 790 Region: III

7	.13	.13							
8									
9	6.46	4.56	1.27	.13					

TABLE B-3.3—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
10	18.23	17.72	15.06	12.41	6.08				
11	36.33	36.07	18.48	19.49	11.39	4.94			
12	23.54	24.81	39.87	22.66	11.77	11.65	1.14	.13	
13	12.78	13.16	17.34	21.26	21.51	12.53	8.10	2.66	
14	2.15	2.66	4.17	11.77	16.20	21.26	13.54	7.34	.13
15	.13	.38	2.41	8.23	18.86	16.07	21.01	16.96	
16	.25	.38	.51	1.39	8.61	19.74	19.62	18.10	.13
17		.13	.38	1.77	2.41	8.99	18.61	22.28	7.34
18			.38	.38	2.66	3.42	11.27	17.47	17.84
19				.38	.25	1.14	5.44	10.88	17.85
20			.13	.13	.13	.13	1.01	3.42	23.29
21					.13	.13	.13	.63	22.28
22							.13	.13	6.71
23									3.16
24									.89
25									.38
Max.	16	17	20	20	21	21	22	22	25
Avg.	11.3	11.4	11.9	12.5	13.5	14.5	15.9	16.7	19.7
Min.	7	7	9	9	10	11	12	12	14

Truck Type: 2-S1 Number Reported: 265 Region: IV

8	.38	.38	.38	.38					
9	3.02	2.64	1.13	.38	.38	.38			
10	9.43	9.06	6.04	5.28	2.26				
11	28.31	27.93	12.08	12.83	6.42	2.26	.38		
12	26.42	27.17	33.20	20.00	11.32	6.80	.38	.38	
13	21.13	21.51	28.30	28.68	19.24	11.32	4.91	.75	
14	8.30	8.30	8.68	10.95	18.49	17.36	9.06	4.53	
15	1.13	1.13	4.91	8.30	17.36	19.62	16.98	10.19	
16	.75	.75	2.26	6.79	10.56	16.60	22.64	16.23	.38
17	.38	.38	1.13	2.64	6.42	12.83	18.49	25.29	4.53
18			.38	1.13	3.77	7.17	12.07	19.62	10.57
19	.75	.75	1.13	1.13	1.13	1.89	8.68	10.94	14.34
20			.38	1.13	.38	1.51	2.26	7.17	24.53
21				.38	1.89		1.89	2.64	17.73
22					.38	1.51			13.96
23						.75	1.13	.75	8.68
24							.75	.38	3.02
25							.38	.75	.75
26								.38	.38
27									.38
28									
29									
30									.75
Max.	19	19	20	21	22	23	25	26	30
Avg.	11.9	12.0	12.6	13.2	14.2	15.2	16.5	17.4	20.5
Min.	8	8	8	8	9	9	11	12	16

Truck Type: 2-S1 Number Reported: 3,232 Region: U.S.

7	.03	.03							
8	.09	.09	.03	.03					
9	2.78	2.29	.65	.15	.06	.03			
10	10.27	9.47	7.27	5.14	2.26	.06			
11	24.91	25.00	10.12	12.19	4.86	1.95	.09	.03	
12	23.95	24.38	30.97	19.06	8.79	4.98	.50	.12	
13	18.69	18.35	22.06	22.22	18.16	8.85	3.22	.93	
14	10.12	10.46	10.68	13.59	15.78	16.34	7.30	3.10	.15
15	3.84	4.03	7.80	10.43	18.47	16.12	14.85	9.00	.06
16	3.09	3.19	4.55	6.31	10.68	17.86	17.08	13.65	.22
17	.90	1.27	2.44	4.52	6.90	12.56	17.39	18.57	2.94
18	.68	.62	1.76	3.10	6.31	7.58	14.23	17.73	8.88
19	.28	.40	.59	1.08	3.31	4.89	9.10	13.58	11.79
20	.12	.12	.50	1.08	1.52	4.08	5.88	8.29	19.09
21	.19	.15	.25	.43	1.39	1.45	4.12	5.38	19.06
22		.03	.15	.28	.59	1.58	2.26	3.16	10.99
23	.06	.09	.09	.12	.28	.74	1.73	2.57	8.26
24				.12	.31	.25	.65	1.58	5.88
25					.12	.25	.62	.74	4.18
26		.03	.03	.06	.03	.22	.43	.53	3.22
27			.03	.03	.03	.03	.25	.43	1.45
28				.03	.09	.06	.12	.31	1.08
29			.03		.03	.06	.03	.09	.84
30				.03		.03	.09	.09	.65
31					.03	.03	.03	.06	.37
32							.03	.06	.43
33									.22
34									.15
35									.06
36									
37									.03
Max.	23	26	29	30	31	31	32	32	37
Avg.	12.2	12.3	13.0	13.5	14.8	15.8	17.2	18.1	21.4
Min.	7	7	8	8	9	9	11	11	14

TABLE B-3.4

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S2

Percentage distributions shown are based on 1954 loadometer data

Truck Type: 2-S2 Number Reported: 1,440 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	.69								
8	4.31								
9	4.65	1.32	.07	.07					
10	11.32	5.83	3.40	1.46	.21				
11	11.04	7.15	5.83	5.35	1.39	.07			
12	22.29	12.01	10.27	6.67	3.33	1.46			
13	16.53	14.72	13.68	9.93	5.90	3.33	.35	.07	
14	13.41	10.76	11.11	9.72	8.89	5.07	1.74	.28	
15	8.33	12.99	11.74	12.57	8.82	6.53	5.07	2.22	
16	3.82	11.53	9.38	11.39	11.46	10.42	4.93	3.96	
17	2.57	5.83	10.56	11.66	11.80	8.68	5.35	5.56	.14
18	.69	8.89	9.31	7.64	10.62	14.37	10.48	5.42	1.67
19	.07	4.79	4.79	7.57	9.44	10.63	10.83	10.41	2.57
20	.07	1.46	4.24	5.28	9.10	7.22	10.62	9.58	4.17
21	.21	1.81	2.08	3.75	4.93	12.08	11.94	12.08	4.03
22		.56	2.08	2.50	5.76	4.93	7.22	9.37	4.65
23		.07	.83	2.15	2.99	4.51	10.20	7.98	8.47
24		.07	.28	1.18	2.43	4.65	7.22	9.03	8.61
25		.07	.14	.69	1.53	2.15	4.10	9.10	11.11
26		.07	.07	.14	.63	1.81	2.85	4.65	10.62
27			.07	.07	.35	1.04	3.54	2.85	8.33
28				.07	.21	.63	1.88	3.13	7.50
29				.07		.07	.63	1.94	7.98
30		.07			.07	.14	.63	1.32	5.76
31					.07		.21	.35	4.72
32						.14		.42	2.64
33								.07	2.50
34									1.60
35			.07				.14		1.81
36								.14	.63
37				.07					.14
38									.07
39					.07				.07
40						.07			
41							.07	.07	.07
42									
43									.07
44									.07
Max.	21	30	35	37	39	40	41	41	44
Avg.	12.4	14.5	15.3	16.2	17.6	18.9	20.8	21.9	26.2
Min.	7	9	9	9	10	11	13	13	17

Truck Type: 2-S2 Number Reported: 2,825 Region: II

7	.57								
8	2.27								
9	3.25	.99	.11	.07	.04	.04			
10	8.28	3.15	2.48	1.17	.07				
11	11.36	4.81	3.61	2.69	1.17	.07	.04		
12	29.20	7.01	5.70	4.28	1.45	1.06		.04	
13	25.17	13.45	9.59	4.89	3.89	1.73	.39	.04	
14	12.42	9.53	10.80	7.61	4.53	3.61	1.17	.39	
15	4.74	14.69	11.11	11.33	6.12	3.58	2.76	1.56	
16	1.95	22.73	9.84	11.01	10.16	6.59	3.22	2.05	
17	.64	8.28	22.58	17.70	12.99	7.54	3.29	3.54	.11
18	.07	9.70	13.77	15.22	12.71	14.12	6.55	3.29	1.20
19	.04	3.72	4.39	11.36	17.73	13.81	9.91	7.57	2.12
20	.04	1.20	3.75	7.01	13.42	12.46	12.21	7.82	2.23
21		.60	1.35	2.83	6.58	18.76	16.00	13.13	2.51
22		.14	.71	1.27	5.84	7.19	14.12	14.44	4.53
23			.14	1.06	1.49	4.25	13.81	14.80	5.45
24			.07	.32	.71	3.36	9.06	11.36	7.04
25				.18	.85	.60	3.47	11.89	13.35
26					.21	.67	1.70	3.79	16.82
27					.04	.42	1.13	2.02	14.02
28						.14	.71	.92	10.47
29							.28	.78	7.53
30							.14	.39	5.17
31							.04	.11	3.19
32								.07	1.70
33									1.56
34									.53
35									.28
36									.11
37									.04
38									
39									
40									.04
Max.	20	22	24	25	27	28	31	32	40
Avg.	12.3	15.0	15.7	16.6	18.0	19.2	21.0	22.0	26.1
Min.	7	9	9	9	9	9	11	12	17

Truck Type: 2-S2 Number Reported: 3,698 Region: III

7	.54								
8	1.14								
9	3.03	1.51	.68	.19	.05				
10	5.46	2.65	1.89	1.16	.27	.05			
11	12.06	4.68	3.19	2.11	1.00	.22			
12	25.99	6.27	5.46	4.06	1.33	.84	.05		

TABLE B-3.4—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
13	40.10	9.55	7.60	4.87	3.36	1.65	.57	.22	
14	9.62	11.28	9.30	5.60	4.46	3.08	1.30	.49	
15	1.62	11.01	12.22	10.44	4.92	3.52	2.16	1.54	
16	.30	30.20	6.71	8.63	8.03	5.30	2.68	1.73	
17	.11	15.14	28.74	19.71	10.20	5.38	3.41	2.79	.81
18		6.30	19.82	20.63	10.82	10.30	4.76	3.27	1.24
19	.03	1.11	2.46	13.49	21.74	12.68	6.44	5.11	1.41
20		.19	1.22	6.81	23.39	15.50	7.35	5.68	1.65
21		.08	.35	1.30	6.54	30.31	15.47	7.54	2.27
22		.03	.14	.46	2.81	7.06	20.74	12.25	3.46
23			.19	.27	.54	2.30	24.77	23.45	3.84
24			.03	.19	.27	1.27	7.57	21.85	4.87
25				.08	.19	.24	1.62	11.33	7.16
26					.05	.24	.62	1.70	14.90
27					.03	.03	.35	.70	23.28
28						.03	.11	.24	20.12
29									8.60
30							.03	.08	3.54
31									1.73
32								.03	.87
33									.11
34									
35									.08
36									.03
37									
38									.03
Max.	19	22	24	25	27	28	30	32	38
Avg.	12.3	15.0	15.8	16.7	18.1	19.3	21.2	22.3	26.3
Min.	7	9	9	9	9	10	12	13	17

Truck Type: 2-S2 Number Reported: 1,031 Region: IV

7	.48								
8	.68		.10						
9	.97	.97	.78	.87	.39	.19			
10	4.75	2.23	1.75	.58	.58	.29			
11	9.60	2.23	.97	1.55	.97	.68	.29		
12	24.25	3.88	3.01	1.55	.48	.68	.29	.19	
13	33.95	9.89	4.94	3.20	1.45	.68	.58	.48	
14	17.94	11.54	10.76	3.98	2.72	1.07	.78	.58	
15	4.66	14.35	13.38	8.44	3.88	2.23	.78	.78	
16	1.94	21.05	9.89	11.64	6.79	4.36	1.65	.68	
17	.48	15.23	19.79	16.68	10.09	4.07	1.94	1.75	.58
18	.10	13.58	23.96	20.17	13.00	10.67	4.46	1.55	.39
19		2.91	4.66	15.62	20.17	14.45	3.78	4.27	1.65
20		.78	3.20	9.99	21.05	13.00	8.34	3.59	.97
21	.10	.97	1.45	2.52	8.83	28.52	16.97	7.57	1.55
22		.29	.78	2.04	6.11	9.21	18.04	13.00	1.45
23	.10	.10	.29	.87	1.65	5.24	23.95	20.37	2.52
24			.19	.10	.97	2.81	11.06	21.43	3.20
25			.10	.10	.48	.97	3.59	16.78	6.60
26					.29	.29	1.26	3.20	14.16
27				.10		.39	1.36	1.36	16.49
28					.10	.10	.39	1.36	20.47
29							.29	.58	15.33
30						.10	.10	.19	7.57
31							.10	.10	3.49
32								.19	1.16
33									.97
34									.78
35									.19
36									.29
37									.19
Max.	23	23	25	27	28	30	31	32	37
Avg.	12.7	15.5	16.3	17.3	18.6	19.8	21.7	22.9	27.2
Min.	7	9	8	9	9	9	11	12	17

Truck Type: 2-S2 Number Reported: 8,994 Region: U.S.

7	.57								
8	1.95		.01						
9	3.12	1.26	.41	.21	.08	.03			
10	7.20	3.27	2.30	1.15	.23	.06			
11	11.40	4.84	3.49	2.75	1.11	.20	.04		
12	26.21	7.15	6.03	4.26	1.59	.99	.06	.03	
13	30.94	11.64	8.90	5.49	3.71	1.83	.48	.17	
14	12.07	10.67	10.23	6.70	4.99	3.34	1.27	.43	
15	4.02	12.86	11.93	10.83	5.81	3.87	2.66	1.57	
16	1.57	23.82	8.48	10.17	9.11	6.42	3.09	2.07	
17	.71	11.51	22.87	17.45	11.32	6.44	3.51	3.35	.46
18	.14	8.62	16.71	16.80	11.63	12.20	6.21	3.42	1.20
19	.03	2.72	3.69	12.12	18.34	12.91	7.93	6.64	1.85
20	.02	.78	2.73	6.99	17.70	12.93	9.52	6.74	2.16
21	.04	.62	1.07	2.31	6.56	23.56	15.24	10.03	2.54
22		.18	.70	1.22	4.62	7.00	16.19	12.56	3.76
23	.01	.02	.29	.89	1.36	3.60	18.90	17.90	4.93
24		.01	.10	.38	.83	2.65	8.38	16.46	5.96
25		.01	.03	.21	.64	.74	2.82	11.78	9.67
26		.01	.01	.02	.22	.63	1.39	3.00	14.73
27			.01	.02	.08	.36	1.22	1.53	17.20
28				.01	.04	.17	.61	1.05	15.11
29				.01		.01	.22	.62	8.94
30		.01			.01	.03	.17	.39	4.87
31					.01		.06	.10	2.87
32						.02		.12	1.45

TABLE B-3.4—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
33								.01	1.05
34									.51
35			.01				.02		.43
36								.02	.18
37				.01					.06
38									.02
39					.01				.01
40						.01			.01
41							.01	.01	.01
42									
43									.01
44									.01
Max.	23	30	35	37	39	40	41	41	44
Avg.	12.3	14.9	15.7	16.7	18.1	19.3	21.1	22.2	26.3
Min.	7	9	8	9	9	9	11	12	17

TABLE B-3.5

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-S2

Percentage distributions shown are based on 1954 loadometer data

Truck Type: 3-S2 Number Reported: 12 Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
8	16.67								
9									
10	8.33	16.67							
11	8.33		8.33						
12	33.34		8.33	16.67					
13	25.00				8.33				
14	8.33	8.33	8.33	8.33	8.33	8.33			
15		25.00				8.33			
16		33.34	8.33		8.33		16.67	16.68	
17		8.33	25.01	8.33					
18		8.33	33.34	25.00	16.67	8.33			
19			8.33	33.34	8.33	8.33			
20				8.33	16.67	25.01	8.33	8.33	16.67
21						8.33			
22					25.01		16.67	8.33	
23					8.33	8.33	25.00	33.34	
24						16.68			
25						8.33			
26							16.67	8.33	
27							8.33	8.33	8.33
28							8.33	8.33	
29									
30								8.33	16.67
31									8.33
32									25.01
33									
34									8.33
35									
36									8.33
37									8.33
Max.	14	18	19	20	23	25	28	30	37
Avg.	11.5	14.8	16.3	17.1	18.9	20.3	22.7	23.1	30.1
Min.	8	10	11	12	13	14	16	16	20

Truck Type: 3-S2 Number Reported: 32 Region: II

6	3.13								
7		3.13							
8	6.25		3.13						
9	6.25			3.13					
10	9.37	3.13							
11	18.74	6.24	3.13		3.13				
12	6.25	6.25	6.25			3.13			
13	28.12	9.37	6.25	15.62					
14	3.13	15.62	18.74	6.25	6.25		3.13	3.13	
15	3.13	3.13	3.13	6.25	6.25				
16	9.37	21.87	9.37	18.74	12.50	6.25			
17	3.13	9.37	15.62	3.13	9.37	12.50			
18		3.13	12.49	12.49	12.50	3.13	6.25	3.13	3.13
19	3.13	3.13	3.13	12.50	3.13	18.74	9.37	12.49	
20		9.37	3.13	3.13	6.25	6.25	3.13	3.13	
21		3.13	9.37	9.37	15.62	6.25	12.49	6.24	
22					6.25	3.13	9.37	12.49	
23			3.13	3.13		12.49	6.25	9.37	
24		3.13		3.13	12.49	9.37	6.25		3.13
25			3.13	3.13			3.13	3.13	6.25
26					3.13	9.37	12.49	3.13	9.37
27						3.13	6.25	15.62	6.25
28					3.13	3.13	3.13		
29							9.37	3.13	3.13
30							3.13	9.37	9.37
31						3.13	3.13	3.13	6.25
32								6.25	
33									6.25
34								3.13	
35							3.13		12.50
36									9.37

TABLE B-3.5—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
37									9.37
38								3.13	
39									3.13
40									6.25
41									
42									
43									
44									
45									
46									
47									6.25
Max.	19	24	25	25	28	31	35	38	47
Avg.	12.2	15.4	16.3	17.1	19.2	21.1	23.9	25.0	32.6
Min.	6	7	8	9	11	12	14	14	18
Trck Type: 3-S2				Number Reported: 956				Region: III	
5	.31								
6	.63								
7	1.67	.42							
8	2.51	.52	.21						
9	3.45	1.67	.73	.73	.21				
10	9.52	1.57	1.57	.84	.52	.10			
11	19.35	2.41	1.26	.94	.84	.63			
12	34.52	3.77	1.99	1.99	1.36	.52	.42	.10	
13	16.11	7.22	3.14	1.36	1.36	1.78	.42	.63	
14	8.58	17.15	5.33	3.66	2.51	.94	.94	.94	
15	2.30	25.73	17.68	9.21	2.93	1.99	1.15	.84	
16	.84	21.03	25.11	22.91	8.89	1.99	1.15	1.46	
17		10.98	19.35	20.19	17.58	2.82	1.88	1.46	.73
18	.21	4.60	10.04	16.64	19.35	6.70	1.46	1.57	.52
19		1.78	8.06	11.20	13.81	16.01	1.57	1.36	.52
20		.84	3.56	5.96	13.81	17.68	2.41	2.20	1.05
21		.21	.94	2.20	7.32	15.70	7.11	4.50	1.05
22		.10	.42	.73	4.50	13.39	16.95	14.75	.84
23			.10	.31	2.41	8.37	20.82	22.39	1.67
24			.10	.42	.94	5.02	13.39	13.18	.84
25				.10	.42	3.56	10.05	12.14	.63
26			.21	.10	.31	1.15	9.42	7.53	1.57
27			.10	.10	.31	.52	4.81	3.97	1.67
28			.10			.21	2.20	2.62	3.24
29				.21	.21	.31	2.30	3.14	6.90
30				.10		.21	.52	2.20	14.13
31				.10	.10		.42	1.57	14.96
32					.21	.10	.10	.63	12.14
33					.10	.10	.10	.31	11.30
34						.10	.10	.10	8.89
35						.10	.21	.21	6.70
36							.10	.10	3.35
37								.10	3.03
38									2.09
39									1.46
40									.52
41									.10
42									
43									
44									.10
Max.	18	22	28	31	33	35	36	37	44
Avg.	11.7	14.9	16.2	17.0	18.3	20.4	23.2	23.7	31.3
Min.	5	7	8	9	9	10	12	12	17
Truck Type: 3-S2				Number Reported: 1,973				Region: IV	
5	.15								
6	1.37								
7	1.37	.71	.05						
8	2.43	.81	1.06	.56	.05				
9	2.38	1.32	.71	.61	.81	.20			
10	4.66	1.77	1.77	1.17	.56	.66			
11	7.91	2.28	1.98	1.37	1.42	.66	.20	.05	
12	29.40	2.13	1.37	1.67	1.37	1.17	.56	.20	
13	35.84	3.60	2.64	1.98	2.28	1.12	.96	1.06	
14	11.10	7.55	4.92	2.28	1.52	1.32	.81	.76	
15	1.98	16.68	9.07	6.89	2.64	2.08	1.12	.96	
16	.96	39.38	22.71	15.11	6.89	1.67	.81	1.22	
17	.10	15.16	31.88	28.54	18.35	2.28	1.57	1.06	.25
18	.20	5.27	12.47	24.48	30.82	4.97	1.72	1.52	.86
19	.05	1.88	5.63	8.42	16.62	15.41	1.47	1.67	.86
20	.05	.76	2.03	4.05	5.58	17.84	2.23	1.22	.76
21	.05	.25	1.01	1.06	5.12	27.02	3.24	3.70	.51
22		.20	.25	1.06	3.14	11.00	8.47	5.58	.71
23		.10	.20	.35	1.01	6.18	19.26	14.55	.56
24		.05	.10	.10	.81	2.84	25.09	18.10	1.12
25			.05	.10	.56	1.72	16.98	19.87	.96
26		.10		.05	.20	.96	8.42	5.98	.91
27			.05	.10	.05	.35	3.65	10.59	1.77
28					.05	.20	1.62	5.68	1.93
29			.05		.05	.15	.71	2.89	2.58
30					.05	.05	.51	1.62	4.36
31						.05	.20	.76	5.17
32				.05		.05	.20	.41	8.72
33								.10	13.99
34							.05	.25	16.22
35							.10		15.56
36					.05		.05	.05	12.11

TABLE B-3.5—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
37								.05	5.48
38								.05	1.98
39						.05			1.17
40									.51
41									.35
42									.10
43									.15
44								.05	.15
45									.10
46									
47									
48									
49									
50									.05
51									.05
Max.	21	26	29	32	36	39	36	44	51
Avg.	12.2	15.4	16.3	16.9	17.9	20.1	23.4	24.2	32.9
Min.	5	7	7	8	8	9	11	11	17

Truck Type: 3-S2 Number Reported: 2,973 Region: U.S.

5	.20								
6	1.14								
7	1.45	.64	.03						
8	2.56	.71	.81	.37	.03				
9	2.76	1.41	.71	.67	.61	.13			
10	6.29	1.78	1.68	1.04	.54	.47			
11	11.64	2.35	1.78	1.21	1.24	.64	.13	.03	
12	30.88	2.69	1.65	1.85	1.35	.98	.50	.17	
13	29.37	4.81	2.83	1.88	1.95	1.31	.77	.91	
14	10.19	10.73	5.21	2.79	1.95	1.21	.87	.84	
15	2.12	19.48	11.74	7.60	2.76	2.05	1.11	.91	
16	1.01	33.27	23.28	17.60	7.60	1.82	.98	1.35	
17	.10	13.72	27.65	25.50	17.93	2.56	1.65	1.18	.40
18	.20	5.05	11.77	21.83	26.88	5.52	1.68	1.55	.77
19	.03	1.88	6.39	9.45	15.54	15.61	1.58	1.68	.74
20	.03	.87	2.52	4.68	8.28	17.69	2.32	1.58	.91
21	.03	.27	1.11	1.45	5.89	23.08	4.57	3.97	.67
22		.17	.34	1.08	3.74	11.64	11.24	8.61	.74
23		.07	.17	.37	1.51	6.96	19.65	17.09	.91
24		.03	.10	.20	.94	3.67	20.99	16.22	1.04
25			.03	.10	.54	2.29	14.54	17.12	.91
26		.07	.07	.07	.27	1.11	8.78	6.46	1.21
27			.07	.10	.13	.47	4.14	8.71	1.82
28			.03		.03	.27	1.85	4.81	2.32
29			.03	.07	.10	.20	1.35	2.62	3.97
30				.03	.03	.10	.50	1.92	7.60
31				.03	.03	.03	.27	1.11	8.35
32				.03	.07	.07	.24	.50	9.79
33					.03	.03	.03	.13	12.99
34						.03	.07	.27	13.66
35						.03	.13	.03	12.62
36					.03		.03	.10	9.25
37								.07	4.74
38								.03	1.98
39						.03			1.28
40									.57
41									.27
42							.03		.13
43									.10
44								.03	.13
45									.07
46									
47									
48									
49									
50									.03
51									.03
Max.	21	26	29	32	36	39	42	44	51
Avg.	12.0	15.3	16.2	16.9	18.0	20.2	23.3	24.0	32.4
Min.	5	7	7	8	8	9	11	11	17

TABLE B-3.6
RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-3

Percentage distributions shown are based on 1954 loadometer data

Truck Type: 3-3 Number Reported: None Region: I
Truck Type: 3-3 Number Reported: None Region: II
Truck Type: 3-3 Number Reported: None Region: III
Truck Type: 3-3 Number Reported: 185 Region: IV
Region: U.S.

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
6	.54								
7	.54								
8	.54	.54							
9	3.24	.54							
10	4.86	.54	1.08	.54					
11	18.38	2.70		.54	.54				

TABLE B-3.6—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
12	67.04	2.16	2.70		.54	.54			
13	2.70	4.32	2.16	3.24	.54	.54			
14	1.08	17.30	6.49	1.62	1.08				
15		62.17	15.68	3.78	1.62	.54	1.08		
16	1.08	6.49	32.43	8.11	4.32	2.16			
17		2.16	27.57	41.08	4.32	4.86		1.08	
18			10.27	22.71	19.46	2.16	1.62		
19			.54	16.22	40.55	12.98	1.08		
20		.54		.54	23.25	34.06	2.16	1.62	
21		.54	.54	.54	2.16	17.30	2.16	1.08	
22			.54	.54		20.00	3.24	1.62	.54
23				.54		2.70	14.60	2.75	
24					1.62	.54	32.44	2.70	.54
25						1.08	19.46	5.95	.54
26						.54	18.38	27.03	
27							2.16	29.19	.54
28							.54	15.68	1.00
29							1.08	9.73	.54
30									2.66
31								1.08	2.16
32								.54	1.62
33									1.62
34									7.03
35									11.89
36									24.87
37									16.76
38									20.55
39									4.86
40									1.62
41									1.08
Max.	16	21	22	23	24	26	29	32	41
Avg.	11.6	14.6	16.0	17.2	18.7	20.2	24.1	26.5	35.9
Min.	6	8	10	10	11	12	15	17	22

TABLE B-3.7

RELATIVE FREQUENCIES OF EQUIVALENT H TRUCK LOADINGS BASED ON MAXIMUM MOMENTS PRODUCED BY HEAVY TRUCKS IN SIMPLE SPANS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR ALL SIX MAJOR VEHICLE TYPES

Percentage distributions shown are based on 1954 loadometer data

Truck Type: All — Number Reported: 3,189 — Region: I

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
7	.31								
8	2.07	.06							
9	2.57	1.04	.13	.13	.03	.03			
10	7.27	4.58	2.88	1.22	.19				
11	11.95	10.14	5.39	5.74	1.85	.53	.47	.41	.38
12	22.30	17.11	13.80	10.22	5.55	3.54	1.76	1.72	1.51
13	19.19	17.30	18.28	15.49	10.66	5.55	3.32	2.85	2.35
14	15.80	14.13	14.17	12.98	11.38	9.22	4.33	2.51	2.35
15	8.06	10.14	12.01	12.07	12.29	9.19	7.06	4.52	2.16
16	5.30	9.32	8.69	9.91	11.04	11.60	7.09	5.83	1.22
17	2.51	4.36	7.68	9.57	10.38	11.10	8.81	7.34	.88
18	1.32	5.43	6.34	6.40	9.91	11.70	11.88	8.84	2.64
19	.47	3.14	3.32	4.96	7.53	9.13	10.60	11.67	3.58
20	.25	.97	2.70	3.73	6.09	7.40	10.00	10.38	6.27
21	.38	1.29	1.69	2.38	3.70	7.31	9.50	10.25	7.87
22	.13	.38	1.32	1.88	3.54	3.89	5.68	7.37	7.93
23	.06	.28	.69	1.32	2.04	3.10	6.68	6.62	9.22
24	.03	.06	.25	.85	1.47	2.54	4.05	5.71	8.94
25	.03	.06	.16	.41	1.04	1.44	2.63	4.99	8.91
26		.06	.13	.22	.47	1.16	1.82	2.67	7.93
27		.09	.09	.13	.22	.60	2.07	1.94	5.24
28		.06		.09	.22	.38	1.03	1.82	4.61
29			.16	.03	.06	.16	.38	1.00	4.55
30				.09	.03	.09	.38	.75	3.23
31				.06	.13	.06	.13	.22	2.60
32					.06	.16	.06	.28	1.72
33			.03				.09	.13	1.35
34			.03						.94
35			.06	.06			.06		.94
36				.03	.06	.03		.06	.31
37				.03	.03	.06	.03	.03	.13
38							.06	.06	.06
39					.03				.06
40						.03			.03
41							.03	.03	.03
42									
43									.03
44									.03
Max.	25	28	35	37	39	40	41	41	44
Avg.	12.84	13.99	14.77	15.42	16.09	17.77	19.26	20.14	23.59
Min.	7	8	9	9	9	9	11	11	11

Truck Type: All — Number Reported: 4,116 — Region: II

6	.02					
7	.39	.02				
8	1.68		.02			
9	2.72	1.09	.19	.07	.02	.02

TABLE B-3.7—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
10	8.33	4.23	3.14	1.68	.44	.02	.02	.02	.02
11	16.86	12.10	6.37	6.22	2.84	1.65	1.26	1.24	1.24
12	29.20	13.58	15.89	10.76	5.88	4.01	2.36	2.24	2.16
13	23.45	14.19	12.37	10.28	8.58	4.91	1.99	1.41	1.19
14	10.84	8.92	9.91	8.53	8.15	7.34	3.06	1.55	.70
15	4.06	11.35	9.11	10.15	8.96	7.29	6.24	3.33	.27
16	1.70	16.54	7.92	9.16	9.45	9.35	7.68	5.44	.32
17	.56	6.46	16.30	13.14	10.67	8.02	7.00	8.19	.73
18	.05	7.07	10.30	11.59	10.20	11.59	8.26	7.58	3.06
19	.05	2.77	3.67	8.70	13.10	10.69	9.04	8.82	5.49
20	.02	.97	2.84	5.32	10.08	9.74	9.72	7.14	8.07
21	.05	.56	1.17	2.24	4.84	13.22	11.78	10.11	7.56
22		.10	.58	.97	4.30	5.22	10.04	10.45	5.64
23			.15	.80	1.07	3.09	9.72	10.40	5.27
24	.02	.05	.05	.24	.63	2.41	6.29	7.92	5.54
25			.02	.15	.58	.44	2.45	8.21	9.52
26					.17	.53	1.29	2.65	11.86
27					.02	.32	.83	1.53	9.72
28					.02	.12	.51	.63	7.21
29							.27	.56	5.20
30							.12	.34	3.64
31						.02	.05	.10	2.24
32								.10	1.17
33									1.14
34								.02	.36
35							.02		.29
36									.15
37									.10
38								.02	
39									.02
40									.07
46									.05
Max.	24	24	25	25	28	31	35	38	41
Avg.	12.18	14.17	14.88	15.67	16.89	17.94	19.49	20.43	23.97
Min.	6	7	8	9	9	9	10	10	10

Truck Type: All — Number Reported: 5,658 — Region: III

5	.05								
6	.11								
7	.69	.09							
8	1.31	.09	.04						
9	3.55	1.96	.74	.27	.07				
10	8.00	4.51	3.68	2.69	1.13	.07	.02	.02	.02
11	17.67	9.54	5.48	4.70	2.79	1.33	.39	.39	.39
12	27.45	8.93	10.39	7.12	3.82	3.34	1.24	.95	.81
13	31.09	9.65	8.23	6.73	5.67	3.38	1.86	.92	.30
14	8.08	11.20	7.88	6.22	5.88	5.42	3.23	1.84	.35
15	1.50	12.28	11.59	9.74	6.59	5.07	4.73	3.69	.19
16	.37	23.58	9.31	9.88	8.11	6.79	4.89	4.12	.23
17	.07	11.82	22.48	17.25	10.53	5.67	5.39	5.36	1.84
18	.04	4.91	14.92	16.74	11.22	8.78	5.39	5.36	3.71
19	.02	1.04	3.02	10.90	16.74	11.47	5.69	5.57	3.96
20		.27	1.43	5.51	17.73	13.25	5.48	4.73	4.84
21		.09	.39	1.22	5.55	22.50	11.40	5.85	4.93
22		.04	.16	.42	2.60	6.89	16.43	10.52	3.41
23			.14	.23	.76	2.92	19.72	19.12	3.24
24			.04	.19	.34	1.68	7.21	16.51	3.45
25				.07	.19	.76	2.76	9.45	4.86
26			.04	.02	.09	.35	2.00	2.38	10.00
27			.02	.02	.07	.11	1.04	1.13	15.50
28			.02			.05	.44	.60	13.70
29				.04	.04	.05	.39	.53	6.79
30				.02		.04	.11	.42	4.70
31				.02	.02		.07	.27	3.66
32					.04	.02	.02	.12	2.62
33					.02	.02	.02	.05	1.98
34						.02	.02	.02	1.50
35						.02	.04	.04	1.18
36							.02	.02	.58
37								.02	.51
38									.37
39									.25
40									.09
41									.02
42									
43									
44									.02
Max.	19	22	28	31	33	35	36	37	44
Avg.	12.00	14.37	15.24	16.07	17.39	18.67	20.54	21.44	25.81
Min.	5	7	8	9	9	10	10	10	10

Truck Type: All — Number Reported: 3,925 — Region: IV

5	.08								
6	.71								
7	1.55	.36	.03						
8	3.34	.46	.59	.31	.03				
9	2.27	1.86	.71	.56	.54	.18			
10	4.63	3.18	3.36	1.40	.61	.41			
11	11.79	7.21	4.71	4.35	3.31	1.94	1.27	1.07	1.04
12	29.12	5.99	6.34	6.11	4.97	4.69	3.06	2.39	1.91
13	30.47	6.88	5.58	5.43	4.92	3.74	3.62	3.13	1.53
14	11.62	8.53	6.62	3.36	3.41	3.13	2.50	2.47	1.68
15	2.55	16.33	9.43	6.65	3.77	3.13	2.37	2.11	.99

TABLE B-3.7—Continued

EHTL	Span in Feet								
	10	20	30	40	50	60	80	100	Inf.
16	1.30	26.57	16.43	11.90	6.39	3.39	2.47	2.01	.92
17	.25	12.58	23.46	21.63	13.25	4.02	3.08	3.11	.84
18	.13	6.47	13.99	19.56	20.96	6.70	3.85	3.34	1.78
19	.08	1.99	4.56	10.11	16.58	13.17	3.26	3.75	2.83
20	.03	.79	2.22	5.12	9.88	14.65	4.23	2.73	3.03
21	.05	.46	1.15	1.48	5.42	22.26	6.67	4.48	2.45
22		.18	.41	1.22	3.39	9.17	9.38	6.60	2.11
23	.03	.08	.20	.46	.97	4.74	16.87	12.94	1.76
24		.03	.10	.13	.79	2.21	17.12	14.95	1.68
25			.05	.08	.46	1.25	10.44	14.75	2.37
26		.05		.03	.18	.59	5.48	5.17	4.23
27			.03	.08	.03	.28	2.29	7.08	5.27
28					.05	.13	.94	3.95	6.42
29			.03		.03	.08	.48	2.06	5.38
30					.03	.05	.28	.87	4.33
31						.03	.13	.46	3.62
32				.03		.03	.10	.28	4.76
33								.05	7.36
34							.03	.13	8.69
35							.05		8.43
36					.03			.03	7.34
37								.03	3.59
38								.03	1.96
39						.03			.82
40									.33
41									.23
42							.03		.05
43									.08
44								.03	.08
45									.05
50									.03
51									.03
Max.	23	26	29	32	36	39	42	44	51
Avg.	12.16	14.86	15.67	16.42	17.44	19.05	21.47	22.39	28.62
Min.	5	7	7	8	8	9	11	11	11

Truck Type: All Number Reported: 16,888 Region: U.S.

5	.04								
6	.21								
7	.75	.12	.01						
8	2.01	.15	.15	.07	.01				
9	2.87	1.55	.49	.26	.16	.05			
10	7.16	4.14	3.32	1.87	.67	.14	.01	.01	.01
11	15.02	9.74	5.51	5.19	2.75	1.40	.82	.76	.75
12	27.30	10.92	11.43	8.36	4.90	3.85	2.04	1.74	1.53
13	26.83	11.55	10.51	8.94	7.14	4.24	2.58	1.90	1.19
14	11.03	10.57	9.27	7.40	6.90	6.07	3.22	2.05	1.12
15	3.61	12.59	10.56	9.56	7.59	5.94	4.99	3.36	.77
16	1.84	19.87	10.51	10.18	8.59	7.52	5.42	4.29	.60
17	.69	9.28	18.41	15.81	11.17	6.89	5.90	5.91	1.15
18	.31	5.90	11.95	14.19	12.99	9.53	6.96	6.09	2.90
19	.12	2.08	3.60	9.06	14.08	11.23	6.85	7.10	4.00
20	.06	.69	2.19	5.03	11.85	11.62	7.08	5.91	5.48
21	.09	.52	1.01	1.73	4.97	17.31	10.04	7.40	5.55
22	.02	.15	.55	1.04	3.39	6.45	11.20	8.98	4.51
23	.02	.07	.25	.63	1.13	3.41	14.16	13.21	4.52
24	.01	.02	.09	.31	.72	2.14	8.69	12.01	4.58
25	.01	.01	.04	.15	.52	.92	4.45	9.54	6.18
26		.02	.04	.05	.20	.60	2.59	3.15	8.72
27		.02	.03	.05	.08	.30	1.48	2.80	9.77
28		.01	.01	.02	.05	.16	.69	1.65	8.71
29			.04	.02	.03	.06	.38	.92	5.65
30		.01		.02	.01	.04	.20	.57	4.08
31		.01		.02	.03	.02	.08	.27	3.10
32		.01		.01	.02	.04	.05	.18	2.59
33			.01		.01	.01	.02	.05	2.91
34			.01			.01	.01	.05	2.79
35			.01	.01		.01	.04	.01	2.61
36				.01	.02	.01	.01	.03	2.00
37				.01	.01	.01	.01	.02	1.05
38							.01	.02	.59
39					.01	.01			.29
40						.01			.13
41							.01	.01	.07
42							.01		.02
43									.02
44								.01	.03
45									.01
50									.01
51									.01
Max.	25	32	35	37	39	40	42	44	51
Avg.	12.24	14.37	15.16	15.93	17.15	18.41	20.25	21.17	25.60
Min.	5	7	7	8	8	9	10	10	10

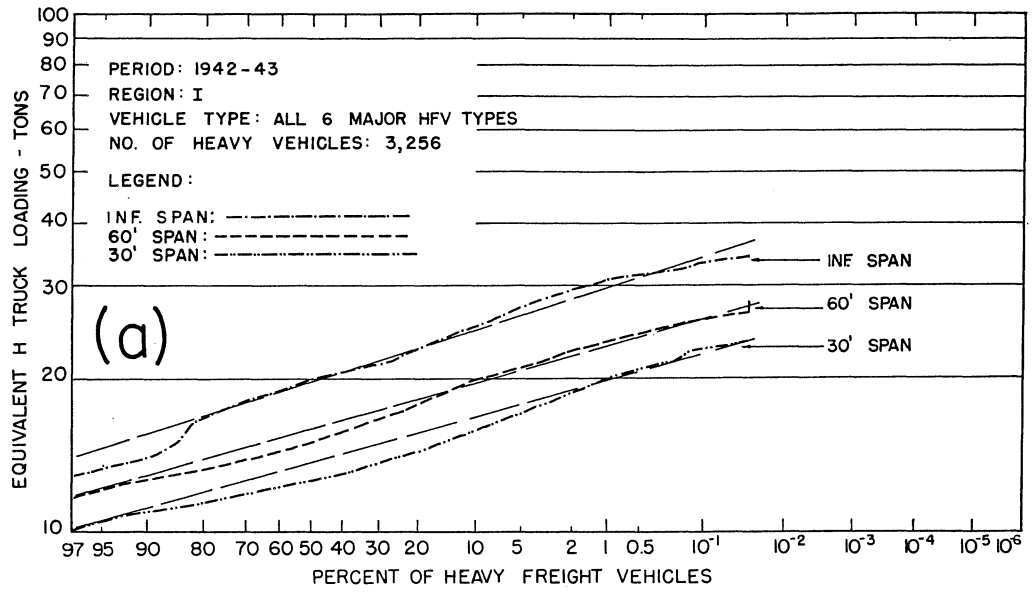


Figure B-1.1a. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

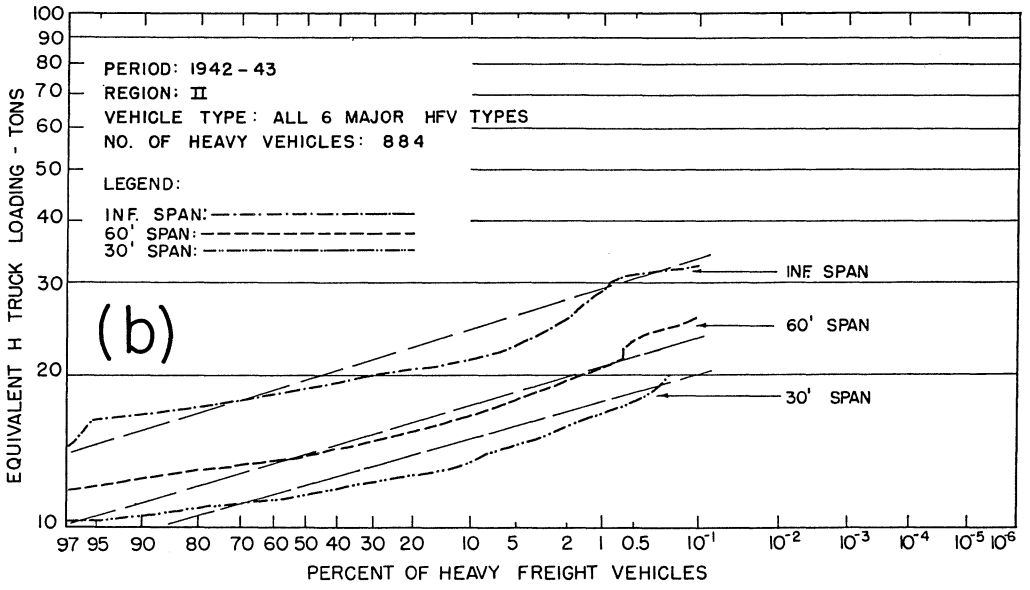


Figure B-1.1b. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

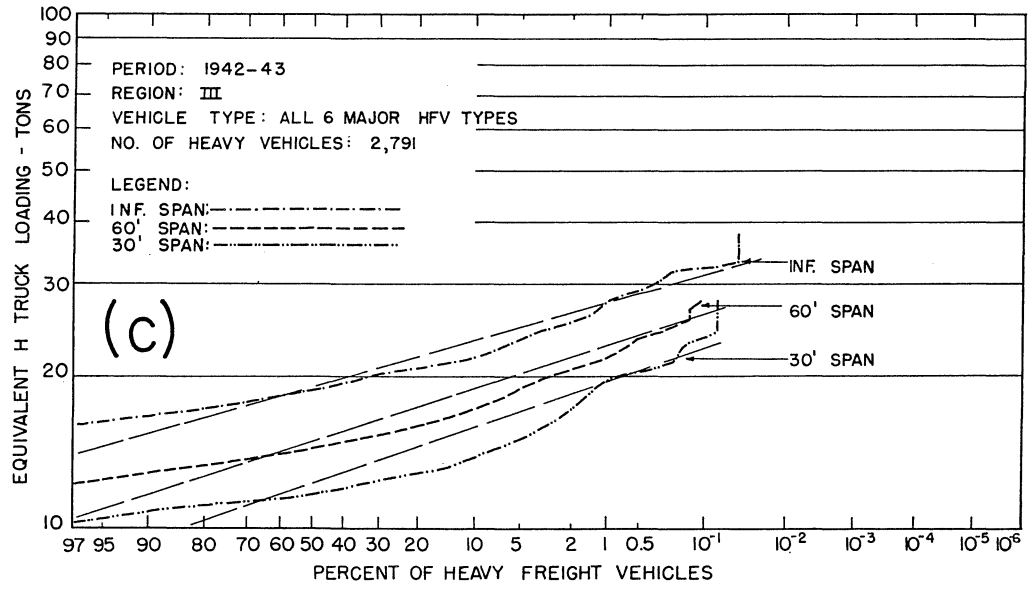


Figure B-1.1c. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

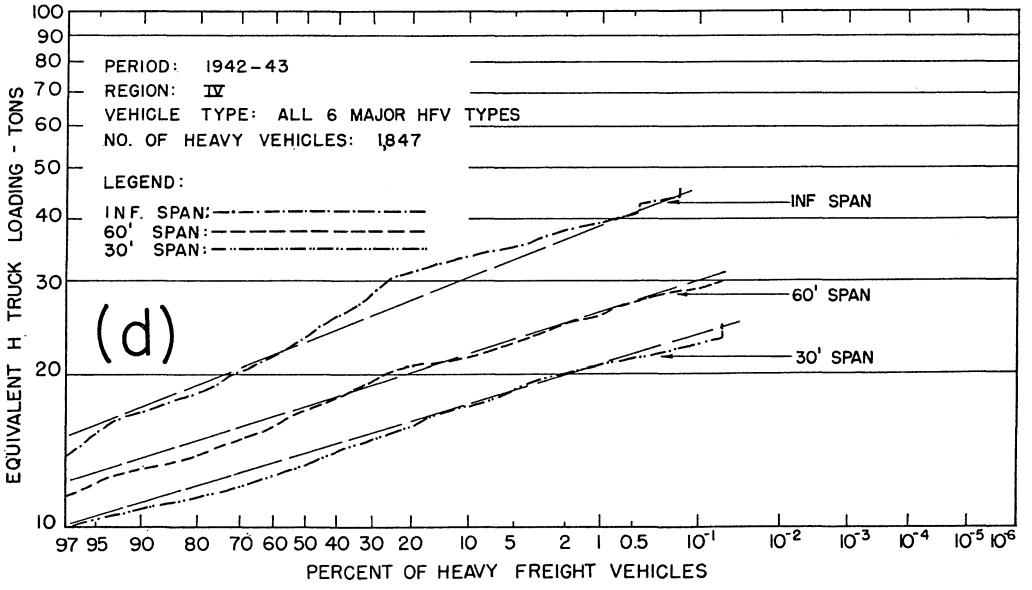


Figure B-1.1d. Cumulative per cent of heavy freight vehicles having H truck loadings equal to or greater than stated values.

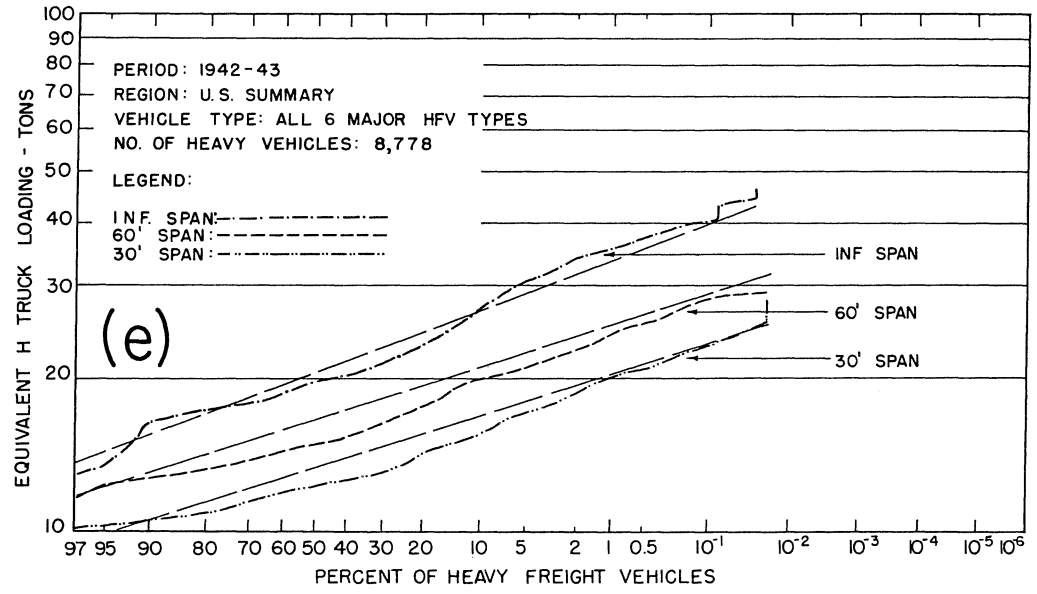


Figure B-1.1e. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

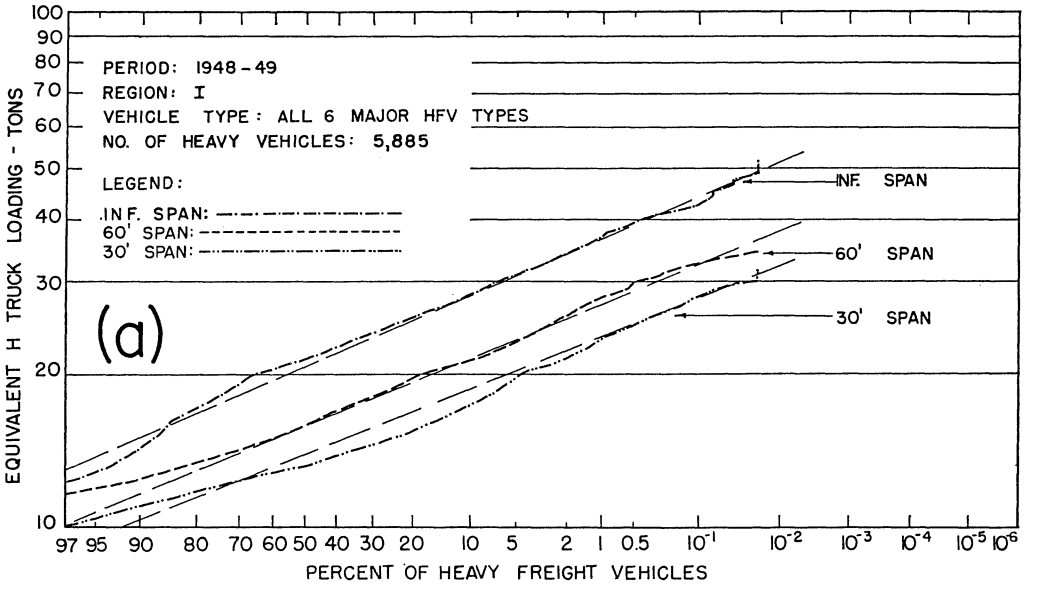


Figure B-1.2a. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

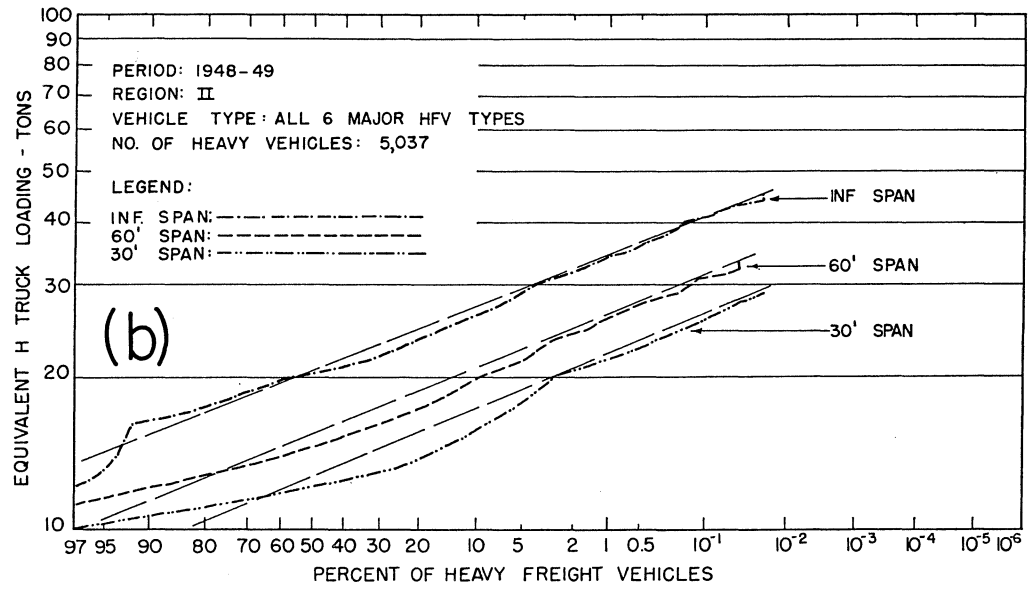


Figure B-1.2b. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

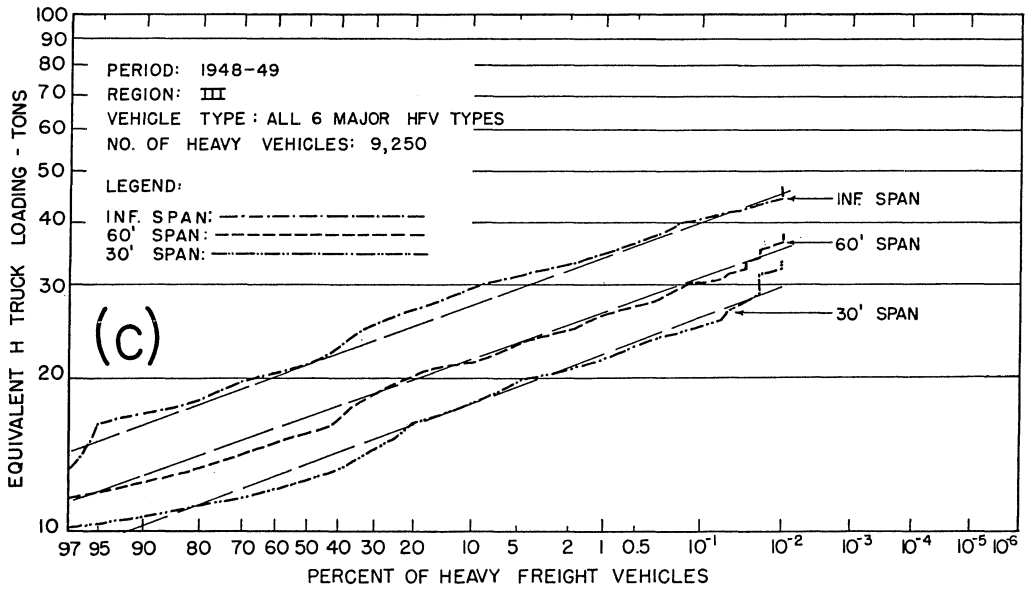


Figure B-1.2c. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

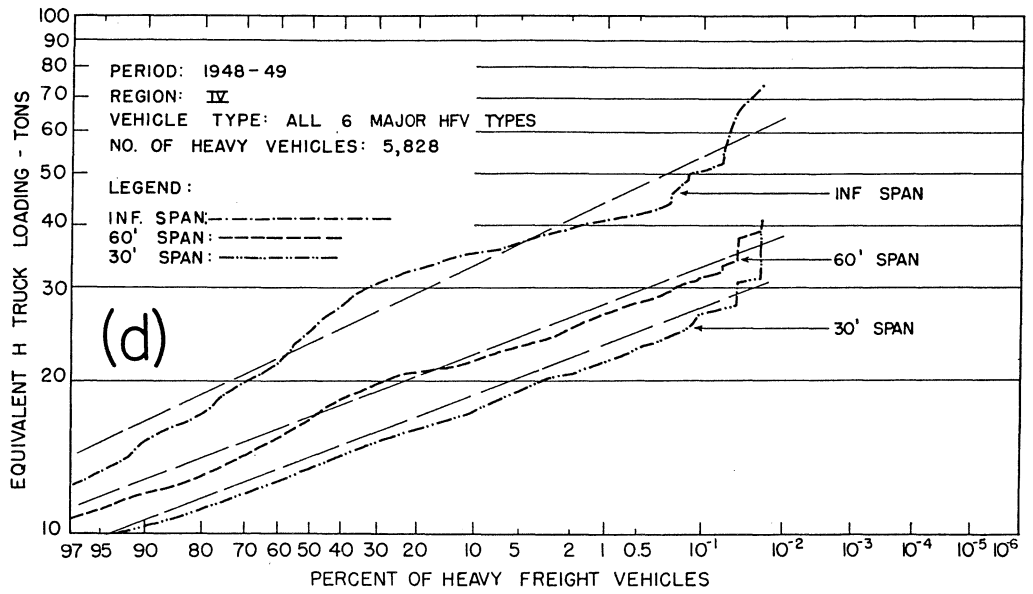


Figure B-1.2d. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

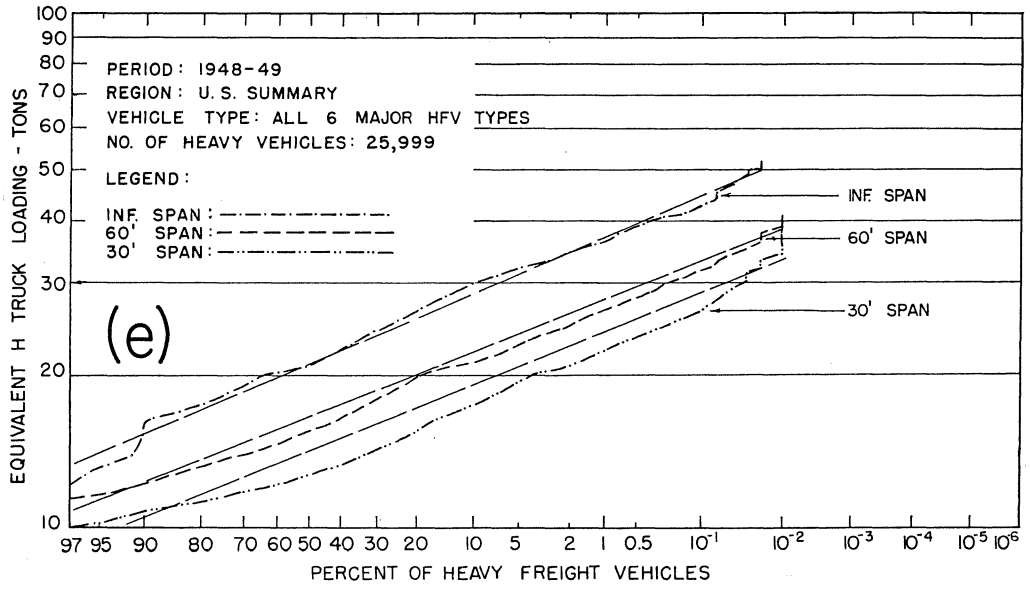


Figure B-1.2e. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

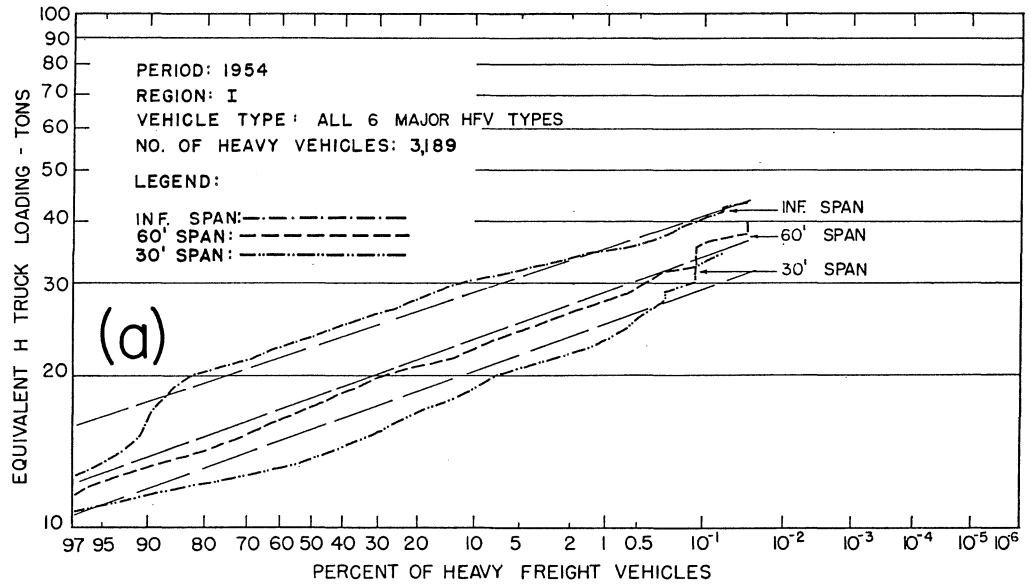


Figure B-1.3a. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

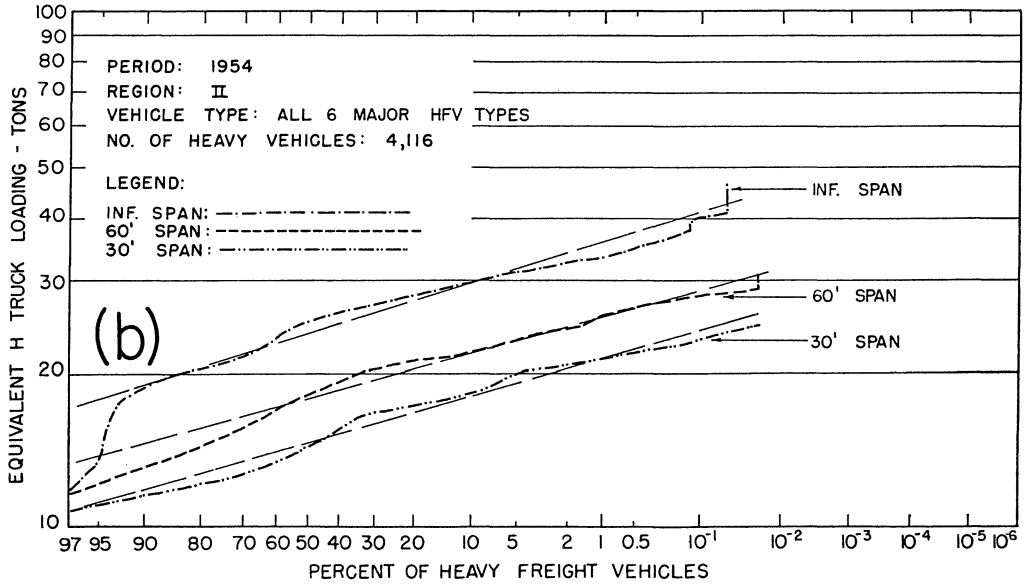


Figure B-1.3b. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

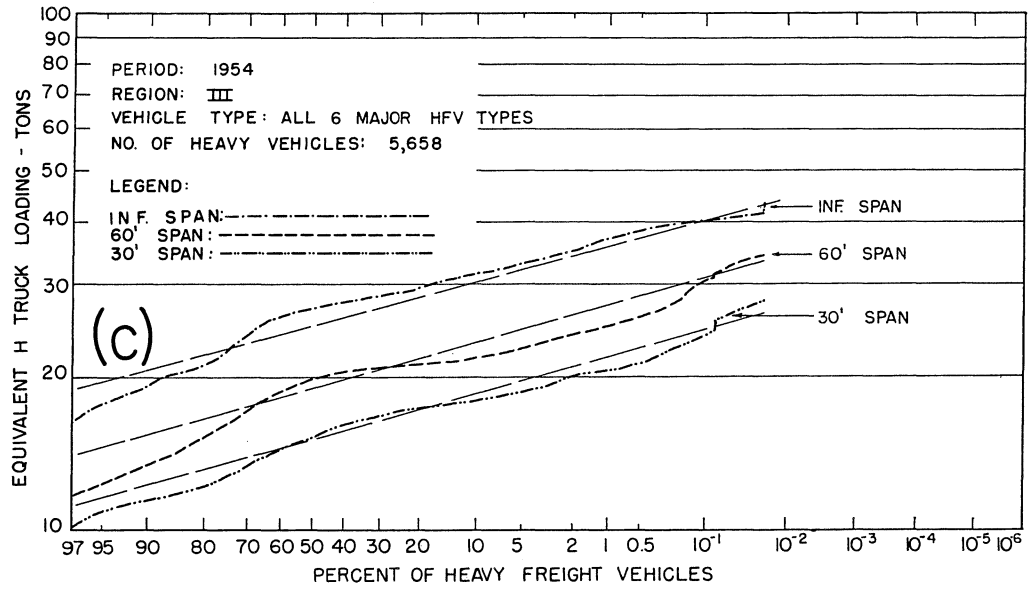


Figure B-1.3c. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

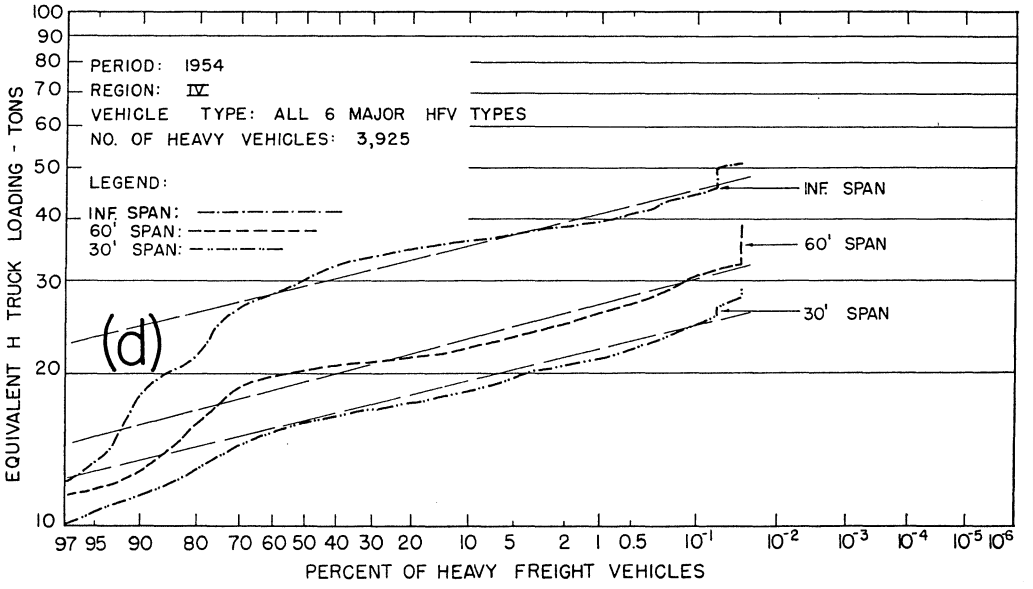


Figure B-1.3d. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

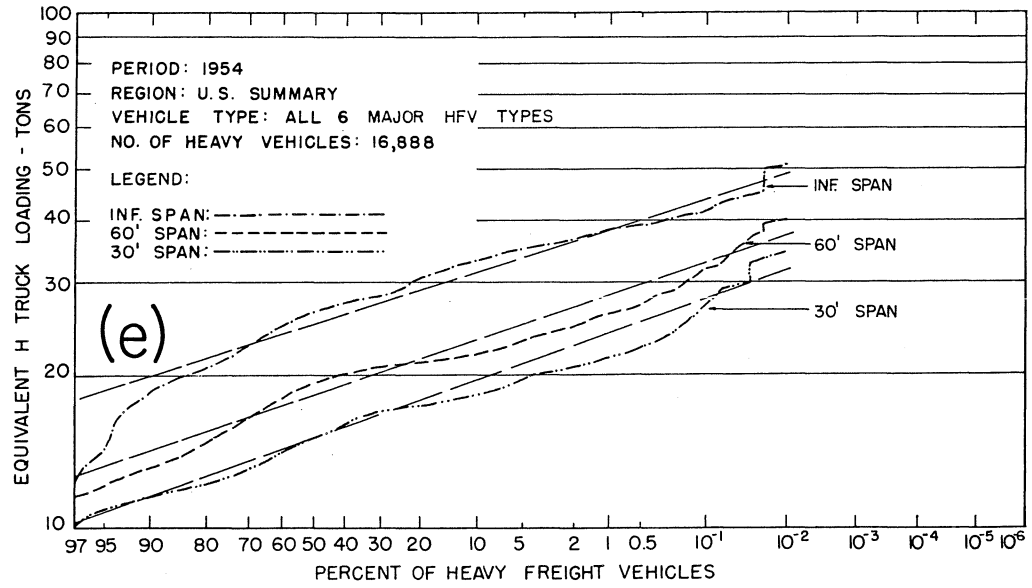


Figure B-1.3e. Cumulative per cent of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

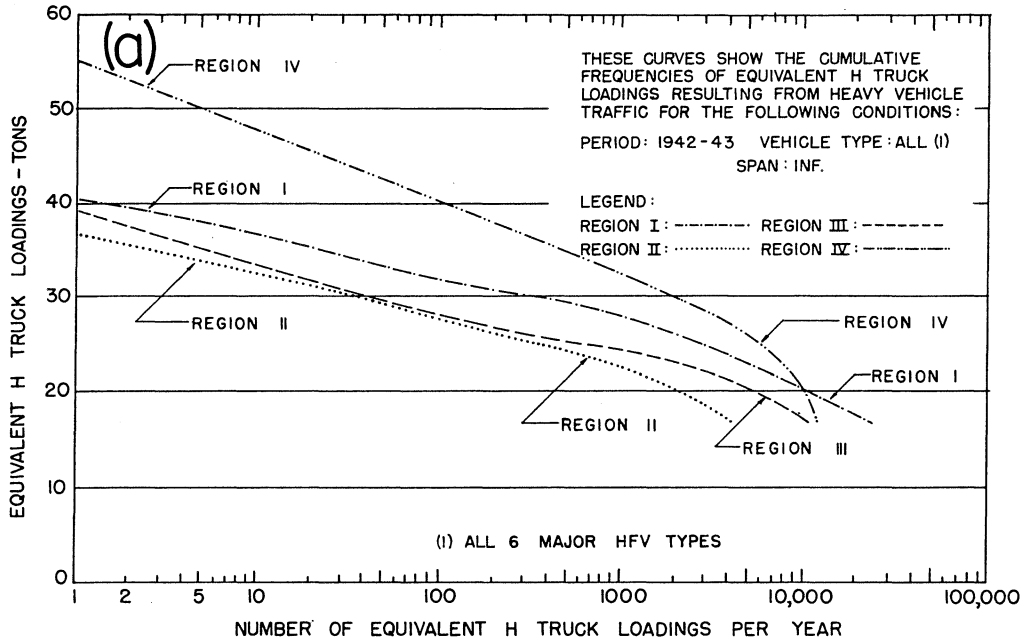


Figure B-2.1a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

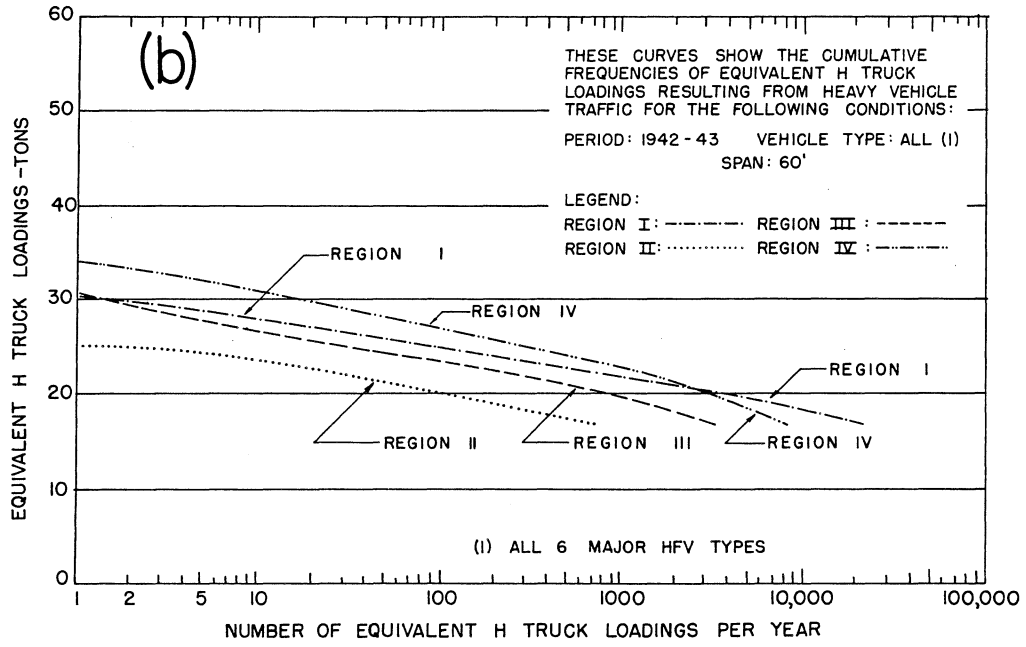


Figure B-2.1b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

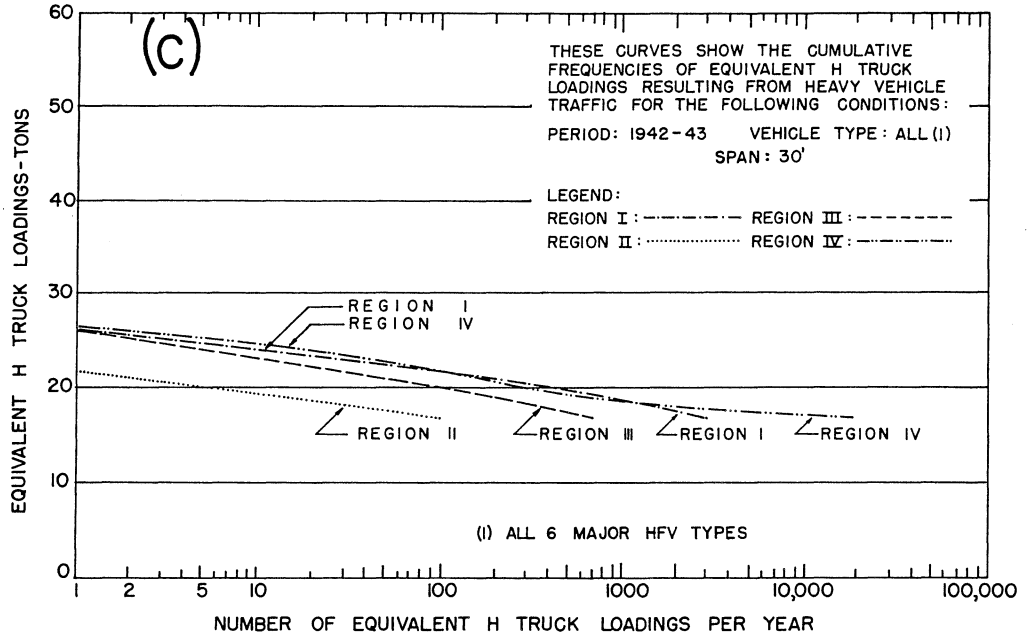


Figure B-2.1c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

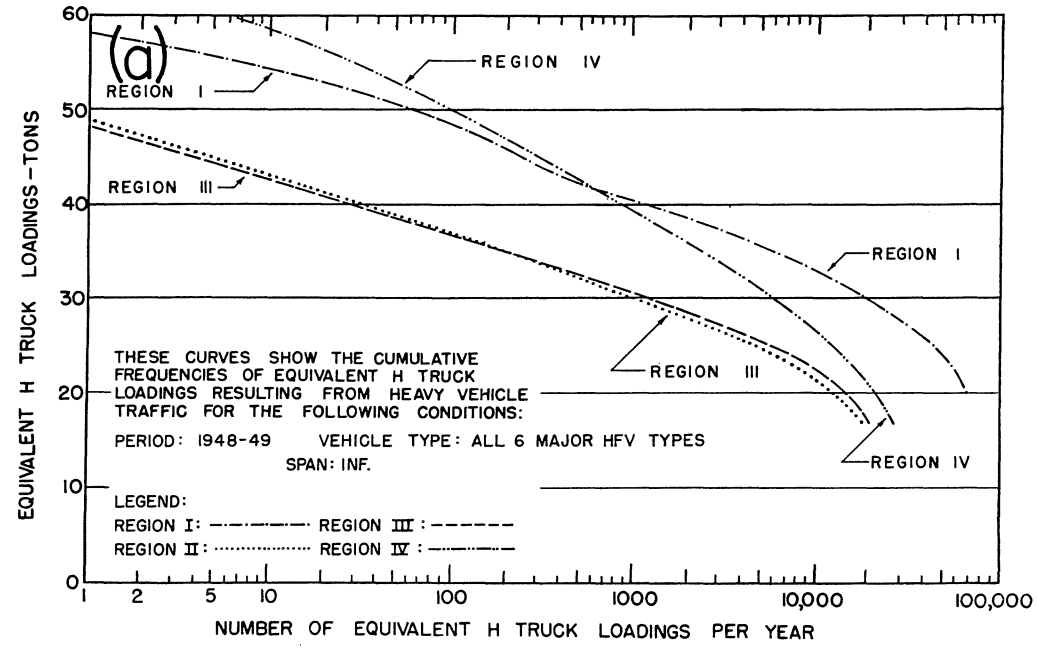


Figure B-2.2a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

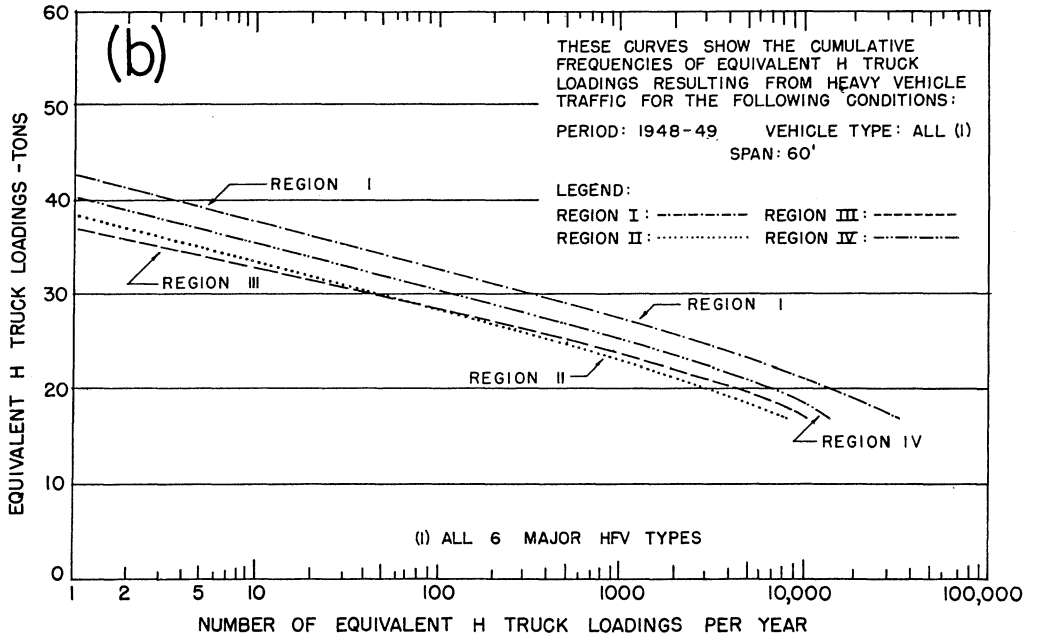


Figure B-2.2b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

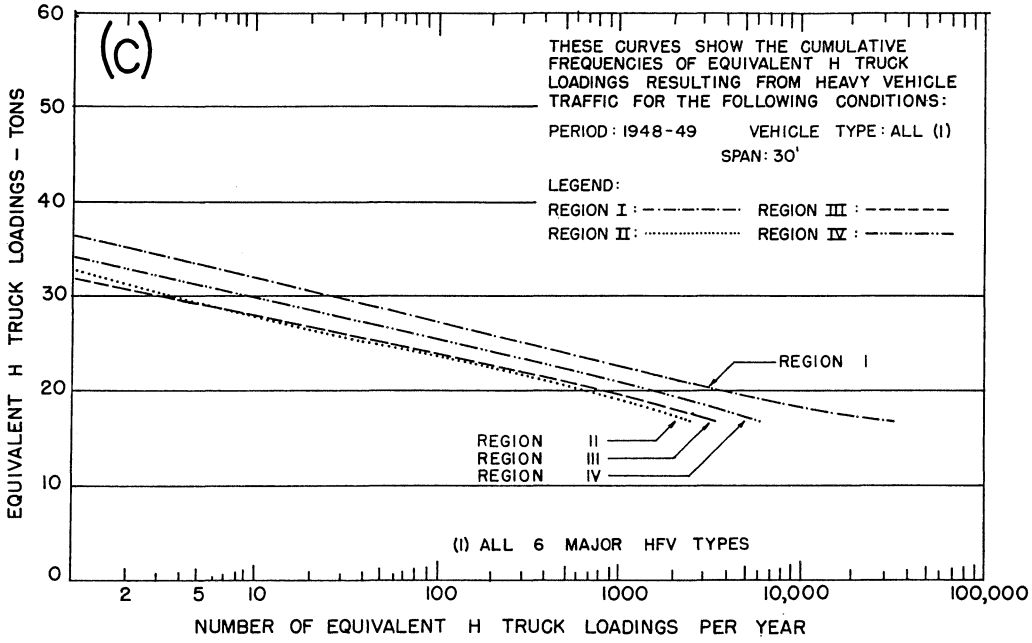


Figure B-2.2c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

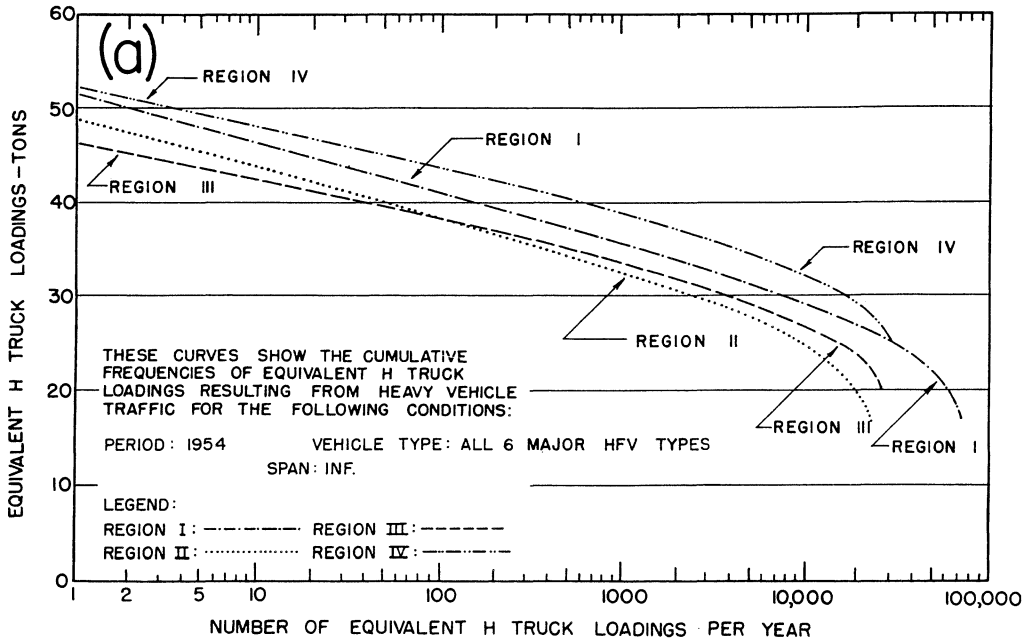


Figure B-2.3a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

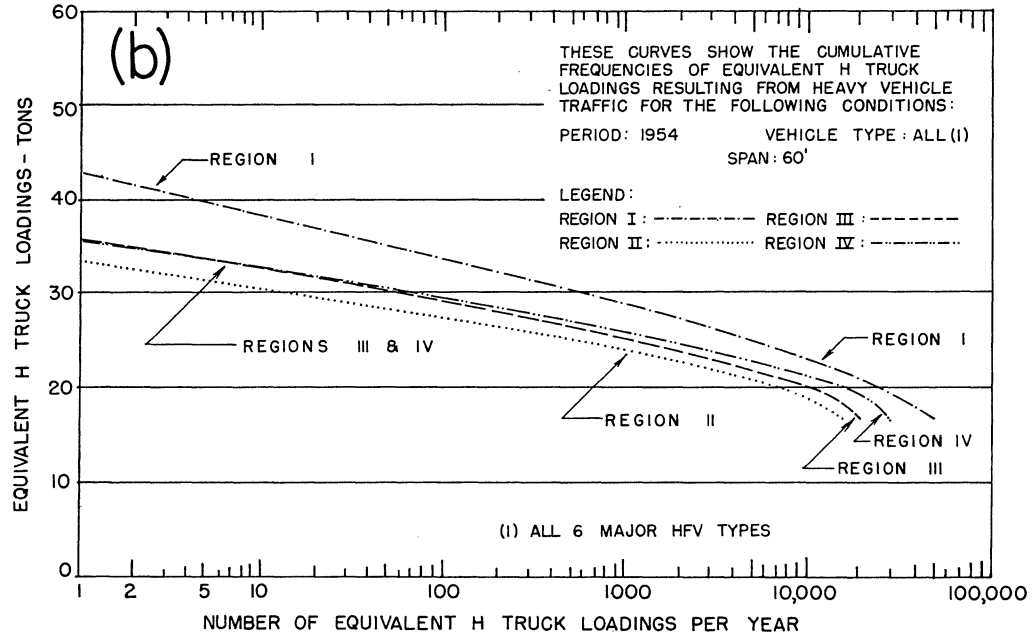


Figure B-2.3b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

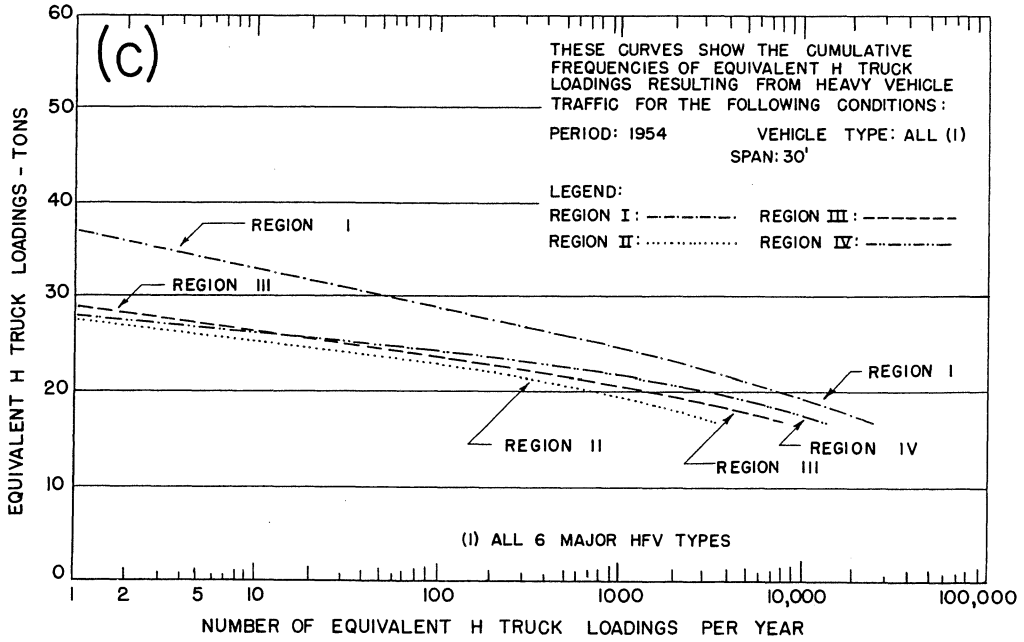


Figure B-2.3c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

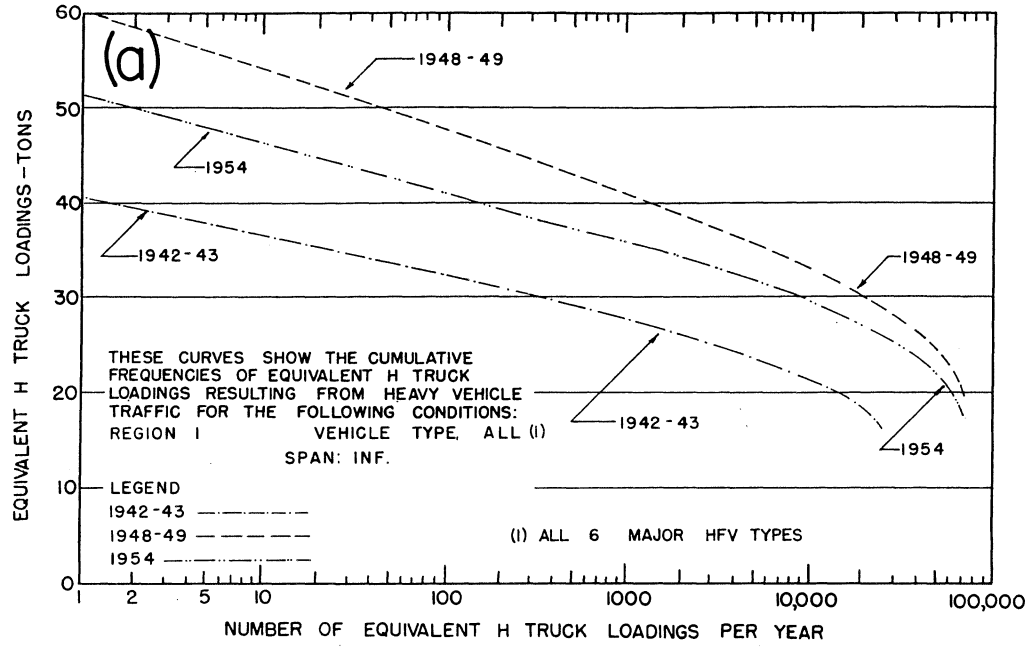


Figure B-2.4a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

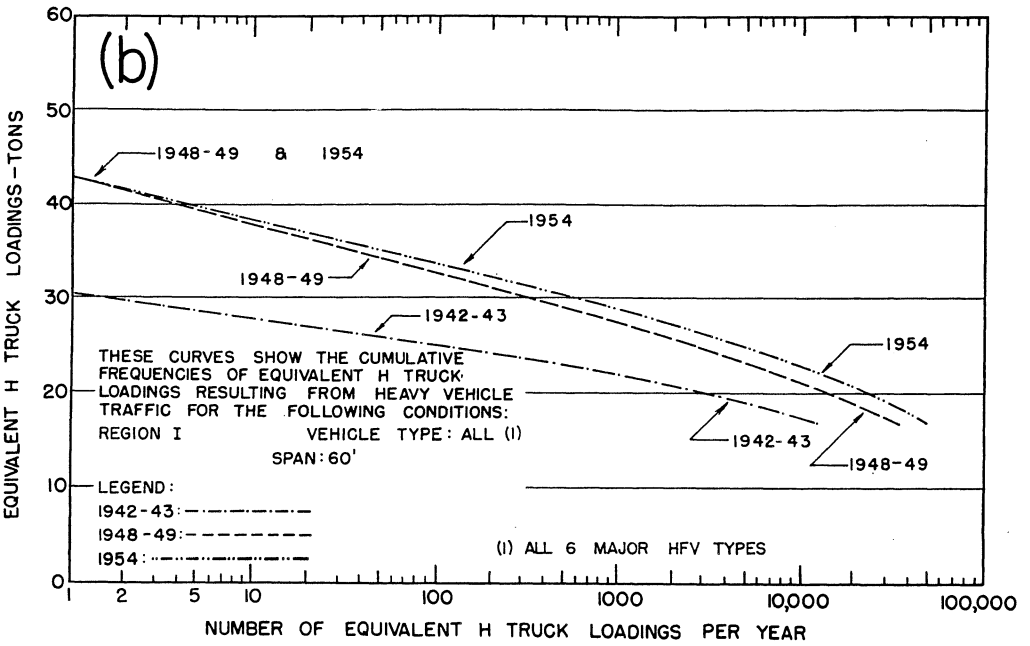


Figure B-2.4b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

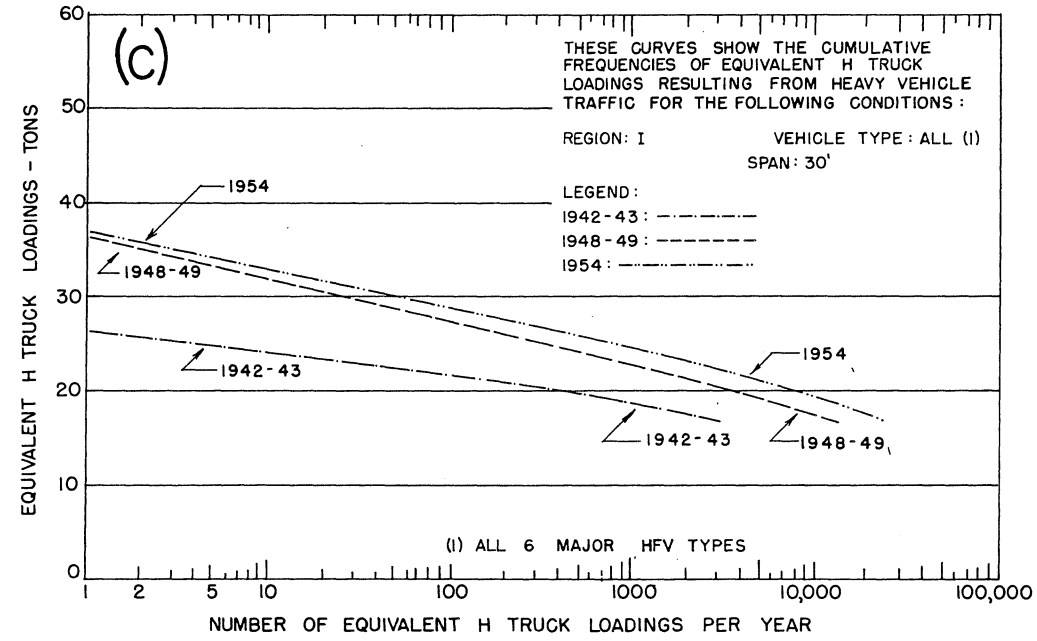


Figure B-2.4c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

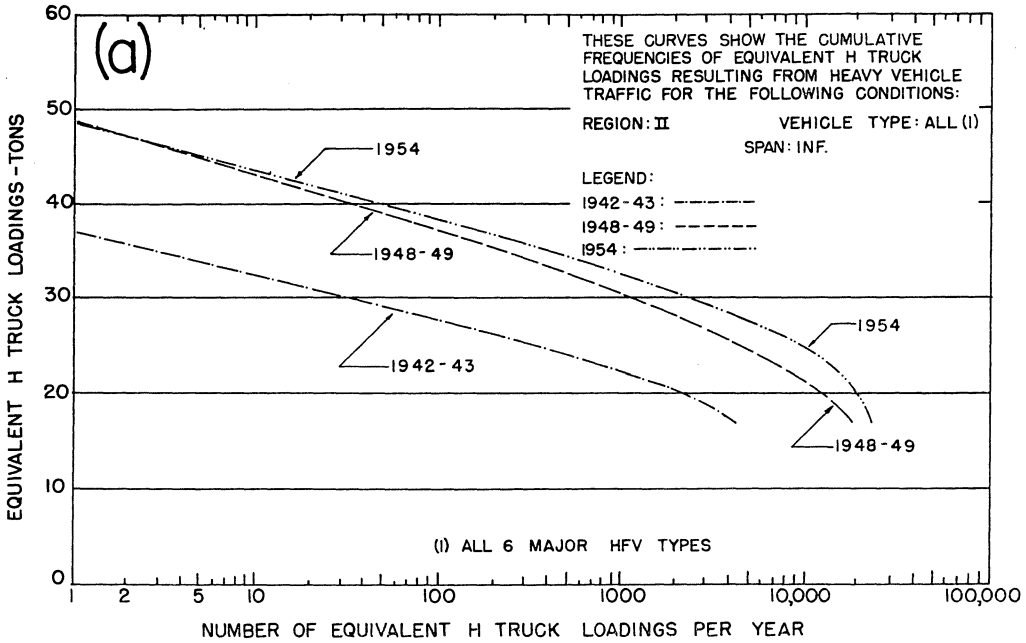


Figure B-2.5a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

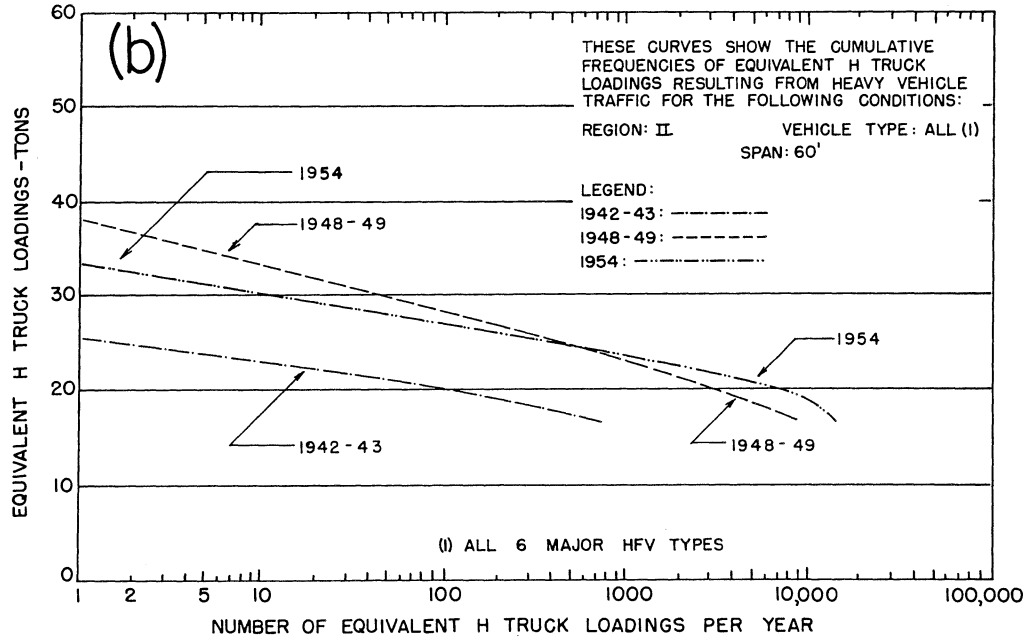


Figure B-2.5b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

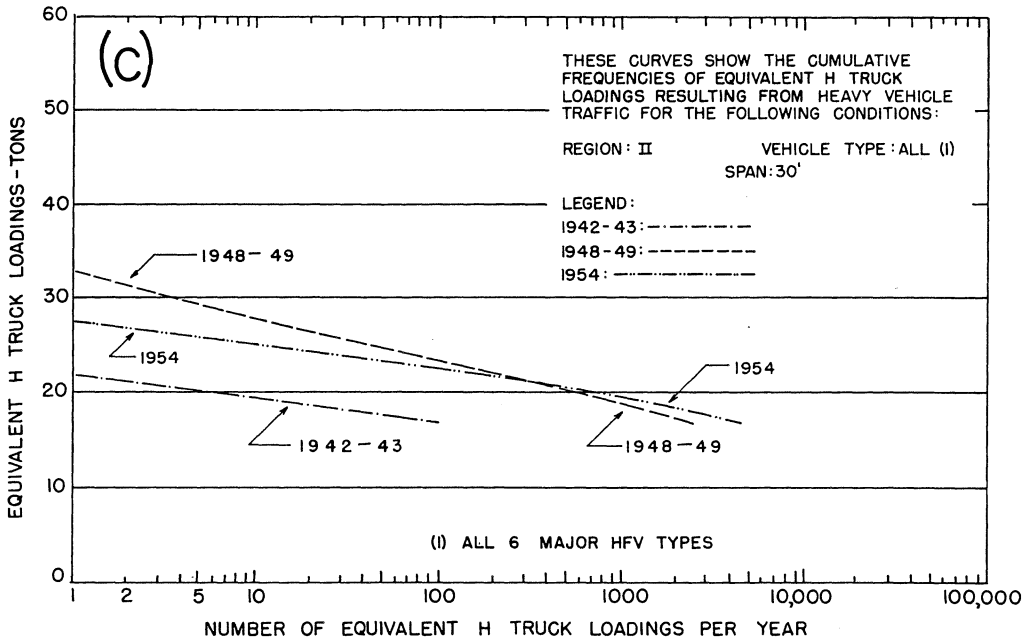


Figure B-2.5c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

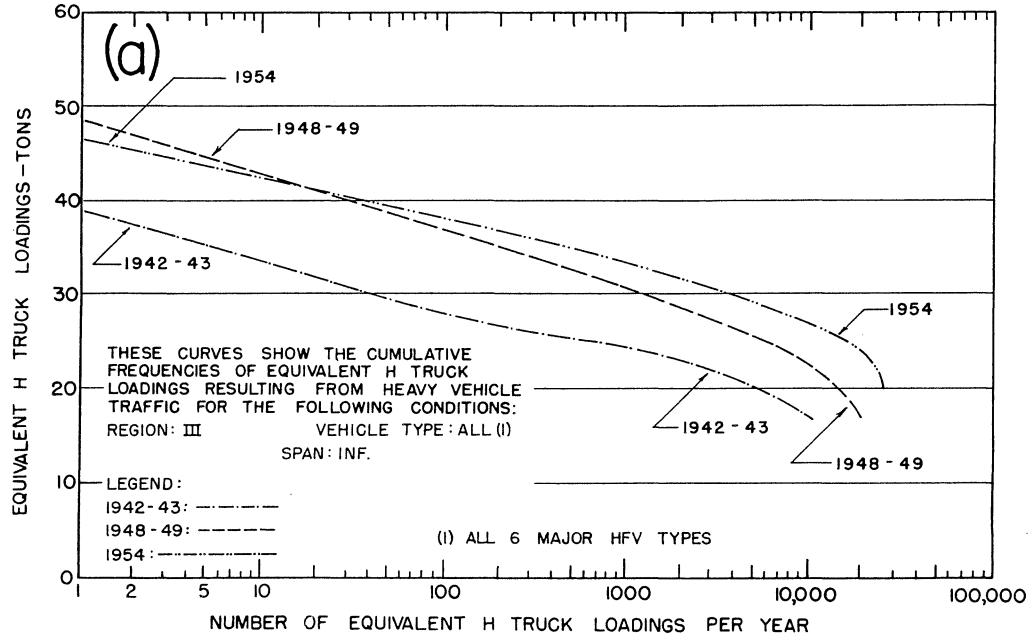


Figure B-2.6a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

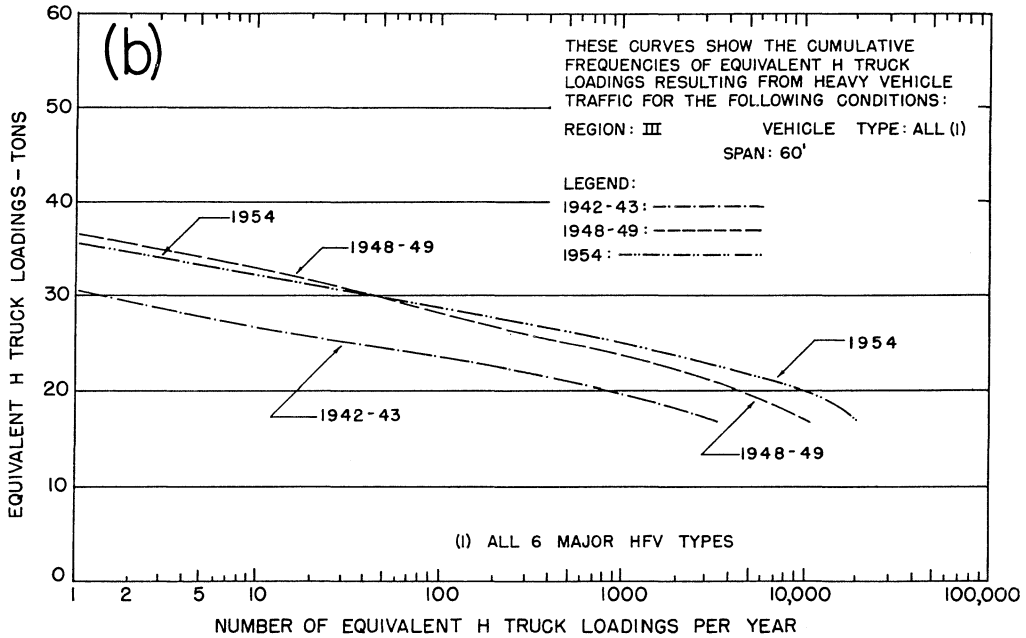


Figure B-2.6b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

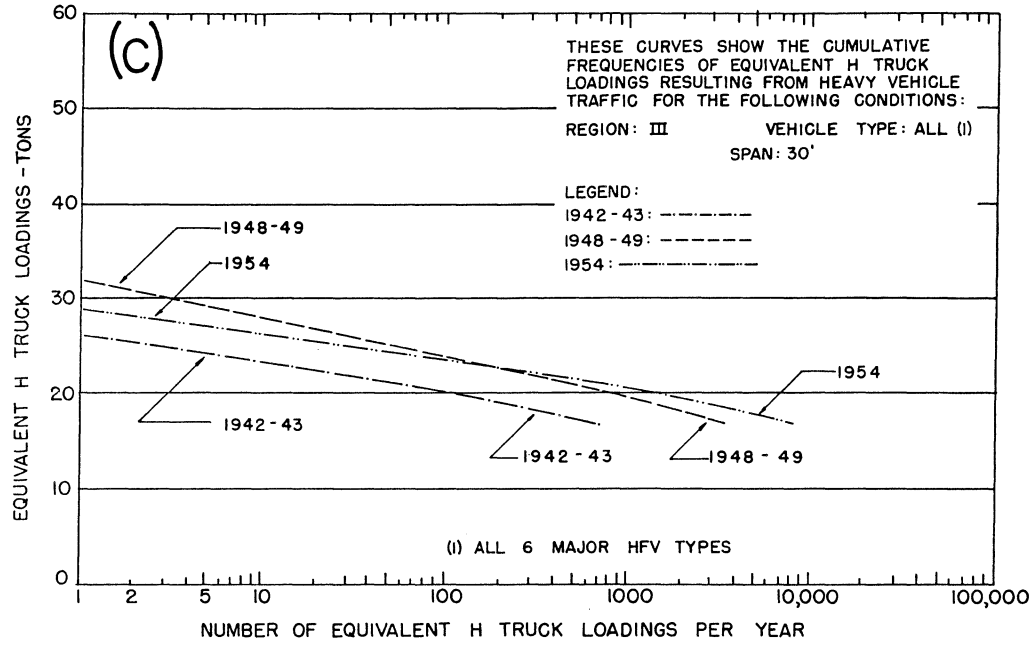


Figure B-2.6c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

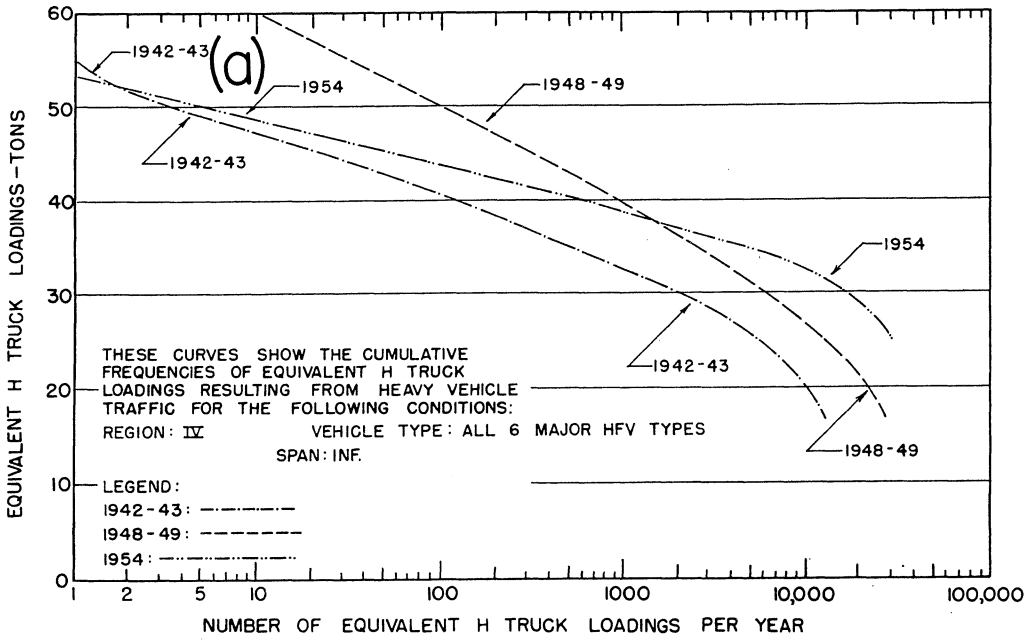


Figure B-2.7a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

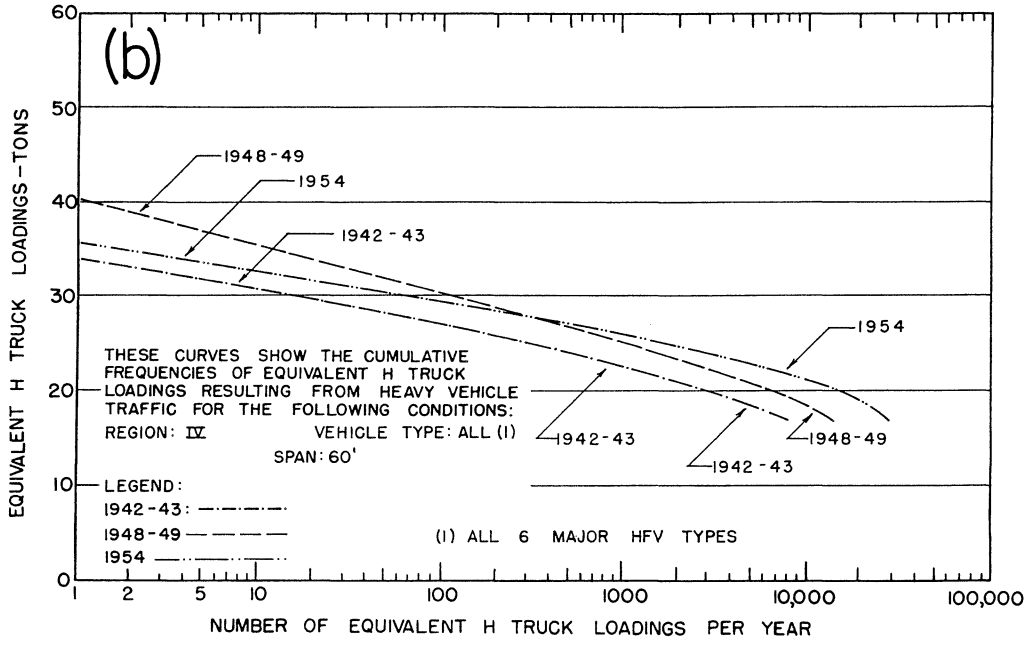


Figure B-2.7b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

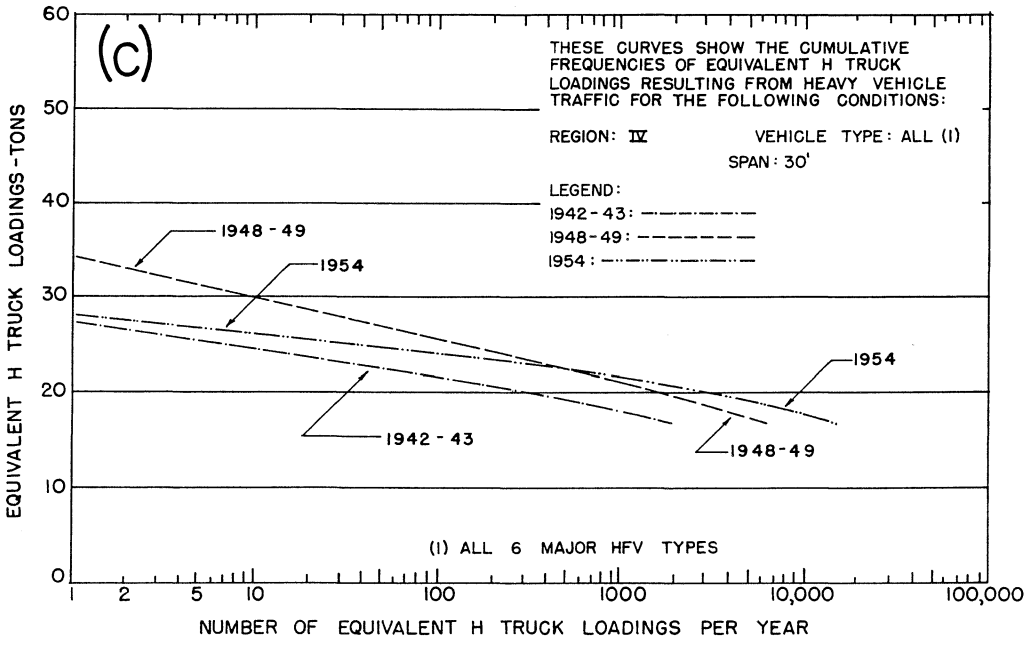


Figure B-2.7c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

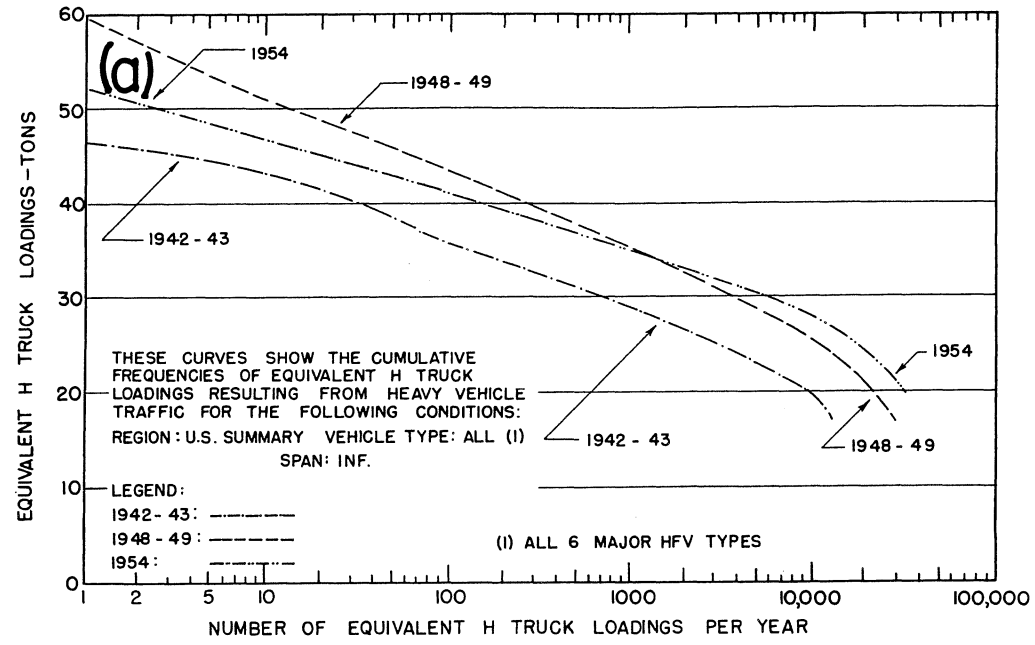


Figure B-2.8a. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

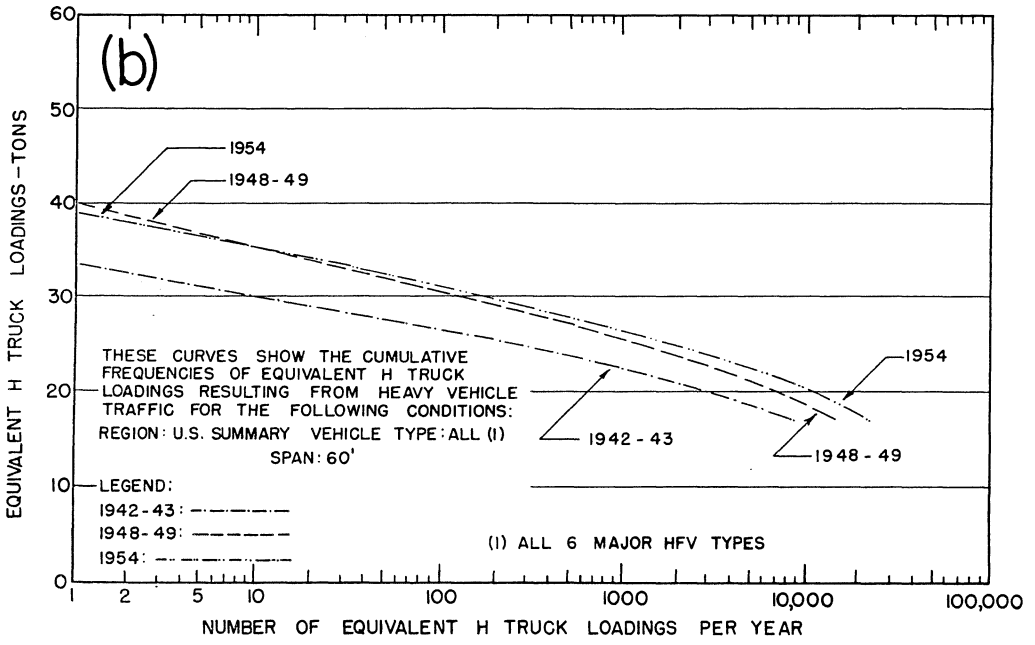


Figure B-2.8b. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

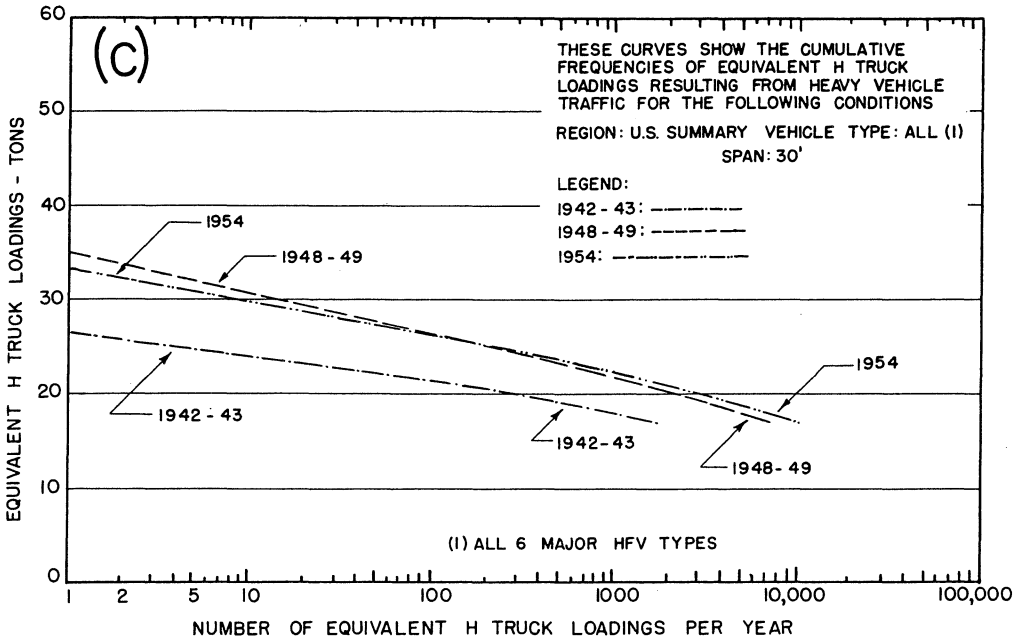


Figure B-2.8c. Estimated annual frequencies of heavy freight vehicles having equivalent H truck loadings equal to or greater than stated values.

APPENDIX C

List of Tables and Illustrations

PERCENT OF HEAVY TRUCKS HAVING EQUIVALENT H-TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES

ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS

CUMULATIVE ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES; BY VEHICLE TYPES, BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS

TABLE C-1.1a

PERCENT OF HEAVY TRUCKS HAVING EQUIVALENT H TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43			.29	.29				
20	1948-49	.96	2.03	2.39	2.99				
	1954	1.96	2.80	2.80	3.65	.88	.88	.88	.88
	1942-43								
25	1948-49				.12				
	1954						.44	.44	.44
	1942-43								
30	1948-49								
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								
		Region 3				Region 4			
	1942-43								
20	1948-49		(1)			.35	.35	.35	.35
	1954								
	1942-43								
25	1948-49								
	1954								
	1942-43								
30	1948-49								
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								
		U.S. Summary							
	1942-43			.25	.25				
20	1948-49	.52	1.06	1.22	1.52				
	1954	1.03	1.36	1.37	1.71				
	1942-43								
25	1948-49				.12				
	1954		.11	.11	.11				
	1942-43								
30	1948-49								
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								

(1) No Type 2 Vehicle Reported for Region 3.

TABLE C-1.1b

PERCENT OF HEAVY TRUCKS HAVING EQUIVALENT H TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43	4.19	9.79	14.44	20.27			4.17	4.17
20	1948-49	14.21	22.13	24.03	27.85	5.47	8.19	10.94	13.00
	1954	49.52	69.52	73.34	79.05	14.61	36.92	40.77	53.07
	1942-43		.46	.69	2.32				
25	1948-49	1.91	3.28	3.82	4.91		1.36	1.37	2.74
	1954	12.37	21.89	23.80	28.55			.77	1.54
	1942-43								
30	1948-49	.27	1.09	1.09	1.64				
	1954	2.85	6.66	7.61	8.55				
	1942-43								
35	1948-49		.27	.27	.27				
	1954	.95	2.85	2.85	4.75				
	1942-43								
40	1948-49								
	1954				.95				
		Region 3				Region 4			
	1942-43	6.39	11.35	11.36	13.48	1.98	3.30	4.61	9.88
20	1948-49	3.70	5.33	6.57	9.87	1.46	3.31	4.77	6.96
	1954	.83	7.49	12.49	27.49	8.97	18.30	22.22	30.47
	1942-43	.71	.71	.71	1.42	.66	.66	.66	.66
25	1948-49	.82	1.23	1.23	1.64		.37	.55	.91
	1954				.83		1.08	1.08	2.16
	1942-43								

TABLE C-1.1b—Continued

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
30	1948-49				1.23				
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								
		U.S. Summary							
	1942-43	3.90	8.19	11.31	15.98				
20	1948-49	6.08	9.85	11.45	14.24				
	1954	15.14	28.56	32.66	42.61				
	1942-43	.26	.52	.65	1.69				
25	1948-49	.69	1.61	1.76	2.55				
	1954	2.06	4.11	4.58	6.18				
	1942-43								
30	1948-49	.08	.31	.31	.69				
	1954	.48	1.11	1.27	1.44				
	1942-43								
35	1948-49		.08	.08	.08				
	1954	.16	.48	.48	.80				
	1942-43								
40	1948-49								
	1954				.16				

TABLE C-1.1c
PERCENT OF HEAVY TRUCKS HAVING EQUIVALENT H TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S1

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43	.65	11.12	25.62	60.96		.77	3.64	30.28
20	1948-49	1.79	16.43	39.75	77.59	.15	2.12	9.70	52.14
	1954	2.52	19.73	46.80	90.90	.11	2.77	10.32	73.36
	1942-43		.45	2.97	14.17		.13	.13	1.15
25	1948-49	.04	1.21	4.11	25.06	.03	.12	.21	4.44
	1954	.24	1.74	5.58	29.46			.11	2.77
	1942-43			.04	1.75				.13
30	1948-49		.02	.36	3.60			.03	.15
	1954		.16	.56	4.55				.22
	1942-43				.04				
35	1948-49			.02	.45				
	1954				.24				
	1942-43								
40	1948-49				.02				
	1954								
		Region 3				Region 4			
	1942-43	.12	.83	3.49	29.18		1.38	6.91	39.63
20	1948-49	.12	1.32	6.40	48.92		2.78	12.79	51.45
	1954	.13	.26	4.18	56.71	.38	3.77	12.07	70.18
	1942-43	.04	.08	.16	.62			.69	2.07
25	1948-49		.02	.07	2.03			.36	4.11
	1954				.38			1.13	2.26
	1942-43			.04	.16				.69
30	1948-49				.07				.12
	1954								.75
	1942-43				.04				
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								
		U.S. Summary							
	1942-43	.32	4.99	12.73	42.95				
20	1948-49	.68	6.63	18.74	59.43				
	1954	1.08	8.78	23.29	75.96				
	1942-43	.02	.23	1.33	6.29				
25	1948-49	.03	.44	1.48	10.43				
	1954	.09	.68	2.31	12.68				
	1942-43			.04	.84				
30	1948-49		.01	.14	1.27				
	1954		.06	.21	1.91				
	1942-43				.04				
35	1948-49			.01	.16				
	1954				.09				
	1942-43								
40	1948-49				.01				
	1954								

TABLE C-1.1d

PERCENT OF HEAVY TRUCKS HAVING EQUIVALENT H TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 2-S2

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43		52.17	91.30	95.65	6.90	20.70	65.52	93.10
20	1948-49	24.88	55.70	81.77	94.39	9.82	29.73	59.32	89.35
	1954	9.86	39.44	72.08	95.62	6.02	47.85	81.52	96.57
	1942-43			34.77	86.95		3.45	13.80	44.84
25	1948-49	4.39	20.85	44.47	76.87	.58	5.21	18.19	49.54
	1954	.35	6.05	24.04	65.69		1.83	19.97	74.81
	1942-43				30.44				13.80
30	1948-49		4.22	15.06	41.69		.44	3.36	14.96
	1954	.07	.35	2.37	20.15			.57	12.62
	1942-43								
35	1948-49			2.98	16.13			.29	3.56
	1954	.07	.07	.21	2.93				.47
	1942-43								
40	1948-49				4.05				.58
	1954		.07	.07	.21				.04
		Region 3				Region 4			
	1942-43	4.27	19.40	51.55	80.24	1.35	24.62	60.71	89.04
20	1948-49	8.38	42.46	73.85	92.71	6.81	32.25	62.72	86.96
	1954	1.93	56.98	84.85	96.54	6.01	60.63	89.72	97.38
	1942-43		1.56	5.82	25.60		.68	5.91	46.88
25	1948-49	.24	3.41	20.66	65.96	.28	3.37	15.26	56.42
	1954		.54	14.08	80.45	.10	1.85	23.76	87.69
	1942-43			.39	1.95				5.90
30	1948-49	.04	.28	1.59	14.90		.36	1.93	12.83
	1954			.03	6.39		.10	.48	14.64
	1942-43								.17
35	1948-49		.04	.06	1.26			.28	2.14
	1954				.06				.67
	1942-43								
40	1948-49			.02	.18				.42
	1954								
		U.S. Summary							
	1942-43	2.33	23.69	59.02	86.83				
20	1948-49	9.60	39.32	69.81	91.17				
	1954	4.95	51.71	82.32	96.49				
	1942-43		.99	6.85	41.75				
25	1948-49	.63	5.05	21.03	62.11				
	1954	.06	1.97	18.63	77.14				
	1942-43			.11	5.65				
30	1948-49	.02	.63	2.99	16.58				
	1954		.06	.65	11.49				
	1942-43				.11				
35	1948-49		.02	.37	2.98				
	1954		.01	.01	.74				
	1942-43								
40	1948-49			.01	.60				
	1954		.01	.01	.04				

TABLE C-1.1e

PERCENT OF HEAVY TRUCKS HAVING EQUIVALENT H TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-S2

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43		No Sample				66.66	66.67	100.00
20	1948-49	20.00	40.00	40.00	60.00	16.67	50.00	50.01	83.34
	1954		66.68	74.99	100.00	18.76	56.25	81.25	93.74
	1942-43		No Sample						100.00
25	1948-49		20.00	40.00	60.00		16.67	50.01	66.68
	1954		8.33	24.99	75.00	3.13	18.76	46.89	93.74
	1942-43		No Sample						66.66
30	1948-49			40.00	40.00		16.67	16.67	50.01
	1954			8.33	58.33		3.13	25.01	68.74
	1942-43		No Sample						
35	1948-49				40.00			16.67	33.34
	1954				16.66			3.13	34.37
	1942-43		No Sample						
40	1948-49				20.00				16.67
	1954								12.50
		Region 3				Region 4			
	1942-43		33.33	66.66	100.00	7.53	60.14	81.94	95.49
20	1948-49	12.30	64.74	79.91	88.93	5.76	45.06	73.70	92.46
	1954	5.53	66.52	91.64	98.23	3.74	68.46	91.50	98.03
	1942-43				66.66		12.41	36.09	84.59
25	1948-49	.41	12.30	46.72	83.60	.43	5.63	28.50	80.08

TABLE C-1.1e—Continued

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
	1954	.41	6.36	34.62	92.78	.15	3.58	48.35	94.37
	1942-43				33.33		.38	4.89	56.77
30	1948-49		.41	8.20	70.07	.06	.30	5.07	58.86
	1954		.61	5.22	78.77		.20	3.34	86.22
	1942-43							.38	15.06
35	1948-49			.82	23.77	.06	.06	.36	17.77
	1954		.10	.41	17.35		.05	.20	37.76
	1942-43								.76
40	1948-49			.41	3.69		.06	.06	2.14
	1954				.72			.05	1.46
		U.S. Summary							
	1942-43	7.35	60.29	81.61	95.58				
20	1948-49	6.32	47.64	74.38	91.94				
	1954	4.47	67.70	91.38	98.09				
	1942-43		12.13	35.29	84.55				
25	1948-49	.42	6.58	31.08	80.43				
	1954	.23	4.66	43.91	93.82				
	1942-43		.37	4.78	56.62				
30	1948-49	.05	.37	5.56	60.27				
	1954		.32	4.19	83.59				
	1942-43			.37	14.74				
35	1948-49	.05	.05	.47	18.66				
	1954		.06	.26	31.20				
	1942-43				.74				
40	1948-49		.05	.10	2.44				
	1954			.03	1.33				

TABLE C-1.1f
PERCENT OF HEAVY TRUCKS HAVING EQUIVALENT H TRUCK LOADINGS EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, BY AASHO REGIONS, AND FOR THE UNITED STATES—FOR VEHICLE TYPE 3-3

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43								
20	1948-49		(1)				(2)		
	1954								
	1942-43								
25	1948-49								
	1954								
	1942-43								
30	1948-49								
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								
		Region 3				Region 4			
	1942-43					1.07	43.51	83.29	91.78
20	1948-49		(3)			1.22	39.83	75.19	85.77
	1954					1.08	76.22	98.92	100.00
	1942-43						2.13	50.93	85.40
25	1948-49					.18	1.22	55.37	77.57
	1954						1.62	89.20	98.92
	1942-43							3.18	72.40
30	1948-49					.09	.18	3.68	69.27
	1954							1.67	96.22
	1942-43							.53	28.11
35	1948-49						.09	.61	43.85
	1954								81.63
	1942-43								2.93
40	1948-49							.09	4.55
	1954								2.70
		U.S. Summary							
	1942-43	1.07	43.51	83.29	91.78				
20	1948-49	1.22	39.83	75.19	85.77				
	1954	1.08	76.22	98.92	100.00				
	1942-43		2.13	50.93	85.40				
25	1948-49	.18	1.22	55.37	77.57				
	1954		1.62	89.20	98.92				
	1942-43			3.18	72.40				
30	1948-49	.09	.18	3.68	69.27				
	1954			1.67	96.22				
	1942-43			.53	28.11				
35	1948-49		.09	.61	43.85				
	1954				81.63				
	1942-43				2.93				
40	1948-49			.09	4.55				
	1954				2.70				

(1) No Type 3-3 Vehicle Reported for Region 1.
(2) No Type 3-3 Vehicle Reported for Region 2.
(3) No Type 3-3 Vehicle Reported for Region 3.

TABLE C-2.1a

ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES: BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS—FOR VEHICLE TYPE 2

Tabulated values are in millions of annual vehicle miles.

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43			.1	.1				
20	1948-49	1.3	2.8	3.3	4.2				
	1954	3.6	5.1	5.1	6.6	.5	.5	.5	.5
	1942-43								
25	1948-49				.2				
	1954						.2	.2	.2
	1942-43								
30	1948-49								
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								
		Region 3				Region 4			
	1942-43								
20	1948-49		(1)			.1	.1	.1	.1
	1954								
	1942-43								
25	1948-49								
	1954								
	1942-43								
30	1948-49								
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								

(1) No Type 2 Vehicle Reported for Region 3.

TABLE C-2.1b

ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS—FOR VEHICLE TYPE 3

Tabulated values are in millions of annual vehicle miles.

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43	2.4	5.6	8.3	11.6			.4	.4
20	1948-49	8.7	13.5	14.6	17.0	1.1	1.6	2.1	2.5
	1954	26.8	37.6	39.6	42.7	4.0	10.1	11.1	14.5
	1942-43		.1	.3	.4				
25	1948-49	1.0	1.5	1.8	2.3		.1	.3	.3
	1954	5.1	8.7	9.8	12.9			.2	.2
	1942-43								
30	1948-49	.2	.7	.7	1.0				
	1954		3.6	4.1	4.6				
	1942-43								
35	1948-49		.2	.2	.2				
	1954	.5	1.5	1.5	2.6				
	1942-43								
40	1948-49								
	1954				.5				
		Region 3				Region 4			
	1942-43	1.9	3.4	3.4	4.1	.6	1.1	1.5	3.2
20	1948-49	1.1	1.6	2.0	2.9	1.2	2.6	3.8	5.6
	1954	.2	2.1	3.5	7.7	6.8	13.9	16.8	23.1
	1942-43	.2	.2	.2	.4	.2	.2	.2	.2
25	1948-49	.1	.2	.4	.4		.3	.3	.4
	1954				.2		.8	.5	.8
	1942-43								
30	1948-49				.4				
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								

TABLE C-2.1c

ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS—FOR VEHICLE TYPE 2-S1

Tabulated values are in millions of annual vehicle miles.

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43	2.1	36.2	83.4	198.5		1.1	5.0	41.5
20	1948-49	12.2	112.3	271.6	530.2	.7	9.2	41.9	225.3
	1954	16.4	126.1	304.7	591.9	.2	5.1	18.9	134.7
	1942-43		.5	6.2	33.3		.2	.2	1.1
25	1948-49	.1	4.9	19.8	119.3	.1	.3	.8	11.3
	1954	1.6	7.2	25.1	131.1			.2	2.9
	1942-43			.1	5.7				.2
30	1948-49		.1	2.5	24.6			.1	.7
	1954		1.0	3.7	29.6				.4
	1942-43				.1				
35	1948-49			.1	1.9				
	1954				1.6				
	1942-43								
40	1948-49				.1				
	1954								
		Region 3				Region 4			
	1942-43	.6	4.2	17.6	146.8		1.2	6.1	34.9
20	1948-49	.6	6.8	33.1	252.9		3.4	15.5	62.5
	1954	.2	.5	7.7	104.7	.3	2.7	8.7	50.6
	1942-43	.2	.2	.6	1.0			.6	1.2
25	1948-49		.1	.1	6.7			.2	3.5
	1954				.7			.3	1.1
	1942-43			.2	.8				.6
30	1948-49				.4				.2
	1954								.5
	1942-43				.2				
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								

TABLE C-2.1d

ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS—FOR VEHICLE TYPE 2-S2

Tabulated values are in millions of annual vehicle miles.

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43		1.6	2.8	2.9	.4	1.2	3.7	5.2
20	1948-49	23.6	52.9	77.7	89.7	17.5	53.1	106.0	159.7
	1954	72.7	290.8	531.5	705.0	34.7	275.6	469.5	556.2
	1942-43			.9	2.2		.2	.8	2.0
25	1948-49	2.2	15.5	33.4	67.9	.6	6.8	22.5	66.4
	1954	1.6	28.8	110.2	402.4		7.1	46.5	354.0
	1942-43				.9				.8
30	1948-49		4.0	14.3	39.6		.8	6.0	26.7
	1954	.5	2.6	17.5	148.6			3.3	72.7
	1942-43								
35	1948-49			1.5	12.0			.3	3.7
	1954	.5	.5	1.6	8.3				1.1
	1942-43								
40	1948-49				3.8				1.0
	1954		.5	.5	1.6				.2
		Region 3				Region 4			
	1942-43	2.5	11.5	30.5	47.5	1.6	29.9	73.6	108.0
20	1948-49	43.5	220.2	383.1	480.9	13.9	66.0	128.4	178.1
	1954	16.6	490.7	730.7	831.4	16.9	170.4	252.1	273.6
	1942-43		.5	1.6	9.2		.6	2.7	41.7
25	1948-49	.5	11.3	53.8	281.0	.4	5.1	18.8	95.7
	1954		2.6	23.7	631.2	.3	2.5	19.6	227.8
	1942-43			.2	1.2				7.2
30	1948-49	.2	1.4	8.2	77.3		.7	4.0	26.3
	1954			.3	55.0		.3	1.4	41.1
	1942-43								.2
35	1948-49		.2	.2	4.6			.3	2.8
	1954				.5				1.4
	1942-43								
40	1948-49			.2	.9				.9
	1954								

TABLE C-2.1e

ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS—FOR VEHICLE TYPE 3-S2

Tabulated values are in millions of annual vehicle miles.

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43						.4	.4	.6
20	1948-49	.2	.3	.3	.5	.1	.3	.3	.6
	1954		3.9	4.5	6.0	1.3	3.9	5.7	6.5
	1942-43								.6
25	1948-49		.2	.3	.5		.1	.2	.3
	1954		.5	1.5	4.5	.2	1.3	3.3	6.5
	1942-43								.4
30	1948-49			.3	.3		.1	.1	.3
	1954			.5	3.5		.2	1.7	4.8
	1942-43								
35	1948-49				.3			.1	.2
	1954				1.0			.2	2.4
	1942-43								
40	1948-49				.2				.1
	1954								.9
		Region 3				Region 4			
	1942-43		.1	.1	.2	4.1	32.8	44.7	52.1
20	1948-49	3.7	19.4	23.9	26.6	13.8	107.9	176.4	221.4
	1954	12.4	148.5	204.6	219.3	20.1	368.7	492.8	527.9
	1942-43				.1		2.5	12.7	44.7
25	1948-49	.1	2.6	9.2	24.6	.3	8.2	43.3	185.2
	1954	.9	6.3	50.2	205.7	.8	10.0	153.4	503.0
	1942-43				.1		.2	2.7	30.9
30	1948-49		.1	2.4	20.9	.1	.7	12.1	140.9
	1954		1.4	11.7	175.9		1.1	179.9	464.3
	1942-43							.2	4.9
35	1948-49			.1	4.3	.1	.1	.7	28.9
	1954		.2	.5	23.8		.3	1.1	119.6
	1942-43								.4
40	1948-49			.1	1.1		.1	.1	5.1
	1954				1.6			.3	7.9

TABLE C-2.1f

ANNUAL VEHICLE MILES OF TRAVEL ON MAIN RURAL ROADS BY HEAVY TRUCKS HAVING H-EQUIVALENCIES EQUAL TO OR GREATER THAN STATED VALUES; BY YEARS, BY SPAN LENGTHS, AND BY AASHO REGIONS—FOR VEHICLE TYPE 3-3

Tabulated values are in millions of annual vehicle miles.

EHTL	Years	Span—Feet				Span—Feet			
		30	60	100	Inf.	30	60	100	Inf.
		Region 1				Region 2			
	1942-43								
20	1948-49		(1)				(2)		
	1954								
	1942-43								
25	1948-49								
	1954								
	1942-43								
30	1948-49								
	1954								
	1942-43								
35	1948-49								
	1954								
	1942-43								
40	1948-49								
	1954								
		Region 3				Region 4			
	1942-43					.8	33.4	63.9	70.4
20	1948-49		.1	.1	.1	2.1	67.0	126.3	144.1
	1954		.2	.3	.3	.6	39.1	50.8	51.3
	1942-43						.8	31.3	64.9
25	1948-49			.1	.1	.3	1.2	74.7	127.6
	1954			.2	.3		.3	42.7	50.5
	1942-43							2.4	55.5
30	1948-49				.1	.2	.3	6.2	116.3
	1954				.3			.8	49.4
	1942-43							.4	13.0
35	1948-49						.2	1.0	56.1
	1954				.2				35.8
	1942-43								2.2
40	1948-49							.2	7.6
	1954								1.4

(1) No Type 3-3 Vehicle Reported for Region 1.
(2) No Type 3-3 Vehicle Reported for Region 2.

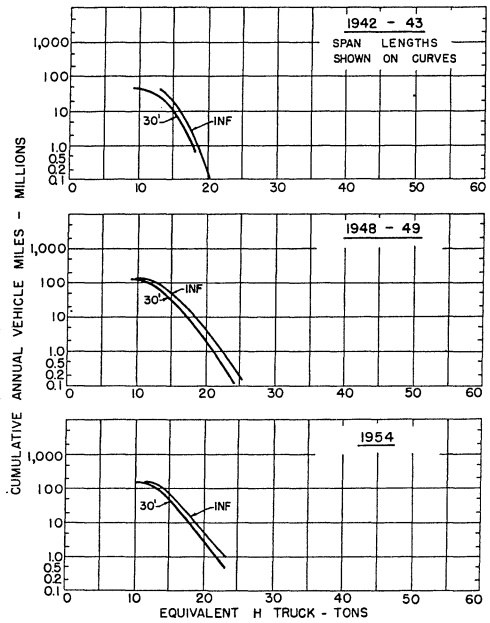


Figure C-1.1 Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2, region 1.

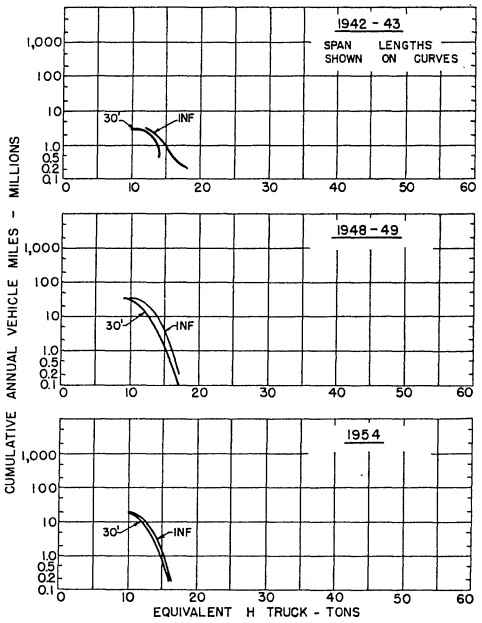


Figure C-1.3. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2, region 3.

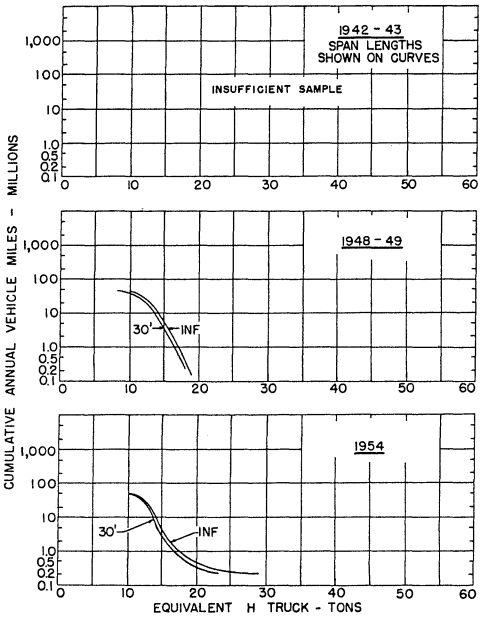


Figure C-1.2. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2, region 2.

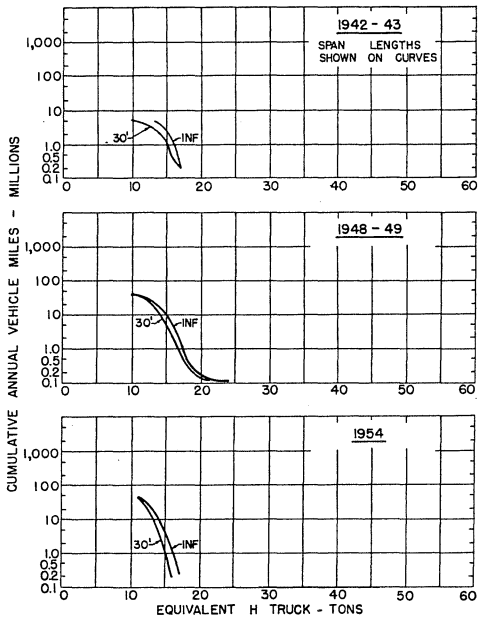


Figure C-1.4. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2, region 4.

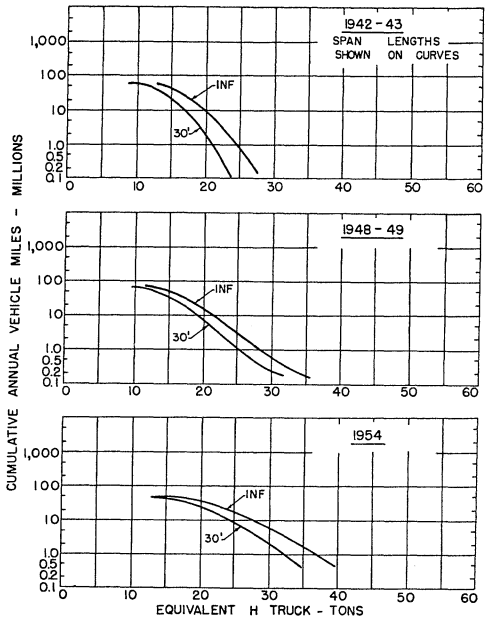


Figure C-2.1. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3, region 1.

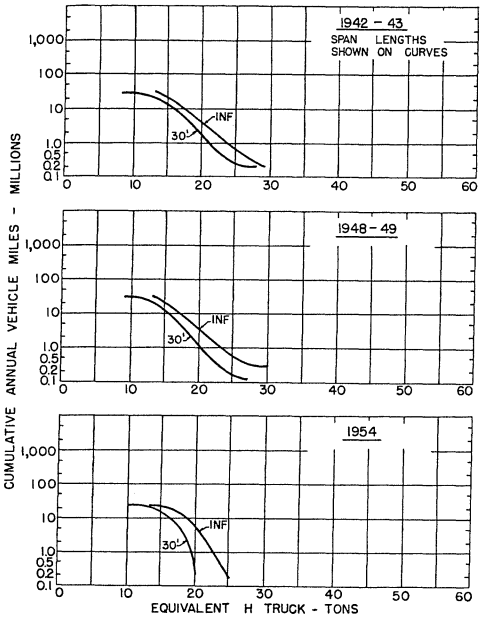


Figure C-2.3. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3, region 3.

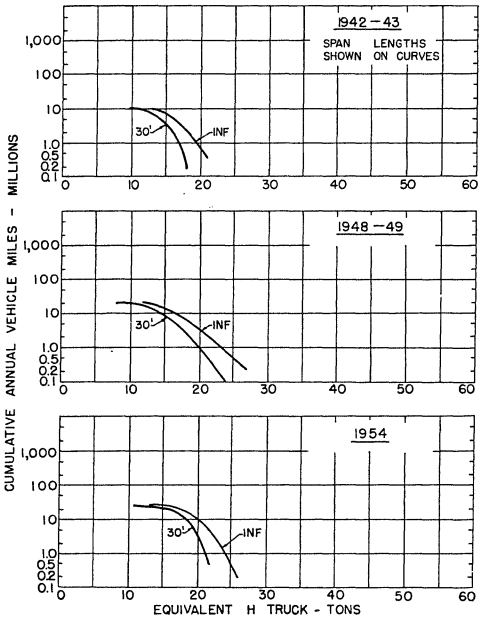


Figure C-2.2. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3, region 2.

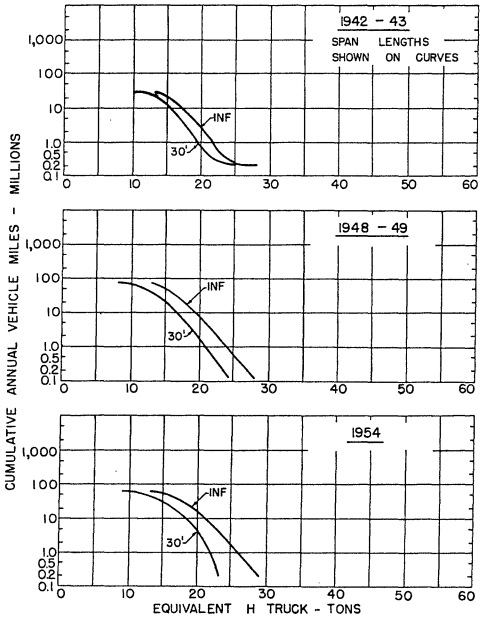


Figure C-2.4. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3, region 4.

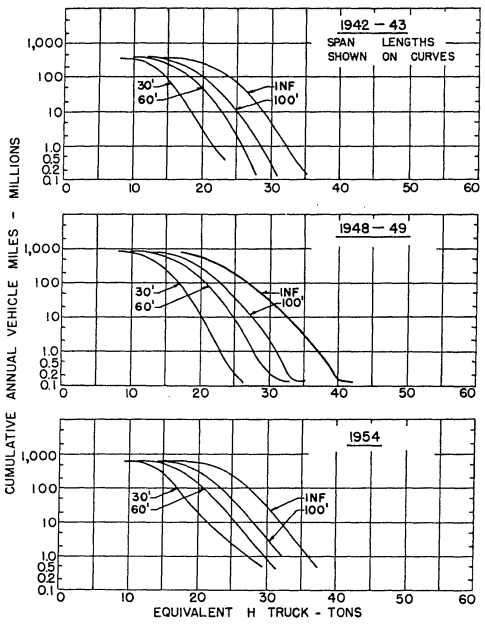


Figure C-3.1. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S1, region 1.

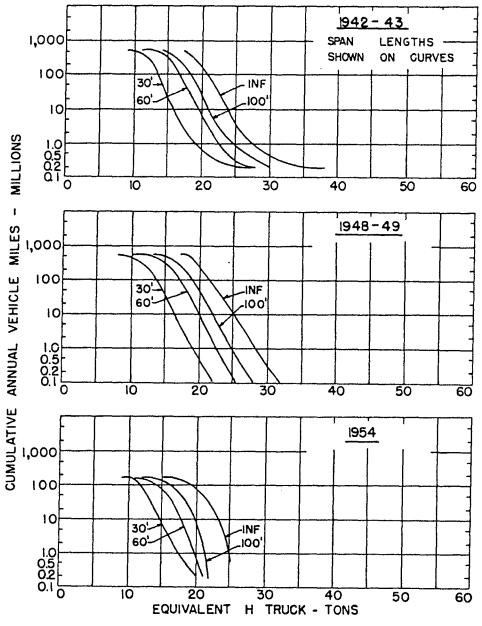


Figure C-3.3. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S1, region 3.

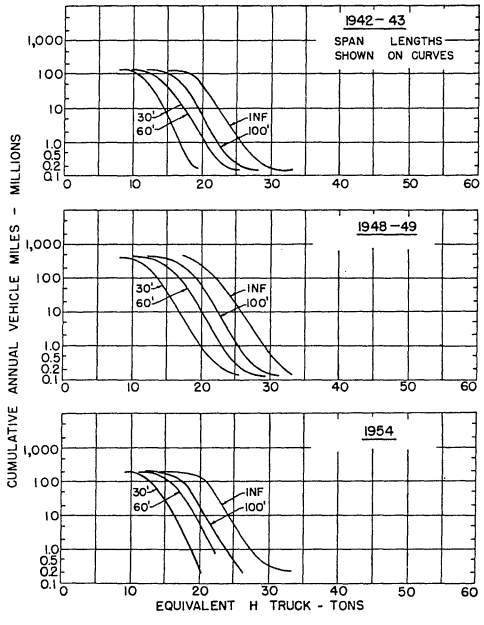


Figure C-3.2. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S1, region 2.

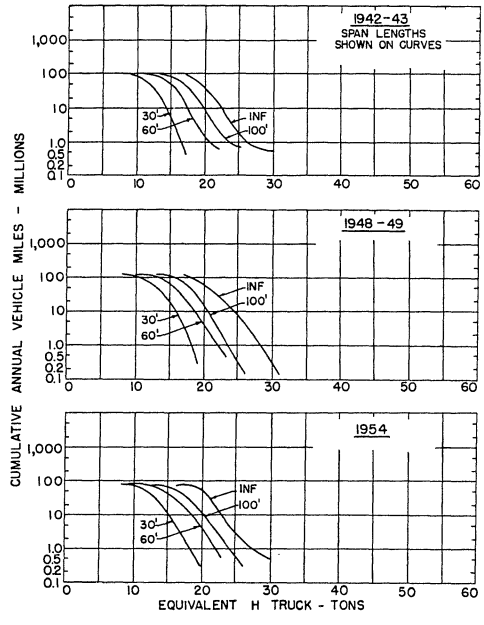


Figure C-3.4. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S1, region 4.

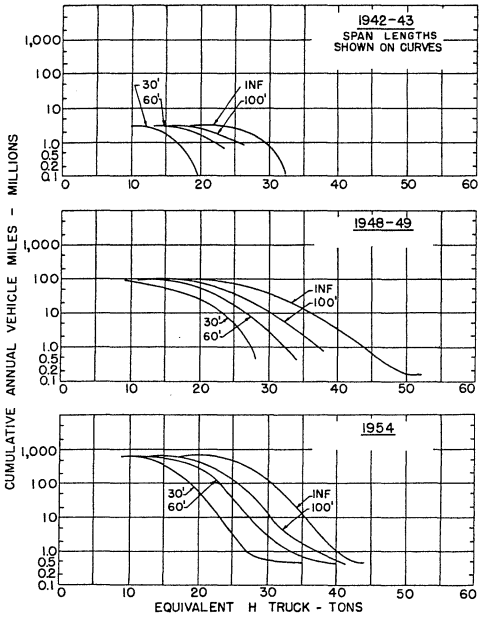


Figure C-4.1. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S2, region 1.

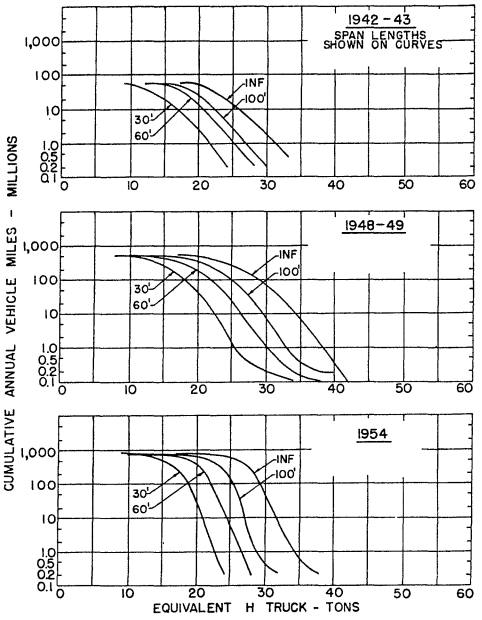


Figure C-4.3. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S2, region 3.

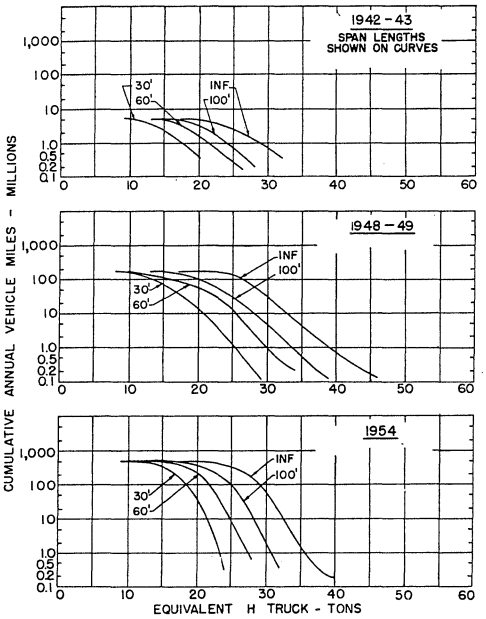


Figure C-4.2. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S2, region 2.

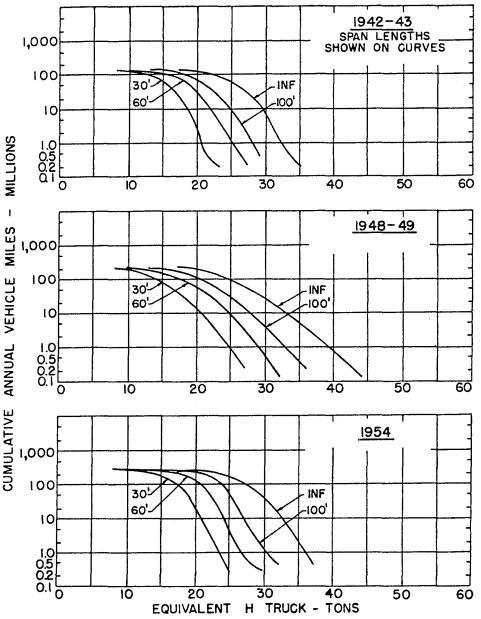


Figure C-4.4. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 2-S2, region 4.

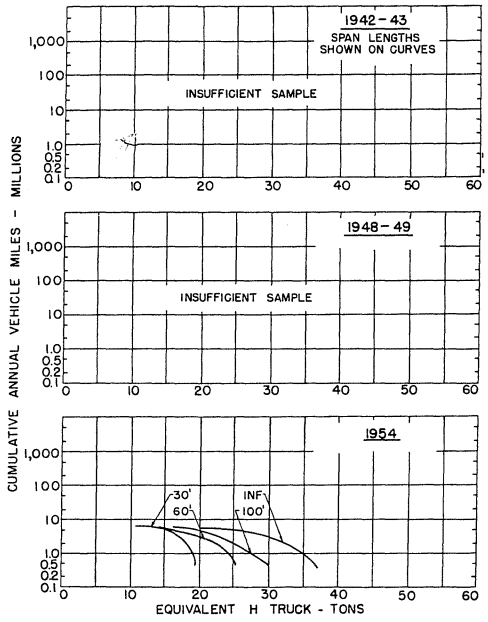


Figure C-5.1. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3-S2, region 1.

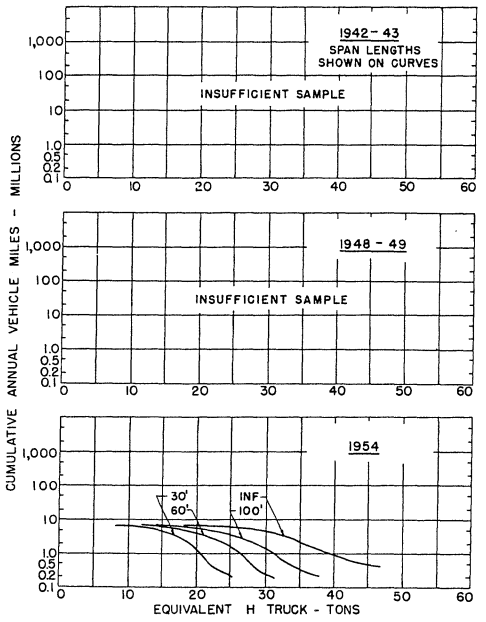


Figure C-5.2. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3-S2, region 2.

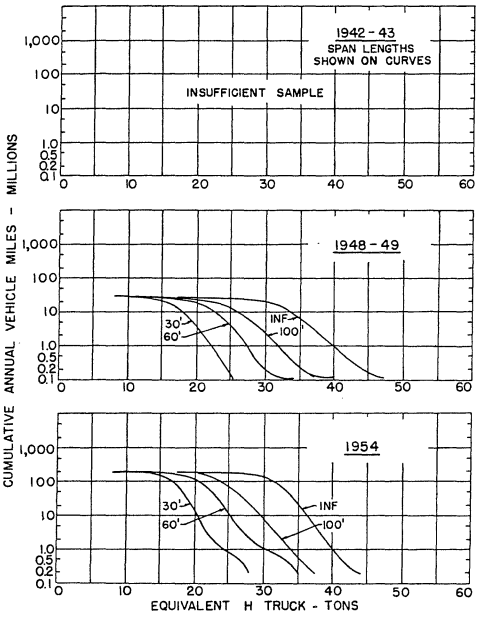


Figure C-5.3. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3-S2, region 3.

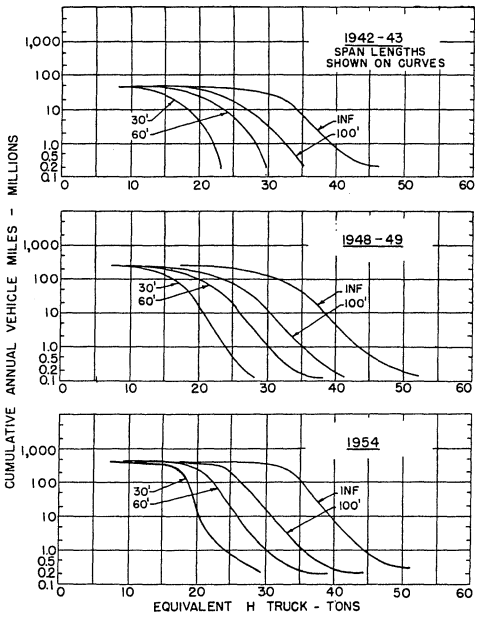


Figure C-5.4. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3-S2, region 4.

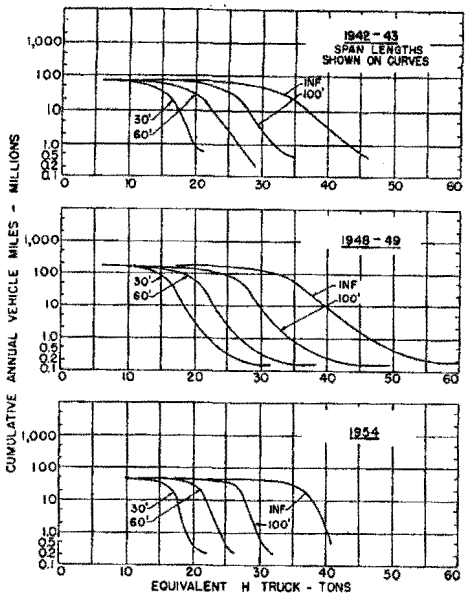


Figure C-6.1. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for vehicle type 3-3, region 4.

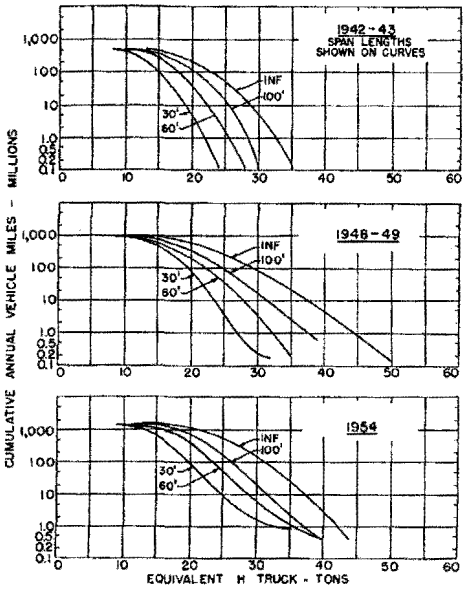


Figure C-7.1. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for all 6 major HFV types, region 1.

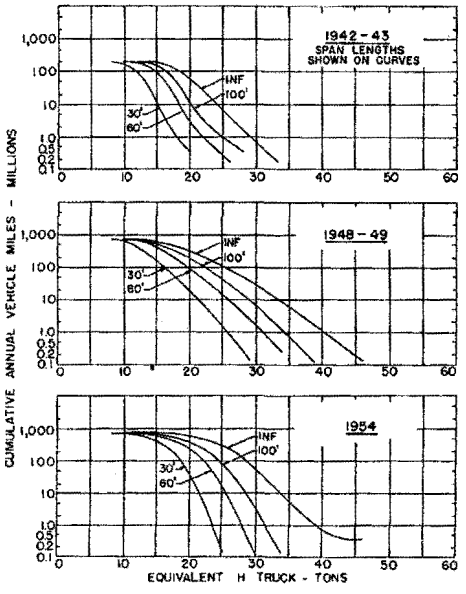


Figure C-7.2. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for all 6 major HFV types, region 2.

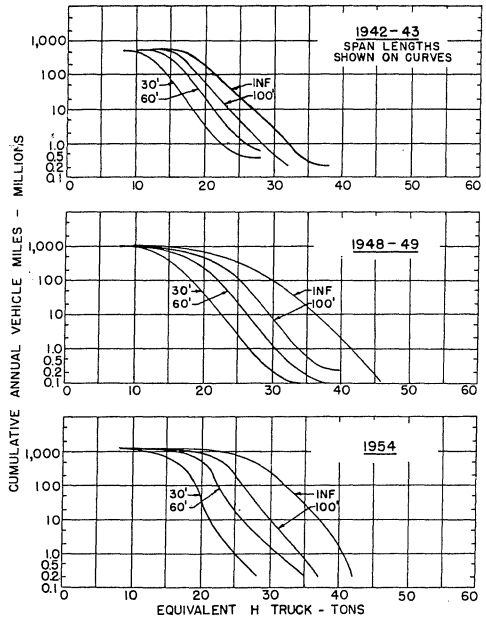


Figure C-7.3. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for all 6 major HFV types, region 3.

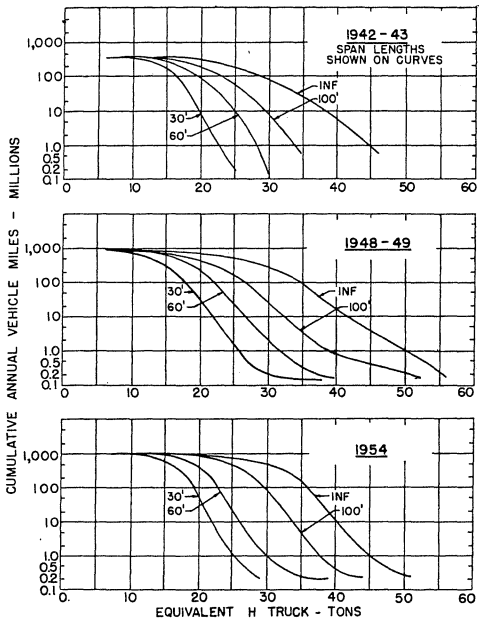


Figure C-7.4. Cumulative annual vehicle miles of travel on main rural roads by heavy trucks having H-equivalencies equal to or greater than stated values; by years, by span lengths, and by AASHO regions—for all 6 major HFV types, region 4.

APPENDIX D

Definitions of Terms

AASHO—Abbreviation for American Association of State Highway Officials.

Bridge provision—See highway provision. In a broad sense bridge provision is included in the term highway provision. But when reference is to bridges alone, the term bridge provision has a meaning similar to that of highway provision.

Equivalent H truck loading (EHTL)—If a particular heavy truck produces the same stress effect on a given span as a standard H truck of given weight, the truck under consideration is said to have an equivalent H truck loading of that weight on the same span. For example, if a particular truck produced the same maximum moment on a 60-foot span as a standard H truck weighing 22.5 tons, it would be rated as an equivalent H22.5 truck (based on moment) on a 60-foot span.

Equivalent H truck rating (EHTR)—Same as equivalent H truck loading or H-equivalency.

Freight vehicle—This term is used to describe freight or cargo carrying trucks of all types to distinguish them from automobiles and buses.

H-equivalency—Same as equivalent H truck loading or equivalent H truck rating.

Heavy freight vehicles — See definition of heavy trucks.

Heavy motor vehicles—See definition of heavy trucks.

Heavy trucks—As used in this report, all single unit trucks weighing 26,000 pounds or more and all other combination vehicles weighing 34,-

000 pounds or more are defined as heavy trucks. In the literature on this subject, the terms "heavy motor vehicle," "heavy freight vehicle," and "heavy vehicle" have been used in the same sense as the term "heavy trucks" is used in this report.

Heavy vehicles — See definition of heavy trucks.

Highway provision—This term is used to describe the composite result of all the factors and considerations which enter into the planning and furnishing of a given highway facility. For example, the volumes and compositions of traffic to be accommodated together with the balancing of costs with the degree of comfort and convenience desired are among the factors which establish the design standards commensurate with the over-all financial and service requirements which obtain for location under consideration. The providing of such a highway facility may be described simply as "highway provision."

Loadometer—This term or name is used to describe the portable scales sometimes used by truck weight and traffic survey crews for weighing individual truck wheels. The total load on a given axle, for example, is the sum of the weights obtained separately for each of the two wheels.

Loadometer and pitscale stations—Loadometers and pitscales (sometimes referred to as platform scales) are used at traffic survey stations to obtain axle loads and total vehicle weights. In general, the standard forms used for reporting truck weight and traffic data refer to these stations as "loadometer stations" even though the station may be equipped with pitscales or platform scales for obtaining axle and truck weights.

Main rural roads—Main rural roads include all rural mileage outside municipalities and urban places that is on either a State highway system, exclusive of local roads under State control, the Federal-aid primary system, or both.

Miscellaneous vehicles — During the trend period 1942-43 military vehicles were not stopped, classified, or weighed; such vehicles were reported as miscellaneous vehicles.

Two-axle trucks—2-axle trucks are classified as 2 P, 2 S and 2 D trucks; 2 P refers to 2-axle, 4-tired panel and pickup trucks; 2 S refers to other 2-axle, 4-tired trucks (the S refers to single tires on rear wheels); and 2 D refers to 2-axle, 6-tired trucks (the D refers to dual tires on rear wheels).