1st Ed.

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Trip Generation

This report, which will be updated periodically, was prepared by Committee 6A6, Department 6 of the ITE Technical Council. Members of the committee were: Dan Cherepacha (M); Juergen A. Fehr (M); Christopher R. Fleet (A); Lawrence Gassman (M); Lawrence V. Hammel (M); Herman A. J. Kuhn (M); Clinton L. Lefler (M); Gary D. Long (M); and James B. Saag (M). Special thanks are given to the U.S. Department of Transportation, Federal Highway Administration for its assistance in computer programming and analysis.

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CONTENTS

I. INTRODUCTION

Objectives of the Report: The primary objective of this report is to provide traffic and transportation engineers with a single document and guide on trip generation rates for all land uses and building types. The report will be updated periodically to include analyses of additional land uses and building types; differences in rates will be investigated and changes in travel patterns monitored.

Use of the Report: Trip generation rates have been developed for the average weekday, Saturday and Sunday for the peak hours of the generator and of the adjacent street traffic. However, in some cases, only limited data could be obtained and thus may not be too indicative of a particular building type. This report is intended as a guide in estimating the number of trips which may be generated by a specific building or land use.

Variations in generation rates for the same building or land use type exist and have been identified in the report. Because of these variations, sample size and special characteristics of a site being analyzed, extreme care must be made in the use of the rates. The data in this report represent weighted averages of those collected throughout the United States since 1966. At specific sites, the traffic and transportation engineer may wish to modify the generation rate presented in this report because of public transportation service, proximity to other developments which may reduce vehicle trip making through walking or combining trips or because of special characteristics of the site or the surrounding area.

Definition of Terms: The following definitions of terms are presented to clarify the terminology used throughout the text and tables:

Trip: A single or one-direction vehicle movement with either the origin or destination (exiting or entering) inside the study site.

Trip End: The origin or destination of a trip. Each trip has two ends. On a daily basis, each end has two trips: one entering and one exiting for an attractor of trips, and one exiting and one entering for a producer of trips. In this report, trip end refers to a two-direction vehicle movement at the origin or destination of a trip.

Average Trip Rate: A weighted average of the number of trips or trip ends per unit of related independent variable, i.e., trip ends per dwelling unit, employee, etc. The average rate was calculated by summing all trips or trip ends and all independent variables where paired data were available and then dividing the trip sum by the sum of the independent variable to obtain a weighted average.

Average Weekday Vehicle Trip Ends (AWDVTE): The weighted 24-hour total of all vehicle trips counted to and from a study site from Monday through Friday.

Average Trip Rate for Peak Hour of Adjacent Street Traffic: The weighted average trip rate during the hour of the highest volume of traffic passing the site on adjacent streets between 7 and 9 A.M. or between 4 and 6 P.M.

Average Trip Rate for Peak Hour of Generator: The weighted trip rate during the hour of highest volume of traffic entering and exiting the study site in the A.M. or in the P.M. It may or may not coincide in time or volume with the trip rate for the peak hour of the adjacent street traffic.

Independent Variable: A physical, measureable and predictable unit quantifying the study site or generator, i.e., building area, employees, seats, acres, dwelling units, etc.

Regression Equation: An expression of the optimal mathematical relationship between two or more related items (variables) according to a specified criterion, as: $Y=a + bX$.

The objective in developing the relationship between X (independent variable) and Y (dependent variable) is to determine values of the parameters "a" and "b" so that the expected error involved in estimating the dependent variable given estimates of the independent variable will be a minimum.

Correlation Coefficient (R): A measure of the degree of linear association between two vari-

ables. The correlation coefficient indicates the degree of which the model estimated values account for the deviations in the individual observed values of the dependent variable from their mean value. Numerical magnitudes for "least squares" models range from −1 to +1 with larger absolute values representing higher degrees of linear association. The correlation coefficient for rate models is undefined when the use of a constant of trips is better than the use of the rate model (a condition that does not occur with least square models) (Figure 1).

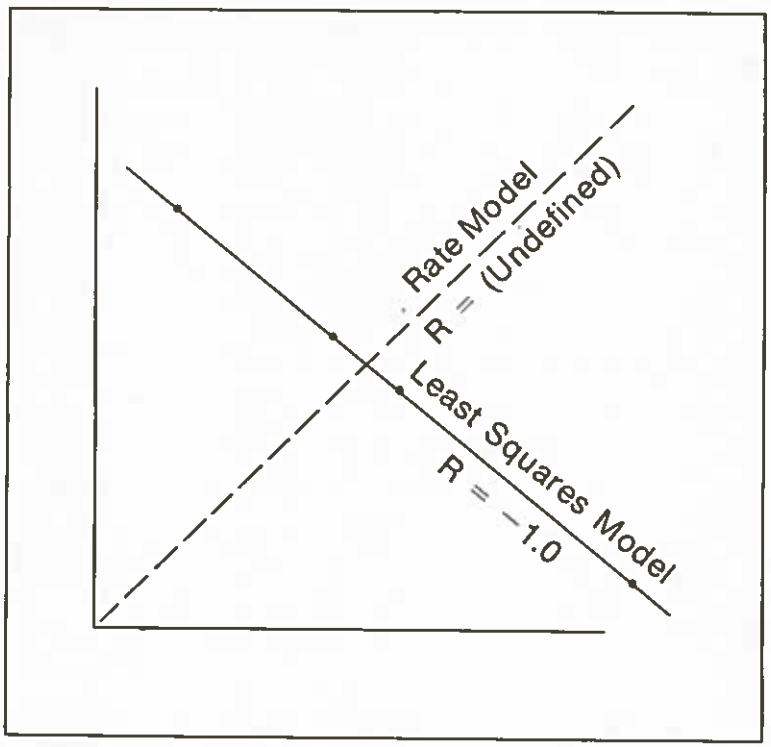

Figure 1.

II. DATA COLLECTION PROCEDURE

The data analyzed in this report were obtained from various local governmental agencies, consulting engineers, universities and colleges and technical reports from sections of the Institute of Transportation Engineers. No attempt was made to conduct original field surveys for this initial report.

Field Data Collection: Generally, the data have been collected with automatic counters varying from one weekday to seven days, by counting vehicular traffic entering and exiting a site. These counts cordoned the site and did not include through traffic. They were made on driveways of sufficient length to avoid double counts of turning vehicles. In some cases, counts were nondirectional and therefore did not separate entering from exiting vehicles. Manual counts supplemented some of the automatic counts to obtain vehicle occupancy and classification, to check the reliability of the automatic counters and to obtain directional counts during peak periods where a nondirectional automatic count was being made. In other cases, only manual counts were made during peak periods. Therefore, all data summarized in this report result in vehicle trip generation rather than person trip generation.

Because some data provided only average weekday volumes, some only nondirectional peak hour volumes and some directional peak hour and average weekday volumes, separate analyses were made for each type of measurement to obtain generation rates for various time periods of the day or week. Therefore, in most cases, the peak hour entering plus exiting rates do not equal the total two-way rates. Before the reader uses these rates, an adjustment in the entering and exiting rates usually must be made to equal the total two-way rate.

Data concerning the generator or site were obtained either through personal interviews, actual measurements, telephone conversations or mail-back questionnaires.

Data Reports: In almost all cases, the data analyzed in this report were contained in published reports listed in the References. Additional data were provided from unpublished analyses by governmental agencies, firms or individuals. For more detailed information concerning a specific generator at a specific location, see References and the reference numbers included at the bottom of the rate tables.

III. GENERATION RATE ANALYSES

The generation rate analyses were performed by coding the data from each source document and then, by use of computer, determining the related variables, the average trip generation rates and regression equations.

Coding Format: All data were coded uniformly on a six-page input form. This form was established to permit additional land uses not studied thus far and to add other variables, if necessary. All data were coded to a Standard Metropolitan Statistical Area (SMSA) when known. The SMSA four-digit code was obtained from the 1970 Geographic Identification Code Scheme of the Bureau of the Census.

A three-digit land use code was established to identify the types of uses studied or requiring study. This code (see VII. Trip Generation Land Use Code) can easily be expanded to include uses not presently identified.

The data coded and keypunched on cards permit additional computer analyses for any one land use or building type and an opportunity to examine the data from each set and source.

Statistical Programs: Three statistical computer programs were used to produce the rates and regression equations and their associated statistics:

1. Statistics. Statistics for each variable were developed using program BMDO1D "Simple Data Description."* This program, part of a series of statistical programs developed by the University of California at Los Angeles, computes simple averages and provides measures of dispersion of the variables specified

Certain methods for handling blanks and special values can be specified by the user. For this analysis, blanks were not counted and did not enter the computations as this situation was the result of missing data or data that were not available from the source studies.

The output of this program includes: means; standard deviations; standard errors of the means; maximum values; minimum values; ranges; and sample sizes. All items were calculated for each land use activity measured, e.g., number of employees, persons, vehicles, etc., and each trip variable. Only the maximum and minimum values and sample sizes were used from this program as the means produced are developed by averaging the mean of each set, and thus not a weighted average.

2. Rates. The rates (for all combinations of paired variables) were developed using program MATCH* which was written to obtain rates based on the totals of each variable that had valid data coded for each source study. These rates can be quite different from rates developed using BMDO1D, which develops a rate for each case first, then computes an average rate.

The output from this program (in matrix format) includes: number of observations; means of each dependent variable with respect to all independent variables; means of each independent variable with respect to all dependent variables; and trip rates for each independent/dependent variable combination.

3. Equations. Equations were developed using the "Sub-Program Regression" in the Statistical Package for the Social Sciences (SSPS).** This is a stepwise multiple regression program which allows the choice of independent variables that will give the "best" final equation so that certain statistical limitations are satisfied. Use of a specified option allowed the deletion of cases which contain missing data values. Thus, if a value of either an independent or dependent variable were missing from the

*Complete user documentation, including brief descriptions of the statistical principles involved, is available in "BMD Biomedical Computer Programs Manual," published and distributed by the University of California Press, 2223 Fulton, Berkeley, California 94720.

*Documentation and source deck can be obtained from Dan H. Bryant, Urban Planning Division, Federal Highway Administration, Washington, D.C. 20590.

**Nie, Norman, Dale H. Bent and C. Hadlai Hull, *Statistical Package for the Social Sciences*, New York City: McGraw-Hill Book Co., 1970.

data, the case involving that variable was eliminated from the calculations.

The output of the program includes: variable means and standard deviations; simple correlation coefficients; and, for each step: the variables in the equation; variables not in the equation; the regression coefficients for each variable; the equation constant; R^2; standard error of estimate; degrees of freedom; and the F value.

000—Port and Terminal

021—Commercial Airport

Description: A commercial airport accommodates commercial passenger service. All of the commercial airports surveyed also accommodated general aviation activities.

Commercial airports are characterized by long runways, for serving large jets, and extensive terminal facilities. However, some commercial airports have shorter runways and serve exclusively intrastate and commuter airlines.

Three of the four commercial airports surveyed were located inside a standard metropolitan statistical area (SMSA). Of the three, one was in a rural area and the other two in suburbs outside the central business districts. The airports ranged in number of employees from 80 to 873; in based aircraft from 165 to 500; in average flights per day from 119 to 1,335; in commercial flights per day from 18 to 158; and in area from 150 to 1,500 acres.

Trip Characteristics: On the average, commercial airports were found to generate 16.8 weekday vehicle trip ends per employee; 11.8 weekday vehicle trip ends per total flights per day; and 77.0 weekday vehicle trip ends per commercial flights per day. See the summary tables for peak hour and Saturday and Sunday generation rates.

Data Limitations: These rates are based on a small number of data observations; variability within this limited data is considerable. Therefore, the maximum and minimum rates have been shown opposite each average rate.

Person-trip information was not available, and for commercial airports this travel component is important.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Commercial Airport — ITE Land Use Code: 021

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			16.82	26.61	11.55		4	358
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.97	0.97	0.97		1	227
		Exit	0.66	0.66	0.66		1	227
		Total	1.63	1.63	1.63		1	227
	P.M. Between 4 and 6	Enter	1.41	1.41	1.41		1	227
		Exit	1.50	1.50	1.50		1	227
		Total	2.91	2.91	2.91		1	227
Peak Hour of Generator	A.M.	Enter	0.53	0.84	0.45		2	550
		Exit	0.57	0.93	0.48		2	550
		Total	1.18	1.76	0.92		4	358
	P.M.	Enter	0.49	0.49	0.49		1	873
		Exit	0.53	0.53	0.53		1	873
		Total	1.14	1.57	1.01		3	401
Saturday Vehicle Trip Ends			13.71	14.47	8.88		3	401
Peak Hour of Generator		Enter	0.46	0.46	0.46		1	873
		Exit	0.54	0.54	0.54		1	873
		Total	0.99	1.00	0.88		2	476
Sunday Vehicle Trip Ends			15.91	16.24	12.25		2	476
Peak Hour of Generator		Enter	0.58	0.58	0.58		1	873
		Exit	0.55	0.55	0.55		1	873
		Total	1.14	1.25	11.26		2	476

Source Numbers: 8, 11, 13, 40

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Commercial Airport — ITE Land Use Code: 021

Independent Variable—Trips per: Ave. Flights/Day

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			11.83	60.73	2.57		4	508
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.16	0.16	0.16		1	1335
		Exit	0.11				1	1335
		Total	0.27				1	1335
	P.M. Between 4 and 6	Enter	0.24				1	1335
		Exit	0.25				1	1335
		Total	0.49				1	1335
Peak Hour of Generator	A.M.	Enter	0.37	1.77	0.14		2	778
		Exit	0.40	1.89	0.16		2	778
		Total	0.83	3.66	0.25		4	508
	P.M.	Enter	1.93	1.93	1.93		1	220
		Exit	2.08	2.08	2.08		1	220
		Total	1.97	4.01	0.28		3	233
Saturday Vehicle Trip Ends			23.59	57.41	1.97		3	233
Peak Hour of Generator		Enter	1.84	1.84	1.84		1	220
		Exit	2.13	2.13	2.13		1	220
		Total	1.62	3.96	0.19		2	290
Sunday Vehicle Trip Ends			26.14	64.45	2.72		2	290
Peak Hour of Generator		Enter	2.30	2.30	2.30		1	220
		Exit	2.17	2.17	2.17		1	220
		Total	1.87	4.47	0.28		2	290

Source Numbers: 8, 11, 13, 40

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Commercial Airport ITE Land Use Code 021

Independent Variable—Trips per Commercial Flights/Day

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			77.86	84.56			4	77
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	2.86				1	77
		Exit	1.95				1	77
		Total	4.80				1	77
	P.M. Between 4 and 6	Enter	4.16				1	77
		Exit	4.42				1	77
		Total	8.57				1	77
Peak Hour of Generator	A.M.	Enter	2.47	2.47	2.47		2	118
		Exit	2.73	2.73	2.73		2	118
		Total	5.48	7.07	5.00		4	77
	P.M.	Enter	2.68				1	158
		Exit	2.90				1	158
		Total	5.92	7.00	5.56		3	77
Saturday Vehicle Trip Ends			71.09	79.44	39.44		3	77
Peak Hour of Generator		Enter	2.56				1	158
		Exit	2.96				1	158
		Total	5.35	5.51	3.88		2	88
Sunday Vehicle Trip Ends			86.14	89.74	54.44		2	88
Peak Hour of Generator		Enter	3.20				1	158
		Exit	3.02				1	158
		Total	6.15	6.22	5.56		2	88

Source Numbers 8, 11, 13, 40

ITE Technical Committee 6A-6—Trip Generation Rates

Date:

022—General Aviation Airport

Description: A general aviation airport is designed primarily for the use of small private and corporate aircraft, not for commercial passenger service. It is usually characterized by short runways, few or no terminal facilities and many small planes.

All general aviation airports surveyed were located within an SMSA, some in rural areas, some in suburban areas outside central business districts and others at locations not given. The airports ranged in size from 5 to 2,542 employees; 80 to 490 based aircraft; 150 to 990 flights per day; and from 70 to 973 acres.

Trip Characteristics: On the average, general aviation airports were found to generate 6.5 weekday vehicle trip ends per employee and 3.1 weekday vehicle trip ends per total flights per day. See the summary tables for peak hour and Saturday and Sunday trip generation rates.

Data Limitations: These rates are based on a small number of data observations, and variability within this limited data is considerable. For instance, the six observations of average weekday vehicle trip ends per airport employee ranged from 3.2 to 122.0.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Gen. Aviation Airport ITE Land Use Code 022

Independent Variable—Trips per Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			6.51	122.00	3.16		6	478
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	12.86				1	7
		Exit	12.86				1	7
		Total	25.72				1	7
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	22.86				1	7
Peak Hour of Generator	A.M.	Enter	0.24	0.39	0.23		2	1341
		Exit	0.07	0.39	0.05		2	1341
		Total	0.37	1.38	0.29		4	713
	P.M.	Enter	0.15	14.29	0.09		3	896
		Exit	0.25	14.29	0.20		3	896
		Total	0.48	28.57	0.29		5	572
Saturday Vehicle Trip Ends			2.52	23.09	1.59		4	713
Peak Hour of Generator		Enter	0.07	0.57	0.04		2	1341
		Exit	0.11	0.37	0.09		2	1341
		Total	0.24	2.64	0.14		4	713
Sunday Vehicle Trip Ends			2.51	128.80	1.13		5	572
Peak Hour of Generator		Enter	0.10	14.00	0.04		3	896
		Exit	0.13	12.00	0.07		3	896
		Total	0.25	3.54	0.11		4	713

Source Numbers 8, 9, 12, 13

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Gen. Aviation Airport ITE Land Use Code 022

Independent Variable—Trips per Ave. Flights/Day

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.06	10.28	0.96		10	689
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.18				1	493
		Exit	0.18				1	493
		Total	0.36				1	493
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.32				1	493
Peak Hour of Generator	A.M.	Enter	0.47	0.75	0.09		2	684
		Exit	0.14	0.18	0.09		2	684
		Total	0.45	0.93	0.09		4	594
	P.M.	Enter	0.22	0.29	0.13		3	620
		Exit	0.36	0.64	0.11		3	620
		Total	0.48	0.93	0.17		5	574
Saturday Vehicle Trip Ends			3.03	5.15	1.69		4	594
Peak Hour of Generator		Enter	0.14	0.14	0.14		2	684
		Exit	0.21	0.30	0.09		2	684
		Total	0.29	0.44	0.19		4	594
Sunday Vehicle Trip Ends			2.38	3.66	1.02		5	602
Peak Hour of Generator		Enter	0.14	0.20	0.11		3	667
		Exit	0.17	0.24	0.09		3	667
		Total	0.31	0.37	0.22		4	594

Source Numbers 8, 9, 12, 13, 18

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

100—Industrial/Agricultural

Industrial

The categories of industrial activities surveyed include light industry, industrial parks, manufacturing and warehouses. Many of the categories overlap, for example, manufacturing and warehousing facilities often occupy the same building. Occasionally, there is a problem in distinguishing between comparable land uses such as light industrial and manufacturing. In cases where doubt exists as to the exact category of industrial use, it is suggested that the following composite rates of average weekday trip ends be used:

Measure	*Average Weekday Trip Ends*
Per employee	3.0
Per 1,000 gross square feet of floor area	5.43
Per acre	59.9

The following tables summarize composite trip generation rates for all industrial categories from the data assembled to date.

Nearly all of the more than 80 cases analyzed were on the East and West Coasts of the United States. Additional data from noncoastal states are needed to verify the accuracy of the information acquired up to this time.

Little data were found with regard to weekend trip generation for industrial facilities. Except in unusual circumstances, however, it may be assumed that weekend trips to and from industrial areas will be nominal in comparison with weekday rates.

Finally, substantially more information is needed with regard to traffic movements during shift changes at industrial facilities operated around the clock. While the trip rates described herein refer to peak directional movements, the transportation planner should be cognizant of potential opposing traffic as well as the need for surplus parking space during shift overlap.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Industrial — ITE Land Use Code: 100

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.0	15.7	1.4		96	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.49	2.1	0.2		66	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.57	8.6	0.2		63	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.55	9.0	0.2		85	
	P.M.	Enter						
		Exit						
		Total	0.48	2.2	0.2		85	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers:

ITE Technical Committee 6A-6—Trip Generation Rates

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SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Industrial — ITE Land Use Code: 100

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.43	52.0	0.5		98	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.85	8.7	0.10		66	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	1.05	15.2	0.09		63	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.97	15.9	0.1		85	
	P.M.	Enter						
		Exit						
		Total	0.84	7.8	0.09		85	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers

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SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Industrial — ITE Land Use Code: 100

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			59.9	441.2	3.5		87	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	9.3	124.0	0.5		66	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	12.0	148.0	0.6		62	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	11.5	124.0	0.5		84	
	P.M.	Enter						
		Exit						
		Total	10.0	148.0	0.6		84	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers:

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Date: 1975

110—General Light Industrial

Description: Light industrial facilities usually employ less than 500 persons with an emphasis on other than manufacturing. Nevertheless, the distinction between light industrial and manufacturing (Category 140) land uses is sometimes vague. Light industries typical of those included in this category are printing plants, material testing laboratories, assemblers of data processing equipment and power stations.

All of the light industries surveyed were free-standing facilities devoted to one use. The number of employees ranged from 76 to 413 with an average of 202. Average gross floor space per employee was 587 square feet—or 1.7 employees per 1,000 square feet of floor space. The employee density per acre of developed land was 16.4. Buildings ranged in size from 21,000 to 328,000 square feet.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all measurable variables was made to determine the best variable for use in predicting vehicle trip ends. From the data assembled to date, number of employees and gross square feet of floor area have been found to have the highest correlation with average weekday vehicle trip ends, as shown in the table.

Since parking spaces are usually determined by the size of the building, it is recommended that parking spaces should not be used as a predictive independent variable for calculating average weekday vehicle trip ends.

On the average, light industrial facilities generate 3.2 weekday vehicle trip ends per employee and 5.46 vehicle trip ends per 1,000 gross square feet of floor area. See the following table for daily and peak hour trip generation rates.

Light industrial facilities usually generate trips at the same time as adjacent street traffic (7 to 9 A.M. and 4 to 6 P.M.), as indicated on the following tables.

Data Limitations: No data were available on vehicle occupancy for trips to and from light industrial areas. The average was approximately 1.3 persons per vehicle for all industrial uses.

More information is needed concerning peak period directional distribution of traffic during shift changes as well as vehicle occupancy.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Light Industry.

Independent Variables	*Correlation Coefficient (R)*
Employees	0.804
1,000 Gross Square Feet	0.650
Acres	−0.067
Parking Spaces	.736

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Gen. Light Industrial ITE Land Use Code 110

Independent Variable—Trips per Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.20	4.48	1.52		13	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.67	1.02	0.39		10	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.65	0.95	0.43		8	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.67	1.01	0.39		12	
	P.M.	Enter						
		Exit						
		Total	0.67	0.95	0.37		12	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 7, 9, 10, 11, 15, 17

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type General Light Industrial ITE Land Use Code 110

Independent Variable—Trips per 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.46	16.88	1.58		13	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	1.11	2.75	0.49		10	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	1.18	2.86	0.40		8	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	1.12	2.75	0.49		12	
	P.M.	Enter						
		Exit						
		Total	1.13	2.86	0.40		12	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 11, 9, 7, 10, 15, 17

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type General Light Industrial ITE Land Use Code 110

Independent Variable—Trips per Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			52.4	159.4	5.2		13	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	11.4	34.4	1.6		10	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	10.1	28.0	1.3		8	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	11.3	34.4	1.6		12	
	P.M.	Enter						
		Exit						
		Total	11.4	31.2	1.3		12	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 7, 9, 10, 11, 15, 17

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

130—Industrial Park

Description: Industrial parks are areas containing a number of industrial or related facilities. They are characterized by a mix of manufacturing, service and warehouse facilities with a wide variation in the proportion of each type of use from one location to another. Many industrial parks contain highly diversified facilities—some with a large number of small businesses and others with one or two dominant industries.

The number of employees in industrial parks surveyed ranged from 88 to 2,200 with an average of 803. Gross square feet of floor area per employee averaged 481, or about 2.1 employees per 1,000 gross square feet of building area, and 19 employees per acre of developed land. Size of the industrial parks surveyed ranged from 1.6 to 115 acres with an average of approximately 45 acres.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all measurable variables was made to determine the best variable for use in predicting vehicle trip ends. From the data assembled to date, number of employees has been found to have the highest correlation with average weekday vehicle trip ends. Gross square feet of floor area and total area occupied by the industrial park showed less correlation with average weekday trip ends, as shown in the table.

Since parking spaces are usually determined on the basis of the building size, it is recommended that parking not be used as a predictive variable for calculating trip ends.

On the average, industrial parks generate 4.1 weekday vehicle trip ends per employee. See the following tables for daily and peak hour trip generation rates.

Industrial parks generate trips usually at the same time as the adjacent street traffic (7 to 9 A.M. and 4 to 6 P.M.), as indicated on the table.

Data Limitations: Caution should be exercised when using average trip generation rates found for industrial parks. The data showed wide inconsistencies (average weekday vehicle trip ends ranged from 1.9 to 7.2 per employee), believed to be due to differences in the mix of activities from one park to another.

It is recommended that traffic generation of industrial parks be forecast using rates for each type and amount of activity, i.e., manufacturing, office, warehouse, light industrial, etc. The combined result of these calculations should give a more realistic rate than the average indicated herein. It is not believed that additional data sources will improve validity of an average rate for all industrial parks.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Industrial Parks.

Independent Variables	*Correlation Coefficient (R)*
Employees	0.793
1,000 Gross Square Feet	0.543
Acres	0.579
Parking Spaces	0.779

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Industrial Park — ITE Land Use Code: 130

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			4.14	7.16	1.90		21	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.57	1.13	0.29		13	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.61	1.36	0.27		12	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.57	1.13	0.29		15	
	P.M.	Enter						
		Exit						
		Total	0.61	1.36	0.27		15	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 7, 10, 14, 68, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Industrial Park — ITE Land Use Code: 130

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			8.34	36.9	2.1		23	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.99	2.28	0.31		13	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	1.21	2.85	0.30		12	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.99	2.28	0.14		15	
	P.M.	Enter						
		Exit						
		Total	1.05	2.95	0.30		15	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 7, 10, 14, 68, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Industrial Park — ITE Land Use Code: 130

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			68.1	441.2	24.3		17	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	9.4	41.2	3.4		13	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	10.2	59.4	3.2		12	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	9.8	48.7	3.4		15	
	P.M.	Enter						
		Exit						
		Total	10.4	59.4	3.2		15	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 7, 10, 14, 68, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

140—Manufacturing

Description: Manufacturing facilities are places where the primary activity is the conversion of raw materials or parts into finished products. Size and type of activity may vary substantially from one facility to another. In addition to actual production of goods, manufacturing facilities generally also have office, warehouse, research and associated functions.

Manufacturing facilities surveyed ranged from 17,000 to 2,200,000 gross square feet of floor area. The number of employees ranged from 34 to 5,170. Average floor space per employee was 529 square feet, or 1.9 employees per 1,000 gross square feet of floor area, and 25.2 employees per acre of developed land.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all measured variables was made to determine the best variable to use for predicting vehicle trip ends. From the data assembled to date, number of employees and gross square feet of building area have been found to have the highest correlation with average weekday vehicle trip ends. Parking spaces also indicate a high correlation with trips but are usually developed upon the size of building. Therefore, it is believed that parking spaces should not be used as a predictive independent variable for average weekday vehicle trip ends.

On the average, manufacturing facilities generate 2.2 weekday vehicle trip ends per employee and 4.1 weekday vehicle trip ends per 1,000 gross square feet of building area. See the following tables for daily and peak hour trip generation rates.

Manufacturing facilities-generated trips usually peak at the same time as the adjacent street traffic (7 to 9 A.M. and 4 to 6 P.M.), as indicated on the following tables.

The regression equations developed for calculating the average weekday vehicle trip ends (AWDVTE) are as follows:

AWDVTE = 341 + 1.72 × Employees R = 0.973

= 80 + 3.90 × 1,000 G.S.F. R = 0.940

Data Limitations: More information is needed concerning directional and traffic movements during shift changes at manufacturing facilities.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Manufacturing.

Independent Variables	*Correlation Coefficient (R)*
Employees	0.973
1,000 Gross Square Feet	0.940
Acres	0.613
Parking Spaces	0.959

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Manufacturing — ITE Land Use Code: 140

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			2.17	6.66	1.39		46	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.44	0.94	0.20		32	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.39	0.89	0.24		30	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.41	0.94	0.20		42	
	P.M.	Enter						
		Exit						
		Total	0.39	1.11	0.24		42	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 7, 10, 15, 17, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Manufacturing — ITE Land Use Code: 140

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			4.10	52.0	0.5		46	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.83	8.75	0.1		32	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.81	7.85	0.1		30	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.79	8.75	0.1		42	
	P.M.	Enter						
		Exit						
		Total	0.76	7.85	0.1		42	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 7, 10, 15, 17, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Manufacturing — ITE Land Use Code: 140

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			53.6	396.0	3.5		42	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	9.4	124.0	0.5		32	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	11.2	148.0	0.6		30	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	10.3	124.0	0.5		42	
	P.M.	Enter						
		Exit						
		Total	9.7	148.0	0.6		42	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 7, 10, 15, 17, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

150—Warehousing

Description: Warehouses are facilities which are all or largely devoted to storage of materials. They may also include office and maintenance areas, but the primary function is storage.

The warehouses surveyed ranged in size from 33,000 to 2,230,000 gross square feet of floor area. The number of employees per facility varied from 12 to 2,594 with an average of 332. Average floor area per employee was 843 square feet, or about 1.2 employees per 1,000 gross square feet, and 14.6 employees per acre.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all measured variables was made to determine the best variables to use for predicting vehicle trip ends. From the data assembled to date, number of employees, gross floor area, parking spaces and size of the site in acres were found to have the highest correlation with average weekday vehicle trip ends. Although the correlation coefficient of average weekday vehicle trip ends per acre of site or parking spaces was high, it is believed that this is a coincidental relationship. Differences in building height and site coverage from one location to another may vary substantially. Also, parking spaces are usually based on the size of the building. It is suggested, therefore, that the number of employees and gross floor area of the facility be accepted as the primary variable for estimating trip generation of warehousing facilities.

Warehousing facilities generate 4.3 average weekday vehicle trip ends per employee or 50 average weekday vehicle trip ends per 1,000 gross square feet of building area. See the following tables for daily and peak hour trip generation rates.

Trips generated by warehouse facilities generally did not peak at the same time as the adjacent street traffic during the A.M. peak hour. The average trip rate during the peak hour of adjacent street traffic was on the order of one-half to one-third of the volume during the A.M. peak hour of traffic entering and leaving the warehouse facilities as indicated on the following tables.

The regression equations developed for calculating the average weekday vehicle trip ends (AWDVTE) are as follows:

AWDVTE = 362 + 3.18 × Employees R = 0.939

= 374 + 3.68 × 1,000 G.S.F. R = 0.907

Data Limitations: The trip generation rates presented are based on a relatively small sample (14 studies) of warehousing facilities. More information is needed to confirm the validity of these rates and add to the peak hour data.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Warehouses.

Independent Variables	*Correlation Coefficient (R)*
Employees	0.939
1,000 Gross Square Feet	0.907
Acres	0.963
Parking Spaces	0.999

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Warehousing — ITE Land Use Code: 150

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			4.26	15.71	2.94		14	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.48	2.14	0.37		10	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	1.37	8.64	0.37		12	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	1.37	9.04	0.37		14	
	P.M.	Enter						
		Exit						
		Total	0.59	2.22	0.37		14	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 6, 7, 12, 13, 15, 17, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Warehousing — ITE Land Use Code: 150

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.01	17.0	1.51		14	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.58	1.41	0.33		10	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	1.63	1.52	0.35		12	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	1.61	1.59	0.28		14	
	P.M.	Enter						
		Exit						
		Total	1.63	1.52	0.35		12	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 6, 7, 12, 13, 15, 17, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Warehousing — ITE Land Use Code: 150

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			62.0	256.0	42.5		13	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	9.8	32.8	5.1		10	
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	20.2	33.0	6.5		11	
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	20.0	39.8	5.1		13	
	P.M.	Enter						
		Exit						
		Total	8.4	29.4	3.8		13	
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 6, 7, 12, 13, 15, 17, 74

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

200—Residential

This section summarizes trip generation for all types of residential dwellings. Each category of residential housing, particularly single-family detached housing and apartments, used data from a wide range of units with varying sizes, price ranges, locations and ages. Consequently, there could be as wide a variation in trips generated within each category as there is between different categories. As expected, dwelling units that were larger in size, more expensive or farther away from the central business districts had a higher trip generation rate per unit than those smaller in size, less expensive or closer to the CBD. However, other factors such as geographic location in the country and type of adjacent and nearby development also had an effect on the generation rate. Thus, only the above general statement (instead of some linear relationship) concerning size, cost and location of dwelling unit and the income of the occupant could be made.

As expected, the single-family detached unit has the highest generation rate per unit of all residential uses. This is followed by apartments, with retirement communities having the lowest rate. The rate for planned unit developments, which has a mix of single-family, detached units and apartments, is in between these two types. Single-family detached units have the highest rate because: 1) They are the largest units in size and have more people and more vehicles per unit than any other types; 2) they are generally located farther away from shopping centers, employment areas and other attractors than are other types; and 3) they have fewer alternate modes available because they are not as concentrated as other types of units.

Summary of Rate Tables of the Different Types of Dwelling Units.

Type of Dwelling Unit	*Average Weekday Vehicle Trip Ends per Unit*		
	Average	Maximum	Minimum
210 Single-Family Detached Unit	10.0	21.9	4.3
220 Apartment, General	6.1	12.3	0.5
221 Low-Rise Apartment	5.4	5.5	4.7
222 High-Rise Apartment	4.3	6.4	3.1
230 Condominium	5.6	5.6	5.6
240 Mobile Home	5.4	6.8	2.8
250 Retirement Community	3.3	4.9	2.8
270 Planned Unit Development	7.9	10.0	6.2

210—Single-Family Detached Housing

Description: Any single-family detached home on an individual lot is included in this category. A typical example is a home in a modern subdivision.

Slightly over 200 different studies were made of subdivisions containing single-family homes. The average size subdivision contained 506 dwelling units for a total of more than 105,000 dwellings studied. These subdivisions were located primarily in suburban areas throughout the United States.

The average development density was 3.5 units per acre with 3.7 persons per unit. The average automobile ownership measured was 1.6 vehicles per unit.

Trip Characteristics: The analysis of correlation between average weekday vehicle trip ends and all measured independent variables is shown in the table.

Although the number of vehicles and number of residents have the highest correlations with average weekday trip ends, these variables have limited use. This is because: 1) The number of vehicles and residents is difficult to obtain and very few of the studies contained these data; and 2) these data are also difficult to predict. The number of units has a high correlation with average weekday vehicle trip ends. This variable is best used because it is contained in most studies, it is easy to project and convenient to use.

As indicated on the following tables, single-family dwellings generate on the average 10 vehicle trip ends per weekday per dwelling unit. Saturday vehicle trip generation is only slightly higher, and Sunday is lower.

The regression equations developed for calculating the average weekday vehicle trip ends (AWDVTE) are as follows:

$$\text{AWDVTE} = 138 + 8.17 \times \text{Units} \qquad R = 0.937$$

$$= -100 + 2.55 \times \text{Persons} \qquad R = 0.995$$

$$= -185 + 6.76 \times \text{Vehicles} \qquad R = 0.999$$

Data Limitations: Some of the data are from studies conducted in the late 1960s and therefore should be updated. Additional data concerning auto occupancy and other modes of transportation are necessary.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Single Family Detached Houses.

Independent Variables	*Correlation Coefficient (R)*
Persons	0.995
Number of Units	0.937
Number of Vehicles Owned	0.999
Units per Acre	0.431
Acres	0.339

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Single Family Housing — ITE Land Use Code: 210

Independent Variable—Trips per: Person

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			2.5	4.8	1.2		107	1890
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.1				25	
		Exit	0.2				26	
		Total	0.2				95	
	P.M. Between 4 and 6	Enter	0.2				26	
		Exit	0.1				26	
		Total	0.3				94	
Peak Hour of Generator	A.M.	Enter	0.1				26	
		Exit	0.2				26	
		Total	0.2				97	
	P.M.	Enter	0.2				28	
		Exit	0.1				26	
		Total	0.3				96	
Saturday Vehicle Trip Ends			2.7				37	
Peak Hour of Generator		Enter	0.2				21	
		Exit	0.1				21	
		Total	0.3				31	
Sunday Vehicle Trip Ends			2.4				32	
Peak Hour of Generator		Enter	0.1				19	
		Exit	0.1				19	
		Total	0.3				30	

Source Numbers: 1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 24, 26, 34, 35, 36, 38, 40, 71, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10-1-75

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Single Family Housing ITE Land Use Code 210

Independent Variable—Trips per Vehicle

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			6.5	9.4	1.0		108	720
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.2				26	
		Exit	0.4				27	
		Total	0.5				96	
	P.M. Between 4 and 6	Enter	0.4				27	
		Exit	0.2				27	
		Total	0.7				95	
Peak Hour of Generator	A.M.	Enter	0.2				27	
		Exit	0.3				27	
		Total	0.5				98	
	P.M.	Enter	0.5				29	
		Exit	0.2				27	
		Total	0.7				97	
Saturday Vehicle Trip Ends			7.1				37	
Peak Hour of Generator		Enter	0.4				21	
		Exit	0.3				21	
		Total	0.8				31	
Sunday Vehicle Trip Ends			6.2				32	
Peak Hour of Generator		Enter	0.4				19	
		Exit	0.4				19	
		Total	0.8				30	

Source Numbers 1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 24, 26, 34, 35, 36, 38, 40, 71, 72

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Date: 10-1-74

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Single Family Detached Housing ITE Land Use Code 210

Independent Variable—Trips per Dwelling Unit

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			10.0	21.9	4.3		208	506
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.3	0.6	0.1		37	248
		Exit	0.6	1.7	0.2		38	258
		Total	0.8	2.3	0.4		173	269
	P.M. Between 4 and 6	Enter	0.7	1.8	0.3		38	245
		Exit	0.4	1.2	0.1		38	245
		Total	1.0	3.0	0.4		196	292
Peak Hour of Generator	A.M.	Enter	0.3	0.6	0.1		38	245
		Exit	0.6	1.7	0.2		38	245
		Total	0.8	2.3	0.4		175	271
	P.M.	Enter	0.7	1.8	0.3		40	252
		Exit	0.4	1.2	0.1		38	245
		Total	1.0	3.0	0.4		193	261
Saturday Vehicle Trip Ends			10.1	14.7	6.3		43	292
Peak Hour of Generator		Enter	0.5	1.0	0.4		21	273
		Exit	0.5	0.7	0.3		21	273
		Total	1.0	1.7	0.7		35	296
Sunday Vehicle Trip Ends			8.8	11.7	0.5		38	301
Peak Hour of Generator		Enter	0.5	0.8	0.3		19	252
		Exit	0.5	1.2	0.4		19	252
		Total	1.0	2.0	0.7		34	284

Source Numbers 1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 24, 26, 34, 35, 36, 38, 40, 71, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 6-4-75

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Single Family Housing — ITE Land Use Code: 210

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			25.7				115	95
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.7				25	
		Exit	1.6				26	
		Total	2.1				108	
	P.M. Between 4 and 6	Enter	1.9				26	
		Exit	1.1				26	
		Total	2.7				107	
Peak Hour of Generator	A.M.	Enter	0.7				26	
		Exit	1.5				26	
		Total	2.1				110	
	P.M.	Enter	2.1				28	
		Exit	1.1				26	
		Total	2.7				109	
Saturday Vehicle Trip Ends			29.9				37	
Peak Hour of Generator		Enter	1.5				21	
		Exit	1.3				21	
		Total	2.9				29	
Sunday Vehicle Trip Ends			24.9				32	
Peak Hour of Generator		Enter	1.2				19	
		Exit	1.2				19	
		Total	2.9				27	

Source Numbers: 1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 24, 26, 34, 35, 36, 38, 40, 71, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10-1-75

220—Apartment

Apartments in this analysis include both low-rise or "walk-ups" and high-rise multifamily dwellings. Included in this category were all the studies that did not specify the type (height) of apartment studied. An apartment is defined as a rental dwelling unit that is located within the same building as at least one other dwelling unit. Examples of this category are duplexes, fourplexes and all types of apartment buildings.

Data were provided from 113 different studies of apartments having an average size of 279 units. The average development density was 21.7 units per acre with 2.1 persons per unit. The average automobile ownership was measured at 1.3 vehicles per unit.

Trip Characteristics: The measured correlation coefficients are shown in the table.

The average weekday vehicle trip generation was measured at 6.1 trip ends per apartment unit. As with single-family dwellings, Saturday generation is slightly higher and Sunday slightly lower. See the following tables.

The regression equations developed for estimating average weekday vehicle trip ends (AWDVTE) are as follows:

$$AWDVTE = 80 + 5.84 \times Units \qquad R = 0.962$$

$$= 258 + 243 = Persons \qquad R = 0.975$$

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Apartments.

Independent Variables	*Correlation Coefficient (R)*
Persons	0.975
Number of Vehicles	0.963
Number of Units	0.962
Acres	0.425
Units per Acre	0.129

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Apartment — ITE Land Use Code: 220

Independent Variable—Trips per: Person

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			2.8	5.8	1.2		70	632
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.1				1	
		Exit	0.2				1	
		Total	0.3				35	
	P.M. Between 4 and 6	Enter	0.2				1	
		Exit	0.1				1	
		Total	0.4				49	
Peak Hour of Generator	A.M.	Enter	0.1				1	
		Exit	0.2				1	
		Total	0.3				35	
	P.M.	Enter	0.2				1	
		Exit	0.1				1	
		Total	0.4				50	
Saturday Vehicle Trip Ends			3.1				20	
Peak Hour of Generator		Enter						
		Exit						
		Total	0.3				20	
Sunday Vehicle Trip Ends			2.8				18	
Peak Hour of Generator		Enter						
		Exit						
		Total	0.3				18	

Source Numbers: 2, 4, 5, 6, 9, 10, 11, 12, 13, 14, 16, 19, 20, 24, 34, 35, 40, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10-1-75

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Apartment — ITE Land Use Code: 220

Independent Variable—Trips per: Vehicle

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.1	8.6	2.9		63	360
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.1				1	
		Exit	0.2				1	
		Total	0.3				29	
	P.M. Between 4 and 6	Enter	0.2				1	
		Exit	0.1				1	
		Total	0.4				42	
Peak Hour of Generator	A.M.	Enter	0.1				1	
		Exit	0.2				1	
		Total	0.3				29	
	P.M.	Enter	0.2				1	
		Exit	0.1				1	
		Total	0.4				43	
Saturday Vehicle Trip Ends			3.1				15	
Peak Hour of Generator		Enter						
		Exit						
		Total	0.3				15	
Sunday Vehicle Trip Ends			2.8				13	
Peak Hour of Generator		Enter						
		Exit						
		Total	0.3					

Source Numbers: 2, 4, 5, 6, 9, 11, 12, 13, 14, 16, 19, 20, 24, 34, 35, 40, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10-1-75

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Apartment — ITE Land Use Code: 220

Independent Variable—Trips per: Dwelling Unit

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			6.1	12.3	0.5		98	279
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.1	0.1	0.0		17	260
		Exit	0.4	0.6	0.2		17	260
		Total	0.6	1.0	0.1		68	217
	P.M. Between 4 and 6	Enter	0.4	0.8	0.2		20	266
		Exit	0.2	0.5	0.1		20	266
		Total	0.7	1.6	0.1		86	218
Peak Hour of Generator	A.M.	Enter	0.1	0.1	0.0		17	260
		Exit	0.4	0.6	0.2		17	260
		Total	0.6	1.0	0.1		68	217
	P.M.	Enter	0.4	0.8	0.2		20	266
		Exit	0.2	0.5	0.1		20	266
		Total	0.7	1.6	0.1		87	220
Saturday Vehicle Trip Ends			6.5	8.4	2.8		20	157
Peak Hour of Generator		Enter						
		Exit						
		Total	0.5				20	157
Sunday Vehicle Trip Ends			5.9	7.5	2.4		18	166
Peak Hour of Generator		Enter						
		Exit						
		Total	0.5				18	166

Source Numbers: 2, 4, 5, 6, 9, 10, 11, 12, 13, 14, 16, 19, 20, 24, 34, 35, 40, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 6-4-75

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Apartment — ITE Land Use Code: 220

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			22.2				59	66
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit	0.1				1	
		Total	1.2				34	
	P.M. Between 4 and 6	Enter	0.1				1	
		Exit	0.1				1	
		Total	2.2				46	
Peak Hour of Generator	A.M.	Enter						
		Exit	0.1				1	
		Total	1.2				34	
	P.M.	Enter	0.1				1	
		Exit	0.1				1	
		Total	2.2				47	
Saturday Vehicle Trip Ends			84.4				17	
Peak Hour of Generator		Enter						
		Exit						
		Total	7.0				17	
Sunday Vehicle Trip Ends			74.8				15	
Peak Hour of Generator		Enter						
		Exit						
		Total	6.9				15	

Source Numbers: 2, 4, 5, 6, 9, 11, 12, 13, 14, 16, 19, 20, 24, 34, 35, 40, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10-1-75

221—Low-Rise Apartment

This category includes apartments in buildings that are only one or two levels (floors). An example of this is garden apartments or suburban apartments. Only three studies contained data on low-rise apartments. See the following tables for the measured trip generation data.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Low Rise Apartment — ITE Land Use Code: 221

Independent Variable—Trips per: Dwelling Unit

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.4	5.5	4.7		3	295
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.1				1	372
		Exit	0.4				1	372
		Total	0.5	0.5	0.4		2	257
	P.M. Between 4 and 6	Enter	0.4				1	372
		Exit	0.2				1	372
		Total	0.6	0.6	0.6		2	257
Peak Hour of Generator	A.M.	Enter	0.1				1	372
		Exit	0.4				1	372
		Total	0.5	0.5	0.4		2	257
	P.M.	Enter	0.4				1	372
		Exit	0.2				1	372
		Total	0.6	0.6	0.6		2	257
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 11, 21, 71

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Date:

222—High-Rise Apartment

High-rise apartments are in buildings three or more levels high. Only two studies contained trip generation data, as summarized on the following tables.

Data Limitations: More data for both daily and peak hours are needed to differentiate between high- and low-rise apartment trip generation.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: High Rise Apartment — ITE Land Use Code: 222

Independent Variable—Trips per: Dwelling Unit

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			4.3	6.4	3.1		2	434
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.3	0.3	0.2		2	434
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.3	0.4	0.3		2	434
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.3	0.4	0.3		2	434
	P.M.	Enter						
		Exit						
		Total	0.5	0.5	0.5		1	308
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 35, 38

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Date:

230—Condominium

Condominiums are defined as single-family ownership units that have at least one other single-family owned unit within the same building structure. Both condominiums and townhouses are included in this category.

Only one study, in New England, contained vehicle trip generation for condominiums. More data are necessary to form a reliable set of rates or equations for estimating vehicle trip generation for condominiums. From the one study, it appears that condominiums may have similar trip generation characteristics as apartments (220).

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Condominium — ITE Land Use Code: 230

Independent Variable—Trips per: Dwelling Unit

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.6	5.6	5.6		1	37
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.1				1	37
		Exit	0.3				1	37
		Total	0.4				1	37
	P.M. Between 4 and 6	Enter	0.3				1	37
		Exit	0.1				1	37
		Total	0.4				1	37
Peak Hour of Generator	A.M.	Enter	0.1				1	37
		Exit	0.3				1	37
		Total	0.4				1	37
	P.M.	Enter	0.3				1	37
		Exit	0.1				1	37
		Total	0.4				1	37
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 4

ITE Technical Committee 6A-6—Trip Generation Rates

Date:

240—Mobile Home

Description: Mobile home parks generally consist of trailers shipped, sited and installed on permanent foundations. Typically, they have community facilities such as recreation rooms, swimming pools and laundry facilities. Many such parks restrict occupancy to adults.

Seventeen mobile home parks located in suburban or rural portions of the San Francisco Bay Area are included in this study.[9,10,11] The parks vary in size from 20 to 328 units, the average being 176. The development density ranges from 4 to 16 units per acre, the average being 10. Due to the large number of sites which prohibit children, the number of persons per unit is low, ranging from 1.4 to 3.5, with an average of 2.1. However, auto ownership is high, ranging from 1.1 to 2.0 autos per unit, with an average of 1.5.

Trip Characteristics: An analysis of the correlation between average weekday vehicle trip ends and all measured independent variables revealed that the best variable to use to predict trip ends is occupied dwelling units as shown in the table.

Mobile homes generated 5.38 average weekday trip ends per occupied dwelling unit; 3.39 vehicle trip ends for each automobile owned; and 2.50 vehicle trip ends per person. Saturday trip ends were slightly higher than average weekday rates; however, Sunday rates were generally lower. See the following tables for trip generation rates.

The regression equations developed for calculating the average weekday vehicle trip ends (AWDVTE) are as follows:

$$AWDVTE = 279 + 1.77 \times Persons \quad R = 0.869$$

$$= 125 + 2.9 \times Vehicles \quad R = 0.946$$

Peak hour traffic generation for mobile homes coincided with the peak hour flow on the adjacent streets. Generally, the afternoon peak hour for the site was slightly higher than the morning peak.

Data Limitations: The data presented in this report do not include modes other than auto driver. There was no information on the availability of transit service. Since all of the mobile home parks were located in California, it is inappropriate to apply these trip rates universally, although these data may eventually be found applicable throughout the United States and Canada. These data combined adult mobile home parks with family mobile home parks. Additional analyses are necessary to differentiate between the two types of mobile home parks.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Mobile Home Parks.

Independent Variables	*Correlation Coefficient (R)*
Occupied Dwelling Unit	0.962
Persons	0.869
Vehicles	0.946

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Mobile Home — ITE Land Use Code: 240

Independent Variable—Trips per: Person

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			2.50	3.6	1.6		17	378
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.04	0.1	0.0		4	499
		Exit	0.15	0.3	0.1		5	599
		Total	0.21	0.6	0.1		10	379
	P.M. Between 4 and 6	Enter	0.16	0.3	0.1		8	460
		Exit	0.09	0.1	0.0		8	460
		Total	0.27	0.4	0.2		15	391
Peak Hour of Generator	A.M.	Enter	0.05	0.2	0.0		9	432
		Exit	0.15	0.3	0.1		9	432
		Total	0.21	0.6	0.1		17	378
	P.M.	Enter	0.16	0.3	0.1		9	432
		Exit	0.10	0.2	0.1		9	432
		Total	0.28	0.5	0.2		17	378
Saturday Vehicle Trip Ends			2.52	3.9	1.6		14	382
Peak Hour of Generator		Enter	0.12	0.3	0.1		8	420
		Exit	0.10	0.2	0.1		8	420
		Total	0.24	0.4	0.1		14	382
Sunday Vehicle Trip Ends			2.17	3.2	1.1		15	392
Peak Hour of Generator		Enter	0.11	0.2	0.1		9	432
		Exit	0.10	0.3	0.1		9	432
		Total	0.22	0.5	0.1		15	392

Source Numbers: 9, 10, 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Mobile Home — ITE Land Use Code: 240

Independent Variable—Trips per: Vehicle

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.39	4.8	1.9		17	280
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.05	0.1	0.0		4	369
		Exit	0.22	0.3	0.1		5	415
		Total	0.27	0.7	0.1		10	296
	P.M. Between 4 and 6	Enter	0.22	0.3	0.1		8	324
		Exit	0.13	0.2	0.1		8	324
		Total	0.36	0.7	0.3		15	287
Peak Hour of Generator	A.M.	Enter	0.07	0.2	0.0		9	310
		Exit	0.22	0.3	0.1		9	310
		Total	0.28	0.7	0.1		17	280
	P.M.	Enter	0.23	0.3	0.1		9	310
		Exit	0.14	0.2	0.1		9	310
		Total	0.37	0.7	0.3		17	280
Saturday Vehicle Trip Ends			3.43	4.6	2.1		14	280
Peak Hour of Generator		Enter	0.17	0.3	0.1		8	296
		Exit	0.15	0.2	0.1		8	296
		Total	0.32	0.5	0.2		14	280
Sunday Vehicle Trip Ends			2.94	4.1	1.4		15	289
Peak Hour of Generator		Enter	0.15	0.2	0.1		9	310
		Exit	0.14	0.4	0.1		9	310
		Total	0.29	0.6	0.2		15	289

Source Numbers: 9, 10, 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Mobile Home — ITE Land Use Code: 240

Independent Variable—Trips per: Unit (Occupied)

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.38	6.8	2.8		17	176
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.08	0.1	0.0		4	218
		Exit	0.38	0.4	0.3		5	240
		Total	0.46	1.0	0.2		10	177
	P.M. Between 4 and 6	Enter	0.37	0.6	0.3		8	197
		Exit	0.22	0.3	0.1		8	197
		Total	0.59	0.8	0.5		15	178
Peak Hour of Generator	A.M.	Enter	0.12	0.3	0.0		9	192
		Exit	0.35	0.4	0.2		9	192
		Total	0.44	1.0	0.3		17	176
	P.M.	Enter	0.37	0.6	0.3		9	192
		Exit	0.22	0.3	0.1		9	192
		Total	0.59	0.8	0.5		17	176
Saturday Vehicle Trip Ends			5.53	7.3	3.0		14	174
Peak Hour of Generator		Enter	0.28	0.5	0.2		8	181
		Exit	0.24	0.3	0.2		8	181
		Total	0.52	0.8	0.4		14	174
Sunday Vehicle Trip Ends			4.71	6.5	2.0		15	181
Peak Hour of Generator		Enter	0.24	0.3	0.2		9	192
		Exit	0.23	0.6	0.1		9	192
		Total	0.47	1.0	0.3		15	181

Source Numbers: 9, 10, 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

250—Retirement Community

Retirement communities—restricted to adults or senior citizens—contain residential units similar to apartments or condominiums and are usually self-contained villages. They may also contain special services such as medical services, dining facilities and some limited supporting retail.

Only five studies conducted in the San Francisco Bay Area contained trip generation for these communities. The average weekday vehicle trip generation rate measured entering and leaving the communities was 3.3 vehicle trip ends per dwelling unit. See the following table of rates.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Retirement Community — ITE Land Use Code: 250

Independent Variable—Trips per: Dwelling Unit

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.3	4.9	2.8		5	834
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.4	0.6	0.2		5	834
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.4	1.0	0.3		5	834
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.4	0.6	0.2		5	834
	P.M.	Enter						
		Exit						
		Total	0.4	1.1	0.3		5	834
Saturday Vehicle Trip Ends			2.6	3.6	2.1		5	834
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			2.5	3.4	2.2		5	834
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 8, 10

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

270—Planned Unit Development (Residential)

Planned unit developments are defined in this analysis as developments containing any combination of the previously described residential units. They could also contain some supporting services such as limited retail and recreational facilities. (In this case, it is a residential development versus a commercial development, which could also be a planned unit development.)

Trip Characteristics: Six different studies contained trip generation data for residential planned unit developments. The average size development contained 389 dwelling units. The average weekday vehicle trip generation rate was measured at 7.9 vehicle trip ends per dwelling unit. As indicated on the following tables, Saturday generation is slightly higher than the weekday and Sunday is slightly lower.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Planned Unit Development — ITE Land Use Code: 270

Independent Variable—Trips per: Dwelling Unit

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			7.9	10.0	6.2		6	389
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.5	0.9	0.2		3	222
		Exit	0.5	1.0	0.3		3	222
		Total	0.8	1.9	0.6		5	390
	P.M. Between 4 and 6	Enter	0.5	1.0	0.2		3	222
		Exit	0.4	1.2	0.2		3	222
		Total	0.8	1.8	0.6		5	390
Peak Hour of Generator	A.M.	Enter	0.5	0.9	0.2		3	222
		Exit	0.5	1.0	0.3		3	222
		Total	0.8	1.9	0.6		5	390
	P.M.	Enter	0.5	1.0	0.2		3	222
		Exit	0.4	1.2	0.2		3	222
		Total	0.8	1.8	0.6		5	390
Saturday Vehicle Trip Ends			8.0	9.9	6.3		2	209
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			7.0	8.3	5.8		2	209
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 6, 11, 13, 16, 26

ITE Technical Committee 6A-6—Trip Generation Rates

Date:

300—Lodging

Lodging has been categorized for trip generation purposes into the following three groups:

310 Hotel

320 Motel

330 Resort Hotel.

From the data obtained to date, the average weekday vehicle trip end generation rate is very similar for each category when related to occupied rooms or number of employees.

The correlation between average weekday vehicle trip ends and the independent variables for all lodging combined is shown on the table.

The regression equation developed for all lodging for calculating average weekday vehicle trip ends (AWDVTE) is as follows:

AWDVTE = −46 + 10.5 × Number of Occupied Rooms R = 0.968

The following is a more detailed discussion of each type of lodging vehicle trip generation.

Correlation Between Average Weekday Trip Ends and the Independent Variables for All Lodging.

Independent Variables	*Correlation Coefficient (R)*
Employees	0.909
Total Rooms	0.766
Occupied Rooms	0.968

310—Hotel

Description: A hotel is defined, for the purposes of trip generation, as a place of lodging providing sleeping accommodations, restaurants, cocktail lounges, meeting and banquet rooms or convention facilities and other retail and service shops.

The hotels surveyed were all located outside the central business districts and usually in suburban areas. Studies of hotel employment density indicate that on the average, a hotel will employ 0.90 employees per room.* The employment density ranged between 0.46 to 1.38 employees per room. Approximately 49 percent of the employees work during the daytime hours.

The hotels surveyed ranged in size from 105 to 545 rooms.

Trip Characteristics: Trip generation rates have been developed for the independent variables, number of occupied rooms and total employment. On the average, hotels generate 10.5 weekday vehicle trip ends per occupied room. Hotel traffic generally peaks in the A.M. after the A.M. peak hour of the adjacent street traffic. During the P.M., hotel traffic peaking varies between 3 and 4 and 6 and 8, with a lesser volume between 4 and 6.

Saturday and Sunday vehicle trip generation was measured slightly lower than for the average weekday, as shown on the following generation rate tables.

Data Limitations: The data presented in this report do not include person trip ends by mode or hotels located with the central business districts of cities.

In some cases, it has been difficult to ascertain whether a hotel surveyed was in fact a hotel offering a full line of services or a large motel without eating facilities. In other cases, data were dropped from the analysis because it was not known whether the independent variable was total rooms or occupied rooms. It is imperative for these analyses that traffic volume counts always be related to the number of occupied rooms, otherwise, a lower generation rate might result.

More data are needed to define the trip generation for entering and leaving traffic during the peak periods of the adjacent street traffic and for the hotel itself.

*Buttke, Carl H., unpublished studies of building employment densities, Portland, Oregon.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Hotel — ITE Land Use Code: 310

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			11.3	17.2	7.2		4	181
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.36				1	600
		Exit	0.24				1	600
		Total	0.88	1.51	0.60		4	301
	P.M. Between 4 and 6	Enter	0.20				1	600
		Exit	0.19	0.89			1	600
		Total	0.52		0.39		3	343
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.91	1.51	0.63		4	181
	P.M.	Enter	0.39				1	600
		Exit	0.13				1	600
		Total	0.73	1.43	0.48		5	265
Saturday Vehicle Trip Ends			10.4	15.1	5.9		4	181
Peak Hour of Generator		Enter						
		Exit						
		Total	0.86	1.32	0.48		4	181
Sunday Vehicle Trip Ends			9.6	14.8	4.8		4	181
Peak Hour of Generator		Enter						
		Exit						
		Total	0.60	0.83	0.38		3	184

Source Numbers: 12, 13, 55

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Hotel — ITE Land Use Code: 310

Independent Variable—Trips per: Room

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			10.5	13.4	9.1		5	191
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.58				2	475
		Exit	0.29				2	475
		Total	0.85	1.18	0.61		6	300
	P.M. Between 4 and 6	Enter	0.36				2	475
		Exit	0.37				2	475
		Total	0.73	1.04	0.47		7	269
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.90				6	234
	P.M.	Enter						
		Exit						
		Total	0.87				9	245
Saturday Vehicle Trip Ends			8.1	11.8	5.8		4	234
Peak Hour of Generator		Enter						
		Exit						
		Total	0.67	1.34	0.37		4	234
Sunday Vehicle Trip Ends			8.8	13.2	5.4		4	198
Peak Hour of Generator		Enter						
		Exit						
		Total	0.61	1.06	0.42		3	182

Source Numbers: 4, 5, 12, 13, 55, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

320—Motel

A motel is defined as a place of lodging offering only sleeping accommodations and possibly a restaurant.

The average employment at motels is much lower than that for hotels. The motels surveyed ranged in employment density between 0.22 to 0.58 employees per room. The size of motels surveyed ranged between 15 and 345 rooms.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all the measured independent variables was made to determine the best variables to use for predicting vehicle trip ends. These are summarized in the table.

The number of occupied rooms resulted in the highest correlation to vehicle trip making. On the average, motels generate 9.58 weekday vehicle trip ends per occupied room and 10.58 vehicle trip ends per employee. Saturday and Sunday vehicle trip generation is lower than the average weekday, as shown in the following generation rate tables.

A regression equation was developed for motel trip generation and is as follows:

AWDVTE = −55 + 10.7 × Number of Occupied Rooms R = 0.960.

Data Limitations: The same limitations of data exist for motels as with hotels. This analysis has indicated motel average weekday vehicle trip rates to be almost double of previously made summaries. The reason for this higher rate is that this analysis was based on the number of occupied rooms. It is best to collect data on both total rooms and total occupied rooms to eliminate any misunderstanding in the rate analysis.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Motels.

Independent Variables	*Correlation Coefficient (R)*
Employees	0.885
Total Rooms	0.834
Occupied Rooms	0.960

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Motel — ITE Land Use Code: 320

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			10.58	28.00	7.20		4	60
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.69	1.67	0.64		2	106
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.47				1	200
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.69	1.67	0.64		2	106
	P.M.	Enter						
		Exit						
		Total	0.94	4.00	0.48		4	60
Saturday Vehicle Trip Ends			8.74	26.67	5.90		3	79
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			7.23	20.83	4.75		3	79
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 11, 13

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Motel — ITE Land Use Code: 320

Independent Variable—Trips per: Room

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			9.58	11.00	8.19		5	91
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.65	0.84	0.43		8	126
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.71	1.69	0.48		8	147
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.86	1.33	0.65		4	66
	P.M.	Enter						
		Exit						
		Total	0.88	1.83	0.49		11	117
Saturday Vehicle Trip Ends			8.35	10.32	7.66		3	83
Peak Hour of Generator		Enter						
		Exit						
		Total	0.83	1.94	0.62		3	83
Sunday Vehicle Trip Ends			6.91	8.13	6.17		3	83
Peak Hour of Generator		Enter						
		Exit						
		Total	0.58	0.97	0.49		3	83

Source Numbers: 2, 4, 11, 13, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

330—Resort Hotel

Resort hotels are similar to hotels (310) in that they provide guest rooms, restaurants, cocktail lounges, retail shops, guest services and sports facilities. The major difference is that resort hotels cater to the tourist and vacation business more than the convention business.

Only one resort hotel has been studied, and it is located in Hilo, Hawaii. The trip generation characteristics are shown on the following tables.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Resort Hotel — ITE Land Use Code: 330

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			10.3				1	270
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.3				1	270
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.7				1	270
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.5				1	270
	P.M.	Enter						
		Exit						
		Total	0.8				1	270
Saturday Vehicle Trip Ends			13.6				1	270
Peak Hour of Generator		Enter						
		Exit						
		Total	1.2				1	270
Sunday Vehicle Trip Ends			10.2				1	270
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 40

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Resort Hotel — ITE Land Use Code: 330

Independent Variable—Trips per: Occupied Room

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			10.2				1	273
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.3				1	273
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.7				1	273
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.5				1	273
	P.M.	Enter						
		Exit						
		Total	0.8				1	273
Saturday Vehicle Trip Ends			13.4				1	273
Peak Hour of Generator		Enter						
		Exit						
		Total	1.2				1	273
Sunday Vehicle Trip Ends			10.1				1	273
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 40

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

400—Recreational

Description: Land for recreation is used for any type facility that was not given a specific land-use code; this includes bowling alleys, zoos, seaworlds, as well as lakes and pools. Some regional parks also are in this category.

Most of the recreation sites were located in suburban areas of San Francisco. The average weekday trips ranged from as little as 90 vehicle trips per day to as high as 14,390. The number of parking spaces at the recreation sites ranged from 60 to 3,251, while the number of acres ranged from 2.7 to 4,680.

Trip Characteristics: An analysis of the correlation between average weekday vehicle trips and all available variables was made to determine the best variable for predicting trip ends. The number of parking spaces had the highest correlation (.878) with average vehicle trip ends. The number of acres was analyzed too, but this correlation proved to be less than adequate.

On the average, general recreation facilities generate 3.1 vehicle trips per parking space and 3.6 vehicle trips per acre. From the available data, it appears that Sunday trip rates per parking space are double the weekday rates. The peak hours for recreation facilities are usually from noon to 2 P.M. and from 3 to 5 P.M.

Data Limitations: The data presented here are only for California and represent only 13 sites. They do not give person trip ends, only vehicle trip ends.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Recreational — ITE Land Use Code: 400

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			22.8	183.7	8.3		11	120.7
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends			162.2	354.2	47.6		9	14.2
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18, 8

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Recreational — ITE Land Use Code: 400

Independent Variable—Trips per: Parking Space

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.1	5.4	0.4		13	737
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.2				1	190
		Exit						
		Total	0.4				1	190
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter	0.2				1	190
		Exit	0.3				1	190
		Total	0.4				1	190
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			6.6	10.4	1.8		10	314
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18, 8

ITE Technical Committee 6A-6—Trip Generation Rates

Date:

410—Park; 411—City Park; 412—County Park; 413—State Park

Description: The parks varied as to location and ownership; some of them were privately owned but the majority were public. They differed greatly as to kinds of facilities. There were lakes and pools as well as ball fields, camp sites and picnic facilities. Because of the varying facilities, the seasonal use of the individual sites is quite different. Some are used primarily for boating while others are used for baseball games, etc.

Most of the parks were located in suburban areas. The average vehicle trips ends range from as little as 90 per day to as many as 23,600 in some of the county parks. The number of picnic sites ranges from 6 to 379 while the parking spaces range from 12 to 9,000.

Trip Characteristics: An analysis of the correlations between average weekday vehicle trip ends and all measured variables was made to determine the best variable for predicting vehicle trip ends. Separate correlations were done for each land use. There was no consistency between land uses and the best correlated variable. For city parks, the number of acres had the highest correlation (.834) with the dependent variable. Employees and parking spaces had the highest correlation for county parks (.999 and .955, respectively). For the state parks, the highest correlation was found when using employees.

The peak hours for parks differ from the normal peak hour of other activities, they are from noon to 2 P.M. and 3 to 5 P.M.

Data Limitations: The parks varied as to size and facilities available. Seasonal use is another dissimilarity that makes it difficult to draw legitimate conclusions. Some of the land uses—such as city parks—had too few cases to warrant any strong conclusions. All data were based on California sites.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Park — ITE Land Use Code: 410

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			96.2	183.7	42.3		4	15.0
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			193.2	354.2	107.2		4	15.0
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18, 12

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Park. ITE Land Use Code: 410

Independent Variable—Trips per: Parking Space

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			7.8	24.3	2.9		9	769.0
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18, 12

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: City Park — ITE Land Use Code: 411

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			60.0	8.0	1.0		3	2.0
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18, 13

ITE Technical Committee 6A-6—Trip Generation Rates

Date:

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: County Park — ITE Land Use Code: 412

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			26.5	183.3	23.3		13	77
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			27.0	380.0	14.8		13	77
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: County Park — ITE Land Use Code: 412

Independent Variable—Trips per: Parking Space

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			2.2	21.0	0.4		12	969.8
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			2.0	13.0	1.5		8	1234.8
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: County Park — ITE Land Use Code: 412

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.1	81.2	0.2		17	326
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			5.8	90.0	0.3		13	359
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: State Park — ITE Land Use Code: 413

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			61.1	183.3	21.9		10	6.6
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			126.8	366.6	58.1		10	6.6
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18, 12, 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: State Park — ITE Land Use Code: 413

Independent Variable—Trips per: Parking Space

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			1.2	3.1	0.4		8	603
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			2.4	6.6	1.2		6	408
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18, 12, 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: State Park — ITE Land Use Code: 413

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			0.6	16.6	0.1		12	928.6
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			0.6	26.2	0.1		12	1424.5
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 18, 12, 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

420—Marina

Description: The marinas analyzed were both public and private. Some of them had social and club activities scheduled throughout the week.

The number of boat berths ranged from 108 to 491, the number of acres from 11 to 105, and parking spaces from 65 to 493. The number of vehicle trip ends ranged from 500 to 1,700 on weekdays, from 990 to 1,380 on Saturdays and from 1,210 to 2,160 on Sundays.

Trips Characteristics: An analysis of correlation was made between average weekday trips and all measured variables to determine the best variable for predicting trips, as shown in the table.

The average number of trip ends per acre was 20.9; per employee 258.7; and per boat berth 3.8. These correlations, however, were based on only three studies.

Data Limitations: There were only nine studies available for analysis, all of them in California.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Marinas.

Independent Variables	*Correlation Coefficient (R)*
Acres	0.948
Employees	0.804
Boat Berths	0.703

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Marina — ITE Land Use Code: 420

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			258.7	276.6	233.0		3	3.7
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends			307.3	345.0	252.5		3	3.7
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			426.4	540.0	302.5		3	3.7
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 6, 12, 19

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Marina — ITE Land Use Code: 420

Independent Variable—Trips per: Boat Berth

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.8	10.0	1.9		9	230.1
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends			5.7	12.7	3.4		3	199.0
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			7.9	20.0	4.1		3	199.0
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 6, 12, 19

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Marina — ITE Land Use Code: 420

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			20.9	75.4	10.3		3	45.3
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends			24.9	90.0	13.1		3	45.3
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			34.5	120.0	20.5		3	45.3
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 6. 12. 19

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

430—Golf Course

Description: The golf courses analyzed were both 9- and 18-hole, country clubs as well as some municipal courses. Some of the private courses were large with clubhouses with bars and banquet facilities. Many public courses had no clubhouses.

Most of the facilites were located in suburban areas, a few in scenic, rural areas. Number of acres varied from 53 to 275, parking spaces from 127 to 382. Average weekday traffic ranged from 176 trip ends to 6,260.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all measured variables was made to determine the best variable to predict trip ends and is shown in the table.

As indicated on the following tables, on the average, golf courses generate 9.1 vehicle trip ends per acre on an average weekday, 5.9 on Saturdays and 6.6 on Sundays.

Data Limitations: All data analyzed were from studies in California and are limited to daily generation rates.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Golf Courses.

Independent Variables	*Correlation Coefficient (R)*
Parking Spaces	0.916
Employees	0.746
Acres	0.719

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Golf Course — ITE Land Use Code: 430

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			34.2	49.1	22.5		3	25.3
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends			33.5	80.0	21.0		3	25.3
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			34.7	55.6	17.5		3	25.3
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18, 12, 11, 7

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Golf Course — ITE Land Use Code: 430

Independent Variable—Trips per: Parking Space

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			8.2	16.3	2.6		5	222.4
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends			3.7	7.9	2.3		4	182.5
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			3.7	7.0	2.1		3	180.3
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18, 12, 11, 7

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Golf Course — ITE Land Use Code: 430

Independent Variable—Trips per: Acre

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			9.1	22.7	2.5		11	135.3
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends			5.9	9.9	2.2		8	124.6
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends			6.6	12.3	2.0		7	113.9
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18, 12, 11, 7

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

500—Institutional

501—Military Base

Description: All military bases surveyed were located in San Diego. Actual study sites were confidential and are not available.

Average weekday vehicle trip ends ranged from 4,004 to 25,600. Number of employees ranged from 1,575 to 25,613, number of vehicles from 3,067 to 40,000.

Trip Characteristics: An analysis of the correlation between average weekday vehicle trip ends and the two available variables was made to determine the best variable for predicting vehicle trip ends. This analysis showed that the number of vehicles had the highest correlation (.958). Since the number of employees also had a high correlation (.898), trip generation rates were developed for both independent variables.

On the average, military bases generate 1.8 vehicle trip ends per employee and 0.9 per vehicle.

Data Limitations: The data are only for military bases located in California and only represent seven sites. They do not give any person but only vehicle trip ends.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Military Base — ITE Land Use Code: 501

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			1.8	4.1	1.0		7	7747
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Military Base — ITE Land Use Code: 501

Independent Variable—Trips per: Vehicle

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			0.9	2.3	0.6		7	16002
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

520—Elementary School

Description: Elementary schools serve students between the kindergarten and high school levels. Usually, they are centrally located in residential communities in order to facilitate access by the young students they are designed to serve. In terms of travel modes, elementary students generally use school buses more than regular transit and are "dropped off" and "picked up" more than high school students, who are apt to walk longer distances, bicycle and, in some cases, drive cars. The elementary school sites surveyed exhibited significant variations in terms of facilities provided per student.

Trip Characteristics: Only two elementary schools were surveyed. As shown on the following table, these schools generated on the average 0.51 vehicle trip ends per student per weekday.

Data Limitations: Only two schools were analyzed and therefore may not be indicative of what may be expected on the average.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Elementary School — ITE Land Use Code: 520

Independent Variable—Trips per: Student

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			0.51	0.72	0.28		2	1583
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.16	-	-		1	2860
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.01	-	-		1	2860
Peak Hour of Generator	A.M. 7 - 9	Enter	0.11	-	-		1	2860
		Exit	0.05	-	-		1	2860
		Total	0.16	0.16	0.15		2	1583
	P.M. 2 - 4	Enter	0.04	-	-		1	2860
		Exit	0.07	-	-		1	2860
		Total	0.11	0.20	0.11		2	1583
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 32

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

530—High School

Description: High schools are for students between the elementary and junior college or university levels. Those analyzed were generally separated from other land uses and had exclusive access points, parking facilities, etc. Acreage and floor space varied with populations served and the social and economic characteristics of the areas. The sites surveyed ranged from student populations of 700 to 2,900; floor areas of 89,000 to 540,000 square feet; and acreage from 12.5 to 54.

Correspondingly, there was a wide range in ratios such as square feet per student—from a low of 54 to a high of 410. There was also a wide disparity in parking spaces, ranging from 0.41 to 0.90 per student and 1.4 to 5.5 per staff member.

Trip Characteristics: Transit use data were available for four out of the six high schools surveyed and show significant use by students. Three sites showed above 30 percent use. The data did not differentiate between use by regular transit service and that by special school bus.

The site peak traffic for all of the locations surveyed occurred between 7 to 9 A.M., but information differentiating site peaks from adjacent highway peaks was available for only one site. The site P.M. peak hour was generally beginning at 3, which would be different from the adjacent street peak in most cases.

As shown on the following table, the high schools studied generated on the average 1.22 vehicle trip ends per student per average day.

Data Limitations: Due to the high transit use found, it is desirable that future surveys include related details. Information detailing number of students served by school bus would enable analyses to be refined to present trips per nonschool bus student. Since information on busing programs for most schools would normally be readily available, this refinement could prove useful in projecting high school trip ends. Since the purpose of trip generation is to enable the engineer to evaluate impact on the adjacent street system and access requirements, information on drop-off/pick-up trips versus trips with "ends" within the study sites could also prove useful. More analyses are needed for high schools.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: High School — ITE Land Use Code: 530

Independent Variable—Trips per: Student

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			1.22	2.14	0.74		6	1573
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.14	-	-		1	1356
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.06	-	-		1	1356
Peak Hour of Generator	A.M. 7 - 9	Enter	0.19	0.27	0.14		4	1674
		Exit	0.07	0.09	0.04		4	1674
		Total	0.26	0.44	0.18		6	1573
	P.M. 3 - 4	Enter	0.07	0.11	0.03		4	1674
		Exit	0.13	0.20	0.07		4	1674
		Total	0.23	0.41	0.10		6	1573
Saturday Vehicle Trip Ends			0.77	1.21	0.59		2	2027
Peak Hour of Generator		Enter	0.11	0.21	0.07		2	2027
		Exit	0.04	0.05	0.02		2	2027
		Total	0.15	0.22	0.12		2	2027
Sunday Vehicle Trip Ends			0.23	0.43	0.15		2	2027
Peak Hour of Generator		Enter	0.01	0.01	0.01		2	2027
		Exit	0.01	0.03	0.01		2	2027
		Total	0.02	0.04	0.01		2	2027

Source Numbers: 31, 33, 34, 98, 104

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

540—Junior/Community College

Description: Included in this grouping were all two- and four-year educational institutions which called themselves a junior college, community college or college. Those identifying themselves as universities were grouped as such. This method of grouping was used because the available data did not always identify whether the institution had a two- or four-year curriculum. Hence, the more desirable two-year versus four-year distinction was not possible.

Trip Characteristics: The data summarized in tabular form shows a considerable variation in student population, ranging from a low of 700 students to a high of 14,317. Although a number of institutions also had sizable evening programs, their trip rate characteristics did not vary significantly from institutions having day programs only. The student population appeared to be the best and most consistent basis for establishing travel rates since other identifiable parameters such as numbers of staff, parking accommodations, campus acreage and building area varied considerably between institutions. The correlation coefficient between total students and average weekday vehicle trip ends was calculated at 0.864.

Data Limitations: Although the sample size (19) on which the generating equation is based is reasonable, the availability of additional data would have allowed greater refinement in developing a family of equations for use with varied situations.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Junior/Community College — ITE Land Use Code: 540

Independent Variable—Trips per: Student

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			1.55	2.90	0.94		18	5985
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.15	0.19	0.12		7	5672
		Exit	0.02	0.06	0.01		7	5672
		Total	0.18	0.25	0.13		7	5672
	P.M. Between 4 and 6	Enter	0.04	0.09	0.01		7	5672
		Exit	0.08	0.19	0.02		7	5672
		Total	0.12	0.29	0.04		7	5672
Peak Hour of Generator	A.M.	Enter	0.16	0.19	0.12		7	5672
		Exit	0.03	0.26	0.01		7	5672
		Total	0.18	0.43	0.13		7	5672
	P.M.	Enter	0.05	0.18	0.01		7	5672
		Exit	0.11	0.25	0.07		7	5672
		Total	0.16	0.44	0.10		7	5672
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 7, 8, 9, 10, 14, 18, 40, 67

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10/15/75

550—University

Description: The institutions grouped together in the university category were so grouped solely on the basis of their being called universities. Those called a college of some sort—because a number of them could not be identified as two- or four-year institutions—were grouped in the college category (540).

Trip Characteristics and Data Limitations: Sufficient data were not available to allow the development of a satisfactory explainer equation. Average weekday vehicle trip end rates varied from a low of 1.40 per student for an institution of very modest size (1,176 students) to a high of 3.89. The largest institution (student population: 23,157) had a trip rate of 2.36. Considerably more data should be obtained on universities. Additionally, when it is possible to identify the curriculum lengths at all of the colleges, it would be interesting to rework the data to see what differences two-year versus four-year programs might make for this study's data base.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: University — ITE Land Use Code: 550

Independent Variable—Trips per: Student

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			2.41	3.89	1.40		5	9875
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 18, 26

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10/15/75

590—Library

Description: Libraries include universities and other public and private facilities.

Trip generation information was found for only two libraries. These ranged between 23 and 50 employees and between 25,000 and 60,000 square feet of gross floor area. Both were located in suburban central business districts within an SMSA.

Trip Generation Characteristics: Since there were only two observations, no correlation analysis was performed for libraries to determine which independent variables were most relevant. On the average, libraries were found to generate 51 weekday vehicle trip ends per employee and 41.8 weekday vehicle trip ends per 1,000 square feet of gross floor area. See the summary tables for peak hour and Saturday and Sunday generation rates.

Data Limitations: Two libraries are not sufficient as a sample on which to base trip generation rates. More data are sorely needed.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Library — ITE Land Use Code: 590

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			51.0	81.9	36.8		2	36.5
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter	1.4				1	50
		Exit	1.4				1	50
		Total	3.2	4.4	2.6		2	36.5
	P.M.	Enter	3.8				1	50
		Exit	3.4				1	50
		Total	8.2	12.6	6.2		2	36.5
Saturday Vehicle Trip Ends			41.0				2	36.5
Peak Hour of Generator		Enter	2.2				1	50
		Exit	1.6				1	50
		Total	4.7	6.5	3.8		2	36.5
Sunday Vehicle Trip Ends			36.5				1	23
Peak Hour of Generator		Enter						
		Exit						
		Total	5.2				1	23

Source Numbers: 10, 12

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Library — ITE Land Use Code: 590

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			41.8	75.4	28.8		2	45
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter	1.1				1	64
		Exit	1.1				1	64
		Total	2.6	4.0	2.0		2	45
	P.M.	Enter	3.0				1	64
		Exit	2.7				1	64
		Total	6.7	11.6	4.8		2	45
Saturday Vehicle Trip Ends			33.6	49.6	27.3		2	45
Peak Hour of Generator		Enter	1.7				1	64
		Exit	1.3				1	64
		Total	3.8	6.0	3.0		2	45
Sunday Vehicle Trip Ends			3.4				1	25
Peak Hour of Generator		Enter						
		Exit						
		Total	4.8				1	25

Source Numbers: 10, 12

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

600—Medical

610—Hospital

Description: The term hospital here refers to any institution where medical or surgical care is given to nonambulatory and ambulatory patients. The term does not, however, refer to medical clinics (facilities which provide diagnoses and outpatient care only) or to nursing homes (facilities devoted to the care of persons unable to care for themselves).

Data were collected from hospitals located primarily on the West Coast; some hospitals were situated within major cities while others were located in the outlying suburban areas. The results indicate that, on the average, 4.1 hospital employees per 1,000 gross square feet of building area will occupy the building. The hospitals surveyed range in size from 56,000 square feet (with 77 beds) to 1,367,000 square feet (with 1,875 beds).

Trip Characteristics: No information was available regarding person trip ends, therefore, all analyses were performed on the basis of vehicle trip ends. An analysis of the correlation between average weekday vehicle trip ends and all measured variables was made to determine the best variable to use for predicting vehicle trip ends. From the data thus far assembled, gross floor area was found to have the highest correlation with average weekday vehicle trip ends followed closely by employment, as shown on the table.

On the basis of the available information, hospitals can be expected to generate an average of 16.9 weekday vehicle trips per 1,000 square feet gross floor area or 5.5 trips per hospital employee, or 12.2 trips per bed. The following tables present the estimated daily and peak hour generation rates as well as other statistical information.

The observed peak hour for hospital trips fell between 3 and 5 P.M., slightly different from the times at which peaking is normally observed for adjacent street traffic (4-6 P.M.). Since almost all available data were collected on the West Coast, it was not possible to test the sensitivity of hospital trip generation rates to geographic location.

The regression equation developed for estimating average weekday vehicle trip ends (AWDVTE) is as follows:

AWDVTE = 106 + 5.38 × Number of Employees
R = 0.922.

Data Limitations: Because the availability of data was limited, several fairly significant problems were encountered. First, the value of a regression analysis is questionable when working with small samples; the resultant calculated correlation coefficients can be misleadingly high. Second, it is often difficult (if not impossible) to generate all relevant statistics from a sample of small size. In this particular case, it was not possible to incorporate person trip ends into the analysis since no such information was available. It is therefore recommended that additional work be done in collecting more comprehensive data sets for use in studies similar to this one.

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Hospitals.

Independent Variables	*Correlation Coefficient (R)*
1,000 Gross Square Feet	0.957
Number of Employees	0.922
Number of Beds	0.826
Current Patients	0.581

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Hospital — ITE Land Use Code: 610

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.50	11.10	2.17		16	829
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M. 3- 5	Enter	0.31				1	129
		Exit	0.38	0.85	0.31		9	1035
		Total	0.61	1.16	0.27		8	509
Saturday Vehicle Trip Ends			3.78	7.98	2.55		13	887
Peak Hour of Generator		Enter	0.39				1	129
		Exit	0.25	0.47	0.16		7	701
		Total	0.85				1	129
Sunday Vehicle Trip Ends			3.38	6.78	2.42		13	887
Peak Hour of Generator		Enter	0.22	0.39	0.17		2	276
		Exit	0.20	0.47	0.17		6	1004
		Total	0.60				5	470

Source Numbers: 2, 6, 14, 19, 28

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Hospital — ITE Land Use Code: 610

Independent Variable—Trips per: Bed

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			12.16	32.83	3.00		16	375
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M. 3 - 5	Enter	0.46				1	87
		Exit	0.86	2.08	0.57		9	464
		Total	1.30	2.38	0.82		8	239
Saturday Vehicle Trip Ends			8.53	21.04	4.55		13	394
Peak Hour of Generator		Enter	0.57				1	87
		Exit	0.63	1.43	0.42		7	279
		Total	1.26				1	87
Sunday Vehicle Trip Ends			7.61	15.32	4.11		13	394
Peak Hour of Generator		Enter	0.52	0.57	0.49		2	114
		Exit	0.43	1.05	0.22		6	477
		Total	1.36				5	207

Source Numbers: 2, 6, 14, 19, 28

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Hospital — ITE Land Use Code: 610

Independent Variable—Trips per: 1,000 Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			16.91				12	322
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M. 3 -5	Enter						
		Exit	1.09				8	399
		Total	2.27				4	168
Saturday Vehicle Trip Ends			11.03				12	322
Peak Hour of Generator		Enter						
		Exit	0.96				6	204
		Total						
Sunday Vehicle Trip Ends			9.87				12	322
Peak Hour of Generator		Enter	0.88				1	80
		Exit	0.52				5	445
		Total	1.93				4	168

Source Numbers: 2, 6, 14, 19, 28

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

620—Nursing Home

Description: For the purposes of this analysis, a nursing home is defined as any facility whose primary function is to care for persons unable to care for themselves. Thus, the term is applicable not only to rest homes (which are primarily for the aged) but also to chronic and convalescent homes.

Trip generation data for nursing homes were available from only one source (a study of 17 nursing homes located within the State of Connecticut) and these data were averaged to represent a typical nursing home. The homes surveyed ranged in size from a 59-bed to a 210-bed facility.

Trip Characteristics: No information was available regarding person trip ends, therefore, all analyses were performed on the basis of vehicle trip ends. The results of the analysis are presented in the following summary, which shows that nursing homes can be expected to generate 2.7 average weekday vehicle trip ends per bed. The observed peak hour for trips to nursing homes was found between 2 and 4 P.M., significantly different from the times at which peaking is normally observed for adjacent street traffic (4-6 P.M.). Since all available data were collected within the State of Connecticut, it was not possible to test the sensitivity of nursing home trip generation rates to geographic location.

Data Limitations: Undoubtedly, the biggest problem encountered regarding the study of nursing home trip generation rates was the lack of available information. It is recommended that attempts be made to overcome this deficiency: Only by increasing our data base will it be possible to improve the reliability of the estimates.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Nursing Home — ITE Land Use Code: 620

Independent Variable—Trips per: Bed

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			2.7	4.0	1.9		17	112
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.14	0.25	0.05		17	112
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.21	0.41	0.14		17	112
Peak Hour of Generator	A.M. Between 6 and 8	Enter						
		Exit						
		Total	0.20	0.33	0.07		17	112
	P.M. Between 2 and 4	Enter						
		Exit						
		Total	0.36	0.53	0.21		17	112
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 29

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

630—Clinic

Description: For purposes of this analysis, a clinic is defined as any facility which provides diagnoses and outpatient care but which is unable to provide prolonged in-house medical/surgical care.

Trip generation data for medical clinics were available for only one such facility which is located in the City of San Diego, California. This functions primarily as a hospital and consists of 240 hospital beds served by 650 employees. The institution is situated on 42 gross acres and contains 16,100 square feet of floor space. As a medical clinic, it serves an average of 91 out-patients daily.

Trip Characteristics: The available data indicate that, for this particular facility, an average of 5.9 weekday vehicle trip ends are made for every clinic employee. The P.M. peak hour was found to begin at about 5, approximately the same time at which peaking is normally observed for the adjacent street traffic. Since only one set of data was available, it was not possible to test the sensitivity of clinic trip generation rates to geographic location.

Data Limitations: It is recommended that additional work be carried out in collection and making available data regarding the trip generation rates for medical clinics located in various spots across the country. A significant difficulty was encountered in establishing a clear definition of a "clinic" since medical uses often overlap with other hospital functions.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Clinic * ITE Land Use Code: 630

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			5.9				1	650
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M. Between 11 and 12	Enter						
		Exit	0.17				1	650
		Total						
	P.M. Between 5 and 6	Enter						
		Exit	0.62				1	650
		Total						
Saturday Vehicle Trip Ends			3.4				1	650
Peak Hour of Generator	P. M. Between 5 and 6	Enter						
		Exit	0.29				1	650
		Total						
Sunday Vehicle Trip Ends			6.0				1	650
Peak Hour of Generator	P.M. Between 5 and 6	Enter						
		Exit	0.55				1	650
		Total						

Source Numbers: 19

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

*Note: Represents "Research and Special Cases" Clinic; often Clinics are associated with hospitals.

700—Office

710—General Office Building

Description: A general office building houses one or more tenants and is the location where the affairs of a business, commercial or industrial organization, professional person or firm are conducted. The building may be limited to one tenant, either the owner or lessee, or it could contain a mixture of tenants including professional services, a bank or savings and loan institution, insurance companies, investment brokers, company headquarters and services for the tenants.

The general office buildings surveyed were all located outside the central city business district and usually in suburban areas. Studies of office building employment density indicate that on the average, 4.4 employees per 1,000 gross square feet of building area will occupy the building.* Recently constructed and fully occupied office buildings tend to house a lower density than older buildings with approximately 4.25 employees per 1,000 gross square feet of building area.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all measured independent variables was made to determine the best variables to use for predicting vehicle trip ends. These are summarized on the table.

* Buttke, Carl H., unpublished studies of building employment densities, Portland, Oregon.

The employment and gross building area have a high correlation to vehicle trip making. However, since the number of parking spaces is usually based upon the size of the building, it is believed that parking spaces should not be used as a predictive independent variable.

General office buildings generate 11.7 average weekday vehicle trip ends per 1,000 gross square feet of building area and 3.46 average weekday vehicle trip ends per employee. See the following table for daily and peak hour trip generation rates. Office building-generated trips peak at the same time as adjacent street traffic (7 to 9 A.M. and 4 to 6 P.M.).

The regression equations developed for calculating the average weekday vehicle trip ends (AWDVTE) are:

AWDVTE Employees $= 466 + 2.68 \times$ Number of Employees, $R = 0.981$

$= 653 + 9.63 \times 1{,}000$ G.S.F., $R = 0.980$

The average automobile occupancy has been measured at 1.2 persons per car, 1.1 to 1.2 persons for work purposes and 1.6 persons for other purposes.[50,51] The buildings measured for trip generation were either not serviced by public transportation or no information was available concerning such service. A variation in trip generation because of geographic loca-

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for General Office Buildings.

Independent Variables	*Correlation Coefficient (R)*
Employees	0.981
1,000 Gross Square Feet	0.980
Parking Spaces	0.988
Acres	0.120

tion within the United States does not appear from the available data.

Data Limitations: The data presented in this report do not include person trip ends by mode nor general office buildings located within the central business districts of cities.

More information is needed concerning person trip generation and its relationship with other buildings in the immediate vicinity. The rates presented are actually driveway volumes into and out of the site; they may include some trips already on the adjacent street system passing the site and induced to stop for personal business or to drop off or pick up a passenger. These trips have not been identified.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type General Office Building ITE Land Use Code 710

Independent Variable—Trips per Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			3.46	11.21	2.66		5	594
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	0.74	1.43	0.59		5	594
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	0.70	1.79	0.64		5	594
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	0.74	1.43	0.59		5	594
	P.M.	Enter						
		Exit						
		Total	0.70	1.79	0.64		5	594
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 19, 20

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: General Office Building — ITE Land Use Code: 710

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			11.69	43.50	3.60		22	318
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	1.90	3.31	1.45		5	299
		Exit	0.36	1.04	0.11		5	299
		Total	2.34	5.98	1.56		14	194
	P.M. Between 4 and 6	Enter	0.19	0.43	0.14		5	299
		Exit	1.48	3.19	1.34		5	299
		Total	2.09	6.39	1.50		16	187
Peak Hour of Generator	A.M.	Enter	1.90	3.31	1.45		5	299
		Exit	0.36	1.04	0.11		5	299
		Total	2.34	5.98	1.56		14	194
	P.M.	Enter	0.19	0.43	0.14		5	299
		Exit	1.48	3.19	1.34		5	299
		Total	2.09	6.39	1.50		16	187
Saturday Vehicle Trip Ends			5.43	8.89	2.50		3	23
Peak Hour of Generator		Enter						
		Exit						
		Total	1.14	2.22	0.50		3	23
Sunday Vehicle Trip Ends			2.00	4.44	1.00		3	23
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 2, 5, 19, 20, 21, 51, 53, 54, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

720—Medical Office Building

Description: A medical office can be defined as a facility which provides diagnoses and outpatient care on a routine basis but which is unable to provide prolonged in-house medical/surgical care. A medical office is generally operated by either a single private physician or a group of doctors.

Since medical functions often overlap with those of medical clinics, some problems exist in making a clear distinction between medical offices and clinics in the source data. This problem has led to variable trip generation rates for each of these facilities depending on the definitions used.

Trip generation data for medical offices were available for five facilities, all of which are located within the State of California. Each study site contained a number of medical offices and could therefore be classified as a medical office center. Average observed trip characteristics for these centers are discussed in the following section.

Trip Characteristics: The available data indicate that, for this facility type, an average of 75.0 weekday vehicle trip ends are made for every 1,000 square feet of gross floor area, as shown in the following table. The P.M. peak hour was generally observed to begin at about 4; however, it is not known at what time peaking usually occurs for adjacent street traffic. Because all available data are from facilities located within California, it was not possible to test the sensitivity of the observed generation rates to geographic location.

Data Limitations: It is recommended that additional studies be conducted in other areas of the country to provide a more comprehensive data base which would be usable in all geographic locations.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Medical Office Building — ITE Land Use Code: 720

Independent Variable—Trips per: 1,000 Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			75.0	99.0	38.0		5	22.9
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit	5.9	7.0	5.0		3	21.7
		Total						
	P.M.	Enter						
		Exit	6.4	7.4	5.0		3	21.7
		Total						
Saturday Vehicle Trip Ends			34.7	49.4	21.7		3	21.7
Peak Hour of Generator		Enter						
		Exit	4.3	5.6	2.9		3	21.7
		Total						
Sunday Vehicle Trip Ends			3.8	4.7	3.3		3	21.7
Peak Hour of Generator		Enter						
		Exit	0.5	0.6	0.4		2	20.5
		Total						

Source Numbers: 8, 19

ITE Technical Committee 6A-6—Trip Generation Rates

Date: May 1975

730—Government Office Building

Description: A government office building is defined as an individual building containing the entire function or simply one agency of a city, county, state, federal government or other governmental units. It differs from a civic center in that it is not a grouping of several buildings which are interconnected with pedestrian ways.

Only one government building was studied: the City Hall of Fremont, California, in the San Francisco Bay Area. The study took place in 1970, when 102 employees were housed in 17,684 square feet of gross floor area of building area for a density of 5.8 employees per 1,000 square feet of gross floor area.

Trip Characteristics: The rates measured are shown on the following tables and are very high as compared to other office buildings.

Data Limitations: Since only one study was available, more data are required to develop representative rates. It may also be necessary in the future to divide the government building group into smaller units based on occupancy when more data are developed.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Government Office Building — ITE Land Use Code: 730

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			12.0				1	102
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.85					
		Exit	0.17					
		Total	1.02					
	P.M. Between 4 and 6	Enter	-					
		Exit	-					
		Total	-					
Peak Hour of Generator	A.M. Between 8 and 9	Enter	0.85					
		Exit	0.17					
		Total	1.02					
	P.M. Between 1 and 2	Enter	1.42					
		Exit	0.49					
		Total	1.91					
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Government Office Building — ITE Land Use Code: 730

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			68.93				1	17.7
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	4.92					
		Exit	0.96					
		Total	5.88					
	P.M. Between 4 and 6	Enter	-					
		Exit	-					
		Total	-					
Peak Hour of Generator	A.M. Between 8 and 9	Enter	4.92					
		Exit	0.96					
		Total	5.88					
	P.M. Between 1 and 2	Enter	8.20					
		Exit	2.83					
		Total	11.03					
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 11

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

740—Civic Center

Description: A civic center generally is a facility housing many functions of a city or county, or both, in a number of buildings. Data from only one civic center have been obtained for this analysis: the Marin County Civic Center north of San Francisco. It contains county offices, courts, library and an adjacent post office. It is also a tourist attraction because it was designed by Frank Lloyd Wright.

The data were obtained in 1967 when 575 employees were housed in the 140,000 gross square feet of floor space for an employee density of 4.1 employees per 1,000 gross square feet.

On an average weekday basis, it generated 250 vehicle trip ends per 1,000 gross square feet and 6.09 vehicle trip ends per employee. See the following generation rate tables. The trip generation rates are nearly double those for a general office building.

Data Limitations: These rates were calculated for only one civic center in suburban California and therefore may not be representative of all civic centers. Additional research and analyses are necessary for the further development of generation rates for civic centers.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Civic Center — ITE Land Use Code: 740

Independent Variable—Trips per: Employee

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			6.09				1	575
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.49				1	575
		Exit	0.06				1	575
		Total	0.55				1	575
	P.M. Between 4 and 6	Enter	0.22				1	575
		Exit	0.48				1	575
		Total	0.70				1	575
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 8

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Civic Center — ITE Land Use Code: 740

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			25.0				1	140
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	2.00				1	140
		Exit	0.25				1	140
		Total	2.25				1	140
	P.M. Between 4 and 6	Enter	0.89				1	140
		Exit	1.96				1	140
		Total	2.85				1	140
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 8

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

800—Retail

820—Shopping Center

Description: A shopping center is an integrated group of commercial establishments which is planned, developed, owned and managed as a unit. It is related to its market area in terms of size, location and type of store. It is provided with off-site parking facilities.*

Studies of 210 different type shopping centers were obtained for this analysis and included centers as small as 6,900 to as large as 1,600,000 gross square feet of leasable area. The centers studied are located throughout the United States and throughout urban areas and therefore reflect average conditions anywhere within the U.S.

Some of the centers included nonmerchandizing uses: office buildings, theatres, post offices, banks, health clubs and recreational facilities such as ice skating rinks.

From the outset of this analysis, shopping centers were divided into three categories to best describe the vehicle trip generation characteristics. These are:

- **821—Regional Shopping Center:** A regional shopping center was categorized as containing more than 500,000 gross square feet of leasable area. They usually contain one to six full-line department stores, are as large as 2 million gross square feet of leasable area and may include other nonmerchandizing facilities.

- **822—Community Shopping Center:** A community shopping center was categorized as containing between 100,000 and 499,999 gross square feet of leasable area. These centers may contain one or two full-line department stores, or junior department stores, or a discount stores as the major tenants.

- **823—Neighborhood Shopping Center:** A neighborhood shopping center was categorized as containing less than 100,000 gross square feet of leasable area. These centers contain tenants merchandizing convenience goods with the major tenant being a supermarket or a large drug store. They may also include a restaurant.

Trip Characteristics: An analysis of correlation between average weekday vehicle trip ends and all measured independent variables was made for each category of shopping center with roughly similar results. As shown on the table, the usual independent variables known when planning a future center or inventorying an existing center, such as the number of employees or 1,000 gross square feet of leasable area, have not shown a good correlation with vehicle trip generation.

The calculated vehicle trip end rates based on 1,000 gross square feet also exhibited a wide range in results for similar size centers. There are many probable reasons for this lack of correlation and range in trip generation rates:

- types of tenants
- method of marketing the center and tenants' merchandise
- density of the market area
- newness of a center in a relatively undeveloped market area
- size of center
- categorization of centers by type and size.

Even though the independent variable 1,000

*Urban Land Institute

Correlation Between Average Weekday Vehicle Trip Ends and the Independent Variables for Shopping Centers.

Independent Variables	*Correlation Coefficient (R)*		
	Neighborhood Center	Community Center	Regional Center
Employees	0.424	0.704	0.414
1,000 G.S.F.	0.137	0.639	0.442
Parking Spaces	−0.021	0.449	0.118

gross square feet of leasable building area has not shown a good correlation for estimating trips, no other variable has been found to better describe a center and calculate trip generation rates. Therefore, it is used for all rate calculations for shopping centers.

Upon examination of the calculated rates of each center, as shown on Figure 2, it became apparent that the categorization of centers into the three types was not a good grouping to indicate average trip generation rates. Within each of the categories (regional, community and neighborhood) the general decreasing trend in rates versus size of center was too great to indicate one weighted average for each category. Furthermore, the plot shown on Figure 2 shows no distinct change in rates at any size center to use as a basis for subdividing into smaller categories of centers. On the other hand, the rates for centers between 500,000 and 1,000,000 gross leasable area appear to be somewhat constant given the wide variation in rates.

Therefore, it is recommended that the plot on Figure 2 be used to obtain an average weekday vehicle trip generation rate for a given size shopping center.

To obtain peak hour and weekend trip generation characteristics, the shopping centers were grouped into nine different size categories whose characteristics are summarized on the following trip generation tables.

A variation in trips to and from shopping centers occurs throughout the year. Table 1 indicates a generalized monthly variation in traffic entering and dollar sales at shopping centers in excess of 500,000 gross square feet of leasable area.

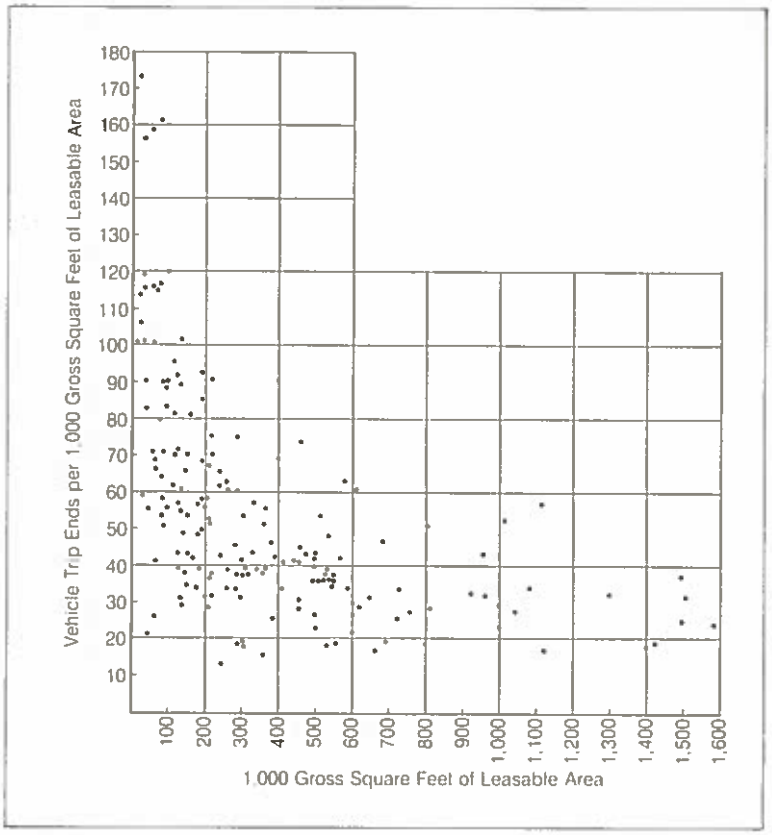

Figure 2.

Table 1. Monthly Variation in Traffic and Sales.

	Percent of Average Monthly Traffic Volume	Percent of Average Monthly Sales
January	70	80
February	60	65
March	100	85
April	90	80
May	110	95
June	110	92
July	103	90
August	100	115
September	95	95
October	115	102
November	105	110
December	150	200

Source: 1. Two Confidential Regional Shopping Centers in Washington, 1971, and One Shopping Center in California, 1965.

2. Cleveland, Donald E., and Edward A. Mueller, *Traffic Characteristics at Regional Shopping Centers.* New Haven, Connecticut: Bureau of Highway Traffic, Yale University, 1961.

The data upon which Table 1 is based are limited but do show that trip ends are not directly related to dollar sales. During the midyear, people tend to make more trips per dollar sales, probably because more time is spent shopping for an item. Prior to holidays, and especially at Christmas, people spend more money in relation to vehicle trips to a center.

Data Limitations: A wide variation in calculated trip rates has resulted from the data obtained for the probable reasons indicated. More research is necessary in measuring shopping center trip generation to adjust the measurements to variations within the week and by month of the year. More peak-hour data by direction during average weekdays, weekends and during the peak days and months of the year are necessary. Additional statistical analyses should be made to develop usable generation equations which express the decreasing trend in rates as the centers increase in size.

Further research is necessary to determine if low generation rates for the new large shopping centers are a result of combined trip making through a greater number of shops at one destination or because the market area is not fully developed. It could also be a combination of these and other factors.

The described rates are driveway volumes of vehicles entering and leaving shopping centers. More research is necessary to determine what portion of the driveway volumes is made up of traffic which would have passed the site in any case while making a trip for another reason.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Shopping Center - 0 to 49,999 Gr. Sq. Ft. ITE Land Use Code: 820

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			115.8	270.9	21.5		18	30.7
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	1.1				4	20.3
		Exit	0.9				4	20.3
		Total	3.5				7	26.8
	P.M. Between 4 and 6	Enter	7.2				6	23.4
		Exit	7.2				6	23.4
		Total	14.7				14	30.3
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	8.5				7	36.3
	P.M.	Enter	6.8				7	22.9
		Exit	7.0				7	22.9
		Total	15.5				16	29.9
Saturday Vehicle Trip Ends			156.3				3	40.3
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 2, 3, 4, 6, 19, 59, 64, 72, 75, 78

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Shopping Center ~~50,000 to 99,999 Gross Square Feet~~ ITE Land Use Code 820

Independent Variable—Trips per 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			79.1	161.3	25.5		21	75.8
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	2.9				4	73.7
	P.M. Between 4 and 6	Enter	2.4				3	86.4
		Exit	2.7				3	86.4
		Total	8.2				7	75.8
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	7.7				7	70.1
	P.M.	Enter	3.3				3	86.4
		Exit	3.4				3	86.4
		Total	9.1				13	73.5
Saturday Vehicle Trip Ends			107.6				7	69.6
Peak Hour of Generator		Enter	4.2				1	85.0
		Exit	5.6				3	72.5
		Total	12.6				5	76.1
Sunday Vehicle Trip Ends			44.5				1	89.3
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 3, 4, 6, 14, 19, 59, 64, 72, 75, 78

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Shopping Center ~~100,000 to 199,999 Gross Sq. Feet~~ ITE Land Use Code ~~820~~

Independent Variable—Trips per 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			60.4	103.7	32.1		31	150
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter	2.6				4	123
		Exit	2.9				4	123
		Total	5.0				7	128
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	3.8				6	149
	P.M.	Enter	3.0				4	128
		Exit	2.8				4	128
		Total	5.5				13	146
Saturday Vehicle Trip Ends			79.7				6	161
Peak Hour of Generator		Enter	4.1				3	127
		Exit	3.8				3	127
		Total	7.9				3	127
Sunday Vehicle Trip Ends			64.9				3	165
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 3, 4, 5, 14, 18, 19, 49, 54, 59, 64, 72, 76, 78

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Shopping Center 200,000 to 299,999 Gross Square Feet ITE Land Use Code 820

Independent Variable—Trips per 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			49.9	92.0	18.0		29	236
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter	2.1				3	234
		Exit	2.3				3	234
		Total	4.8				8	240
Peak Hour of Generator	A.M.	Enter	2.6				1	200
		Exit	2.5				1	200
		Total	4.1				9	230
	P.M.	Enter	2.7				4	240
		Exit	2.5				4	240
		Total	5.3				13	235
Saturday Vehicle Trip Ends			82.7				4	223
Peak Hour of Generator		Enter	4.3				2	206
		Exit	4.1				2	206
		Total	8.3				3	204
Sunday Vehicle Trip Ends			49.9				2	203
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 3, 13, 14, 19, 48, 49, 54, 59, 72, 76, 77, 78

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Shopping Center ~~300,000 to 399,999 Gross Square Feet~~ ITE Land Use Code: 820

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			40.4	58.4	16.0		18	343
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	5.2				2	335
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	3.4				2	335
	P.M.	Enter						
		Exit						
		Total	5.2				2	335
Saturday Vehicle Trip Ends			78.9				3	330
Peak Hour of Generator		Enter						
		Exit						
		Total	10.8				1	320
Sunday Vehicle Trip Ends			39.4				1	320
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 3, 6, 13, 14, 26, 49, 54, 64, 78

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Shopping Center ~~400,000 to 499,999 Gross Sq. Feet~~ ITE Land Use Code: 820

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			47.6	90.0	29.0		12	439
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	5.7				2	455
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	3.9				6	444
	P.M.	Enter						
		Exit						
		Total	5.0				6	444
Saturday Vehicle Trip Ends			66.1				4	448
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 3, 13, 40, 49, 54, 78

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type Shopping Center 500,000 to 999,999 Gross Square Feet ITE Land Use Code 820

Independent Variable—Trips per 1,000 Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			34.5	61.2	17.3		38	635
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.64	1.29	0.16		4	682
		Exit	0.32	0.63	0.08		3	710
		Total						
	P.M. Between 4 and 6	Enter	1.23	2.29	0.62		17	645
		Exit	1.29	2.82	0.83		8	649
		Total	3.30	5.10	2.37		4	780
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter	2.22	3.53	0.92		18	640
		Exit	1.92	4.22	0.94		11	669
		Total	3.01	4.83	1.51		4	714
Saturday Vehicle Trip Ends			43.9	55.8	27.2		10	638
Peak Hour of Generator		Enter	2.69	3.46	2.04		6	686
		Exit	3.34	6.52	2.16		7	663
		Total						
Sunday Vehicle Trip Ends			17.4	23.9	12.2		5	717
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 1, 3, 5, 6, 13, 14, 18, 22, 26, 49, 54, 59, 60, 61, 64, 65, 72, 73, 77, 79

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Shopping Center - 1,000,000 to 1,249,999 Gross Square Feet — ITE Land Use Code: 820

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			31.1	57.0	16.4		6	1063
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter	1.37				1	1085
		Exit	1.81	2.77	1.30		3	1085
		Total						
Peak Hour of Generator	A.M. Between 11 and 12	Enter						
		Exit	153	2.24	0.79		2	1085
		Total						
	P.M. Between 8:30-9:30	Enter	0.68				1	1085
		Exit	4.22				1	1085
		Total	4.90				1	1085
Saturday Vehicle Trip Ends			41.7				1	1000
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 1, 18

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Shopping Center - Over 1,250,000 Gross Square Feet — ITE Land Use Code: 820

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable Study
Average Weekday Vehicle Trip Ends			26.5	35.7	18.9		7	1463
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.35	0.52	0.16		2	1455
		Exit	0.15	0.21	0.09		2	1455
		Total	0.50	0.73	0.24		2	1455
	P.M. Between 4 and 6	Enter	1.10	1.31	0.89		4	1477
		Exit	1.48	1.95	0.89		4	1477
		Total	2.58	2.88	1.79		4	1477
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter	1.40	1.60	1.07		4	1477
		Exit	1.66	2.54	1.25		4	1477
		Total	3.06	4.12	2.32		4	1477
Saturday Vehicle Trip Ends			34.3				3	1470
Peak Hour of Generator		Enter	2.04				1	1510
		Exit	2.27				1	1510
		Total	4.31				1	1510
Sunday Vehicle Trip Ends			12.5				1	1400
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 13, 48, 42

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

824—Discount Stores

Description: Discount stores are free-standing stores with off-street parking. They usually offer fewer services, centralized cashiering and a wide range of products. They are often the only store on a site, but again, one can find them in mutual operation with their own or other supermarkets, garden centers and service stations, or as part of community-sized shopping centers. They usually maintain long store hours, also on Sundays.

Data from only a small number of studies are summarized on the following trip generation rate table. The centers studied ranged in size from 70,000 to 154,000 gross square feet of leasable area.

Initially, it was thought, from a traffic generation standpoint, that discount centers should be a separate category from other shopping centers. However, upon inspection of the trip generation table, especially the average weekday rates, it appears that discount centers could be grouped with the other centers merely on the basis of size. More data are necessary to determine if this is the case.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Discount Store — ITE Land Use Code: 824

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			64.6	121.1	29.8		15	113
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter	1.4				1	125
		Exit	1.9				1	125
		Total	3.3					
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter	2.6				1	125
		Exit	2.4				1	125
		Total	6.3				4	104
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 5, 48, 54, 57, 77

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

831—Quality Restaurant

Description: This category of restaurants comprises eating establishments of high quality and with turn-over rates generally of at least one hour or longer. Separate categories deal with high-turnover restaurants (Code 832) and drive-in restaurants (Code 833).

Data were collected from three different studies conducted by the California Division of Highways. The restaurants surveyed ranged in size from 4,500 to 10,000 square feet of gross floor area with seating capacities from 161 to 662.

Trip Characteristics: No information was available regarding person trip ends, therefore, all analyses were performed on the basis of vehicle trip ends. Vehicle occupancy rates were given by one study as 2.0 persons per car for an average weekday. In the same study, 2.1 percent of the average weekday trips were trucks.

Trip generation rates were developed on the basis of two variables: per seat and per 1,000 square feet gross floor area. On the basis of available information, quality restaurants can be expected to generate, on an average weekday, 1.2 vehicle trip ends per seat or 56.3 vehicle trip ends per 1,000 square feet gross floor area. Maximum restaurant use occurred on Saturdays at generation rates of 1.87 trip ends per seat or 87.3 trip ends per 1,000 square feet floor area. The observed peak hour for restaurants was found to fall between noon and 2 P.M. except for Saturdays, when the peak hour occurred between 8 and 9 P.M.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Quality Restaurant — ITE Land Use Code: 831

Independent Variable—Trips per: Seat

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			1.20				3	358
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.03				2	206
		Exit	0.02				2	206
		Total	0.02				3	358
	P.M. Between 4 and 6	Enter	0.09				2	206
		Exit	0.05				2	206
		Total	0.07				3	358
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter	0.16				2	206
		Exit	0.15				2	206
		Total	0.15				3	358
Saturday Vehicle Trip Ends			1.87				3	358
Peak Hour of Generator		Enter	0.22				2	206
		Exit	0.28				3	358
		Total	0.69				1	662
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total	0.11				1	662

Source Numbers: 13

ITE Technical Committee 6A-6—Trip Generation Rates

Date: July 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Quality Restaurant — ITE Land Use Code: 831

Independent Variable—Trips per: 1,000 Square Feet GFA

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			56.3				3	7.7
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	0.85				2	6.5
		Exit	0.46				2	6.5
		Total	1.13				3	7.7
	P.M. Between 4 and 6	Enter	2.77				2	6.5
		Exit	1.69				2	6.5
		Total	3.44				3	7.7
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter	5.08				2	6.5
		Exit	4.85				2	6.5
		Total	7.00				3	7.7
Saturday Vehicle Trip Ends			87.3				3	7.7
Peak Hour of Generator		Enter	7.00				2	6.5
		Exit	8.39				2	6.5
		Total	13.00				3	7.7
Sunday Vehicle Trip Ends			45.4				1	10.0
Peak Hour of Generator		Enter						
		Exit						
		Total	7.60				1	10.0

Source Numbers: 13

ITE Technical Committee 6A-6—Trip Generation Rates

Date: July 1975

832—High Turn-Over, Sit-Down Restaurant

Description: This category of restaurants comprises sit-down eating places with turn-over rates of generally less than one hour. Restaurants in this group are usually moderately priced and frequently belong to chains such as Howard Johnson's, Sambo's and others. Typical drive-in restaurants which are primarily take-out oriented are not included in this analysis but are treated separately under Land Use Code 833.

Data were collected from four different sources comprising a total of 22 studies located in various parts of the U.S. The restaurants investigated ranged in size from 1,200 to 17,500 square feet of gross floor area; seating capacities for restaurants for which this information was available were between 100 and 1,000 seats per restaurant.

Trip Characteristics: Since no information was available on person trip ends, only vehicle trip end data could be inventoried. Trip generation rates were computed on the basis of 1,000 square feet gross floor area since this was the only common information available for all studies. Data were not sufficient to develop meaningful trip generation rates based on the number of seats per restaurant.

On the basis of the available information, high turn-over, sit-down restaurants generate an average of 164.4 vehicle trip ends per 1,000 square feet gross floor area on an average weekday. Saturday and Sunday trip volumes were significantly lower at 67.8 and 39.0 vehicle trip ends per 1,000 square feet respectively, as shown in the following summary.

The weekday generator peak hour was between 6 and 7 P.M., followed closely by the noon period. No information was available with respect to the timing of the peak hours on Saturdays and Sundays.

Data Limitations: Although a sizable number of studies was available for analysis, considerable differences existed in the type of data and the time periods for which data were collected. There is a great need for more precise definitions and a more common terminology in trip generation data gathering.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: High Turn-Over, Sit-Down Restaurant — ITE Land Use Code: 832

Independent Variable—Trips per: 1,000 Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			164.4	551.2	47.9		9	5.7
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total*	47.5	63.5	24.0		2	3.1
	P.M. Between 4 and 6	Enter	9.9	17.3	7.6		3	11.7
		Exit	4.0	10.3	3.2		3	11.7
		Total	10.5	38.7	3.0		11	8.3
Peak Hour of Generator	A.M. Between 12-1 P.M.	Enter	10.1	11.9	6.6		4	9.6
		Exit	5.5	20.8	2.4		4	9.6
		Total	15.7	75.0	5.1		19	7.2
	P.M. Between 6 and 7	Enter	13.0	17.8	11.2		3	8.2
		Exit	9.2	21.2	6.8		3	8.2
		Total	22.2	39.0	18.0		3	8.2
Saturday Vehicle Trip Ends			67.8	105.2	62.4		2	9.7
Peak Hour of Generator		Enter						
		Exit						
		Total	10.0	13.2	7.0		6	10.9
Sunday Vehicle Trip Ends			39.0	40.0	32.4		2	9.7
Peak Hour of Generator		Enter						
		Exit						
		Total	6.9	8.8	4.6		6	10.9

Source Numbers: 2, 4, 5, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: July 1975

*Represents two restaurants which apparently cater to breakfast patrons.

833—Drive-In Restaurant

Description: This category includes drive-in and fast-food restaurants that have no or only a limited number of sit-down facilities. Generally, food is ordered and taken out to be consumed outside the restaurant building. Surveyed restaurants included fast-food eating places such as McDonald's, Dunkin Donuts, Burger Chef and others.

Data were collected from trip generation studies conducted by the New England and Ohio Sections ITE, comprising a total of 12 observations. The restaurants investigated ranged in size from 1,590 to 5,400 square feet of gross floor area with an average of 2,900 square feet per restaurant. Seating capacity data were available for only three observations with an average of about 30 seats per restaurant.

Trip Characteristics: Trip generation rates were computed on the basis of 1,000 square feet of gross floor area. As the summary indicates, drive-in restaurants generated an average of 553 vehicle trip ends per 1,000 square feet gross floor area on an average weekday. No information was available for Saturday and Sunday trip generation. The generator peak hour occurred generally between noon and 1 P.M. During this hour, an average of 78.8 vehicle trip ends were generated per 1,000 square feet floor space in both directions.

Data Limitations: Lack of data existed for weekend trip generation rates which conceivably could surpass the weekday rates. Also, the data were limited to fast-food restaurants along major arterial streets, easily accessible by auto. None of the observations included a fast-food restaurant in a downtown or central business district which would rely heavily on walk-in patrons.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Drive-In Restaurant — ITE Land Use Code: 833

Independent Variable—Trips per: 1,000 Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			553	828	376		6	2.68
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	49.7*				1	1.59
		Exit	40.2*				1	1.59
		Total	89.9*				1	1.59
	P.M. Between 4 and 6	Enter	17.0				4	3.57
		Exit	14.6				4	3.57
		Total	31.6	73.0	21.1		4	3.57
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M. Between 12 and 1	Enter	44.4				4	3.57
		Exit	41.9				4	3.57
		Total	78.8	194.7	37.0		11	2.98
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 4, 5

ITE Technical Committee 6A-6—Trip Generation Rates

Date: July 1975

*Represents Dunkin Donuts Restaurant

841—New Car Sale

Description: New car sales facilities are generally located as strip development along major arterial streets which already have a preponderance of commercial development. Generally included are auto services and parts sales along with a sometimes substantial used-car operation. Some dealerships also include leasing activities and truck sales and servicing.

Trip Characteristics and Data Limitations: Due to the limited sample size (only two studies are cited) the data should be used with caution. Further studies should identify a number of characteristics describing each dealership including: new and used car lot area, truck lot area, number of remote vehicle storage areas and their sizes, number of service stalls for autos and trucks, show room, service and parts facility areas, auto/truck brands sold, size of metropolitan area served and number of same brand dealerships in the area. Because of the great variability in the above, far greater than the maximum and minimum rates cited can be expected.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: New Car Sale — ITE Land Use Code: 841

Independent Variable—Trips per: Site

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends								
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	33	39	27		2	1
		Exit	19.5	33	6		2	1
		Total	52.5	72	33		2	1
	P.M. Between 4 and 6	Enter	39	45	33		2	1
		Exit	40.5	47	34		2	1
		Total	79.5	92	67		2	1
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10/15/75

844—Service Station

Description: Automobile service stations generally are located at intersections or freeway interchanges and include facilities for servicing, repairing and fueling motor vehicles.

Trip Characteristics: On an average weekday, a service station will generate nearly 750 vehicle trip ends per station or 133 per pump as indicated on the following tables. However, much of this traffic is already on the street for another purpose. "Vehicular movements were traced at eight stations in three Illinois cities, with the findings that 54 percent of the A.M. peak hour volume and 58 percent of the P.M. peak hour volume involved vehicles passing by on their way to another destination."*

The peak-hour generation rates indicated only a two-way rate. The amount entering or leaving is usually one-half the hourly two-hour volume.

Data Limitations: More data are necessary to determine the effect on trip making by the size of station.

* "Trip Generation Study of Selected Commercial and Residential Developments." Illinois Section ITE, June 1969.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Service Station — ITE Land Use Code: 844

Independent Variable—Trips per: Station

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			748	1000	620		5	1
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total	21	50	8		14	1
	P.M. Between 4 and 6	Enter						
		Exit						
		Total	25	52	7		18	1
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total	25	60	8		15	1
	P.M.	Enter						
		Exit						
		Total	31	48	18		6	1
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total	54	54	54		1	1
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 2, 4, 5, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 5/27/75

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Service Station — ITE Land Use Code: 844

Independent Variable—Trips per: Pump

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			133	170	103		4	5.5
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	1.00				1	8
		Exit	0.75				1	8
		Total	1.75				1	8
	P.M. Between 4 and 6	Enter	1.88				1	8
		Exit	1.75				1	8
		Total	3.63				1	8
Peak Hour of Generator	A.M.	Enter	2.75				1	8
		Exit	2.75				1	8
		Total	5.50				1	8
	P.M.	Enter	3.25				1	8
		Exit	2.75				1	8
		Total	6.00				1	8
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 4

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 5/27/75

846—Car Wash

Description: The car wash facilities cited are semiautomated facilities in which the automatic washing operation is preceded by interior cleaning and vacuuming by car wash personnel and followed by damp toweling to remove water and catch dirty spots which were missed by the automatic washing. Most facilities also have a car waxing capability in which the wax is applied automatically in liquid spray form at the end of the automatic wash cycle. Gasoline is usually available for purchase and the amount of purchase qualifies the customer for a discount on the car wash.

Trip Characteristics: The preponderance of data are from Chicago area car washes and were collected only for Saturdays, which generally seems to be the peak operating period. Occasionally one finds a car wash which is also open on Sundays. Where this is the case, although no data are available for this report, substantial volume and long queues waiting to be serviced have been observed. The values cited should be reasonably representative even though they are based on but a few studies.

Data Limitations: A large sampling should be obtained for a number of metropolitan areas in addition to identifying such variables as time of year (season) and possibly some indication of existing and recent weather and street conditions. It may be that car wash use is greater in northern climates shortly after snowfalls. Other data which should be identified are: number of car wash channels (single or multiple queue), the gasoline brand, metropolitan area size and number of car washes in relation to the market area.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Car Wash — ITE Land Use Code: 846

Independent Variable—Trips per: Site

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends								
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total	59.6	96	43		9	1
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 2

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10/15/75

848—Highway Oasis
849—Truck Stop

Description: Highway oasis and truck stop facilities are usually (but not always) located on sites adjacent to major freeway interchanges in a rural or semirural setting. Often, the site is in close proximity to a metropolitan area of varying size, more likely than not on the "city side" of the interchange. Site sizes for the four studies cited ranged from 3 to 6.1 acres, the largest being for the truck stops.

Highway oasis facilities include fuel sales for autos and occasionally for diesel trucks, minimal mechanical services for autos (tune-ups, fan belts, brakes, etc.) but not for large trucks, a restaurant, rest rooms and, on occasion, a gift and/or cheese/candy shop.

Truck stop facilities are geared primarily to truckers' needs and include auto and truck fuels (possibly including LP), a restaurant, rest rooms, trucker mechanical services (sometimes sufficiently complete to allow major overhauls), truck icing and weighting, trucker supplies and clothing, and trucker overnight accommodations.

Trip Characteristics: When the restaurant is of high quality it may serve as one of the community's dining spots as well as serving passing motorists and consequently generate considerable local business. With the high volume of traffic possible, the entrances should be designed as important three-leg intersections. Although the sample cited in this work is small, 16 hour two-way volumes (from 6 A.M. to 10 P.M.) as high as 1,894 and 1,278 were noted for oasis and truck stop facilities, respectively. Since the truck stop volumes included 45.5 percent heavy trucks (mostly semitrucks), special design considerations may be in order.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Highway Oasis — ITE Land Use Code: 848

Independent Variable—Trips per: Site

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends								
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	34				1	1
		Exit	43	46	40		2	1
		Total	80				1	1
	P.M. Between 4 and 6	Enter	27				1	1
		Exit	55.5	77	34		2	1
		Total	61				1	1
Peak Hour of Generator	A.M.	Enter	44				1	1
		Exit	48.5	64	33		2	1
		Total	77				1	1
	P.M.	Enter	40				1	1
		Exit	64.5	81	48		2	1
		Total	88				1	1
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 81

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10/15/75

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Truck Stop — ITE Land Use Code: 849

Independent Variable—Trips per: Site

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends								
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter	31.5	37	26		2	1
		Exit	32.5	44	21		2	1
		Total	64	81	47		2	1
	P.M. Between 4 and 6	Enter	47	49	45		2	1
		Exit	35.5	36	35		2	1
		Total	82.5	85	80		2	1
Peak Hour of Generator	A.M.	Enter	39	44	34		2	1
		Exit	48.5	52	45		2	1
		Total	87.5	96	79		2	1
	P.M.	Enter	50.5	56	45		2	1
		Exit	52.5	67	38		2	1
		Total	103	123	83		2	1
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 81

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 10/15/75

850—Supermarket

Description: Supermarkets are retail stores selling a complete assortment of food, food preparation and wrapping materials and household cleaning and servicing items. Supermarkets are usually open for business between 9 A.M. and 9 P.M.

Trip Characteristics: Supermarkets, on the average, generate 125.5 average weekday trip ends per 1,000 gross square feet of building area, as indicated on the following table.

Data Limitations: Most data for supermarkets were collected for peak hours, very little data indicated the entering and leaving hourly volume. More research is needed to add to this data base, including average weekday and Saturday and Sunday trips.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type: Supermarket — ITE Land Use Code: 850

Independent Variable—Trips per: 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			125.5	270.8	51.7		3	22.5
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter	3.7	5.1	3.0		2	22.6
		Exit	3.3	5.3	2.3		2	22.6
		Total	10.9	16.6	5.2		9	17.5
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter	6.0	11.9	2.7		3	21.1
		Exit	7.4	15.8	3.1		3	21.1
		Total	15.7	27.7	5.8		10	18.2
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers: 2, 4, 5, 72

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

851—Convenience Market

Description: Convenience markets are usually open 15 to 24 hours per day, depending on the management and possibly the location. These stores are usually several thousand gross square feet in size.

Trip Characteristics: Data from only five studies in Delaware were obtained. These were grouped for the stores which were open 15-16 hours and for those operating on a 24-hour basis because the generation rates reflected that type of grouping. Only average weekday vehicle trip ends data were reported and summarized on the following tables.

Data Limitations: Measurements at more of these establishments are necessary to establish a data base for estimating trip generation rates.

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type 15-16 Hour Open Convenience Market ITE Land Use Code 851

Independent Variable—Trips per 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			322.6	351.7	293.6		2	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 78

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Date: 1975

SUMMARY OF TRIP GENERATION RATES

Land Use/Building Type 24-Hour Open Convenience Market ITE Land Use Code 851

Independent Variable—Trips per 1,000 Gross Square Feet

			Average Trip Rate	Maximum Rate	Minimum Rate	Correlation Coefficient	Number of Studies	Average Size of Independent Variable/Study
Average Weekday Vehicle Trip Ends			577.5	699.2	480.0		3	
Peak Hour of Adjacent Street Traffic	A.M. Between 7 and 9	Enter						
		Exit						
		Total						
	P.M. Between 4 and 6	Enter						
		Exit						
		Total						
Peak Hour of Generator	A.M.	Enter						
		Exit						
		Total						
	P.M.	Enter						
		Exit						
		Total						
Saturday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						
Sunday Vehicle Trip Ends								
Peak Hour of Generator		Enter						
		Exit						
		Total						

Source Numbers 78

ITE Technical Committee 6A-6—Trip Generation Rates

Date: 1975

V. DATA LIMITATIONS

As indicated in the trip generation tables, the data presented have limitations. The basic limitation, and one reason for variations in rates, is the sample size of counts at some generators and for peak hours for most generators. Additional data are needed for most generators to more accurately state the peak hour entering and exiting rates.

Another reason for such variation is caused by different lengths of count periods and the time of the year the traffic volumes were counted. Daily and seasonal variations exist for most generators. In some cases, full week counts were made to define the average weekday; in other cases, a single day's count was obtained. In almost no case was the generation measurement adjusted for seasonal variations. This is especially true for shopping centers.

Variations in generation rates may also exist because of the location of the generator studied either within a metropolitan area or within the U.S. These locations have been identified in the data sets but no separate analyses have been made to determine if a difference exists because of location.

In all cases, the generation rates presented in this report represent drive-way volumes of vehicles entering and exiting the site. For some building types, such as retail establishments, the generation rate could overstate the volume of traffic when assigned to the adjacent street system because some traffic is attracted to the site from the passing stream of traffic. That portion of the total generated traffic attracted to the site would pass on the adjacent street system whether or not the site were developed. It is essential that emphasis be focused on defining how much of the total generated traffic would be attracted from the passing adjacent street traffic to all building types to more accurately define the traffic impact on the street system caused by development of a site.

The data summarized in this report are only for vehicle trip ends and do not include all person trip ends by mode. More data are needed for each building and land use type to define vehicle occupancy rates and person trip generation rates by mode of travel.

More data are needed to define generation rates for the following types of buildings or land uses:

- water ports
- truck terminals
- railroad terminals
- low and high rise apartments
- condominiums
- retirement communities
- residential planned unit developments containing a mixture of duplexes, apartments and/or single family units
- day care centers
- churches
- museums
- libraries
- hospitals
- nursing homes
- clinics
- medical offices
- government buildings
- speciality shopping centers containing a mixture of small specialty shops and restaurants
- building materials retail establishments
- high quality restaurants
- drinking establishments
- banks, savings and loan institutions, real estate offices, insurance offices and other financial services
- recreational uses.

VI. UPDATE PROCEDURE

The Institute has established a formal procedure for updating the data summarized in this report to add data for additional land uses or building types not sufficiently covered and to develop data on person trip ends by mode.

The Institute invites all Districts and Sections to be involved in this continual update procedure. Districts and Sections, through their technical committees, can collect data from at least one or more sites annually and send it either on keypunch cards or on the trip generation coding sheets to the ITE Technical Council for updating this report. In many cases, traffic counters or even personnel may be available from time to time to conduct a generation study in a given area.

The Institute will be coordinating these efforts with federal, state, local and private agencies. This will result in a continual, uniform method of obtaining and summarizing the current trip generation data for all types of special generators, land uses and building types.

The function of the trip generation committee is to:

1. Store all trip generation data.

2. Coordinate with ITE District and Section technical committees, governmental agencies and private consultants for the collection of additional data.

3. Distribute trip generation coding sheets and instructions to those collecting data.

4. Maintain computer program for trip generation analyses and summarization.

5. Maintain and modify when necessary a uniform procedure for collecting data.

6. Summarize trip generation data.

7. Conduct special trip generation analyses when appropriate.

8. Revise trip generation rate tables and appropriate text of report on basis of the additional data.

9. Establish data collection needs in areas where deficiences exist or where little information is available.

The following procedure is presented to obtain new generation data from actual traffic volume counts. It is recommended that this procedure be followed when collecting data.

- Count a special generator where automatic counts can be made on drivers without double-counting vehicles and without counting through traffic. Preferably, directional counts should be made. The site should be self-contained with adequate parking not shared by other activities.

- Conduct seven-day automatic counts during a typical week of the year to provide data concerning the average weekday, Saturday and Sunday and peak hours.

- Supplement automatic counts with a manual count for several hours on a weekday to record hourly inbound and outbound vehicular traffic by classification and vehicle occupancy and to compare with corresponding automatic counts to determine a counter factor for adjusting the raw automatic counts.

- Where recording or directional counts cannot be made automatically, manual counts should be made on a typical weekday during the A.M. and P.M. peak two-hour periods of the special generator being counted and that of the adjacent street traffic to record the peak-hour entering and exiting volumes.

- Where possible, supplement the above work with manual counts or controlled interviews to determine average weekday person trip ends by mode and determine how many trips were actually generated by the site and how many were attracted to the site from the adjacent street traffic normally passing the site.

- Data concerning the site should be obtained through interviews with the site owner or manager and, if necessary, measurements. Information on the maximum number of related

variables should be obtained to determine which is the best related to trip generation. In all cases, it is essential to obtain the number of employees, the gross building area, the number of occupied rooms or dwelling units, the population and the acreage of development.

- Code data on coding forms.
- Obtain trip generation reference number from permanent committee and, if necessary, a new land use or building type code if one does not already exist.
- Transmit data to Technical Council.

VII. TRIP GENERATION LAND USE CODE

000—Port and Terminal
010—Water Port
020—Airport
021—Commercial Airport
022—General Aviation Airport
030—Truck Terminal
040—Railroad Terminal

100—Industrial/Agricultural
110—General Light Industrial
120—General Heavy/Industrial
130—Industrial Park
140—Manufacturing
150—Warehousing
160—Construction
170—Utility
180—Agricultural

200—Residential
210—Single Family Detached Housing
220—Apartment
221—Low-Rise Apartment
230—Condominium
231—Low-Rise Condominium
232—High-Rise Condominium
240—Mobile Home
250—Retirement Community
260—Recreational Home
270—Planned Unit Development (Residential)

300—Lodging
310—Hotel
230—Motel
330—Resort Hotel

400—Recreational
410—Park
411—City Park
412—County Park
413—State Park
420—Marina
430—Golf Course
440—Theater
441—Live Theater
442—Music Theater
443—Movie Theater (sit down)
444—Drive-In Theater
450—Stadium
451—Baseball/Football
452—Horse Race
453—Auto Race
454—Dog Race
460—Camp
480—Amusement Park

500—Institution
501—Military Base
510—Preschool
520—Elementary School
530—High School
540—Junior/Community College
550—University
560—Church
570—Court
580—Museum/Gallery
590—Library

600—Medical
610—Hospital
620—Nursing Home
630—Clinic

700—Office
710—General Office Building
720—Medical Office Building
730—Government Office Building
740—Civic Center
750—Office Park
760—Research Center

800—Retail
810—Retail/General Merchandise
820—Shopping Center
821—Regional Shopping Center—
over 500,000 G.L.F.A.
822—Community Shopping Center—
100,000 to 500,000 G.L.F.A.
823—Neighborhood Shopping Center—
under 100,000 G.L.F.A.
824—Discount Store
825—Specialty Retail Center
826—Specialty Store
827—Building Material
830—Restaurant
831—Quality Restaurant
832—High-Turnover, Sit-Down Restaurant
833—Drive-In Restaurant
840—Auto
841—New Car Sale
842—Used Car Sale
843—Auto Parts Sale
844—Service Station
845—Tire, Battery and Accessory
846—Car Wash
847—Auto Repair
848—Highway Oasis (including truck fuel, minimal trucker and mechanical services)
849—Truck Stop (including food, auto and truck mechanical services, trucker supplies and trucker overnight sleeping accommodations)
850—Supermarket
851—Convenience Market
860—Wholesale
870—Apparel
890—Furniture

900—Services
910—Financial
911—Bank (walk-in)
912—Drive-In Bank
913—Savings and Loan (walk-in)
914—Drive-In Savings and Loan
915—Stockbroker
916—Lending Agency
920—Real Estate
930—Insurance

VIII. REFERENCES

1. "Trip Generation," Western Section ITE, Jan. 1967.

2. "Trip Generation Study of Selected Commercial and Residential Developments," Illinois Section ITE, June 1969.

3. "Trip Generation for Commercial and Industrial Development," Southern Section ITE, 1972.

4. "Trip Generation Study," New England Section ITE, July 1973.

5. "Trip Generation Study," Ohio Section ITE, Nov. 1973.

6. "Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, Dec. 1965.

7. "Second Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, Dec. 1966.

8. "Third Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, Dec. 1967.

9. "Fourth Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, Dec. 1968.

10. "Fifth Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, Dec. 1969.

11. "Sixth Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, Dec. 1970.

12. "Seventh Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, Dec. 1971.

13. "Eighth Progress Report on Trip Ends Generation Research Counts," San Francisco: State of California Transportation Agency, Dept. of Public Works, Div. of Highways, District 4, July, 1973.

14. "Trip Generation Study," Baltimore: Maryland State Road Commission, Bureau of Traffic Planning, 1968.

15. "Trip Generation Study," Baltimore: Maryland State Road Commission, Bureau of Transportation Planning, 1970.

16. "Special Traffic Generator Study, Report No. 1, Residential Generators," Dover, Delaware: State of Delaware, Dept. of Highways and Transportation, 1971.

17. "Special Traffic Generator Survey, Industrial," Dover, Delaware: State of Delaware, Dept. of Highways and Transportation, 1972.

18. "First Progress Report on Traffic Generators," San Diego, California: State of California Business and Transportation Agency, Dept. of Public Works, Div. of Highways, District 11, Dec. 1971.

19. "Second Progress Report on Traffic Generators," San Diego, California: State of California Business and Transportation Agency, Dept. of Public Works, Div. of Highways, District 11, Dec. 1972.

20. "Comparison of Virginia Urban Trip Generation Studies with Similar Investigations Conducted by the States of Maryland and California," Richmond: Virginia Dept. of Highways, Metropolitan Transportation Planning Div., July 1972.

21. "Trip Generation Rates, Interim Technical Report 4365-4410," New York City: Tri-State Regional Planning Commission, May 1973.

22. "Interim Technical Report, Transportation Considerations of Regional Shopping Centers," New York City: Tri-State Transportation Commission, Nov. 1969.

23. "Interim Technical Report, Travel to General Hospitals," New York City: Tri-State Transportation Commission, March 1970.

24. "La Crosse Area Transportation Study, Survey Data," La Crosse, Wisconsin: Wisconsin Dept. of Transportation, Div. of Highways, 1970.

25. "Janesville Area Transportation Study," Janesville, Wisconsin: Wisconsin Dept. of Transportation in cooperation with U.S. Dept. of Transportation, Federal Highway Administration, 1973.

26. "Lexington Transportation Study, Special Generator Study," Frankfort, Kentucky: Kentucky Dept. of Highways, July 1972.

27. Biciunas, A. E., "Trip Generating Potential of Hospitals," *Research News* (Chicago Area Transportation Study), Vol. 7, No. 4, Dec. 31, 1965.

28. Pendakur, V. Setty, and Paul O. Roer, "Access and Parking Criteria for Hospitals," *Highway Research Record 371*, 1971.

29. Zevin, Israel, "Traffic Generation Study of Rest Homes and Chronic and Convalescent Homes," Wethersfield, Connecticut: Connecticut Dept. of Transportation, Dec. 1972.

30. Shuldiner, Paul W., Donald S. Berry and James M. Montgomery Jr., "Traffic and Parking Requirements of Off-Center Medical Office Building," *Highway Research Record 49*, 1963.

31. "Trip Generation Equations by Zone," Dougherty Area Regional Transportation Study,

Atlanta: State of Georgia Dept. of Transportation, Feb. 13, 1969.

32. "Floyd-Rome Urban Transportation Study, Technical Report Number Six, Documentation of Model Development and Calibration," Atlanta: State of Georgia Dept. of Transportation, July 1972.

33. "Trip Generation Summary, Trip Generation Study of Kaiser Koulai Clinic, Study Number TG-006, Revised," Honolulu: State of Hawaii Dept. of Transportation, Highways Div.—Planning Branch.

34. "Trip Generation, Las Cruces Area Transportation Study," City of Las Cruces, New Mexico: New Mexico State Highway Dept., 1970.

35. "Composite Report of Traffic Generation Studies," Los Angeles: City of Los Angeles, Aug. 1969.

36. "Trip-Making Characteristics," Los Angeles: City of Los Angeles, Nov. 1972.

37. "Single Family Generation Study—Summary," Los Angeles: City of Los Angeles, June 1972.

38. "Trip Generation Rates," unpublished report, County of Los Angeles, Los Angeles, March 1973.

39. "Single Family Dwelling Unit Trip Generation Factors from Department of Traffic Studies," Los Angeles: City of Los Angeles, June 1973.

40. "Trip Generation Summary," Honolulu: State of Hawaii, Dept. of Transportation, Highways Div., Planning Branch, 1972.

41. Cohen, Daniel S., "A Methodology for Determining the Traffic Impact of Regional Shopping Centers," unpublished report, Washington, D.C., July 1970.

42. Kimmel, H., S. E. Rowe, A. Rubenstein, R. Stanford and A. Weber, "Trip Generation," Los Angeles: Automobile Club of Southern California, Jan. 1967.

43. "Traffic Characteristics of Shopping Centers," Washington, D.C.: Metropolitan Washington Council of Governments, July 1970.

44. Hollander Associates, Sidney, "Study of Eighteen Alder Community Shopping Centers," Baltimore: The Mayor's Small Business Administration, City of Baltimore, Nov. 1965.

45. Stoll, Walter, "Characteristics of Shopping Centers," Chicago: Chicago Area Transportation Study, State of Illinois, July 1966.

46. Cousens, Patricia D., William M. Ladd and David A. Pampu, "Residential Location and Shopping Pattern in Oakland County," Pontiac, Michigan, Aug. 1966.

47. Buttke, Carl H., "An Approximation of Regional Shopping Center Traffic," *Traffic Engineering*, April 1972.

48. Miller, Forrest D., "Trip Generation at Shopping Centers," *Traffic Engineering*, Sept. 1969.

49. Keefer, Louis E., "Urban Travel Patterns for Airports, Shopping Centers, and Industrial Plants," Washington, D.C.: Highway Research Board (NCHRP Report 24), 1966.

50. Keefer, Louis E., and David K. Witheford, "Urban Travel Patterns for Hospitals, Universities, Office Buildings and Capitols," Washington, D.C.: Highway Research Board (NCHRP Report 62), 1969.

51. "Parking and Traffic Generation—Office Buildings," Newport Beach, California: Herman Kimmel and Associates, Sept. 1970.

52. "Traffic Generation and Parking Factors," St. Paul: Barton-Aschman Associates, Inc., 1971.

53. "Summary of Special Generator Studies," Minneapolis: Twin Cities Area Metropolitan Council, 1971.

54. "Travel Generation," Cedar Rapids, Iowa: National Association of County Engineers, Action Guide Series, July 1972.

55. "Parking and Trip Generation Reports and Summaries, Vol. 1," unpublished report, DeLeuw, Cather & Company, Chicago.

56. "Atlantic City Urban Area Transportation Study, Survey Data," Atlantic City: New Jersey Dept. of Transportation, 1973.

57. Steinhauer, J. J., "Traffic Generator Study, Shopko West Shopping Center," Green Bay, Wisconsin: Wisconsin Dept. of Transportation, Dec. 1967.

58. "Traffic Generator Study, Arlan's Shopping Center," Sheboygan, Wisconsin: Wisconsin Dept. of Transportation, April 1967.

59. Degiorgi, Bruno R., "Traffic Generated by Shopping Centers," Poughkeepsie, New York: New York State Dept. of Transportation, Planning Group, Region 8, 1971.

60. "Palo Alto Transportation Planning Program, Data Measured at Stanford Shopping Center," Palo Alto, California: DeLeuw, Cather & Company, 1969.

61. Silver, Jacob, and Walter G. Hansen, "Characteristics of Travel to a Regional Shopping Center," *Public Roads*, Dec. 1960.

62. Oregon State Highway Division Studies of three shopping centers at confidential locations, unpublished, Salem, Oregon, 1972.

63. "Report of Traffic and Engineering Investigation of Mayfair Shopping Center Driveways on S.T.H. 100 and West North Avenue," City of

Wauwatosa, Wisconsin: State Highway Commission of Wisconsin, Dec. 1964.

64. Messner, William H., "Shopping Center Study," Wethersfield, Connecticut: Connecticut Highway Dept., June 1968.

65. Harding, C. H. V., "Shopping Centers; Planning and Design for Traffic and Traffic Generation," Berkeley, California: The Institute of Transportation and Traffic Engineering, University of California, Aug. 1960.

66. "Traffic Generator—Motorola Inc.," unpublished paper, Schaumberg, Illinois, 1972.

67. "Traffic Generator—William Harper Jr. College," unpublished paper, 1971.

68. "Land Use Master Plan, Swan Island Industrial Park," Portland, Oregon: Planning Div., Port of Portland, 1972.

69. ITE Technical Council Committee 6V-a, "Transportation Considerations of Regional Shopping Centers," *Traffic Engineering*, Aug. 1972.

70. "Guidelines for Driveway Design and Location," Arlington, Virginia: Institute of Traffic Engineers, 1975.

71. "Interim Technical Report, Residential Trip Generation," New York City: Tri-State Transportation Commission, May 1971.

72. "Trip Generation Statistics," New York City: New York Metropolitan Section ITE, Jan. 1973.

73. "Trip Generation Studies of Three Regional Shopping Centers in Washington," Olympia, Washington: Washington State Dept. of Highways, 1973.

74. "Industrial Park Trip Generation Study," Wethersfield, Connecticut: Connecticut Dept. of Transportation, Bureau of Planning and Research, 1972.

75. "Study Number TG-005, Revised," Honolulu: State of Hawaii, Dept. of Transportation, Highways Div., Planning Branch, 1972.

76. Gern, Richard C., "Variations in Traffic Flow at Regional Shopping Centers," prepared for the Canadian Good Roads Association. Evanston, Illinois: Barton-Aschman Associates, Inc., Sept. 1968.

77. "Various Studies of Shopping Centers," unpublished report, Simpson & Curtin, Philadelphia.

78. "Special Traffic Generator Study, Shopping Centers," Dover, Delaware: State of Delaware, Dept. of Highways and Transportation, 1972.

79. "Interim Technical Report, Travel to Regional Shopping Centers," New York City: Tri-State Transportation Commission, Jan. 1970.

80. "Trip Generation," Santa Ana, California: Office of County Surveyor and Road Commissioner, Orange County, Oct. 1972.

81. Kuhn, Herman A. J., "Land Use and Traffic Generation Characteristics of Rural Highway Interchanges," unpublished data, University of Wisconsin, Madison, Wisconsin, 1967.

82. "Trip Generation by Land Use," Tempe, Arizona: Maricopa Association of Governments, April 1974.

83. Kanaan, George E., "Parking and Access at General Hospitals," Westport, Connecticut: Eno Foundation for Transportation, Inc., 1973.