

# Shoulder Use on an Urban Freeway

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This project consists of the establishment of a comprehensive system of surveillance and control on an urban freeway. The purposes of the project are to evaluate the use of surveillance, traffic control and sensing equipment; to investigate the characteristics of the freeway traffic flow which may be determined and treated by such equipment; to improve freeway traffic operation and safety by these means, as well as to conduct basic research into freeway operations by making use of this specialized equipment. For the first time it is possible to assemble the specialized equipment required to carry on a project of this scope.

This report pertains to one of a number of individual studies to be performed. Each of the studies will be reported separately as it is completed and each will contribute to the overall objective of this study.

•THE USE of shoulders on the highway has become a subject of increasing interest to authorities. In highway planning, design and operations, shoulder usage has grown from relative unimportance to a factor of major consideration along with volume, cross-section, speed and other related conditions. The major development which brought this about was probably control of access. By elimination of almost all elements of marginal friction, the principal remaining one, shoulder usage, can have a considerable effect on traffic flow on the controlled access facility. On such a facility, a driver has no refuge other than the shoulder.

The need for adequate shoulders is now commonly accepted. Design features have improved through the years and modern standards call for shoulder continuation even across some bridges. The effect of shoulder usage on moving traffic has been studied and the results published by the Highway Research Board and elsewhere.

A final question concerns the extent and nature of the shoulder usages that actually occur. The answer can be of value to those who design efficient freeways, control such usage or aid the shoulder user, and to those concerned with the improvement of traffic operations.

## OBJECTIVES

The general objective is to determine the extent of shoulder usage on an urban freeway and the typical characteristics of this usage. In particular, the objectives are to study:

1. The amount of shoulder usage on some rate basis such as vehicle-miles, per mile, or per hour.
2. Use by type of vehicle.
3. Length of stay.
4. Reason for using the shoulder.
5. Assistance received.
6. Other vehicles involved in the same incident.
7. The findings in relation to other shoulder usage studies.

## PREVIOUS STUDIES

There is other information on shoulder usage available from previous studies (1-4). These reports were studied both for comparative results and for methods of conducting such a study.

In general, it seems that the previous studies are not directly comparable to this study. Some studies were primarily on rural highways with varying cross-section and design standards. Although others obtained more detailed information on the driver and his reason for stopping, full-time coverage was not possible because of the methods used. In one case, there was full-time coverage on a short "control" section; otherwise, data were generally obtained by observers driving back and forth over the study section.

It is likely that shoulder usage in urban areas is quite different because of the great difference in trip length and purpose, driving time, access to assistance and time between stops. However, some of the previous findings are noted in the analysis which follows.

## STUDY SITE AND FACILITIES

The study location was the John C. Lodge Freeway between the Edsel Ford and Davison Interchanges, a distance of 3.2 miles, in midtown Detroit. The Lodge Freeway is a depressed facility with full control of access. The study section was built between 1950 and 1955. There are no major interchanges between the two boundaries indicated, but there are five on-ramps and five off-ramps for northbound traffic, and six on-ramps and five off-ramps for southbound traffic including the two boundary interchanges. Roadways are four lanes in each direction for about half the length of the section, and three lanes in each direction for the remainder. The continuous shoulders are 8 ft wide, bituminous paved, and have a mountable curb between them and the through lane. The 3.2 miles of freeway are covered by 14 closed-circuit television cameras spaced from 800 to 1,800 ft apart (Fig. 1).

The cameras are equipped with regular wide-angle and telescopic lenses which can be changed on any camera, remotely by the observer, to provide the desired detail of coverage. The cameras can also be rotated both horizontally and vertically by the operator. All data were collected from the control center which is located in a building adjacent to the freeway at about the mid-point of the study section.

Although the total length of the project section is 3.2 miles, there are blind spots. The horizontal sweep of the camera is only 60 degrees, so the shoulders immediately adjacent to the structures on which the cameras are located are not visible. In a few cases the distance between cameras is greater than the usable camera range and thus blind spots exist at the extremities of the camera field. These blind spots will be located and measured as a part of a study on equipment limitations. Because the information is not yet available, determination of only 2.5 miles of visible roadway was used in the computation of vehicle-miles. Because the camera fields show both directions of traffic, the 2.5 miles of visible roadway actually include 5 miles of shoulder.

Traffic volume information was obtained by ultrasonic detecting equipment located over each lane of the freeway at two locations.

The project facilities are especially useful in this type of study because continuous observation over an extensive length of urban freeway is possible under all conditions, and inasmuch as drivers are unaware that they are being observed and studied, their normal behavior is not affected.

## METHOD OF STUDY

The data were obtained by trained observers watching the monitors. When a shoulder usage was observed the time and location were recorded on the log, and remaining data were recorded as they were determined. Location was indicated by using camera number and direction of travel, that is, 1<sup>i</sup>—Camera No. 1, inbound (Fig. 2).

In this study, no attempt was made to determine the number of incidents that were missed by the observers. It is assumed that their accuracy was good, subject to the completion of an observer evaluation study which will be reported separately. It is

known, however, that some incidents were missed so the results derived from the data should be on the conservative side.

The "reason for stoppage" was determined entirely by the trained observer's evaluation of the incident from his location at the television control center. If there was no obvious indication, the reason for stopping was indicated as "undetermined." No attempt was made to determine the reason for stopping by sending someone to the scene or by notifying the police, because a part of this study was to determine the length of stay under normal conditions. This, of course, was not the case in any situation involving injury accidents or severe emergency conditions.

The traffic volume data were collected from automatic vehicle detectors and recorded at specified times from the visual dials of this equipment to determine vehicle-mile information. This volume is assumed to represent the average volume over the entire study section because the only major interchanges are located at the extreme ends of the study section. Ramp volumes throughout the section will be observed and reported in another study.

### DATA COLLECTION

The field studies were conducted in May and August of 1961. In May, the study was performed during the period Monday the 15th to Friday the 26th, which included one weekend. The hours of study each day were 6 AM to 8 PM. Observer's shifts were changed during the middle of the day without interruption to the data collection.

The August studies included only weekdays. Observations were made from 6 AM to 1 PM and 1 PM to 8 PM on alternate days.

Data for 168 hours of observation were recorded during the twelve days in May and 70 hours during ten days in August for a total of 238 man-hours of observer time.

All data for twelve days in May were complete so that it was possible to include all in the summaries and tables. Portions of the August data were unusable because reliable volume information was not available. Therefore, data for August cover only seven days of seven hours each.

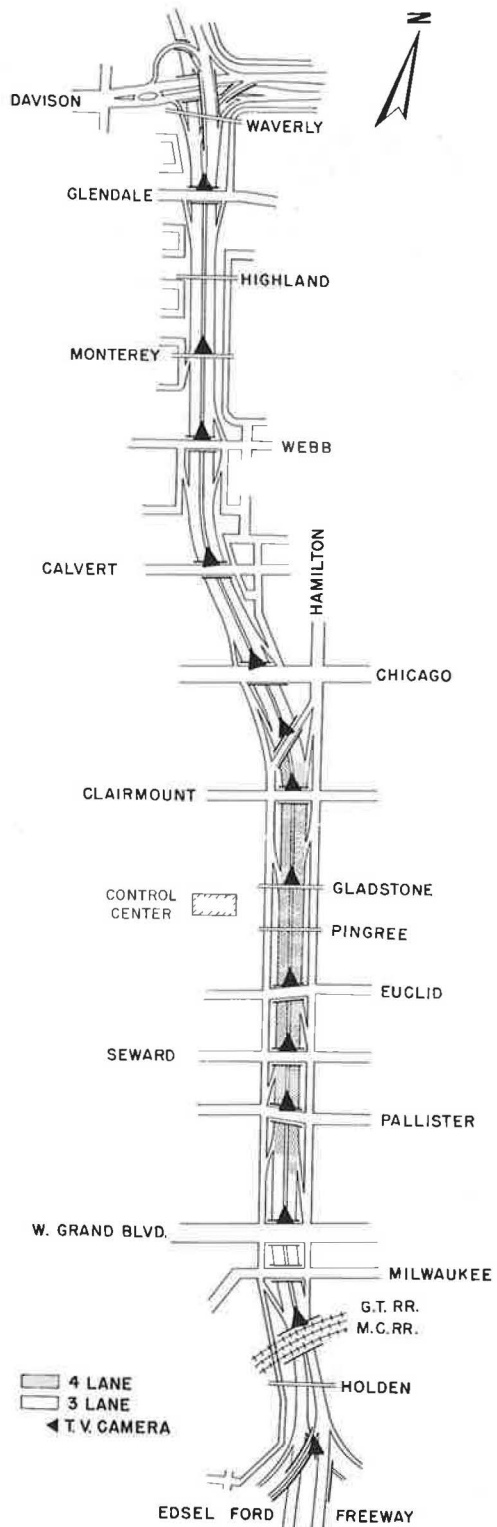


Figure 1. Camera locations.

0600  
1000

CHICAGO (OUTBOUND)

10533

VOLUME

CHICAGO (INBOUND)

11766

STUDY 417 "SHOULDER USAGE"
DATE 5-23-61
DAY TUES
OBSERVER JL & CR
TIME STARTED 0600

TIME IN	LOCATION	TYPE OF VEHICLE	CAUSE	AID REC'D	AIDED BY	TIME OUT	RD. SURFACE	WEATHER
071000	1*	FOREIGN	OUT OF GAS		SELF	074030	DRY	CLEAR
072100	9*	STAND PASS	MOTOR TR		SELF	072400	"	"
072200	8*	"	REC'D TICKET			072400	"	"
072200	8*	MOTORCYCLE	ISSUE TICKET			072400	"	"
083300	8*	STAND PASS	REC'D TICKET			083415	"	"
083300	8*	MOTORCYCLE	ISSUE TICKET			083415	"	"
084300	3*	STAND PASS	OVERHEATED	GOT WATER FOR RADIATOR	WKMH	084730	"	"
084330	3*	STAND (WKMH)	TO OFFER ASSIST.			084730	"	"
091000	11*	COMBINATION	CRACK MOTOR			091100	"	"
091515	9*	COMBINATION	ADN CAREWD			092200	"	"
092545	12*	COMPACT	UNDETER			092900	"	"
102630	12*	STAND PASS	FLAT TIRE		SELF	103705	"	"
103240	9*	SINGLE UNIT	FLAT TIRE	TIRE CHANGE	2 PASS MOTOR	111230	"	"
105155	9*	STAND PASS	TO OFFER ASSIST.			110735	"	"
105245	9*	PANEL	"			111215	"	"
110205	3*	SINGLE UNIT	UNDETER			110240	"	"
111005	5*	SINGLE UNIT	"			111210	"	"
111009	5*	SINGLE UNIT	"			111213	"	"
111805	10*	STAND POLICE	CALL IN			111840	"	"
113200	9*	"	"			113355	"	"
115525	11*	STAND PASS	UNDETER			115625	"	"
121919	13*	COMBINATION	REC'D TICKET			122610	"	"
121930	13*	STAND (POLICE)	ISSUE TICKET			122600	"	"
123140	10*	STAND PASS	MOTOR TR		SELF	124545	"	"

NOTE: LOCATION INDICATED BY CAMERA NUMBER AND DIRECTION OF TRAVEL, i.e. 10-CAMERA 10 FIELD OF VIEW INBOUND, 11-CAMERA 11 FIELD OF VIEW OUTBOUND.

Figure 2. Log sheet.

In order to determine how traffic volumes during May and August were related to volumes throughout the year, comparisons were made with data from a permanent traffic count station  $\frac{1}{4}$  mile south of the study section. At that location, May and August volumes were 102.6 and 100.3 percent, respectively, of the average monthly traffic.

### ANALYSIS AND RESULTS

The data collected were divided into three basic groups: May weekdays, May weekend, and August weekdays. Data were analyzed and summarized separately for each of the groups.

Table 1 gives a general summary of the three study periods. It is interesting to note that the average use per hour during the weekday periods in May and August are so close together in spite of the differences in uses per 10,000 vehicle-miles. Note the difference in hours of observation between May and August weekdays which explains the difference in vehicle-miles and number of uses.

As previously mentioned, comparisons are not made with other usage studies but some previous results are shown. Billion (3) found one use per 2,100 vehicle-miles on New York rural highways having 2, 3 or 4 lanes in which the shortest average trip length was 150 miles. He also reported one use per 5,600 vehicle-miles on rural 4-lane facilities with volumes over 10,000 vehicles per day. Blensly and Byars (4) reported several rural rates ranging from one use per 318 vehicle-miles to one use per 1,900 vehicle-miles.

TABLE 1  
COMPARISON OF PERIODS STUDIED

Period	Hours Observed	No. of Uses	Vehicle-Miles	Uses per 10,000 VM	VM per Use	Uses per Hr	Uses per Mi per Hr
May weekdays	140	670	2,492,000	2.70	3,660	4.7	0.9
Aug. weekdays	49	221	929,400	2.38	4,220	4.5	0.9
May weekend	28	105	330,600	3.18	3,110	3.7	0.7
Total	217	996	3,752,000	2.68	3,770	4.5	0.9

TABLE 2  
SHOULDER USAGE BY TYPE OF VEHICLE

Type	% of Type <sup>1</sup> in Traffic Stream	May Weekdays		August Weekdays		May Weekend	
		No.	%	No.	%	No.	%
Passenger							
Standard	80.6	418	62.4	152	68.8	85	81.0
Compact	6.8	8	1.2	2	0.9	0	0
Foreign	3.3	18	2.7	4	1.8	1	0.9
Commercial							
Panel/pick-up	3.8	45	6.7	9	4.1	4	3.8
Single unit	2.9	121	18.1	42	19.0	9	8.6
Combination	2.1	32	4.8	4	1.8	1	0.9
Other							
Motorcycle	0.1	27	4.0	8	3.6	5	4.8
Buses	0.4	1	0.1	0	—	0	0
Total	100.0	670	100.0	221	100.0	105	100.0

<sup>1</sup>Typical weekday.

In order to determine the percentage of each type of vehicle in the total traffic stream, classification data for a typical day was obtained from the volume and classification study for this project. The classifications used are standard BPR. This information is given in Table 2 which indicates the shoulder use by type of vehicle. The disparity between the composition of the traffic stream and the composition of vehicle types using the shoulder on weekdays indicates the importance of shoulders so far as trucks are concerned. It should be pointed out that inasmuch as the classification information relates to a typical weekday, no such comparison can be made for the weekend data. The comparison in the case of motorcycles is not valid because this type of shoulder usage is related to police activities and has no relationship to vehicle type.

Table 3 gives the reasons for the use of the shoulder. Even though, in all periods, "to offer assistance" was the most frequent single reason, this use would not have occurred if there had not been an earlier use for some other reason. The most frequent reasons for an initial usage were motor trouble and tire trouble. Some of the more infrequent causes for usages are given in Table 3.

Of course the infrequent uses could be grouped together, but the variety of reasons is interesting. For example, one driver stopped on the shoulder, walked up the em-

TABLE 3  
REASON FOR USAGE

Reason	May Weekdays		August Weekdays		May Weekend	
	No.	%	No.	%	No.	%
Motor trouble	70	10.4	17	7.8	10	9.5
Tire trouble	62	9.3	17	7.8	12	11.4
To offer assistance	120	18.0	30	13.6	17	16.2
Received ticket	51	7.7	14	6.3	8	7.6
Out of gas	11	1.6	4	1.8	2	1.9
Check tires	8	1.2	4	1.8	1	0.9
Police—use call box	14	2.1	4	1.8	3	2.9
Police—issue ticket	40	6.0	14	6.3	8	7.6
Adjust cargo	21	3.1	4	1.8	1	0.9
Check motor	4	0.6	—	—	1	0.9
Retrieve hub cap	1	0.1	—	—	1	0.9
Fasten hood	—	—	1	0.4	1	0.9
Accident	51	7.7	5	2.3	—	—
Freeway maintenance	10	1.5	6	2.7	—	—
Conversation	2	0.3	4	1.8	—	—
Discharge passengers	2	0.3	3	1.4	—	—
Police—conversation	—	—	2	0.9	2	1.9
Transfer load	1	0.1	—	—	—	—
Clean windows	3	0.4	—	—	—	—
Retrieve cargo	1	0.1	—	—	—	—
Work on vehicle	6	0.9	—	—	—	—
Police—switch drivers	1	0.1	—	—	—	—
WKMh call-in	1	0.1	—	—	—	—
Use call box	—	—	1	0.4	—	—
Raise convertible top	—	—	1	0.4	—	—
Converse with police	—	—	2	0.9	—	—
Pick up object	—	—	1	0.4	—	—
Check front end	—	—	—	—	1	0.9
Undetermined	190	28.4	87	39.4	37	35.2
Total	670	100.0	221	100.0	105	100.0

bankment and across the service road to a house. A little later, he came out of the house, returned to his car and drove off.

Uses involving accidents do not seem proportionally great nor do uses for roadway maintenance purposes. It should be noted that a maintenance vehicle might travel the shoulder for some distance and stop occasionally. In this case, no usage was recorded unless the vehicle moved back and forth into the traffic stream.

Table 4 indicates the range of duration, total time, and average and median duration of stay of shoulder usages. The ranges are quite widespread for all three study periods, but only a few vehicles stayed for the longer periods of time. This is further indicated by the comparison of the average and median lengths of stay. Although the average length of stay is much higher and quite different from weekday to weekend, the median lengths of stay for all three periods are approximately the same and all are under 5 minutes.

Table 5 is related to the "to offer assistance" reason (see Table 3) in that it shows the source of aid.

On Detroit freeways, Wayne County Road Commission wreckers patrol the facilities and are only authorized to move vehicles to the shoulder or to perform simple mainten-

TABLE 4  
LENGTH OF USAGE

Time	May Weekdays	August Weekdays	May Weekend
Range	9 sec to 5 hr, 45 min, 0 sec	10 sec to 4 hr, 43 min, 40 sec	18 sec to 19 hr, 6 min, 30 sec
Total	176 hr, 38 min, 46 sec	31 hr, 27 min, 34 sec	49 hr, 41 min, 39 sec
Average	15.8 min	8.54 min	28.4 min
Median	4.5 min	2.75 min	3.75 min

TABLE 5  
SOURCE OF AID

Source	May Weekdays	August Weekdays	May Weekend
	No. of Aids	No. of Aids	No. of Aids
Passing motorist	53	14	7
Police	13	2	4
Wrecker	47	4	6
WKM <sup>1</sup>	7	10	—
Total	120	30	17

<sup>1</sup> Radio station vehicle.

ance. All other wrecker service must be called. This prohibits commercial wrecking services from patrolling freeways looking for business. The police stop and aid shoulder users to the extent of providing a list of available wreckers and calling the one chosen by the motorist. They also provide sufficient gas to enable the motorist to reach a gas station. WKM vehicles will, on occasion, aid in the same manner. WKM is a local radio station which operates a freeway patrol that broadcasts traffic information from 6:30 AM to 9:30 AM, and 3:30 PM to 6:30 PM.

The interesting and unexpected data in the table is the amount of assistance provided by passing motorists. As explained earlier, no attempt was made to go to the scene and determine what this assistance consisted of.

Table 6 indicates the length of time a shoulder user had to wait for outside aid. This table shows no apparent relation between the length of wait and the source of aid received. It points again to the consideration shown by fellow motorists.

The total column indicates that on weekdays, assistance was offered in less than 15 min in 60 percent of the cases. On the weekend, the reverse is true. More than half the vehicles had to wait more than 60 min for assistance.

Table 7 relates the reason for the use of the shoulder with the duration of stay. As might be expected, motor and tire trouble are the major causes of vehicles staying on the shoulder for longer periods of time. Nearly all of the undetermined usages fell in the duration category of less than 15 minutes. For no reason visible to the observer, a great number of vehicles simply pull onto the shoulder for a few minutes and then leave. Perhaps this is to rest, to get one's bearings, or to read a map. In any case, they are a major contributor to shoulder usage.

TABLE 6  
LENGTH OF WAIT FOR AID

Length of Wait	Source of Aid				
	Passing Motorists	Police	Wrecker	WKMh	Total
(a) May Weekdays					
Less than 1 min	8	3	3	0	14
1 min to 5 min	13	3	6	5	27
5 min to 15 min	12	4	13	1	30
15 min to 1 hr	10	3	18	1	32
Over 1 hr	<u>10</u>	<u>0</u>	<u>7</u>	<u>0</u>	<u>17</u>
Total	53	13	47	7	120
(b) August Weekdays					
Less than 1 min	4	2	—	4	10
1 min to 5 min	—	—	—	1	1
5 min to 15 min	3	—	1	3	7
15 min to 1 hr	5	—	3	2	10
Over 1 hr	<u>2</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>2</u>
Total	14	2	4	10	30
(c) May Weekend					
Less than 1 min	1	1	—	—	2
1 min to 5 min	1	2	1	—	4
5 min to 15 min	1	1	—	—	2
15 min to 1 hr	—	—	—	—	—
Over 1 hr	<u>4</u>	<u>—</u>	<u>5</u>	<u>—</u>	<u>9</u>
Total	7	4	6	—	17

Finally it should be noted that each incident involving use of the shoulder may involve one or several vehicles. In all previous tables, the actual number of vehicle usages regardless of their relation to other vehicle usages has been used.

Table 8 provides some gross information obtained by summarizing data to indicate as a single event all vehicles occupying the shoulder as a result of a single incident. For the purposes of this table, the number of vehicles using the shoulder was disregarded as long as all were related to a single incident. The rate of incidents is smaller than the rate of usages, but it does indicate the frequency of events that involve some amount of shoulder usage.

#### FINDINGS

Based on the analysis of data obtained on the John C. Lodge Freeway in Detroit for 19 days, the following findings are indicated:

1. There was an incident involving one or more vehicles using the shoulder for every 5,300 vehicle-miles of travel during the overall study period.
2. There were 996 vehicles or individual shoulder uses involved in the 711 incidents observed, representing an average of one usage per 3,800 vehicle-miles, or more than 4.5 uses per hour over a study section of 2.5 miles.



TABLE 7  
CAUSE AND LENGTH OF SHOULDER USAGE

Reason	Duration of Stay															Total					
	Less than 15 Min	15 to 30 Min	30 to 45 Min	45 Min to 1 Hr	1 Hr to 1 Hr 15 Min	1 Hr 15 Min to 30 Min	30 Min to 45 Min	45 Min to 1 Hr	1 Hr to 2 Hr	2 Hr to 2 Hr 15 Min	2 Hr 15 Min to 30 Min	30 Min to 45 Min	45 Min to 1 Hr	1 Hr to 2 Hr	2 Hr to 3 Hr		3 Hr to 3 Hr 15 Min	3 Hr 15 Min to 4 Hr	4 Hr to 4 Hr 15 Min	4 Hr 15 Min to 5 Hr	Over 5 Hr
(a) May Weekdays																					
Motor trouble	34	8	5	4	5	3	1	1	-	-	1	2	-	-	1	1	1	1	1	67	
Tire trouble	24	14	10	4	4	1	1	-	-	-	-	-	-	-	-	1	-	-	2	61	
To give aid	105	11	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	
Received ticket	48	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	
Out of gas	4	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	
Check motor	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Check tires	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	
Police—call-in	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	
Police—issue ticket	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	
Retrieve hub cap	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Accident	18	16	9	2	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	48	
Adjust cargo	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	
Freeway maintenance	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	
Transfer load	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Conversation	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Police—switch drivers	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Clean windows	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
Retrieve cargo	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
WKMh call-in	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Discharge passengers	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Miscellaneous work	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	
Undetermined	173	4	1	2	1	-	-	-	-	-	-	-	-	-	1	2	-	-	2	186	
(b) August Weekdays																					
Motor trouble	3	4	2	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	16	
Tire trouble	10	4	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	16	
To give aid	28	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	
Received ticket	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	
Out of gas	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Check motor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Check tires	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Police—call-in	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Police—issue ticket	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	
Freeway maintenance	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	
Discharge passengers	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
Check cargo	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Driver used call box	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Accident	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
Drivers talking	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Put up top	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Talk to police	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Picked something up	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Fasten hood	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Police conversation	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Undetermined	77	2	2	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	84	
(c) May Weekend																					
Motor trouble	3	1	-	-	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	9	
Tire trouble	5	3	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	11	
To give aid	12	3	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	
Received ticket	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	
Out of gas	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Check motor	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Check tires	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Police—call-in	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
Police—issue ticket	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	
Fasten hood	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Retrieve hub cap	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Police—conversation	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Police—undetermined	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Check front end	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Adjust cargo	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Undetermined	30	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	34	

3. The percentage of vehicles using the shoulder that were trucks was consistently higher than the percentage of trucks in the traffic stream as a whole. The reverse was generally true for passenger cars.

4. The most frequent single reason for stopping that could be determined was because of, or to assist, another shoulder user. Motor and tire trouble were the next most frequent visible reasons.

5. During the study periods, an equal number of vehicles remained on the shoulder more than, and less than 3 to 5 minutes—the median range. The average length of stay was much higher because of a few vehicles remaining for many hours.

6. In 44 percent of the cases where a second vehicle stopped to aid a previously stopped vehicle, the second vehicle was an ordinary passing motorist rather than a police or service vehicle.

7. On weekdays, about 60 percent of the motorists who received assistance had to wait less than 15 minutes. On the weekend, more than half the motorists receiving aid had to wait more than one hour.

TABLE 8  
SHOULDER USE INCIDENTS

Period	May Weekdays	Aug. Weekdays	May Weekend
Vehicle-miles	2,492,000	929,400	330,600
No. of incidents (veh)	470 (670)	166 (221)	75 (105)
Incidents/veh-mi	1/5301	1/5602	1/4400

8. Shoulder usages for reasons that were not evident to the television observer constituted the greatest number of cases. Nearly all stayed less than 15 minutes. The necessity for these numerous usages on an urban freeway without visible reason is most intriguing and may prove important in further study.

There is additional information that can be obtained in this area. It is planned to collect the same type of data during winter and early spring in order to determine any effect of weather on the frequency or duration of shoulder usage. When this work is completed, another report will be issued which, in combination with this report, should provide more complete data on shoulder usage under varying weather conditions.

#### ACKNOWLEDGMENTS

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### *Appendix*

#### TYPE OF VEHICLE AND DURATION OF STAY

May Weekdays							
Type	Hr	Min	Sec	Type	Hr	Min	Sec
Standard	9	28	30	Standard	0	50	00
Standard	5	45	00	Comb.	0	49	30
Standard	5	27	15	Standard	0	49	10
Standard	4	58	15	Standard	0	47	40
Standard	4	27	40	Standard	0	46	50
Standard	4	18	00	Foreign	0	46	30
Standard	3	59	18	Police Call In	0	46	10
Standard	3	32	15	Single Unit	0	45	02
Standard	3	31	50	Standard	0	44	40
Standard	3	23	30	Standard	0	44	10
Single Unit	3	18	30	Standard (PD)	0	42	55
Standard	3	03	00	Standard (PD)	0	42	30
Single Unit	2	49	35	Standard (PD)	0	42	20

## May Weekdays (continued)

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Panel	2	49	35	Standard (PD)	0	42	15
Standard	2	39	00	Pick-Up	0	41	55
Single Unit	2	18	35	Standard	0	41	30
Standard	1	55	00	Wrecker	0	39	50
Foreign	1	48	55	Standard	0	39	30
Standard	1	38	00	Standard	0	38	30
Standard	1	31	35	Standard	0	37	35
Standard	1	29	50	Standard	0	37	30
Standard	1	29	30	Standard	0	35	40
Standard	1	27	50	Standard	0	35	25
Standard	1	18	47	Standard	0	34	15
Standard	1	18	00	Standard	0	33	55
Standard	1	17	15	Standard	0	33	50
Standard	1	12	55	Standard	0	33	50
Single Unit	1	12	50	Standard	0	33	00
Standard	1	11	40	Standard	0	32	45
Standard	1	11	35	Standard	0	32	30
Comb.	1	11	15	Standard	0	32	05
Standard	1	06	50	Comb.	0	32	00
Pick-Up	1	06	35	Standard	0	30	35
Standard	1	05	15	Foreign	0	30	30
Standard	1	03	45	Standard	0	30	00
Single Unit	1	03	35	Standard	0	29	50
Panel	1	01	30	Standard	0	28	55
Standard	1	00	40	Standard	0	28	25
Standard	1	00	30	Standard	0	28	20
Foreign	0	59	15	Standard	0	27	50
Standard	0	58	00	Standard	0	27	50
Standard	0	56	20	Pick-Up	0	27	45
Standard	0	54	00	Standard	0	27	00
Comb.	0	54	00	Panel	0	26	40
Standard	0	51	00	Panel	0	26	30
Standard	0	26	23	Cycle (PD)	0	15	00
Standard	0	26	05	Sgle. Unit (Wrkr)	0	14	55
Standard	0	25	45	Standard	0	14	45
Standard	0	24	40	Standard	0	14	45
Standard	0	24	20	Compact	0	14	45
Standard (PD)	0	24	10	Standard	0	14	35
Standard	0	24	10	Sgl. Unit (Wrkr)	0	14	30
Standard	0	24	00	Standard	0	14	10
Standard	0	24	00	Standard	0	14	05
Standard (PD)	0	23	30	Sgl. Unit (Wrkr)	0	14	00
Foreign	0	23	20	Foreign	0	13	55
Standard	0	22	55	Standard	0	13	40
Single Unit	0	22	50	Standard	0	13	40
Single Unit	0	22	50	Wrecker	0	13	15
Standard	0	22	50	Standard	0	13	15
Sgl. Unit (Wrkr)	0	22	35	Standard	0	13	15
Sgl. Unit (Wrkr)	0	21	50	Standard	0	13	05
Standard	0	21	10	Single Unit	0	12	45
Pick-Up	0	21	05	Standard	0	12	41
Pick-Up	0	21	00	Compact	0	12	40
Standard	0	20	50	P.D.	0	12	40
Standard (PD)	0	20	30	Standard	0	12	35
Comb.	0	20	15	Standard	0	12	35
Standard	0	20	00	Single Unit	0	12	30
Standard	0	20	00	Sgl. Unit (Wrkr)	0	12	25
Panel	0	19	30	Standard	0	12	00
Sgl. Unit (Wrkr)	0	19	15	Standard	0	12	00
Standard	0	19	00	Panel	0	12	00
Standard	0	18	55	Single Unit	0	11	50
Standard	0	18	55	Standard	0	11	50

## May Weekdays (continued)

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Standard	0	18	05	Standard	0	11	45
Standard (PD)	0	18	00	Standard	0	11	45
Standard	0	17	55	Standard	0	11	40
Standard	0	17	25	Pick-Up	0	11	30
Sgl. Unit (Wrkr)	0	17	10	Standard	0	11	30
Standard	0	17	00	Standard	0	11	30
Standard	0	16	30	Standard	0	11	20
Cycle (PD)	0	16	20	Single Unit	0	11	15
Standard	0	16	14	Standard	0	11	15
Compact	0	16	02	Standard	0	11	15
Standard	0	15	55	Standard (PD)	0	11	00
Sgl. Unit (PD)	0	15	45	Standard (PD)	0	11	00
Sgl. Unit (Wrkr)	0	15	40	Single Unit	0	11	00
Standard	0	15	40	Passenger	0	10	55
Single Unit	0	15	35	Cycle (PD)	0	10	50
Standard	0	15	30	Standard	0	10	45
Standard	0	15	30	Standard	0	10	45
Standard	0	15	25	Standard	0	10	40
Sgl. Unit (Wrkr)	0	15	15	Standard	0	10	40
Single Unit	0	15	15	Standard	0	10	30
Standard	0	15	13	Standard	0	10	25
Standard	0	15	00	Standard	0	10	25
Standard	0	10	00	Standard (PD)	0	7	00
Cycle	0	10	00	Single Unit	0	7	00
Sgl. Unit (Wrkr)	0	9	55	Sgl. Unit (Wrkr)	0	7	00
Sgl. Unit (Wrkr)	0	9	55	Sgl. Unit (Wrkr)	0	7	00
Standard (PD)	0	9	45	Pick-Up	0	7	00
Foreign	0	9	40	Standard	0	7	00
Standard	0	9	40	Standard	0	7	00
Single Unit	0	9	37	Single Unit	0	6	55
Standard	0	9	30	Standard	0	6	55
Comb.	0	9	20	Sgl. Unit (Wrkr)	0	6	55
Standard	0	9	20	Comb.	0	6	51
Standard (PD)	0	9	15	Standard	0	6	50
Standard	0	9	05	Comb.	0	6	50
Pick-Up	0	9	00	Standard (PD)	0	6	50
Sgl. Unit (Wrkr)	0	9	00	Single Unit	0	6	50
Standard	0	8	50	Comb.	0	6	45
Standard	0	8	50	Standard	0	6	45
Standard	0	8	48	Single Unit	0	6	45
Sgl. Unit (Wrkr)	0	8	40	Standard	0	6	40
Standard	0	8	25	Single Unit	0	6	40
Standard	0	8	25	Standard	0	6	35
Comb.	0	8	18	Police	0	6	30
Pick-Up	0	8	15	Wrecker	0	6	30
Standard	0	8	10	Standard	0	6	30
Standard	0	8	10	Single Unit	0	6	30
Sgl. Unit	0	8	05	Single Unit	0	6	30
Cycle	0	8	00	Comb.	0	6	25
Standard (PD)	0	8	00	Standard	0	6	25
Standard	0	7	55	Standard (PD)	0	6	25
Standard (PD)	0	7	55	Wrecker	0	6	20
Standard (PD)	0	7	55	Standard	0	6	15
Foreign	0	7	45	Single Unit	0	6	15
Standard	0	7	45	Compact	0	6	12
Single Unit	0	7	40	Sgl. Unit (Wrkr)	0	6	10
Sgl. Unit (Wrkr)	0	7	35	Standard	0	6	10
Single Unit	0	7	30	Standard (PD)	0	6	10
Standard	0	7	30	Standard	0	6	00
Sgl. Unit (Wrkr)	0	7	29	Single Unit	0	6	00
Standard (PD)	0	7	25	Standard	0	5	50
Standard	0	7	25	Standard	0	5	50

## May Weekdays (continued)

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Single Unit	0	7	20	Cycle (PD)	0	5	50
Standard	0	7	20	Panel	0	5	50
Standard (PD)	0	7	20	Foreign	0	5	50
Compact	0	7	15	Standard	0	5	46
Single Unit	0	7	15	Single Unit	0	5	45
Standard	0	7	15	Comb.	0	5	45
Sgl.Unit(Wrkr)	0	7	10	Cycle (PD)	0	5	45
Comb.	0	7	05	Standard	0	5	40
Sgl.Unit(Wrkr)	0	7	05	Standard	0	5	40
Single Unit	0	7	05	Standard	0	5	40
Comb.	0	7	05	Cycle (PD)	0	5	40
Standard	0	5	40	Single Unit	0	4	15
Standard	0	5	36	Standard	0	4	15
Foreign	0	5	35	Standard	0	4	15
Single Unit	0	5	30	Single Unit	0	4	15
Standard	0	5	30	Standard	0	4	10
Foreign	0	5	25	Cycle (PD)	0	4	09
Single Unit	0	5	15	Cycle (PD)	0	4	02
Foreign	0	5	15	Panel	0	4	00
Standard	0	5	15	Pick-Up	0	4	00
Standard	0	5	10	Standard	0	4	00
Pick-Up	0	5	10	Standard	0	4	00
Single Unit	0	5	10	WKMh	0	4	00
Standard	0	5	05	Standard	0	4	00
Standard	0	5	05	Wrecker	0	4	00
Single Unit	0	5	05	Standard	0	4	00
Single Unit	0	5	05	Standard (PD)	0	4	00
Comb.	0	5	00	Standard	0	3	59
Foreign	0	5	00	Standard	0	3	53
Wrecker	0	5	00	Single Unit	0	3	50
Standard	0	5	00	Pick-Up	0	3	50
Panel	0	5	00	Foreign	0	3	45
Standard	0	5	00	Standard	0	3	45
Standard	0	4	58	Standard (PD)	0	3	45
Comb.	0	4	55	Standard	0	3	35
Wrecker	0	4	55	Wrecker	0	3	35
Standard	0	4	55	Standard	0	3	35
Standard (PD)	0	4	50	Standard (PD)	0	3	35
Cycle (PD)	0	4	50	Standard	0	3	35
Standard	0	4	50	Pick-Up	0	3	35
Single Unit	0	4	50	Standard	0	3	30
Standard	0	4	45	Single Unit	0	3	30
Standard	0	4	45	Standard	0	3	29
Comb.	0	4	45	Standard	0	3	27
Comb.	0	4	45	Standard	0	3	25
Single Unit	0	4	45	Standard (PD)	0	3	25
Standard (PD)	0	4	40	Wrecker	0	3	20
Pick-Up	0	4	40	Standard	0	3	20
Cycle (PD)	0	4	40	Wrecker	0	3	15
Standard (PD)	0	4	31	Comb.	0	3	15
Standard	0	4	30	Compact	0	3	15
Panel	0	4	30	Standard	0	3	15
Standard	0	4	30	Single Unit	0	3	15
Standard	0	4	30	Standard	0	3	15
Single Unit	0	4	30	Sgl.Unit(Wrkr)	0	3	10
Standard	0	4	25	Standard	0	3	10
Single Unit	0	4	25	Pick-Up	0	3	05
Standard (PD)	0	4	20	Wrecker	0	3	05
Single Unit	0	4	20	Foreign	0	3	05
Standard	0	4	20	Foreign	0	3	05
Standard (PD)	0	4	15	Single Unit	0	3	00
Cycle (PD)	0	3	00	Panel	0	2	00

## May Weekdays (continued)

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Cycle (PD)	0	3	00	Standard	0	2	00
Standard	0	3	00	Standard	0	2	00
Standard (PD)	0	3	00	Standard	0	2	00
Standard	0	3	00	Standard	0	2	00
Standard	0	3	00	Standard (PD)	0	2	00
Bus	0	3	00	Standard	0	2	00
Standard	0	3	00	Cycle (PD)	0	2	00
Standard	0	3	00	Cycle (PD)	0	2	00
Cycle (PD)	0	2	55	Panel	0	2	00
Comb.	0	2	55	Compact	0	1	55
Standard	0	2	50	Standard	0	1	55
Wrecker	0	2	50	Compact	0	1	55
Standard	0	2	50	Standard	0	1	55
Cycle (PD)	0	2	50	Standard (PD)	0	1	55
Cycle (PD)	0	2	50	Single Unit	0	1	50
Standard	0	2	50	Standard	0	1	50
Standard (PD)	0	2	50	Foreign	0	1	48
Single Unit	0	2	45	Standard	0	1	45
Standard	0	2	45	Standard	0	1	45
Standard (PD)	0	2	45	Comb.	0	1	45
Standard	0	2	45	Pick-Up	0	1	45
WKMh	0	2	45	Standard	0	1	45
Standard (PD)	0	2	40	Standard	0	1	45
Single Unit	0	2	40	Single Unit	0	1	45
Single Unit	0	2	40	Standard	0	1	45
Standard (PD)	0	2	40	Standard	0	1	45
Standard	0	2	35	Single Unit	0	1	45
Single Unit	0	2	35	Standard	0	1	40
Cycle (PD)	0	2	30	Standard	0	1	40
Standard	0	2	30	Standard	0	1	40
Standard	0	2	25	Standard	0	1	40
Standard	0	2	25	Comb.	0	1	40
Standard	0	2	20	Single Unit	0	1	40
Comb.	0	2	20	Standard	0	1	40
Comb.	0	2	20	Standard (PD)	0	1	40
Standard	0	2	20	Panel	0	1	40
Standard	0	2	20	Standard	0	1	40
Pick-Up	0	2	20	Standard	0	1	40
Standard	0	2	19	Single Unit	0	1	40
Standard	0	2	15	Single Unit	0	1	35
Single Unit	0	2	15	Sgl.Unit(Wrkr)	0	1	35
Standard	0	2	15	Comb.	0	1	35
Standard	0	2	10	Std. (WKMh)	0	1	33
Standard	0	2	10	Standard	0	1	31
Standard	0	2	10	Standard	0	1	30
Wrecker	0	2	05	Comb.	0	1	30
Standard	0	2	05	Std. (WKMh)	0	1	30
Wrecker	0	2	05	Standard	0	1	30
Wrecker	0	2	04				
Pick-Up	0	1	30	Standard	0	1	00
Standard (PD)	0	1	30	Standard	0	1	00
Sgl.Unit(Wrkr)	0	1	30	Standard	0	1	00
Cycle (PD)	0	1	30	Panel	0	1	00
Single Unit	0	1	30	Standard	0	1	00
Standard (PD)	0	1	30	Standard	0	1	00
Single Unit	0	1	30	Cycle (PD)	0	1	00
Standard	0	1	28	Standard	0	1	00
Tractor	0	1	28	Standard	0	1	00
Standard	0	1	27	Standard	0	1	00
Standard	0	1	25	Single Unit	0	1	00
Sgl.Unit(Wrkr)	0	1	25	Panel	0	1	00
Standard (PD)	0	1	22	Sgl.Unit(Wrkr)	0	1	00

## May Weekdays (continued)

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Standard	0	1	20	Standard	0	1	00
Cycle	0	1	20	Standard	0	1	00
Standard	0	1	20	Comb.	0	1	00
Standard	0	1	20	Cycle (PD)	0	1	00
Standard	0	1	15	Cycle (PD)	0	1	00
Panel	0	1	15	Standard	0	1	00
Standard	0	1	15	Pick-Up	0	1	00
Standard	0	1	15	Standard	0	0	55
Standard	0	1	15	Standard	0	0	55
Standard	0	1	15	Standard	0	0	55
Standard	0	1	15	Standard	0	0	55
Panel	0	1	15	Standard	0	0	55
Comb.	0	1	15	Standard	0	0	53
Standard (WKMh)	0	1	15	Standard	0	0	50
Single Unit	0	1	15	Standard (PD)	0	0	50
Cycle	0	1	15	Standard	0	0	50
Standard	0	1	15	Comb.	0	0	50
Cycle	0	1	15	Standard	0	0	50
Cycle (PD)	0	1	15	Standard	0	0	50
Standard	0	1	15	Standard (PD)	0	0	50
Single Unit	0	1	10	Standard (PD)	0	0	50
Standard	0	1	10	Standard	0	0	50
Standard	0	1	10	Comb.	0	0	50
Standard (PD)	0	1	10	Standard	0	0	50
Single Unit	0	1	10	Sgl.Unit(Wrkr)	0	0	45
Sgl.Unit(Wrkr)	0	1	10	Standard	0	0	45
Standard	0	1	05	Standard	0	0	45
Standard	0	1	05	Standard (PD)	0	0	45
Standard	0	1	05	Single Unit	0	0	45
Single Unit	0	1	05	Standard	0	0	45
Standard	0	1	05	Pick-Up	0	0	45
Standard	0	1	05	Standard	0	0	45
Standard	0	1	05	Single Unit	0	0	45
Standard	0	1	05	Standard	0	0	40
Sgl.Unit(Wrkr)	0	1	05	Single Unit	0	0	40
Standard	0	1	05	Standard	0	0	40
Standard	0	1	05	Standard	0	0	40
Standard	0	1	02	Standard	0	0	40
Comb.	0	1	00	Pick-Up	0	0	40
Standard	0	0	40	Standard	0	0	20
Standard	0	0	40	Standard	0	0	20
Standard	0	0	40	Standard	0	0	15
Standard	0	0	40	Standard	0	0	15
Standard (PD)	0	0	40	Standard	0	0	15
Standard	0	0	40	Standard	0	0	15
Standard	0	0	40	Standard	0	0	12
Standard	0	0	40	Standard	0	0	10
Standard (PD)	0	0	40	Pick-Up	0	0	10
Standard	0	0	40	Comb.	0	0	09
Sgl.Unit(Wrkr)	0	0	35				
Standard (PD)	0	0	35				
Standard	0	0	35				
Standard	0	0	35				
Single Unit	0	0	35				
Standard	0	0	35				
Comb.	0	0	35				
Standard	0	0	35				
Panel	0	0	35				
Standard (WKMh)	0	0	35				
Standard	0	0	35				
Standard	0	0	34				
Pick-Up	0	0	33				

## May Weekdays (continued)

<u>Type</u>	<u>Hr</u>	<u>Min</u>	<u>Sec</u>	<u>Type</u>	<u>Hr</u>	<u>Min</u>	<u>Sec</u>
Pick-Up	0	0	32				
Standard	0	0	30				
Standard	0	0	30				
Standard (PD)	0	0	30				
Sgl. Unit (Van)	0	0	30				
Standard	0	0	30				
Standard	0	0	30				
Standard	0	0	30				
Standard	0	0	30				
Standard (WKMH)	0	0	30				
Standard	0	0	30				
Standard	0	0	30				
Pick-Up	0	0	30				
Foreign	0	0	30				
Standard	0	0	30				
Comb.	0	0	30				
Single Unit	0	0	30				
Standard	0	0	30				
Single Unit	0	0	25				
Standard	0	0	25				
Standard	0	0	25				
Standard	0	0	25				
Standard	0	0	20				
Standard	0	0	20				
Single Unit	0	0	20				

## May Weekend

<u>Type</u>	<u>Hr</u>	<u>Min</u>	<u>Sec</u>	<u>Type</u>	<u>Hr</u>	<u>Min</u>	<u>Sec</u>
Comb.	19	6	30	Standard	0	3	40
Standard	7	19	50	Standard (PD)	0	3	40
Standard	3	22	35	Standard	0	3	30
Standard	2	2	45	Standard (PD)	0	3	27
Standard	1	42	00	Standard (PD)	0	3	15
Standard	1	10	35	Standard (PD)	0	3	15
Standard	1	10	10	Standard (PD)	0	3	13
Standard	1	10	0	Standard (PD)	0	3	00
Standard	1	8	43	Sgl. Unit (WCRC)	0	2	53
Standard	1	6	30	Standard	0	2	50
Standard	0	57	45	Standard (PD)	0	2	30
Sgl. Unit (Wrkr)	0	48	30	Standard (PD)	0	2	30
Standard	0	29	30	Standard (PD)	0	2	30
Standard	0	22	15	Standard (PD)	0	2	30
Standard	0	22	15	Standard (PD)	0	2	10
Panel/Pick-Up	0	18	45	Panel/Pick-Up	0	2	10
Standard	0	18	40	Standard (PD)	0	2	10
Standard	0	17	30	Cycle (PD)	0	2	00
Standard	0	17	30	Standard (PD)	0	2	00
Standard	0	15	45	Cycle (PD)	0	2	00
Standard	0	15	30	Sgl. Unit (WCRC)	0	2	00
Standard	0	14	0	Standard	0	1	30
Standard	0	13	32	Standard	0	1	30
Standard	0	13	20	Standard	0	1	25
Standard	0	13	20	Standard	0	1	05
Standard	0	12	45	Standard	0	1	05
Standard	0	12	0	Standard	0	1	00
Standard	0	12	0	Standard	0	1	00
Standard	0	11	30	Standard	0	1	00
Standard	0	10	5	Standard	0	0	55
Sgl. Unit (Wrkr)	0	9	35	Standard	0	0	55



## May Weekend (continued)

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Standard	0	9	30	Standard	0	0	50
Sgl.Unit(Wrkr)	0	9	10	Standard (PD)	0	0	50
Sgl.Unit(Wrkr)	0	7	30	Cycle (PD)	0	0	50
Standard	0	7	15	Standard	0	0	50
Standard	0	7	0	Standard	0	0	45
Standard	0	6	50	Standard	0	0	45
Standard (PD)	0	6	50	Standard	0	0	45
Standard (PD)	0	6	30	Single Unit	0	0	45
Sgl.Unit(Wrkr)	0	5	31	Pick-Up	0	0	40
Standard	0	5	10	Standard	0	0	40
Cycle (PD)	0	5	0	Standard	0	0	38
Standard	0	4	50	Standard	0	0	35
Standard	0	4	50	Standard	0	0	35
Standard (PD)	0	4	50	Standard	0	0	33
Standard	0	4	35	Standard (PD)	0	0	30
Standard	0	4	20	Standard	0	0	25
Standard	0	4	20	Standard	0	0	21
Panel/Pick-Up	0	4	20	Small	0	0	20
Cycle (PD)	0	4	20	Standard	0	0	18
Standard	0	3	45				
Standard	0	3	45				

## August Weekdays

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Standard	4	43	40	Single Unit	0	7	15
Pick-Up	2	28	20	Comb.	0	7	10
Standard	1	38	55	Standard	0	7	00
Single Unit	1	26	55	Standard	0	6	50
Standard	0	57	00	Standard	0	6	10
Standard	0	51	00	Cycle (PD)	0	6	10
Standard	0	43	05	Standard	0	6	00
Single Unit	0	38	45	Standard (PD)	0	6	00
Standard	0	37	00	Standard	0	5	50
Standard	0	33	10	Standard	0	5	50
Standard	0	31	00	Standard	0	5	45
Panel	0	28	30	Sgl.Unit(WCRC)	0	5	30
Standard (WKMH)	0	27	05	Cycle (PD)	0	5	25
Standard	0	26	00	Standard	0	5	20
Pick-Up	0	23	50	Standard (PD)	0	5	20
Standard	0	23	40	Standard	0	5	15
Standard	0	23	30	Standard	0	5	10
Standard	0	23	30	Single Unit	0	5	10
Standard	0	21	00	Sgl.Unit (WCRC)	0	5	10
Standard	0	20	00	Standard (PD)	0	5	00
Standard	0	17	50	Standard	0	5	00
Sgl.Unit(Wrkr)	0	17	30	Foreign	0	5	00
Standard	0	16	00	Standard	0	5	00
Sgl.Unit(Wrkr)	0	16	00	Standard	0	4	50
Standard	0	15	20	Sgl.Unit(WCRC)	0	4	50
Standard (PD)	0	14	15	Cycle (PD)	0	4	45
Standard	0	14	10	Standard (PD)	0	4	32
Pick-Up	0	14	00	Cycle (PD)	0	4	25
Standard	0	14	00	Standard	0	4	25
Foreign	0	13	50	Standard (PD)	0	4	20
Standard	0	13	50	Standard (WKMH)	0	4	10
Standard	0	12	05	Standard	0	4	05
Standard	0	12	00	Standard (WKMH)	0	4	05
Standard	0	12	00	Standard (PD)	0	4	05
Standard	0	11	50	Standard (PD)	0	4	00

## August Weekdays (continued)

Type	Hr	Min	Sec	Type	Hr	Min	Sec
Standard	0	11	42	Standard	0	4	00
Standard	0	11	30	Standard	0	4	00
Standard	0	11	15	Standard	0	4	00
Pick-Up	0	11	00	Standard	0	3	45
Sgl.Unit(Wrkr)	0	10	10	Standard	0	3	35
Standard	0	10	05	Standard	0	3	30
Standard	0	9	40	Sgl.Unit(Wrkr)	0	3	30
Standard	0	9	30	Standard	0	3	30
Cycle (PD)	0	9	20	Standard	0	3	16
Standard	0	9	05	Sgl.Unit(Bell)	0	3	15
Standard	0	8	15	Comb.	0	3	15
Standard	0	7	55	Standard	0	3	05
Standard	0	7	45	Single Unit	0	3	00
Sgl.Unit(Wrkr)	0	7	35	Standard	0	3	00
Standard (WKMh)	0	7	20	Single Unit	0	3	00
Standard	0	7	20	Standard	0	3	00
Standard	0	7	20	Standard (PD)	0	3	00
Standard	0	3	00	Compact	0	1	15
Sgl.Unit(PLC)	0	2	55	Sgl.Unit (WCRC)	0	1	15
Standard (PD)	0	2	51	Single Unit	0	1	15
Standard (WKMh)	0	2	50	Standard	0	1	10
Standard	0	2	50	Standard	0	1	10
Standard	0	2	50	Standard	0	1	10
Standard	0	2	45	Standard	0	1	10
Standard (WKMh)	0	2	40	Standard	0	1	10
Standard	0	2	40	Standard	0	1	05
Standard	0	2	35	Comb.	0	1	05
Sgl.Unit(Wrkr)	0	2	35	Sgl.Unit(WCRC)	0	1	05
Single Unit	0	2	30	Foreign	0	1	05
Single Unit	0	2	30	Standard	0	1	05
Standard (WKMh)	0	2	30	Standard	0	1	05
Sgl.Unit(Wrkr)	0	2	30	Standard	0	1	00
Pick-Up	0	2	25	Single Unit	0	1	00
Standard (PD)	0	2	25	Standard (PD)	0	1	00
Standard (PD)	0	2	15	Standard	0	1	00
Standard	0	2	10	Single Unit	0	1	00
Standard	0	2	10	Standard(WKMh)	0	0	58
Pick-Up	0	2	08	Standard	0	0	55
Standard (PD)	0	2	07	Single Unit	0	0	50
Sgl.Unit(Wrkr)	0	2	05	Standard	0	0	50
Sgl.Unit(WCRC)	0	2	00	Small	0	0	50
Standard	0	1	55	Standard	0	0	45
Standard (PD)	0	1	55	Standard	0	0	45
Single Unit	0	1	55	Standard	0	0	45
Standard	0	1	55	Standard	0	0	40
Standard	0	1	50	Single Unit	0	0	40
Single Unit	0	1	50	Standard (WKMh)	0	0	40
Single Unit	0	1	50	Standard (PD)	0	0	40
Standard	0	1	50	Cycle (PD)	0	0	40
Standard	0	1	45	Single Unit	0	0	40
Standard	0	1	45	Standard	0	0	40
Standard	0	1	45	Pick-Up	0	0	40
Compact	0	1	40	Standard	0	0	40
Single Unit	0	1	40	Single Unit	0	0	35
Cycle (PD)	0	1	40	Standard	0	0	35
Standard	0	1	40	Standard	0	0	35
Standard	0	1	40	Sgl.Unit(WCRC)	0	0	35
Single Unit	0	1	35	Standard (PD)	0	0	35
Standard	0	1	35	Standard	0	0	30
Single Unit	0	1	30	Standard	0	0	30
Standard (WKMh)	0	1	30	Standard	0	0	30
Standard	0	1	30	Standard (PD)	0	0	30

## August Weekdays (continued)

<u>Type</u>	<u>Hr</u>	<u>Min</u>	<u>Sec</u>	<u>Type</u>	<u>Hr</u>	<u>Min</u>	<u>Sec</u>
Standard	0	1	30	Standard	0	0	25
Standard	0	1	30	Standard	0	0	20
Standard (PD)	0	1	30	Standard	0	0	20
Standard	0	1	25	Standard	0	0	20
Single Unit	0	1	23	Panel	0	0	20
Sgl.Unit(Wrkr)	0	1	20	Standard	0	0	20
Standard	0	1	20	Sgl.Unit(Wrkr)	0	0	20
Single Unit	0	1	20	Standard	0	0	15
Cycle	0	1	20	Standard	0	0	15
Standard	0	1	20	Standard	0	0	12
Standard	0	1	15	Standard	0	0	10