

*Abridgment*

# Applications of Variable Work Hours in the Twin Cities Metropolitan Area

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This paper describes a study conducted for the Minneapolis-St. Paul Metropolitan Transit Commission in 1976 to investigate the application of variable work hours in the Minneapolis-St. Paul metropolitan area. As a major focus of metropolitan activity, travel, and transit routes, the central business district (CBD) received primary study emphasis, but suburban applications were also considered. The specific objectives of the research were to identify (a) possible benefits with respect to transit operations, (b) the degree to which traffic congestion could be decreased, (c) any impacts on high-occupancy vehicle use, and (d) any institutional impediments to the implementation of a variable work hours strategy.

## STUDY PROCEDURES

The basic study process involved (a) determining the current distribution of employee start and leave times, (b) selecting those types of employers who have the highest potential for the variation of work hours, (c) identifying employer and employee attitudes to various types of variable work hour strategies, (d) determining the impact of varying work hours on high-occupancy vehicle use, (e) determining the impact of varying work hours on transit operation, and (f) determining the impact of a variable work hours program on vehicle movement.

The bulk of the study effort was based on employer and employee surveys conducted throughout the Twin Cities metropolitan area at eight sample locations that were representative of different work situations. Fifty-five employers, jointly representing 36 000 employees, responded to the employer survey. Information obtained from these locations allowed for an assessment of areawide applications (CBD), corridor applications, and an activity-center application (industrial park). Further, it allowed for a multiemployer program assessment as well as an individual employer assessment. During the course of the study, the term "staggered work hours" was interpreted as a reference to all types of programs for varying work times, including staggered work hours, flextime, and the 4-d week. Thus, the study was not limited to the staggered work hours option alone.

## SUMMARY OF PRINCIPAL FINDINGS

### Existing Conditions

The study revealed that an unexpectedly high percentage of surveyed firms (up to 48 percent) were currently varying work hours in some fashion. However, employers as a whole were not receptive to changes in their current work hour schedules. Even large administrative and service employers in the Minneapolis CBD (identified on the basis of research efforts in other areas as the best candidates for a variable work hours program) did not consider themselves good candidates for a variable work hours program. However, if classified on a functional basis, only a small percentage

(about 16 percent) of CBD employers clearly have "fixed" schedules that are not subject to variation.

An analysis of work start and leave times revealed a sharp morning peak (around 8:00 a.m.) in both CBDs and suburban locations (Figure 1) whereas the afternoon peak was generally not as sharp since leave times were more evenly distributed throughout the peak period. The evening peak also seems to vary in each location surveyed. For example, in the Minneapolis CBD, employee leave times are fairly evenly distributed between 3:45 and 5:15 p.m., but suburban afternoon leave times appear to peak more sharply. The afternoon CBD vehicle peak is generally greater than the employee leave times in the survey might indicate, apparently because of through traffic and the time spent in the CBD by employees who leave early for other activities. Differences in peaking characteristics must then be considered in the application of a variable work hours program.

Employee start and leave times in the Minneapolis CBD peak differently for different types of industry, demonstrating a certain degree of natural work hour staggering. For example, nearly all retail employees (90 percent) begin work after the morning peak time and leave work after the afternoon peak time. As a result, it appears that retail employment is not a major component of peak-hour traffic.

### Employer Attitudes

The majority of employer respondents indicated that they would not support any areawide variable work hours program to improve transit or multioccupancy vehicle service for a number of reasons that relate to business efficiency. Employers were particularly opposed to a 4-d workweek. If hours were to be changed, the maximum acceptable range was 1 h before or after current working hours. There was greater acceptance of starting work after than before 8:00 a.m.

### Employee Attitudes

Over 75 percent of the surveyed employees supported the concept of variable work hours. However, they could not agree as to the type of program or the hours. First preference was given to the 4-d week and second to flextime. Employees were opposed to changing work hours by more than 1 h in either direction (as were employers) and expressed more opposition to later than earlier hours. Major concerns regarding work hour changes were personal commitments outside current work hours and the possible creation of problems for other family members.

### Perceived Impact on Mode Choice

Some shift in travel mode from bus to automobile and from car pool to driving alone is a likely result of a variable work hours program. The actual degree of the shift—short and long term—could not conclusively be drawn from the study, however.

Thirty-five percent of current employee bus riders

to the Minneapolis CBD said they would shift to the automobile if they were required to start work or leave work 1 h earlier or later than their current hours. A 5 percent shift from bus to automobile might result from a 15-min work hour change. About 50 percent of employee car poolers in the Minneapolis CBD indicated that they would shift to driving alone if their work hours were changed significantly. It should be noted that these represent perceived results and thus may be overstated. In addition, the data do not account for reformation of former habits based on a new set of circumstances.

Potential Applications

The investigation of transit applications was oriented toward the reduction of bus-fleet requirements during the peak period. Currently, the peaking of transit demand, particularly in the CBD, requires a large number of buses that are all used within a short period of time (Figure 2). If work hours could be perfectly staggered, up to 39 fewer buses (6 percent of the current fleet) would be required to serve current transit demands during the peak periods. Reduction in vehicle congestion in the CBD as the result of basic staggered work hours programs was also investigated. Three examples were considered:

1. The voluntary staggering of work times for finance, insurance, real estate, and government employees (highest potential for such a program) in the Minneapolis CBD would decrease the current afternoon peak interval by 9.3 percent (approximately 502 vehicles). However, the peak is shifted from the 4:30 to 4:45 p.m. interval to the 4:45 to 5:00 p.m. interval (Figure 3). In addition, where no employees from these industry groups currently leave between 5:15 and 6:15 p.m., 8556 employees or 2663 vehicles would have to leave during this time period if staggering of work hours were introduced.

2. If an even distribution of employee leave times for all industry groups was desired, the total vehicle distribution in the downtown area would be similar to that of the voluntary staggering of selected industries for the time intervals before 5:00 p.m. (Figure 3). After 5:00 p.m., the number of trips increases significantly, and a new peak appears at the 5:15 to 5:30 p.m. interval. The new peak is only 191 vehicles less than the present peak—a generally insignificant reduction in peak-hour traffic of less than 4 percent.

3. If an even distribution of vehicle departures is desired during the peak period, an uneven distribution of employee leave times is required (Figure 3). To achieve a level of approximately 4200 vehicles leaving during each interval, approximately 19 656 persons would have to leave work at or after 6:00 p.m.—a situation that is difficult to achieve on a voluntary basis.

The employer survey indicated that certain major suburban roadway corridors, particularly US-12 west of Minneapolis, have a high degree of afternoon peaking. It would appear that traffic congestion could be decreased along this route if leave times along the corridor were evenly spread across the entire peak period.

CONCLUSIONS

The study of variable work hours resulted in the following preliminary conclusions with respect to the application of variable work hours programs in the Twin Cities metropolitan area:

1. An extensive nonvoluntary staggered work hours program has the potential to reduce the size of the bus fleet required and to reduce traffic congestion in the Twin Cities area.
2. An areawide variable work hours program in a CBD characterized by diverse activity would be extremely difficult to implement under current conditions

Figure 1. Employee arrival and departure times based on employer survey.

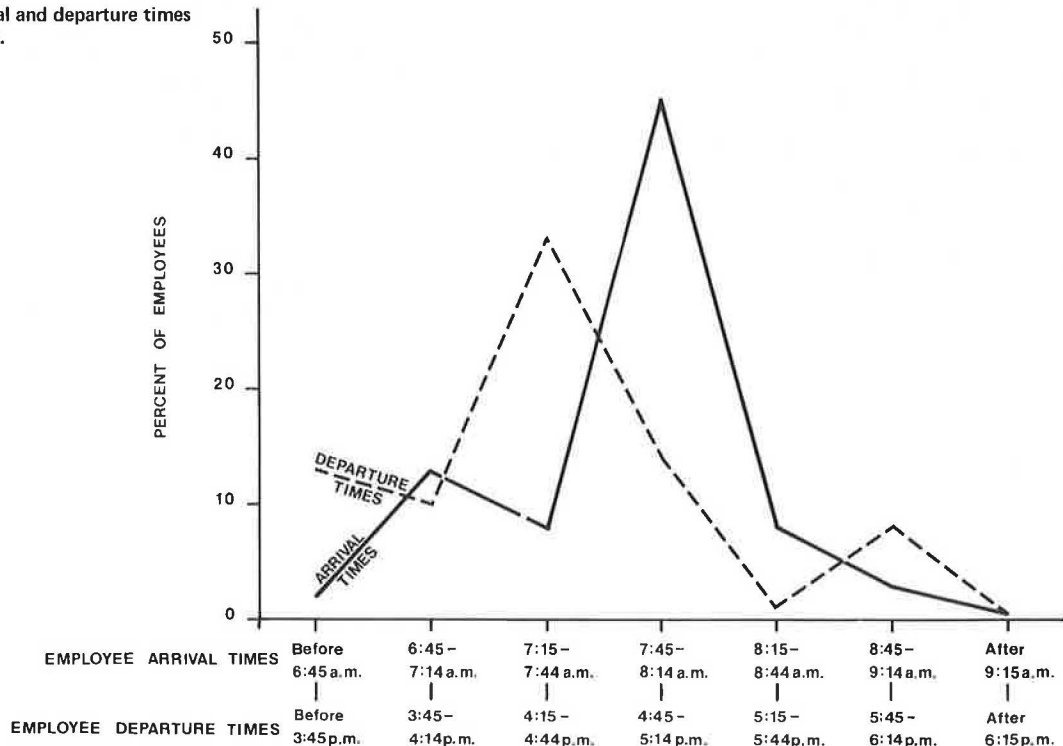
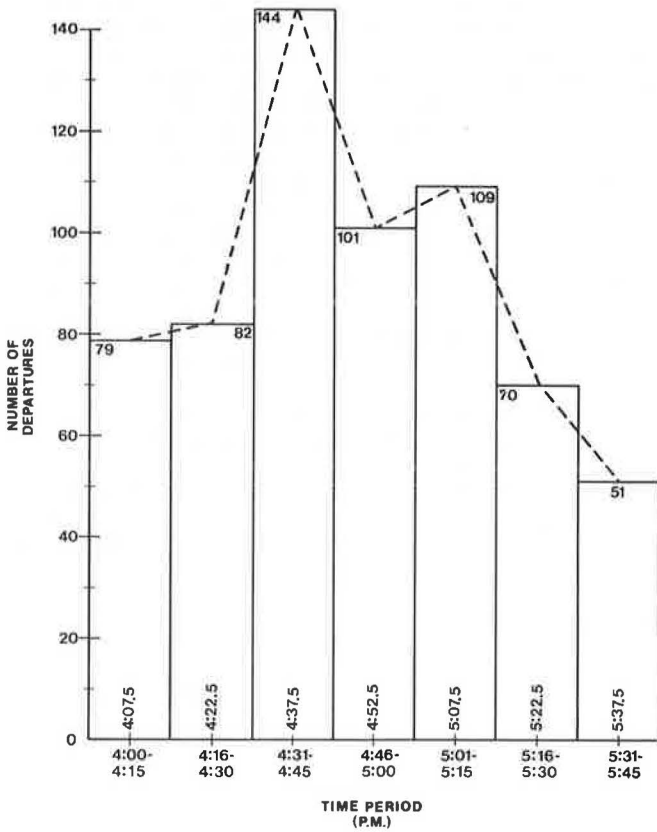


Figure 2. Distribution of bus departures from the Minneapolis CBD during afternoon peak period (4:00 to 5:00 p.m.).



without substantial employee incentives or government dictate. Rigid and substantial changes in work hours would be required if a variable work hours program were to be effective. Both employees and employers appear to be unwilling to accept voluntarily such drastic changes in their work hours.

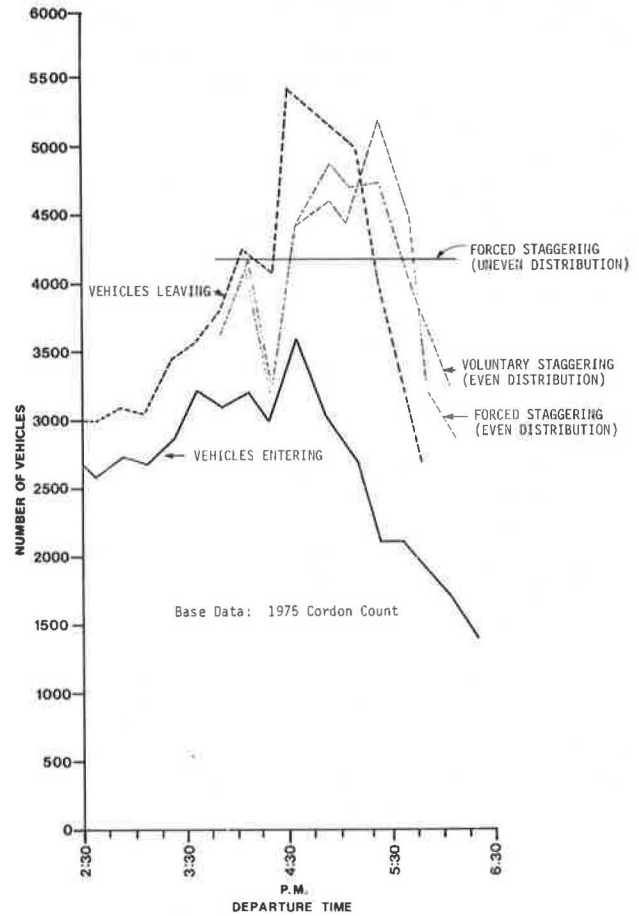
3. A variable work hours program may cause a mode shift in work trip travel away from public transit, car pools, and van pools.

4. Selective, individual-employer programs of variable work hours to reduce local traffic congestion or better schedule transit service appear to have the best chance for current implementation in the Twin Cities metropolitan area.

**ACKNOWLEDGMENTS**

We express our gratitude to John R. Jamieson, Hugh

Figure 3. Effect of staggered work hours on 1975 afternoon peak period in the Minneapolis CBD.



Faville, and other members of the Twin Cities Metropolitan Area Transit Commission staff and to members of the Transit Commission's Committee on Low-Capital Alternatives for Urban Transportation Project Management and Advisory Committee for their cooperation during the conduct of the study on which this paper is based. The source for Figures 1 and 2 is Barton-Aschman Associates, Minneapolis.

*Publication of this paper sponsored by Committee on Social, Economic, and Environmental Factors of Transportation.*