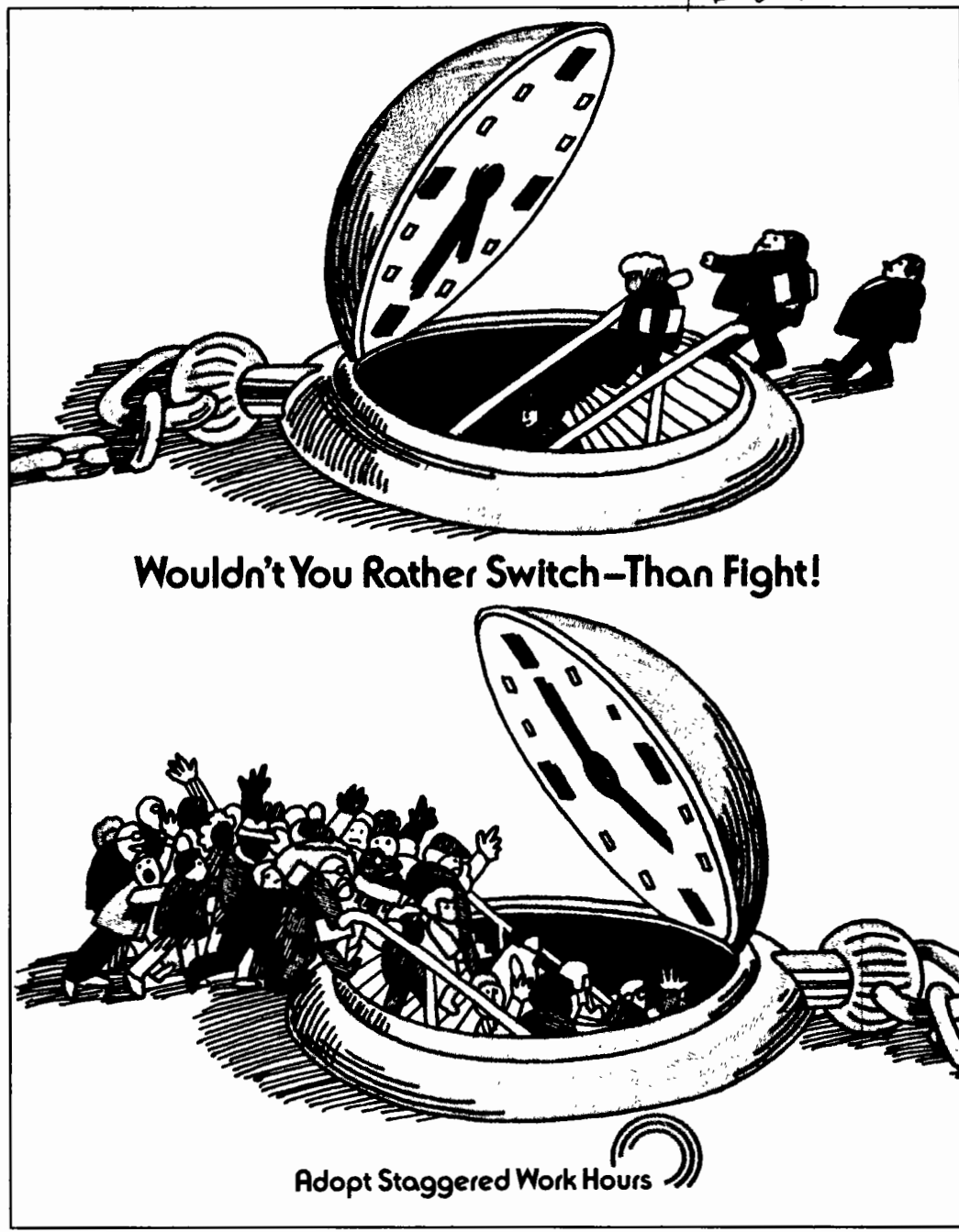


# STAGGERED WORK HOURS STUDY

## Phase I - Final Report

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## Vol. I - Executive Summary

THE PORT AUTHORITY OF NY & NJ

August 1977

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STAGGERED WORK HOURS STUDY  
Design and Implementation of Staggered Work Hours in Manhattan

PHASE I

AUGUST, 1977

FINAL REPORT - VOLUME I

Prepared By  
THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY  
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In Cooperation With  
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U.S. DEPARTMENT OF TRANSPORTATION  
WASHINGTON, D.C.

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**STAGGERED WORK HOURS STUDY**

**FINAL TECHNICAL REPORT**

**Volume 1 - Executive Summary**

**Volume 2 - Technical Report**

**Volume 3 - "Staggered Work Hours Manual"**



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# **STAGGERED WORK HOURS STUDY**

**Volume I**

**Executive Summary**

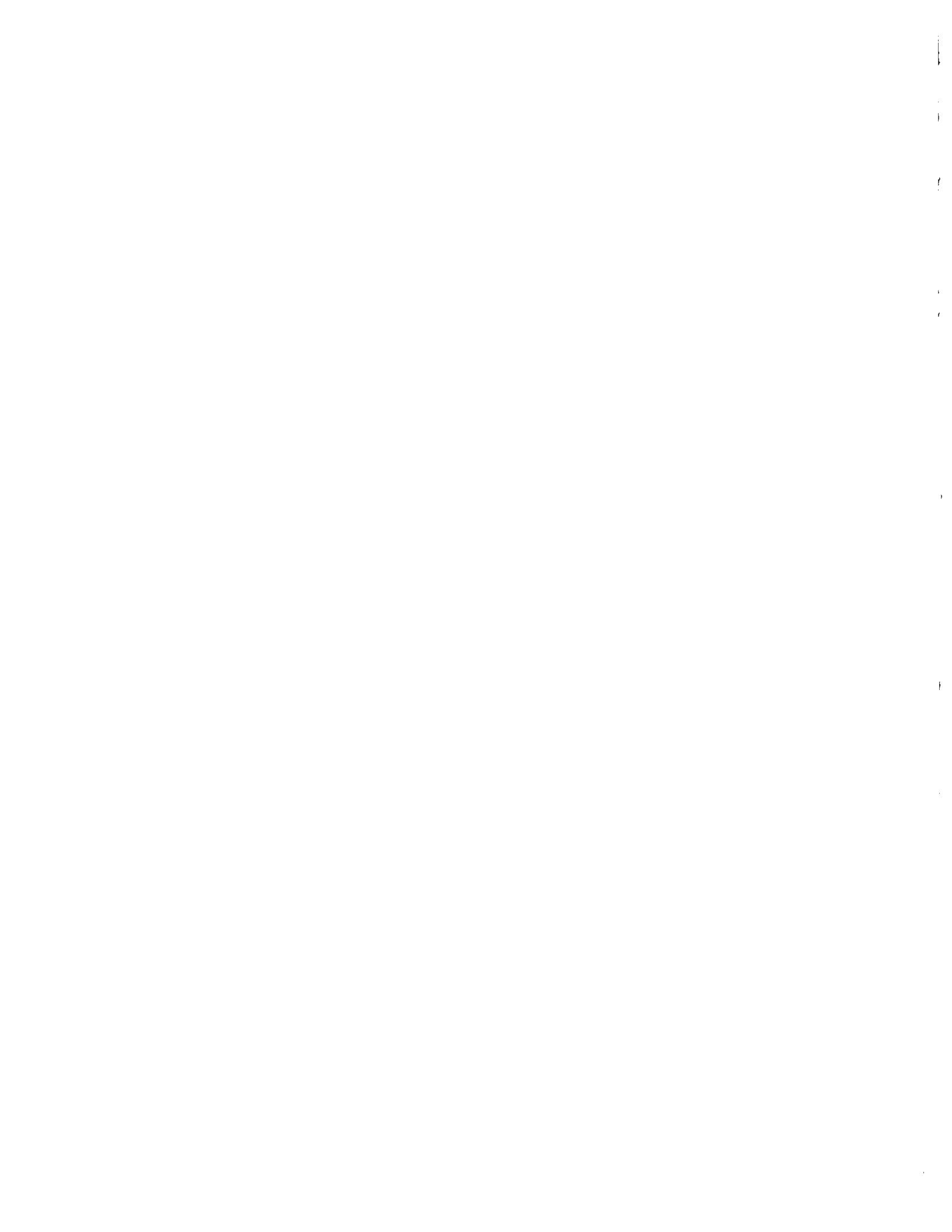


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NOTE: Volume III of this report is a Manual which outlines the steps to be taken in organizing a Staggered Work Hours Program. It is available separately from the National Technical Information Services, Springfield, Virginia 22151.



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## I. INTRODUCTION

A critical transportation problem facing urban areas, service centers and industrial developments alike is peak hour congestion of highway and mass transit systems. Building bigger or better transportation systems may not be the answer, given their high costs and social and environmental impacts. Therefore, the problems of peak hour congestion must be solved in some other way.

The problem itself is quite simple:

Most individuals in cities throughout the world go to work at the same time in the morning and depart from work at the same time in the afternoon, creating severe congestion on many transportation facilities.

If this peak demand could be altered by inducing people to change to earlier or later work schedules, transportation systems could operate more efficiently and comfortably, and individuals would benefit in terms of reduced frustration and irritation.

The concept of Staggered Work Hours is a proven, "low capital-intensive" method of reducing transportation congestion.

As the operator of the PATH rail rapid transit system, one of the most severely peaked transit systems in the world, the Port Authority of New York and New Jersey became involved with Staggered Work Hours more than five years ago. In cooperation with the Downtown-Lower Manhattan Association, the Port Authority initiated a Staggered Work Hours Program that has since expanded to midtown Manhattan and Newark and now involves hundreds of thousands of men and women in the New York-New Jersey region.

Experience has shown that the Staggered Work Hours program in Manhattan has not only reduced congestion on transportation systems, but improved efficiency in business operations by reducing lobby congestion and improved employee attendance, punctuality and morale, all of which are additional non-cost benefits.

## II. OBJECTIVES

This three-volume report is the product of a \$200,000 grant from the United States Department of Transportation to document and further implement staggered work hours programs in Manhattan. The grant was made by the Urban Mass Transportation Administration (UMTA) and co-sponsored and administered by the Tri-State Regional Planning Commission.

In awarding the grant UMTA exhibited its support of the Manhattan program in particular, and of low capital intensive projects in general, as a way local communities can relieve transportation congestion without huge capital expenditures.

Accordingly, the objective of the study was not only to further the staggered work hours program in the New York-New Jersey region but also to determine means and methods to assist other communities in establishing their own staggered work hours programs. As part of the study, the Port Authority was required to:

1. Determine the "State-of-the-Art" of past and ongoing Staggered Work Hours Programs (SWHP) and determine techniques employed, achievements, cost benefits and other factors.
2. Develop criteria for determining the feasibility of staggered work hours programs in central business districts and in other areas.
3. Discuss the development of work schedule surveys required to determine work schedule patterns prior to the establishment of a SWHP.



4. Prepare a comparative evaluation of several variations of staggered work hours.
5. Establish procedures for designing staggered work schedules.
6. Develop implementation procedures for staggered work hour programs.
7. Determine the impact of SWHP and evaluate such impact upon urban areas.
8. Survey employees and supervisory staff of firms participating in staggered work hour programs to determine the reaction of employees to work schedule changes. Particular emphasis was to be placed on the effect on their private lives, efficiency, productivity, and punctuality.
9. Conduct additional transportation surveys and attempt to determine the quantitative and qualitative benefits accruing to transportation systems from staggered hour programs.
10. Determine the probable impact on transportation design of ongoing and continuing staggered work hour programs.

One product of the study was a "manual" to help interested organizations determine if a program of variable hours -- staggered work hours, flexitime or shortened work week -- is feasible and to assist them in implementing staggered hours programs.

### III. PRINCIPLE RESULTS AND FINDINGS

A staggered work hours program, if adopted extensively, can make commuters' lives more comfortable while, at the same time, improving the efficiency of existing transportation services for the transit operator. In fact, if such a program spreads the peak sufficiently, it may possibly preclude the need for additional capital intensive facilities.

The specific findings of this study are:

1. State-of-the-Art: Staggered hours has a relatively long history, starting as early as the 1920's. The attractiveness of the idea has grown in urban areas with the increased use of mass transportation, higher employment densities and an increasingly longer journey to work. Much has been written on this subject beginning with the period around World War II when 260 cities in the United States had a staggered work hours program. In 1974, the Port Authority conducted a comprehensive survey of 131 U.S. and 77 foreign cities. Of the 141 cities returning the questionnaire, some 51, or 36%, had a form of Staggered Work Hours Programs and 35 cities reported that a formal "Work Schedule Survey" had been taken. Some 44 of the 141 cities reported experience with flextime or the 4-day week. This attempt at changing work schedules was due, no doubt, to the fact that more than three-quarters reported that passenger flow was sharply "peaked" within the busiest travel period.

2. Criteria for determining feasibility: If transit vehicle loadings are excessive during a short part of the peak hour, then this strongly suggests the desirability of adjusting work schedules to earlier and/or later times when service is more likely to be at a higher comfort level. A criteria for implementing a Staggered Work Hours Program is met when the comfort capacity at the maximum load point on public transportation systems is exceeded for a significant part of the peak period, while at the same time, there exists reserve comfortable

capacity in either or both of the "shoulders" on each side of the peak. An important step in any investigation into the feasibility of a program is to determine the current work schedule patterns and practices. A work schedule survey will verify the degree to which starting and quitting times can be directly correlated with transportation congestion and which firms influence this pattern.

3. Alternate Program Designs: Although flexible work hours, which allow employees to determine their work schedules within pre-established limits and regulations, may provide the ultimate in all around benefits, experience has shown that most firms will not directly adopt this concept. Staggered work hours, which involves shifting the fixed five-day work schedule onto either earlier or later time periods, is the most readily accepted concept for quick implementation and once adopted, may evolve into flexible hours. The Four-Day Week would, if universally adopted, lead to continued transportation congestion if only over fewer work days.

The approach to designing a Staggered Work Hours effort will depend on the nature of the area, the public and private organizations and transportation facilities and its goals as well as resources. There are three basic plans - comprehensive, specific transportation facility directed and neighborhood or special group oriented. The effort and approach needed for each of these plans is different.

4. Program Implementation: If a Staggered Hours Program is to be effective, it must be professionally organized with a full-time staff, adequately funded, have a time frame of several years and have solid business backing in order to achieve substantive results.

Effective strategies include:

- Stressing the benefits to the organization of participating
- Getting strong business sponsorship

- Giving priority to the largest organizations
- Direct personal selling
- Being "business-like" and highly professional
- Initially contacting those at top levels in an organization
- Offering and giving assistance
- Helping alleviate possible transportation difficulties
- Developing program materials
- Having a continual promotional program

5. Attitudes and Benefits: As determined from surveys, there is an overall favorable reaction to Staggered Work Hours on the part of employees and management. Among the benefits reported by employees were less congestion on transportation systems, in elevators and lobbies, higher job satisfaction and greater satisfaction because of time spent off the job. Benefits cited by supervisors were: net gains in productivity and increased punctuality. A substantial majority of unit heads reported no severe communications problems because of changed hours.

Improvements to transportation facilities as a result of a Staggered Work Hours Program are related to the level of service and include reduced crowding and a faster trip as a result of shorter travel times and reduced delay.

#### IV. STATE OF THE ART

With the increasing Federal emphasis on "low capital-intensive" measures to reduce transportation congestion, there has been a growing interest in the concept of staggered work hours as one of the most fruitful and least costly methods of reducing transportation congestion.

In order to determine the state-of-the-art of staggered work hours programs in the United States and abroad, the Port Authority of New York and New Jersey conducted a comprehensive survey of 131 U.S. cities and 77 foreign cities in 1974-75. In addition to general information about employment and transportation, the survey covered the techniques employed, achievements, costs, benefits, sponsorship and other pertinent factors involved in staggered work hours programs.

A six-page questionnaire requested information from each city about its central business district as well as its involvement with a staggered work hours program. Detailed results and copies of the questionnaire are included in Section I of the main report.

The first group of questions were related to the characteristics of the cities' CBD -- specifically, highway and public transportation systems -- the type and number of employees, lunch period and work schedule practices. The second group of questions attempted to determine the status of any staggered work hours practices, as well as to secure information on the implementation and promotion of such programs. Estimates of any cost and efficiency improvements created by hours staggering programs were requested, as well as any data on attitudes of employees and management. A single questionnaire was used for

both U.S. and foreign cities, regardless of possible language barriers.

The survey was mailed to the mayors of the 131 U.S. cities designated as having a CBD and to 77 foreign cities. In the case of cities abroad, the questionnaire was mailed to the head of city government. A total of 141 cities returned questionnaires, for an overall 66 percent response rate. Included were 99 U.S. cities (76%) and 42 from the rest of the world (54%).

Analysis of the questionnaires shows that hours staggering programs are used throughout the world. Formal programs predominate in the United States, Canada and Europe, with little interest in the concept in South America and Africa. There is some hours staggering in Asia.

Of the cities returning a questionnaire, 51 had some type of staggered work hours program, ranging from formal programs sponsored by a government or civic organization to individual company programs. Based upon responses, the most comprehensive ongoing program appears to be the Manhattan program, which is the subject of this study. A higher proportion of foreign cities reported staggered work hours programs. Only 28 cities reported that formal "work schedule surveys" had been conducted; the link between their transportation systems "peaking" and work schedules appears to have been made more by observation or intuition than by specific surveys.

Some 44 cities reported experience with other work scheduling concepts, particularly "flexible work hours" or the four-day week. In this area, cities located outside the United States predominate, with 20 (50%) reporting that they had some form of variable hours.

The four-day work week has received more attention in the United States, with 19% of the cities reporting significant experiences. In contrast, only 12% of foreign cities report any involvement with a four-day week. The

experience with flexible work hours is just the opposite. Only 10% of the U.S. cities are aware of developments in this area, while 65% of foreign cities reported using the flexible work week.

The state-of-the-art survey indicated that the "peaking" phenomenon is universal, and is most often attributed to prevailing work schedule patterns.

V. CRITERIA FOR STAGGERED WORK HOURS

The peaking phenomenon is a familiar one to transportation professionals throughout the United States and around the world. It is caused by the natural evolution of a common starting and quitting time for the work day within a community. In most cities in the world, this results in a pronounced surge in travel during a relatively brief period every morning and afternoon. Contrasted with the twice-daily peaks, most of the urban transportation facilities are relatively under-utilized for the balance of the day. Even so, the facilities must be designed to reasonably handle the maximum commuting load each day.

In recent years, a number of new work schedule concepts have been implemented in many cities throughout the world -- namely, Staggered and Flexible Work Hours and the Shortened Workweek. Each concept seeks to alter the tradition of everybody working at the same time each day, and each attempts to reduce transportation congestion in varying degrees. The fact that they have become increasingly popular and successful is due also to non-transportation benefits, including increased productivity, social and morale benefits.

There appears to be a natural evolution in a city towards a single work starting and quitting time, unless other factors preclude this arrangement. The simple fact is that the business community must be open the same time each day in order to maximize efficiency for the community as a whole -- at least, this is the traditional concept. There is little reason why this should be otherwise, until, at least, congestion on such service facilities as elevators, eating places and



transportation systems begins to cut into the advantages of a uniform business day.




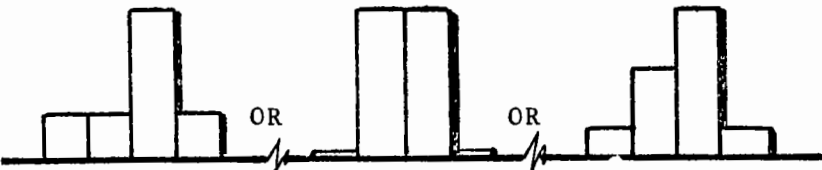
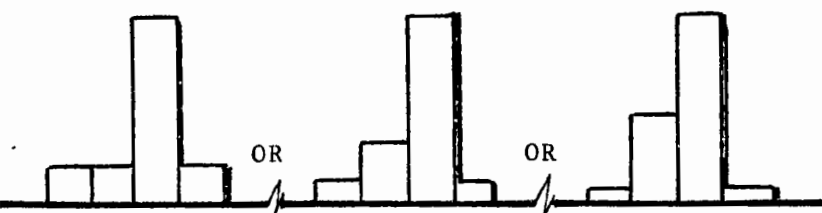
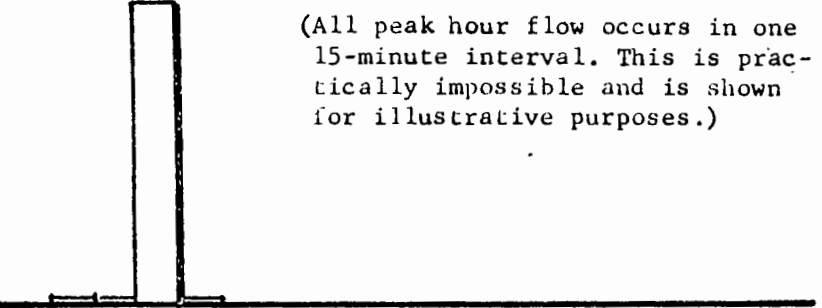
This study suggests several criteria to determine if such congestion can be remedied by revising work schedules. While as yet there are no definitive equations, a series of useful techniques has been developed to determine the nature of peaking on different systems, and to provide a rationale for deciding whether to implement a work schedule revision.

The following recommendations are offered:

1. The determination of vehicle loadings on transit facilities is effective in identifying both the nature of peak demand and appropriate goals for improvement in service. If transit vehicle loadings are excessive during a short part of the peak hour, then this strongly suggests the desirability of adjusting work schedules to earlier and/or later times when service is operating at a more comfortable level.
2. The Peak Hour Factor (PHF), in common use in the highway transportation field, can, in certain applications, be a helpful indicator in determining whether revised work schedules would be used to reduce congestion. PHF is an arithmetic expression of the relationship between the number of passengers traveling in the highest 15 minute period of a peak hour and the total number of passengers in the peak hour. The lower the factor, therefore, the higher the peaking. Generally, when the numerical difference in the PHF's of the service offered and the transportation demand exceed a certain amount, a Staggered Hours effort is increasingly warranted. More research is needed, however, to refine the PHF to more reliably predict situations of adverse peaking. (Exhibit S-1).

Staggered Work Hour Study

Exhibit S-1  
PEAK HOUR FACTORS AND SHAPES OF DISTRIBUTION

*Peak Hour Factor (PHF)	Description of Peaking	Sample Peak Hour Distributions Corresponding to PHF (Distributions are by 15 minutes for a nominal peak hour of 1,000)	Volume
1.0 (maximum value)	No Peaking	(Only distribution possible) 	300 200 100 0
0.85	Slight peaking		400 300 200 100 0
0.70	Moderate Peaking		400 300 200 100 0
0.50	Severe Peaking		600 500 400 300 200 100 0
0.40	Extreme Peaking		600 500 400 300 200 100 0
0.25 (minimum value)	Limit of Peaking	(All peak hour flow occurs in one 15-minute interval. This is practically impossible and is shown for illustrative purposes.) 	1000 500 0

\*Note: The Peak Hour Factor (PHF) on a 15-minute basis is:

$$15\text{-minute PHF} = \frac{\text{Peak Hour Volume}}{4 \times \text{Peak 15-minute Flow Rate}}$$

3. More research in this area is recommended in order to give transportation professionals better tools with which to examine the nature of peaking and decide whether modifying demand is necessary and/or desirable. In the past, this has been simply a technique of "eyeballing" a demand curve and not really understanding whether peaking was or was not excessive. As Staggered Work Hours and other work schedule concepts increasingly are being used to reduce transportation congestion, such factors must be developed to better define criteria for the use of such techniques.

## VI. WORK SCHEDULE SURVEYS

The first step in any investigation of the feasibility or desirability of a staggered work hours program is to determine the current work schedule patterns and practices in the area under consideration. This so-called "work schedule survey" (WSS) of employers should include start and quit times of employees, the number of employees on alternative schedules, employees' modes of transportation and places of residence.

If the survey indicates that the work schedules are concentrated at certain starting and/or quitting times, and this pattern can be directly correlated with transportation congestion, then a well-planned staggered work hour program can be expected to yield beneficial results. Accordingly, the information determined from a work schedule survey is fundamental to implementing any formal staggered work hours program.

Section III of Volume II covers a series of work schedule surveys performed by the Port Authority, and analyzes the survey techniques and recommendations. The report also discusses work schedule surveys reported by other cities in the state of the art survey.

The success of the work schedule survey, as well as the implementation of a staggered work hours program, depends on the influence and standing of its prime sponsor. The leadership of prestigious organizations and individuals is necessary if adequate interest in even the first step is to be generated. In cases where special task forces are set up, a prominent business or civic leader should be named chairman. Staff work should be centralized under a project manager who maintains close liaison with the task force leader.

The following work schedule survey techniques are recommended:

1. A formal work schedule survey should be conducted to definitively determine if prevailing work schedule patterns are correlated with peak period congestion on transportation facilities.
2. When conducting a work schedule survey, there are several keys to insure a good sample return and useable information. Specifically, effective sponsorship, persistent follow up of the survey, and the soliciting of a contact in the organization who will be responsible for completing the survey form and will handle future communications all help to guarantee good data.

VII. COMPARATIVE EVALUATION OF WORK SCHEDULE CONCEPTS

The three most common concepts of work schedule changes are best defined as follows: (See Exhibit S-2)

- Staggered work hours involves shifting the fixed five-day work schedule onto either earlier or later time periods. The concept requires employees to be at work by a specific time and leave at a specific time but the overall length of the work day remains unchanged. The aim is to spread the fixed work schedules to time periods earlier or later than the normal predominant schedule in order to relieve transportation congestion and make the commute to and from work more comfortable and enjoyable. Staggered hours has a relatively long history, starting as early as the 1920's. The attractiveness of the idea has grown in urban areas with the increased use of mass transportation facilities, higher employment densities and an increasingly longer journey to work. Work staggering aroused increasing interest during World War II, and there are reports that work staggering was implemented in a number of large cities during World War II, although there is little documentation of the extent, problems incurred or the success of the program.

# Staggered Work Hours Study

## Exhibit S-2

### GRAPHIC DESCRIPTIONS OF WORK SCHEDULE CONCEPTS

Examples of various work schedules with Staggered Work Hours, Flexible Work Hours and the Four-Day Week.

● STAGGERED WORK HOURS

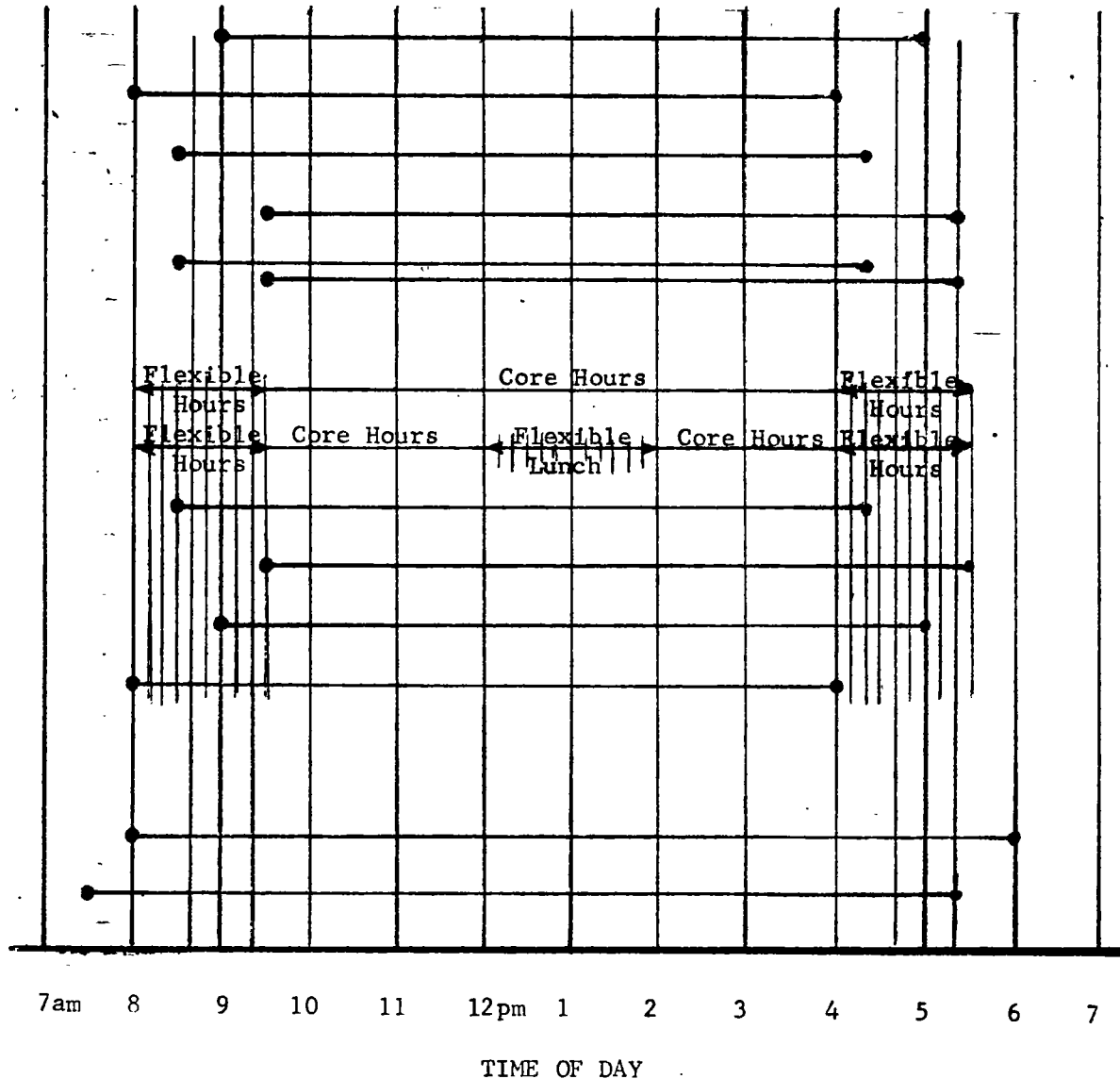
- "Standard" 9-5
- Staggered 8-4
- Staggered 8:30-4:30
- Staggered 9:30-5:30
- Split staggered 8:30-4:30/  
9:30-5:30

● FLEXIBLE WORK HOURS

- Port Authority FWH experiment
- FWH with flexible lunch period
- Four examples of "floating day" where, as shown respectively, employee arrives by choice at 8:30, 9:30, 9 and 8AM, and leaves eight hours later.

● FOUR-DAY WEEK

- Four-day 8-6
- Four-day 7:30-5:30



More recently, the popularity of staggered hours has increased in many urban areas. In the State-of-the-Art Survey which is discussed in detail in the technical report, 16% of the 131 U.S. cities surveyed reported that they had used staggered hours. Eleven foreign cities or 38% of those responding also had current staggered hours programs.

- Flexible Work Hours, which is also known as "gliding" work hours, "flextime", "flexitime" or "plantime", is a new concept in work time management which allows employees a degree of freedom in determining work schedules. Basically, flexible hour programs permit employees to set their own daily starting and quitting times within pre-established limits. Generally they are required to be present at work during a "fixed" or "core" time with the ability to choose their starting and quitting times in a flexible manner subject to the demands of management.

Flexible hours was initiated in West Germany in 1967. The plan not only relieved traffic congestion but had a positive impact on employee morale. The concept is just beginning to be explored by United States organizations. Only 8 U.S. cities, or 10% of those reporting in the State-of-the-Art Survey, indicated experience with flexible hours. In contrast,



17 foreign cities or 65% of the sample were using some form of flexible hours.

- The four day (or shortened) work week concept generally involves the compression of the total number of hours worked per week into a shorter-than-five-day week. In some cases the total hours required of work are somewhat reduced but generally the shortened week in the U.S. is the four days-40 hours or "4-40".

Since 1970 the concept of the shortened work week has become increasingly accepted. The American Management Association (AMA) Research Report published in 1972 reported that between 700 and 1000 U.S. firms were using the four-day week. Indications are that this figure has been steadily increasing over the last three years. In most instances the idea was introduced by small manufacturing organizations to provide a fringe benefit not offered by their larger competitors. Of the firms surveyed by the AMA, 85% were in the manufacturing sector with the remainder predominantly in service and retail industries. Recently there have been more and more white collar experiments with the four-day week, in spite of the fact that serious questions have arisen regarding fatigue and long-term productivity under the system.

The Port Authority has extensively examined and applied each of the above concepts in its own internal work setting. The results of this examination as well as other analyses of the concepts are described below.

All three of the work scheduling concepts, by the very fact that they shift people out of peak commuting hours, lead to reductions in peak transportation congestion, provided that congestion is principally caused by adherence to a single five-day work schedule. Generally, the congestion reduction is directly related to the absolute amount of participation and the degree to which new schedules are spread away from the old work schedule hours. (Exhibit S-3)

For example, staggered work hours has been very successful in relieving peak period congestion on public transportation systems. Further, the amount of congestion reduction with staggered hours programs is predictable, since the analyst can determine how many employees are on different schedules and identify the typical pattern of arrival and departure. While staggered hour programs have proven their ability to reduce peak congestion, flexible hours programs also appear comparable in their potential for relieving transportation peaking. This is because commuters, if given a choice, will choose work times to avoid

Staggered Work Hours Study  
Exhibit S-3

SUMMARY COMPARISON OF TRANSPORTATION IMPACTS

	----- Transportation Aspect -----			
	<u>Reduce Peaking</u>	<u>Elevator Operations</u>	<u>Modal Changes</u>	<u>Commuter Attitudes</u>
<b>1. STAGGERED WORK HOURS</b>				
a. One schedule	Reduces transit peaking	Generally effective in reducing congestion	Not significant	Commute generally more comfortable
b. Several schedules	Reduces transit peaking	More effective since it creates a smoother usage	Not significant	Commute generally more comfortable
<b>2 FLEXIBLE WORK HOURS</b>	Potential to relieve; allows use at least congested times, but less control over effect	Very beneficial as it improves flow; workers come and go during 1 - 2 hour span.	Little evidence of switching modes	Improved commute; relieves pressure to be on time; can pick best time for travelling
<b>3. FOUR-DAY WEEK</b>				
a. Same day off	Reduces peak by moving commuters away from peak period; but may create new peak	Doesn't generally reduce congestion; only changes time it occurs	Could encourage auto usage; also hurt carpools	Transit service less frequent for wider-spread schedules; travel by auto less congested.
b. Staggered day off	Also moves commuters out of the peak; and reduces any new level of peaking	Will reduce peak demand on elevators with perhaps 20% fewer using them to come and go on a given day	Could encourage increased auto usage, and be very difficult for carpools	Transit service less frequent; travel by auto less congested

the most congested travel times. In the Port Authority's flexible hours experiment three-quarters of the participants said that they adjusted their hours to avoid the most congested traveling periods. However, because the commuter can choose his/her hours within certain time limits, it becomes more difficult to predict the revised arrival and departure patterns, making it difficult to reduce congestion at specific points by a flexible hours program.

The four-day week has the specific purpose of increasing employee moral and/or productivity. It also has definite implications in reducing transportation congestion. For example, a company working a four-day week on an 8 A.M. to 6 P.M. schedule has shifted its employees out of the most crowded travel times, thus reducing peak congestion. However, widespread adoption of the four-day week could increase transportation congestion at certain hours as the bands of starting and quitting times for the longer work day would be much narrower.

As to change in transportation mode, it has been difficult to establish that any one of the scheduling concepts has a direct impact. In large urban areas such as Manhattan, flexible hours and staggered work hours have had no identifiable effect on mode use. Where there is heavy reliance upon public transit, in fact, one may be more inclined to continue using it by traveling in less crowded time periods.

However, staggered work hours may be counter productive to car pooling efforts, since car poolers may end up on different schedules.

The four-day week has definite implications for modal use. Where automobile commuting predominates, there is little impact although car pooling arrangements would be nearly impossible among people on four-day and regular work week schedules.

As to employee attitudes, staggered work hours and flexible work hours have repeatedly proven to be well-liked by employees. Flexible work hours particularly has been implemented specifically in some organizations as an employee benefit. The four-day week, although positively received by some workers, has been less favored by others who complained primarily of the tiring, long work day. (Exhibit S-4)

The effect of staggered hours on office operation has been researched in depth. Generally, supervisors reported gains in productivity, increased punctuality and reduced absenteeism. Some further noted that through two or three schedules they benefited from extended hours of office operations. Supervisors also perceive flexible hours positively, although it required more careful coordination to assure that certain office functions, such as telephone coverage and customer services, are provided.

Staggered Work Hours Study

Exhibit S-4

SUMMARY COMPARISON OF EFFECTS ON ATTITUDES

	----- Attitudinal Aspect -----			
	<u>Overall Reaction</u>	<u>Work Schedule Preference</u>	<u>Home Life</u>	<u>Employee Morale &amp; Job Satisfaction</u>
<b>1. STAGGERED WORK HOURS</b>				
a. One schedule	Overwhelmingly favorable	Earlier hours usually preferred	Positive - More time in evening with family more daylight hours	Improved
b. Several schedules	Overwhelmingly favorable	Usually combination of earlier and later hours; some chance to choose preferred schedules	Positive - More time with family; either morning or evening	Definitely improved, especially when work preference considered
<b>2. FLEXIBLE WORK HOURS</b>				
	Highly positive; preferred to fixed schedule	Trend to earlier hours, but allows for individual preference	Positive - better balance between work and family	Perceptibly increased
<b>3. FOUR-DAY WEEK</b>				
a. Same day off	Ranges from positive to negative; varies by type of business	Little room to accommodate preferences	Positive and negative effects; impact can be severe	Popular with mfg. employees but varies with office workers
b. Staggered day off	Reactions mixed	Allows for some personal preferences as to day off	Positive and negative effects	Popularity varies

The four-day week, on the other hand, can be the most disruptive of any schedule change. An important distinction is whether the organization closes its operation for one day a week or whether the employees alternate the day off to keep the business functioning for five work days. Many small manufacturing concerns have profited by closing their operation for an extra day each week. They have found that production has increased and operating costs have been reduced. By contrast, many offices are reluctant to close for an entire day. They therefore arrange for employees within a given unit to take a day off, which sometimes makes it difficult to arrange five-day coverage.

Communication problems are more apt to arise under flexible work hours than under staggered hours, but they generally have not been serious enough to halt the growing exception of the concept.

The four-day week presents difficult problems of communication. In the Port Authority trial, complaints from management about communications within units was a particular problem. Moreover, coordination between units was also of concern. Supervisors remaining on the five-day schedule had less than a full staff at all times, which they felt to be a problem. Many firms using the four-day

week expressed concern about communications, but many merely close the office on the fifth day or maintained only a skeleton staff.

With regard to productivity, supervisors on staggered hours and flexible hours generally reported gains in productivity. On the other hand, there are mixed reactions as to the effect of the four-day week on productivity.

As to punctuality, staggered hours appear to have a beneficial effect; almost 80% of the supervisors interviewed said their employees were arriving on time or early under staggered hours. In contrast, flexible hours practically eliminate the concept of lateness since there is no need to be at work at an established time. In addition, it may lessen the tendency to call in "sick" if the employee oversleeps. On the four-day week, employees who favor the system may make a concentrated effort to be in on time, but having to work an hour or so earlier may be difficult in terms of transportation and employees' own personal habits. (Exhibit S-5).

While the three major work schedules have been compared in brief above, the following summary is of value:

1. While the concepts of staggered work hours and a four-day week have been documented to a



Staggered Work Hours Study

Exhibit S-5

SUMMARY COMPARISON OF EFFECTS ON OFFICE OPERATION

----- Aspect of Office Operations -----

	<u>Overall Effect</u>	<u>Communications</u>	<u>Productivity</u>	<u>Punctuality</u>
<b>1. STAGGERED WORK HOURS</b>				
a. One schedule	Very positive	No significant problems; minor adjustments all that's usually required	More increases than decreases	Beneficial effect, since fewer and shorter delays. travelling away from peak
b. Several schedules	Very positive	No significant problems; some benefits from extended coverage	Usually no changes, but more positive than negative reports	Beneficial effect
<b>2. FLEXIBLE WORK HOURS</b>				
	Positive, although with some problem spots	Potential for problems; requires close coordination, adequate office coverages	Most firms report increased productivity for various reasons	Eliminates concept of "being late"
<b>3. FOUR-DAY WEEK</b>				
a. Same day off	Both positive and negative aspects	Potential for serious problems; requires careful coordination Most businesses dislike complete day off; requires skeleton force	Both increases and decreases reported	More difficult to be "on time" since on much earlier schedule
b. Staggered day off	Positive and negative effects reported	Some problems; provides 5-day coverage instead of 4	Both increases and decreases reported	Early starts make it harder to be on time

certain extent, more research is needed regarding the impact of flexible hours on transportation, employee attitudes and business operations.

Since flexible hours may become increasingly popular in the U.S., as it has in Europe, it is important to fully understand its ramifications on travel demands, modal choice and other factors.

2. The concept of flexible work hours appears to be superior to staggered work hours and the four-day week, particularly in the areas of reduced transportation congestion and improved employee attitudes.

3. Staggered work hours is generally the easiest of the three concepts to implement, while the other two involve more administrative, operating and institutional complications. The lead time required for implementation of staggered hours is also generally shorter than for the other two concepts. These factors should be kept in mind when mounting an effort to implement a program involving work schedule changes.

Most firms, on a fixed five-day work schedule will not directly embrace Flexible Hours. Rather, experience indicates that once a firm takes a "first step" with Staggered Hours, it is then more willing to evolve towards Flexible Hours. Currently, the Four-Day Week does not appear to be universally acceptable nor should it be an important part of a work scheduling program to reduce transportation congestion.

The designer of Staggered Work Hours schedules must be cognizant of the attitudes of both employees and management. Of fundamental importance is to determine whether employees and management will entertain a shift in work schedules at all, whether they prefer earlier and/or later schedules and what would be the maximum shift that they would be willing to accept. It has been found in the Manhattan program, as well as in all other known organized efforts, that there is a universal preference by most employees for schedules earlier than their current hours. The maximum degree of shift that is usually allowed, at least on the initial stage, is limited to a half hour, in most cases.

There are some informal guidelines relating the characteristics of different industries to their receptiveness to Staggered Work Hours. Generally, there is an especially high potential for enlistment onto Staggered Hours where a business is not in direct contact with either the public or suppliers or does not provide other services. Industries like this include insurance and other mail-order processing types of businesses. Similar functions are also located within any business, and would include accounting, billing, finance, personnel, office services

and electronic data processing. Headquarters of corporations also are generally receptive to shifting away from the predominant schedule.

Designers of Staggered Hours programs also should be concerned with the availability of transportation services geared to serve revised work schedules. This concern is often overstated or overblown, however, and sometimes unnecessary service adjustments are made by transit operators regardless of participation in Staggered Hours.

The philosophy followed in the Manhattan program was as follows: an assumption was made that adequate bus and rail transit service was available on individual systems to handle persons making relatively small adjustments, say a half hour, in their work schedules. (This is, in fact, the main reason why Staggered Hours programs are advanced: to spread the demand to adjacent times in the peak hour when existing service now being provided is underutilized.) Only when service was not available, such as on a specific express route, would a priori consideration be necessary for adding or revising service patterns by the transit operators.

To further assist the designer, a computer modelling technique to quantify the impact of Staggered Work Hours alternatives has been developed. It is fully explained in Section V of the main report.

### VIII. SCHEDULE DESIGN PROCEDURES

Staggered Work Hours involves a voluntary effort to adjust work schedules to reduce transportation congestion and therefore, the program design is a critical factor in its ultimate success or failure. Unfortunately, there are no "cookbook" design procedures which can assure a successful program.

However, much is known about how to design an effective Staggered Hours Program. Design procedures developed in this section involve a three-pronged approach: 1) evaluating several overall strategies which might be employed, 2) buttressing the chosen strategy with real design factors and 3) developing a working model to evaluate and recommend various specific work schedule rearrangements to achieve desired changes in transportation demand patterns.

Designing a Staggered Hours Program includes several basic steps: defining the problem clearly, identifying potential alternate work scheduling methods, evaluating each of these methods by predicting their effectiveness, deciding on the basic method of approach and implementation.

A city's approach to designing a Staggered Work Hours effort will vary depending on the nature of its CBD, the city's public and private organizations and transportation facilities, its goals and resources and the availability of usable data. Three approaches have been developed as follows:

- A "Comprehensive Plan" and evaluation process to identify the transportation problems and estimate the effectiveness of Staggered Hours in alleviating them.
- Two "Directed Plans" aimed at alleviating specific transportation problems, where initial results guide the gradual evolution of the overall program.

The steps in the "Comprehensive Plan" are:

1) Survey of Conditions on Transportation Modes - Determine the "levels of service" currently being provided on transportation modes serving the CBD. Where possible, existing data should be used to determine values of demand and service patterns and peaking characteristics, although it may be necessary to conduct some additional surveys.

2) Evaluate the Current Level of Service on Transportation Modes - Once the surveys have been analyzed, current levels of service on various transportation modes should be reviewed. These include the levels of transit crowding, operating speeds of rail transit systems, congestion and flow rates on roadways, bus speeds and conditions on pedestrian facilities. If current levels of service are unsatisfactory during short time durations, or if projected service levels indicate future problems, then Staggered Hours programs should be pursued.

3) Determine the Expected Need for Additional Transit Facilities - The need for additional transit facilities should be determined. This includes facilities currently being planned or

those indicated based upon deficiencies in the current or projected future levels of service. If new facilities are forecast, then Staggered Hours should be investigated to spread the demand in order to obviate their need entirely or to reduce their scope. Costs of such facilities should be estimated, including capital annual operating expenses, with these costs representing a potential long-run dollar benefit if Staggered Hours is effective in obviating or reducing their need.

4) Conduct a Work Schedule Survey Within the CBD - A "work schedule survey" of numbers of employees on various starting and quitting times within the CBD should be conducted, as discussed in Section VI.

5) Compare Projected Arrival and Departure Patterns to Those Observed on Transportation Modes - The projected arrival and departure patterns, based on the work schedule survey results, should be compared to demand patterns observed on transportation modes having unsatisfactory levels of service during parts of the peak period. The potential effectiveness of Staggered Hours to improve levels of service is based on 1) the degree of "peaking" in patterns of arrival to and departure from work, 2) how well correlated these patterns are to actual arrival and departure patterns observed on transportation modes and 3) survey results or estimates of the proportion of journey-to-work trips on transit and roadway systems during peak periods, since these would be the only trips affected by work schedule adjustments.

6) Develop Staggered Hours Alternatives - Alternative Staggered Work Hours proposals should be developed based on the results

of organizational and employee attitude surveys towards changes in work schedules, and the projected impact of the various work hours' schemes in reducing peaking.

7) Project the Potential Impact of a Staggered Hours Program - The design of recommended Staggered Hours alternatives should be based upon its acceptability to employers and employees, and the potential impact in improving current or future levels of service.

8) Implement the Staggered Hours Program - The program should be expeditiously implemented once the recommended Staggered Work Hours approach has been chosen. Methods of implementing programs are discussed in Section IX. Follow-up attitudinal and transportation surveys should be conducted as participation increases, with the results compared to similar surveys conducted prior to the program. The changes in arrival and departure patterns, transportation demand, crowding and congestion should be compared to those predicted and, where necessary, modifications in the program should be made to achieve the benefits originally sought.

The two "Directed Plans" which can be used to design a Staggered Work Hours program are named because they are directed or aimed at specific transportation facilities or specific neighborhoods rather than at the Central Business District as a whole. The objectives of the Directed Plans are to reduce the time, cost and effort required to design the program by concentrating efforts on specific transportation problems.

The first direct plan is oriented to "Physical Facilities." In this approach, data collection and analysis are concentrated on the



transportation facilities, modes and routes which have the greatest congestion and delay, and on the bottlenecks occurring on particular routes within that mode.

In conducting work schedule surveys -- which are a focal point of data in the design of any Staggered Work Hours plan -- attention is concentrated on those organizations and areas which are the heaviest users of the congested facilities. These surveys may therefore take a somewhat different form than those suggested earlier for the "Comprehensive Plan," as data may be collected directly from the transportation mode users to determine their place of employment and work schedule.

In designing alternative work schedule changes under this Directed Plan, effort is concentrated on reducing peak period congestion at the bottlenecks on the identified problem modes of transportation. Similarly, transportation surveys to obtain comparisons of crowding and delay would be limited to the congested areas and modes. Surveys of participants, employees, and organizations would still be required, although on a smaller scale than in the comprehensive approach, in order to determine attitudes and organizational effects. The goal of this Directed Plan would be to eliminate or reduce crowding and delay at specific physical problem areas, rather than the broad goal in the "Comprehensive Plan" of reducing congestion on all modes and places. (Exhibit S-6)

The Neighborhood or Special Group Oriented Directed Plan also provides a simpler and shorter method of designing a Staggered Hours effort by eliminating some of the surveys and analysis steps in the "Comprehensive Plan" approach. The basic idea of the neighborhood

Staggered Work Hours Study

Exhibit S-6

EVALUATION OF STAGGERED WORK HOURS ALTERNATIVES FOR ROCKEFELLER CENTER

Run #	Percent Switching From 9:00 and 5:00	Percent Switching Schedules								Percentage of 90-min. Peak Period					
		Minutes Earlier					Minutes Later				AM Arrivals		PM Departures		
		0	15	30	45	60	15	30	45	60	Peak 15 Min.	Peak Hour	Peak 15 Min.	Peak Hour	
BASE	-										31.4	80.0	37.4	87.6	
#1	20	-	-	6.7	6.7	6.7					21.6	71.0	30.3	77.6	
#2	40	-	-	13.3	13.3	13.3					20.8	63.2	23.3	72.3	
#3	60	-	-	20	20	20					16.4	60.9	18.1	57.6	
#4	40	-	40	-	-	-					26.9	79.2	35.7	86.8	
#5	Uniform number	of employees starting from 8:00 - 9:30 and 4:00 - 5:30										18.0	65.4	17.8	69.6

approach is to evaluate the results of Staggered Hours directly through a step-by-step experimental program, gradually building up the number of participants from a small initial base and empirically evaluating the results after each incremental step.

In this experimental plan, work schedule surveys are again usually the first step. The willingness of organizations on the predominant starting and quitting times to participate must be evaluated, and a selection made to enlist one or more of these organizations to serve by initiating experimental efforts. Starting with a number of major employers utilizing Staggered Hours on a temporary basis, the effectiveness of the changed schedule can be evaluated through "before and after" transportation surveys at stations, terminals, bus stops or roadways used by that organization's employees to determine changes in waiting time, congestion, delay and trip time. Additional surveys also provide important data on changes experienced by employees in commuting, internal operations, elevator service and in employee attitudes.

Assuming that the results of the initial pilot studies are favorable, the neighborhood type plan can be expanded to include entire industry groups, e.g., banks, manufacturers, municipal workers, etc., or concentrated geographical areas. As in the initial pilot studies, limited employee attitude and transportation surveys can now be extended to include measurement of crowding and delay on those transit modes serving the participating area or group.

Assuming a positive response, Staggered Hours can be continuously expanded as needed through extension to additional organizational

groups or geographical areas. This can continue until the transportation goals of the program are met, or until a practical saturation point is reached at which it becomes difficult to recruit further participation.

There are a number of important design considerations common to all three approaches which must be recognized. These aspects are a blend of technical factors, human nature, corporate psychology and other areas, which can be applied in each of the three overall approaches just discussed.

A word of caution at the outset: while many design considerations are important in developing a plan, the simpler the Staggered Hours plan the better. Although the many factors entering into the design tends to result in recommending a complex plan, this would be self-defeating since, in most cases, the successful participation of an individual organization simply involves the entire staff shifting to another single work schedule.

Project staff feel strongly that Staggered Work Hours is currently the most readily accepted concept for quick implementation by organizations in cities throughout the western world -- especially in comparison with the other two concepts. There are several reasons for this. First, Staggered Hours does not involve the kind of fundamental revision in an organization's operations which comes about with the adoption of either the Four-Day Week or Flexible Hours. Second, a significant amount of "informally-staggered" scheduling is already practiced in the business community. Third, the concept is straightforward, popular, easily understood, usually non-controversial and, as a result, more readily implementable.

### IX. IMPLEMENTING THE PROGRAM

Implementing a voluntary Staggered Work Hours Program in a CBD can be very complex and, indeed, frustrating. Although the concept is generally popular, organizations invariably will tell the project sponsor one or more of the following:

- "It's okay for others to stagger their hours, but we can't because of the nature of our business."
- "Our people already are on staggered hours, especially our management personnel." (Even though they're not, in terms of the program's definition of participation.)
- "We would lose control of our employees."
- "We have to work the same hours as our clients."
- "There would be serious communications problems both internally and externally."
- "There would be no commuting services available on Staggered Hours schedules."
- "We think staggered hours is a great idea, but we can't make a change at this time -- please keep us informed."

But there's hope. After five years of promoting the Staggered Work Hours concept in Manhattan and Newark, and maintaining close contact with similar efforts in Toronto, Philadelphia and other cities, there is solid evidence that Staggered Hours can be effectively "sold" to CBD organizations as a popular and beneficial concept. This will only happen,

though, by organizing a professional effort, buttressed by solid documentation, persistent follow-up, publicity and full-time staff support.

If a Staggered Hours program is to be effective, it must be professionally organized with a full-time staff, adequate financial resources, a time duration of several years and have solid business backing in order to achieve substantive results. A glossy, superficially-appearing approach serves to "turn off" executives as companies will not be receptive to a "gimmick" program to change its work hours, an important aspect of daily business procedure. Too often, such is the case of a Staggered Hours effort by several sponsors in a short-term flurry of activity characterized by much publicity and relatively little substance.

It would be easier to "sell" Staggered Work Hours if it were a "thing" -- like an office machine, a desk or other such tangible item. Since it's a concept, even a popular one, staggered hours still represents a change in established business procedures, and any such change is always seriously regarded.

Experience suggests that the strategy of an effective Staggered Work Hours Program involves these major points:

- Stress the benefits of participating to the organization - Document what's in it for them: their people, operations, morale, punctuality, commuting, and, if possible, their productivity. The fact that the program has its basic impetus as a CBD transportation program should be only of background interest, for an appeal only to civic pride and responsibility will most likely be ineffective.
- Get strong business sponsorship of the program - Private support is critical if private participation is desired.

Business institutions must be in the forefront even if governmental agencies are doing the staff work in the background. In most cases it has to be recognized that the Mayor or other governmental leader does not engender the respect of business executives for changes of this type which affect their operations (except in the case of an emergency).

- Give priority to the largest organizations - Since about the same amount of staff time is taken in convincing firms employing 1,000 people and 100 people to try Staggered Hours, an efficient strategy has to stress targeting the bigger employers.
- Direct personal selling should be the keystone of the promotion effort - While many types of promotional activities can be effective in catalyzing participation in Staggered Hours, the most effective approach centers around direct contact at meetings, on the phone, in personal correspondence -- all keying on treating organizations individually.
- Be "business-like" and highly professional - You wouldn't think much of a company which sent you poorly-typed letters or cheap-looking materials. Therefore, to sell an organization on a concept like changing its work schedules, the project must pay special attention to presenting a superior image in all it says and does.
- The initial contact should be made at the top level of an organization - Whether initial contact is made by the sponsoring business leader or Mayor, there is no substitute for dealing with the "top and then down" in an organization.

- Offer any and all assistance to companies and be prepared to back it up - Use project staff to make it as easy as possible for an organization to adjust its work hours, including conducting surveys of schedule preferences, transportation problems, writing office notices and press releases.
- Be ready to aid a participating company with transportation or other difficulties which may result - Most such problems are usually minor, and adjustments used in another company on Staggered Hours may be appropriate elsewhere. The worst publicity is a company reverting back to its original work schedule.
- Document everything - Build up a reference library of surveys, analyses, brochures, and program materials which can be used repeatedly.

An effective promotional program is crucial if Staggered Work Hours is to be widely accepted on a voluntary basis. The direct selling efforts with organizations will be enhanced if employers and employees are aware of what Staggered Hours means, what benefits it would entail for them and how to do it. This educational process can be achieved through a wide variety of promotional activities.

Such activities should appeal to all media and be a blend of "hard news" and publicity and, if necessary exposure isn't achieved with these, paid advertising. News material would involve project facts contained in press release, announcements of participating companies, milestones achieved and other project developments. Publicity can be a spin-off from this in performing media interviews or holding special events or ceremonies to attract free media coverage. There should be



little need to resort to paid advertising in a Staggered Hours program unless an appeal to a specific group is necessary and neither attractive, nor complimentary space is offered.

A wide variety of media should be utilized. These would include numerous written forms as well as print and electronic media. Professional assistance in developing an effective marketing program should be solicited from public relations firms, advertising agency or other similar resource.

Finally -- and perhaps most important -- the "target audiences" for a Staggered Work Hours program must be clearly identified for the promotional activities to reach them. Several such audiences include:

- corporate executive management,
- middle management personnel with responsibility for administrative recommendations,
- employees to reach them and gain influential supporters,
- members of the print and electronic media.

Based upon extensive experiences in devising promotions to reach these audiences, the following are our key observations:

Staggered Work Hours is an extremely attractive media topic - Professionals have repeatedly underestimated the ability of Staggered Hours materials to achieve extensive publicity, even and especially in the absence of "hard news" developments. One reason for the subject's popularity is that it's essentially a "people" project, unlike many other transportation programs, and therefore lends itself to feature-type coverage. Also, it's almost universally popular so people will enjoy talking about it publicly and government and business leaders will not hesitate to be in front of the publicity efforts.

Develop an arsenal of ready-to-use project materials - This has aided tremendously in responding to requests from media or organizations interested in Staggered Hours.

Keep the program regularly in the public eye - Don't let the effort appear to get "stale". No matter how effective (or not effective) the program has been up to a certain point, there is little substitute for a new firm shifting hours or a recent newspaper story covering the program to keep it fresh and lively.

Solicit public service help from professional agencies to the maximum extent - All advertising and public relations firms do some public service work, and a Staggered Hours program can be a prime recipient of this valuable assistance. Costs for these services, if any, are usually reimbursable on an out-of-pocket expense basis.

Samples of promotion materials used in the Manhattan program are included in Section VI of the main report, as well as in Exhibit S-7 a & b.

In the all-important area of implementing a voluntary Staggered Work Hours program, a number of recommendations stand out:

1. The sponsors of the effort should always seek out professional assistance in the areas of market research, public relations and advertising to mount a most persuasive promotional campaign. Oftentimes, such assistance is available free of charge in the public interest.

2. Additional market research is needed regarding the acceptability of alternative work schedules by the business and governmental communities. If such alternative schedules are to be effectively "sold" to major employers, there needs to be a better understanding of their current perceptions on the part of the project sponsor.


Wouldn't You Rather Switch... than Fight?



### Midtown Task Force on Staggered Work Hours

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**THE PORT AUTHORITY OF NY & NJ**  
**Port Authority of New York and New Jersey**  
**One World Trade Center - 72E**  
**New York, New York 10048**

I am interested in the Staggered Work Hours Program and how it can benefit my organization:

Please send me further information

Please have your representative contact me

Name \_\_\_\_\_

Title \_\_\_\_\_

Organization \_\_\_\_\_ zip \_\_\_\_\_

Address \_\_\_\_\_

Telephone (\_\_\_\_) \_\_\_\_\_

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**Civic & Trade Organizations**

- Association For A Better New York
- Avenue of the Americas Association Inc
- New York Board of Trade
- Broadway Association
- Clean Air Week Committee
- East Side Association
- Fifth Avenue Association
- 14th Street Association

**Midtown Development Council**

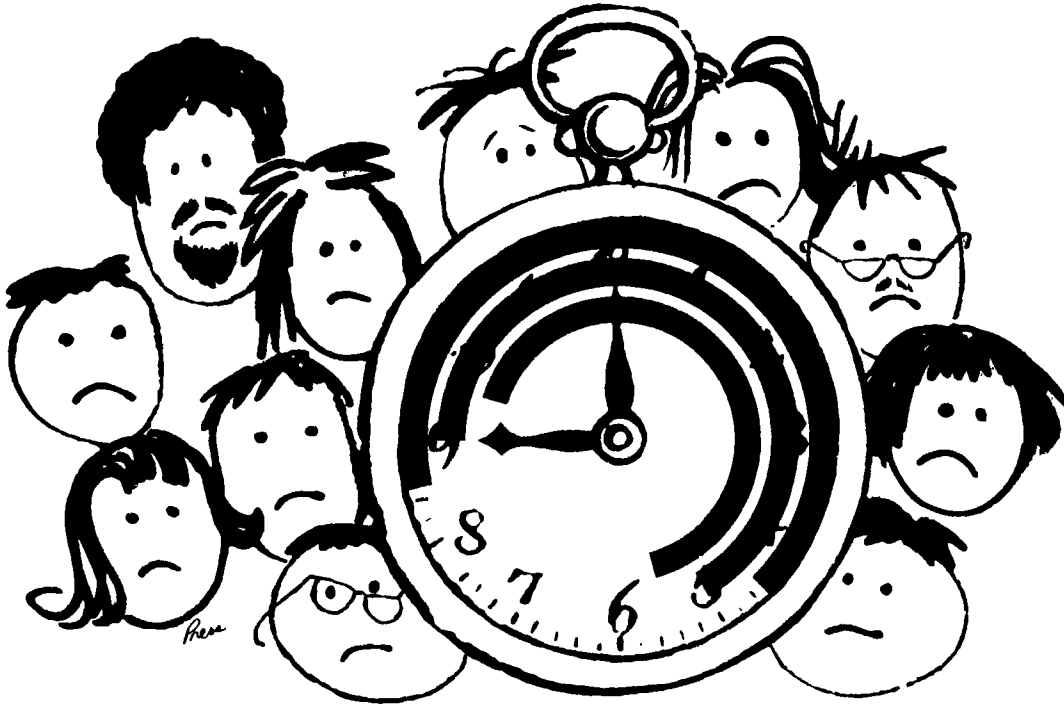
- Midtown Realty Owners Association
- New York Chamber of Commerce and Industry Inc
- New York Convention and Visitors Bureau Inc
- Real Estate Board of New York Inc
- Regional Plan Association
- Rockefeller Center Inc
- Thirty Fourth Street—Midtown Association Inc
- West Side Association of Commerce Inc

**Public Agencies**

- Metropolitan Transportation Authority
- New York City Community Planning Board #4
- New York City Community Planning Board #5
- New York City Community Planning Board #6
- New York City Office of the Mayor
- New York City Office of Midtown Planning and Development
- New York City Planning Commission
- New York City Transportation Administrator
- The Port Authority of New York and New Jersey

Staggered Work Hours Study

Exhibit S-7b



# Wouldn't You Rather Switch ...Than Fight?

Start earlier, start later, but leave the  
9 to 5 crowd. Join us in the  
Staggered Work Hours Project

Staggered Work Hours Project  
Downtown-Lower Manhattan Association  
120 Broadway, New York 10005 N.Y.



3. Any communication with employers must be as "businesslike" as possible in order to make a positive impact. One must endeavor to use materials of high quality and approaches which emulate influential methods practiced by business itself, in order to avoid a negative appearance which might, in itself, "turn off" prospective participants.

4. The appeal to employers to adopt Staggered Work Hours must be directed mainly at the decision-makers -- the highest levels in the management. While efforts are also made to inform other target groups like employees and the media, it must be understood that without the interest of decision-makers in the firms, there will be no broad support for the program. Further, contact with firms should be made at the highest level possible, so the further contact with them comes from the "top down" in dealing with other management levels.

5. In order to maintain a ready file of informational materials, it is important to document experiences as much as possible. This would involve soliciting and preparing reports, keeping files on news clippings and other informative material which may become very valuable to augment the "selling" effort with organizations.

#### X. EFFECT ON TRANSPORTATION SYSTEMS

Surveys were conducted both prior to and during the implementation of staggered work hours, in order to evaluate the program's impact on transportation patterns. The survey data focused upon the ability of work schedule changes to reduce "peaking" problems resulting in congestion.

All major transportation modes were surveyed several times in the period 1972 to 1976, mostly in a "time series" form which can be repeated at regular intervals. Survey methods included manual counts, turnstile readings, toll register readings and dispatcher records. Locations, dates and times of the surveys were carefully chosen so that the data would represent average travel patterns during the peak period. In general, the time periods covered were 7:30 - 9:30 a.m. and 4:00 - 6:00 p.m.

Most available data were not fine-tuned enough to pick up any travel pattern changes within the peak hour, since they were taken at 30 or 60 minute intervals. Therefore, new data were collected at 5-minute intervals, specifically for this study.

Once the data were collected, the Peak Hour Factor (PHF), a measure of the degree of peaking during the peak hour, was determined for each location. The Peak Hour Factor is equal to the total peak hour volume divided by four times the highest 15-minute volume. The lower the ratio, the more severe the peaking. Other factors analyzed were subway dwell times, travel times, carloadings and volume/capacity ratios. Several special analyses - the "Transportation Tardy Study",

a survey of service adjustments, and photographic monitoring studies - were also performed during the course of this study.

The major study findings are summarized below:

1) Rail Rapid Transit - The data collected at Manhattan subway stations indicated a short-term congestion problem due to peaking of demand at 9 am. and 5 p.m., the traditional end points of the work day. Peak Hour Factors substantiate this evidence of peaking.

With the implementation of a staggered work hours program, peak 15-minute volumes at affected stations dropped significantly and volumes in adjacent periods increased. The net result is a flattening of the peak. (Exhibit S-8)

2) Commuter Railroad - The flow of passengers through the commuter rail terminals was found to be fairly uniform throughout the peak period both before and after staggered work hours. This is due to the metering affect of trains arriving and departing on set schedules.

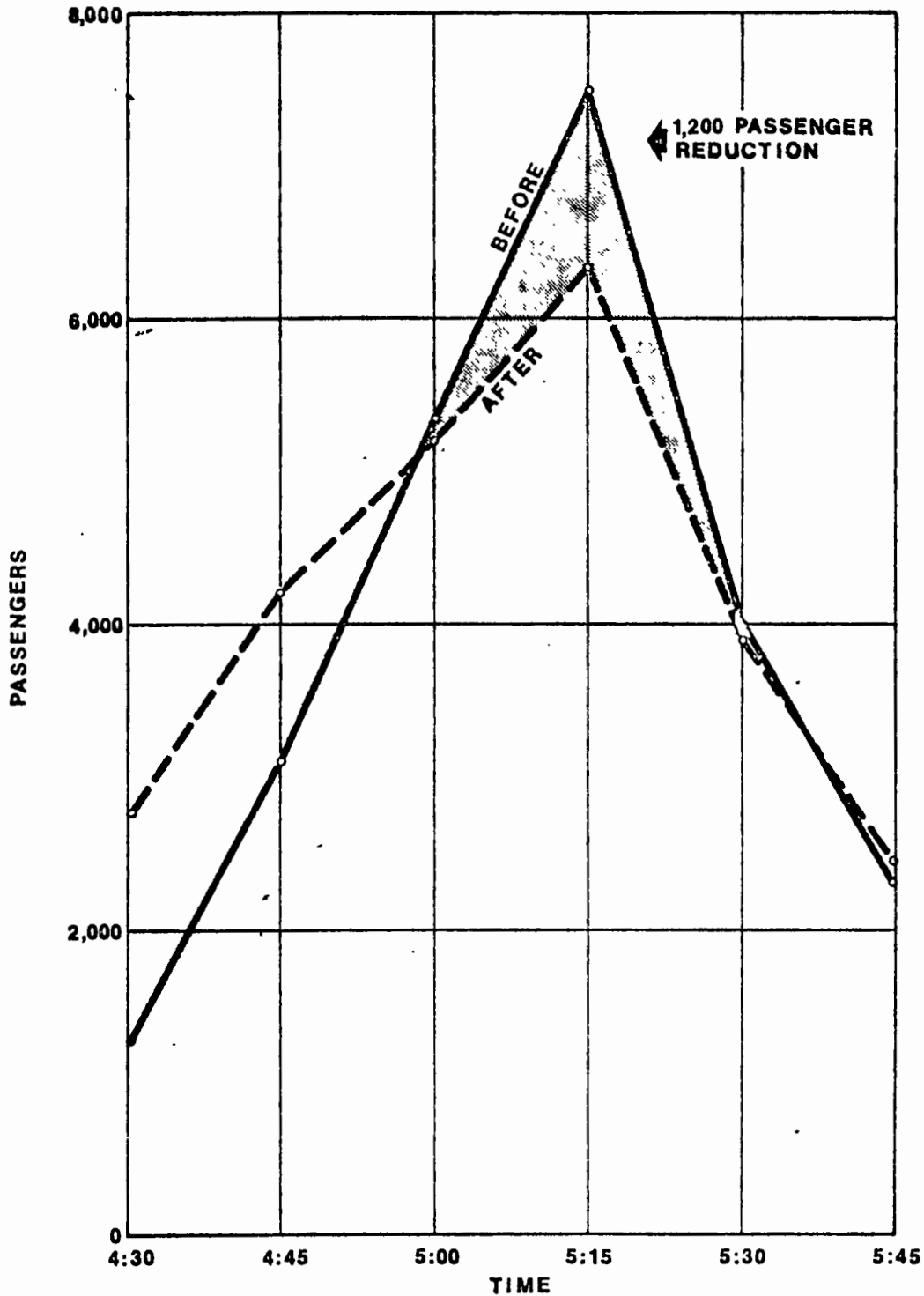
Because there is no real peaking problems, staggered work hours did not affect commuter rail operations to any great degree.

3) Bus - Surveys of transit bus volumes, travel times and average speeds show the buses experience moderate peaking of demand. Because of their lack of a reserved right-of-way, transit buses were also found to be affected by peak hour auto, cab and pedestrian congestion problems. This is evidenced by increased travel times and decreased speeds as the peak progresses.

The prime effect of staggered work hours is to switch some passengers out of the peak -- when bus loadings far exceed seating capacity -- and into either earlier or later periods, when capacity does exist.

Exhibit S-8

### EFFECTS OF STAGGERED WORK HOURS ON PATH HUDSON TERMINAL P.M. PASSENGER VOLUMES





4) Auto - Counts taken at major Manhattan vehicular access/egress points indicate that such facilities do not experience peaking, but rather operate at an above capacity for almost three hours in both the morning and evening.

Because the resultant congestion is a capacity rather than peaking problem, staggered work hours cannot improve traffic conditions on auto facilities.

5) Pedestrian Systems - Most walkways and escalators were found to be used uniformly throughout the peak, with any congestion a result of lack of capacity rather than peaking. Exceptions to this were found at two major transportation terminals, where at 5 o'clock workers descended in droves to catch trains and buses home, resulting in a peaking of demand from 5-5:15.

In these two cases, staggered hours could spread out the peak demand and relieve the problems; however, in most cases staggered hours has little impact on pedestrian systems.

6) Building Systems - Data collected at several major office buildings pointed up that lobbies and elevators experience severe peaking at starting and quitting times. Counts taken "after" a work schedule change was made showed that congestion and waiting times had decreased. (Exhibit S-9)

From the data it is concluded that a staggered work hours program can significantly reduce lobby and elevator crowding.

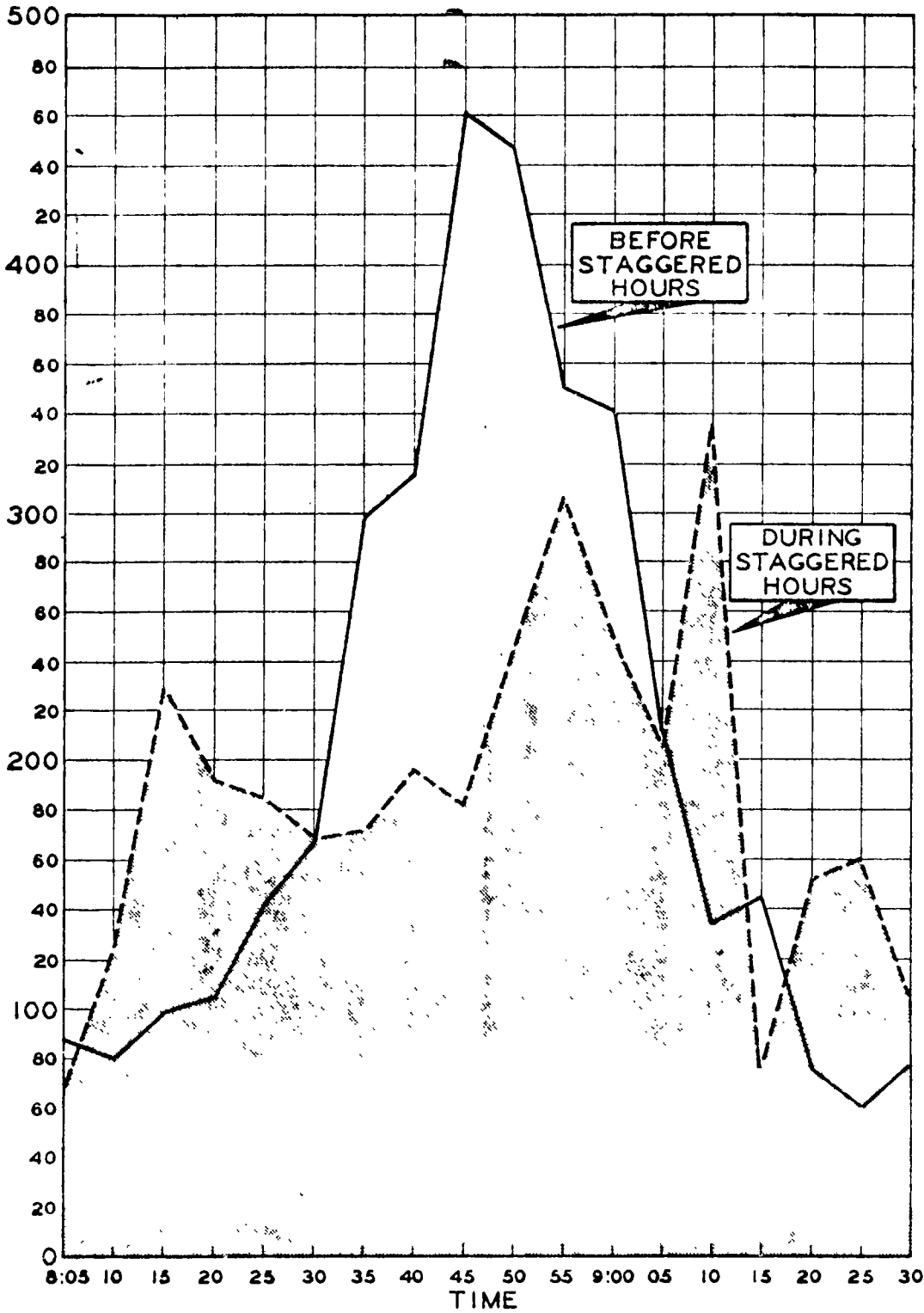
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To summarize, staggered work hours proved most effective in relieving transportation problems of rapid rail systems, transit buses and building systems -- because, in general, congestion at these locations is due to peaking of demand rather than capacity constraints.

Exhibit S-9

### ARRIVAL TIME AND NUMBER OF PERSONS ENTERING PORT AUTHORITY BUILDING LOBBY

PERSONS



Staggered hours had little impact on commuter railroads, automobile facilities and pedestrian facilities, mainly because such systems do not experience peaking.

XI. ATTITUDES TOWARD STAGGERED HOURS

Although the Port Authority's prime interest in Staggered Work Hours has been to determine whether it would relieve transportation congestion, staff recognized fully that the program would never succeed if the people involved reacted negatively to revised work hours. Attitude surveys therefore were conducted to determine the responses of supervisors and employees before and during the implementation of Staggered Work Hours Programs.

The attitude survey attempted to check the value of a Staggered Work Hours Program related to the following aspects:

1. What is the employee's overall attitude towards Staggered Work Hours?
2. What hours does he/she prefer to work?
3. What are the characteristics of his/her commuting trip?
4. Does he/she anticipate any potential problems if Staggered Work Hours are adopted?

One of the most detailed and formal surveys of Staggered Work Hours was conducted by the Port Authority and the Downtown-Lower Manhattan Association in 1970. Other formal surveys include one evaluating the affect of Staggered Hours on employees of the Port Authority. In addition, several organizations in New York City surveyed their employees' reaction to Staggered Hour programs. The Lower Manhattan Survey involved 27,000 returns, with about half of those who returned questionnaires actually participating in Staggered Hours. More importantly, almost 85% of the

respondents provided a favorable overall reaction to Staggered Work Hours.

They reported:

- Lessened congestion and overcrowding were reported by more than 40% of the respondents. This included overcrowding in elevators, in the lobbies of the buildings where they worked, and in the streets around their places of employment. Some 18% noted that crowding had been alleviated in restaurants and stores during the lunch hour.

- Increased job satisfaction was expressed by almost one quarter of those who directly participated in the project, while some 7% reported that they were less satisfied. Over 21% reported an increase in their effectiveness on the job, while most others felt there was no change. With respect to time spent with friends and relatives in the evening hours, and to involvement in various social activities, there appears to be far greater satisfaction than dissatisfaction with the project.

- People's commuting experiences were reported positively affected by Staggered Hours. Over 46% of those responding indicated that they were more satisfied with their commuting of travel to work while only 10% were less satisfied.

- Employees preferred to work the 8:30-to-4:30 time frame rather than the old 9:00-to-5:00.

Regardless of how employees feel about a Staggered Work Hours Program, it is obvious that such a program cannot be implemented unless management is convinced that the efficiency of operations will not suffer. Management's opinions were:

- Six times as many supervisors reported gains in productivity under the new hours than reported losses.

- The punctuality of employees increased.
- A substantial majority of unit heads surveyed reported that no severe communications problems resulted from the changed hours. About 15% cited some impact, but evidently the problems were not sufficient to cause a drop in efficiency.

It is also worthwhile to note some testimonials of major firms concerning Staggered Hours. As an example, The New York Life Insurance Company reported, "It is gratifying to be able to report that service and productivity had been very adequately maintained during the two months of experimental activity on staggered work hours".

Below are excerpts from letters describing reactions from several firms to their experience on Staggered Work Hours schedules.

Chase Manhattan Bank: "...our own organization's experience has been most satisfying...Warmly welcomed by employees at all levels... Those members of the bank staff who are reporting for work at other than the traditional starting time generally say they have experienced no job or home-life disruption because of this change in their routine. We have received many pleased reports from people who appreciate being able to avoid the crowds of the rush hours."

Cities Service Company: "...well pleased with the change of office hours ...Employees now experience fewer incidents of being late... Congestion coming to work and going home has been eased considerably...More applicants favor an 8:30 to 4:30 daily schedule... The new schedule has not handicapped communications with personnel

outside the Company, in-town or out-of-town, although it was expected to be a slight problem at first."

New York Stock Exchange: "We continue to be well pleased with our experience under the Staggered Work Hours Program...Most of the department heads and employees I have talked with express satisfaction with the arrangement and we expect to continue indefinitely with staggered hours."

Department of the Treasury: "We are pleased to state that the new schedule has been enthusiastically received and is now a fixture...Perhaps the best indication of the value of staggered hours both for the industry and our employees is that an earlier starting time to avoid traffic congestion was also adopted for our John F. Kennedy International Airport installation with the same results."

The Home Insurance Company: "...the reactions both Corporate-wise and Employee-wise have been enthusiastically favorable..."

Morgan Guaranty Trust Company: "Our experience has been noticeably successful both from an operational standpoint and in terms of favorable reaction from employees. We are certainly pleased with the continued progress which your project is enjoying. Its concept has proven to be eminently sound."

Project staff makes the following recommendations concerning attitudes toward Staggered Work Hours:

- 1) Since an employee attitude survey invariably reveals a strong desire to adopt earlier working hours, it is recommended that such a survey be used in many cases as a "wedge" to get firms onto Staggered

Hours. Most organizations, undecided as to whether they should participate, invariably switched their schedules after such a survey.

2) It is important that professionals seeking to implement Staggered Work Hours plans have a thorough understanding of prevailing employee and management attitudes. Since persuading some to adopting Staggered Hours can be akin to pulling teeth, one must be especially careful not to propose work schedule shifts which attitude surveys would suggest to be unpopular.



## XII. BENEFITS

The concept of Staggered Work Hours is almost universally regarded as beneficial to the individual and the community. Often, however, these benefits are intangible, indirect and, in dollar terms, most difficult to quantify. One of the very reasons for the slowness in implementing Staggered Hours around the country and the world stems from the lack of clear-cut demonstrable benefits which can be attributed to a program.

Five major areas of potential benefits resulting from a Staggered Work Hours Program have been identified. The first four of these may be considered short-run benefits since they accrue immediately upon the implementation of a successful Staggered Hours program. All involve reduced congestion in transportation operations. The major long-run potential benefit analyzed concerns the need for future expansion of transportation facilities which may be obviated by the implementation of Staggered Hours.

The short-run improvements in the "Level of Service" on transportation facilities include:

- 1) Reduced levels of crowding on transit vehicles, elevator and pedestrian facilities,
- 2) Increased operating speeds on transit systems, thereby reducing travel time and the probability of delay,

The long-run benefit is that the need for future expansion of transportation systems including roadways, transit vehicles and transit right-of-way may be obviated due to spreading of demand patterns.

The expected benefits of a Staggered Hours Program should, of course, be weighed against the possible negative effects, including the following:

1. Staggered Hours might make carpooling more difficult to implement. If carpools are widely used for CBD trips and are composed of riders from various organizations, a variety of work schedules may lessen the number of carpool riders having the same schedule, with a possible resultant increase in the total number of vehicles.
2. A significant reduction in road congestion and delay might, in some circumstances, lead to increased auto usage. This may then cause road congestion to rise again toward its previous levels at the possible expense of mass transit ridership.
3. A significant spreading of demand may increase equipment and/or manpower needs on transit systems due to service changes needed to accommodate the new demand patterns.
4. Some employees in areas with infrequent service may experience longer waiting times due to longer intervals between trains or buses.
5. Some employees who transfer from one mode to another may experience similar delays due to schedule deficiencies outside the height of the peak period.

The major advantage of a Staggered Work Hours Program is that it provides a "low-capital intensive" means of alleviating crowding, congestion and delay on transportation facilities. Accordingly, it is recommended that every effort be made to consider, in depth, the benefits of hours staggering programs.

### XIII. IMPACT ON TRANSPORTATION DESIGN

Since most urban transportation systems suffer from peaking -- excessive demand at certain time periods -- causing inefficiency and congestion, concepts such as Staggered Work Hours might be effectively used to modify the functional design of transportation facilities. The various design elements for any new transportation system should incorporate a program to revise work schedules as an integral part of the design, rather than later using Staggered Hours as a "band-aid" to correct or ameliorate the adverse effects of peaking once the facility is operating.

Many congested highways already operate under a self-enforced spreading of the demand when capacity limitations restrict the absolute number of vehicles for a large portion of the peak period. Since there is no growth possible during the height of the peak because of the capacity "lid," any growth in demand must be accommodated during other time periods. We must assume that there are those who are traveling earlier or later not out of choice, but because of congestion. With the implementation of Staggered Work Hours, there would be a better match between desired and actual times of travel.

The use of reversible bus roadways, priority lanes for multi-occupancy vehicles and other techniques are highway applications which may take precedence over a work scheduling strategy. This is because highways exhibit less peaking than other transportation systems, and therefore, will benefit only from drastic work schedule changes.

Similar design considerations are appropriate for public transportation systems, be they rail or bus. Presently, the general design approach for such facilities is to determine and design for a peak hour ridership at some future year. This determination is based upon a number of planning concepts, ranging from a time-series forecast to sophisticated computer models. These design hours in the forecast year do not generally reflect the peaking within the peak hour. The attempt is to handle in a feasible manner the peak flow rate within the peak hour, or to assume that a given peak hour volume will be distributed in the same pattern as at present. In many cases, the higher-capacity mass transit systems are, of course, able to absorb to a limited degree these surges and peaks in the traffic demand. However, with the flow spread out, a transit system on a close-headway service would be better able to handle demand than with the present severe peaking. Reduction of the peak hour volume -- or the peak therein -- by Staggered Hours can perhaps obviate the need for expensive capital additions to incrementally increase system capacity.

Transportation operators point consistently to the potential benefits they could accrue if the peak period was spread sufficiently in order to get a second usage out of transit equipment and, correspondingly, bus drivers and train crews running the systems.

While Staggered Hours probably will not spread out peak periods in a given area by an unreasonably long amount--since the resistance to this could be great--it can be sufficient to spread the peak to allow equipment to be used twice.

By spreading out the peak, Staggered Work Hours also allows transit operators to lengthen headways and forestalls the need for longer trains. In a major transportation terminal, such reduced train loadings combined with even slightly longer headways could significantly reduce surge loads and related queueing on fixed stairway and escalators servicing these facilities.



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