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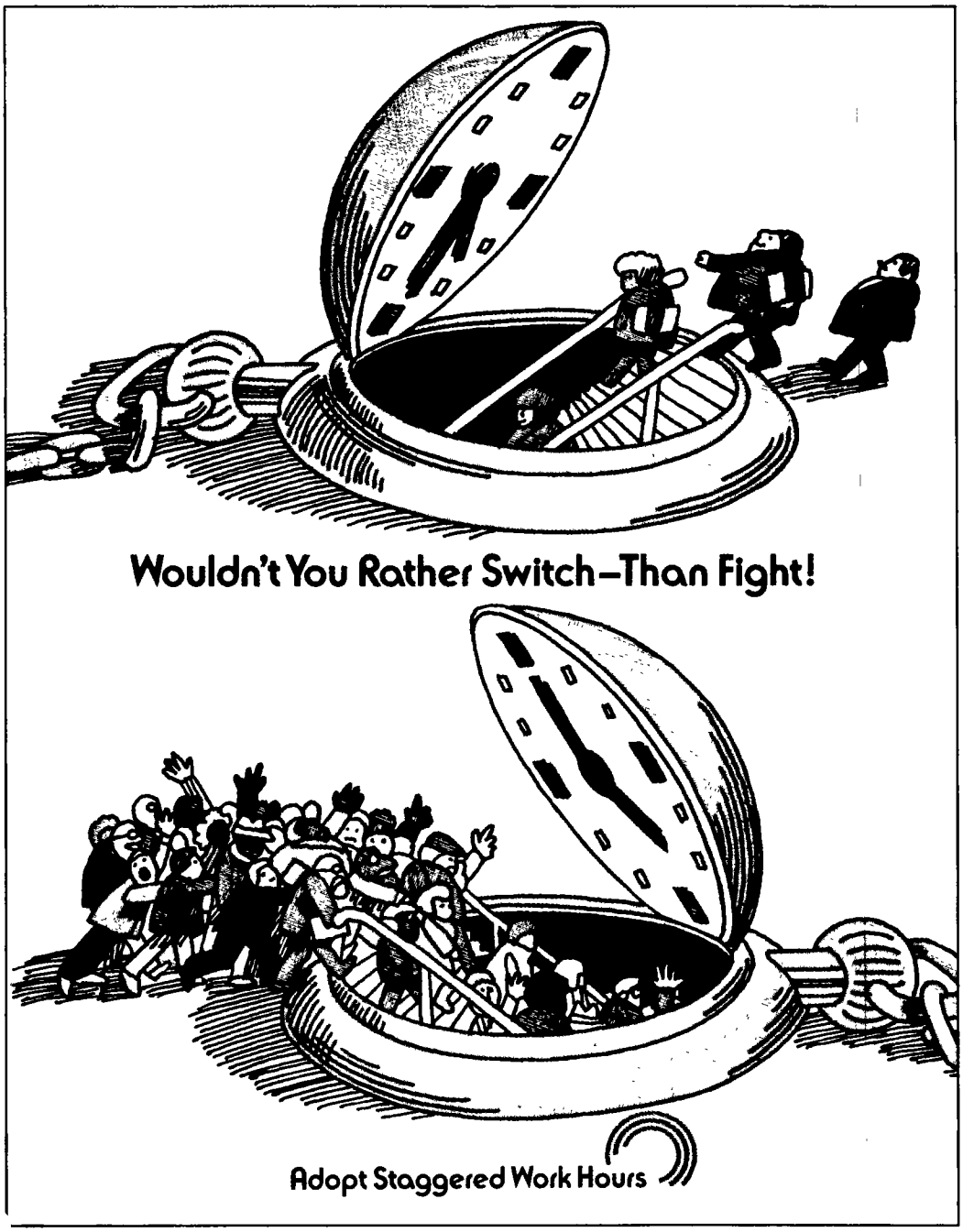
STAGGERED WORK HOURS STUDY
Phase I - Final Report



Vol. II - Technical Report

THE PORT AUTHORITY OF NY & NJ

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

PHASE I

AUGUST, 1977

FINAL REPORT - VOLUME II

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STAGGERED WORK HOURS STUDY

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Chapter I

State-of-The-Art Survey

Staggered Work Hours Study

I. STATE-OF-THE-ART SURVEY

A. OBJECTIVES

With the increasing emphasis in the United States on the importance of "low-capital intensive" measures to reduce transportation congestion, there has been growing interest in the concept of Staggered Work Hours as one of the most fruitful and one of the least costly methods.

In order to determine the State-of-the-Art of past and ongoing efforts to institute Staggered Work Hour Programs in the United States and throughout the world, a comprehensive survey was conducted in 1974 involving 131 United States and 77 foreign cities. The basic purpose of the survey was to inquire about the nature of Staggered Work Hours Programs which have been advanced or adopted in major cities. In addition to general information about employment and transportation, the surveys covered the techniques employed, achievements, costs, benefits, sponsorship and other pertinent factors involved in a Staggered Hours program.

B. WORK PERFORMED

1. Questionnaire

In 1974 a questionnaire was designed which requested, from each city, information about its Central Business District as well as its possible involvement with Staggered Work Hours.

The lengthy six-page questionnaire shown in the Appendix, was designed by Port Authority staff and was composed of eighteen questions. The first group of questions were related to the characteristics of the city's CBD, specifically highway and public transportation systems, the type and numbers of employees, the lunch periods and work schedule practices.

The second group of questions attempted to determine the status of any Staggered Work Hours practices in the CBD, as well as to secure information as to how such programs were promoted. Insofar as possible, estimates of the costs and efficiency improvements created by the programs were requested as well as the attitudes of employees and management. For reasons of economy, it was decided that a single questionnaire must suffice both for U.S. cities and those abroad regardless of possible language barriers.

2. Solicitation

As the survey was to cover work schedule practices in major cities in both the United States and throughout the world, it was necessary to determine both the cities which should be sent a questionnaire and the proper person or office to receive the questionnaire.

2a) United States Cities

The selection of the United States cities to be surveyed proceeded on the basis that only the largest should be considered. This meant that cities with a high area of concentrated employment should receive top priority. Examination of various city summaries suggested that those cities listed in the broader Standard Metropolitan Statistical Area (SMSA's) would probably not be desirable, as they generally included too many major urban centers. Accordingly, 131 of the largest cities were selected from the United States 1967 Census of Business--Major Retail Centers, which included a list of designated Central Business Districts. The CBD is usually an area of very high land value and characterized by a high concentration of retail business, offices, theatres, hotels and service businesses and is an area of heavy traffic flow and related degrees of congestion.

The next step was to determine the recipient of the questionnaire in U.S. cities. Although it was recognized that transportation and planning organizations fill out the questionnaire, it was decided that the questionnaire should be sent to each city's mayor with the thought that this would elicit the best rate of response.

2b) Foreign Cities

Investigation showed that there are some 113 cities abroad with over one million population. In view of the large number, it was decided that only cities with more than a million population should be sent questionnaires. However, a study of the cities by population indicated that several countries, such as India, contain a substantial number of large cities. This was considered undesirable as the survey might be too heavily weighted by one country. Consequently, where there were several cities in a country with a million or more people, some of them were, arbitrarily, not sent questionnaires. Conversely, there are major countries which do not have cities of a million population and it was deemed desirable to send some questionnaires so that these countries would be represented.

The problem now became one of determining the proper recipient, and it appeared logical to send the questionnaire to the head of government of the particular city. Interestingly, researchers often had difficulty in determining the name of the head of government in many cities even though repeated calls were made to foreign embassies and legations at the United Nations in New York. A total of 77 foreign cities were ultimately sent questionnaires.

3. Questionnaire Transmittal and Follow-Up

A letter of transmittal accompanied the questionnaire, signed by Port Authority Executive Director A. Gerdes Kuhbach. This letter indicated that the Port Authority was engaged in a study financed by the Federal Government aimed at gathering information on cities that have advanced or adopted Staggered Work Programs and to determine techniques employed, achievements and costs. It also requested data relative to the characteristics of the CBD. (See the Appendix for copies of the U.S. and foreign transmittal letters.)

In the case of foreign cities, where language difficulties might be expected in some cases, the questionnaire was also mailed to the United States State Department's Economic/Commerical Officer in the consulate or embassy in the city solicited. It was felt that these Officers could help ensure the return of the questionnaire. In addition, a letter was sent to the Department of State in Washington, D.C., advising them of the request for their Officers' assistance. In many cases, the U.S. Dept. of State Official in the city queried, was instrumental in securing the completion and return of the questionnaire.

C. SURVEY RESULTS

1. Summary of Results

An excellent return-rate for the State-of-the-Art survey provided substantial insight into current work schedule practices in many large cities throughout the world. A total of 141 cities returned questionnaires for an overall 66% response rate. These included 99 United States cities and 42 from the rest of the world (response rates of 76% and 54% respectively).

Analysis of the questionnaires indicates that there is a substantial use of Work Staggering programs throughout the world. The use of formal programs predominates in the United States, Canada and in Europe, while there appears to be little interest in the concept in South America or in Africa. There is some use of Work Staggering Programs in Asia, but other problems, primarily economic, occupy their time and take precedent over such efforts. This is particularly true in India, which reports monetary and other problems. No replies were received from cities in the People's Republic of China.

Of all cities returning a questionnaire, some 51 had a form of Staggered Work Hours Program. These range from formal programs generally sponsored by a government or civic organization, to individual company programs. Based upon the responses, the most comprehensive on-going program appears to be the one in Manhattan which is the subject of this Technical Study. A higher proportion of foreign rather than U.S.

cities reported Staggered Hour programs.

Only some 35 cities reported that formal "Work Schedule Surveys" have been conducted (see Section III for detailed discussion). While they may note that their transportation systems "peak" and that there is congestion in their Central Business District (CBD), the cause is attributed to work schedules more by observation or intuition than by specific survey.

Some 44 cities reported that they have experience with other work scheduling concepts, particularly "Flexible Work Hours" or the 4-day week. In this area, cities located outside the United States predominate with 14 reporting other such programs.

In the following sections, the city responses are analyzed with respect to CBD characteristics, transportation patterns, and the nature and extent of work staggering programs. The results and analysis are in the order requested on the questionnaire. Numerous comments, solicited and otherwise, are contained in the Appendix and make for interesting reading.

2. CBD Characteristics

Some 107 cities gave the approximate employment in their CBD, as shown in Table I-1.

Table I-1

CBD EMPLOYMENT

107 Cities Reporting

Question- About how many men and women work in your principal Central Business District (CBD) on a normal workday?

Answer- Number of CBD Employees	CITIES REPORTING			
	United States		Outside U.S.	
	No.	%	No.	%
0-20,000	28	37	0	0
20,001-40,000	19	25	2	6
40,001-60,000	11	15	1	3
60,001-80,000	2	3	4	13
80,001-100,000	6	8	1	3
Over 100,000	9	12	24	75
TOTAL:	75	100%	32	100%

It is not surprising, due to the survey distribution, that the foreign cities responding were generally much larger in CBD employment population than the U.S. cities. Table I-2 shows the largest CBD employee populations reported.

Table I-2
CITIES RESPONDING WITH 500,000 OR MORE EMPLOYEES

1.	New York	2,000,000
2.	Tokyo	1,965,000
3.	Seoul	1,315,000
4.	Osaka	1,219,000
5.	Buenos Aires	736,000
6.	Moscow	500,000

The geographic area of CBD's also varied greatly, as shown in Table I-3 with a higher percentage of cities outside the United States using a larger amount of land area for their CBD.

Table I-3
GEOGRAPHIC AREA OF CBD
120 Cities Reporting

Question- About how large in area is your CBD? (Square Miles)

Answer-

Area (Sq. Mi.)	CITIES REPORTING			
	United States		Outside U.S.	
	No.	%	No.	%
0.00 - 0.50	23	26	3	9
0.51 - 1.00	34	39	7	21
1.01 - 1.51	11	13	4	12
Over - 1.51	19	22	19	58
TOTAL:	87	100%	33	100%

While not asked in the questionnaire, the CBD employment density - - i.e., the number of employees per square mile-- was determined from the data and is shown in Table I-4.

Table I-4
CBD EMPLOYMENT DENSITY
112 Cities Reporting

CBD Employees Per Square Mile	CITIES REPORTING			
	United States		Outside U.S.	
	No.	%	No.	%
0-20,000	29	36	1	3
20,001-40,000	16	20	6	20
40,001-60,000	15	19	2	6
60,001-80,000	8	10	2	6
80,001-100,000	5	5	5	16
Over 100,000	8	10	15	49
TOTAL:	81	100%	31	100%

The survey responses outside the United States indicated more dense CBD's, although there was a wide range of employment densities represented for all cities reporting.

3. Work Schedule Information

Questions were asked as whether work schedule surveys had been conducted, as well as prevailing patterns of work schedules.

As shown in Table I-5, some 28 cities reported surveying employer's work schedule practices, although over three-quarters did not. This is discussed in more detail in Section III of this report in a chapter entitled "Work Schedule Surveys".

Table I-5
WORK SCHEDULE SURVEYS CONDUCTED
124 Cities Reporting

Question - Has there ever been a survey of employers in your CBD to determine their specific work schedule practices?

Answer -

	124 CITIES REPORTING					
	Yes	%	No	%	TOTAL	%
United States	18	19	76	81	94	100
Outside United States	10	33	20	67	30	100
TOTAL:	28	23	96	77	124	100

The depth of these reported surveys ranged considerably. Some reported extensive surveys of work schedule practices, while others consisted of a few questions related to separate surveys of other transportation or business activities.

A wide range of predominant work schedules were reported, with considerable difference between United States and foreign cities. Table I-6 shows the distribution of predominant schedules in 90 cities reporting . By far the most popular schedule in the U.S. is 8:00- to - 5:00, which is the major work schedule for two-thirds of the cities reporting (52 in number). The remaining 25 U.S. cities were on some version of a shorter work day. It appears that 9:00 - 5:00 was the tradition only in a few cities, including New York City. Exhibit I-1 and I-2 show the distribution of start and quit times, respectively, for cities reporting.

STAGGERED WORK HOURS STUDY
(128 Cities Reporting - 1974)

U.S. (99 CITIES) NON U.S. (29 CITIES)

EXHIBIT I-1 / PREDOMINANT START TIMES

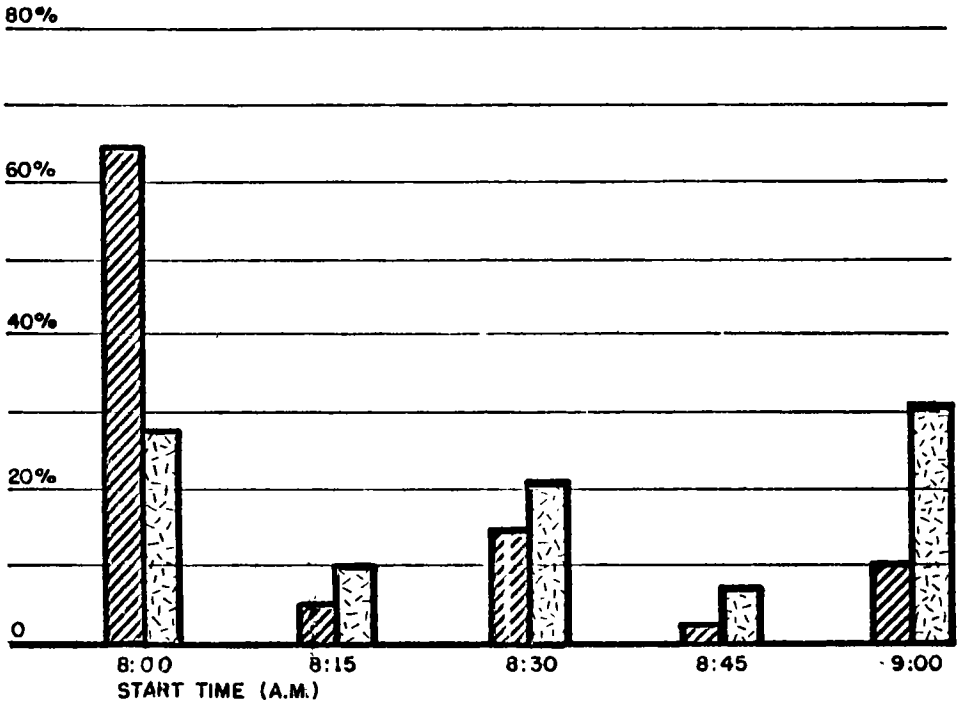
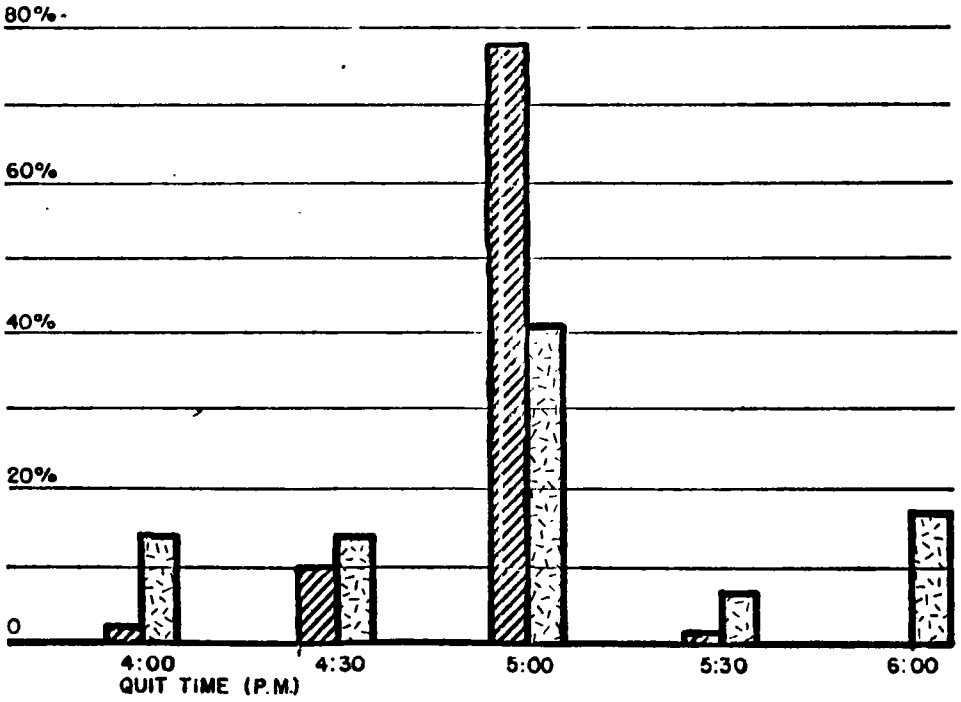


EXHIBIT I-2 / PREDOMINANT QUIT TIMES



Cities outside the United States reported a wider distribution of work schedules with three on 8:00-to-6:00 and five on 9:00-to-5:00. Longer lunch periods account for some of the variations (see below).

Table I-6
PREDOMINANT WORK SCHEDULES
90 Cities Reporting

Q - What is the predominant work schedule being followed in your CBD?

Starting Time: _____ AM
Quitting Time: _____ PM

A - The predominant schedules reported were:

Most Frequent Work Schedule (Start-to-Quit)	90 CITIES REPORTING			
	United States	%	Outside U.S.	%
8:00-to-4:30	5	7	1	8
8:00-to-5:00	52	68	2	15
8:00-to-6:00	0	0	3	23
8:15-to-4:45	4	5	0	0
8:30-to-5:00	8	10	2	15
9:00-to-5:00	8	10	5	39
TOTAL:	77	100%	13	100%

Fifteen (15) other United States cities reported a variety of start and quit times other than as shown in Table I-6. Twelve (12) additional cities outside the United States reported the predominant quit time was 5:00 PM, while the start times varied from 8:00-AM to 9:00 AM by 15-minute intervals. Buenos Aires and Bombay reported start times of 10 AM or later with quit times around 5 PM. Presumably there is a wide range of work schedules in these two cities.

The length of the lunch period is an important aspect of work schedule practices since it helps define the total length of the workday. More than two-thirds of the cities, both in the U.S. and abroad, reported lunch periods of 60 minutes, or one hour. Table I-7 shows the distribution reported, ranging significantly between 30 minutes and 2½ hours (Barcelona).

When lunch periods are combined with start and quit times to determine the average net hours of the workday, the results are 7.6 hours for U.S. cities and an almost identical 7.5 hours for foreign cities.

Table I-7
PREDOMINANT LUNCH PERIODS
153 Cities Reporting

Question - How long is the predominant lunch period of employees working in your CBD?

Answer -

MINUTES	United States No.	United States %	Outside U.S. No.	Outside U.S. %
30	5	5	4	14
45	16	18	6	21
60	70	77	19	65
TOTAL:	91	100%	29	100%

NOTE: In all, 33 cities reported different lunch period practices with the following being particularly noteworthy:

Buenos Aires	90 minutes
Marseille	120 minutes
Saigon	120 minutes
Barcelona	150 minutes

To place these results in proper perspective, there is undoubtedly some degree of variation in each city away from the "predominant" starting and quitting times as well as lunch periods. For example, in New York City prior to initiating Staggered Work Hours, the "predominant" work schedule was (and still is) 9-to-5 with perhaps 50% or more still on that schedule. Some 30-40% were however on other schedules, either on earlier or later end times, or longer or shorter lunch periods and work days.

4. Transportation and "Peaking"

A number of transportation questions were asked to get some flavor of the journey-to-work travel time, modal usage of employees and evidence of transportation "peaking" in each city.

Travel times reported vary considerably, with many more U.S. cities reporting shorter travel times to and from CBD jobs than foreign cities. Table I-8 shows the distribution of travel times reported. While one-quarter of U.S. cities have travel times of less than 20 minutes to CBD jobs -- no foreign city reported trip time this fast -- it should be remembered that the foreign cities generally were larger than most U.S. cities surveyed. Therefore, the travel times cannot be used to directly infer faster (or slower) transportation systems serving the CBD's. One factor related to this is the probable greater distance from residence to CBD in larger cities.

Table I-8
JOURNEY-TO-WORK TRAVEL TIMES
116 Cities Reporting

Question - Please estimate the average one-way travel time spent by most employees commuting to and from your CBD.

Answer -

Travel Time (Minutes)	116 CITIES REPORTING United States	%	Outside U.S.	%
Less than 20	21	25	0	0
20-29	46	54	9	29
30-39	12	14	10	32
40-49	5	6	8	26
50-59	1	1	1	3
60-69	0	0	2	7
Over 70	0	0	1	3
TOTAL:	85	100%	31	100%

Cities reported the transportation modal use distributions of CBD employees, principally for auto, bus, rail rapid transit and commuter railroad. Table I-9 shows the usage of each principal mode. Not surprisingly, U.S. cities had much higher usage of the auto for commuting, where foreign cities had generally greater reliance on public transport systems. Again, the distortion introduced by the fact that foreign cities were larger must be taken into account.

Table I-9

JOURNEY-TO-WORK MODAL USAGE

120 Cities Reporting

Question - Please estimate the percentage of CBD daytime weekday employees arriving by: Auto, bus, rail rapid transit, commuter railroad

Answer -

Mode	Percent using mode	120 CITIES REPORTING United States	Outside U.S.
• Auto	0% - 10%	0	6
	11% - 20%	0	9
	21% - 30%	1	5
	31% - 40%	4	7
	41% - 50%	4	2
	51% - 60%	4	0
	61% - 70%	10	0
	71% - 80%	24	2
	81% - 90%	29	0
	91% - 100%	13	0
Total no. of cities reporting auto use:		89	31
• Bus	0% - 10%	32	3
	11% - 20%	23	3
	21% - 30%	26	4
	31% - 40%	4	6
	41% - 50%		
	51% - 60%	0	
	61% - 70%	0	3
Total no. of cities reporting bus use:		89	24
• Rail Rapid Transit			
	0% - 10%	2	9
	11% - 20%	3	2
	21% - 30%	0	2
	Over 30%	2	10
Total no. of cities reporting rail rapid transit use:		7	23
• Commuter Railroad			
	0% - 10%	2	9
	11% - 20%	3	2
	21% - 30%	0	2
	Over 30%	2	10
Total no. of cities reporting commuter railroad use:		7	23

NOTE: In the category of "other" mode, several cities reported common modes as "Walking" and "Biking". Some cities reported "Trams", "motorcycles" "pedicabs" and, for Saigon, the "LAMBRO 2" - a three-wheeled vehicle with a motorcycle engine.

Several questions were asked on "peaking" phenomena in the cities CBD's and whether any peaking was related to work schedule patterns. In analyzing the answers to these questions -- which were broadly worded of necessity -- an attempt was made to cross-tabulate these results with other CBD data including employment density and other factors.

More than three-quarters of the cities reported that passenger flow is sharply "peaked" within the busiest travel patterns. The response was similar from both U.S. and foreign cities, as shown in Table I-10, suggesting that the "peaking" phenomenon is a universal occurence.

Table I -10
"PEAKING" ON TRANSPORT SYSTEMS
128 Cities Reporting

Question - Do you believe that for your transportation systems, passenger flow is sharply "peaked" within the busiest travel periods? (for example, are there concentrated demands for short time periods, as opposed to spread-out, even flow?)

Answer -

	128 CITIES REPORTING					
	Yes	%	NO	%	TOTAL	
United States	70	74	25	26	95	100%
Outside U.S.	27	82	6	18	33	100%
	97		31		128	

A tabulation of responses for 89 U.S. cities indicates that a solid majority report "peaking" and resultant congestion for auto, bus, and rail transport systems. Table 1-11 highlights these findings.

Table I-11
PEAKING AND CONGESTION BY MODE
89 U.S. Cities Reporting

Mode	No. of Cities	"Peaking" ? Yes	"Peaking" ? No	Congestion? Yes	Congestion? No
Auto	89	67	22	47	38
Bus	89	68	21	48	36
Commuter RR	10	10	0	9	1
Rail Transit	8	5	3	4	4

A follow-up question tried to determine whether cities felt that any observed peaking was related to work schedules. More than half of the cities felt this was indeed the reason, although a significant number are of the opinion that other factors are more the cause. Table I-12 shows the results.

Table I-12
PEAKING" CAUSED BY WORK SCHEDULES?
119 Cities Reporting

Question - If peaking or congestion problems occur in your CBD, as noted in question #9, do you have any evidence that the schedules employees work are the major cause? Yes_____ No_____

Answer -

	119 CITIES REPORTING					
	Yes	%	No	%	TOTAL	
United States	52	59	36	41	88	100%
Outside U.S.	16	52	15	48	31	100%

This question was probably not fully understood. Some cities reported "congestion" but indicated that they did not believe it was caused by work schedules and checked "NO" for this question. Other explanations ranged from a simple "Everyone arrives and departs at the same time", to the frequency of bus schedules with crowded conditions.

5. Status of Staggered Work Hours Considerations

The survey tried to determine the nature of any efforts to study and/or promote the concept of Staggered Work Hours or any other method of adjusting work schedules for the purpose of reducing transportation congestion.

Despite the fact that more than three-quarters of the cities were aware of "peaking" on their transport systems, and that most felt this was related to work schedules, less than one-quarter of the cities had made or, as of 1974, were making an effort to adjust work schedules. The percentage in the United States is less, at 16%, despite well-publicized efforts directed at transportation experts to implement "low-capital intensive" programs, of which Staggered Work Hours is one. These findings are shown in Table I-13.

Table I-13
STAGGERED WORK HOURS EFFORTS?
121 Cities Reporting

Question - If you have peaking or congestion problems, has any coordinated effort ever been made in your city to adjust work schedules in order to reduce such congestion, as for example, with a Staggered Work Hours Program?

Answer -	121 CITIES REPORTING				
	Yes	%	No	%	TOTAL
Currently:	15	16	77	84	92
United States	11	38	18	62	29
Outside U.S.					
Total:	26	21	95	79	121
In the past:					
United States	14	16	75	84	89
Outside U.S.	12	43	16	57	28
Total:	26	22%	91	78%	117

Since "peaking" appears to be a universal occurence, most often related to work schedule patterns, cities were queried as to why a Staggered Work Hours solution had not been considered. Based upon the reponses of 81 cities, the primary obstacle to implementing Staggered Hours is institutional. More than 80% of the cities said that there was no organization to implement a program, or that there was no real support for the effort, or money was lacking. Only a small percentage admitted a lack of knowledge as to how to plan and implement a Staggered Hours program. Table I-14 details the responses, in which multiple reasons were allowed if necessary.

Table I-14
WHY STAGGERED HOURS NOT CONSIDERED?
81 Cities Reporting

Question - If a Staggered Work Hours Program has not been considered as a method of reducing transportation congestion in your city, please check as many of the following reasons that may apply:

Answer -

	81 CITIES REPORTING			
	United States	%	Outside U.S.	%
No knowledge of how to plan/ implement a Staggered Work Hours Program.	11	8	1	5
No organization to implement program	28	22	5	23
No real support for such effort	47	36	11	50
No funds available to implement a plan	30	23	4	17
Transportation congestion is not caused by work scheduling patterns	14	11	1	5
TOTAL:	130	100%	22	100%

Four separate, extensive sub-analyses were conducted to determine if there was any correlation among the reasons why Staggered Work Hours was not considered in a city with respect to several characteristics of its CBD including employment density (employees per square mile), geographic area of the CBD, modal use and the number of CBD employees. For example, would larger employment CBD's have different reasons why Staggered Hours wasn't advanced than smaller cities? The analyses were generally inconclusive, as similar reasons were given by cities regardless of differing total CBD employment and other factors. Table I-15 shows the analysis with respect to number of employees for 74 U.S. cities reporting.

Table I-15
REASONS FOR NO STAGGERED HOURS VS. CBD EMPLOYMENT
Percent Distribution for 74 U.S. Cities Reporting

	PERCENT GIVING REASON FOR NOS WAS:				
No. of CBD Employees	No Knowledge	No Organization	No Support	No Funds	No Congestion
0-20,000	14%	29%	64%	25%	18%
20,001 -40,000	16	37	37	37	11
40,001 -80,00	17	20	33	33	8
80,001 +	7	27	33	33	13
TOTAL:	14%	28%	55%	31%	14%

NOTE: Percentages may add to more than 100% since cities were allowed to cite as many reasons as applicable.

The survey concluded with responses elicited on experiences with other work schedule concepts, specifically the four-day week and "flexible" (or "gliding") work hours. These concepts are discussed more fully in Section IV of this Technical Study, "Comparative Evaluation of Work Schedule Concepts".

The survey reveals a different distribution of experiences with these two work schedule concepts. To summarize, the four-day (or "shortened") work week has received more attention in U.S. cities where 19% have 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. While only 10% of U.S. cities are aware of developments in this growing concept, some 65% of foreign cities reporting are involved. This is not surprising, as this new concept has already taken hold in Europe for increasing numbers of employees, and is only in the last year or two being formally introduced in U.S. cities where it is being received guardedly by American management. Table I-16 summarizes the results of this question, while Exhibits I-3 and I-4 illustrate the findings.

Table I-16
FOUR-DAY WEEK & FLEXIBLE WORK HOURS
111 Cities Reporting

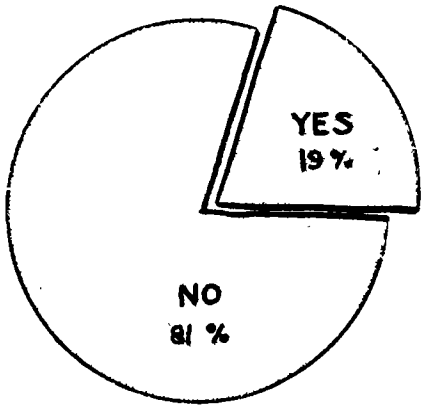
- Has your City ever implemented any of the following work scheduling concepts for transportation congestion reduction?

-	Yes	%	No	%	TOTAL
Four-Day (or shorter than normal) Work week:					
United States	16	19	69	81	85
Outside U.S.	3	12	23	88	26
TOTAL:	19	17	92	83	111
"Flexible" (or Gliding) Work Hours					
United States	8	10	73	90	80
Outside U.S.	17	65	9	35	26
TOTAL:	25	24	82	76	106

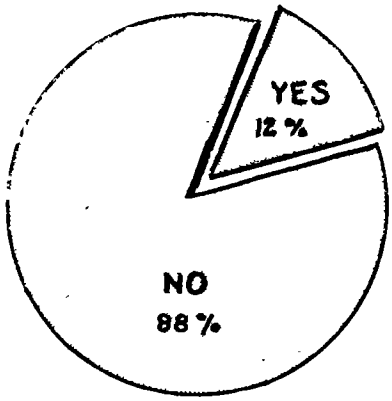
STAGGERED WORK HOURS STUDY

111 Cities Reporting – 1974

- EXHIBIT I-3/TRIED FOUR-DAY (OR SHORTER) WEEK ?

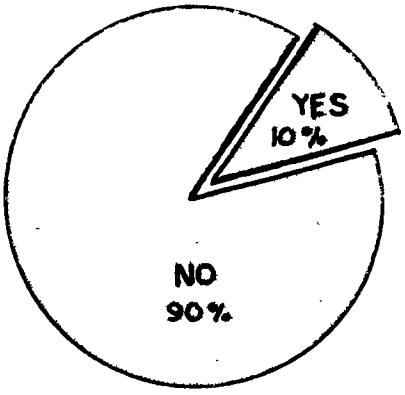


UNITED STATES
(85 CITIES)

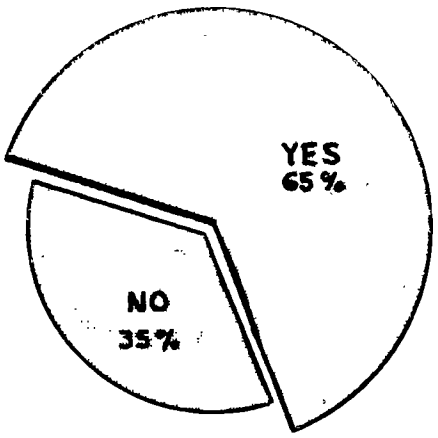


NON-U.S.
(26 CITIES)

- EXHIBIT I-4/TRIED FLEXIBLE WORK HOURS ?



UNITED STATES
(85 CITIES)



NON-U.S.
(26 CITIES)

D. RECOMMENDATIONS

The State-of-the-Art Survey elicited responses from U.S. and foreign cities indicating a universality of the "peaking" phenomenon on transportation systems, and largely attributed it to prevailing work schedule patterns. The survey gathered much general information on transportation patterns, employment data and other materials -- including numerous informative comments -- many of which are contained in the Appendix, Volume IV of this report.

Two recommendations are made based on this survey:

1) Most cities -- large and small-- seem to face a similar assortment of institutional problems in advancing a Staggered Work Hours Program, and solutions and strategies should be developed with this in mind.

2) A greater incentive is needed for cities to focus upon the so-called "low-capital intensive" approach of reducing transportation congestion, with additional financial supports to ensure such efforts.

Chapter II

Criteria for Staggered Work Hours

Staggered Work Hours Study

II. CRITERIA FOR STAGGERED WORK HOURS

A. OBJECTIVES

The objective of this section is to:

1. Examine the nature of "peaking" on urban transportation systems as caused by uneven demand patterns during the morning and afternoon peak periods. The effort was to define the concept of peaking, isolate its cause, and determine its real impact on transportation systems.

2. Develop quantitative guidelines for methods that spread this peaked demand, such as Staggered Work Hours.

B. WORK PERFORMED

The work performed covered two basic areas of research. These are:

1. A historical investigation regarding why people generally come and go to work at the same time, the history of the length of the work day and the background of Staggered Work Hours' scheduling systems.

2. Research of existing measures of transportation demand and supply, including peaking, with emphasis on a variety of qualitative and quantative measures. Extensive examples of these measures were drawn from transportation surveys conducted during the Technical Study. These surveys are discussed in greater detail in Section VII of this report.

C. ANALYSIS

1. Introduction

The peaking phenomenon is a familar one to transportation professionals throughout the United States and around the world. It is caused by the natural evolution for communities to have a common starting and quitting time for the work day. 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, and social and morale benefits.

Why do work schedules evolve in an area so that most working people come and go at the same time every day? How has the length of the workday changed? How can one measure or determine when existing transportation demand patterns are "peaked" enough to warrant investigating or implementing a work schedule program like Staggered Work Hours?

This section seeks to answer some of these questions by formulating and examining the nature of peaking in relationship to supply and demand, and then offer some guidelines as to quantitative and qualitative determination of the criteria for a feasible Staggered Hours program.

2. History

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 begins to take place on such service facilities as elevators, eating places and transportation systems which begins to cut into the advantages of a uniform business day.

In practically every city of the world, there is a predominant work schedule which is followed by a large majority of the business community. The "state of the art" survey conducted as part of this Technical Study (discussed earlier in Section I) revealed that some three-quarters of the cities replying have recognized "peaking" problems which significantly effect transportation systems. These cities have also settled upon a prevailing work schedule which, in most cases, is the cause of the peaking problem in their city.

Since the adjustment of work schedules may involve the changing of hours worked per day as well as the number of days worked in a week, it is helpful to go back in history and determine the nature of the length of the work day and the inception of the Staggered Work Hours concept.

Length of Work Day

In the early days of industry, the normal workday was from sunrise to sunset. A significant increase in the length of the workday during the summer months was sometimes recognized by a higher rate of pay. The total hours worked per year was not greatly in excess of values typical of the 20th century because of the large number of holidays and non-working time during the day.

During the Industrial Revolution in England, however, significantly longer workdays, ranging from 12 to 16 hours, were instituted in order to maximize utilization of costly equipment. Agitation against the extremely long workday, first for children and then for adults, lead to a gradual reduction of the workday to the fairly well-standardized eight hour day prevalant in most business and manufacturing communities today. It is interesting that the first reference to the eight hour day goes back to medieval times when Alfred the Great set forth the following plan as an ideal pattern for the nobleman: eight hours of work, eight hours of reading, meditation and amusement and eight hours of sleep.

Although there are scores of references and sources of information on the length of the workday and how it developed over the centuries, there is a significant lack of information on the daily cycle of actual hours worked, i.e., the starting and quitting times. Research does reveal some reasons for a regular daily cycle, and it is possible to infer reasons for the initial choice of prevailing schedules, such as 9-to-5. Further, it seems clear that after the initial choice, tradition and inertia are two major reasons for the continued wide acceptance of that local workday schedule.

Studies both with animals and with men who are isolated from the outside world indicate that there is an inherent rhythm in bodily functions. Its cycle is approximately 24 hours, so it is therefore called "circadian" from the Latin circa meaning "around" and die meaning "day". Body temperature, pulse, sugar and amino acid levels and a variety of other functions have been shown to rise and fall in circadin cycles.

As a result of these cycles, muscular coordination, strength, judgment, creativity and attention to routine show repeatable patterns each day, even if all cues of light and darkness are removed in an isolated environment. Many studies have shown higher incidence rates of accidents, ill health and errors associated with night work. More recently it has been recognized that in many cases poor performance really stems from the worker shifting from one schedule to another, e.g., living as a "night person" during the week and a "day person" on weekends. Experiments indicate that two or three days are required for an organism to adjust its patterns to a new schedule. This has been documented by many studies on jet lag. A great number of experiments on the diurnal patterns of birds, mammals and men leave no doubt that light or darkness is normally a primary synchronizer of activity patterns.

Studies in an isolated environment without changes in lighting indicate that most people tend toward the cycle of 24½ or 25 hours if allowed to "run free", i.e., sleep and wake naturally without the benefit of any knowledge of time or influence of light from outside.

Given the fact that people are going to work about eight hours per day and that the rhythm of light and darkness must have effected the evolution of life over many million of years, it is interesting to look at natural patterns of light and darkness. Exhibit II-1 shows the time of sunrise and sunset at Greenwich Mean Time. Of course, adjustments for any specific locations would have to be made for its latitude, longitude and time zone. It is also interesting that the average times of sunrise and sunset are approximately 6 a.m. and 6 p.m., respectively. Exactly spacing each eight work hours in the middle of these twelve suggests that an 8-to-4 work schedule would seem most appropriate.

As noted above, however, there are significant work schedule differences depending on geographic location and time zone. In fact, large portions of the population have found it desirable to artificially alter the "normal" pattern through the use of "daylight savings time." There are, of course, significant variations in sunrise and sunset throughout the year which are only grossly approximated by this single one hour adjustment.

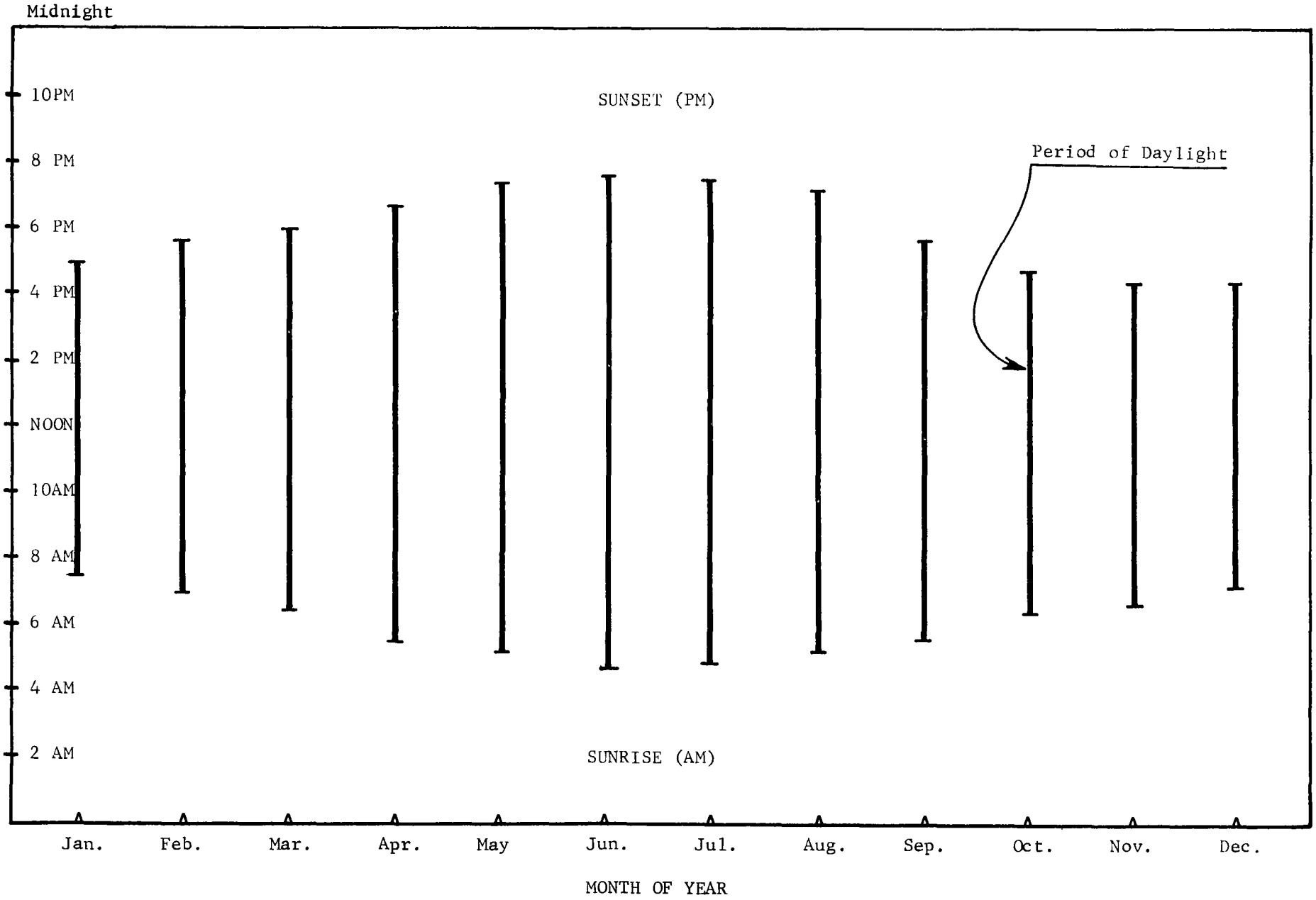
It is also well known that individuals have different daily cycles. Some are most effective in the morning hours while others are most effective in the afternoon and late evening. Thus the idea of Flexible Work Hours schedules established by an individual has advantages. They provide the flexibility to meet both changing conditions throughout the year and to allow employees to take advantage of their own basic work cycle, consistent with maintaining organizational productivity. Flexible Hours provides each individual with the opportunity to choose the work time best suited to

Staggered Work Hours Study

Exhibit II-1

TIME OF SUNRISE AND SUNSET

Greenwich Mean Time



his own particular life style, travel patterns, and normal work cycle. The concept is in keeping with modern management theory, especially for professional and managerial employees, to increasingly place the emphasis on individual responsibility to produce the required work, of managing by objectives and goals, and by evaluating the quantity and quality of the final output rather than by emphasizing control of a specific set of hours at the work location.

The foregoing should not be interpreted as a hypothetical basis for the evolution of daily work schedules. In reality, work schedules have evolved, no doubt, in more fickle ways, such as emulating the practice of a large employer. From city to city, the prevailing work schedule can also depend on the relative travel time to work which may vary for different organizations, locations, and individuals. Whether or not historical practice has led to the common work schedule in a city, its existence is recognized to be an almost universal strain on transportation facilities that results in crowding and delay.

Early Staggered Work Hours Attempts

The first organized efforts in the United States to Stagger Work Hours in a city were made as early as the 1920's. The attractiveness of the idea has since grown with the increased use of mass transportation facilities, higher employment densities and longer journey-to-work trips.

New York City in particular has been the object of a number of efforts to Staggered Hours, due to its high employment density, large population and the geographical location of the Central Business District (CBD) on an island. In 1936, Dr. Lewis Harris, Commissioner of the City's Department of Health, established a committee to Stagger Work Hours with the aim of preventing "the transmission of respiratory infections which are so common where overcrowding exists."

Work staggering also arouses considerable interest nationwide during World War II. The Transportation and Communication Department of the U.S. Department of Commerce published two pamphlets on staggering in 1941 and 1942. But, although there are reports that Staggered Hours plans were introduced in a number of large cities, information on those efforts is not generally available. The Commerce and Industry Association of New York undertook surveys of work hours and of attitudes of CBD firms to work staggering and produced a report of its findings in 1948. There seems to have been no organized effort to implement Staggered Work Hours at that time however.

In the early 1960's, an exhaustive study of Staggered Hours was commissioned by the City of New York. A major reference to this analysis of Staggered Hours was published in 1968 by Professor Lawrence B. Cohen of Columbia University. The concept was analyzed for as to the potential traffic relief in Manhattan's CBD. The report of his study commission, Work Staggering for Traffic Relief, discussed methods of measuring congestion, estimating how much relief Staggered Hours could provide, the use of CBD industry and work schedules and the forecasting of overall feasibility and effectiveness of a program. Mr. Cohen's work was specifically directed at the alleviation of Manhattan's transportation problem through the participation by major industry groups to adopt new schedules to relieve subway congestion. The recommendations were not implemented, due largely to the unwillingness of industry groups to accept the suggested work schedules.

Nonetheless, in 1970, The Port Authority of New York and New Jersey and the Downtown-Lower Manhattan Association started to proceed with a Staggered Hours program in the relatively confined geographical area of Lower Manhattan. The program has since been extended to the Midtown Manhattan business community. Both of these efforts are well-documented in other sections of this report.

3. The Peaking Phenomenon

Now that an historical perspective of the workday has been presented, a closer examination is given to the "peaking" phenomenon exhibited on urban transportation systems, caused by concentrated adherence to single starting and quitting times.

The "peaking" phenomenon on urban transportation systems is simply a surge in the transportation demand over a very short time period during the total peak period or peak hour. The phenomenon has adverse ramifications when demand sharply exceeds the available capacity of transportation services, causing varying degrees of congestion. While it has been argued -- rightly or wrongly -- that a certain amount of peaking is to be expected if an urban area is operating efficiently, it is beyond the scope of this report to discuss this argument.

In any case, the peaking phenomenon is more seriously regarded in situations where demand becomes almost unbounded for a very brief period of time, causing severe congestion on specific transportation systems. This can be observed in a variety of situations, from the early arrival at and departure from work locations, to the surge loading at the conclusion of spectator events.

In addition to understanding the nature of the demand, it is also important to determine if different urban transportation modes exhibit different peaking characteristics. This involves both their operating characteristics with an increased surge of demand, as well as their ability to adjust in order to meet a pre-determined peak demand.

Illustrative of the adverse effects that peaking can have on transportation operations, an example is distilled from the extensive transportation surveys, discussed later in Section VII of this report. The example demonstrates the cause-and-effect relationship of concentrated work schedules adversely impacting subway operations.

New York City's IND E & F subway service to Queens during the afternoon peak period was examined in an analysis which combines a series of data collected in Midtown Manhattan transportation surveys. The ridership on this high-capacity route is extremely heavy and the rolling equipment is of recent vintage and operates well. The line is generally regarded as being at over capacity and is very congested. A new subway tunnel along this corridor has already been built and is now awaiting construction of connections which are planned to significantly relieve the congestion.

In the analysis, five statistics were combined in a case study of the cause and effect relationship that work schedule peaking has on transportation patterns. For a specific study area in the east side of Manhattan, a direct relationship was determined for the sequential patterns of quitting times, subsequent entry into the subway station and an increase in station dwell times leading to lower train speeds through the CBD. Covering the immediate area around the cordon station at Lexington Avenue and East 53rd Street, which is also the "maximum load point" comprising the most number of passengers on trains, the pattern of quitting times in the postal Zip Code area surrounding the station almost identically matched the afternoon arrivals at the station. (See Exhibit II-2). This is not surprising as people would be expected to arrive at the transit station in the same pattern as when they leave work. Further, since these arrivals peak sharply just after 5 P.M., the "dwell time" at the station correspondingly increased due to the large surge of arrivals as well as more holding of doors as people try to board the extremely crowded trains. As the dwell time becomes increasingly excessive, delays to closely following trains results which, in turn, slows the overall speeds of trains through the Central Business District. The entire pattern is shown in Exhibit II-2.

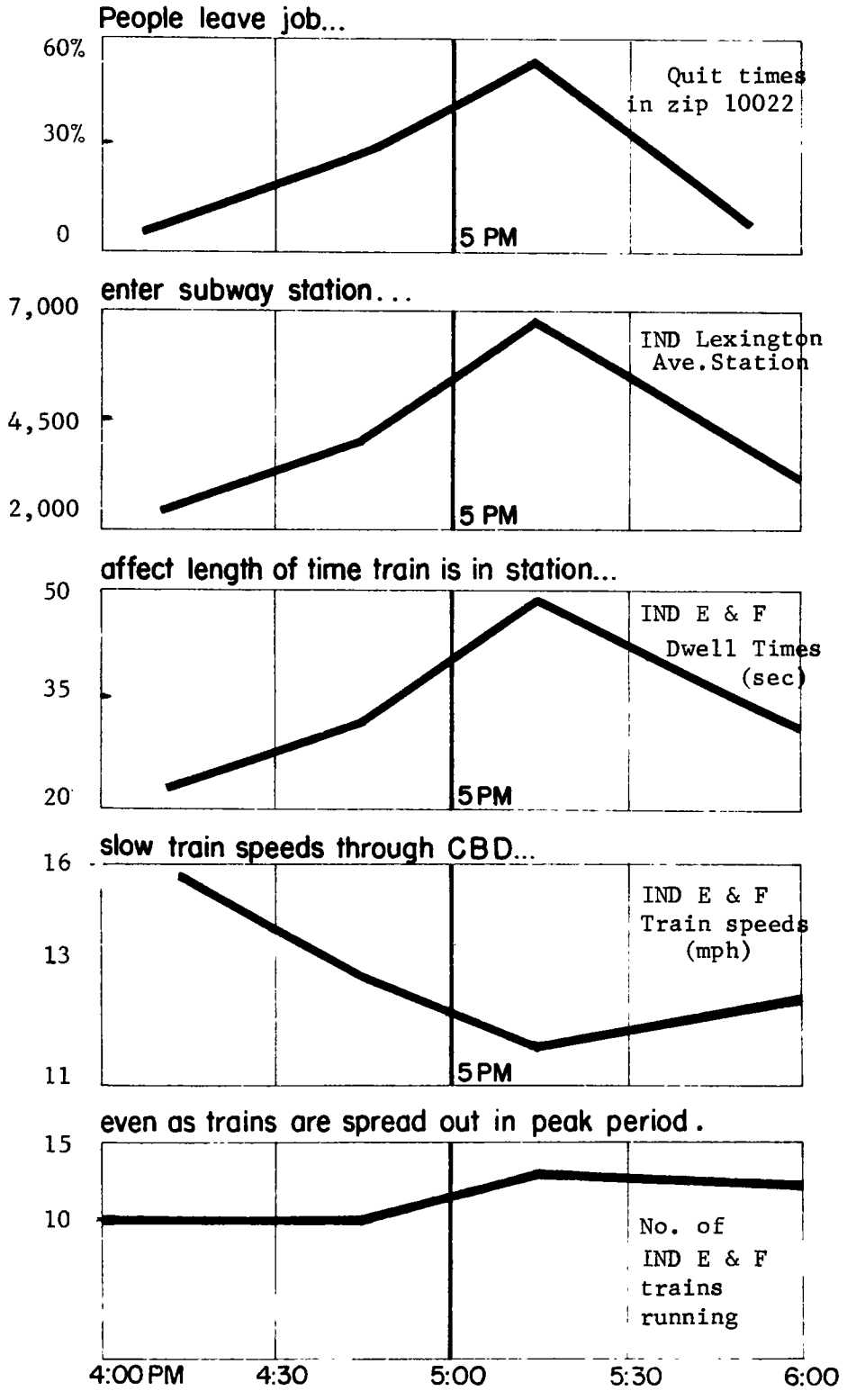
Exhibit II - 2

Staggered Work Hours Study

A CASE STUDY OF THE PEAKING PROBLEM

IND E & F SUBWAY TO QUEENS-AFTERNOON PEAK PERIOD

1972



Ironically, the supply of transportation over the entire peak period on this line can reasonably handle the total number of people, yet is unable to absorb the sharply peaked demand. To illustrate, the bottom graph of Exhibit II-2 shows that the service offered in numbers of trains is almost the same from 4:00 PM through 6:00 PM, although it does not match -- nor cannot match -- the peaking of the passenger demand.

Regarding this case study, one can reasonably hypothesize that staggering the work schedules in the area would reduce the peaking of entrances to this station, reduce dwell times, leading to an increase in CBD train speeds and improved system operations.

These concepts of demand and supply will be illustrated more fully in the following pages as well as in other sections of this report. The purpose here is to develop criteria for determining whether Staggered Work Hours could be effective in improving transportation systems. Such criteria would identify what degree of peaking begins to adversely impact the systems, whereas future sections will deal with the designing staggered work schedules to achieve planned goals. The data base for this work are the extensive transportation surveys conducted and analyzed separately in Section VII of this report. These surveys were conducted in collaboration with the New York City Transit Authority.

4. Transportation Demand

A major portion of the transportation planning process is the determination of demand patterns for which appropriate facilities can be designed to accommodate the demapd. The demand pattern for transportation includes a number of different characteristics, e.g. the time of day, day of the week, trip purpose and other factors. There are many techniques to survey transportation demand and to predict future demand by use of a variety of forecasting models.

While it is beyond the scope of this study to evaluate sophisticated transportation planning models, the analysis herein deals with the measure of "peaking" of transportation demand. What is peaking, how is it measured and what are its characteristics? Even though the peak hour is the most common measure of peak transportation usage, this does not necessarily follow that traffic remains at a high level throughout the entire peak hour. The peaking within the peak hour shows the variability of the demand and may, in many respects, be a more adequate measure of the causative situation which leads to severe congestion.

A common measure of peaking is the "Peak Hour Factor" (PHF). The PHF was developed during the determination of highway capacity techniques evolved since World War II, and which were included in the Highway Capacity Manual, published in 1965 by the Transportation Research Board. The Peak Hour Factor was defined in that manual as follows:

> "PHF - a ratio of the volume occurring during the peak hour to the maximum rate of flow during a given time period within the peak hour. It is a measure of peaking characteristics, whose maximum attainable value is one. The term must be qualified by a specific short period within the hour; this is usually five or six minutes for freeway operation and fifteen minutes for intersection operation. For example, "a peak hour factor of 0.80 based on a five minute rate of flow."

The Peak Hour Factor has been used in highway situations for capacity analyses and intersection signal timing, and is often used in this report to define and measure peaking on all modes of transportation studies. The values of the PHF on a 15-minute basis range from 0.25 for the extreme of peaking (where all peak hour flow occurs in one 15-minute interval) through and including 1.0 which demarks a completely flat pattern (where flow is relatively constant during each 15-minute interval of the peak hour).

While the Peak Hour Factor gives a quick determination of the degree of peaking in a system, it gives only a limited description of actual flow patterns. This is because the PHF can be the same numerical value and still represent different situations, since the PHF is computed from the single highest short-term interval during the peak hour, ignoring equal or smaller values in the remaining intervals. Exhibit II-3 illustrates this point and, as an example, consider a flow with a PHF of 0.5 based on a 15-minute rate of flow. This low PHF value describes a severe peaking situation, although the three illustrative distributions in Exhibit II-3 reveal quite different flow patterns.

5. Transportation Supply

The demand for transportation is coupled with the capability of transportation systems to provide an adequate amount of service. The upper limit of a transportation system to provide this mobility is termed its "capacity." Transportation system capacity can be defined as (paraphrasing from the definition of highway capacity given in the Highway Capacity Manual): the maximum number of vehicles and/or passengers which have a reasonable expectation of passing over a given section of the system in one direction (or two directions) during a given time period under prevailing operating conditions.

The traditional method of providing additional transportation capability when capacity is exceeded has been to provide additional transportation services or facilities. This, however, usually involves a high capital expenditure and, therefore, urban areas are increasingly looking towards "low-capital intensive" approaches such as Staggered Work Hours and other techniques to help relieve their transportation systems by reducing the peak demand to equal at below their capacity.

Staggered Work Hour Study

Exhibit II - 3

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	OR OR	300 200 100 0
0.70	Moderate Peaking	OR OR	400 200 0
0.50	Severe Peaking	OR OR	600 400 200 0
0.40	Extreme Peaking	OR OR	600 400 200 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:

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

All transportation facilities are not necessarily operating at capacity during the peak hour since, in many cases, the services provide peaks in the same form as the demand, up to the physical capacity of the system. A transportation facility can cope with a certain degree of peaking since the facility should have been designed to handle such peaking in the first place. Where the existing service can handle the peaked demand in a satisfactory manner, there is no problem. It is important, however, to determine at what point the peaked demand will begin to adversely effect the system operation. For example, in the case study presented earlier in Exhibit II-2, it was seen that the peaked demand entering a New York City subway station was a significant contribution to reduced train speeds.

An example of peaking adversely effecting highway operations involves a surge loading which would push the volume over the capacity and into a stop-and-go traffic situation. One method of smoothing out flow on a peaked roadway takes place in the Lincoln Tunnel connecting New York and New Jersey, where traffic sensors closely monitor traffic and, when overflow is imminent, meter traffic entering the tunnel with traffic control devices to reduce the chance of a tieup. This approach has succeeded in reducing delays in the Tunnel and increasing the service volume of a Tunnel lane by some ten percent.

Although a definition of capacity as given earlier may seem straightforward, there are a variety of capacity measures to consider. For example, the capacities of a transit system can be determined in a number of ways such as "vehicle", "seated", "comfort", and "crush" capacities. These capacities can be defined and illustrated as follows:

1) Vehicle capacity: the maximum number of transit vehicles during a given time period; usually, expressed in terms of the number of

buses or, in the case of multiple-unit trains, the total number of cars in the train. For example, the vehicle capacity on a subway line might be 45 trains per hour (90-second headway) x 10 cars per train = 450 transit vehicles per hour capacity.

2) Seated capacity: the maximum number of seats during a given time period provided on transit vehicles. For example, if there are 450 transit vehicles per hour, each with 80 seats, the seated capacity equals 80 x 450 = 36,000 seats per hour.

3) Comfort capacity: the maximum number of riders which can be handled "comfortably" on a transit line, taken to mean being able to read a newspaper while standing. For example, 450 transit vehicles per hour x 180 people riding "comfortably" in each vehicle (80 seated x 100 standing) = 81,000 passengers per hour. (Certainly the concept of "comfortable" in the contest of riding a public transportation system is highly subjective, and will be further discussed below as well as in Section IX of this report discussing "benefits".)

4) Crush capacity - the absolute maximum number of riders which can be handled on a transit line. For example, 450 transit vehicles per hour x 250 people riding in each vehicle (80 seated x 170 standing) = 112,500 passengers per hour.

"Capacity" is therefore not just an absolute, single value for any transportation system as it varies with many different factors in each situation by mode.

6. Comparing Demand Patterns and Service Capability

Two analyses have been undertaken in this section to compare existing demand patterns and the ability to the transportation system to adequately serve these demands. Both analyses specifically look for evidence of the

"peaking" problem, and indicate criteria for when a Staggered Work Hours program will yield benefits in reducing this peak.

The first analysis involves a process of graphically displaying passenger occupying data for transit systems in order to indicate whether Staggered Hours would be able to spread ridership sufficiently to reduce peaked demand and approach or achieve a "comfortable" capacity level during the peak period.

The second analysis compares Peak Hour Factors calculated for both the demand as well as the actual service provided on several major urban transportation systems. The PHF service would portray the peaking within the peak hour of the trains and buses themselves. The analysis tests the hypothesis that a Staggered Hours Program would become increasingly feasible as the numerical difference increases between the PHF for demand and PHF for service (PHF service - PHF demand).

Both analyses are conducted using actual survey data, instead of developing theoretical relationships or relying on formal transit schedules. For example, instead of calculating a theoretical capacity for the systems studied, it was felt that most of these systems serving the Manhattan CBD were utilized at a capacity rate during at least part of the peak period. Further, this observable maximum rate would probably be closer to the "actual" capacity than any theoretical calculation, since it takes into account the prevailing operating conditions.

a. Loading Analysis

The loading analysis involved an examination of the passenger and service patterns at the CBD cordon points on transit systems to determine criteria regarding the feasibility of Staggered Hours could be developed based on average passenger loadings of transit vehicles during the peak periods.

Surveys conducted and discussed more fully in Section VII involved counts at major transportation centers for several major modes entering and leaving the Manhattan Central Business District. Vehicle loadings were determined at these centers generally corresponded to the "maximum load points" for a number of subway, bus and commuter railroad services.

A rough measure of the level of service offered on each line can be determined when these values are arrayed against the standing and seating capacities provided by the vehicles used. Certainly, a basic degree of comfort exists if everybody on each system gets a seat. On most transit systems however, it is not economically feasible to offer everyone a seat during the peak. As an increasing number of people must stand on a transit vehicle, there is a subjective interpretation of the level of "comfort". This could depend on the relative crowding, the length of the trip and other factors.

As discussed earlier, three terms have become common to describe various degrees of passenger loading on transit vehicles: "seated capacity," "comfort capacity" and "crush capacity." The latter two concepts are highly subjective, although, as discussed, reasonable values can be determined.

The more difficult concept to both qualify and quantify is that of the "comfort capacity" of a transit vehicle. While it can be argued that it is impossible to stand and be comfortable, one might describe the level of comfort capacity as the maximum number of people at which one still can "comfortably read a newspaper" while standing in a transit vehicle. On a IRT-type New York City subway vehicle, having 44 seats, the commonly-accepted value of a comfort capacity would involve 140 passengers per car, or 96 standees. For the larger 60-foot IND-BMT equipment (but not the newest, longer 75-foot R-44 and later cars) the comfort capacity is 180 passengers per car or 136 standees.

The "crush capacity" involves the maximum number of that people that might fit into a transit vehicle and for a IRT-type car this is determined as being about 180 persons per car, which corresponds to 136 standees. This is 40 more people that the comfort capacity of an IRT car. Similarly, the crush capacity of the 60-foot-long IND-BMT cars is nominally 250 passengers while roughly 350 persons comprise the crush capacity for the newer longer 75-foot cars which have recently been introduced on this system.

Knowledge of these subjective values for passenger loadings on transit vehicles can be used to analyze whether a shift in demand patterns by Staggered Hours can be effective in providing more comfortable transit car loadings with existing services. As an example, Exhibit II-4 shows the level of passenger loadings on the IRT #7 Flushing line at Grand Central during the morning peak period in 1971, and Exhibit II-5 shows this pattern for the afternoon peak. Both depict patterns before the initiation of Staggered Hours in the Midtown Manhattan area. It can be seen from the two exhibits that average subway car loadings exceed comfort capacity for a large portion of both the morning and afternoon peak periods, almost a full hour in each case. In both cases, though, if a significant number of riders would shift to the earliest and, especially, the latest half-hour segments of the peak periods, it would practically ensure that transit car loadings throughout the peak periods on this system would be near or below the comfort capacity level. The sharper afternoon peaking, discussed later in the Peak Hour Factor analysis, is also evident here as average passenger loadings after 5:00 PM rise abruptly to a level approaching the crush capacity. In fact, this 20-minute average value masks the reality of many individual cars and trains running at a crush capacity level.

Some factors regarding these passengers loadings are worth discussing. One is that the average loading values shown on the Exhibits may, in the

EXHIBIT II - 4

RAIL TRANSIT PASSENGER LOADINGS

N.Y.C. Subway - IRT #7 at Grand Central - AM Peak to NY - 1971

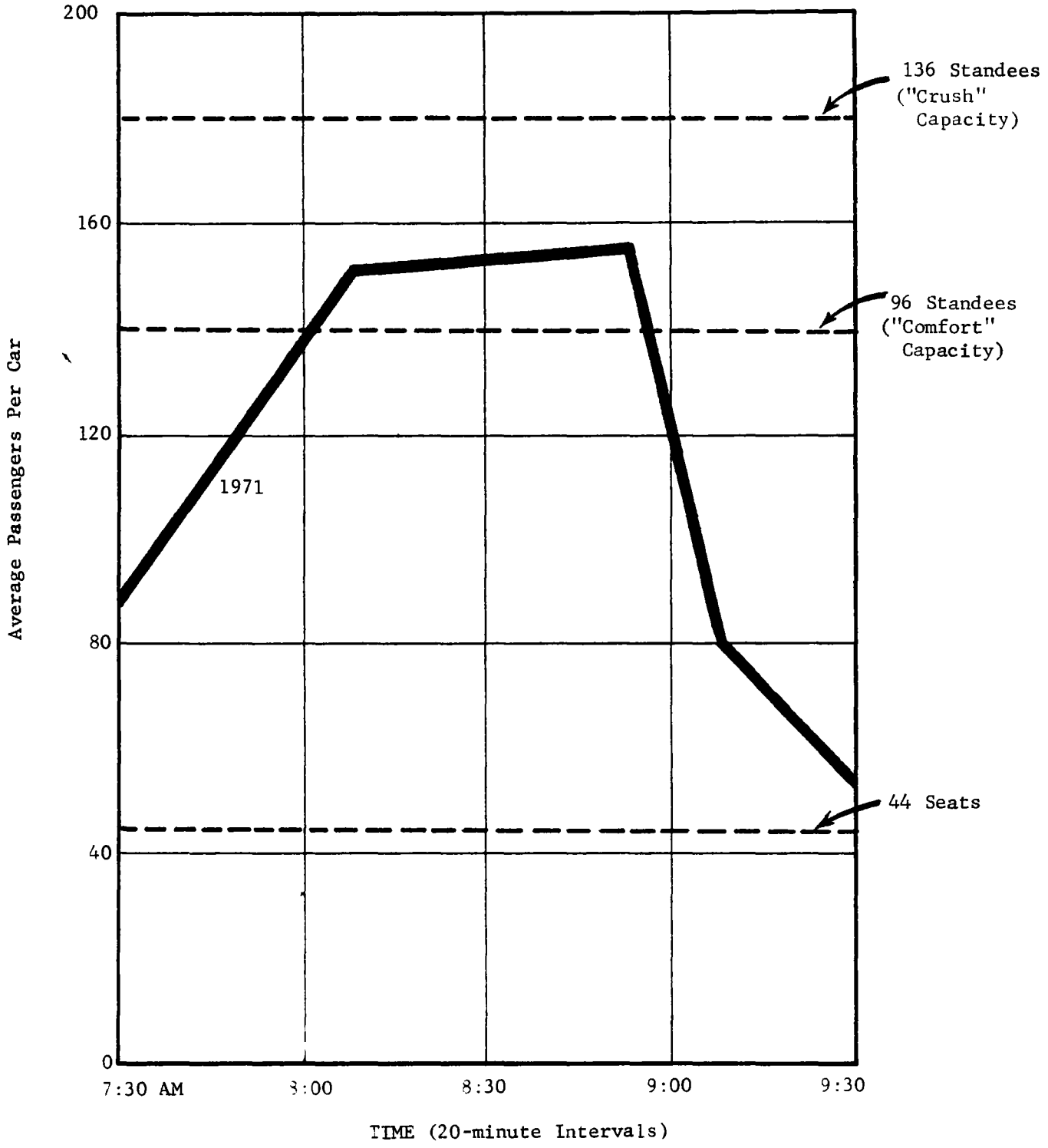
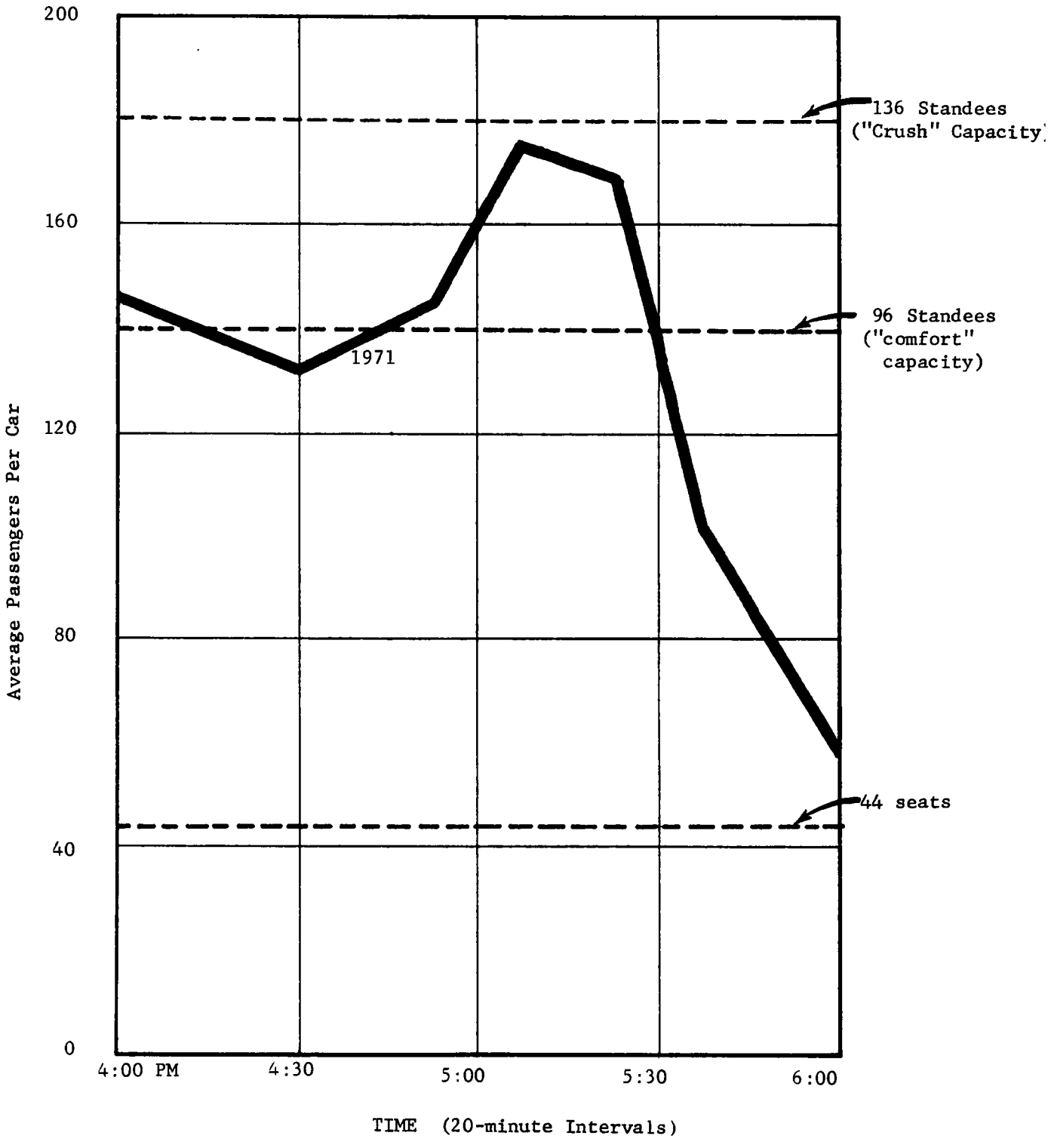


EXHIBIT II - 5

RAIL TRANSIT PASSENGER LOADINGS

N.Y.C. Subway - IRT #7 at Grand Central - PM Peak to Queens - 1971



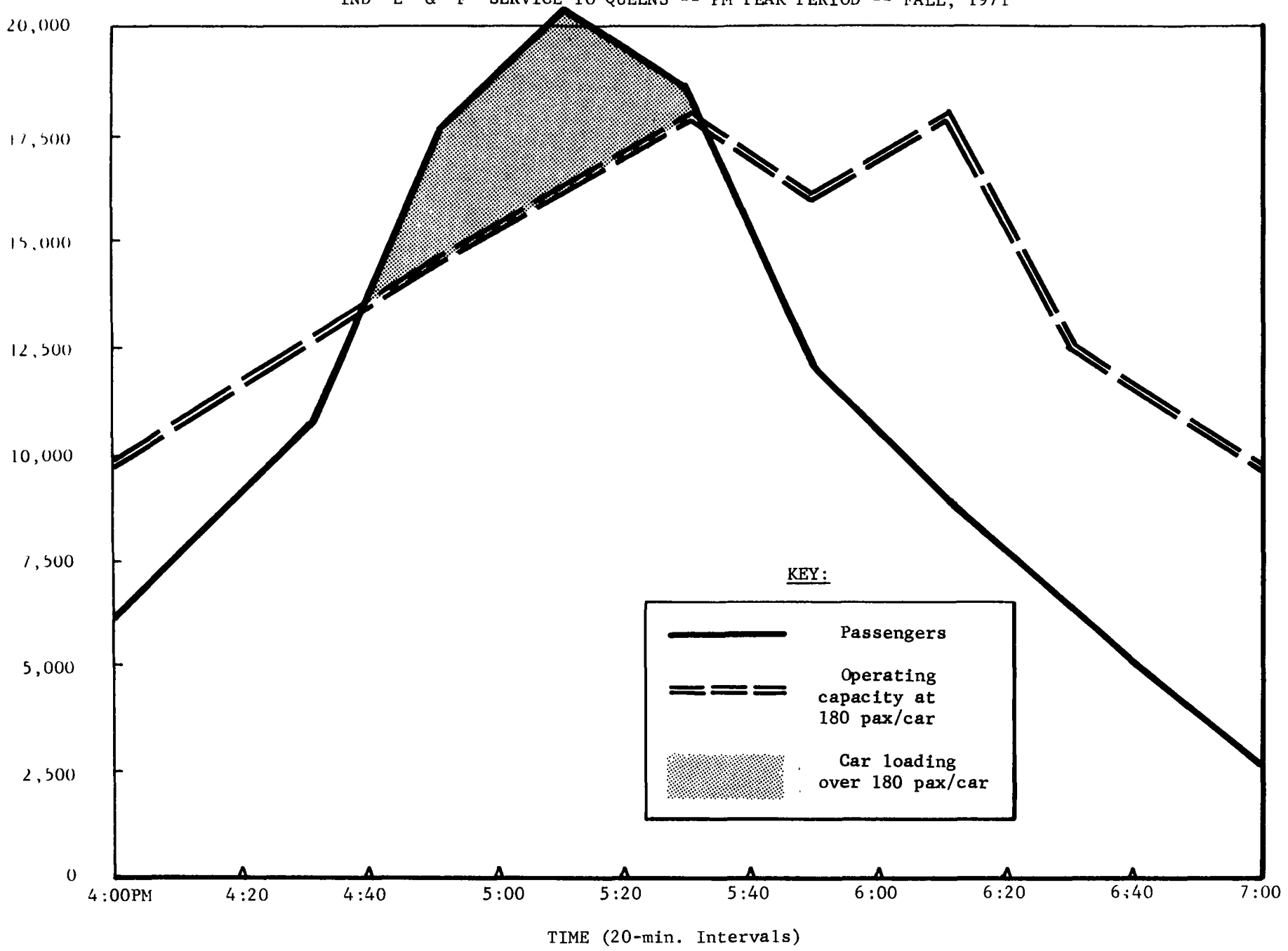
case of a high average, reflect either a combination of extremely heavily-loaded and lightly-loaded trains as well as uniformly heavy loads. A "heavy-light" situation might occur frequently when an earlier train becomes heavily-loaded because of a delay in normal service. Another factor is that while the average car loading on a particular train might be 140 passengers, for example, the individual car loadings may vary considerably. When passenger loadings are at or near crush capacity though, the probability is that all individual cars are also near crush capacity since a lighter load in one car would cause people to shift to it from more heavily-loaded adjacent cars.

The absolute demand pattern and the car loadings can also be illustrated in a different way. Exhibit II-6 shows the situation on the IND E & F subway service to Queens during the afternoon peak period in 1971 prior to initiation of Staggered Work Hours in Midtown Manhattan. The absolute demand pattern is plotted in a solid line. A double-dashed line represents the level of actual train service if it was operating at a comfort capacity level of 180 passengers per car. Therefore, the objective of Staggered Work Hours would be to spread the absolute demand pattern to reduce it to or below the level of comfort capacity throughout the peak period. In this illustration, the shaded area between 4:40 and 5:30 P.M. represents the period in excess of the comfort capacity. Again it can be seen that the 4:00-to-4:40 P.M. period has reserve available, but it could not quite absorb all the overage and still be at the comfort level. This indicates that some passengers must therefore be enticed to adopting later-than-5:30 quitting times, or some existing later trains should be shifted to the earlier time slots in the peak period.

A first glance at these previous exhibits might cause some concern that perhaps trains are being scheduled in the latter part of the peak period when they're not really needed. However, there is much evidence (exemplified

Exhibit II- 6

DEMAND AND SUPPLY AT NYC SUBWAY CBD CORDON POINT
IND "E" & "F" SERVICE TO QUEENS -- PM PEAK PERIOD -- FALL, 1971



by the "case study of peaking" on this line shown in Exhibit II-2) that some of this equipment is actually supposed to appear somewhat earlier in the peak but is delayed because of system congestion which builds through the peak period. One manifestation of this, especially in the afternoon, is that the surge of riders entering stations just after 5:00 PM leads to a few especially crowded trains, causing door holding resulting in excessive dwell times and delaying following trains.

Similar patterns of vehicle loadings can be determined for all transit systems. However, on commuter railroad and express bus systems, where standing is not usually prevalent because of the premium fare paid, equipment in service closely matches the demand pattern. If it doesn't, or if Staggered Hours causes a shift to time periods where adequate seating capacity isn't available, it is a relatively easy to adjust the service by revising bus or train schedules appropriately, or reallocating the number of cars on commuter rail trains.

Further, examples of demand patterns on various transportation systems are discussed in Section VII of this report.

To summarize this cordon analysis, it can be stated that 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.

b. Peak Hour Factor Analysis

This second analysis examines the Peak Hour Factors calculated for both the passenger demand and the services provided on several major transportation systems during the morning and afternoon peak periods both before and after Staggered Work Hours Programs. The systems studied included rail transit

(11 lines sampled), but transit (six lines), commuter railroad (three lines), auto systems (eight facilities) and pedestrian walkways (six locations).

Determination of these peak hour factors would aid in understanding the characteristics of peaking in a number of different situations. Specifically, the objectives of this analysis were to determine the PHFs for: demand and services on various systems, the morning versus afternoon peak period, various transportation modes and before and after Staggered Work Hours.

Determination of PHF's for Demand and Service - Peak Hour Factors on 15-minute intervals were calculated from data collected in the numerous surveys conducted to evaluate Staggered Work Hours effort in Downtown and Midtown Manhattan and in Newark, New Jersey. Only a limited number of the calculations show the effects of Staggered Hours since sufficient participation has been secured in only Downtown Manhattan and in the immediate Grand Central area in Midtown.

For all but one of the dozen rail transit systems studied, the demand PHF was based on arrivals at or departures from a single key station. The service PHF was determined during the same peak hour for actual train service on the lines serving those stations. The calculation for the Newark City Subway was based on the demand and service on the line at the maximum load point on this single-route system, and was not keyed to any one CBD station.

For commuter railroad systems using Grand Central Terminal, the demand PHF was based upon passengers arriving at or departing from GCT. The PHF for rail service was based on the number of rail cars -- not trains -- since trains consisted of varying numbers of rail cars. (The PHF for rail transit service were based upon the actual trains since all had the same car consist within each system during the time periods studied.)

Peak Hour Factors for bus transit systems were based upon buses and riders recorded at the CBD cordon points which were also generally the maximum load points.

A number of different auto systems were studied, although the aggregate of those systems studied was not meant to be typical of a Manhattan CBD highway or street. Since the main thrust of the Manhattan Staggered Hours effort is directed at the already overwhelming percentage of CBD employees now using transit, relatively little analysis was performed on auto corridors. Further, the corridors that were studied, most notably several bridges and tunnels to Manhattan, showed a relatively flat demand profile which was at capacity or above it for most of the morning and evening peak periods.

The PHF for demand on the auto systems considers not riders but the number of vehicles at each location. Since passenger occupancy does not change significantly within intervals during the peak hour, the demand pattern can more easily be presented in terms of actual vehicles. The PHF for service on roadways, as well as for pedestrian walkways, is assumed to be the value of one (1.0), since these systems have the ability to continuously handle movement.

Results - Table II-1 shows the Peak Hour Factors for demand and service calculated for the different systems for survey days in 1970, 1972, 1973 and 1974. The PHF for service is based on the earliest surveys conducted. The purpose of Table II-1 is to reflect the absolute values of the difference between the PHFs, for PHFs service and demand and whether the PHF values for demand have been sensitive to the Staggered Work Hours program in Manhattan. This array of PHFs offers some insights as to how to analyze transportation data and to determine if a severe peaking situation exists.

Staggered Work Hours Study

Table II-1

PEAK HOUR FACTORS FOR TRANSPORT SYSTEMS

Before and After Staggered Work Hours Programs

TRANSPORTATION SYSTEM	PHF FOR SERVICE OFFERED		PHF FOR PASSENGER DEMAND					
			AM			PM		
	AM	PM	Pre SWH	Some SWH	Δ*	Pre SWH	Some SWH	Δ*
A. Rail Transit								
1. IRT #7 @ Grand Central	.84	.86	.89	.97	.08	.86	.99	.13
2. IRT #6 @ 51st St.	.78	.76	.75	.93	.18	.67	.63	-.04
3. IRT #4,5,6, @ 59th St.	.78	.76	.77	.84	.07	.79	.86	.07
4. IRT #1,2,3, @ 34th St.	.76	.78	.88	.97	.09	.83	.76	-.07
5. BMT @ Bway-49th St.	.68	.66	.85	.77	-.08	.70	.76	.06
6. IND E,F @ Fifth Ave.	.72	.72	.84	.79	-.05	.75	.73	-.02
7. IND E,F @ Lexington Ave.	.72	.72	.89	.81	-.08	.68	.67	-.01
8. IND B,D,F,KK @ Rock. Ctr.	.93	.99	.90	.78	-.12	.74	.74	0
9. PATH @ World Trade Ctr.	.95	.98	n.a.	.87	-	.74	.85	.11
10. PATH @ 33rd St.	1	1	.86	-	-	.77	.82	.05
11. Newark City Subway	.88	.78	.87	-	-	.70	-	-
12. 3 Downtwon NYC Stations	n.a.	n.a.	.70	.80	.10	.70	.76	.06
B. Commuter Railroad								
1. PC - Harlem Division	.74	.74	.74	.65	-.09	.75	.87	.12
2. PC - Hudson Division	.82	.79	.83	.75	-.08	.80	.77	-.03
3. PC - New Haven Div.	.75	.80	.84	.82	-.02	.84	.81	-.03
4. PC - All Above Services	.83	.83	.86	.79	-.07	.85	.89	.04

* A positive value indicates peaking of demand has decreased.

(continued)

Table II-1 (Continued)

PEAK HOUR FACTORS FOR TRANSPORT SYSTEMS

Before and After Staggered Work Hours Programs

TRANSPORTATION SYSTEM	PHF FOR SERVICE OFFERED		PHF FOR PASSENGER DEMAND					
			AM			PM		
	AM	PM	Pre SWH	Some - SWH	Δ*	Pre SWH	Some SWH	Δ*
C. Bus Transit								
1. M15 @ 61st St.	.79	.75	.74	.81	.07	.84	.75	-.09
2. M101-101A @ 14th St.	.90	.89	.76	.80	.04	.89	.87	-.02
3. M101-101A @ 61st St	.87	.70	.95	.81	-.14	.74	.88	.14
4. M104 @ 60th St.	.85	.85	.82	.83	.01	.76	.88	.12
5. M106 @ 8th Ave.	.96	.88	.88	.90	.02	.73	.87	.14
6. M5 @ 63rd St.	.88	.69	.88	.84	-.04	.68	.77	.09
D. Auto Systems								
1. Lincoln Tunnel	(1.0)	(1.0)	.98	.99	.01	n.a.	n.a.	-
2. Queens-Midtown Tunnel	"	"	.98	.96	-.02	.97	.97	0
3. Holland Tunnel	"	"	n.a.	.96	-	n.a.	n.a.	-
4. Geo. Wash. Bridge	"	"	n.a.	.99	-	n.a.	n.a.	-
5. Nwk: Broad @ Erie RR	"	"	.92	-	-	.95	-	-
6. Nwk: Broad @ Linc. Pk.	"	"	.87	-	-	.90	-	-
7. Nwk: Market @ Wash.	"	"	.91	-	-	.88	-	-
8. Bklyn-Battery Tunnel	"	"	.92	.91	-.01	.89	.87	-.02
E. Pedestrian Walkways								
1. Penn Station	(1.0)	(1.0)	.92	.90	-.02	.92	.89	-.03
2. GCT-Pan Am Bldg.	"	"	.80	.83	.03	.93	.89	-.04
3. PABT - Subway doors	"	"	.85	.82	-.03	.84	.89	.05
4. PABT - Main Escalators		"	.91	.86	-.05	.80	.87	.07
5. PABT - PM to Platform		"	-	-	-	.85	.86	.01
6. GCT - Park Av. @ 46th St.		"	.87	.84	-.03	.76	.75	-.01

* A positive value indicates peaking of demand has decreased.

Analysis - At the outset is should be noted that the Peak Hour Factors proved to be uncertain identifiers of situations where peaking adversely affects transportation operations, at least within the scope of this work. One reason for this was the sensitivity of the PHF in varying greatly from day to day on the same systems in many cases. In any case, the PHF can be useful in calling attention to severely-peaked situations.

In the case of public transportation systems, a certain amount of peaking is to be expected in the transportation services since such services are scheduled according to usually-peaked demand pattern. If the service pattern does closely match the demand, then the Peak Hour Factors for each should be about the same. For example, on the Broadway BMT Subway at 49th Street, the PHF for afternoon services is 0.66, reflecting a rather high degree of peaking, but the passenger demand is also highly peaked with a PHF of 0.70. A contrasting situation exists during the afternoon at the IND Rockefeller Center Station where constant peak hour train service has a PHF of 0.99, while passenger demand is very peaked with a PHF of 0.74.

Two graphic examples of Staggered Hours positively impacting the PHF can be seen in the afternoon peak period at the World Trade Center Terminal of PATH and at Grand Central Terminal. Prior to the initiation of Staggered Hours in Lower Manhattan, the afternoon PHF for demand was a highly-peaked 0.74. After some one-quarter of the lower Manhattan workforce shifted to Staggered Hours, the PHF rose significantly to 0.85. At Grand Central on the IRT #7 subway line, the PHF rose from 0.86 to 0.99 after a large number of employers in the immediate area shifted away from the 9-to-5 schedule.

Transit bus services in Midtown Manhattan during the afternoon peak have appeared to benefit in a reduced peaking, but it is unclear if the PHF rise from a six-line average of 0.77 to 0.84 is significant. On four

of the six lines surveyed, however, the PHF has jumped significantly, by amounts of 0.09 through 0.14, compared with pre-Staggered Work Hours. This might indicate that the peaking of demand has been reduced on these lines due in some measure by riders shifting away from the 9-to-5 working hours.

The auto systems studied revealed an almost complete lack of peaking of demand during their peak hours. Values of PHF range from 0.87 through 0.99, indicative of a relatively flat peak hour volume. The systems studied comprised four toll tunnels serving the Manhattan CBD, a bridge serving both peripheral as well as Manhattan CBD-bound traffic and three arteries accessing Downtown Newark.

The pedestrian walkways examined also revealed a rather spread out distribution of peak hour users, with one notable exception. That exception involves the rather sharply peaked (PHF=0.75) afternoon flow approaching Grand Central Terminal from the north, the so-called "Canyon of Park Avenue" which is the location of many huge corporate offices.

Afternoon more peaked - Average Peak Hour Factors for the modes studied indicate that the afternoon passenger demand is, in most instances, more highly peaked than the morning demand. Table II-2(a) illustrates the data and shows that the more pronounced afternoon peak is particularly true for the rail transit systems. Meanwhile, the service PHF for these rail transit systems is equal for both morning and afternoon peaks, at 0.83.

This greater afternoon peaking results from employees departing from office buildings just after the normal quitting time, as compared with a more spread out arrival pattern in the morning.

Staggered Work Hours Study

Table II-2

PEAK HOUR FACTOR (PHF) ANALYSIS

(a) Average PHF by Mode

Mode	AM Service	PM Service	AM Demand		PM Demand	
			Pre SWH	Some SWH	Pre SWH	Some SWH
A. Rail transit	.83	.83	.83	.85	.74	.78
B. Commuter railroad	.79	.79	.82	.75	.81	.84
C. Bus transit	.88	.79	.84	.83	.77	.84
D. Auto systems	(1.0)	(1.0)	.93	.96	.92	.92
E. Pedestrian walkways	(1.0)	(1.0)	.87	.85	.85	.86

(b) Distribution of PHFs for demand by mode before SWH

Mode	----------Number of transportation systems surveyed----------					
	AM Peak Period			PM Peak Period		
	Highly Peaked (PHF less than .75)	Moderately Peaked (PHF of .75-.84)	Slightly Peaked (PHF of .85-1)	Highly Peaked (PHF less than .75)	Moderately Peaked (PHF of .75-.84)	Slightly Peaked (PHF of .85-1)
A. Rail transit	1	3	7	7	3	1
B. Commuter railroad	1	2	1	0	3	1
C. Bus transit	1	2	3	3	2	1
D. Auto systems	0	0	6	0	0	5
E. Pedestrian walkways	0	1	4	0	3	3
Totals	3	8	21	10	11	11

The PHF data was further analyzed to determine the number of systems in each mode that are "highly," "moderately" or "slightly peaked." As shown in Table II-2(b), it appears again that rail transit lines are more peaked in the afternoon while none are during the morning. A similar pattern, though to a smaller degree, exists for the six bus transit lines. Contrastingly, every auto system reveals "slight" peaking for both morning and afternoon peak hours.

PHF Criteria for Staggered Hours Feasibility - To the extent of our analysis, determination of Peak Hour Factors can be a guide in identifying highly-peaked situations existing on transportation systems which could be remedied by a Staggered Hours program. In most cases, a serious peaking problem will be identified as the PHF for the service exceeds the PHF for demand by 0.10-0.15, using as a guide the PHF data given in Table II-1. It should also be noted that a great disparity in the PHF values for demand and service could also indicate inefficient scheduling on some systems. An example of this where the PHF's reveal excess demand at the Rockefeller Center Station on the IND Subway line. During the afternoon, PHF for service is 0.99 while the PHF for demand is 0.74, revealing a difference of 0.25. This suggests that the demand is so peaked as to exceed the steady service level offered by trains.

While Peak Hour Factors identified a peaked situation at Rockefeller Center, a similar PHF analysis did not reveal high peaking on the IRT Flushing Line at Grand Central in 1972 before Staggered Hours. The PHFs for the service offered and the passenger demand were equal at 0.86, even though a separate examination of the passenger loading on the trains indicated a rather severe overloading problem existed related to factors which the PHF

does not cover. This includes excess dwell times which led to very heavy loading of certain trains during the peak, delays in the system itself and heavy platform loading. In addition, the PHF for demand was somewhat lower since demand was metered by escalator access to the deep underground station.

As a general hypothesis, a transportation system may be adversely impacted by peaking of demand if the PHF for service exceeds the PHF for demand by 0.10-0.15. The greater this difference, the greater the ability of Staggered Work Hours to relieve the situation. If the PHFs are nearly equal, however, any peaking problem would probably go undetected from a Peak Hour Factor analysis but would be seen from the previous loading analysis. Additional development of this criteria is needed to develop this PHF analysis so it would be a more accurate analytical tool to determine whether a Staggered Hours program would be feasible.

It does appear that the PHF analysis can also be useful in determining whether service adjustments are needed on a given line instead of shifting demand with Staggered Hours. For example, if the demand PHF indicates little peaking, and the PHF for the service offered is highly peaked, then perhaps the service needs adjusting to better conform to the shape of the demand. In addition, of course, an evaluation of schedule adjustments requires an examination of the average passenger loading on transit vehicles and not only just the PHFs.

D. RECOMMENDATIONS

An attempt has been made in this section to develop quantitative guidelines for determining whether Staggered Work Hours will be effective in reducing prevailing transportation congestion. In the continuation of the Staggered Work Hours Program in 1978, additional work will be done in concert with public transit operators to develop methods of quantifying the effects of Staggered Work Hours and its potential.

Traditionally, it has been straightforward to look at curves of system demand and capacity and determine whether there is sufficient capacity or that additional capacity is required. However, it it more difficult to look at the same demand pattern in terms of its peaking within the peak period and determine whether this peaking is of itself adversely affecting operations on the system.

The guidelines offered suggest criteria involving the passenger loading of transit vehicles and the Peak Hour Factor as indicators to determine more appropriately if a congestion condition can be remedied by revising work schedules. While, there are as yet no definitive equations which can be readily used, a series of useful techniques have been brought to the planner's disposal to determine the nature of peaking on different systems, and to provide a rationale for deciding whether to implement a work schedule revision. More definitive work will be done in this area in 1978.

Understanding this, the following recommendations are offered:

1. The determination of vehicle loadings on transit facilities is effective in determining 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 presently operating is at a more comfortable level.

2. The Peak Hour Factor, in common use in the highway transportation field, can, in certain applications, be a helpful indicator in determining whether revised work schedules would be useful to reduce congestion. Generally, when the numerical difference in the PHFs 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.

3. More research is generally recommended in this area to give the transportation professional better tools with which to examine the nature of peaking and the more definitive interpretations of 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 Staggerd Work Hours and other work schedule concepts are being increasingly discussed for reducing transportation congestion, such factors must be developed to be able to better define criteria for the use of such concepts, in the same way as have they been developed for many other transportation facilities.

Chapter III

Work Schedule Surveys

III - WORK SCHEDULE SURVEYS

A. Objectives

An integral step in any investigation of a Staggered Work Hours program, usually at the outset, is to determine the current work schedule patterns and practices in the area under consideration. This so-called "Work Schedule Survey" (WSS) of employers is used to determine basic information such as start and quit times, the number of employees on alternative schedules, the employee's mode of transportation and place of residence.

If the survey indicates that work schedules are concentrated at certain starting and/or quitting times, and this pattern can be directly correlated with transportation congestion determined by separate surveys, then a well-planned Staggered Work Hours program can be expected to yield beneficial results. Information from a Work Schedule Survey is therefore fundamental to implementing Staggered Work Hours.

Work Schedule Surveys can be conducted in several ways, the preferred technique being a questionnaire mailed to employers in the area under study. The survey should be designed to produce useful work practice information about organizations as well as a reliable contact in each organization. It is important to request the name, title and phone number of such a contact. Following the receipt of such information, it is possible to make a judgment as to whether prevailing work schedules contribute significantly to any transportation congestion being experienced.

B. Work Performed

The work performed in this section was in two areas:

1) A series of Work Schedule Surveys performed by the Port Authority were fully documented. The aspects of the survey techniques were then analyzed and recommendations formulated which are contained here and in the manual, "Staggered Work Hours", Volume III of this Technical Study.

2) Synopses were prepared of Work Schedule Surveys reported by other cities, as determined from the State-Of-The-Art Survey (discussed fully in Section I).

C. Analysis of Work Schedule Surveys

This section analyzes Work Schedule Surveys performed by project staff during the course of the Staggered Work Hours Program in Manhattan. It also reviews information on several other cities' investigations of work schedules as reported in the State-Of-The-Art Survey. Table III-1 gives a list of such major Work Schedule Surveys.

The analysis deals principally with the survey design, sponsorship and conduct of the WSS. Case studies of surveys are presented at the end, with exhibits from these surveys -- principally from the major WSS of Midtown Manhattan -- used throughout for illustration.

1. Survey Design

It is important to define with some precision the objectives of any Work Schedule Survey since several large diverse areas of inquiry may be covered. Although attempting to get a lot of information may be desirable -- indeed it may be necessary in order to recommend appropriate work schedule changes -- one must be careful about asking questions of great difficulty or sensitivity which might jeopardize the actual return of the questionnaire. Discussed below are a number of specific objectives in conducting a WSS.

Staggered Work Hours Study

Table III-1

MAJOR WORK SCHEDULE SURVEYS

(Sources: Port Authority surveys and 1974 State-of-the-Art Survey)

Location	Type	Date	Scope
*New York, N.Y.			
Manhattan - Downtown	All firms	1969	Respondents: 113 firms-136,000 employees
Manhattan - Downtown	All firms	1974	Respondents: 179 firms-137,906 employees
Manhattan - Midtown	All firms	1972	Respondents: 1,450 firms-300,000 employees, 20% of employment
Manhattan - World Trade Center	All Private Tenants	1974	Identified 30 firms each with more than 50 employees
Manhattan - City of N.Y.	Five agencies	1975	Covered 9,237 employees in five agencies
Manhattan - Advertising Agencies	Most firms	1973	Respondents: 17 firms-10,549 employees
Manhattan - Consulting Engineers	Most firms	1973	Respondents: 40 firms
Manhattan - JFKIA	Major Airlines	1972	Respondents: 10 major operators - 30,750 employees
*Newark, N.J.	All downtown firms	1974	Respondents: 66 CBD replies-30,798 employees.
Atlanta, Georgia	Selected major employers	1968	Respondents: 176 from 200 mailings
Chicago, Illinois	Most firms	1974	Chicago Association of Commerce and Industry Members
Chattanooga, Tennessee	NA	1974	Not complete at time of survey
Jacksonville, Florida	Major employers	1974	10 major firms
Jackson, Mississippi	Comprehensive	1971	Special City Development Study
Los Angeles, California	Comprehensive	1971	Covered 190,000 private employees

Table III-1 (continued)

Location	Type	Date	Scope
Madison, Wisconsin	Government Employees	1972	Covered 14,626 employees
Madison, Wisconsin	Government employees	1974	Follow-up Survey
New Orleans, Louisiana	NA	NA	Conducted by Regional Planning Commission as part of "Carpooling" Study
Philadelphia, Penn.	NA	1972	Resulted in Work Staggering Program involving over 39 firms and 32,000 employees
Seattle, Washington	City Employees	1974	Sponsored by City - Resulted in Staggered Hours program for some 12 organizations and 2,000 employees
Winston-Salem, N.C.	NA	1973	Conducted by telephone
Washington, D.C.	Government Employees	1963	NA - presumed of major proportions
**Riverside, Calif.	Business & government	1972	Respondents included 60 organizations and 9,500 employees
Bombay, India	All establishments	NA	Survey covered 241 of 938 establishments
Budapest, Hungary	NA	1974	Described as "representative home interview"
Jakarta, Indonesia	NA	NA	As part of comprehensive parking and cordon line survey
Karachi, Pakistan	City employees	NA	Identified work schedule of 25,000 employees
Marseilles, France	NA	NA	By Regie Autonome Des Transports (RATVM)
Paris, France	NA	1969	By Comite pour L'etude et L'amencement (CATROL)
Toronto, Ontario	All firms	1972	140 firms with over 100 employees
Singapore, Republic of Singapore	Most firms	1974	Covered 2,200 commercial and industrial organizations

Table III-1 (continued)

Location	Type	Date	Scope
Stockholm, Sweden	Most firms	1971	Part of comprehensive work day travel study (TU-71)
Vienna, Austria	Most firms	NA	Comprehensive study
Warsaw, Poland	Most firms	1970	Covered all CBD organizations with more than 200 employees

NOTE: In addition, the following cities reported having conducted a Work Schedule Survey but supplied no details:

Baltimore, Maryland	Miami, Florida
Boston, Massachusetts	New Haven, Connecticut
Canton, Ohio	Oklahoma City, Oklahoma
Little Rock, Arkansas	Hamilton, Ontario
Lincoln, Nebraska	Helsinki, Finland

*Surveys conducted by Port Authority
*Unsolicited report

a. Work Schedule Patterns

The main objective is to determine the prevailing work schedule practices followed by organizations in the area under study, usually the Central Business District (CBD). Information requested are the number of employees on separate work schedules. As an example, Exhibit III-1 shows the form used in the 1972 Midtown Manhattan WSS.

The work schedule information to be secured should include the numbers of employees on each prevailing schedule for every work location. In some cases, lunch period data may be requested. The resultant tabulation should show the number and percentage of employees on each of the separate work schedules, usually arranged by 15-minute schedule increments.

It is now possible to aggregate this work schedule data in a number of ways to examine any correlation with separate transportation congestion surveys. This will be most meaningful where large numbers of employees in several organizations are scheduled to start and/or quit at identical times and have a single or limited number of transportation points available. Work schedules are usually tabulated by total CBD response, by smaller geographic areas (such as zip code), by individual large buildings and in specific areas adjacent to major transportation facilities. Exhibit III-2 shows the distribution of starting times in Midtown Manhattan in 1972.

b. Transportation Mode Use

In many cases it is useful to request information on the commuting mode or modes used by employees. This aids in the design of Staggered Hours programs which can be effective in reducing congestion on a particular mode.

In many cities in the United States, it may be possible to trace congestion in certain transportation facilities to the work schedules of particularly large organizations. If this is the case, direct, hard-hitting approaches can be made

Exhibit III-1
Staggered Work Hours Study

WORK SCHEDULE SURVEY FORM--MIDTOWN 1972

MIDTOWN TASK FORCE ON STAGGERED WORK HOURS
STAGGERED WORK HOURS

Please complete one questionnaire for your principal location and one for each subsidiary location, if any. Do not complete a questionnaire for subsidiary locations in which a relatively small number of employees (less than 50) are located, such as bank branches, small stores, etc. Please only include locations which are between 14th Street and 59th Street in Manhattan, and immediately adjacent areas.

1. Name of Company: _____

2. Address: _____

3. Number of employees working at this location in Midtown Manhattan between 14th and 59th Streets or immediately adjacent areas: _____

4. Do all of your employees work on the same time schedule?

   Yes: _____ Schedule is: _____ a.m. to _____ p.m.

   No: _____ Go to Question #5

5. If the answer to #4 is "No", how many different schedules does your firm work? _____

   Please list approximate number of employees on each schedule:

   (a) From _____ a.m. to _____ p.m. No. of employees: _____

   (b) From _____ a.m. to _____ p.m. No. of employees: _____

   (c) From _____ a.m. to _____ p.m. No. of employees: _____

   (d) From _____ a.m. to _____ p.m. No. of employees: _____

6. Would you estimate how many of your employees live in: *

   New York City

   Manhattan _____ New Jersey _____

   Bronx _____ Rockland & Orange _____

   Queens _____ Long Island _____

   Brooklyn _____ Westchester, Putnam & Dutchess _____

   Staten Island _____ Connecticut _____

* If your firm maintains automated records of employee residences by zip code, such zip code summaries would be quite helpful.

Exhibit III-1 (continued)
Staggered Work Hours Study

WORK SCHEDULE SURVEY FORM--MIDTOWN 1972

7. If such information is readily available, would you estimate how many of your employees use the following modes of transportation for the major portion of their commuting trip? Please do not complete this question if it would require an arduous and costly firm-wide survey.

	Approximate Number of Employees
Subway	
Commuter Railroad into Grand Central Station	
Commuter Railroad into Penn Station, New York	
PATH System into 33rd Street Station	
Bus into Port Authority Bus Terminal	
Automobile into Manhattan Central Business District	
Other modes please specify	

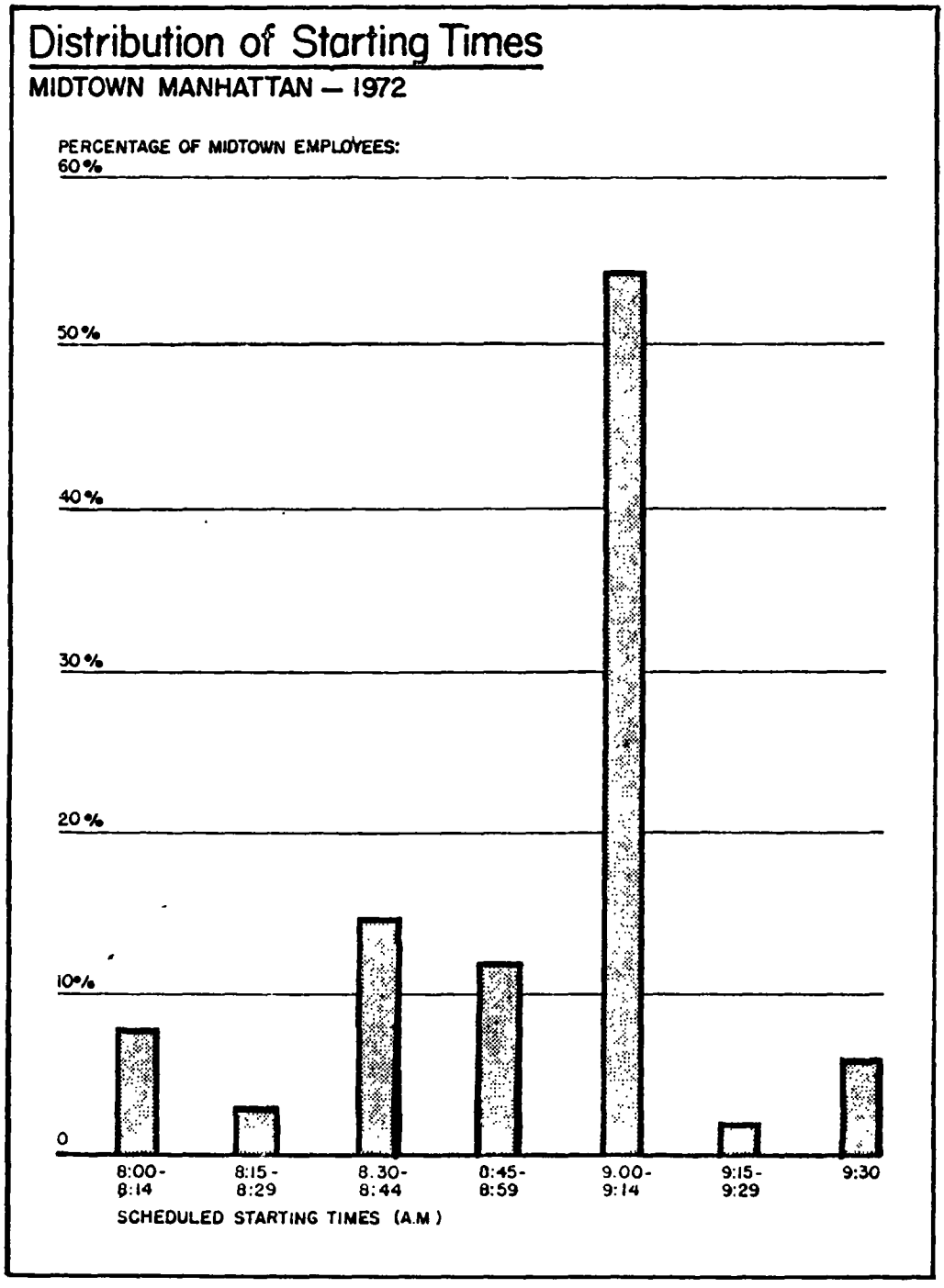
Comments: _____

Thank you very much for your cooperation in providing this information.
Please use the self-addressed envelope to return completed questionnaires to:

Gustav S. Eyssell
Chairman, Midtown Task Force on
Staggered Work Hours
630 Fifth Avenue, Suite 352
New York, New York 10020

Exhibit III-2

Staggered Work Hours Study



to the organization to change its work schedule.

Moreover, it is often desirable to array employee modal use against individual work schedules in order to determine the possible effect of a work schedule change on congestion on a specific transportation mode. For example, to reduce congestion on a certain transit line, it's helpful to know the work schedule patterns of transit riders, which might (or might not) be different than employees using other modes like automobiles. Table III-2 display the commuting mode information received with respect to Midtown Manhattan zip codes.

While transportation mode information is useful, it is difficult to secure and, when secured, constitutes only approximations. Employers often do not want to take the trouble to determine this data.

In fact, the mode of transportation used by employees was <u>not</u> asked in the first Downtown Manhattan survey (1970), as it was feared the work involved in attempting to answer this question might inhibit the overall response rate. Subsequent experience with the Midtown Manhattan and Newark surveys suggests this is not necessarily a problem. However, one chould expect a lower rate of response to questions involving modal use of employees. Table III-3 indicates that only one-third of those responding to the 1972 Midtown Manhattan WSS gave modal information.

Table III-2

Staggered Work Hours Study

MAJOR COMMUTING MODE OF MIDTOWN EMPLOYEES

Midtown Manhattan - 1972
(Numerical & Percentage Distribution)

Zip Code	Total Employee Response	Subway	Railroad to Grand Central	Railroad to Penn Station	Bus to PA Bus Terminal	PATH - 33rd St. Branch	Auto	Other Mode
10001	7,951	5,157 65%	280 4%	1,275 16%	467 6%	378 5%	300 4%	94 1%
10010	7,800	5,220 67%	310 4%	770 10%	254 3%	259 3%	264 3%	723 9%
10011	1,350	721 53%	161 12%	172 13%	71 5%	37 3%	174 13%	14 1%
10016	10,516	7,391 70%	787 7%	766 7%	707 7%	258 2%	283 3%	524 3%
10017	22,206	12,434 56%	3,817 17%	1,994 9%	1,819 8%	825 4%	485 2%	832 4%
10018	8,831	5,679 64%	687 8%	969 11%	1,037 12%	209 2%	210 2%	40 .5%
10019	8,756	6,233 71%	518 6%	504 6%	599 7%	236 3%	316 4%	350 4%
10020	11,396	6,124 54%	1,548 14%	1,333 12%	854 7%	406 4%	270 2%	861 8%
10022	13,895	8,017 58%	1,275 9%	1,228 9%	1,407 10%	468 3%	584 4%	916 7%
10036	12,432	8,686 70%	635 5%	907 7%	1,535 12%	192 2%	186 1%	291 2%
Total All Zips	105,133	65,662 62%	10,018 10%	9,918 9%	8,750 8%	3,268 3%	3,072 3%	4,645 4%

Table III-3

RESPONSE RATE TO SPECIFIC QUESTIONS

Source - 1972 Midtown Manhattan Work Schedule Survey

Nature of Question	Number of Employees Represented in Responses
General Information	295,479
Work Schedule Information	279,048
Employee Residence	231,703
Employee Mode of Transportation	106,821

c. Location of Employee Residence

Many organizations maintain detailed and readily available records of their employees' residences (in some cases by zip code area), and can easily summarize the data. Generally, the best residential breakout to request is by county for at this level a good response can be expected. As shown on Table III-3 about three quarters of those employers responding to the Midtown Manhattan WSS gave employee residential data. Exhibit III-3 shows a graphic display of residential distributions.

Knowing employee residential data, in addition to the work schedule and modal use, enables the planner to more completely define trip patterns along key travel corridors. This is important in the design of recommended work schedules as discussed in Section V of this report.

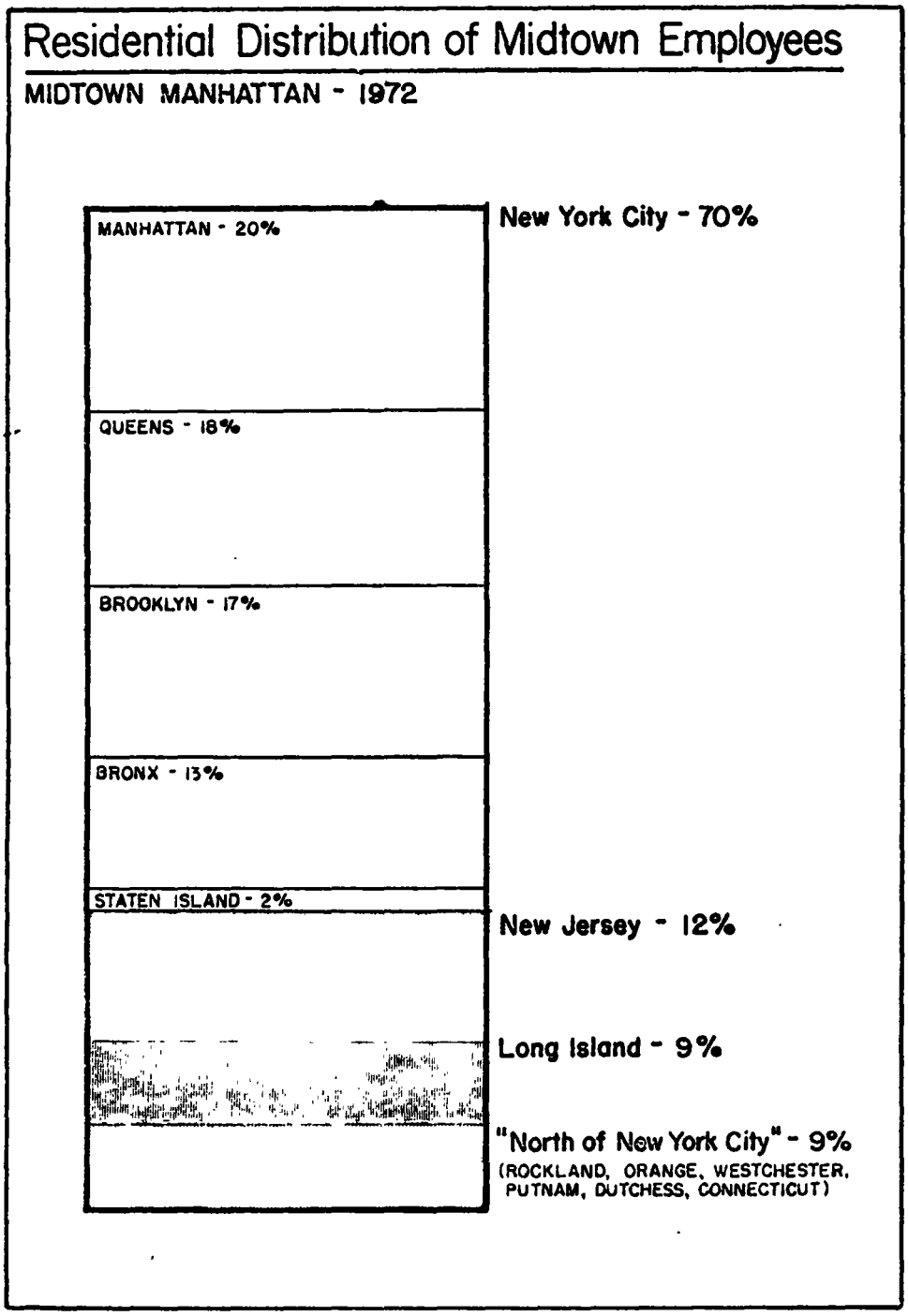
Requesting employee residence also helps the analyst to check the reliability of the Work Schedule Survey by comparing the results with such independent information as U.S. Census of Population data and any past metropolitan transportation surveys.

d. Employee Classification

The Work Schedule Survey may also permit classification of employees as, a) private business or government b) retail, manufacturing or service or c) executive or clerical. Such classifications of the data are valuable in order to determine implementation strategy, since work schedule practices may vary with respect to employee classifications (e.g., shift work, overtime, etc.)

Exhibit III-3

Staggered Work Hours Study



In many cases, a Staggered Work Hours Program in a downtown CBD is targeted to "white collar" office workers only, although efforts may also include manufacturing employees, universities and other major institutions.

e. Tabulation of Data

The completed Work Schedule Survey might include the following tabulations for each employer, employment classification and for geographic areas:

a. Start and quit times
b. Length of the work day
c. Number of separate work schedules followed
d. Lunch period practices
e. Number of employees
f. Mode and duration of travel
g. Residential distribution.

The data can also be summarized by individual office building or group of buildings, zip code or other geographic stratification to assist in pinpointing transportation areas where work staggering can reduce congestion. In addition, the Work Schedule Survey provides an opening wedge for future implementation of a Staggered Hours Program by creating initial interest and establishing a personal contact in each organization for future solicitation.

2. Sponsorship

A sponsor with considerable standing and influence in the community has to take the lead in backing a Work Schedule Survey. Well-known and prestigious organizations and individuals are necessary if adequate interest in even the first program step is to be generated. Not only must the sponsors be extremely interested in furthering a Staggered Work Hours program, but they should also be willing to share the costs involved even if this is limited to providing some clerical help. Those organizations in a position to provide extensive mailing lists of potential participants are, of course, most desirable.

In the Downtown Manhattan program, the prestigious Downtown-Lower Manhattan Association (D-LMA) was a co-sponsor. This is an effective organization composed of almost all major Downtown business firms, and therefore provided access to a large Downtown market of organizations. In Midtown Manhattan, a special "task force" composed of 26 civic and business organizations was formed, since there was no single entity deemed suitable. In addition, this Midtown Task Force on Staggered Work Hours enabled the project to obtain and combine the mailing lists from all organizations. The WSS for Downtown Newark, N.J., was sponsored by the Greater Newark Chamber of Commerce. For John F. Kennedy International Airport, the Port Authority as "landlord" headed up the effort. In Atlanta, the Georgia State Highway Department spearheaded the program.

In the cases where special "task forces" are set up, a prominent business or civic leader should be named Chairman. Thus the Midtown Manhattan Task Force was originally headed by Gustav S. Eysell, former President of Rockefeller Center and is now led by Andrew Heiskell, Chairman of Time Incorporated. Downtown, where the D-LMA co-sponsored the program, its Executive Vice President, John B. Goodman, took the active role with occasional correspondence coming from its former President, Edmund F. Wagner, a noted realtor, or David Rockefeller, its chairman. It is, of course, necessary to have someone specifically responsible for all of the program details ranging from mailing lists to tabulations and analytical reports as well as publicity. In the New York/New Jersey area, the Port Authority assumed this role and provided a project manager and staff.

3. Conduct of Survey

a. Mailing List

With an enthusiastic sponsor(s) and appropriate staff, it is possible to prepare the basic Work Schedule Survey. First, however, all individuals and organizations involved must cooperate in the development of an extensive mailing list. Wherever possible, the list should include the name of the person in each organization who is most likely to be able to assure the compilation of the data. This is usually the President or the Personnel Director, or may be the sponsoring agency's regular contact. Generally, the higher the initial level reached in an organization, the better the response. In any case, all Work Schedule Surveys should solicit the name and phone number of an individual, generally on the working level, who can be contacted for further detail and future communication.

b Survey Questionnaire

A "model" questionnaire for a Work Schedule Survey has been developed and is shown in Exhibit III-4. (It is also included in Volume III, the "Staggered Work Hours Manual."). This form is designed to secure basic data from organizations including the number of employees on various work schedules, the distribution of employee residences and commuting mode as well as a contact in the organization. Samples of survey forms used in all the Work Schedule Surveys conducted by project staff are included in the Appendix - Volume IV.

c. Transmittal Letter

The letter transmitting the questionnaire should be sent over the signature of the most influential person on the task force or in the sponsoring agency and contain a personal plea for cooperation in completing and returning the survey by a certain prescribed date:

d. Questionnaire Distribution

The questionnaire and transmittal letter should be mailed in as attractive manner as possible, to insure prompt, serious consideration. It must not allowed to be regarded as "junk mail".

Exhibit III-4
Staggered Work Hours Study
MODEL WORK SCHEDULE SURVEY FORM

Date: _____

MANHATTAN STAGGERED WORK HOURS PROGRAM

Please complete one questionnaire for your principal location and one for each subsidiary location, if any. Do not complete a questionnaire for subsidiary locations in which a relatively small number of employees (less than 50) are located, such as bank branches, small stores, etc. Please only include locations which are south of 60th Street in Manhattan, river-to-river.

1. Name of Organization: _____

2. Address: _____

3. Type of Business or Governmental Unit: _____

4. Staggered Work Hours Liaison:

   Name: _____

   Title: _____

   Phone: _____

5. Number of employees working at this location: _____

6. Do all of your employees work on the same time schedule?

   Yes: _____ Schedule is: _____a.m. to _____p.m.

   No: _____ Go to Question #7

7. If the answer to #6 is "No", how many different schedules does your firm work? _____

   Please list approximate number of employees on each schedule:

   (a) From _____a.m. to _____p.m. No. of employees: _____

   (b) From _____a.m. to _____p.m. No. of employees: _____

   (c) From _____a.m. to _____p.m. No. of employees: _____

   (d) From _____a.m. to _____p.m. No. of employees: _____

8. Would you estimate how many of your employees live in:*

   New York City

   Manhattan _____ New Jersey _____

   Bronx _____ Rockland & Orange _____

   Queens _____ Long Island _____

   Brooklyn _____ Westchester, Putnam & Dutchess _____

   Staten Island _____ Connecticut _____

*If your firm maintains records of employee residences by zip code, such zip code summaries would be quite helpful.

Exhibit III-4 (continued)
Staggered Work Hours Study
MODEL WORK SCHEDULE SURVEY FORM

9. If such information is readily available, would you estimate how many of your employees use the following modes of transportation for the major portion of their commuting trip? Please do not complete this question if it would require an arduous and costly firm-wide survey.

	Approximate Number of Employees
Subway	_____
Commuter Railroad into Grand Central Station	_____
Commuter Railroad into Penn Station, New York	_____
PATH	_____
Bus into Port Authority Bus Terminal	_____
Automobile into Manhattan Central Business District	_____
Other modes (please specify)	_____

_____

Comments: _____

_____

_____

_____

Thank you very much for your cooperation in providing this information. Please return completed questionnaires to:

Staggered Work Hours Program
The Port Authority of NY & NJ
One World Trade Center
Suite 72E
New York, New York 10048

For example, attractive letterhead and envelopes should be used, first class mail employed, a business reply envelope included and, if possible, letters and envelopes should be "original typed" (either manually or automatically). The more personalized the survey, the better will be the return. A shoddy-looking survey will undermine the ability to elicit a good return of information from the public and private sectors.

Work Schedule Surveys can also be conducted verbally either over the telephone or by personal contact. The latter method, involving substantial amounts of travel, is time consuming and consequently not recommended unless it can be predetermined that only a limited number of contacts are required. Both methods, most specifically telephone contact, run the risk that much important information be overlooked, particularly if it is not readily available at the time of contact. In any event, a comprehensive questionnaire should be at the hand of the interviewer to avoid any oversight and to facilitate follow-up on unanswered questions.

e. Follow-Up

A certain degree of follow-up should be employed to insure an adequate return of the survey. This follow-up can take a number of methods: 1) a second letter - - with another survey form attached -- to those not responding a week or two after the requested due date. 2) selected phone calls to major employers not responding, and/or 3) publicity in the media to initially spur returns and to follow-up any laggard responses.

f. Tabulate Results

Results of the WSS should be tabulated as quickly as possible. Depending upon the size and scope of the survey, either electronic data processing or manual methods can be employed to determine various patterns discussed earlier in this section. Tabulation of data should be undertaken soon after the "due date" for responses, since late returns can usually be easily added to earlier tabulations.

g. Validate Results

To insure the validity of the survey returns, a number of investigations should be undertaken. These may include statistical or non-statistical comparisons with other existing data such as CBD employment, population, mode use, U.S. Census of Population and Chamber of Commerce records. While this validation is important to assure that the WSS returns are truly representative of the entire community as a whole, there is usually little doubt that the data received from each of the individual organizations is valid for that organization. Table III-4 shows such a examination comparing survey returns for Midtown Manhattan. The analysis took into account the changing trends apparent during the decade between the two surveys.

h. Publicity

It is helpful to publicize the results of the WSS, particularly if those results indicate that a Staggered Work Hours program may be desirable. Publicity can be through a combination of media placements as well as distributing copies of a WSS report to participating organizations.

i. Recommendation for Work Schedule Changes

The data gleaned from individual organizations in the WSS will be of enormous help in designing work schedule recommendations if a Staggered Work Hours effort is undertaken. This procedure is discussed more fully in Section V of this volume. Suffice to say here that the WSS information available allows personalized work schedule recommendations to be made, rather than simply resorting to an overall blanket call for revised schedules.

j. Follow-Up of Schedule Changes

As work schedule changes are effected in the course of a Staggered Hours Program, efforts should be made to update the changes in the original WSS tabulations. This will ensure that the project sponsor has the latest information on the status of overall work schedules at their disposal.

Table III-4

Staggered Work Hours Study

RESIDENTIAL DISTRIBUTION OF MIDTOWN EMPLOYEES
Journey-to-Work Survey (1961) vs. Work Schedule Survey (1972)

	Journey-to-Work Survey (1961)	Work Schedule Survey (1972)
• NEW YORK CITY	81.3%	69.8%
Bronx	15.0	13.3
Brooklyn	16.2	16.6
Manhattan	32.2	20.4
Queens	17.0	17.9
Staten Island	0.9	1.6
• EAST OF NYC (LI)	6.7%	8.6%
Nassau	5.8	-
Suffolk	0.9	-
• WEST OF NYC (NJ)	7.4%	12.3%
New Jersey	-	12.3
Bergen	2.9	-
Essex	0.9	-
Hudson	1.6	-
Mercer-Morris-Passaic-Somerset	0.7	-
Middlesex-Monmouth	0.7	-
Union	0.6	-
• NORTH OF NYC	4.7%	9.1%
Fairfield (Conn.)	0.8	3.0[1]
Orange-Rockland-Putnam-Dutchess-Westchester	3.9[2]	6.1[3]
	100.1%[4]	99.8%[4]

NOTES:

[1] Work Schedule Survey had listing for "Connecticut", which no doubt consists almost entirely of Fairfield County residents.

[2] Journey-To-Work breakout: Westchester, 3.6%; Orange-Rockland-Putnam-Dutchess, 0.3%.

[3] Work Schedule Survey breakout: Westchester-Putnam-Dutchess, 5.0%; Orange-Rockland, 1.1%.

[4] Due to rounding, totals do not add to exactly 100%.

4. Case Studies of Work Schedule Surveys

The Port Authority has participated either directly or as an advisor in numerous Work Schedule Surveys since its experimental "in-house" program in 1969. In addition, other cities have also undertaken similar surveys, most notably: Toronto, Philadelphia, Riverside, California, Los Angeles, Madison, Wisconsin, Bombay, Singapore, Warsaw and Atlanta. A brief case study discussion of many of these efforts follow.

a. Downtown Manhattan (Two Surveys: 1969 & 1974)

The Downtown-Lower Manhattan Association (D-LMA) and the Port Authority conducted a survey in 1970 to determine the work hour scheduling practices of firms in lower Manhattan and the extent to which the starting and quitting hours were staggered. The Association had, for many years, advanced the concept of Staggered Work Hours as a possible means of relieving peak hour congestion on transportation facilities in lower Manhattan, an area of concentrated employment. In fact, in a report issued in 1961 entitled "A Study of Travel Patterns," D-LMA recommended that its members actively explore the feasibility of staggered hours. Since that time, it was understood that some lower Manhattan firms had adopted revised starting and quitting schedules, but the magnitude of the changes was not known.

1969 Survey

In 1969, a Work Schedule Survey questionnaire was prepared and distributed by the President of D-LMA to all member firms. The questionnaire solicited information on the total number of employees, the work schedules followed, the place of residence of employees and an appraisal of elevator service in buildings. Some 113 firms, representing about 136,000 employees, responded to the survey. This constituted roughly 70% of D-LMA's membership. Although D-LMA's member roster listed 158 firms, the 113 firms who responded included all of those members which could be classified as major downtown employers. The firms that responded were located principally in three postal zones, all in eastern lower Manhattan. More than 116,000 of the 136,000 employees worked in these easterly zones, while the balance of 19,000 employees were located in the three more westerly zones.

The survey found that in this congested area there was a high concentration on the 9-to-5 schedules: 66% were scheduled to start at 9:00 AM, and 64% quit work at 5:00 PM. The results of the survey therefore showed that a Staggered Work Hours system had not been adopted to any considerable extent by the Lower Manhattan firms even though they had been urged to do so by the D-LMA as early as 1961.

The total number of employees included in the survey responses was 136,045. Of these, 84.5% begin work between 8:00 and 9:29 A.M., with 82.5% quitting between 4:00 and 5:29 P.M. Notable in one zone with a large concentration of banking and securities firms, was that 75% of the employees were on 9-to5.

Reflecting D-LMA's membership and the nature of activities in lower Manhattan, the bulk of the employers responding were from the Finance, Insurance and Real Estate Industries (Standard Industrial Classification - SIC, Numbers 60-69). This grouping, with its total employment of 95,920 in 89 firms, represented 62.2% of the total firm responses and 70.5% of total employment. Within grouping, the Banking Industry was the largest employer with 40.5% of the D-LMA total. The second largest employer was the Securities Industry, which had 20.3% of the total. Combined, these two industries accounted for some 61% of the total D-LMA employees surveyed.

Because of the proportionately large numbers of banking and securities employees represented in the survey, and the likelihood that a typical employee from these firms started at 9:00 A.M. and quit at 5:00 P.M., the influence of these two groups weighed heavily in the overall survey findings. Some 78% of the banking and securities employees started at 9:00 A.M. while the comparable all-industry figure was 66%. About 76% of the employees of these two groups quit at 5:00 P.M. compared to 64% from the overall survey population. It was obvious then, that these industries provided the best chances of success in a Staggered Work Hours Program.

This type of strategic planning is further discussed in Section V of this report on "Design Procedures."

1974 Survey

Although the 1969 Downtown Manhattan Work Schedule Survey and subsequent effort to implement a Staggered Work Hour Program was considered highly successful, it was decided to attempt, in 1974, a further "second stage" increase in the number of employee SWH participants. The goal established an increase in participants from 100,000 to approximately 125,000.

The strategy employed for the 1974 campaign was to identify and switch firms still on 9:00-to-5:00 to earlier and/or later hours and, in addition enlarge the level of participation of many firms already on Staggered Hours but which still had significant numbers of employees on 9:00-to-5:00. In order to prepare the way for this program, a second survey of work schedule practices was conducted. This survey, as in 1969, was mailed to the membership of the Downtown-Lower Manhattan Association over the signature of its President, Edmund F. Wagner.

In response to the survey 179 firms with 137,906 employees furnished data. This represented some 66 more firms than in 1969, but about the same number of employees. They were classified into prospect target groups for ease in promoting the Lower Manhattan program, and allowed for formulating industry work profiles and special meetings with firms with a high percentage of employees working the 9:00-to-5:00 schedule.

While this second survey indicated the significant participation in Staggered Hours by many firms since 1969, it also revealed organizations still on 9:00-to-5:00. The data collected permitted the program sponsors to establish a calendar of activities for contact with the major firms and industries which were not staggering their hours. It also identified specific major firms to which direct personal

contact would be made urging implementation of a staggering program.

b. Midtown Manhattan (1972)

In the Midtown Manhattan Work Schedule Survey, conducted in 1972, information representing the work schedules, residences and travel habits of almost 300,000 men and women from 1,450 private firms and public agencies was accumulated. This represented about one-fifth of total Midtown employment. The results indicated that about 54% of Midtown employees were scheduled to start at 9:00 AM and quit at 5:00 PM. In contrast, only 15% began at 8:30 AM, the next most preferred starting time.

The Midtown WSS was the most comprehensive of those performed by the Port Authority. It was conducted by mailing questionnaires to all member firms of the 26 business, civic and trade organizations represented in the "Midtown Task Force on Staggered Work Hours", an organization specifically set up for the purpose of communicating with the business community relative to schedule staggering. The questionnaire requested specific information on the total number of employees in each firm's Midtown office, current work schedules, residential distribution, and "major mode" of transportation to work. (The questionnaire is Exhibit III-1).

Of the 2,800 questionnaires mailed, 1,450 were returned, of which 1,192 qualified as "Midtown" on the basis of geographic location. The returns represented a sample size of about 300,000 Midtown employees, or about 20% of the approximately 1.5 million persons employed there according to Employment Security Data compiled by New York State.

The questionnaires were returned by mail to the offices of the Port Authority, which provided staff support for the project including coding, key punching, and electronic data processing of the information.

The survey showed that:

- 54% of Midtown employees were scheduled to begin work at 9 AM and 48% were scheduled to quit work at 5 PM. This concentration of starting and quitting times was largely responsible for intense commuting congestion around these times.

- On a Zip Code basis, the largest adherence to 9 AM scheduled work starts was 76% in one Zip Code (10020 - - Rockefeller Center) while the highest percentage at one quitting time was in another Zip Code where 68% of the men and women were scheduled to finish at 5 PM.

- 70% of Midtown employees lived within the boundaries of New York City. The highest number lived in Manhattan (20%), followed closely by Queens (18%), Brooklyn (17%), and the Bronx (13%). New Jersey residents accounted for 12% of total Midtown employees.

- Subways were the "principal" mode of transportation for some 62% of Midtown employees (more also ride the subway in addition to their principal trip by commuter railroad, bus or auto).

- Of some 1,192 firms representing about 300,000 employees analyzed in the Work Schedule Survey, the largest 100 firms alone accounted for about 200,000 employees.

- Two-thirds of the largest firms surveyed operated on two or more work schedules.

c. World Trade Center (1972 and 1974)

The World Trade Center constitutes one of the largest concentration of employees in the Downtown Manhattan area. When fully occupied it is estimated that there will be some 50,000 employees in the Center each working day. These people will be employed by government agencies including the State of New York, the Federal Government and the Port Authority and by numerous private firms engaged in international trade. With this concentration of employment, special surveys of work schedule practices were conducted within the Trade Center during 1972 and 1974.

As previously discussed, the Port Authority headquarters staff, in the Trade Center had been on a variety of staggered work hours schedules since 1969. The State of New York, with some 8,500 employees in the Trade Center, has 3,100 on various Staggered Hours Schedules with the balance (5,400) working 8:30-to-5:00. The United States Customs House, which is part of the Trade Center complex, has shifted its 2,500 employees from a 8:30-to-5:00 schedule to a 8:00-to-4:30 schedule.

Two surveys of only private World Trade Center tenants was issued over the signature of Guy Tozzoli, Director of the Port Authority's World Trade Department. The 1972 survey identified some 3,570 employees who are scheduled to work 9:00-to-5:00 each day. These employees belong to private firms having 50 or more employees. The second survey in 1974 overlapping the previous one somewhat, identified firms where employment totaled over 4,000 people all working 9:00-to-5:00. As a result of the surveys, the larger firms are being urged to stagger their hours.

d. Consulting Engineers and Advertising Agencies in Manhattan (1973)

Separate work schedule surveys were conducted of advertising agencies and consulting engineers in Manhattan to ensure complete understanding of their work schedule practices. These two industries had not been represented on the member list of the 26 sponsoring "Midtown Task Force" associations and accordingly were not well representated in the solicitation effort.

Conducting the surveys was worthwhile as it revealed the variety of scheduling practices which may exist from industry to industry. Consulting engineers, in most cases, still work longer "engineers" hours (e.g., 9:00-to-5:30). Advertising agencies, were not on a nominal 9-to-5, tended towards later hours in many instances (e.g., 9:15-to-5:15 and 9:30-to-5:30). Exhibit III-4 shows the distribution of scheduled starting and quitting times for 17 Manhattan ad agencies. The survey also provided a means to initiate communications with many firms not already contacted.

e. Downtown Newark, New Jersey (1974)

In order to determine whether a Staggered Work Hours Program would reduce peak demands on transportation services in Downtown Newark, New Jersey's largest city, a work Schedule Survey was conducted in the Spring of 1974. The Downtown survey was sponsored by the Greater Newark Chamber of Commerce, which represents some 2,500 organizations in Newark and the surrounding area.

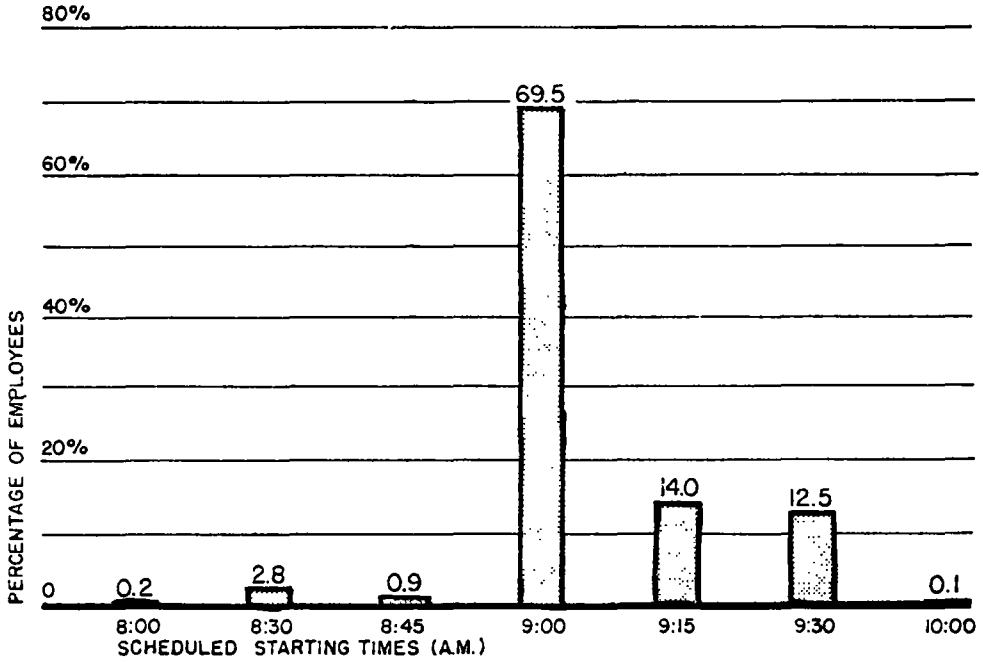
The Work Schedule Survey was conducted by sending questionnaires to member organizations of the Chamber. The questionnaire requested information for each member's Downtown Newark office regarding total employment, work schedules, residence distribution, and all "major" modes of employee transportation to and from work. Out of the 2,000 questionnaires mailed, 123 were returned of which 66 organizations employed 30,798 persons representing a good sample of about 36.2% of some 85,000 persons working in Downtown Newark. Some survey highlights were:

Exhibit III-5
Staggered Work Hours Study

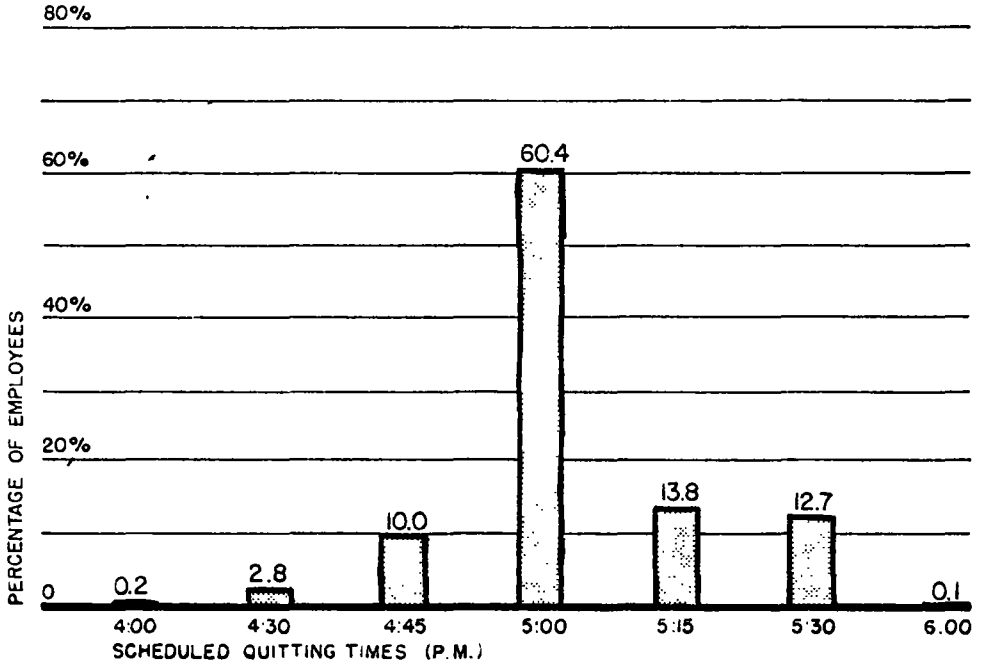
Distribution of Starting and Quitting Times

MANHATTAN ADVERTISING AGENCIES
DECEMBER, 1973 - SAMPLE OF 10,549 EMPLOYEES IN 17 AGENCIES

• STARTING TIMES



• QUITTING TIMES



43.8% of Downtown Newark employees are scheduled to begin work about 8:30 A.M., double those who start at the next-most-common time of 8:00 A.M.,

Some 41.2% leave work about 4:30 P.M., again more than double those scheduled to leave work at 4:00 P.M., second in popularity.

The residential distribution of the Downtown Newark employees indicated that over half live in Essex County while some 23.1% resided in the City of Newark.

Public transportation is used by two-thirds of the Downtown Newark employees. Of the 34.3% who use private autos as their "major" commuting mode, about 1/3 are in car pools.

f. John F. Kennedy International Airport (1972)

John F. Kennedy International Airport, one of the world's largest airports, is operated by the Port Authority under a long-term lease with the City of New York. In 1972 the facility handled over 20 million passengers and had a total employee population of 41,000. Unfortunately, many of the employees ended their work day at a time which coincided with the hours of peak commuter traffic on the peripheral roads and airline passenger traffic. It was therefore deemed desirable to try to stagger work hours in order to ease the congested traffic conditions on access roads to the airport.

In 1972, the Port Authority organized a task force composed of ten tenants which employed some 75% of the airport's work force. Based upon work scheduled data acquired by the Port Authority, the task force recommended that the start time of some 4,800 employees in five shifts to be advanced by 30 to 60 minutes. The concomitant start time was also advanced.

By 1973 over 1,800 employees had shifted their work schedule and a questionnaire was mailed to about 1,200 of these to determine their attitude on their time change, as well as on their travel time and use of carpools.

g. New York City (1975)

New York Mayor Abraham Beame formed a special task force in 1975 to increase the concept of Staggered Hours among City employees. The task force is headed by H. Claude Shostal, Director of the Office of Lower Manhattan Development, and comprises in the first stage the administrators of five major "super agencies".

A work schedule survey was conducted among these agencies to determine the numbers, locations and scheduled work hours of City employees in their Lower Manhattan offices. These agencies comprised the target group for a six-month Staggered Work Hours experiment, which is being expanded to embrace additional city agencies.

A total of 9,237 City employees were represented in the 1975 survey covering the five agencies. Of these, some 58% were concentrated on a 9-to-5 schedule, more than double those on the next-most-popular schedule of 8:30-to-4:30. There were also significant numbers of employees on 8-to-4 and 9:30-to-5:30 schedules.

As a result of the work schedule survey, recommendations were made to shift almost 5,000 employees off of their 9-to-5 work schedule.

h. Other Cities Experience

As part of this Technical Study, a major State-of-the-Art survey was conducted relative to Staggered Work Hour Programs. Among the questions asked in the survey, fully discussed in Section I, was the following:

> "Has there ever been a survey of employers in your CBD to determine their specific work schedule practices? (If "yes" we would appreciate your attaching information about that survey)"

Of the United States cities responding, 19% advised that they had conducted such a survey of employers to determine work schedule practices. One-third of foreign cities responding, in spite of a request for any additional survey details, the scope of the replies were not as comprehensive as desired. Several cities reported a major study of work schedule practices as a forerunner of staggered work scheduling programs. On the other hand, many indicated that their knowledge of work schedule practices was basically limited to observing prevailing bus schedules. In addition, others reported the work schedule was coincident with times of congestion reflected in traffic counts.

Notes on other city programs follow:

ATLANTA, GEORGIA - - Noting that information on working schedules is essential in determining the feasibility of a Staggered Hours Plan, a detailed Staggered Hours Survey was conducted by consultant Wilbur Smith & Associates for the State Highway Department of Georgia. Cooperating were the U.S. Department of Transportation, the City of Atlanta, Fulton County, Dekalb County and the Atlanta Chamber of Commerce. The Work Schedule Survey was conducted in August, 1968, by a mailing to each Metropolitan Area employer with 300 or more employees or those classified by the Atlanta Chamber of Commerce as a major employer. The questionnaire among other items solicited specific information regarding total company employment, number of employees, scheduled work start and quit times at each location. The data was then compiled by a series of "Metropolitan Area Analysis Sectors and Zones." The data was also further categorized by many types of employment.

A separate survey of the Atlanta Area by the Chamber of Commerce received work schedule data for 76 governmental agencies and 118 business firms.

Analysis of the returns for the Atlanta CBD indicated that some 56.3% of the employees are scheduled to start work between 8:00 and 8:30 AM, while 54.3% of the employees in the CBD stop work between 4:30 and 5:00 PM.

Subsequently an in-depth questioning of 28,254 employees, representing 17 of the largest employers as well as 37 government agencies was undertaken. Partially as a result of this effort, along with detailed vehicular traffic counts, it was decided to study various alternatives for staggering work hours. It is reported, however, that the Staggered Hour Plan recommended was not carried out because of employee resistance and lack of support. Thus, a formal program of Staggered Work Hours is not in effect in Atlanta.

BALTIMORE, MARYLAND - - Baltimore reported a comprehensive work schedule survey that was undertaken in connection with "Computeride." Computeride is a car pool encouragement program designed to serve the employees with better and less expensive transportation. Baltimore reported that congestion was caused as over 27% of the employees in the CBD drive alone in their cars to work.

BOSTON, MASSACHUSETTS - - While there has been no citywide nor formal survey of work scheduling practices, both the John Hancock Mutual Life Insurance Company and The Prudential Insurance Company of America conducted surveys of work schedules by their department heads and also solicited employee work hour preferences. It should be noted that within the individual company it is fairly easy to obtain work schedule practices. Changes in such schedules normally would come under the direction of management. The City of Boston itself reported that a staggered hour program is under consideration.

CHICAGO, ILLINOIS - - In the spring of 1974, government agencies and member firms of the Commerce and Industry Association, located in the Central Business District, were surveyed in connection with a proposed study to consider a Staggered Work Hours Program. Interestingly, the mailing which was on the

letterhead of the Chicago Association of Commerce and Industry, although a joint committee spearheaded the effort, referred to the successful New York Staggered Hours Programs. It was stated that New York employers have recognized the advantages and have changed the traditional 9-to-5 pattern of working hours for a substantial percentage of employees. As with most successful programs it was noted that the first step in any possible work staggering program is to identify the existing patterns of work schedules.

Chicago furnished graphs depicting the results of its WSS. These indicate that some 79,000 employees were covered in the survey. 64,000 employees (81%) start work between 8 AM and 8:45 AM. The three quarter-hour periods covered are almost uniform i.e. 22,000, 17,500, and 24,500 respectively. In the evening the same 64,000 depart for home between 4:30 and 5:15 PM. Here, the fifteen-minute peaks rise from 18,000 to 25,000. No formal Staggered Work Hours Program has commenced in Chicago to date.

JACKSON, MISSISSIPPI - - A comprehensive survey of travel habits, entitled "Express Transit Survey", was forwarded by Jackson, Mississippi. The survey included the place of employment, the method of getting to work, the average travel time and scheduled start and quit times. Interestingly, of some 3,663 persons who answered the survey, 57% arrive at work at 8:00 AM and 54% quit work at 5:00 PM. The questionnaire also asked whether the person returned home for lunch, how much they paid to park in the downtown area and whether they would consider riding an express bus and leaving their automobile at a central parking lot. The response to this latter question was "yes" for 51% of the respondents.

LOS ANGELES, CALIFORNIA - - In Los Angeles a standing committee exists is concerned with traffic and off-street parking problems. At the request of this committee, the City administrative officer made a survey in 1972 and reported on work hours of governmental and private businesses in the downtown area. While State of California employees work various hours, including the 4-day week, and the Federal government employees work different hours generally staggered between 7 AM to 5 PM, most private employers work a more normal shift. Some 54% started work at 8 AM and 49% left the job at 4:30 PM. In view of the current staggering of hours, as reported, it was concluded that any work staggering program should be voluntary.

MADISON, WISCONSIN - - The Work Schedule Survey in Madison was conducted by the Madison Area Transportation Study in cooperation with the Wisconsin State Department of Administration. It was desired to obtain parking and travel patterns of state, county and city employees in the Madison area. The survey was very comprehensive and requested not only the employer but the place of employment, the length of travel time, designated working hours and the mode of transportation.

NEW ORLEANS, LOUISIANA - - A Work Schedule Survey was conducted in New Orleans as part of a car pooling study. This study was conducted by the Regional Planning Commission. Details were not available at the time of the State-Of-The-Art Survey.

ROCHESTER, NEW YORK - - While there has been no formal survey of work scheduling practices, an analysis was made of the characteristics and use of the so-called inventory transit system. Prepared by the New York State Department of Transportation, this study analyzed transit and auto operation and illustrates the early morning peak and the late afternoon peak. It is assumed that this peaking is the result of work schedule practices. The Rochester Metropolitan Transportation Study has solicited the opinion of

citizens in Rochester and Monroe County as to ways and means of improving access to the area. This included questions on improvements as well as transportation used, reasons for journey-to-work and sociological economic data.

RIVERSIDE, CALIFORNIA - - While Riverside was not requested to prepare a questionnaire, the respondent to the State-Of-The-Art Survey for Sacramento, California suggested we obtain details about Riverside's Staggered Hours Program kicked off in August, 1972. Questionnaires requesting pertinent work schedules information were sent then to business and governmental agencies. The replies to the questionnaire were received from more than 60 employers of 9,500 people, 6,300 of whom worked in the downtown Riverside area. Some 3,450 people stated that they would voluntarily change work hours if requested. In addition, Riverside City College indicated that it would be possible to stagger morning classes.

WASHINGTON, D.C. - - The Federal Government's General Services Administration (GSA) coordinates the work schedules of Federal employees in GSA buildings. This effort covers some 200,000 employees, or somewhat more than half of all Federal employees in Washington and its suburbs.

Work schedules vary substantially for Washington employees but the predominant quit time is between 4:30 and 5:30 PM. Review of a 1974 GSA study appears to indicate that in Downtown, and in the new Southwest area, work schedules are reasonably equally divided. Scheduled quit times are somewhat uniform for five fifteen minute times during 4:30-to-5:30, inclusive. The approximate numbers of Federal employees scheduled to quit at these times are, respectively, 16,000, 23,000, 24,000, 17,000 and 22,000.

The rest of the District of Columbia appears to concentrate at a 4:30 PM quit time with relatively few Federal employees leaving work at other

hours except for those outside the 3:30-6:15 PM periods. Generally, Federal employees in the Maryland suburbs concentrate at 5:00 PM and secondarily at 4:30 and 4:45 PM. Pentagon employees leave work uniformily at 4:30, 4:45 and 5:00 PM.

BOMBAY, INDIA - - Bombay reports that 241 of 938 establishments in the city were surveyed as to work schedule practices. It is further noted that congestion is not necessarily the result of work schedules but may be the result of over-concentration of work places in close-in areas.

SINGAPORE, REPUBLIC OF SINGAPORE - - Singapore started its Staggered Staggered Work Hours program with a Work Schedule Survey in August, 1974. Questionnaires were mailed to some 2,200 commercial and industrial establishments, and 1,400 of these establishments responded to the questionnaire.

The data revealed considerable bunching together of starting times. In the CBD over 9,000 and 8,000 workers started to work at 8:30 AM and 9 AM respectively. In the Jurong area, over 4,000 started at 7 AM and over 14,000 at 8 AM with 3,000 at 8:30 AM. This contrasted to about 400 at other times of the day. After new starting times were allocated on the basis of the survey, a public meeting was held in October, 1974. The Minister for Communications introduced the scheme to leading executives at this meeting. The establishments were then sent letters requesting them to adopt the new times and to send back the times of their new starting times and number of workers affected.

STOCKHOLM, SWEDEN - - Stockholm provided a copy of their study, "TU-71", which is more commonly known as the Stockholm Area Transportation Study. It started in 1971 and the report was issued in 1972. When finally completed TU-71 will consist of several transport investigations and

include home interviews, population surveys, cordon counts, travel time surveys, and other data. The section on working hours shows the distribution of starting time on a 24-hour basis and the peak periods within the start of working hours. It is provided for four different working districts.

D. RECOMMENDATIONS

The following are recommendations regarding the Work Schedule Survey technique.

1. Conducting a formal Work Schedule Survey is recommended when there is a desire to determine definitively if prevailing work schedule patterns are correlated with and, indeed, contribute significantly to peak period congestion which may exist on transportation facilities. It is a survey technique which will elicit information from the public and private sectors in a fashion which will be usable on a small organizational scale or for an overall urban area.

2. When conducting a Work Schedule Survey, there are several keys to insuring a good sample return as well as usable information. Specifically. there is the need for effective sponsorship, persistent follow up of the survey itself, and the soliciting of a contact in the organization who will be responsible for completing the survey form and will be the person for future contact with that organization.

Chapter IV

Comparative Evaluation of Work Schedule Concepts

IV. COMPARATIVE EVALUATION OF WORK SCHEDULE CONCEPTS

A. OBJECTIVES

The objectives of this section are to compare and analyze three of the most common concepts of work scheduling changes: 1) Staggered Work Hours, 2) "Flexible" or "Gliding" Work Hours and 3) the Four-Day or Shortened Work Week. This section will define each of these concepts, review their present status, and compare their impacts on transportation systems, attitudes, organizational operations, and other relevant aspects of the urban and business community.

B. WORK PERFORMED

The analysis herein is based primarily on:

a) a comparative evaluation of extensive Port Authority staff experiences with Staggered Work Hours, Flexible Work Hours, and the Four-Day Week including many transportation and attitude surveys, and personal interviews,

b) review of reports and information exchanges with other organizations using each of these concepts both in this country and Europe, and

c) examination of literature in the field.

C. ANALYSIS

The format of this analysis is to present an evaluation of each of the three work schedule concepts separately and then summarize and compare them in a concluding section.

The concepts of Staggered Work Hours, Flexible Work Hours and the Shortened or Four-Day Week will each be defined, current practice discussed as well as their impacts on transportation, attitudes and office operations. The discussion on Staggered Hours will be rather brief in some areas since more extensive treatment is given elsewhere in this report. Flexible Work Hours will be given much attention because the Port Authority conducted a special staff experiment under this Technical Study.

1. Staggered Work Hours

a. Definition and Current Practice - Staggered Work Hours involves shifting fixed standard five-day work schedules onto earlier and/or later time periods without changing the length of the workday. Staggered Hours still requires employees to be at work by a specified time and leave at a specified time. The aim of a Staggered Hours program in an urban area is to spread out the concentrated work schedules to earlier or later than a single predominant schedule in order to relieve transportation congestion and thereby make commuting to and from work more comfortable. On an individual organization level, Staggered Hours may be established to relieve elevator congestion, to expand the hours of business coverage and/or to improve employee attitudes toward their work. Some common variations of Staggered Schedules for an 8-hour day are shown in Exhibit IV-1.

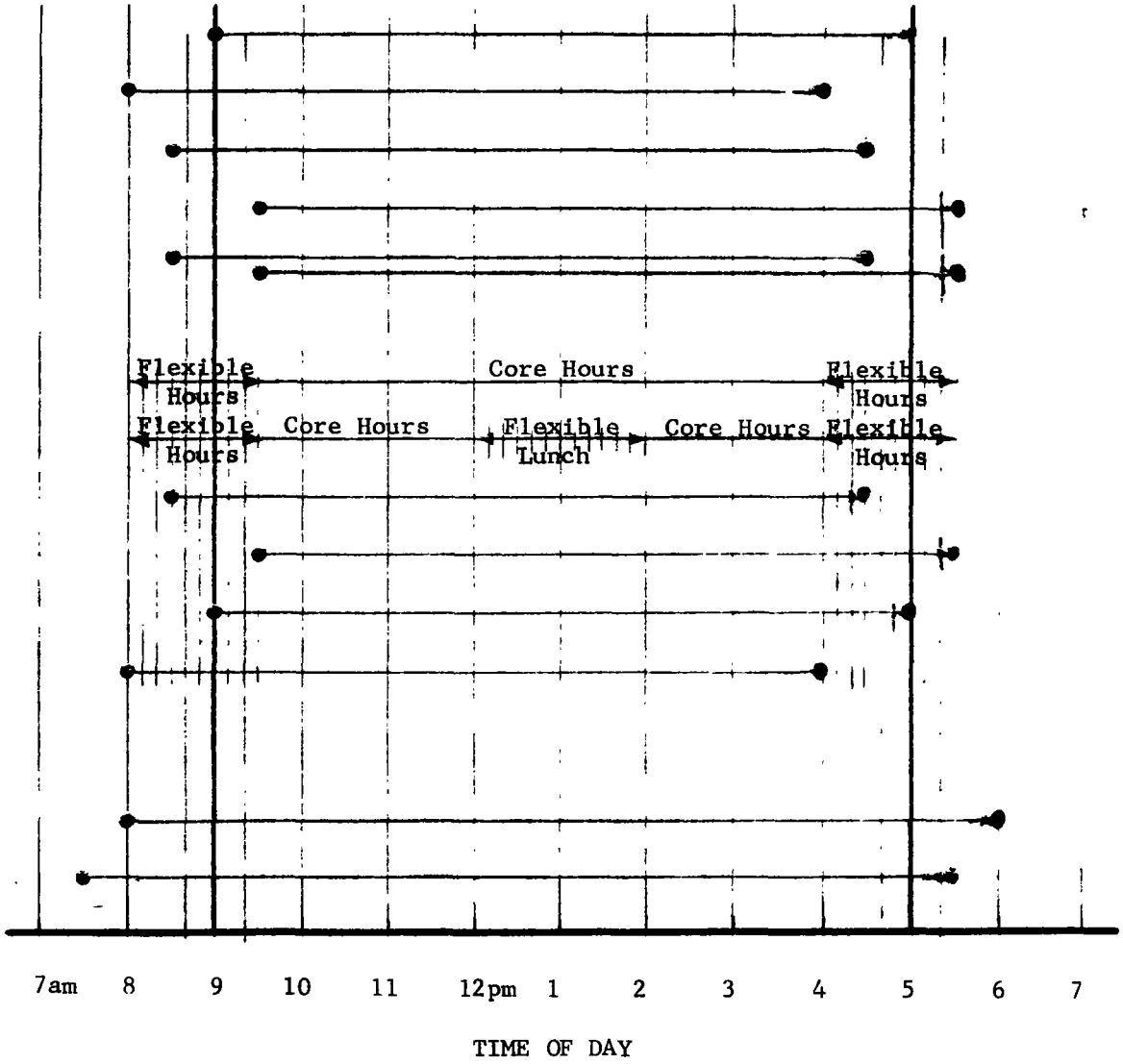
Staggered Work Hours Study

Exhibit IV-1

GRAPHIC DESCRIPTIONS OF WORK SCHEDULE CONCEPTS

Example 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



In recent times, the popularity of Staggered Hours is increasing in many urban areas. It is becoming more accepted as a low-cost and effective method of reducing congestion on transportation systems, which, at the same time, is acclaimed by its participants. In the 1974 State-of-the-Art Survey, conducted as part of this Technical Study and discussed in Section I of this report, 16% of the 131 U.S. Cities responding reported that they had used Staggered Hours to relieve transportation congestion and 11 foreign cities, 38% of these responding, also currently had Staggered Hours. U.S. cities with Staggered Work Hours program include New York, Pittsburgh, Washington, D.C., and Philadelphia.

b. Impact on Transportation Systems - The impact of Staggered Hours on such transportation system aspects as reducing peak period congestion, elevator operations, modal changes and on commuter attitudes will be discussed. See Section VII of this report for a more extensive analysis of the effect of Staggered Work Hours on transportation operations.

i. Reducing Peak Period Congestion - All three work scheduling concepts, by their very nature of shifting people out of peak commuting times, will lead to reducing peak transportation congestion if that congestion is principally caused by concentrated adherence to a single five-day schedule. Generally speaking, the congestion reduction is directly related to the absolute amount of participation, the degree to which the new schedules are spread away from the old hours and the degree of peaking which existed in the old schedules.

Staggered Work Hours has been very successful in relieving peak period congestion, principally on public transportation systems.

In 1972, two years after the Staggered Hours program in Lower Manhattan began, passenger counts showed a significant one-quarter reduction in the peak at three major downtown New York City subway stations and at the World Trade Center Terminal of the Port Authority Trans-Hudson (PATH) Transit system. Two years later, in 1974, transportation crowding was also drastically reduced and peaks flattened in Midtown Manhattan at the Grand Central Station of the IRT Flushing Line subway.

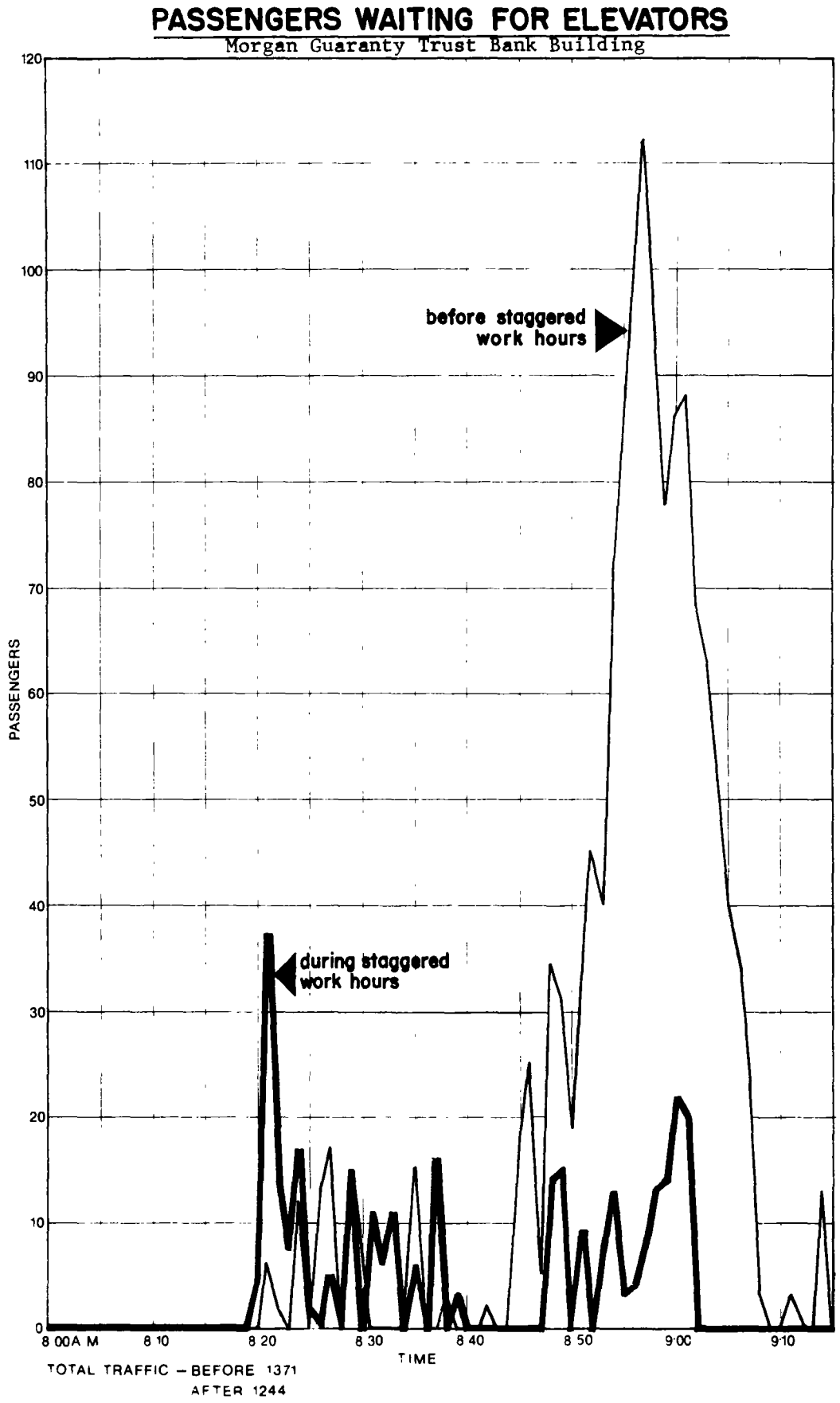
The amount of congestion reductions with Staggered Hours is predictable to a degree since the new work schedules are still fixed, and one can determine how many employees are on different schedules and identify their typical pattern of arrival and departure. Such techniques were developed and are described in Section V of this report to compare the impacts of various Staggered Work Hours schedules.

ii. Elevator Operations - Studies of elevator operations in three office buildings in the Manhattan CBD showed Staggered Hours had a very beneficial impact on operations. In particular, waiting times for employees were observed to be reduced substantially. An illustration of this service improvement was at the Morgan Guaranty Trust Building where a maximum of 673 persons experienced delays in the elevator lobby on a typical weekday before Staggered Work Hours, as compared to only 278 after the program. (See Exhibit IV-2).

The degree of effectiveness of Staggered Hours in relieving elevator crowding depends on whether a company adopts several different schedules or, as in most cases, merely moves all of its 9:00-to-5:00 employees to a new single schedule, such as 8:30-to-4:30. Using several different "split" Staggered Hours schedules is desirable from a number of viewpoints if the organization can be persuaded to do it. Another factor determining the amount of congestion reduction on

Staggered Work Hours Study

Exhibit IV- 2



elevators would be how spread out work schedules are for all employers on a particular bank of elevators.

iii. Modal Changes - An area which has received little attention is the degree to which adoption of a new work schedule concept would impact the choice of transportation mode used. Project staff has not been able to measure this impact quantitatively to a reliable degree but will make an informed opinion having dealt first-hand with each concept.

First, however, let us say a few words about modal split for the journey-to-work. While the auto -- whether used by an individual alone or in a carpool -- is the principal commuting mode throughout most of the United States, many cities rely upon varying degrees of public transit usage. In the Manhattan CBD, of course, this percentage is the highest in the nation with close to 90% using mass transit to get to and from work during the peak hours. Our observations will, therefore, be oriented to the Manhattan experiences, but cognizant as well of other conditions nationwide. (In fact, an offshoot Staggered Hours feasibility study has been prepared by the project staff in Downtown Newark, New Jersey, which is more representative of modal split patterns of other American cities).

Aside from work schedule concepts, present national policy is to use public transit wherever possible and, when not available, maximize auto use by car pooling. It is, therefore, important to determine how the various work schedule concepts affect this in a positive sense, and also how they might tend to be counterproductive by increasing single-passenger auto use.

Staggered Work Hours in a large urban area like Manhattan has had no discernible effect upon mode use. Where there is heavy reliance upon public transit, one may be more inclined to continue using it travelling in less congested time periods on Staggered Hours. However, the converse would occur if there was not satisfactory transit service in time periods just outside the height of the peak, and this therefore requires effecting service adjustments if necessary as part of a successful program. One saving grace here is the relatively small shift of work schedules required in many instances to achieve the congestion reduction desired on transportation systems. In Manhattan, for example, project staff requests only a half-hour change, and this doesn't shift people too far in time away from peak transit services. There could be problems, however, if larger schedule changes are recommended.

Staggered Hours has been thought to encourage some transit riders to decide to switch to auto commuting as they may now travel out of the height of peak congestion. This has not been observed, however, and there are several reasons to suggest that it may not be of great concern. These include the generally longer congestion period occurring for highway facilities (see discussion in Section VII of this report) and other factors which might preclude auto commuting in the first place: the cost of gas, the price and availability of parking and the travel time on congested roads.

c. Impact on Attitudes - Staggered Work Hours have proven repeatedly to be well-liked by a broad cross-section of participants. More detailed analysis of the attitudes regarding Staggered Hours will be found in Section VIII of this report.

i. Overall Reaction - Numerous studies on the effect of Staggered Work Hours on employees attitudes have been made by project staff as well as participating organizations. In addition, in one of the most comprehensive attitude surveys of Staggered Hours, the Port Authority engaged Dr. Derek Phillips, Associate Professor of Sociology at New York University to design questionnaires which were distributed to the employees of 27 companies participating in the Downtown Manhattan project. More than 27,000 men and women completed questionnaires in this survey. The study found that about 85% of the employees sampled had a favorable overall reaction to Staggered Hours, a figure which has had remarkable consistency. Surprisingly, workers felt their work day also seemed "shorter" under the new schedule even though they still worked the same number of hours.

ii. Work Schedule Preferences - When changes in work schedules are contemplated, there is almost always a universal preference for earlier starting and quitting times. Since the success of any work scheduling program depends upon support from employees when schedule changes are implemented, it is important to know their preferences.

In a large number of surveys of Manhattan employees working 9:00-to-5:00 hours, an overwhelming majority, usually anywhere from 75-90%, prefer earlier hours. These include such schedules as 8:30-to-4:30, 8:15-to-4:15 or even 8:00-to-4:00. A smaller though consistent percentage of about 10 to 15% would like to work later and there are usually employees who live very close to their place of work. In New York City, for example, those working in the Manhattan CBD who

prefer 9:30-to-5:30 or 10:00-to-6:00 schedules tend to reside in Manhattan itself, while those wanting earlier hours usually travel longer distances from the other New York City boroughs and suburban areas. In addition, most people prefer to gain hours of "useable" time in the evening at the expense of waking up sooner for earlier schedules. Other Staggered Hours efforts in Philadelphia, Atlanta, Toronto and Madison, Wisconsin, have all noted the overwhelming preference for earlier hours.

iv. Commuter Attitudes - Generally speaking, all work schedule concepts receive plaudits regarding improved commuting, since each reduces the crunch of everyone trying to get to and from work at the same time. Staggered Work Hours has made a very positive impact on how commuters preceive their trip to and from work. In the broadest survey of the Lower Manhattan program, 50% of the Staggered Hours participants were "more satisfied" with their daily commute, while only 10% were less satisfied. Subsequent transit services shifts (discussed in Section VII of this report) satisfied some of those with initial problems. This satisfaction with commuting on Staggered Hours is a consistent finding and very significant in supporting the theory of improved transportation with, in the case of the Manhattan CBD, only a relatively small shift onto Staggered Work Hours schedules.

v. Home Life - In the comprehensive study by Dr. Phillips of Staggered Hours participants in Lower Manhattan, a high percent of those responding felt their new hours had a very positive effect on their home life. With respect to time spent with family in the evening hours and to involvement in various kinds of social activities there was a high degree of satisfaction. Only 12% had minor complaints about Staggered Hours effect on their home life.

d. Impact on Office Operations - Studies of participants emphasize that organizational efficiency in all the industry groups was not negatively affected by changed work schedules; in fact, some organizations reported positive gains in work effectiveness.

i. Overall effect - Regardless of how employees feel about a Staggered Work Hours program, it is obvious that such a program will not be implemented until management is convinced that the efficiency of operations will not suffer. In this study, Dr. Phillips found that under the new hours, six times as many supervisors reported gains in productivity as reported losses; and punctuality of employees on Staggered Hours increased.

ii. Communications - One of the important specifics on the question of work efficiency was whether new hours would affect internal or external communications. A substantial majority of unit heads reported that no severe communications problems resulted from the changed hours. About 15 percent cited some impact, but evidently the problems were not sufficient to cause a drop in efficiency.

Firms which communicate regularly with westerly time zones often expressed concern about keeping in touch on earlier schedules. However, a survey of several major New York corporations on Staggered Work Hours indicated that this has not been a serious problem, mainly because the new work hours required only a very small adjustment in communications habits.

In fact, since both long-distance and local telephone rates drop 35 percent after 5 p.m. and as much as 60 percent before 8 a.m., firms relying on telephone communications can save money by switching to Staggered Hours.

iii. Productivity - Many of the firms on Staggered Work Hours are corporate headquarters, banks, insurance agencies, and the like, where employee productivity cannot be measured in units per hour. To get at

productivity changes among clerical and managerial employees, their supervisors were surveyed and asked whether they felt productivity under Staggered Work Hours had changed. Most reported that productivity was largely unaffected by small shifts in work schedules, although more supervisors noted gains rather than losses. Managers in firms on earlier schedules also report that the time before 9:00 a.m. is the most productive time of day because there are fewer telephone calls or other interruptions.

iv. Punctuality - In the study of Staggered Work Hours in Lower Manhattan, unit heads were specifically asked about employee punctuality. They reported that Staggered Hours appeared to have a beneficial effect. Compared to previous experience, almost 80 percent of the supervisors said their employees were arriving on time or earlier under the new generally earlier schedules. Only 12 percent reported they were arriving later.

Several concrete factors contribute to improved punctuality among Staggered Hours participants in Manhattan. There are, in many cases, fewer and shorter transportation delays in the non-peak hours 30 minutes before the principal starting time of 9:00 a.m. There is also invariably less elevator congestion prior to the peak 9:00 a.m. starting hour.

2. Flexible Work Hours

a. Definition and Current Practice

Flexible Work Hours, also known as "Gliding Work Hours", "Flextime", "Flexitime", "Plantime" and by other names, is a relatively new concept in work time management which allows employees a degreee of freedom in determining work schedules. Under Flexible Hours employees are permitted to set their own daily starting and quitting times within pre-established limits. They are generally required to be present at work during a fixed or "core" time, with the ability to choose their starting and quitting times in "flexible" time periods. Thus, they can vary the length of their total working day in many cases, several of which are illustrated in Exhibit IV-1. For example, the Port Authority Flexible Work Hours system, discussed in this section and shown on Exhibit IV-3, allows participating employees to arrive at work anytime between 8:00 and 9:30 a.m., and depart from work anytime between 4:00 and 5:30 p.m. with total work hours ranging from 5-3/4 hours to 8-3/4 hours (excluding 45 minutes for lunch). Employees are required to be present during the 9:30-to-4:00 core hours, and must accumulate the same total number of weekly hours worked (36¼) as before.

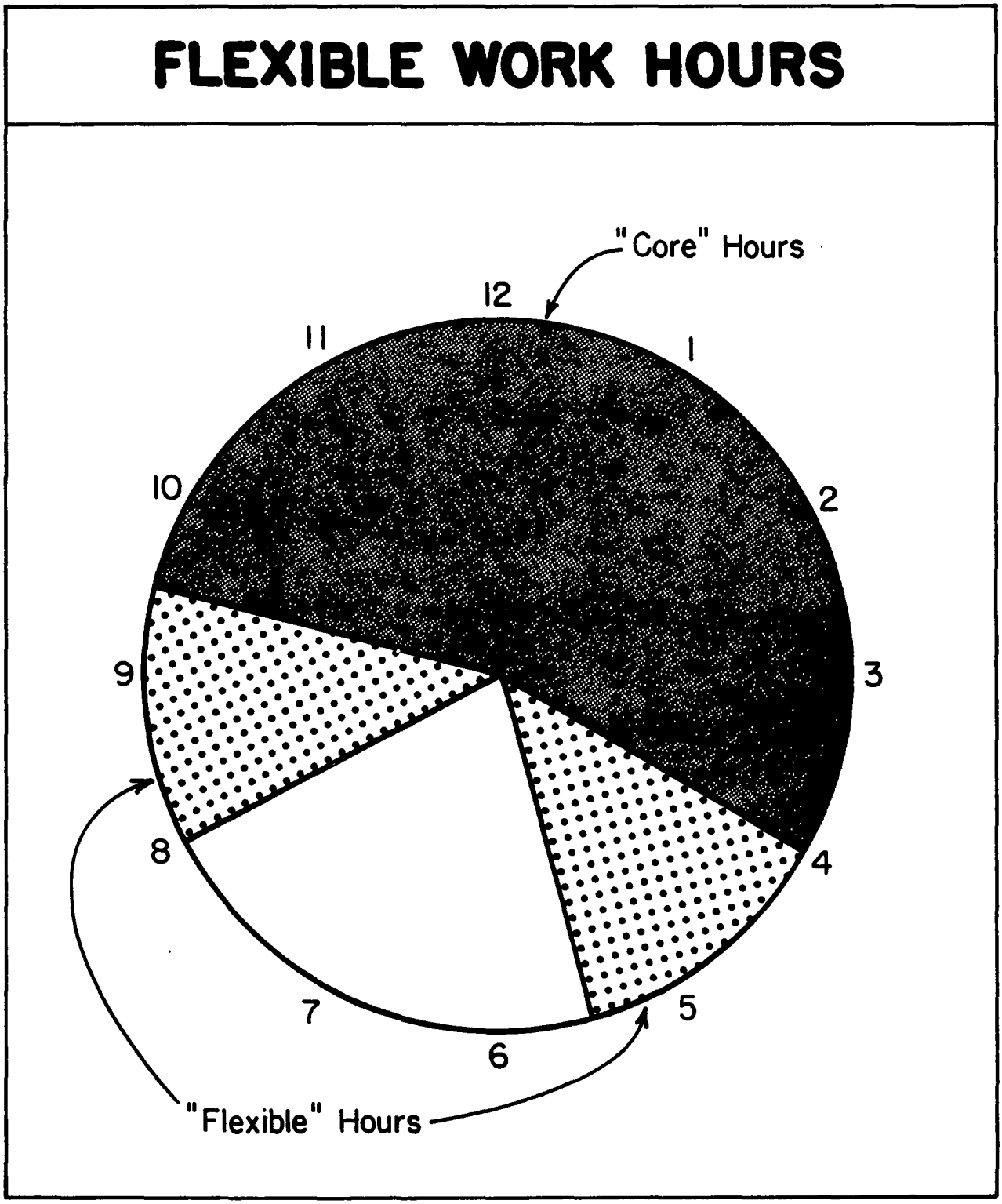
There are several variations of Flexible Hours which are being used by companies. One most often used in the so-called "floating day" which is a bit more restrictive than the "pure" Flexible Hours. Employees on a floating day may choose their starting time within a certain flexible period but thus determine the quitting time based on the length of the workday. For example, an employee might have the option to come to work anytime between 7:30 and 10:00 a.m., but if

Staggered Work Hours Study

Exhibit IV-3

FLEXIBLE WORK HOURS GUIDELINES

Port Authority Flexible Work Hours Experiment



he arrived at 8:15 a.m. he is required to work that day until at least 4:15 p.m. (assuming a total 8-hour day). This is the arrangement implemented successfully for the Metropolitan Life Insurance Company's 15,000 employees in the New York City home office.

Another variation is the "Flexible Hours Plus Four" under which employees can work the total weekly hours requirement in the first four days of the week and thereby take a fifth day off. Other options of this include a longer accounting period allowing one to work longer hours in order to build up a reserve and take a day off during the same period. Another basic variation is to allow a flexible lunch period within the flexible day. Workers can then vary the time when they eat lunch as well as the total length of the lunch period. This possibility is often used to reduce cafeteria and/or elevator congestion at lunch time. In addition, employees may also take longer lunches to perhaps run errands, or shorter lunch periods which allow them to leave work earlier.

Many of these benefits were realized when the Flexible Work Hours system was initiated in 1967 by the Messerschmidt Headquarters at Ottobrunn, West Germany. The new hours not only relieved traffic congestion but had a very positive impact on employee morale. Flexible Hours quickly became popular throughout West Germany, then in many other European countries and, more recently, in Canada. This new concept is just beginning to be explored by U.S. companies and the Federal Government as reported in the State-of-the-Art Survey. While only eight responding U.S. cities, or 10%, report experience with Flexible Hours, this contrasts to 17 foreign cities, or 65% of the sample, which reported experience with Flexible Hours systems in their cities.

Flexible Working Hours has been implemented in the U.S. companies primarily as an employee benefit to improve morale, reduce turnover, tardiness and absenteeism as well as provide the firm with a hiring "edge". Several reasons are cited for this positive impact on employee morale: 1) Flexible Hours allows employees to have more responsibility for their performance, 2) work demands and personal responsibilities can be balanced better, 3) personal business and errands can be done on the employees' time thus reducing excused time, and 4) commuters can choose to travel at the least congested and most convenient times.

b. Impact on Transportation Systems

i. Reducing Peak Period Congestion - While Staggered Hours has proven ability to reduce congestion, Flexible Hours also appears comparable in its potential for relieving transportation peaking. This is because commuters, if given a choice, will generally choose to avoid the most congested travel times. In the Port Authority experiment, three quarters of the participants said they adjusted their hours to avoid the most congested travelling periods. Since employees have this choice within limits on Flexible Hours, it then becomes more difficult to predict the revised arrival and departure patterns or, indeed, to attempt to design Flexible Hours systems specifically to reduce congestion at certain spots. However, much insight has been gained from the Port Authority's Flexible Hours experiment.

The Port Authority experiment showed that arrival patterns on Flexible Hours on the whole remained as spread out as on Staggered Hours, the previous system changed while departure patterns

employed, led to reduced afternoon elevator congestion particularly on floors where large units had previously been on a single schedule. Since most Port Authority units were already on Staggered Work Hours prior to adopting the Flexible system, there was not a sharp change in congestion which was limited. This shift from Staggered to Flexible Hours may be considered quite typical, it should be noted, since few fixed-schedule organizations are amenable to a Flexible Hours system at the outset. Many firms adopting Flexible Hours have tried and succeeded with Staggered Hours initially.

To determine arrival and departure patterns on Flexible Hours, data was collected for a number of days before and during the experiment to obtain total employee morning arrivals and evening departures at a mid-building lobby of One World Trade Center. Similar counts were also taken on seven individual floors, three of which had Port Authority employees on Flexible Hours, two containing employees not participating (serving as "control" floors) and the remaining floors having non-Port Authority tenants. A description of Port Authority floors surveys, and which are discussed below, is shown in Table IV-1.

Table IV-1

Description of Port Authority Floors Surveyed
Flexible Work Hours (FWH) Experiment

P.A. Floor	Nominal Schedule(s) Before FWH Experiment	Comments
Mid-building lobby (44-Skylobby)	Various	Entry/departure lobby for all PA staff. Mix of those on & not on FWH
"A"	8:45 - 4:45	Went on FWH experiment
"B"	Half on 8:00-4:00 Half on 8:30-4:30	Went on FWH experiment
"C"	Mix between those on 8:15-4:15 and on 8:30-4:30	Went on FWH experiment
"D"	On "Floating Day"	Retained flexibility to start between 8:00 and 9:00 a.m.
"E"	8:30 - 4:30	"Control" floor retained 8:30 - 4:30 hours

Mid-building lobby - Surveys of arrivals and departures on the 44th Floor Skylobby covered some 2,000 Port Authority employees of which about 750 were on the Flexible Work Hours experiment. Most others were already working a variety of Staggered Hours schedules with nominal starting times from 8:00 through 9:30 A.M. While the pattern of the earlier-than-9:00-to-5:00 work regimen was retained by a majority of employees, examination of the total arrivals and departures, shown in Exhibits IV-4 and 5, indicate that they are both slightly later on Flexible Hours. This may reflect somewhat the desires of a small but significant number of persons to come and go at later times on Flexible Hours, where on Staggered Hours they were required to work the earlier schedules favored by most others. Since both "control" floors -- those

Exhibit IV-4
Staggered Work Hours Study

FLEXIBLE WORK HOURS - PORT AUTHORITY ARRIVALS ON 44TH FLOOR SKYLOBBY

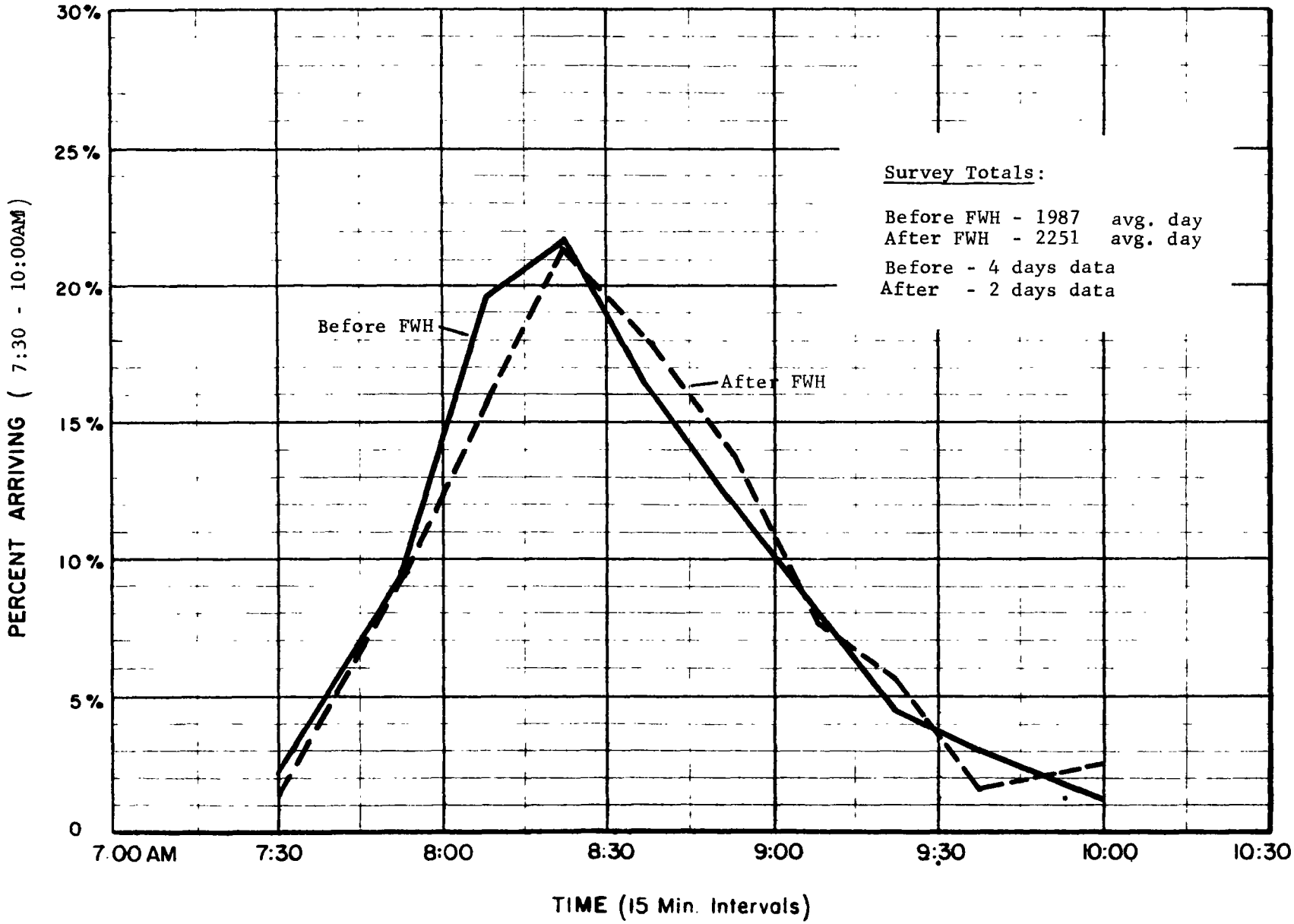


Exhibit IV - 5
Staggered Work Hours Study

FLEXIBLE WORK HOURS - PORT AUTHORITY DEPARTURES ON 44th FLOOR SKYLOBBY

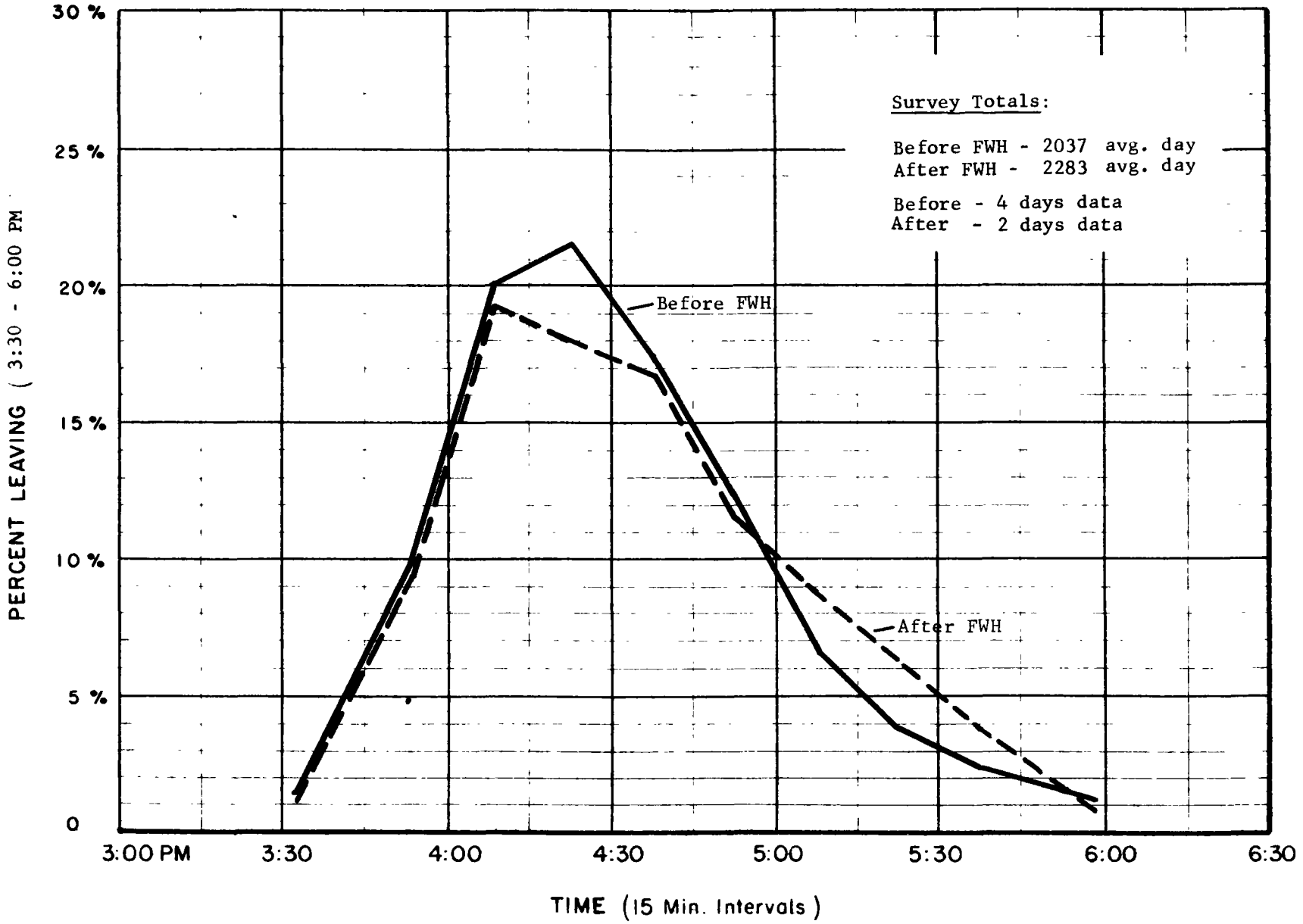


Exhibit IV - 6
Staggered Work Hours Study

FLEXIBLE WORK HOURS - ARRIVALS ON PORT AUTHORITY FLOOR "A"

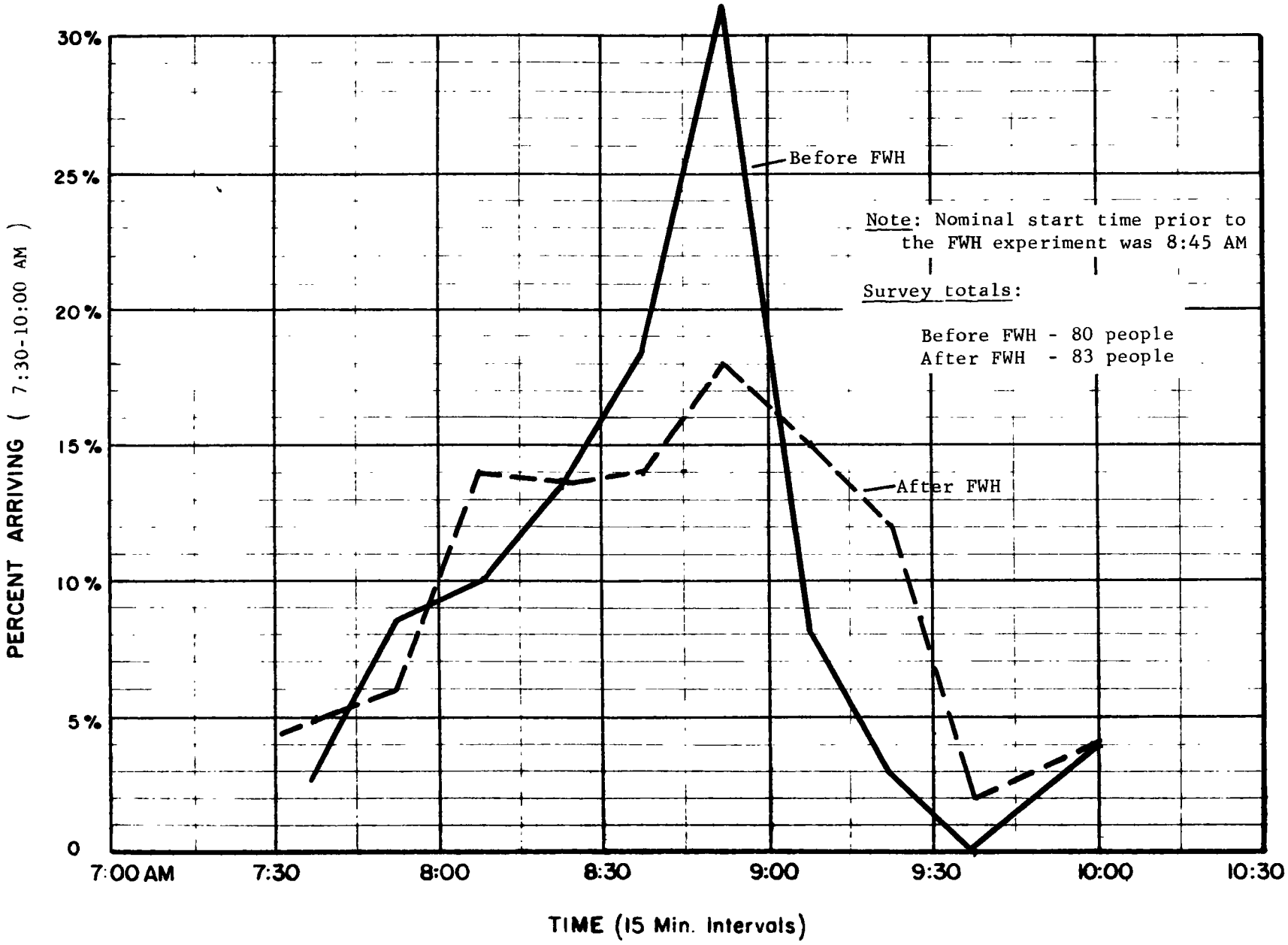
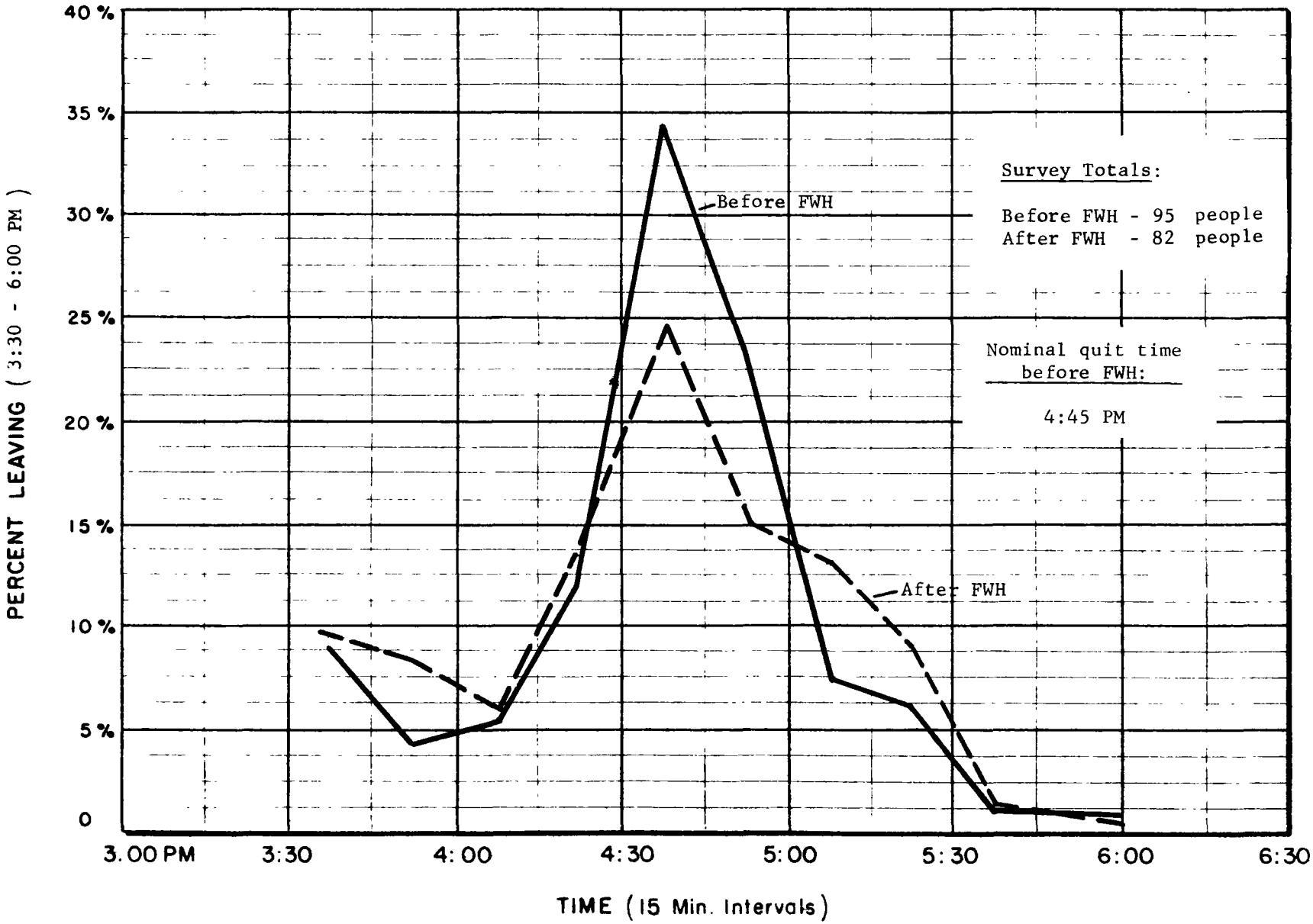


Exhibit IV - 7
Staggered Work Hours Study

FLEXIBLE WORK HOURS - DEPARTURES ON PORT AUTHORITY FLOOR "A"



P.A. floors not participating in the Flexible Hours experiment -- contrasted by recording slightly earlier arrivals and departures after the Flexible Hours experiment began, this indicates that the slightly later arrival and departure patterns for those on Flexible Hours is probably significant.

The 44th Floor Skylobby counts taken prior to and during Flexible Hours also indicated the average arrival time for all employees remained at 8:35 a.m., and that the total number of people arriving during the peak 15-minute interval was only slightly less than prior to Flexible Hours. In the afternoon, however, the average departure time changed slightly, from 4:30 to 4:35 p.m., but the absolute number of people leaving in the peak interval was somewhat reduced. Limited inferences about Flexible Hours can be made from these Skylobby counts since two-thirds of Port Authority people counted there remained on Staggered Hours and did not participate in Flexible Hours.

It should be noted, however, that the determination of an <u>average</u> time of arrival or departure represented only a limited description of travel patterns on Flexible Work Hours. While one would rightly expect under <u>rigid</u> work schedules the average time of arrival and departure to closely approximate the nominal starting and quitting times, this would not necessarily be the case with Flexible Hours. An average arrival time of 8:35 a.m. on Flexible Hours could therefore represent many different arrival distributions. At one extreme, it could represent everyone arriving at 8:35 a.m., which would be similar to the pattern for a rigid 8:30 a.m. starting time. At another extreme, an average arrival time of 8:35 a.m. on Flexible Hours could represent half of the employees arriving at about 8:05 a.m. and another half at

9:05 a.m. And, of course, there are an infinite number of possible variations in between. The shapes of the arrival and departure distributions as shown in the following pages are therefore far more revealing than averages regarding the impacts of Flexible Hours upon arrival and departure patterns.

Floor "A" - Analyses were made of arrivals and departures on a variety of individual floors to more closely determine the impact of Flexible Hours. Exhibit IV-6 shows before and after results for Floor "A" which, prior to the experiment, had its employees all on a single 8:45-to-4:45 schedule. This is reflected in the graph where one-third of arrivals occurred between 8:45 and 9:00 a.m. After the start of the Flexible Hours experiment, however, the arrival pattern was dramatically spread out, with a peak of only 18% occurring during that previously busy 15-minute interval, a 42% reduction. Arrivals increased somewhat during the earlier 8:00-to-8:15 a.m. period and, more significantly, during the 9:00-to-9:30 interval.

Exhibit IV-7 represents departures for Floor "A", and again one can discern a substantial decrease, amounting to 29%, in the peak interval between 4:30 and 4:45 p.m. after Flexible Hours. In addition, the departure pattern for the after data is somewhat more spread out than the before data, with more people leaving between 5:00 and 5:30 p.m.

Several observations are important regarding Floor "A". First, it is the only participating P.A. floor whose employees had been on a single fixed schedule prior to Flexible Work Hours. The total

impact on arrival and departures therefore has been substantial, with beneficial implications for reduced delays and congestion on elevators. Secondly, the experience with Floor "A" might be analogous to another organization shifting onto Flexible Hours after having been on a fixed single schedule. Other floors surveyed, however, are more typical of the effect to be expected where a unit had been on a combination of earlier, split Staggered Hours schedules.

Floor "B" - Exhibits IV-8 and IV-9, respectively, show arrival and departure patterns for Floor "B". Employees there were on "split" schedules prior to Flexible Hours, with half working 8:00-to-4:00 and the other half on 8:30-to-4:30. Arrivals are somewhat more spread out after the start of the Flexible Hours experiment. The departure prior to the experiment showed two peaks, corresponding to the nominal quitting times of 4:00 and 4:30 p.m. After initiation of the experiment, however, departures were generally more spread out, with an initial peak of 27% leaving at the earlier period between 4:00 and 4:15 p.m. and gradually tapering off to later-departing people between 4:45 through 5:30 p.m.

Floor "C" - On Port Authority Floor "C", where a mix of 8:15-to-4:15 and 8:30-to-4:30 schedules had been followed, Flexible Hours had little discernible impact on arrival and departure patterns. As shown in Exhibits IV-10 and IV-11, respectively, the peak rate of arrivals was reduced and spread to all other morning time periods, while departures revealed slightly-earlier quitting times. The fact that there was little change is most likely due to the popularity of the previous staggered hours schedules.

Exhibit IV - 8
Staggered Work Hours Study

FLEXIBLE WORK HOURS - ARRIVALS ON PORT AUTHORITY FLOOR "B"

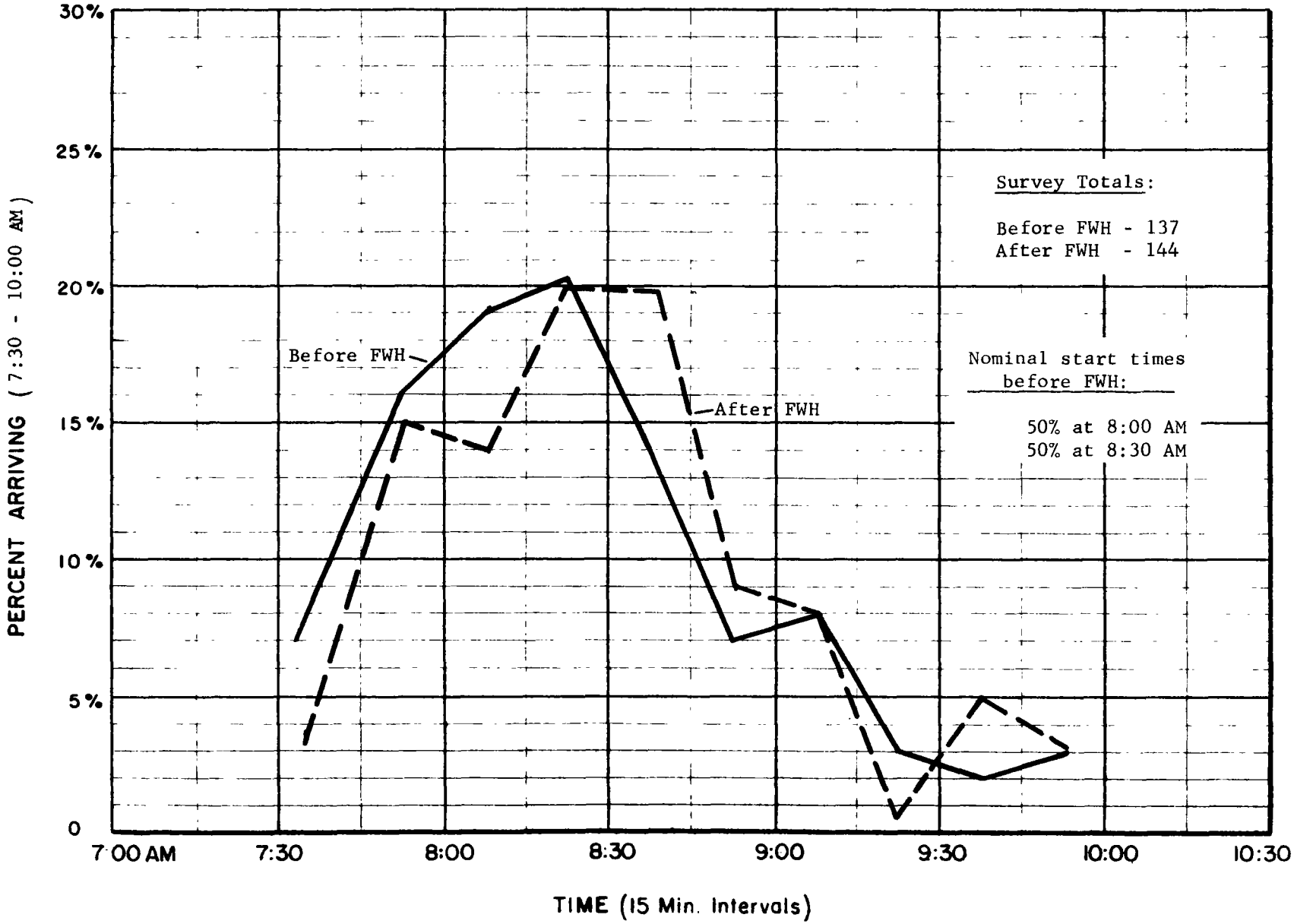


Exhibit IV - 9
Staggered Work Hours Study

FLEXIBLE WORK HOURS - DEPARTURES ON PORT AUTHORITY FLOOR "B"

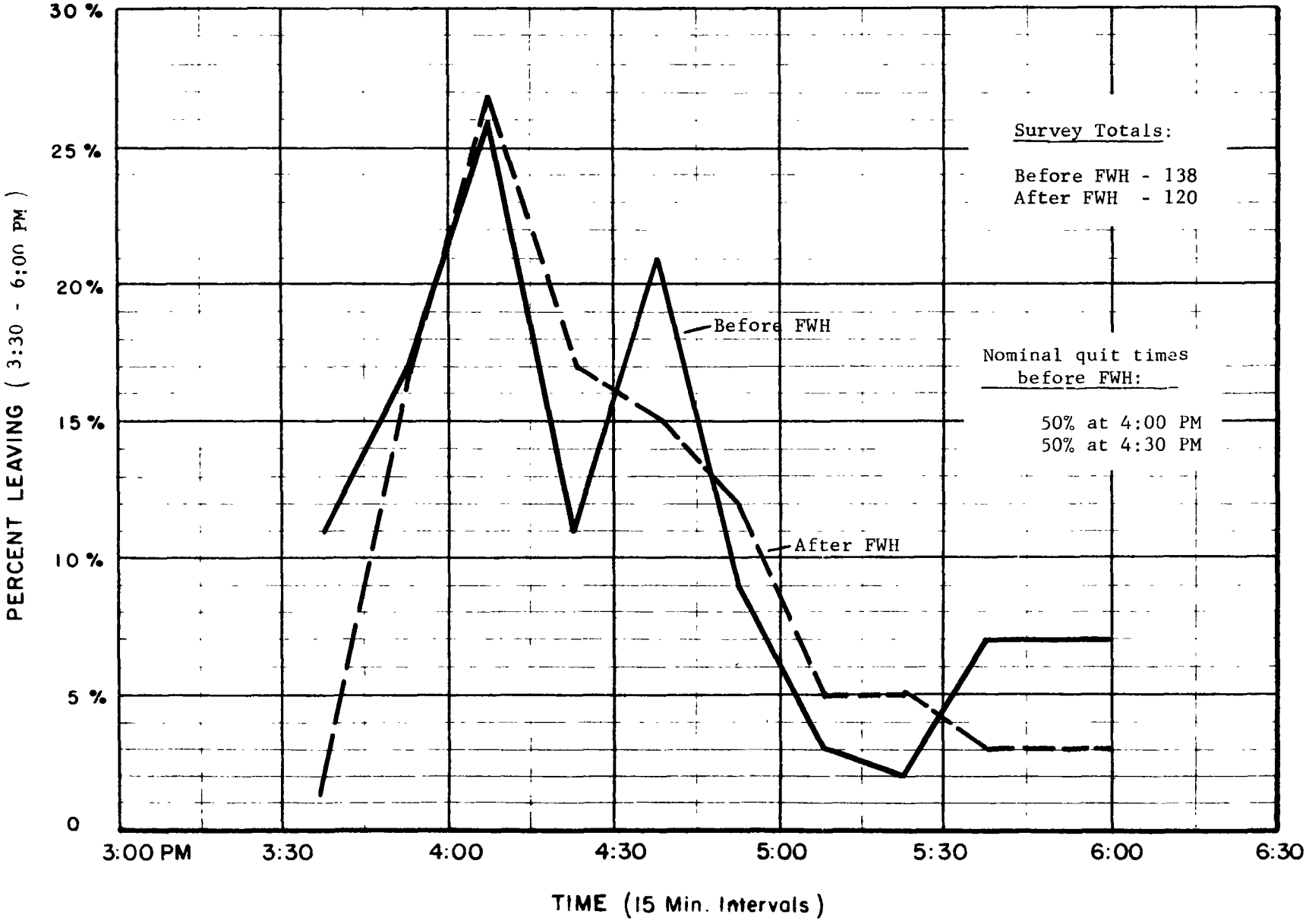


Exhibit IV - 10
Staggered Work Hours Study

FLEXIBLE WORK HOURS - ARRIVALS ON PORT AUTHORITY FLOOR "C"

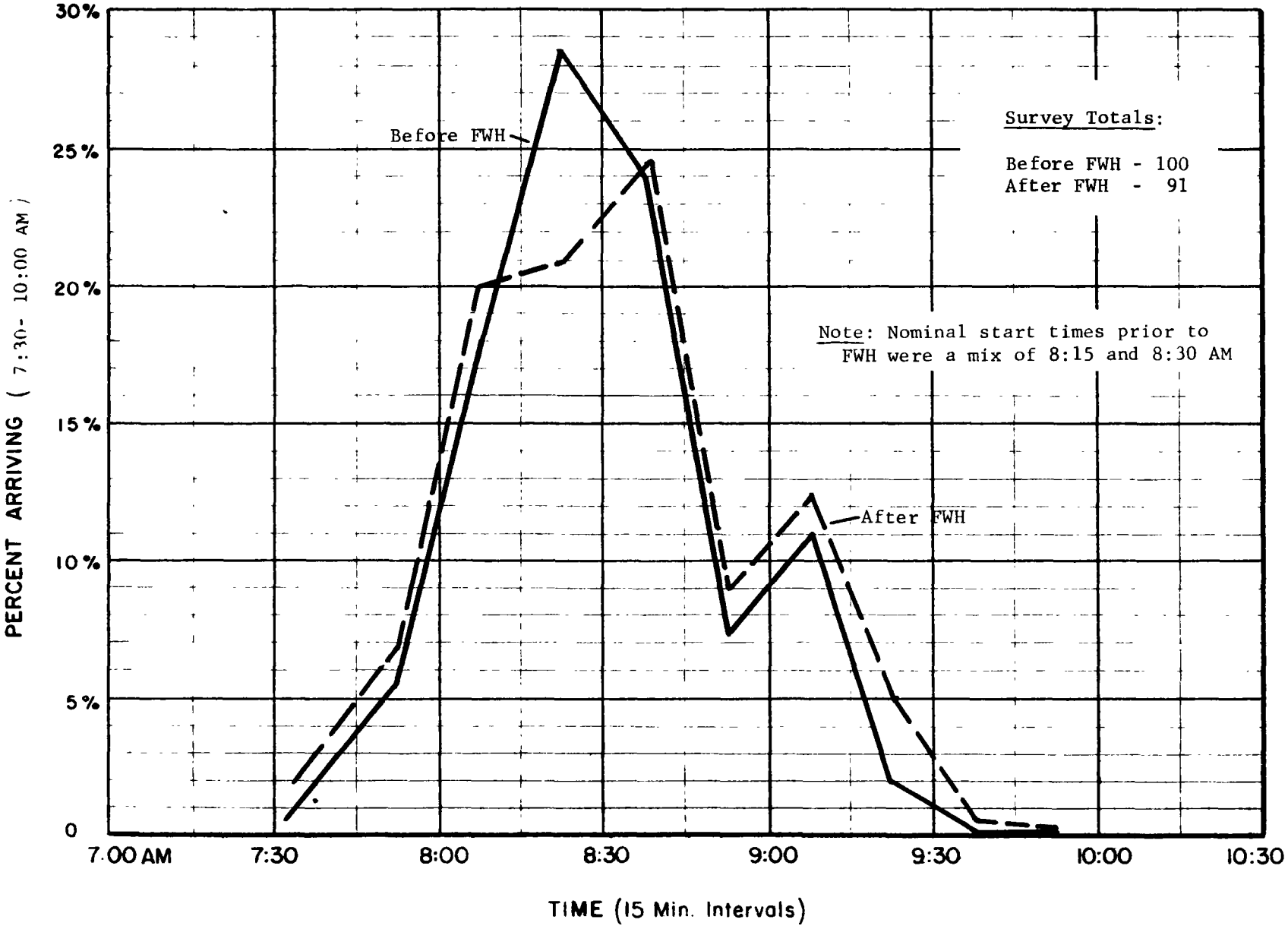
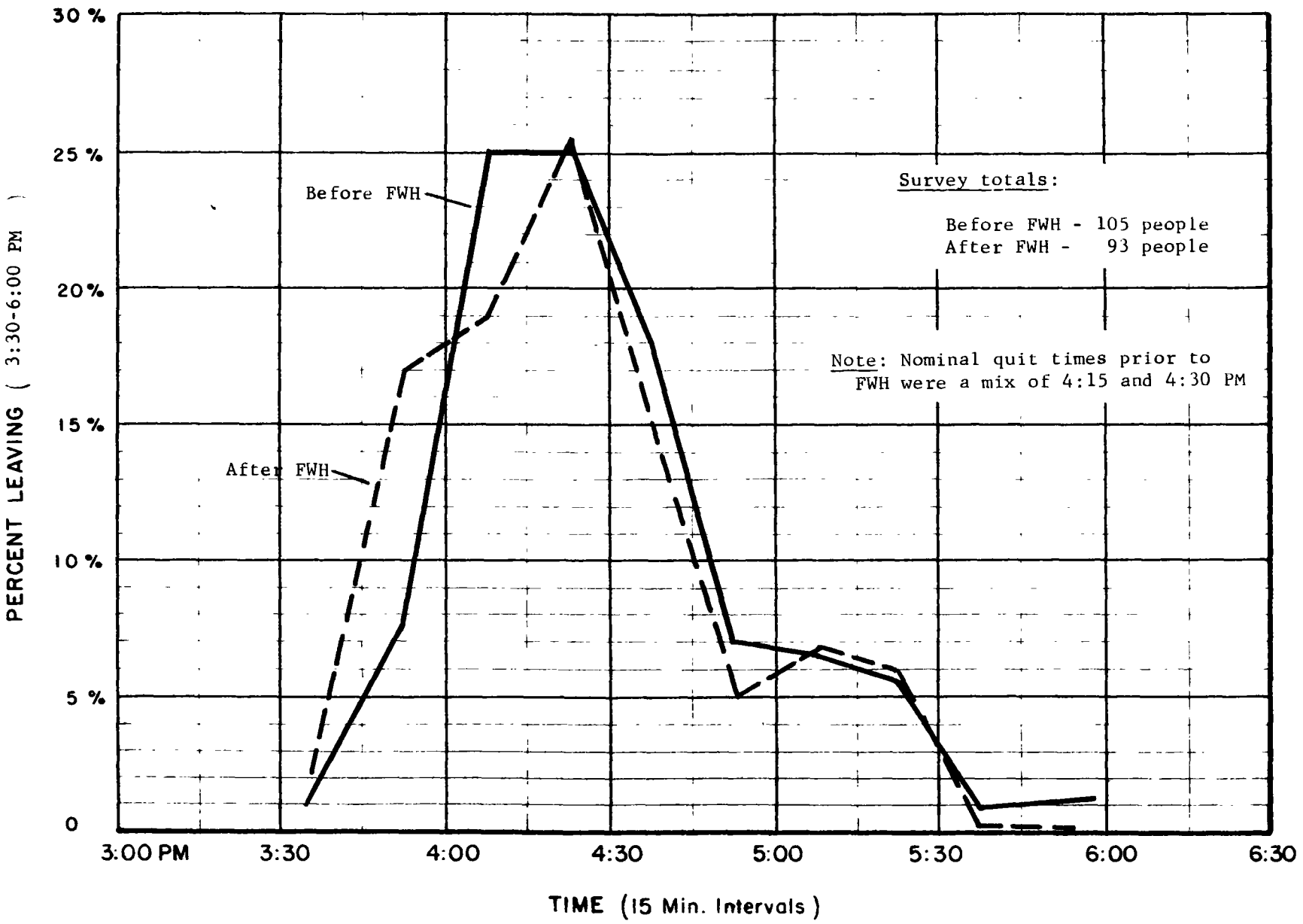


Exhibit IV - 11
Staggered Work Hours Study

FLEXIBLE WORK HOURS - DEPARTURES ON PORT AUTHORITY FLOOR "C"



Arrival and departure counts were also made on several floors where people remained on the same work schedule. The reason was to have experimental "controls" so that any impact observed elsewhere could be reliably attributed to the Flexible Hours experiment if the control remained unaffected.

Floor "D" - Exhibits IV-12 and IV-13 show "before and after" patterns for Floor "D". This floor was on a so-called "floating day" schedule form of Flexible Hours prior to and through the experimental period. Floor "D" employees had and kept the flexibility of being able to start anytime between 8:00 and 9:00 a.m. and leave eight hours later. The arrival and departure patterns therefore should be and were, in fact, found to be basically similar. Although there was no change in their modus operendi, an increase in the arrival peak was noted for persons choosing to start work after 8:45 a.m. after the onset on the Flexible Work Hours experiment in other units. Departures for Floor "D" show the converse, specifically, a decrease in the peak quarter hour after Flexible Hours began in addition to slightly later departure times. However, the overall patterns of arrivals and departures are basically the same spread out distributions, leading one to conclude that similar impacts can be expected from a "floating day" scheme as from a "pure" Flexible Work Hours plan.

Floor "E" - Another one of the "control" floors surveyed was Floor "E", for which employee arrivals and departures are shown in Exhibit IV-14 and IV-15, respectively. This floor retained its working hours of 8:30-to-4:30 both before and during the Flexible Hours experiment. The before and during patterns, as would be expected are practically identical and unchanged. The arrival patterns, while indicating a slightly offset peak, is probably due to the arrivals of a relatively few people just before or after

Exhibit IV- 12
Staggered Work Hours Study

FLEXIBLE WORK HOURS - ARRIVALS ON PORT AUTHORITY FLOOR "D"

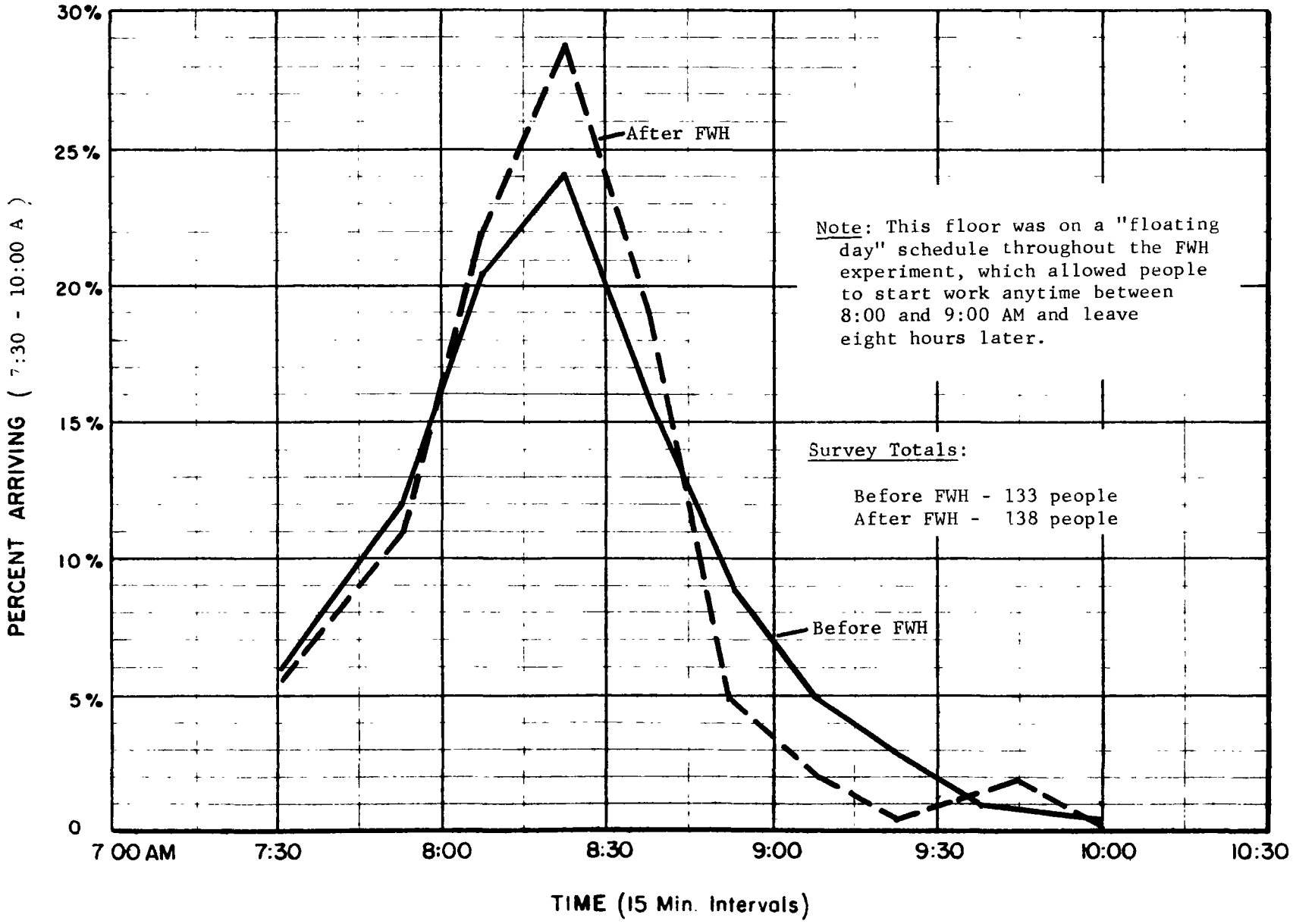


Exhibit IV- 13
Staggered Work Hours Study

FLEXIBLE WORK HOURS - DEPARTURES ON PORT AUTHORITY FLOOR "D"

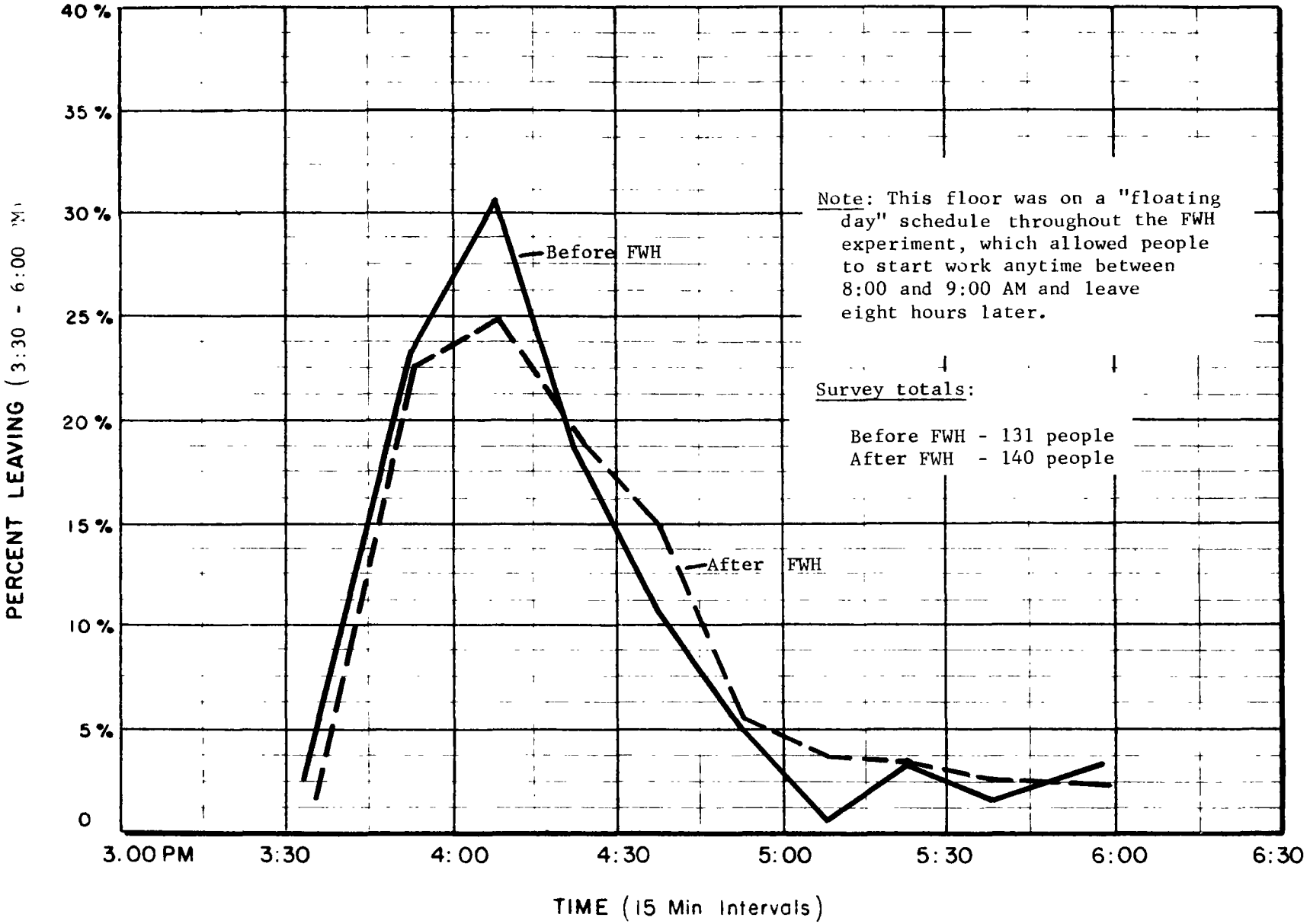


Exhibit IV- 14
Staggered Work Hours Study

FLEXIBLE WORK HOURS - ARRIVALS ON PORT AUTHORITY CONTROL FLOOR "E"

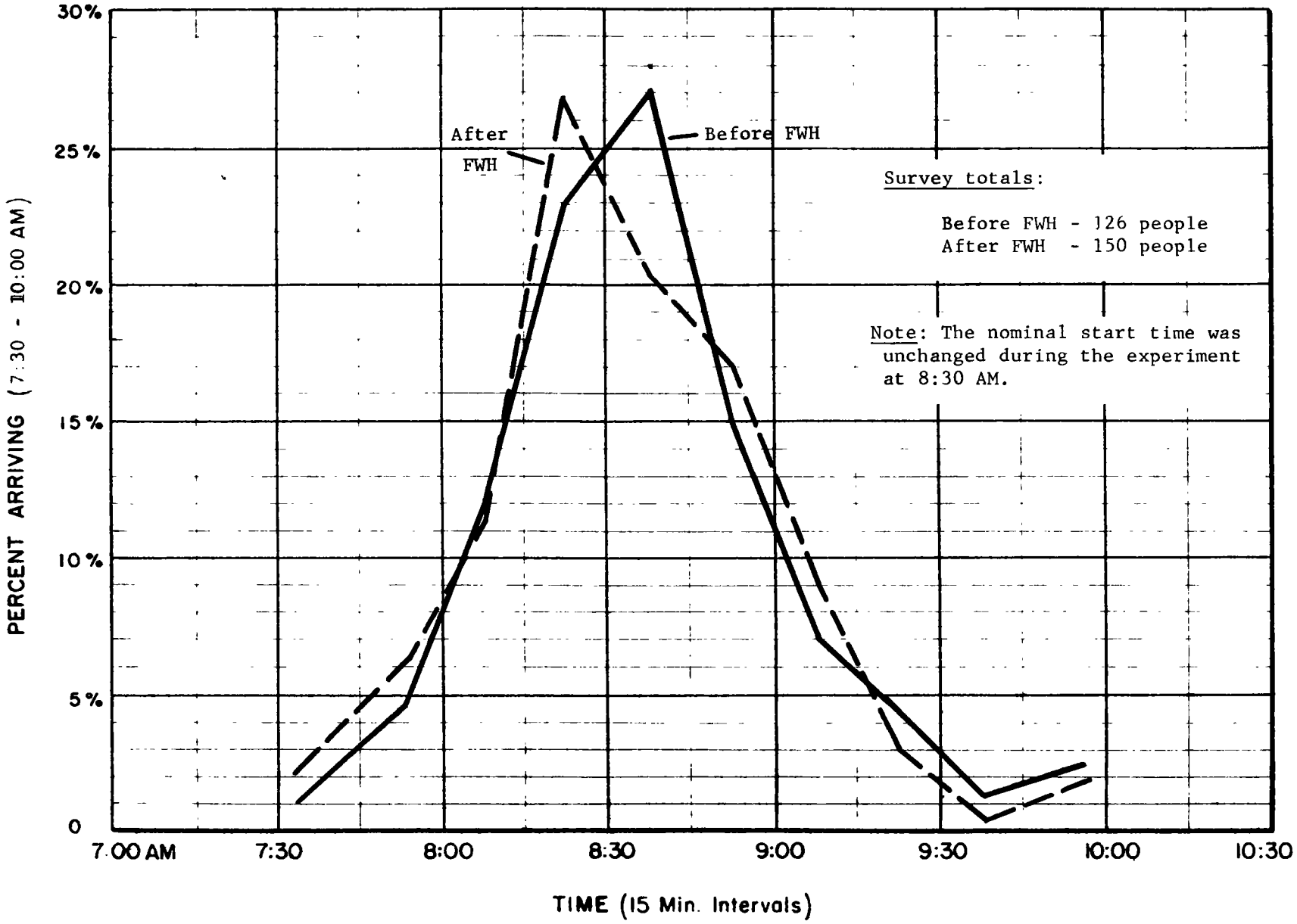
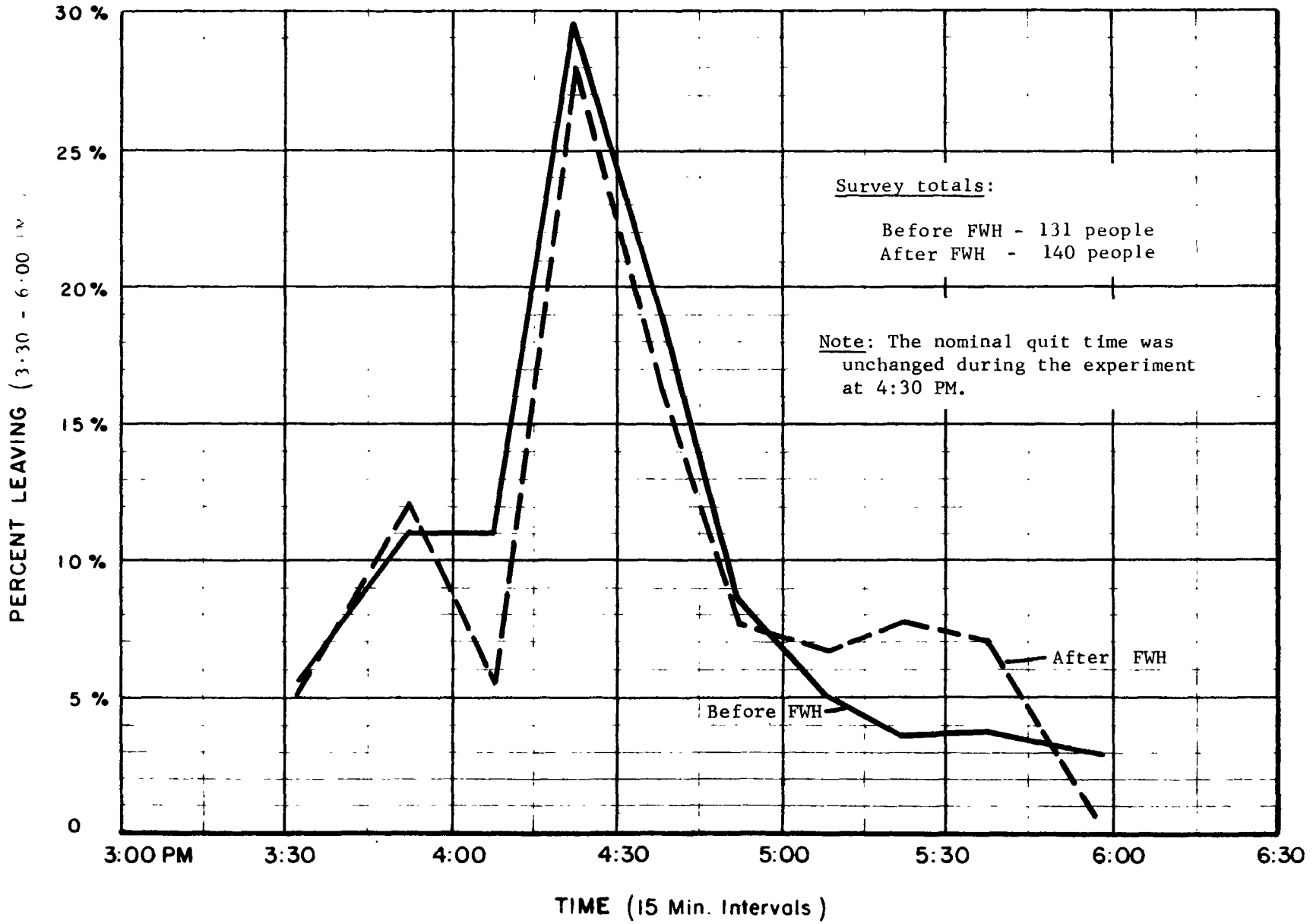


Exhibit IV-15
Staggered Work Hours Study

FLEXIBLE WORK HOURS - DEPARTURES ON PORT AUTHORITY CONTROL FLOOR "E"



the 8:30 a.m. time thus causing them to be counted in separate, adjacent time intervals. The departure patterns also show no change except for a few more people leaving work during the later 5:00-to - 5:45 p.m. period. It can be observed, therefore, that there were no apparent changes in patterns for non-participants during the experiment, leading one to conclude that the changes shown in patterns by participants were due mainly to the impact of Flexible Work Hours.

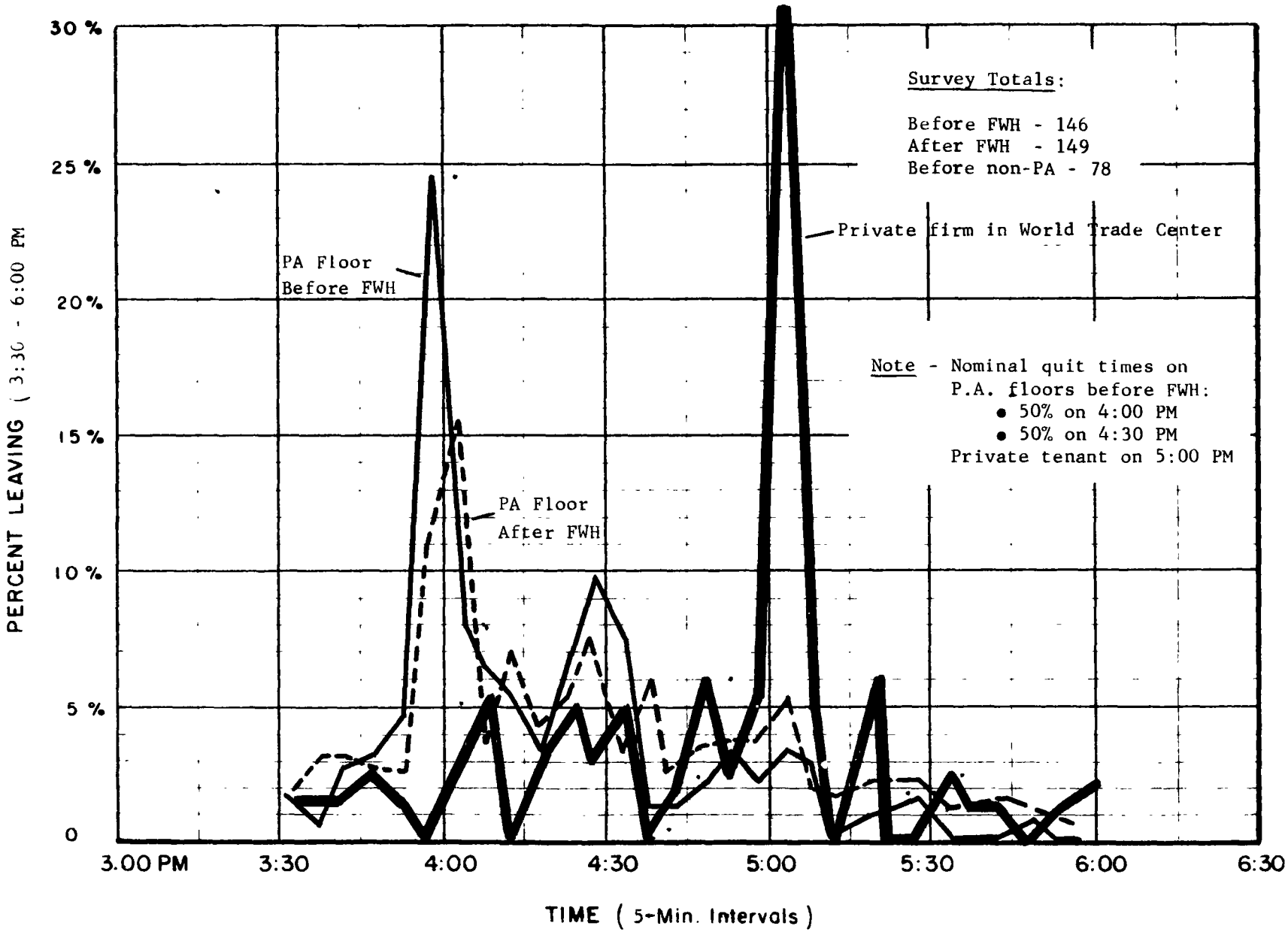
PA vs. Non-PA Floor - Reinforcing this statement was the analysis of the departure patterns of a floor of Port Authority employees, both before and after the start of Flexible Hours, as well as that of a large private tenant firm in the same building of the World Trade Center. The P.A. floor was on a split schedule of nominal 4:00 and 4:30 p.m. quitting times before Flexible Hours, while the private firm remained on a 9-to-5 schedule.

As can be seen from Exhibit IV-16, plotted in this case by 5-minute intervals, Flexible Hours has significantly reduced the peaking of departures on the P.A. floor. Meanwhile, the private firm's peak departure of over 30% was reached just after 5:00 P.M. On either side of this peak, meanwhile, relatively few people were leaving.

This analysis offers a striking contrast between the lesser surge of departures when a floor has several nominal quitting times as opposed to a single concentrated one which, of course, has important implications for elevator services. It is ironic to note that this private firm has resisted repeated overtures to date to adopt Staggered Work Hours.

Exhibit IV - 16
Staggered Work Hours Study

FLEXIBLE WORK HOURS - DEPARTURES OF EMPLOYEES ON P.A. FLOOR V.S. NON-P.A. FLOOR



i. Time Sheets vs. Counts - An additional analysis was performed related to arrivals and departures in addition to raw counts at floors. This involved a comparison of observed counts with those given by participants on time recording sheets used in the experiment. In this analysis, arrivals and departures by five-minute intervals of Port Authority employees on several floors were compared with time recording sheet entries for the same week.

The time sheets were filled out by participating employees for the duration of the experiment for two purposes: to enable determination of detailed arrival and departure patterns, and to help keep track of an individual's weekly schedule especially if one came and went at different times during days of the week. Of course, the time sheets served a supervisory control function too.

Comparison of the data from the time sheets with the observed counts showed no significant differences. Where differences did exist, they might be explained by the natural rounding off of the exact time when one actually "arrived" at or left one's desk, as well as the several-minute offset between the counting location and the office. The project staff was reasonably satisfied, as was management, that employees were honest in putting in the required number of total hours each week during the experiment. (In the final analysis, of course, individual supervisors continued to retain as close control over compliance with work time requirements as they wished to exert.) There has also been a general observation in Flexible Hours programs that employees recognize that abuse of the priveleges afforded could lead to management reinstituting rigid work schedules.

ii. Elevator Operations - Flexible Hours generally has excellent potential for relieving elevator crowding caused by concentrated arrivals and departures. Forty-three percent of the participants in the Port Authority experiment indicated elevator operations were better, and this was after being on Staggered Work Hours. Another 55% felt elevator services were the same, and only 2% felt that they were worse.

Flexible Hours allows employees to come and go over a broad span which creates a more even flow into the elevators. As was discussed in the preceeding section, this benefit is usually more pronounced in the afternoon, as the familiar surge of departures at the quitting time is somewhat blunted by the spreading of departures. In the morning arrivals are observed to be more spread out than departures when on a single starting time.

iii. Modal Changes - The effect that Flexible Work Hours has on modal switching is also not known to a great degree, although this was scrutinized in the Port Authority's experiment. Given a great degree of schedule flexibility, almost all participants reported they used the same mode of travel as before. Again this must be understood in the context that, prior to Flexible Hours, their schedules were mostly Staggered away from the height of peak travel periods. But, perhaps of significant importance, there was little reported shifting away from public transit to the auto or carpool mode which might have been facilitated with flexible schedules. Some 6% did report that they "changed mode," but further analysis of the responses to this question indicates that many of the answers may have reflected a revised journey-to-work by transit rather than meaning, for example, a real modal switch from bus to auto.

In any case, Flexible Work Hours offers some tangible benefits to attract people either to public transit or to facilitate stable carpools. An individual's schedule can be tailored to meet existing transit schedules, and to ride these systems at times of maximum comfort and operating efficiency. An effort was made to disseminate such information in the Port Authority experiment (for example: the best time period between 4:00 and 5:30 p.m. to travel home on the "A" train to Brooklyn?, can be determined from train passenger loading data avilable to project staff). Unfortunately, relatively few staff took advantage of this unique service and, in retrospect, we believe that more publicity about its availability would probably be required.

Flexible Hours also removes another potential problem with revised work schedules: that of providing adequate transportation services for the new schedules before or after they switch hours. Under Flexible Hours, people can simply adjust their start and quit times to conveniently mesh with existing transit schedules.

c. Impact on Attitudes

i. Overall Reaction - In the Port Authority's experiment on Flexible Hours, 84% of the participants surveyed liked the system, 13% were neutral and only 3% felt unfavorable toward the arrangement. In addition, of some 30 random personal interviews of supervisory and non-supervisory personnel, conducted by staff of the P.A. Personnel Department, 27 interviewees felt Flexible Hours was a positive program and that it should be continued in their departments.

ii. Work Schedule Preferences - Flexible Work Hours in most cases allows employees to express their schedule preferences everday and to adjust the hours they work to fit their needs. The "schedule" a worker chooses may be determined by train or carpool schedules. There are other examples of work schedule preferences on Flexible Hours.

In Germany, the Bureau of the Federal Budget found that on Flexible Hours 23% of their 2,000 employees arrived for work by 7:00 a.m., the earliest starting time allowed. At 7:30, 66% of the employees were already at their desk. This trend to start work at increasingly earlier hours has been noted in companies on Flextime all over Germany.

Metropolitan Life Insurance Company, in their New York City headquarters and their Southeast Home Office, found that employees on a "floating day," when given a range of starting times anywhere from either 6:30 or 7:30 until 10:00 a.m., tended to choose earlier schedules, as shown in Table IV-2. Over one-third of their Southeast Home Office staff are in work by 7:00 a.m., while more than three-quarters arrive by 8:00 a.m.

Table IV-2

STARTING TIMES ON FLEXIBLE WORK HOURS

Metropolitan Life Insurance Company

Available Starting Time	N.Y.C. Headquarters	Southeast Home Office
6:30 - 6:59 A.M.	--	37%
7:00 - 7:29	--	22%
7:30 - 7:59	29%	21%
8:00 - 8:29	27%	12%
8:30 - 8:59	30%	4%
9:00 - 10:00	14%	4%
	100%	100%

In the Port Authority Flexible Hours experiment, the average arrival time of all participants was only five minutes earlier than before Flexible Hours as discussed previously. However, there is evidence that many employees made use of the individual flexibility to change their schedule as they wished to earlier and later times, a trend which the aggregate average doesn't reflect. Also, Port Authority employees had worked relatively early Staggered Hours schedules, such as 8:15-to-4:15 and 8:30-to-4:30, before the Flexible Hours Experiment was implemented.

From the employee's point of view, Flexible Hours allows them to suit their own needs more closely than Staggered Hours or the Four-Day Week. From the managers' point of view, Staggered Hours may be preferred as it allows a balance between the closer control of office functions with the desires of the employees for adjusted work schedules.

Since there are relatively few Flexible Hours systems at the present time, extensive analysis was focused upon the variations in employees' work schedule preferences. The variations studied were in the length of day worked and by the day of the week.

Total Hours Worked - Using as a data base the time forms filled out by Port Authority participants on Flexible Hours, an analysis was made of the total hours worked for those who varied their hours day to day. (The remaining majority worked only eight-hour days, even if they shifted around during the week.) Further examined was the variation by the day of the week. These analyses were to see what type of longer and shorter days would be used to accumulate the week's total, and whether there was a daily variation that resulted in perhaps, shorter Fridays.

To determine these patterns, an examination was made of time sheets during a selected one-week period, ignoring all those who worked five eight-hour days (even if they varied their starting and quitting times through the week). The analysis also compared patterns reported by classifications of professional and clerical staffs.

For those working days of variable lengths, only a small percentage chose to work the combination of very long or very short days. Table IV-3 and Exhibit IV-17 give the results of this analysis. Fully 40% of the sample worked the "standard" eight-hour day (including 45-minute lunch) while another roughly 30% worked only 15 minutes longer or shorter hours on any given day. Of course, any time taken off in a shorter day had to be "made up" in a longer day during the same week, so the symmetrical shape of the

Table IV - 3

DISTRIBUTION OF WORK DAY LENGTH
FOR THOSE VARYING HOURS[1]

Port Authority Flexible Work Hours Experiment

Daily Hours Worked (Including 45-Min. lunch)			Pay Plan[2] "B" No.	Pay Plan[2] "B" %	Pay Plan[2] "C" No.	Pay Plan[2] "C" %	Total No.	Total %
↑	6½	(Minimum)	7	1.2%	1	0.4%	8	1.0%
	6 3/4		3	0.5	3	1.3	6	0.7
"Short"	7		10	1.7	7	2.9	17	2.1
day	7¼		22	3.8	7	2.9	29	3.5
	7½		43	7.4	22	9.1	65	7.9
↓	7 3/4		72	12.3	29	12.2	101	12.3
"Standard" day	8		237	40.8	86	36.1	323	39.4
↑	8¼		93	16.1	43	18.1	135	16.5
	8½		54	9.3	25	10.5	79	9.7
"Long"	8 3/4		23	4.0	9	3.7	32	3.9
day	9		5	0.9	5	2.0	10	1.2
	9¼		6	1.0	1	0.4	7	0.9
↓	9½	(Maximum)	6	1.0	1	0.4	7	0.9
			581	100.0%	238	100.0%	819	100.0%

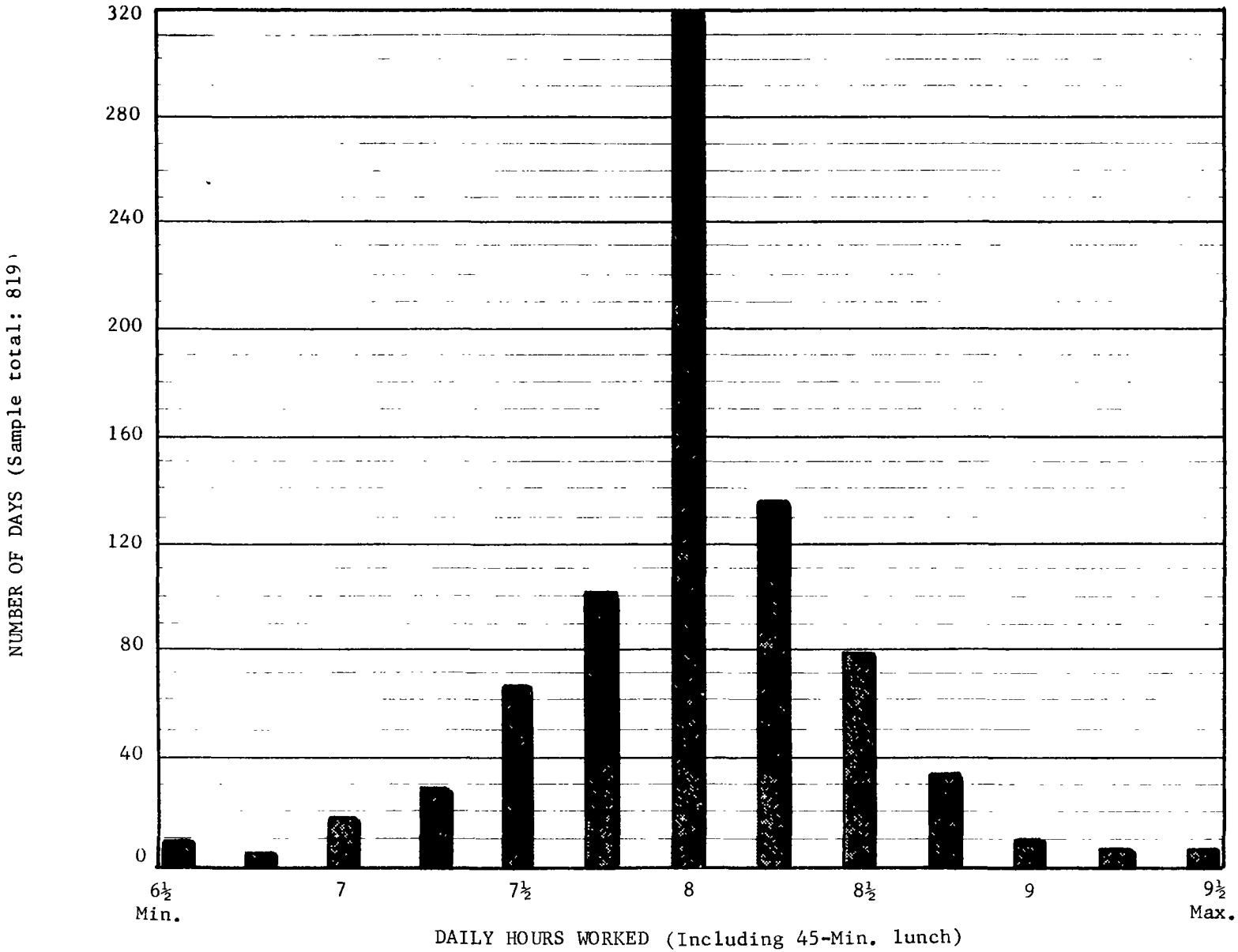
[1] Based upon 165 weekly employee time sheets for the week of December 2, 1974 over five weekdays (825) less sick days.

[2] Pay Plan "B" constitute professional staff while "C" are clerical employees.

Exhibit IV - 17

DISTRIBUTION OF WORK DAY LENGTH
FOR THOSE VARYING HOURS

Port Authority Flexible Work Hours Experiment



distribution in Exhibit IV-17 is to be expected. (The total hours working did indeed "add up" to the required hours: 819 sampled days at an average of eight hours each yielded 6,552 total hours. The total of short, standard and long days reported added to 6,562.5 hours, or 10½ hours longer.) Only about one percent chose on any given day to work either the minimum length (the "core" hours (9:30-to-4:00) or the maximum length (8:00-to-5:30). This was confirmed in the "after" attitude survey, where one percent also reported working two "short", two "long" and one "regular" day.

In comparing the distributions of professional and clerical staffs, there was no significant difference and, in fact, the distributions were practically identical. However, this analysis does not reflect the situation where a professional would neither record nor get "credit" for hours worked past 5:30 P.M. whenever this did occur. This situation was also discouraged for clerical staff since this would require overtime pay. In summary, though, all employees who varied their workday exhibited the same choice of short and long workday combinations.

Variation by Day of Week - A further analysis was made of the total hours worked by weekday for those who varied their Flexible Hours schedules. For example, would people choose to work longer Tuesdays, shorter Fridays and/or some other pattern? The allowable daily spread in the length of the workday was from a minimum of 6½ hours (including a 45-minute lunch period) to a maximum of 9½ hours.

Analysis of the time sheets indicated a definite preference for working shorter Fridays, presumably to be able to leave earlier for the weekend, while "making up" the time in longer Wednesdays, and, to a lesser degree, in longer Tuesdays and Thursdays. Three-quarters of those varying their hours worked shorter Fridays, while a similar percentage worked longer Wednesdays. To a lesser degree, Tuesdays and Thursdays are "longer" days with percentage splits of 60-40 and 61-39, of "longer" vs. "shorter" days respectively. On Monday there is a symmetrical distribution of short and long days.

A closer look at the Friday pattern reveals that some 30% of those surveyed accumulate enough time credit to be able to work very short 6½-7¼ hour days, more than a half hour less than the standard eight hours. A scan of the other days indicates that this time does not seem to be made up entirely in any other single longer day, but over a period of the three mid-week days. These are generalized observations, of course, since the people utilizing the flexibility are not apt to fall into specific day-to-day work schedule habits.

Again corroborating these findings to a certain extent, responses to the "after" attitude survey indicated some 31% varied their work hours from day to day, while 10% said they left earlier on Fridays. These responses, of course, include all respondents who both varied their start and quit times while working eight-hour days, as well as those who worked a combination of longer and shorter days.

iii. Commuter Attitudes - On Flexible Hours, more than half of the participants were happier with their commute. When asked to compare their commuting experience with their previous schedule, 53% were more satisfied with their trip to and from work on Flexible Hours, 44% saw no change from before and only 3% were less satisfied. One frequently-heard remark was that Flexible Hours relieved the pressure of "being late" in the morning and made the trip less stressful, regardless of other commuting conditions.

iv. Home Life - Positive benefits reported on the effect of Flexible Hours on various aspects of their home life, including the impact on the household getting children to and from school and evening activities. While the majority of participants said, for example, that Flexible Hours had no effect on the schedule of other people in their household, a significant 20% said the system actually solved certain problems while only 2% saw problems created.

When asked about getting children to or from school, 6% of the respondents said Flexible Hours had also solved problems there, 19% said "no change" and 75% said the question was not applicable. The "problems solved" were probably ones occurring from a conflict between the children's schedule and the parent's work schedule.

Regarding the effect of Flexible Hours on their participation in various evening activities, 60% of the respondents saw no changes, 37% indicated changes had occurred with which they were satisfied and only 1% felt unsatisfactory changes had resulted. Having more time in the evening to spend with family, as

well as the flexibility to adjust work schedules in order to engage in other activities, were undoubtedly major reasons behind the 37% who noted satisfactory changes.

v. Employee Morale and Job Satisfaction - When asked how they felt about their job now that they were on Flexible Work Hours, some 47% of all the Port Authority employees in the experiment said they were more satisfied, 51% equally satisfied and only 2% were less satisfied. Comparisons between professional and clerical levels show that while both showed substantial increases, a higher percentage of the latter were more satisfied with their job because of Flexible Hours. For clerical levels, 57% were more satisfied with their job while 42% saw no change. For management levels 40% were more satisfied and 57% were as equally satisfied as before. It might be said therefore that work scheduling seems to be a more important factor in overall job satisfaction for clerical levels. Also, management employees generally enjoy a greater degree of work schedule flexibility regardless of schedule practice.

d. Impact on Office Operations

i. Overall Effect - Flexible Hours generally has been received positively by most organizations, although it requires more careful coordination to assure that certain office functions are attended such as telephone coverage and customer services.

In a recent article in Der Speigel, supervisors in some German organizations on Flexible Hours had to require coverage during the later office hours because a large majority of employees chose to work the earliest hours possible. In addition, some managers feel employees arriving

in the early hours do not begin working until their supervisors are present. As noted in a Public Personnel Management article, "Flex Time Systems in New York": "Supervisors can help to alleviate this difficulty with careful work planning that insures all employees know specifically what they are to do at all times."

ii. Communications - Communication problems are more apt to arise under Flexible Hours, but they generally have not been serious enough to halt the growing acceptance of the concept. In the Port Authority trial on Flexible Hours, reactions were mixed on getting in touch with people both inside and outside the organization. Some 55% indicated it was easier to contact others, 15% felt it was the same as in the old schedule and 30% felt it was more difficult. One factor complicating this response was that the idea of "getting in touch with others" may have different meanings to different people. More positive responses were given by individuals queried about specific rather than general aspects of office interactions. The results, shown in the next item, seem to be somewhat contradictory when compared with those of the general reader.

As shown in Table IV-4, most people felt that the quality of several specific office operations was either the same as before or better under Flexible Hours than with the previous schedule.

Table IV-4

EFFECT OF FLEXIBLE WORK HOURS ON OFFICE ASPECTS
1974-5 Port Authority Experiment

Aspect	Better	Same	Worse
Telephone coverage	20.2%	65.5%	11.6%
Ability to schedule meetings	7.3	84.8	3.9
Internal communications	9.7	84.2	4.2
External communications	11.8	84.2	1.6

iii. Productivity - Firms on Flexible Work Hours often feel productivity has increased. Dr. Virginia Schien, who helped implement Metropolitan Life's Flexible Hours (really, a "floating day"), notes that productivity is "definitely up" for their 15,000 employees. This has been a frequent feeling of supervisors involved with the new system. In the Port Authority experiment, the majority of supervisors saw no change in productivity, but more noted increases than decreases in employee performance.

When Port Authority Flexible Hours participants were asked how the system affected their work, 45% said they were more effective at work, 53% said there was no change from their previous schedule and 2% felt they were less effective. Responses were similar for both supervisory and non-supervisory personnel.

iv. Punctuality - Flexible Work Hours practically eliminates the concept of being late since there is no need to be at work at an established time. This can relieve a great deal of pressure on the employee, as evidenced by numerous such comments by participants in the Port Authority experiment. In addition, it may lessen the tendency to call in "sick" if the employee oversleeps and would be late, and thus could also reduce some short-term absenteeism. This latter hypothesis was neither confirmed nor denied by the results of the Port Authority experiment.

3. Shortened or Four-Day Workweek

a. Definition and Current Practice - The shortened workweek generally involves accomplishing the same total hours worked in a workweek fewer than the standard five days. Examples of shortened workweeks include the Three-Day and the Four-Day Week, the discussion that follows is limited to the latter since it is by far the most common. In some cases the total hours required are somewhat reduced, but generally the Four-Day Week in the United States is referred to as the "four-days--forty hours", or "4/40" week. Under the Four-Day Week, the extra day off usually is the same for all or most employees, thus allowing the plant or office to close. In a smaller number of cases, the day off is for portions of employees to enable full five-day business operations.

Three variations of the shorter workweek concept seem to exist: a) the "compressed workweek" which consists of the same number of hours worked in fewer and thus longer work days, shown in Exhibit IV-1, b) a "reduced workweek" providing a slight decrease in total weekly hours but still four longer days, and c) the "less work" week which is merely the usual seven or eight hour day over four days instead of five. The latter is not too popular with management.

Since 1970, the concept of a Shortened or Four-Day Work Week has become increasingly accepted in the United States. An American Management Association (AMA) Research Report on the Four-Day Week, published in 1972, reported between 700 and 1,000 U.S. firms were using the Four-Day with most retaining the 40-hour Week. Indications are that this figure has been steadily

increasing over the last three years. As noted in the AMA Report, in most instances the idea was introduced by management of small manufacturing firms in order to provide a fringe benefit not found in larger competitors. Of the firms surveyed, 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 Four-Day Week.

There seem to be two basic reasons for organizations establishing the new 4-day schedule. One is the attempt to accomodate employees' lifestyles by arranging for another full day of leisure, with the understanding that an equal amount of work can be accomplished more efficiently under the new system. Another recent impetus has been provided by the "energy crisis" as some feel the reduced week will conserve energy. There are, however, serious opponents to this energy conservation theory who point out that, in colder parts of the nation, extended work hours on each end of the regular work day requires additional heat. Also, many if not most modern office buildings cannot shut off heat in partial sectors, and there can be no appreciable energy savings unless all the heat is completely turned off in the entire building. This would therefore necessitate all tenant organizations in a given building ceasing operations on either a Monday or a Friday to create a three-day weekend.

b. Impact on Transportation Systems

i. Reducing Peak Period Congestion - The Four-Day Week, while generally implemented in an organization more for the specific purposes of increasing morale and/or productivity, also has definite implications in reducing transportation congestion. The 4/40 or 4/38 workweek requires the employee to work nine or ten hours a day, and thus the starting and quitting times are pushed beyond the normal travelling periods. For example, an 8:00-to-6:00 schedule would allow employees to avoid the most crowded travel times, while it would also serve to reduce peak congestion.

If widespread adoption of the Four-Day Week takes place, however, one long-range implication for peaking of transportation facilities is that the bands of starting and quitting times for the longer work day would be much narrower. This might lead back to severe peaking in many urban areas, only at earlier and later times with very little acceptable margins for change.

While the project staff did not investigate the Four-Day Week in the same depth of either Staggered or Flexible Hours, there has been some documentation of the shortened workweek concept and its effects on transportation. These effects are especially contingent on whether one has a three-day or a four-day schedule, and also whether the day(s) off itself is staggered, or whether, as is more common, all employees are off from work on Friday or Monday.

ii. Elevator Operations - Depending upon the way it is organized, the Four-Day Work Week may or may not ease any elevator congestion existing in a building. If a staggered day-off scheme is set up for employees on the Four-Day Week, it could relieve elevator congestion since there would be about 20% fewer people working on any given day. If everyone works the same four days

however, then elevators might still be congested around the nominally scheduled starting and quitting times assuming a single work schedule in the elevator bank.

iii. Modal Changes - The Four-Day Week has definite implications for modal use, although to what extent is not exactly certain. Where auto commuting predominates there may be little impact, although carpool arrangements would be nearly impossible among people in Four-Day and regular workweek schedules.

In an urban area with heavy transit usage, people adopting the Four-Day Week would find significantly fewer and less convenient transit services available at the earlier morning and later evening start and quit times. There would then be a tendency to switch to the auto at a time when roads may be less crowded away from the height of the peak. Another reason which might encourage a shift from transit is the reduced fare costs with two less work trips per week (unless a monthly commutation system is used.) If implemented on a broad scale, this could reduce revenues for already financially-ailing transit systems.

c. Impact on Attitudes

i. Overall Reaction - In 1971, the Port Authority conducted a Four-Day Week experiment in two departments for ten weeks. When surveyed after the ten-week trial, only 50% wanted to remain on the schedule indefinitely. This highlights the schism apparent because some people like the concept as much as others dislike it. There is not much middle ground. In essence, the Four-Day

Week certainly is feasible in many applications, although the benefit of a day off may not outweigh the problems of four longer work days and other factors. A significant shortening of the 40-hour work week, resisted strongly by U.S. management, would be on of the only foreseeable boosts to a widespread popularity of the Four-Day Week.

ii. Work Schedule Preferences - Under the Four-Day Week, the length of the work day makes it harder to vary the starting and quitting times significantly to allow for employees preferences. However, there is the option of varying the day-off. In the Port Authority trial, some employees chose to take Fridays off while other selected Mondays. In this way, employees could suit their needs to a degree, and the office benefited because about half of the staff was there on Mondays and Fridays.

iii. Commuter Attitudes - On the Four-Day Week, commuters generally have more difficulty in getting frequent transportation service to and from work. This was a common complaint in the Port Authority experiment. As already pointed out, a plus from the commuter's point of view is the reduction of commuting expenses as they would only be paying for four trips instead of five. Of dubious public value, but of personal worth, is the fact that auto travel outside the peaks becomes more attractive because of less congestion.

iv. Home Life - The Four-Day Week has had profound effects on workers' home life, some positive and some negative. In companies where the Four-Day Week has been successful, employees report the extra day off is more important than the extra hours worked daily during the week. Many say they take more trips with their family and generally have time to accomplish more on the day off.

In the Port Authority, however, many employees were not as happy with the Four-Day Week's effect on their home life. While many participants agreed that a three-day weekend is more valuable than a short or regular work day, some 50% found that adding two working hours to a length commute asks them to give up too much in their daily routines at home. Also, while 75% preferred the 3-day weekend, 25% stated that the schedule upset their family routine to a degree that the extra day at home did not compensate. These, as well as other difficulties, resulted in less than half of the employees wanting to remain on the Four-Day Week.

v. Employee Morale and Job Satisfaction - The Four Day Week has had both positive and negative impacts on morale. The most receptive workers have been those in manufacturing and production industries, as noted in the Harvard Business Review of January-February, 1974, by Ebling, Gadon and Gordon. Varying effects have occurred for office workers. For example, many Port Authority employees complained of these problems: handling of absences was considered unprofessional and, even though the bulk of the employees had little or no trouble adjusting physically to the schedule, 17% did indicate that fatigue was a problem for the entire ten weeks test period.

d. Impact on Office Operations

i. Overall Effect - The Four-Day Week can be the most disruptive of the three work schedule changes. An important distinction is whether the organization closes its operation for one day a week or whether their 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 operation costs have been reduced. By contrast, many offices feel reluctant to close for an entire day. They therefore arrange for employees within a given unit to take different days off, which sometimes makes it difficult to get things done.

ii. Communications - The Four-Day Week has presented some understandable problems in certain organizations in communications. 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 the resources of a less-than-full staff complement at any given time, and they felt this to be a problem. Many firms using the Four-Day Week interviewed by the staff, expressed concern about communications, but many merely closed the office on the fifth day or maintained only a skeleton staff. The problem in itself has certainly not prevented many firms from using the Four-Day Week.

iii. Productivity - There have been mixed reactions about productivity on the Four Day Week. In the American Management Association report, discussed earlier, 66% of 143 Four-Day companies surveyed reported increased productivity, 35% said it remained the same. Only 3% saw a decrease. Contrastingly, Martin Gannon, in a recent issue of California Management Review, notes that many firms with the Four-Day Work Week have seen productivity decline after a few months time to below what existed on a Five-Day Week. He also notes that, because of this, many companies have reverted back to their former five-day schedule. At the Port Authority, there was no evidence of an increased level of productivity on the Four-Day Week. Work progress was not blocked, and there may have been a slight improvement shown by a few, but certainly no unusual increases in output were realized.

iv. Punctuality - On the Four-Day Week, employees who favor the system may make a concerted effort to be on time. Having to arrive at work an hour or so earlier than on the old schedule, however, may be difficult in terms of transportation and the employee's own personal habits.

4. Subjective Ratings Comparing Work Schedule Concepts

The three major work schedule concepts -- Staggered Work Hours, Flexible Work Hours and the Four-Day Week -- have been evaluated and compared in the previous narrative with respect to their impact upon transportation systems, participant's attitudes and office operations.

This section focuses on summarizing the previous discussion, and then subjectively and comparatively rating each work scheduling concept as each relates to aspects of transportation, attitudes and office operations. To our knowledge such a rating system has not been done, although the ratings developed here are far from being definitive.

In developing a rating system to judge each work scheduling concept relative to one another, a technique was needed to provide the framework for making reasonable subjective evaluations. Such a technique was adapted from a "factor profile" method of arraying alternative highway schemes, developed in "A Policy on Design of Urban Highways and Arterial Streets - 1973".[1]

The first step required the development of a tabular summary comparison of each work schedule concept with respect to the factors under consideration. Therefore, Tables IV-5, IV-6, and IV-7 were prepared showing, respectively, these impacts on transportation, attitudes and office operations. Comparisons are developed for Flexible Work Hours, two variations of Staggered Work Hours (one schedule and several schedules) and two types of the Four-Day Week (same day off, staggered day off). The summaries in the table are necessarily

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[1] American Association of State Highway Officials, 1973. Page 256

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Table IV- 5

SUMMARY COMPARISON OF TRANSPORTATION IMPACTS

	Transportation Aspect			
	Reduce Peaking	Elevator Operations	Modal Changes	Commuter Attitudes
1. STAGGERED WORK HOURS				
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
2. FLEXIBLE WORK HOURS	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
3. FOUR-DAY WEEK				
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

Table IV-6

SUMMARY COMPARISON OF EFFECTS ON ATTITUDES

	Attitudinal Aspect			
	Overall Reaction	Work Schedule Preference	Home Life	Employee Morale & Job Satisfaction
1. STAGGERED WORK HOURS				
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
2. FLEXIBLE WORK HOURS	Highly positive; preferred to fixed schedule	Trend to earlier hours, but allows for individual preference	Positive - better balance between work and family	Perceptibly increased
3. FOUR-DAY WEEK				
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

Table IV-7

SUMMARY COMPARISON OF EFFECTS ON OFFICE OPERATION

	Overall Effect	Aspect of Office Operations: Communications	Productivity	Punctuality
1. STAGGERED WORK HOURS				
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
2. FLEXIBLE WORK HOURS	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"
3. FOUR-DAY WEEK				
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

brief and are based upon the extensive documentation in the previous sections.

These summary table provided the framework for subjectively comparing the three work schedule concepts, after melding into one the two variations shown in the table for Staggered Hours and the Four-Day Week. The rating technique involved comparing the three concepts relative to one another, and then on an absolute scale of positive and/or negative impact with respect to 12 different factors. The graphic result of this subjective evaluation is shown in Exhibit IV-18.

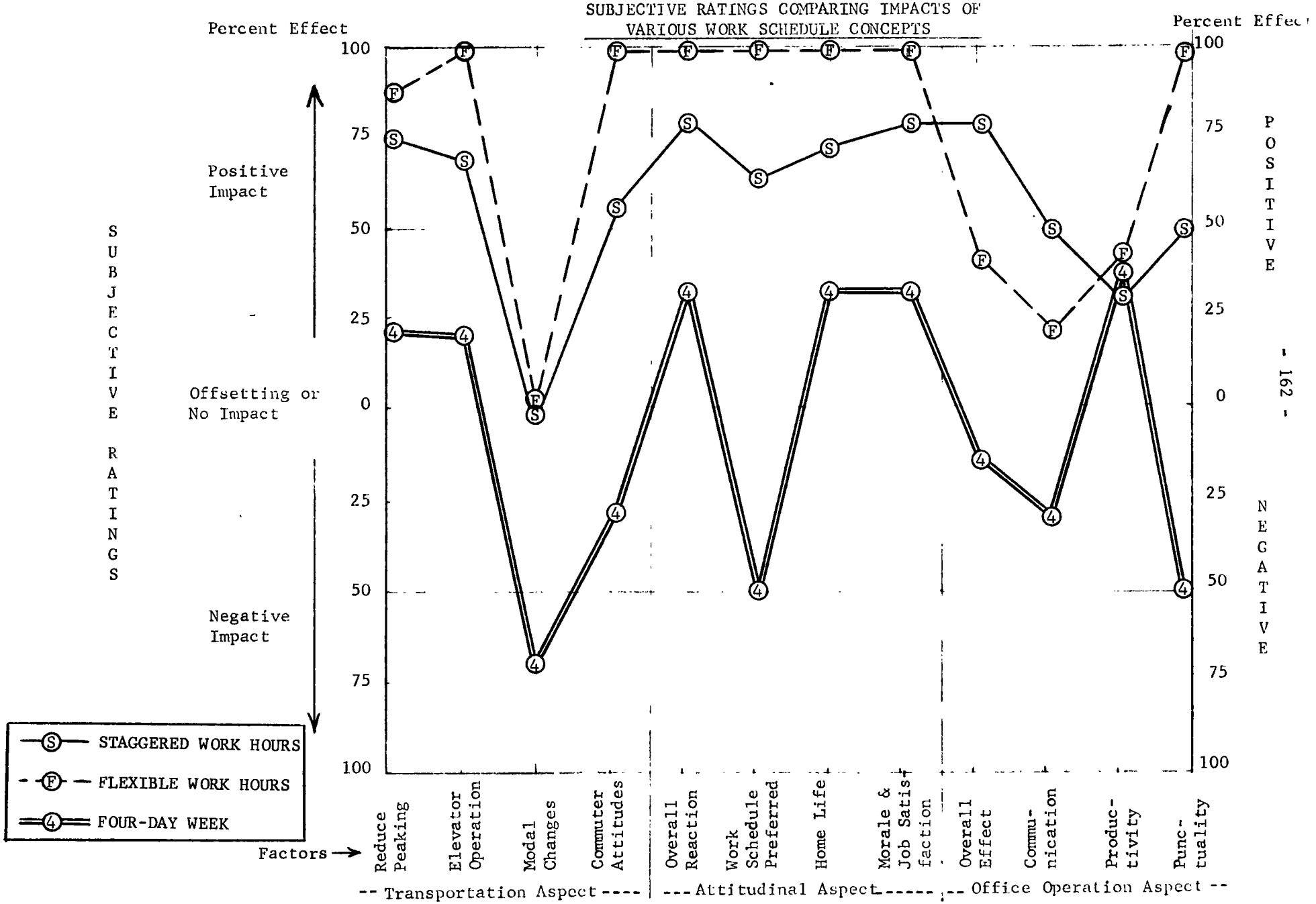
Many of the rating values shown in the chart may not be readily apparent and, to be sure, there can be wide swings in their values under any number of circumstances. The values range absolutely from +100% for the best positive impact, down to -100% for the worst negative impact. Values around zero indicate either offsetting impacts or no impact at all. Usually, the highest-rated concept was assigned +100% and the others rated relative to the top-rated one. In some other cases, the highest-rated concept was assigned a rating of less than +100% for various reasons including some offsetting negative impacts. The ratings were based in all cases upon the most commonly-occurring impact and/or situation.

Three illustrations of the ratings for specific factors may be helpful to understand the development of Exhibit IV-18:

1) "Reduce Peaking" - When broadly evaluated in their relative ability to "reduce peaking", i.e., to spread out demand patterns to reduce congestion on transportation systems, all three concepts would accomplish this

Exhibit IV- 18

SUBJECTIVE RATINGS COMPARING IMPACTS OF VARIOUS WORK SCHEDULE CONCEPTS



to varying degrees. Generally, Flexible Hours and Staggered Hours will do this more effectively by spreading out the demand, while the Four-Day Week may simply shift the peak to another time, especially on elevator systems.

Also, by its nature, Flexible Hours would generally be better than Staggered Hours. In two extreme cases, which can not be portrayed graphically, peaked demand would be completely spread by Flexible Hours while peaking would be unabated by a large firm shifting to another single Staggered Hours schedule. The other extreme would find an organization adopting a number of split Staggered schedules and reducing peaking, while a firm on a "floating day" form of Flexible Hours might, unfortunately, increase peaking if a huge concentration of staff choose to come and go on the earliest possible times (say 8:00 AM and 4:00 PM). But, generally, Flexible Hours will be incrementally superior to Staggered Hours in reducing transportation congestion. Hence, the subjective positive ratings of 85% for Flexible Hours, 75% for Staggered Hours and 25% for the Four-Day Week.

2) "Modal Changes" - Since little evidence was found of modal changes with Staggered or Flexible Hours, both are shown graphically at zero or no impact. However, since the Four-Day Week will cause some diversion towards the private auto (and not towards public transportation and/or carpools) it is shown as having a significant negative impact of -75%.

3) "Work Schedule Preferences" - Another clearer situation involves preferences, and here Flexible Hours is the obvious top choice since everyone can choose, within limits, their favorite schedule. Staggered Work Hours is also highly rated since the schedules, although generally prescribed by employers, are usually popular schedules among most staff. In contrast, the Four-Day Week is very controversial, strongly liked by some and disliked

by others. In the context of this subjective evaluation it therefore receives a -50% rating since it is safe to say that the longer hours are preferred by few.

If one generally abides by the subjective ratings embodied in Exhibit IV-17, several interesting findings result. These include the almost across-the-board dominance of Flexible Hours as the optimum work schedule system of the three. Perhaps as significant is the close "runner-up" position of Staggered Hours, which is far easier to implement on both micro (individual organization) and macro (citywide) scales. And there is little surprise that the Four-Day week hovers between moderately positive and negative positions. These findings may aid in the consideration of each of these concepts relative to one another, since one could select from the chart the concept best-suited to the factor(s) under consideration.

D. RECOMMENDATIONS

The three major varieties of work schedule changes have been compared in this section with heavy emphasis placed upon first-hand Port Authority experience with each concept as well as a thorough knowledge of other applications.

Based upon this analysis, the following recommendations are made:

1) While the concepts of Staggered Work Hours and the Four Day Week have been relatively well documented more research is needed to examine the impact of the Flexible Work Hours concept on transportation, attitudes and business operations. Since Flexible Hours will probably become increasingly popular in the United States (as it already has in Europe), it is of growing importance to fully understand its ramifications on travel demands, modal choice and other pertinent factors.

2) The concept of Flexible Work Hours appears to be superior to Staggered Work Hours and especially the Four-Day Week, particularly in the areas of reduced transportation congestion and improved employee attitudes, while not adversely affecting business operations.

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

Chapter V

Design Procedures For a Staggered Work Hours Program

Staggered Work Hours Study

V. DESIGN PROCEDURES FOR A STAGGERED WORK HOURS PROGRAM

A. OBJECTIVE

This section's objective is to organize a framework for the design of an urban-area Staggered Hours program. To accomplish this, three design strategies are developed which should result in achieving significant voluntary participation in Staggered Hours. The discussion focuses upon major design considerations to assist in determining the appropriate strategy as well as a modelling technique for testing alternative schedules to carry out the chosen plan.

B. WORK PERFORMED

The work performed involved organizing the broad experience of Port Authority project staff in designing Staggered Hours programs in Downton and Midtown Manhattan, in Downtown Newark, New Jersey and in reviewing other efforts. These design procedures are for Central Business Districts as well as for many subclassifications of individual industry groups, small geographical locations, and individual office buildings. A number of the design concepts discussed here were also drawn from staff's knowledge of other Staggered Hours efforts, some successful and some not, gained in part through the "State-of-the-Art" survey discussed in Section I of this Report.

The work involved three major areas: 1) outlining several overall program design strategies, 2) discussing major design considerations, and, 3) developing a computer model to test alternative Staggered Work Hours schedules.

C. ANALYSIS

1. Introduction

Staggered Work Hours in an urban area involves a voluntary effort to adjust work schedules to reduce transportation congestion. Since participation is usually voluntary, 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. There is no Highway Capacity Manual, for example, where a methodology combining empirical and theoretical data can be used with known precision to many differing situations.

However, much is known about how to design an effective Staggered Hours Program. Design procedures developed in this section involves 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 which will achieve desired changes in transportation demand patterns.

Absolutely critical in the program design is an understanding of the complex factors which will persuade employers to switch their work schedules voluntarily. While this may seem obvious, it should nevertheless be stated since without the active involvement of a number of organizations, any potential transportation benefit will not be realized. As an example, one factor discussed later involves evaluating work schedule concepts which are acceptable to the business community as well as those which would not be attractive. In some instances where Staggered Hours efforts have not succeeded, the designed work schedules were simply unacceptable to the employers or employees, or both.

The concepts offered here are, in most cases, based upon the characteristics of the Manhattan business community. The general approach however is valid for any U.S. Central Business District. Manhattan-based organizations on Staggered Hours represent practically every industry and many embrace nationwide operations. In addition, characteristics observed in Manhattan are consistent with those found under Staggered Hours programs in other cities.

2. Overall Design Strategy

The overall design strategy of a Staggered Hours Program should be to adjust work schedule patterns in such a way that transportation demand would be smoothed. This would make for more efficient operations with less congestion and delay, as well as higher utilization of equipment and facilities.

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, and deciding on the basic method of approach and implementation. The following are some questions that must be answered:

1) What should be the overall approach of a Staggered Hours Program for a particular CBD? Obtaining an answer to this involves the examination of available sources of transportation information, data on current employment and work schedules, and the planning of various surveys to obtain any additional necessary information.

2) What objectives should be set and what are the most effective options to be considered? Will the program be directed at a particular transportation mode, geographic location or peak time (morning or evening), or towards the entire CBD itself? Also, which work schedule approaches will be practical and effective in the particular city.

3) How can one predict the effects of a particular work schedule program in a given city? How are the results to be evaluated, what level of participation should be attempted and how can one anticipate the potential problems of each alternative?

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, with their elements being shown in Exhibit V-1:

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

The various survey and analysis techniques developed in this study to identify transportation problems, and to aid in the design of Staggered Hours program, are discussed in conjunction with the "Comprehensive Plan." These same methodologies would also be applied on a more limited basis if either of the "Directed" approaches are selected. A more extensive discussion of each approach now follows.

a. "Comprehensive Plan"

This section outlines a framework of a Comprehensive Plan for the design of a Staggered Hours effort (shown in Exhibit V - 1).

Staggered Work Hours Study

Exhibit V-1

BASIC OVERALL DESIGN STRATEGIES FOR A STAGGERED WORK HOURS PROGRAM

"COMPREHENSIVE PLAN"

The most thorough strategy aimed at identifying transportation problems and the effectiveness of Staggered Hours in alleviating them. The sequential elements involved in a "Comprehensive Plan" include:

- Survey conditions on transportation modes
- Evaluate current level of service on transportation modes
- Determine expected need for additional transit facilities
- Conduct a Work Schedule Survey within the CBD
- Analyze correlation of projected demand patterns with those observed on transportation modes
- Develop Staggered Work Hours alternatives
- Project the potential impact of a Staggered Hours program
- Implement the Staggered Hours program

"DIRECTED PLANS"

- Physical Facilities Oriented - The design of the Staggered Work Hours program is directed or aimed at a specific congested transportation facility or mode rather than at an entire Central Business District.
- Neighborhood or Special Group Oriented - The Staggered Work Hours program evolves initially from a relatively small experimental base participation within a specific neighborhood or industry and evolves on a step-by-step basis until the desired reduction in peak demand for transportation facilities is achieved.

Steps in "Comprehensive Plan":

1) Survey of Conditions on Transportation Modes - The first step is to determine the "levels of service" currently being provided on transportation modes serving the CBD. Where possible, existing data should be utilized 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. (This is discussed in detail in the section on "Criteria.")

3) Determine the Expected Need for Additional Transit Facilities - The need for additional transit facilities should be determined. These include those 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. (Section IX of this report discusses the benefits of Staggered Hours in more detail.)

4) Conduct a Work Schedule Survey Within the CBD - The Staggered Hours design effort requires explicit information on current work scheduling practices. A "work schedule survey" of numbers of employees on various starting and quitting times within the CBD should be conducted. This survey should include as many as possible of the major public, private, or other organizations which generate substantial peak period traffic. (Both the conduct and analysis of work schedule surveys are discussed in Section III.) A method of determining expected arrival and departure patterns related to these nominal "official" work schedules is discussed later.

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. Section IV of this report contains a comparative evaluation of the relative degree of "peaking" reduction that can be expected from different work schedule concepts like Staggered and Flexible Work Hours and the Four-Day Week. A computer

program, described later, is designed to evaluate the impact of a combination of purely Staggered Hours alternatives.

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. The methods to determine this impact are similar to those discussed above in Step #2 where levels of service were found. This procedure may be carried out for several sets of Staggered Hours alternatives to determine which will result in the greatest benefits.

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 VI.) 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.

b. "Directed Plan"

The two "Directed Plans" to designing 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 either Directed Plan are to reduce the time, cost and effort required to design the program by concentrating efforts on specific transportation problems.

1. Physical Facilities Oriented

In this "Direct Plan" 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 in terms of elimination or reduction of crowding and delay at the specific physical problem area, rather than the broader goal in the "Comprehensive Plan" of reducing congestion on all modes and places.

2. Neighborhood or Special Group Oriented

Like the previous plan, this variant of the Directed Plan also provides a relatively 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 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 to participate by organizations on the predominant starting and quitting times 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. The various Staggered Work Hours programs underway in the CBD's of Manhattan and Newark, New Jersey, come under the category of "Directed Plans" in that they evolved from small beginnings in certain areas.

3. Major Design Considerations

There are a number of important design considerations of which the designer must be cognizant in structuring potentially successful Staggered Hours programs. 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 in most cases simply involves the entire staff shifting to another single work schedule. This would work well in spite of theoretical exercises which call for a variety of split schedules because of modal, residential, employee classification, industry type or some other of the design considerations discussed below.

Generally, the more sophisticated the recommended Staggered Work Hours program, the less likely it will be implemented no matter how well it will benefit the transportation system. It is much easier to implement a simpler, more easily-understood plan, so that even if the unit benefit is less, the aggregate transportation benefit of many organizations shifting will be greater. Therefore, the purpose of these design considerations is to achieve as much transportation benefit as possible while designing recommended work schedules which are simple, attractive and implementable.

a. Acceptability of Work Schedule Concepts

It is basic to the design of a Staggered Hours program to understand which work schedule concepts are acceptable. Certain scheduling concepts are well-known and can readily be accepted by employers, while others may be anathema to an organization because of fear of losing employer control of employees, union resistance or other factors. For example, if work schedule adjustments recommended for a certain industry are not consistent with practices acceptable to their industry, firms probably would reject such recommendations out of hand.

1) Current Alternative Work Schedules

The following are several work schedule concepts which can be reasonably implemented today in urban areas. Briefly they are:

- Staggered Work Hours - Shifting of fixed starting and quitting times while retaining the same total five-day workweek. This may involve shifting entirely to a different single schedule, or splitting staff by unit onto several different schedules, and these shifts may be either to earlier hours or later hours or to a combination.

- Four-Day or Shortened Workweek - Reducing the number of days in the workweek, usually from five to four, while retaining in most cases the same number of total hours worked. This results in significantly longer individual work days and still retains fixed starting and quitting times.

- Flexible Work Hours - Introducing a specific degree of flexibility by allowing employees to come and go from work within certain daily time bands, usually retaining the framework of a five-day week.

In the previous Section IV, these concepts were evaluated as to their effects these work schedule concepts have on transportation, attitudes and organizational efficiencies. The purpose of the following discussion is to understand the realistic status of each concept.

2) "Implementality" of Concepts

Project staff feels 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" schedules is usually practiced in the business community. Third, the concept is straightforward, popular, easily understood, usually non-controversial and, as a result, more readily implementable.

In the Manhattan and Newark programs, for example, only Staggered Hours scheduling has been recommended (although a number of organizations wish to pursue and implement Flexible Hours or a Four-Day Week). Over 400 Manhattan organizations have adopted Staggered Hours systems, which includes many variations of the concept, and it has been found very effective in reducing transportation congestion on over-crowded facilities.

In Toronto, a broader approach has been to promote "variable work hours," which is either Staggered or Flexible Work Hours. Employers have been more receptive in Toronto towards the concept of Flexible Hours than so far in the United States, probably due somewhat to a greater European influence where the concept has been widely embraced. Although the Port Authority has analyzed an extensive Flexible Hours experiment (discussed earlier in Section IV), the transportation impact of Flexible Hours is still uncertain except that it seems comparable to Staggered Hours systems in reducing congestion.

It seems also that a firm on a fixed five-day work schedule will not directly embrace Flexible Hours. Rather, there is much experience to indicate that once a firm needs to take a "first step" with Staggered Hours in order to find that switching off their traditional work schedule has not resulted adversely -- and, in fact, has entailed many benefits. These firms have been more willing to then evolve towards Flexible Hours, and they include such large Manhattan-based organizations as Bristol-Myers, Montgomery Ward, Equitable Life Assurance, Metropolitan Life Insurance, First National City Bank, and The Port Authority of New York and New Jersey.

The Four-Day Week is widely known throughout the United States and can be an acceptable scheduling concept for many organizations. However, it is very controversial since it involves a longer work day and there is great dissatisfaction in some companies which have tried it. It is also not as desirable as Staggered and/or Flexible Work Hours from a transportation viewpoint in that, while it can potentially reduce peak transportation congestion, it would drastically reduce public transportation revenues. Further, the usual practice of Mondays or, in most cases, Fridays off, might exacerbate traffic congestion on the remaining work days. Currently, therefore, 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 should be aware that, while Staggered Work Hours is generally acceptable, there are some factors which can make it unacceptable For one, Staggered Hours has the connotation of an emergency or temporary system and this "image problem" should be confronted early. Further, recommended schedule changes might be viewed as arbitrary or too excessive -- amounting perhaps to shifting an hour or more. On the latter point, schedule changes need not be too great in most cases for adequate transportation relief. In Manhattan (although it's recognized that this situation is not typical of most other areas) the recommended work schedule change is usually only a half-hour either earlier or later. Similar requests are made in the Toronto, Newark and Philadelphia programs. This can usually afford enough transportation relief since peaking on many facilities serving a CBD is such that a 30-minute change will take people out of the height of the peak and into a more comfortable commuting period. This also needn't create a new peak if schedules are spread to both earlier and later hours. More important, though, a 30-minute change is realistically the maximum an organization will voluntarily entertain at first.

Past attempts at Staggered Work Hours in Manhattan, principally those advanced in the 1960s by the City-supported Cohen study, entitled Work Staggering Relief in New York, developed much broader recommendations for schedule changes of an hour or more and by industry type. Recommending such broad schedule changes encounters the basic resistance of the business community to want to make any changes at all, since the ingrained concept of the business day is to have everybody on the same schedule. Any change in work hours is usually

considered anathema, let alone a large change of an entire industry's work schedules. Therefore, the designer can recommend large schedule changes and gain little or no adherence, or pare one's requests and gain more effective participation.

Since highway systems generally exhibit "flatter" demand patterns than public transportation systems (discussed in Section VII of this report), cities having a heavy reliance on automobile commuting may find it necessary however to recommend work schedule changes greater than 30 minutes to achieve significant congestion reduction with Staggered Hours. This recommendation must be well documented, and must continue to be balanced against the strong resistance of organizations to change greater than thirty minutes, no matter what their present schedule. Interestingly, however, cities with such heavier auto commuting as Madision (Wisconsin), Riverside (California) and Atlanta have recommended only half-hour changes to potential participants. Atlanta's program floundered though when several organizations balked at participating. Washington, D.C., is of course a city where Federal work schedules are widely staggered by individual agency. It is not a typical situation found in other cities since the Government can promulgate these optimum schedules.

To summarize, therefore, a Staggered Work Hours program in a city for the purpose of transportation relief should concentrate on recommending initially no more than half-hour shifts on the part of employers. Further, Staggered Hours should be the scheduling concept utilized for quick implementation and effective transportation congestion reduction.

b. Preferences of Employees and Management

The design of Staggered Work Hours schedules must be cognizant of the attitudes of both employees and management. While more extensive discussion on

such preferences is covered later in Section VIII of this report, several specific factors affecting the design of an overall Staggered Hours program are discussed here.

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. Knowledge of these factors will guide the design of work schedule recommendations, and provide practical constraints on what is voluntarily requested. 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. Later hours are preferred to some extent, including instances where the commute to work is very short or when business considerations override. The maximum degree of shift that is usually allowed, at least on the initial stage, is limited to a half hour, in most cases.

Most shifts away from the height of the congested time periods, even in some cases to later hours, are acceptable to a majority even if it wasn't their preferred time that they shifted to. For example, while most employees in Manhattan prefer earlier working hours, firms that shifted onto slightly later schedules still found widespread acceptance since it took employees out of congested travel time periods often. One reason reported for this was that travel times were faster at these less-congested time periods so that, in many cases, people would get home only slightly later than on their previous quit time during the height of peak congestion.

It has been found to be critically important not to recommend schedules to which people will greatly object. This is especially true since Staggered Hours is a voluntary effort which has to be acceptable to both employees and

management. Staggered Hours will be unacceptable if people are asked to adjust their daily schedules to hours they dislike, or shift by too great a degree. It should be understood that many people associate "Staggered Work Hours" with an undesirable image of an emergency, temporary situation or one which requires people to work at odd hours or around the clock. It is important to dispel these notions with a simply designed program which is acceptable to all and does not require too great a time shift in work hours.

Regarding the practical aspects of earlier versus later hours, one direct cause of the failure of the Atlanta effort to date was the unpopular recommendation for later hours to some potential participants. When this proved unsalable, the momentum to shift was lost.

How does one assimilate all these preference factors to design Staggered Hours recommendations? It's not really that complex. Fortunately, since earlier hours appear to be universally popular, most organizations can usually be encouraged in this direction. Those individuals or operations not able to shift earlier could remain on the previous schedule, in many cases to provide needed "coverage."

Later hours should be encouraged only where it is found to be popular among stratified groups. These include people who like later working hours (generally both older and younger people without children and those who have a short commuting trip), certain industries (like communications, advertising, publishing and the legal profession) and some service-oriented or retail operations directly serving the public. For the latter, a combination of earlier and later hours can increase effective hours of operation, and can usually be accommodated by employees opting to the earlier or later shift of their choice.

In summary, the design of recommended work schedules should lean heavily on shifting people onto earlier working hours. It would be a bonus if a certain number of people would be enticed to shift onto later work schedules, but it should not result in staff proposing that any organization adopt later hours in order to participate. However, don't underestimate the tremendous popularity of shifting onto much earlier schedules -- more so than even management would entertain at first -- but which could evolve to an hour or more shift of work hours after experimenting with a smaller shift. Many of the organizations who first went from 9:00 onto 8:30 AM have since shifted even further to 8:00 AM starts.

c. Industry Preferences

The success of a voluntary Staggered Hours program largely depends upon its acceptability by large public and private organizations. While much emphasis traditionally has been placed on the various characteristics, pecularities and attitudes of specific industries and government agencies in designing work schedule recommendations, our experience suggests that it was probably too much emphasis when, in fact, other universal factors like office productivity, punctuality, employee's attitudes, elevators and transportation might be more important.

An example of a coordinated industry approach that fizzled was one made to a large Manhattan-based industry. For one reason or another, their industry trade association turned out to be powerless and defensive. The various industry members were also seemingly more jealous of one another than interested in how Staggered Hours could be accomplished in their industry. In fact, the firms were usually expressing more concern about what other businesses in its immediate neighborhoods or its own building were doing regarding Staggered Hours rather than those in its industry.

In any case, however, many different industries do reflect widely-varying conditions, business aspects and attitudes. Understanding these should not be overlooked. The degree with which one understands the different industries will aid eventual implementation of work schedule changes, although it is unwise to expect that industry-based recommendations will make firms in an industry more conducive to shifting work hours than the individualized approach.

As a general rule, there has been little difference from industry to industry with regard to communications, attitudes, and transportation. In fact, it is felt that most problems in enlisting any organizations in a Staggered Hours program stem simply from the resistance or inertia to any change in the way of doing business. While a modern corporation is, in some circles, deemed the epitome of logic and rationale, it is probably not surprising to report that many businesses have been found to be overly conservative when it comes to evaluating the pros and cons of making a work schedule change. Typical of human behavior, there are some firms which are leaders in trying new things, while most others are followers and some never try anything new.

There are some informal guidelines relating the characteristics of different industries to its 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, suppliers or has to provide other service characteristics. Industries like this include insurance and other mail-order processing types of businesses. Similar functions are also located within <u>any</u> business, and would include accounting, billing, finance, personnel, office services and electronic data processing. Headquarters offices of corporations also are generally receptive to shifting away from the predominant schedule.

One repeated concern from these headquarters operations involves maintaining effective communications with widely-placed operations. These frequently involve time-zone differentials between the east and the three westerly time zones in the United States. In the Manhattan program, solicited testimonials from a half-dozen firms with nationwide operations which have shifted their headquarters onto Staggered Hours revealed that the half-hour shift in Manhattan did not significantly affect communications. While minor adjustments might be needed, it certainly did not outweigh the benefits of Staggered Hours.

Some firms initially not very receptive to Staggered Hours are: advertising agencies, accounting firms and law firms and other similar direct service businesses, which cite the need for maintaining liaison with clients. In these cases, ask them to focus only upon staff who are not directly related with day-to-day client relationship. Such units were mentioned above. A major advertising agency shifted their entire accounting department onto earlier hours, while maintaining other staff on 9-to-5 in order to serve clients. This strategy is effective in that a significant portion of such a firm's office staff -- maybe 20-50% or more -- doesn't deal directly with the public. Also, one doesn't alienate such a service firm by unreasonably requesting that they all shift since it would possibly affect their operations adversely.

When dealing with different industries, design recommendations should involve discussions with the trade association in the local area to enlist their assistance in shifting the industry's firms onto the program. If the trade or industry association is a progressive, action-oriented entity that has the support of the major firms in the business community, its support and backing is invaluable in assuring a successful program. However, as said earlier, one should be aware that occasionally, an association may be quite reluctant

to be out in front on any issue or program that is new and relatively untold in their industry. The trade groups do, however, provide a forum for industry discussion and can be very helpful. This will be discussed more fully in the implementation procedures discussed later in Section VI of this report.

Getting government agencies to adopt Staggered Work Hours is similar to the effort and approach required for private organizations. However, it is often taken for granted that government will readily participate when such agencies actually may be more complex to work with. People in government agencies have similar attitudinal responses as those in the private sector; also, government agencies are concerned about maintaining contact with other agencies as well as "serving the public." While this may or may not preclude some individual units from adopting Staggered Hour schedules, many large agencies have already instituted several work schedules and it generally should not be too difficult to switch those remaining on a peak congested schedule. As with private firms, it has been effective to encourage individual units to experiment with the new hours first. The support of the Mayor or other appropriate governmental leader is usually essential in this effort.

The large size of many government agencies also makes it difficult to treat them as a single entity in developing agency-wide work schedule recommendations. This might be feasible only if the agency is willing to undertake a large portion of the task of surveying their people and developing definitive recommendations. Much better results have been achieved, however, when the program sponsor deals separately with individual governmental units and works with them like they were separate companies in terms of recommended work schedules. This approach has been used with City of New York agencies in Lower Manhattan where a task force was set up by the Mayor and project staff works with separate units to develop work schedule recommendations. This enabled

recommendations to be made on a functional basis to separate agencies involved in finance, personnel and units providing a variety of municipal services.

To summarize, greater efforts should be placed in treating organizations individually rather than to rely on their industry identification as the controlling factor in their adoption of Staggered Work Hours. The more one understands the industry's characteristics, however, the more potential there is for enlisting a successful response and participation.

d. Responsiveness of CBD Community

It is important to have widespread support for a Staggered Work Hours plan to succeed. If there is an obvious awareness of tremendous congestion generated by concentrated work schedules, or if there is an exceptionally responsible business community, then there would be a greater impetus to embrace a well-organized effort to Staggered Work Hours.

The design effort should reflect an understanding of a CBD community for, like people and individual organizations, they have different characters. It is important, therefore, to determine the general outlook of the community to a program like this in order to design a strategy which will garner broad support. Fortunately, the concept of Staggered Work Hours has been generally very popular and avoids much controversy which usually surrounds transportation proposals these days. It is still important though to marshal strong support from CBD community leaders in order to have the greatest impact upon organizations which will be requested to make schedule changes. It is also important to have the support of any and all business, civic and other major institutions within the community so that the effort will not be undermined by lack of communication with one or several interest groups. Throughout the course of the Manhattan program, innumerable groups were briefed about Staggered Hours and their support and sponsorship solicited. This has engendered a broadly

positive opinion which has succeeded in bypassing many roadblocks and gaining broad-based CBD support. If the program had incurred negative reaction from certain sectors, particularly in the business community, the whole effort might have failed.

e. Arrival and Departure Patterns

In order to design Staggered Work Hours strategies, it is essential to understand the impact that adjustments in work schedules have upon transportation patterns. Before discussing that, however, it is important to realize that a nominal work schedule does not entirely reflect the actual time that a person arrives at or leaves work. The reason for this is that employees will tend to arrive either earlier, "on time" or later to work than their nominal work schedule and to do likewise for their afternoon departure. Thus, there are separate distributions of arrivals and departures around the nominal starting and quitting times, respectively.

Determining these distributions need not be very precise in order to design a Staggered Hours program. However, several aspects of arrival and departure patterns are helpful, some of which are covered more fully later in this chapter during the discussion of a computer model to predict the impact of Staggered Work Hours alternatives.

1) Morning and Afternoon Patterns

Morning arrival patterns are usually quite spread out, the major reason being that the various commuting systems do not deliver people to work at a precise time. Of course, most people allow a certain amount of time for delays although some do arrive at work "late." A significant number of people will arrive at work much earlier than their scheduled starting time for reasons which include personal preference, doing work during "quiet time," eating breakfast, avoiding congestion or getting a better parking space.

Afternoon departure rates more closely approximate the nominal quitting time for clerical-type employees and as well as for most employee categories. One obvious reason is not to stay any longer than the required work time. Also, employees are more concentrated at their work location and can reach the departure mode (elevators or other systems) at the same time, a factor which can result in severe elevator congestion when a large organization is on a single quitting time.

Typical distributions of arrival and departure patterns around nominal schedules are given below in the discussion on the computer modelling (page 33) and are based on observations of employees in different contexts and job classifications. (Arrival and departure patterns under Flexible Work Hours are discussed more fully in Section IV.)

2) Variations by Industry

There will be significant variations in arrival and departure patterns among organizations in different types of business. Based upon Midtown Manhattan, which is made up of the type of industries found in any large city, corporate headquarters and insurance companies generally adhere more closely to the nominal start and quit times than do others. Those organizations involved in sales and contact work usually have more varying schedules which correspond to these contacts rather than to formal start and quit times. Other organizations that generally don't rigidly conform to a nominal work schedule include those employing a high percentage of professional and/or "creative" personnel such as in advertising agencies, accounting, engineering and law firms.

There is one common fallacy to be avoided: that management personnel do not work on the nominal schedule of an organization. This is oftentimes mentioned to project staff by the organizations saying that "while we're officially on the schedule, most of our management people come in earlier

and leave later." While this is undoubtedly true to a certain extent, it is more usually the case that many, if not most, executive and managerial personnel do arrive and leave at or near the nominal times on any given day. This can readily be observed by counting attache cases at building exits at 5:00 P.M., or by looking at commuter railroad schedules showing peak services and riding patterns for the 9:00 A.M. and 5:00 P.M. schedule times. Those are management people riding those trains and, if they are on the 5:24 to New Canaan, they are also leaving at 5:00 P.M. These are observations that are difficult to quantify, but they are important to understand in assisting the design of Staggered Work Hours schedules for a given firm and in countering an oft-stated objection.

Another factor related to arrival and departure patterns is that the impact of any organization on congestion at a specific transportation facility is reduced as the access time to that particular facility increases. In other words, the closer one is to a facility, the more direct impact any work schedule adjustment will have upon transportation patterns there. An example at one extreme would involve a clerical-type firm leaving nominally at 5:00 P.M. resulting in a surge of people using elevators within a few minutes after five o'clock. First, this surge is "metered" by a combination of factors including the capacity of elevators and then further deluted by the walking time to access the first mode of the trip home. There is further blunting of the peak as a person travels to a more distant cordon point location where Staggered Work Hours surveys are conducted. These factors can be determined and utilized in the design of a program, such as by concentrating promotional efforts in areas most accessible to the transportation facilities whose patterns are to be modified.

f. Maximum Load Points

Staggered Work Hours recommendations are usually designed to relieve congestion at the "maximum load point" of a transportation system. This MLP, usually a location at the edge of the CBD, is where the maximum number of people and/or vehicles are handled. At this point system congestion is usually the heaviest.

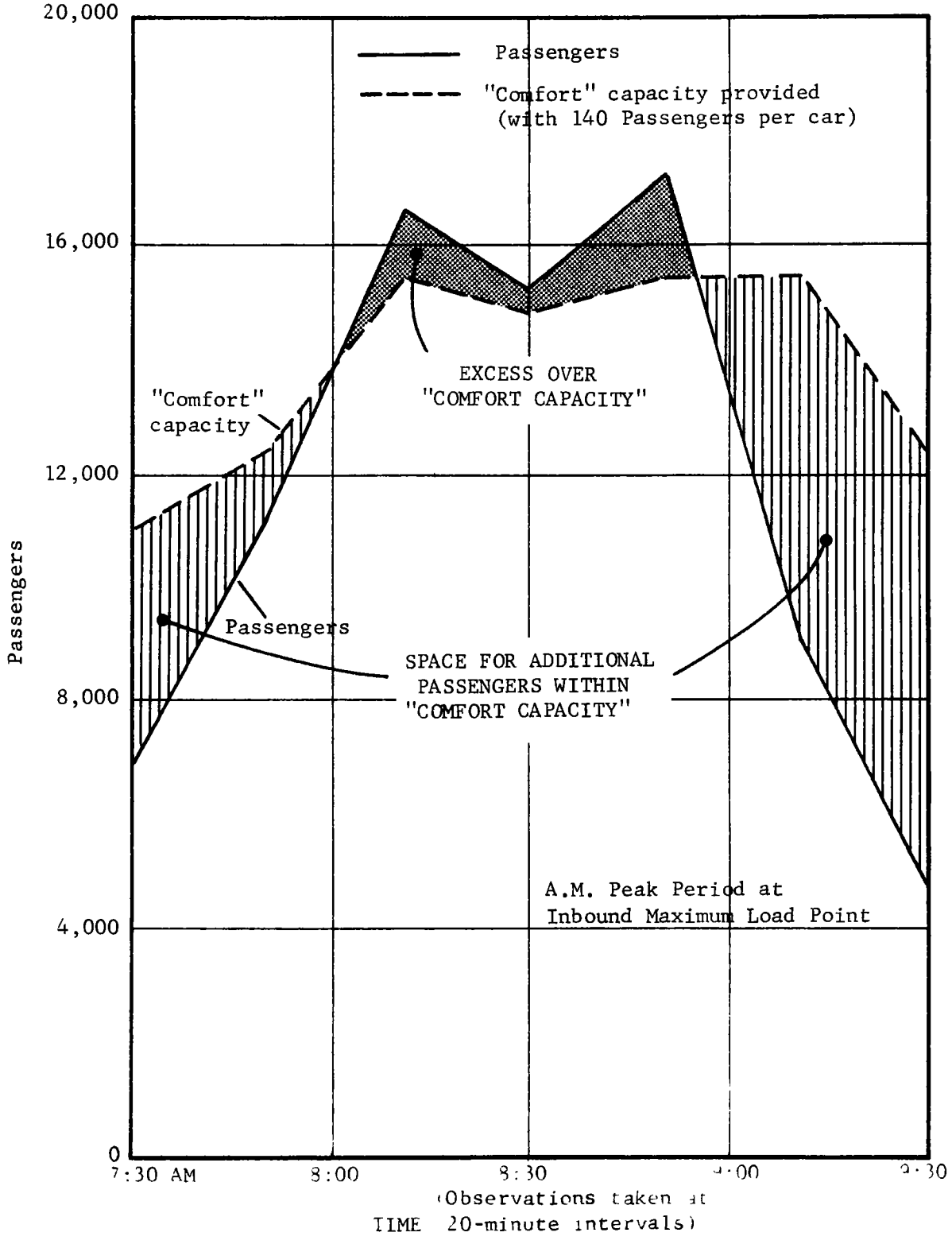
Except for locally-occurring congestion, e.g., at elevators or specific transit stations, the objective of adjusting CBD work schedules is to alter patterns at the maximum load point, which is also usually the "cordon" location. To understand how to do this it is necessary to determine 1) the demand pattern occurring at the maximum load point and 2) how work schedules within the CBD are related to patterns at the maximum load point. These two points are discussed in the following paragraphs.

Exhibits V-2 and V-3 show the demand pattern during the peak periods at the maximum load point on the New York City subway IRT #7 Flushing line at Grand Central Station. The chart shows the numbers of passengers in 20-minute intervals, as well as the service provided at a level of 140 passengers per car -- the "comfort capacity" (which is discussed later). The average number of passengers-per-car during intervals is a key indicator of comfort. Determining the "seated capacity" is straightforward (44 seats per IRT-type car), although it is more difficult to determine car-loadings which might be considered "comfort capacity" and another value commonly termed as "crush capacity." For the IRT-type car, these latter values are 140 passengers per car and 180 passengers per car respectively, corresponding to 96 and 136 standees.

It is very difficult to either qualify, and therefore quantify, the concept of "comfort" on a transit vehicle. It at least can be argued

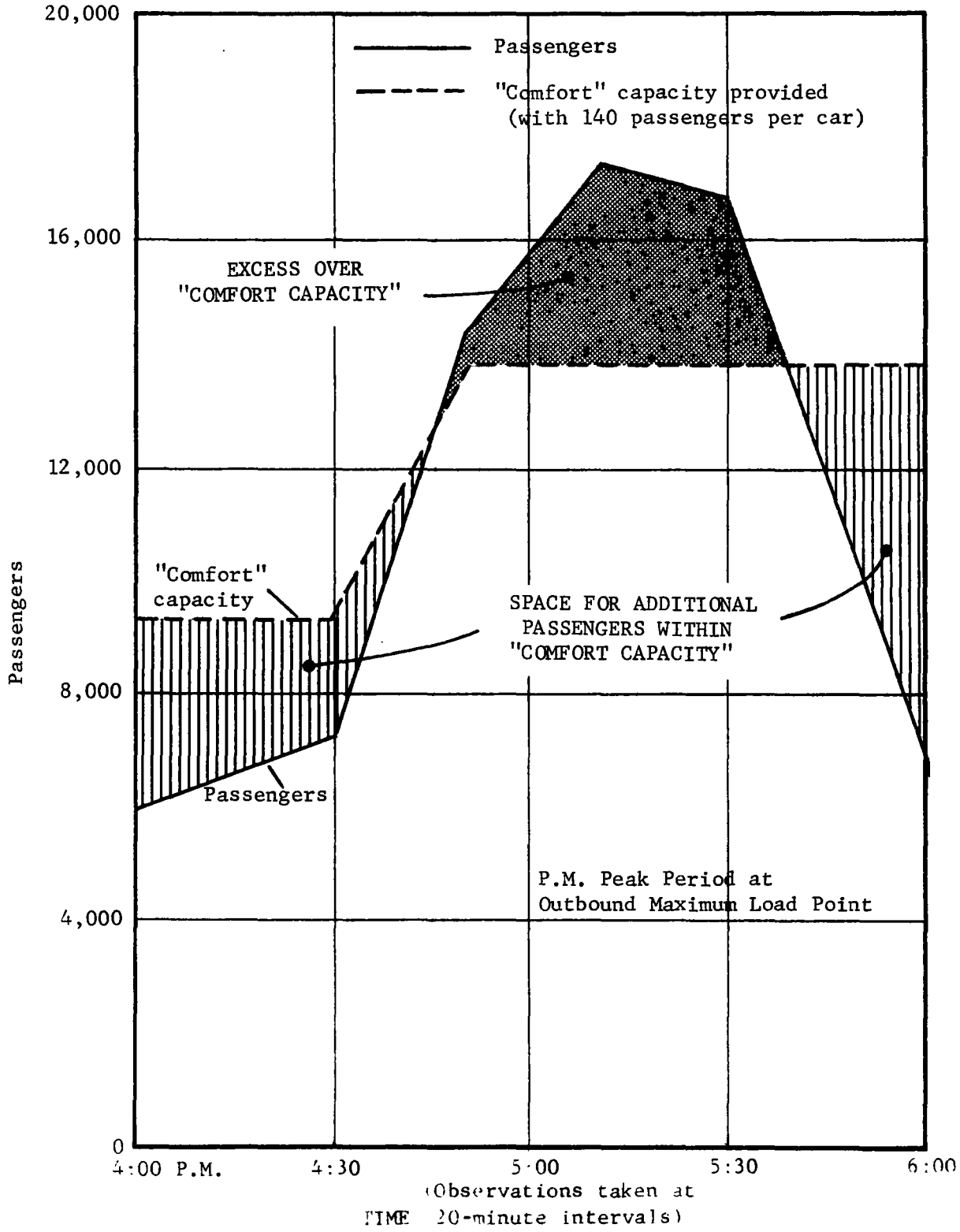
Staggered Work Hours Study
Exhibit V-2

RAIL TRANSIT SUPPLY & DEMAND
N.Y.C. Subway - IRT #7 - Grand Central Station - 1971 - AM



Staggered Work Hours Study
Exhibit V-3

RAIL TRANSIT SUPPLY & DEMAND
N.Y.C. Subway - IRT #7 - Grand Central Station - 1971 - PM



that transit is comfortable only if everyone gets a seat, although this cannot be economically justified on most urban transit systems during the peak commuting times. Therefore, the concept of a "comfort capacity" could be pragmatically defined as seating and standing passenger load with the standees having enough room to change positions somewhat, flap their elbows perhaps to ventilate their lungs and read a newspaper or a book without being jostled by their neighbor when the car tilts. Ironically, the "crush capacity" is easier to quantify since one can observe the maximum number of people which can fit into a transit vehicle. Once you are in under these conditions, little movement is possible.

Arrangement of the data for each maximum load point in the form as shown as Exhibits V-2 and V-3 gives the designer a visual opportunity to determine the pattern which may be achieved by spreading the peak period demand. How sensitive are these patterns however, to a change in CBD work schedules particularly at the maximum load point? This depends upon several factors: change in arrival or departure rates at their work location with a change in work hours, and the travel time it takes to reach the maximum load point location.

Two examples will illustrate this. Consider a firm with many clerical employees quitting at 5:00 PM and located near a maximum load point subway station. The combination of rapid departures immediately after 5:00 PM, combined with quick access to the subway station, will cause these employees to be counted in a 5:00-to-5:15 PM time interval. If this firm shifted their work schedule by a half-hour earlier, similar reasoning would show a high likelihood of removing some percentage of the passengers recorded at the maximum load point from the 5:00-to-5:15 PM interval up to the earlier 4:30-to4:45 PM period.

In a second example, consider another firm more involved in client services work in the center of the CBD located several station stops away from the maximum load point station. Employees there with a nominal 5:00 PM quitting time are less apt to leave work en masse at that time and, with a 15-to-30 minute travel time to the edge of the CBD, they won't be recorded in the maximum load point survey until the 5:15-to-5:30 PM or later intervals. Therefore, a nominal change in this firm's work schedule will have less impact on the maximum load point pattern than the previous firm.

This suggests several approaches in both the design of a Staggered Work Hours plan and priorities in its implementation. The sensitivity of a passenger loading pattern at a maximum load point to being changed varies directly as the adherence to that nominal schedule and to the nearness of the employee's location.

g. Residential Distribution

The residential distribution of employees in both the CBD and in individual organizations can be determined with good precision from a work schedule survey. Usually such residential data is gathered on a county basis and can be validated from other sources such as the Journey-to-Work break-out of the U.S. Census of Population. However, the value of residential data in designing work schedule recommendations is limited as observed in the Manhattan program.

One general finding has been that most people prefer to adopt earlier hours from all residential areas, although a significant percentage who live close to their work location might be more amenable to later hours. These attitudes were expressed consistently in a number of attitude surveys conducted among private and public organizations.

Another factor to be aware of, especially in a large CBD, is the general affinity of people trying to work in the CBD as close to their residential location as possible -- a kind of gravity model that applies to people and jobs. To put this another way, a person living north of a large CBD might tend to work in the northern part of that CBD. In the same sense, an employee would more likely to work near a major transportation facility or terminal serving his particular area. This phenomenon, of course, is not illogical and was found to a great degree in every section of Manhattan in which we have worked. For example, in the Lower Manhattan community, a significantly greater affinity was found for residential locations in Brooklyn, Staten Island and New Jersey which are the more accessible. Similarly, Midtown Manhattan employees showed higher residential representation from locations closer to it. This relationship was true in localized situations, where much higher concentrations of New Jersey residents chose to work in the vicinity of the Port Authority Bus Terminal which primarily serves the New Jersey commuter.

To summarize the impact of residential location on designing work schedule recommendations, employees living in or very close to the CBD may be more prone to preferring (or at least accepting) slightly later work hours. Further, knowledge that the residential distribution of company employees in one portion of a large CBD may be statistically "biased" towards closer residential areas may aid in setting priorities for working with such companies to relieve congestion at certain transportation facilities or terminals.

h. Modal Use

Determining modes of travel of employees is helpful in designing work schedule recommendations, although it may require data which is not readily available from most organizations without conducting a separate survey.

When it can be obtained, mode use of employees is useful in several situations. On a CBD-wide basis, it gives the relative percentages using different modes and systems, especially when the public transportation sectors seem best suited to congestion-relief by a Staggered Hours program. Mode use information obtained on a company basis can be helpful, especially if the overall program is directed at relieving modes which a significant number of its employees utilize. This is also a plus if improvements in punctuality result because of reduced delays on these modes.

Do Staggered Work Hours schedules result in significant changes in modal use? Experience has shown no perceptible nor statistically significant changes in mode use due to revised work schedules. Further, there is little evidence correlating mode use and work schedule preference or any other factor related to Staggered Hours. One exception though is absolute availability of public transportation on various schedules, and this is discussed in the next section.

i. Transportation Services Available

Designers of Staggered Hours programs 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.

In the cases of Manhattan and Newark, the amount of transit service offered on practically every route was such that basic transportation services did not have to be altered before the program began. In selling the program, however, we assured potential participants that our investigations showed adequate service was indeed available. Further, we have sought and received assurances or full cooperation from transit operators that they would attempt to the maximum extent possible to adjust their pattern of operations to conform to newly-adopted Staggered Hours schedules. To identify such transportation problem areas, we developed a special "complaint questionnaire" which we asked organizations to give to employees who reported difficulties after they had changed their hours. As a result, several hundred such questionnaires were received in the early stages of the program and more than a score of transportion service adjustments were made by appropriate transportation operators. To put this into perspective, it should be noted that less than one per cent of the participants reported any problems at all with public transportation.

In some cities it may be necessary prior to the outset of the program, however, to make revisions in certain transit services. In the Philadelphia program this was done, for example, and appropriate local analyses should be made on the question of transit adequacy under revised work schedules.

To summarize, the designer should not simply presume that wholesale revisions in transit services would be necessary for a Staggered Work Hours program to be successfully implemented. In fact, unless specific voids in services are identified, it is recommended that a "wait and see" attitude

be taken regarding transportation service changes but that, when substantive complaints are solicited and received, there be a concerted and conscientious effort to solve such problems. The sponsors in this case should set themselves up as "ombudsmen" for the participants.

4. Modelling Alternative Staggered Work Hours Schedules

The preceding sections have covered a number of important major design considerations for recommending revised CBD work schedules. The following sections explain a computer modelling technique to quantify the impact of different Staggered Work Hours alternatives.

a. Introduction

There are a wide variety of options available in implementing a Staggered Hours program, including staggered earlier or later schedules, or a combination of both, as well as a Four-Day Week or Flexible Work Hours. Both the numbers and type of employees participating and the type of schedule changes will determine the effectiveness of the program in reducing congestion and delay. It is useful to be able to foresee expected results of alternate strategies so that a good program can be developed and its effectiveness can be predicted in advance.

The task of evaluating and predicting the efficiency of different program designs would be relatively simple if all employees arrived at and departed from work at exactly the nominal starting and quitting times. As previously discussed this doesn't occur, and observations in New York City have also shown different employee types to have significantly different patterns of arrival and departure about their nominal time.[1] Exhibits V-4 and V-5, for example, show these patterns for "executive employees" and "trade service workers" and it can be seen that the patterns for trade service employees are much more sharply peaked than for executives.

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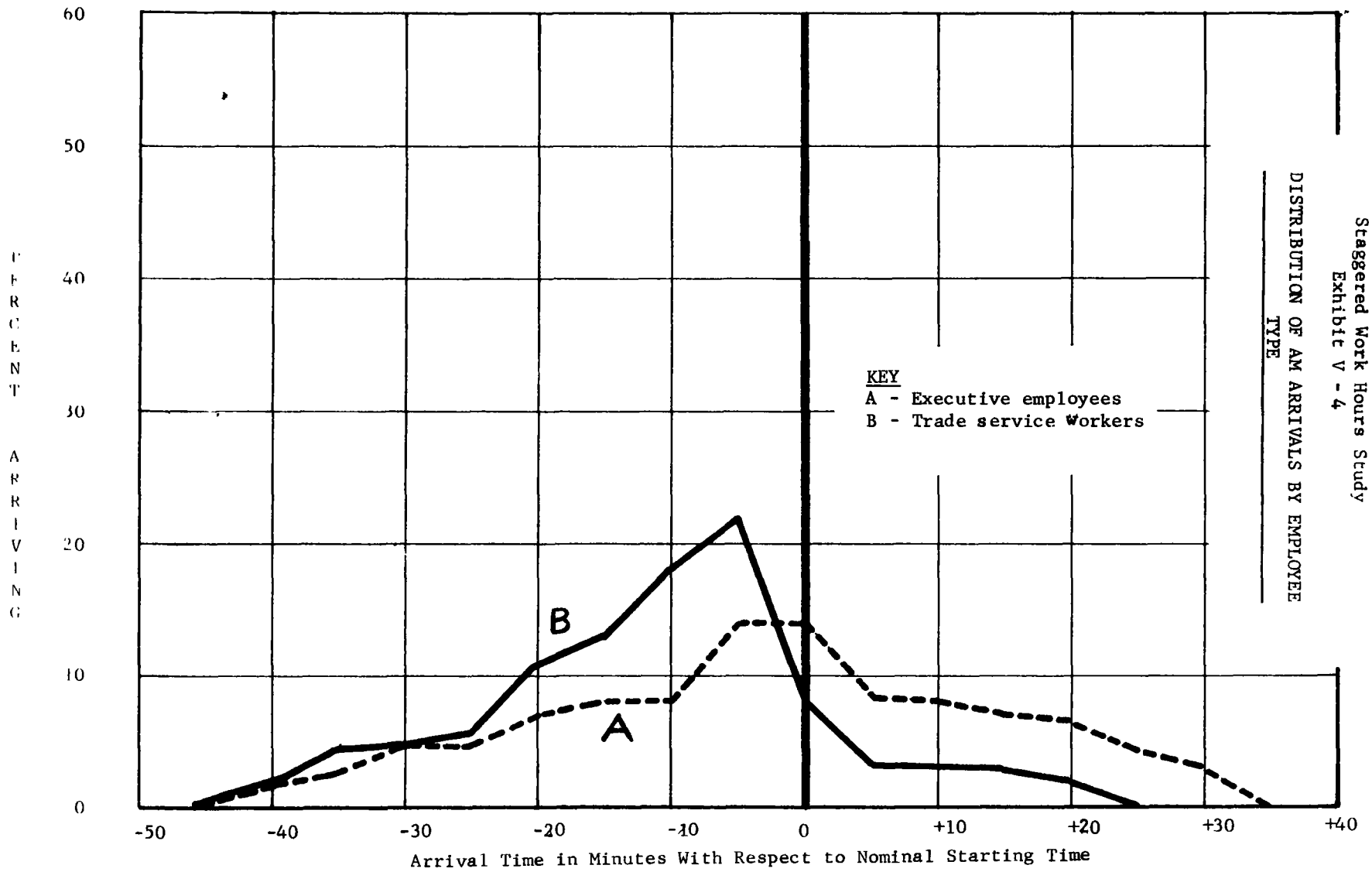
[1] Observations conducted by the Port Authority in various Manhattan buildings during 1965 in connection with the "World Trade Center Elevator Study." Data from this study is used throughout this narrative.

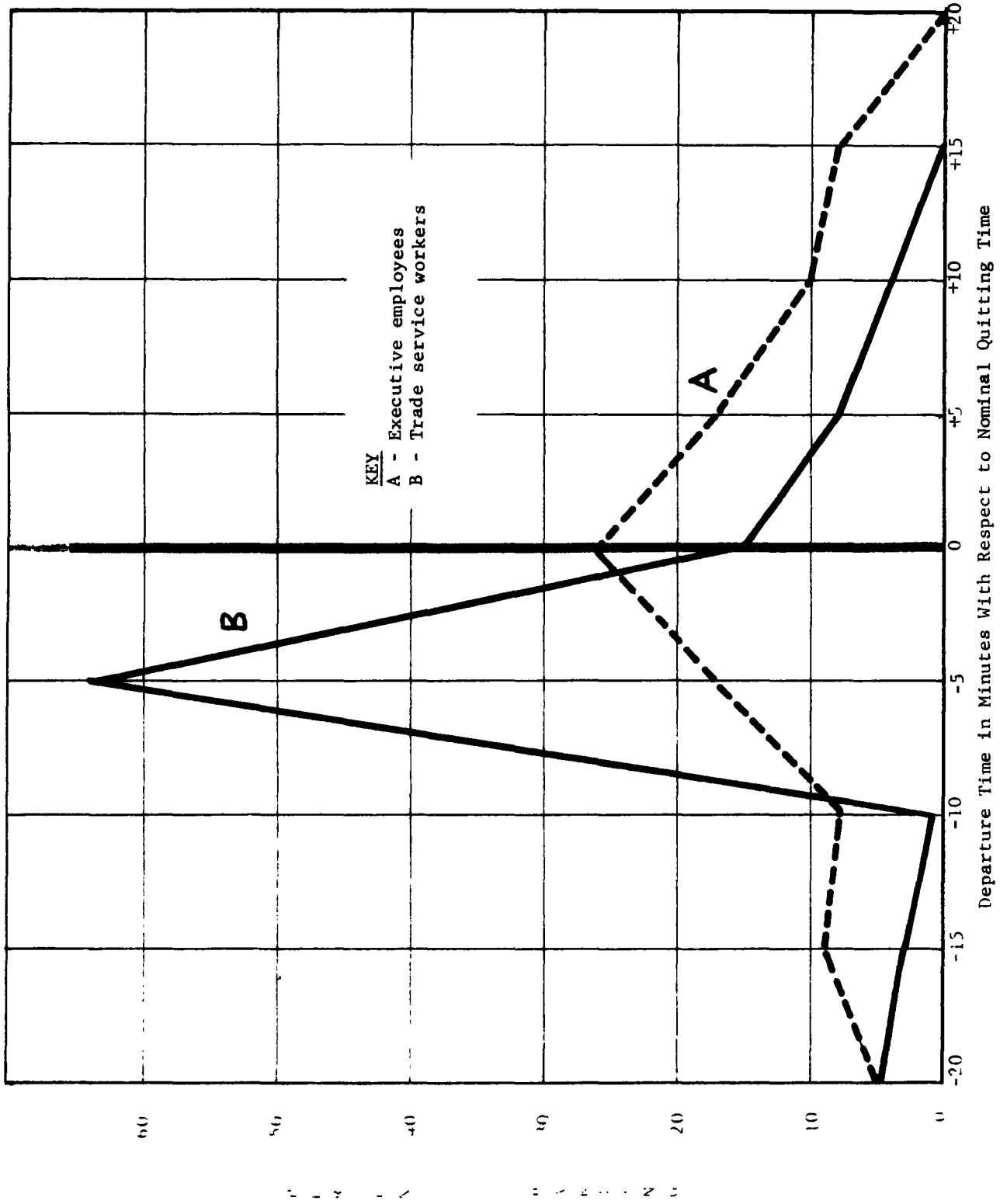
Staggered Work Hour Study
Exhibit V-4
DISTRIBUTION OF A.M. ARRIVALS BY EMPLOYEE TYPE



DISTRIBUTION OF AM ARRIVALS BY EMPLOYEE TYPE

Staggered Work Hour Study
Exhibit V-5

DISTRIBUTION OF P.M. DEPARTURES BY EMPLOYEE TYPE



The total arrival and departure patterns for a CBD will be a composite distribution determined by the nominal starting and quitting times, the numbers and types of employees and their characteristic patterns or distributions around the nominal working times. In effect, the composite pattern will be the weighted sum of the individual distributions each describing the variations from the nominal times. The effect of Staggered Hours will be to shift the individual distributions of employees earlier or later, thereby reducing the level of peaking in the total arrival pattern.

An analysis method has been developed for determining the effects of different Staggered Hours options on the total peaking. A computer program will be described to facilitate the analysis by relieving the computational burden and the use of the methodology will be illustrated through two examples: Staggered Hours for all of Midtown Manhattan, and for the Rockefeller Center area. In each case, the expected results of different work schedule options in reducing peaking will be obtained. Finally, methods of analyzing the expected impact of Flexible Work Hours or a Four-Day Week are also described and illustrated. This methodology and computer program can be used to evaluate Staggered Work Hours alternatives for any CBD.

b. Method of Analysis

The first step in the analysis is to determine the existing composite patterns of arrivals and departures. One must therefore fix both the number and type of employees with each nominal starting and quitting time and define the associated distribution types. The composite arrival and departure patterns can then be obtained by adding together (manually or using a computer program) the expected arrivals in each time period for all employees. This composite demand pattern will show the nature of the peaking problem and provide a measure of current demands.

The impact of any variation of Staggered Work Hours can then be evaluated by identifying the number and type of employees affected and shifting the appropriate distributions. When this is done, the expected composite demand patterns after a Staggered Hours program for the given strategy can be obtained and the predicted changes in demand pattern identified and quantified. The same procedure can be applied to each work schedule alternative that is being considered so that their relative effectiveness can be gauged.

Data collected at numerous building locations in Manhattan indicated that a distribution around the nominal start or quit time over a 1½-hour period was appropriate. With a 9 AM starting time, for example, the total number of arrivals at a work location is approximately equal to the nominal working population at that location. In effect, visitors and "double counts" due to coffee or breakfast trips compensate for employees who do not report to work because of vacation, sickness, business trips or for other reasons. In the evening peak period, however, the number of employees leaving the same location is less than the nominal working population even if 2 or 2½-hour counts are taken. In our analyses we have used a 1½-hour period during which 70 percent of the nominal working population typically depart. This percentage is based on the empirical data collected at various buildings in New York City.

Many tables and exhibits have been prepared to illustrate the following analyses. While a number of these are contained in this narrative, all of them may be found in the Appendix -- Volume IV of this Report.

c. Midtown Manhattan Analysis -- Earlier Work Schedules

Distributions of starting and quitting times obtained in the 1972 Midtown Manhattan Work Schedule Survey provided the first step toward the

generation of "before" Staggered Hours patterns of employee arrivals and departures. Distributions of starting and quitting times are moderately peaked with about 54% of employees nominally scheduled starting at 9 AM and 48% scheduled to depart at 5 PM. Seven different distributions of arrivals around nominal starting times and of departures around nominal quitting times were used. These distributions were based on data collected in New York on the following seven employee types: 1) Sales-Buyers, 2) Clerical, 3) Administrative - Professional, 4) Executive, 5) Mixed Office Employees, 6) Trade Services and 7) Financial. The empirical distributions of arrival and departure for these employee types about their nominal times are given in Tables V-1 and V-2.

STAGGERED WORK HOURS STUDY

TABLE V-1

A.M. ARRIVAL DISTRIBUTION BY EMPLOYEE TYPE
(All figures in body of table are in percents)

	Minutes of Arrival with Respect to Nominal Start Time																	
	Before Start Time												After Start Time					
EMPLOYEE TYPE	59 to 55	54 to 50	49 to 45	44 to 40	39 to 35	34 to 30	29 to 25	24 to 20	19 to 15	14 to 10	9 to 5	4 to 0	1 to 5	6 to 10	11 to 15	16 to 20	21 to 25	26 to 30
Sales/Buyers	1	1	1	1	3	3	4	9	11	13	19	13	6	4	3	3	3	2
Clerical	0	0	0	1	3	5	5	5	7	11	11	19	11	11	.5	2	2	2
Administrative/ Professional	0	0	0	1	2	3	4	5	7	9	11	12	14	11	8	5	4	3
Executive	0	0	0	2	2	5	4	7	8	8	14	14	8	8	7	6	4	3
Mixed Office	1	1	2	3	3	4	3	6	7	10	13	13	13	9	4	4	3	2
Trade Services	0	0	0	2	5	5	6	11	13	18	22	8	3	3	3	2	0	0
Financial	0	0	1	1	2	1	2	4	7	10	9	11	10	15	8	5	6	8

Source: Observations by The Port Authority in Manhattan during 1965 in connection with the "World Trade Center Elevator Study".

STAGGERED WORK HOURS STUDY

TABLE V-2

P.M. DEPARTURE DISTRIBUTION BY EMPLOYEE TYPE
(All figures in body of table are in percents)

	Minutes of Departure with Respect to Nominal Quit Time										
	Before Departure Time						After Departure Time				
EMPLOYEE TYPE	29 to 25	24 to 20	19 to 15	14 to 10	9 to 5	4 to 0	1 to 5	6 to 10	11 to 15	16 to 20	over 20
Sales/Buyers	0	0	0	0	29	36	12	11	4	5	3
Clerical	0	0	0	0	31	41	13	6	6	3	0
Administrative/ Professional	0	1	2	5	25	34	17	8	8	0	0
Executive	0	5	9	8	17	26	17	10	8	0	0
Mixed Office	1	5	5	5	9	40	15	8	11	0	0
Trade Services	0	5	3	1	64	15	8	4	0	0	0
Financial	0	2	4	6	19	44	12	6	5	2	0

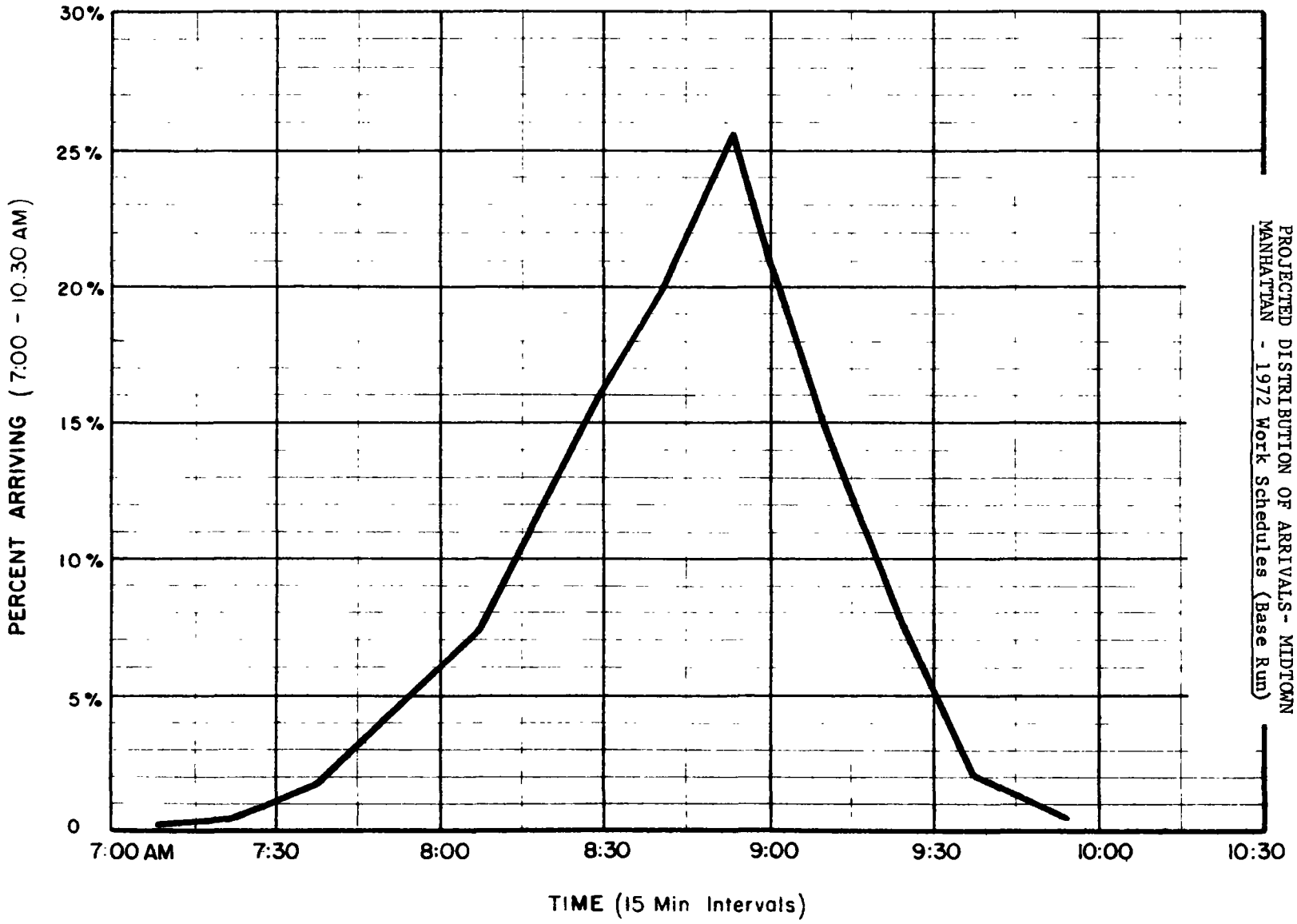
Source: Observations by The Port Authority in Manhattan during 1965 in connection with the "World Trade Center Elevator Study".

Since the detailed data of the number of employees of each type were not available, it was assumed that there were an equal number of employees in each of the seven categories defined. Exhibits V-6 and V-7 show the composite arrival and departure patterns based on the Midtown Manhattan Work Schedule Survey and with one-seventh (1/7) of the total employment assigned each of the seven arrival distributions. The composite estimated morning arrivals peak in the 8:45-to-8:59 AM period which represent 26% of the total morning peak arrivals (total peak period defined as 7:00 to 10:00 AM). In the evening, approximately 29% of the evening peak (3:30 to 6:30 PM) distributions would be expected to occur in the peak 15-minute period from 5:00-to-5:14 PM.

These projected arrival and departure patterns were compared to morning and evening counts at four subway stations in Midtown Manhattan. Exhibits V-8 and V-9 show that there are a close correspondence between the calculated patterns and the actual subway counts. Although the subway counts are not quite as sharply peaked, this may be accounted for in differences in walking times from the subway to the actual work locations. The greatest discrepancy in the evening counts was at the 34th Street Station, which was probably related to the high proportion there of shoppers because of the station's proximity to major retail stores.

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECTED DISTRIBUTION OF ARRIVALS AT WORK
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES (BASE RUN)

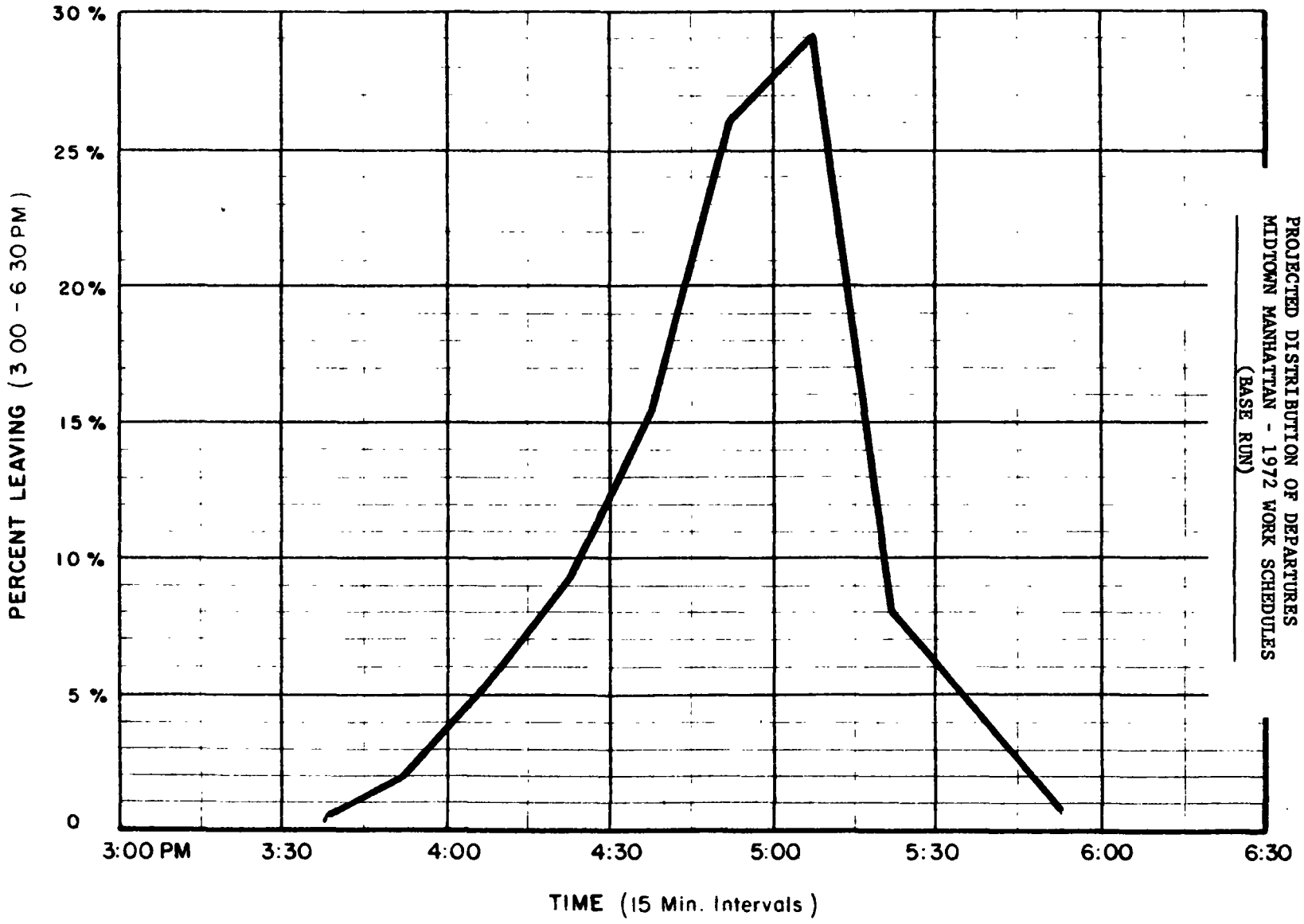


PROJECTED DISTRIBUTION OF ARRIVALS- MIDTOWN MANHATTAN - 1972 Work Schedules (Base Run)

Staggered Work Hours Study
Exhibit V-6

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECTED DISTRIBUTION OF DEPARTURES FROM WORK
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES (BASE RUN)

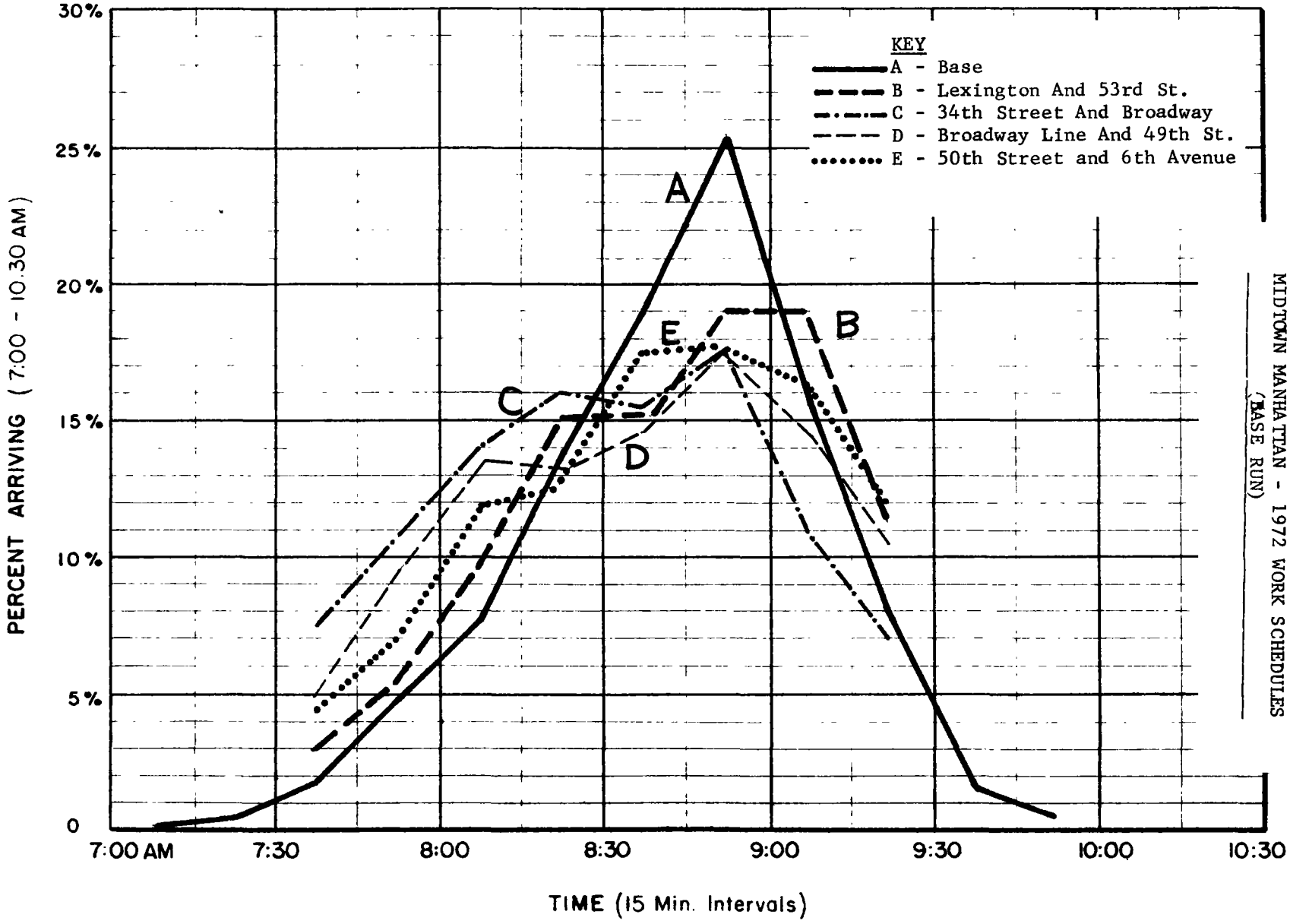


PROJECTED DISTRIBUTION OF DEPARTURES
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES
(BASE RUN)

Staggered Work Hours Study
Exhibit V-7

Comparative Evaluation of Staggered Work Hours Alternatives

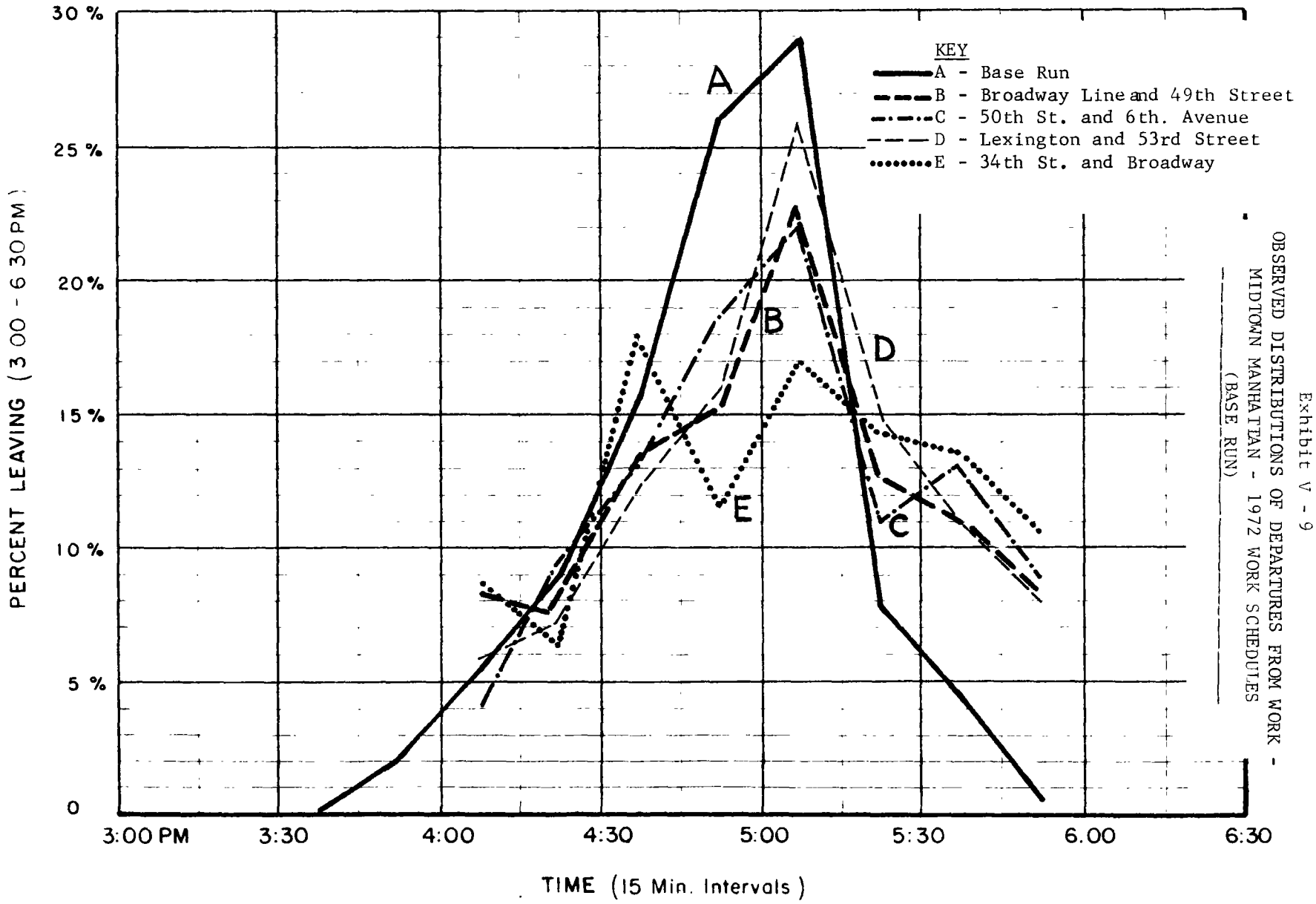
OBSERVED DISTRIBUTIONS OF ARRIVALS
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES (BASE RUN)



OBSERVED DISTRIBUTION OF ARRIVALS AT WORK - MIDTOWN MANHATTAN - 1972 WORK SCHEDULES (BASE RUN)

Comparative Evaluation of Staggered Work Hours Alternatives

OBSERVED DISTRIBUTIONS OF DEPARTURES FROM WORK
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES (BASE RUN)



OBSERVED DISTRIBUTIONS OF DEPARTURES FROM WORK -
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES
(BASE RUN)

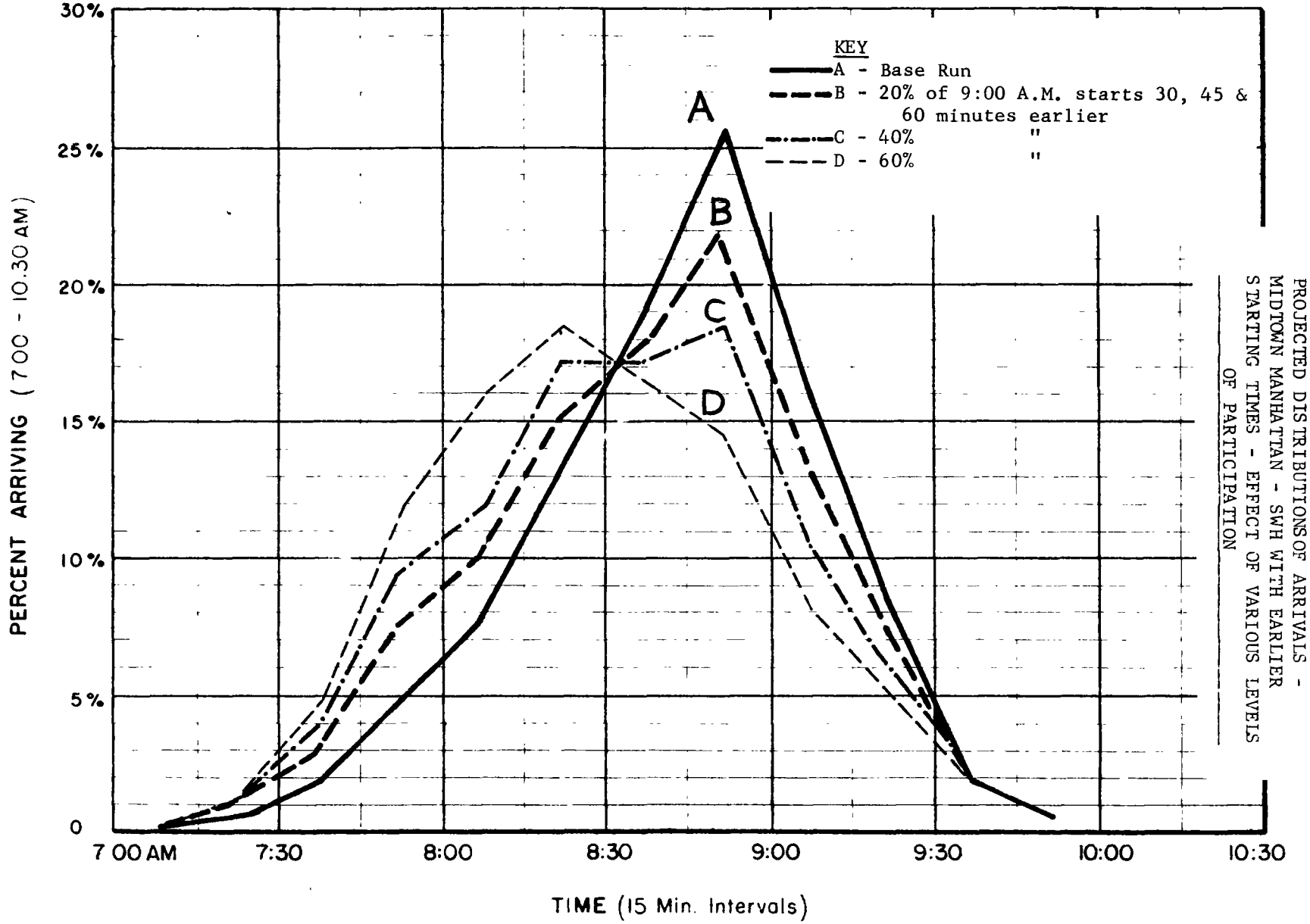
Employee attitude surveys in the New York area have repeatedly shown that the large majority of employees prefer work schedules that start and end earlier than the predominant 9-to-5 schedule. Therefore, the first alternative evaluated was the effect of a Staggered Hours program with only earlier starting and quitting times. The effects of various levels of participation were evaluated by assuming that a total of 20%, 40% and 60% of employees presently on 9:00 starting times and on 5:00 p.m. quitting times would participate in Staggered Hours. Exhibits V-10 and V-11 show the results of this analysis for the morning and afternoon peak periods, respectively, compared to the 1972 work schedules shown in the base runs. For each level of participation, it was assumed that one-third of the participants would start and quit 30, 45 and 60 minutes earlier than the peak 9:00 a.m. or 5:00 p.m. time. In other words, if a total of 20% participated in Staggered Hours, 6.7% would be assumed to shift by 30 minutes earlier, 6.7% by 45 minutes earlier and 6.7% by 60 minutes earlier.

Significant reductions in the peaking observed in arrival and departure patterns could be expected if 40% shifted their work hours away from 9 a.m. and 5 p.m. For the morning peak period, the percentage arriving during the highest 15-minute interval would be reduced by one-quarter: from 26% to 19% (Exhibit V-10). Instead of a peaked arrival pattern during 8:45-to-8:59 a.m., there would be three consecutive 15-minute periods with an almost uniform arrival rate. The percentage leaving during the afternoon peak 15-minute period would be reduced even more dramatically from 29% to 20%, or by about one-third. Again the demand during three consecutive 15-minute periods in the afternoon peak would be almost uniform.

It is interesting to note that if 60% of those working on 9 a.m. or 5 p.m. are shifted onto earlier schedules, the peak 15-minute intervals both in the morning and evening would be higher than if only 40% shifted.

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECTED DISTRIBUTIONS OF ARRIVALS
MIDTOWN MANHATTAN - STAGGERED WORK HOURS WITH EARLIER STARTING TIMES
EFFECT OF VARIOUS LEVELS OF PARTICIPATION

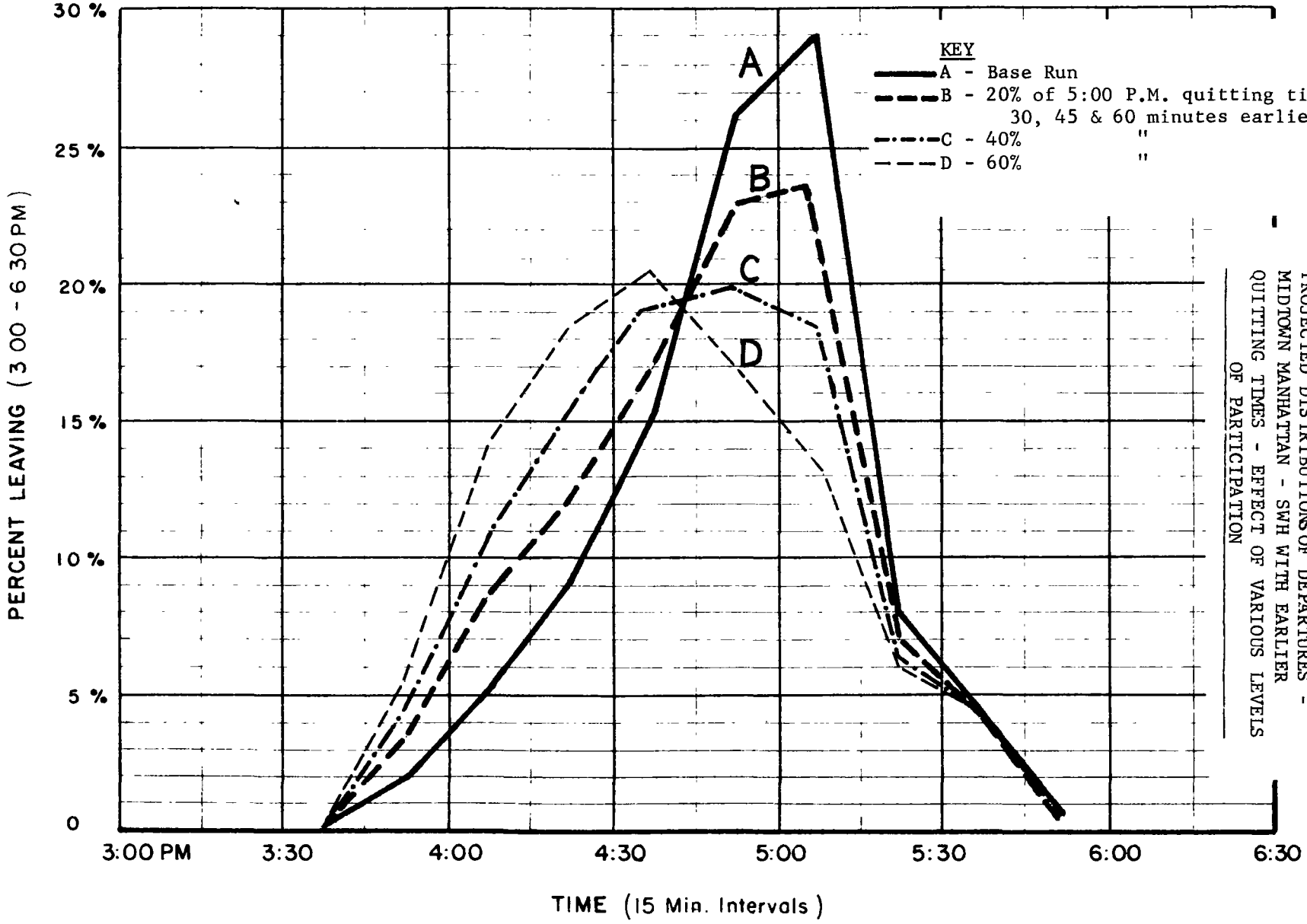


PROJECTED DISTRIBUTIONS OF ARRIVALS - MIDTOWN MANHATTAN - SWH WITH EARLIER STARTING TIMES - EFFECT OF VARIOUS LEVELS OF PARTICIPATION

Staggered Work Hours
Exhibit V - 10

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECTED DISTRIBUTIONS OF DEPARTURES
MIDTOWN MANHATTAN - STAGGERED WORK HOURS WITH EARLIER QUITTING TIMES
EFFECT OF VARIOUS LEVELS OF PARTICIPATION



PROJECTED DISTRIBUTIONS OF DEPARTURES - MIDTOWN MANHATTAN - SWH WITH EARLIER QUITTING TIMES - EFFECT OF VARIOUS LEVELS OF PARTICIPATION

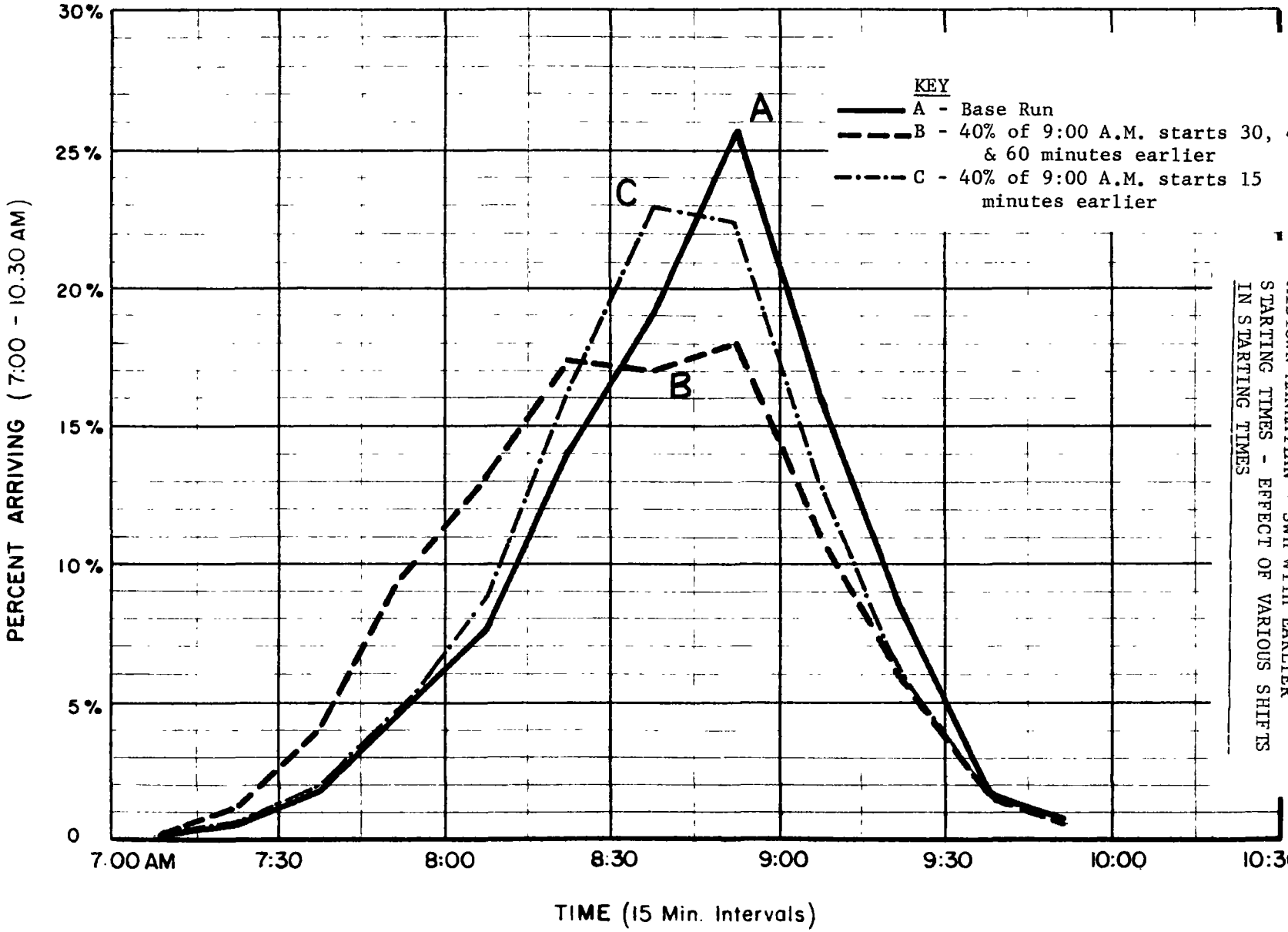
Two additional analyses were carried out. In the first of these 40% of the employees were shifted 15 minutes earlier. Exhibits V-12 and V-13 show that this is not effective in reducing peak demand. In fact, the expected evening demand during the peak 15 minutes is actually increased. This pattern is contrasted in the Exhibits with the previous analysis of 40% shifting 30 minutes (13.3%), 45 minutes (13.3%) and 60 minutes (13.3%).

The last analysis assumes an equal number of employees on each starting time by fifteen-minute intervals between 8:00 and 9:30 a.m. representing the "ultimate" in Staggered Work Hours. As might be expected, this yielded a share reduction in the peak intervals.

Table V-3 gives a summary of the five evaluations with these earlier starting times. Two measures are included in the table to provide a quantitative assessment of the effectiveness of each alternative. The first is the expected percentage of employees arriving or leaving during the peak 15-minute period compared to the entire 90-minute peak period. The second is the expected percentage of employees arriving or leaving during the peak one-hour period compared to the entire 90-minute peak period. Together they provide a quantitative measure of the extent to which arrival and departure patterns have been "depeaked."

Comparative Evaluation of Staggered Work Hours Alternatives

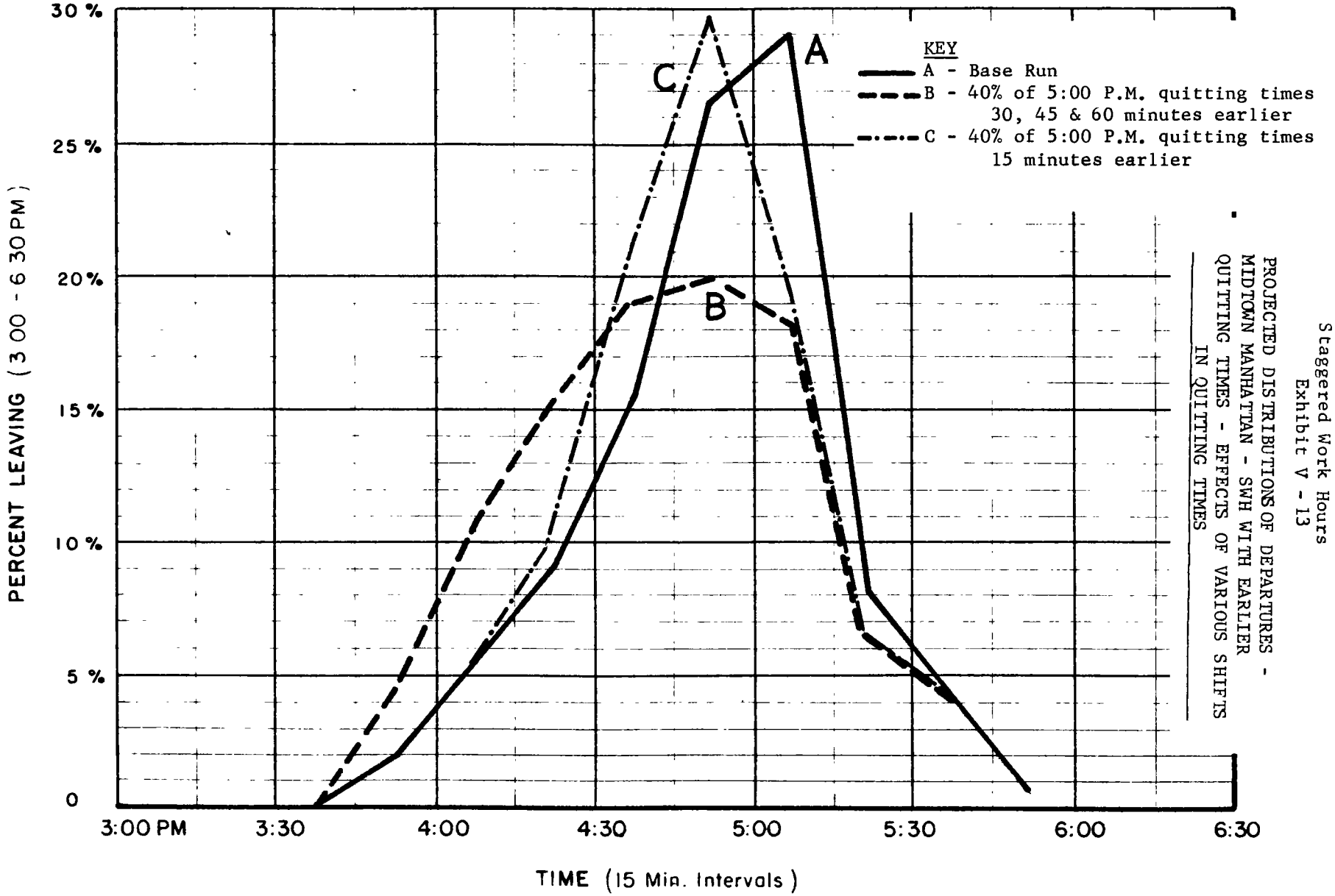
PROJECTED DISTRIBUTIONS OF ARRIVALS
MIDTOWN MANHATTAN - STAGGERED WORK HOURS WITH EARLIER STARTING TIMES
EFFECT OF VARIOUS SHIFTS IN STARTING TIMES



PROJECTED DISTRIBUTIONS OF ARRIVALS - MIDTOWN MANHATTAN - SWH WITH EARLIER STARTING TIMES - EFFECT OF VARIOUS SHIFTS IN STARTING TIMES

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECTED DISTRIBUTIONS OF DEPARTURES
MIDTOWN MANHATTAN - STAGGERED WORK HOURS WITH EARLIER QUITTING TIMES
EFFECTS OF VARIOUS SHIFTS IN QUITTING TIMES



PROJECTED DISTRIBUTIONS OF DEPARTURES - MIDTOWN MANHATTAN - SWH WITH EARLIER QUITTING TIMES - EFFECTS OF VARIOUS SHIFTS IN QUITTING TIMES

Table V-3

EVALUATION OF STAGGERED WORK HOURS ALTERNATIVES FOR MIDTOWN MANHATTAN

Run #	Percent Switching From 9:00 and 5:00	Percent Switching Schedules: Minutes Earlier 0	15	30	45	60	Minutes Later 15	30	45	60	Percentage of 90-min. Peak Period: AM Arrivals Peak 15 Min.	AM Arrivals Peak Hour	PM Departures Peak 15 Min.	PM Departures Peak Hour
BASE	-										25.7	74.4	28.8	79.5
#1	20	-	-	6.7	6.7	6.7					21.9	68.8	23.5	75.8
#2	40	-	-	13.3	13.3	13.3					17.3	65.7	19.9	71.8
#3	60	-	-	20	20	20					18.9	65.6	20.5	70.0
#4	40	-	40	-	-	-					23.1	74.7	30.0	80.0
#5	Uniform number of employees starting from 8:00 - 9:30 or 4:00 - 5:30										18.2	65.6	17.8	69.8

d. Later Work Schedules

Although attitudinal surveys in New York indicate that later work schedules are not generally popular (discussed in Section VIII), they are attractive to a significant number of employees. Therefore, several alternative arrangements were analyzed for only later work schedules. (A combination of earlier and later schedules will be discussed next.) Five Staggered Hours alternatives of later schedules were tested similar in design to those previously tested for the earlier starting times. The most significant reduction in peaking occurs when an equal number of Staggered Hours participants are shifted 30, 45 and 60 minutes later. A 15-minute shift to later times, however, proved ineffective. Another run showed, on the other hand, that a shift to a single time of 30 minutes later would be effective in reducing peaking.

e. Combination of Earlier and Later Work Schedules

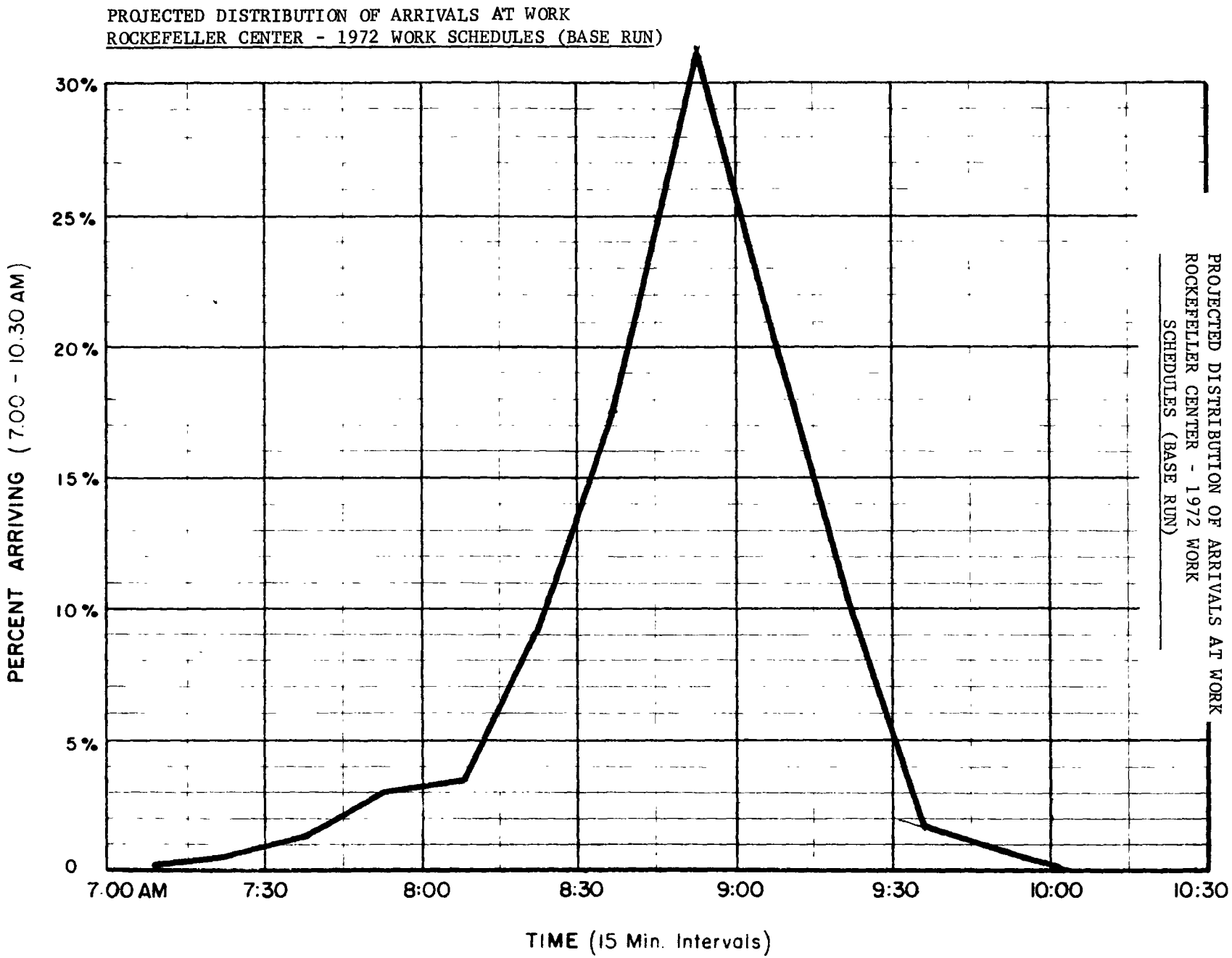
The impact of a mix of earlier and later times on expected arrival and departure patterns were also evaluated assuming various levels of participation. When CBD starting times were staggered onto both earlier and later hours, the reduction in peaking was found to be directly related to the level of participation. This contrasts with the previous evaluation of only earlier times when peaking increased as participation rose from 40% to 60%.

f. Analysis of Staggered Work Hours Alternatives for Rockefeller Center

Separate analyses were carried out for the Rockefeller Center area to show how impacts could be analyzed on sharply-peaked patterns of arrivals and departures. In that area, about 76% of all employees had a nominal time of 9 a.m. and 64% of them had a 5 p.m. quitting.

As in the overall Midtown analysis, an equal distribution of each of the seven employee types were assumed in the absence of detailed data. Exhibits V-14 and V-15 show the projected arrival and departure patterns based on this 1972 Rockefeller Center work schedule information. Comparing these to the patterns for Midtown shown in Exhibits V-6 and V-7, it is clear that 15-minute peaks are sharper in the Rockefeller Center area.

Comparative Evaluation of Staggered Work Hours Alternatives

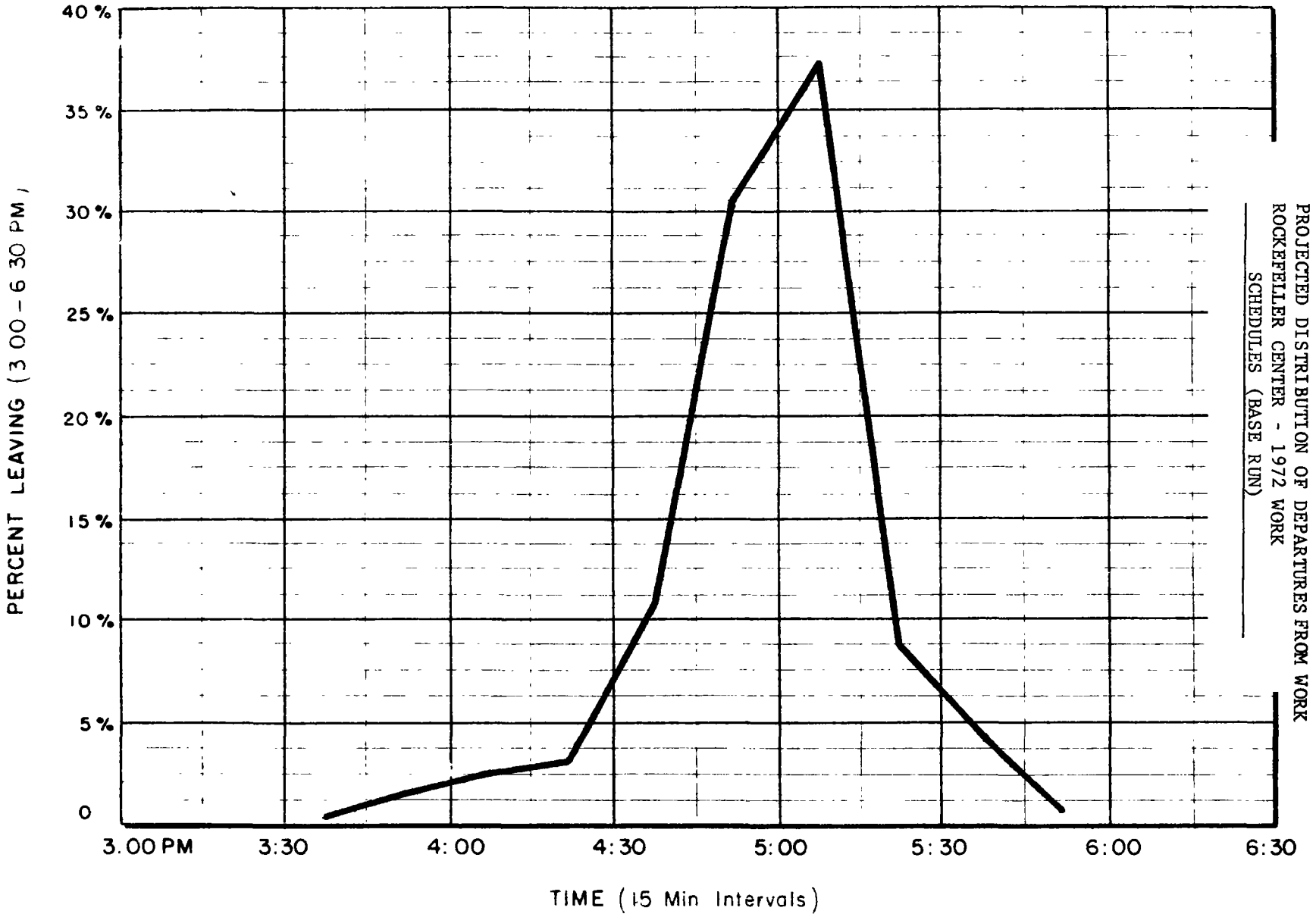


PROJECTED DISTRIBUTION OF ARRIVALS AT WORK
ROCKEFELLER CENTER - 1972 WORK
SCHEDULES (BASE RUN)

Staggered Work Hours Study
Exhibit V - 14

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECTED DISTRIBUTION OF DEPARTURES FROM WORK
ROCKEFELLER CENTER - 1972 WORK SCHEDULES (BASE RUN)



PROJECTED DISTRIBUTION OF DEPARTURES FROM WORK
ROCKEFELLER CENTER - 1972 WORK
SCHEDULES (BASE RUN)

Table V-4 shows the results of the Rockefeller Center analyses with earlier starting and quitting times. Exhibits V-16 and V-17 show the effects of the level of participation in reducing peaking. It was found that the higher the level of participation the more significant the reduction in peaking. For example, with a total of 60% participating by shifting 30, 45 and 60 minutes earlier, the morning and afternoon highest 15-minute percentages of the 90-minute peak period are reduced from 31% to 16%, and from 37% to 18% respectively. Significant reductions in peaking are also projected with 40% participation.

Evaluations with only later starting times revealed that any of several variations has about the same effect in reducing the highest 15-minute interval of arrivals and departures, but that later or mixed times are more effective in reducing the expected percentage for the total peak hour. When the effects of various levels of participation in Staggered Hours with both earlier and later starting times, the higher the level of participation, the more the peak hour demands are reduced.

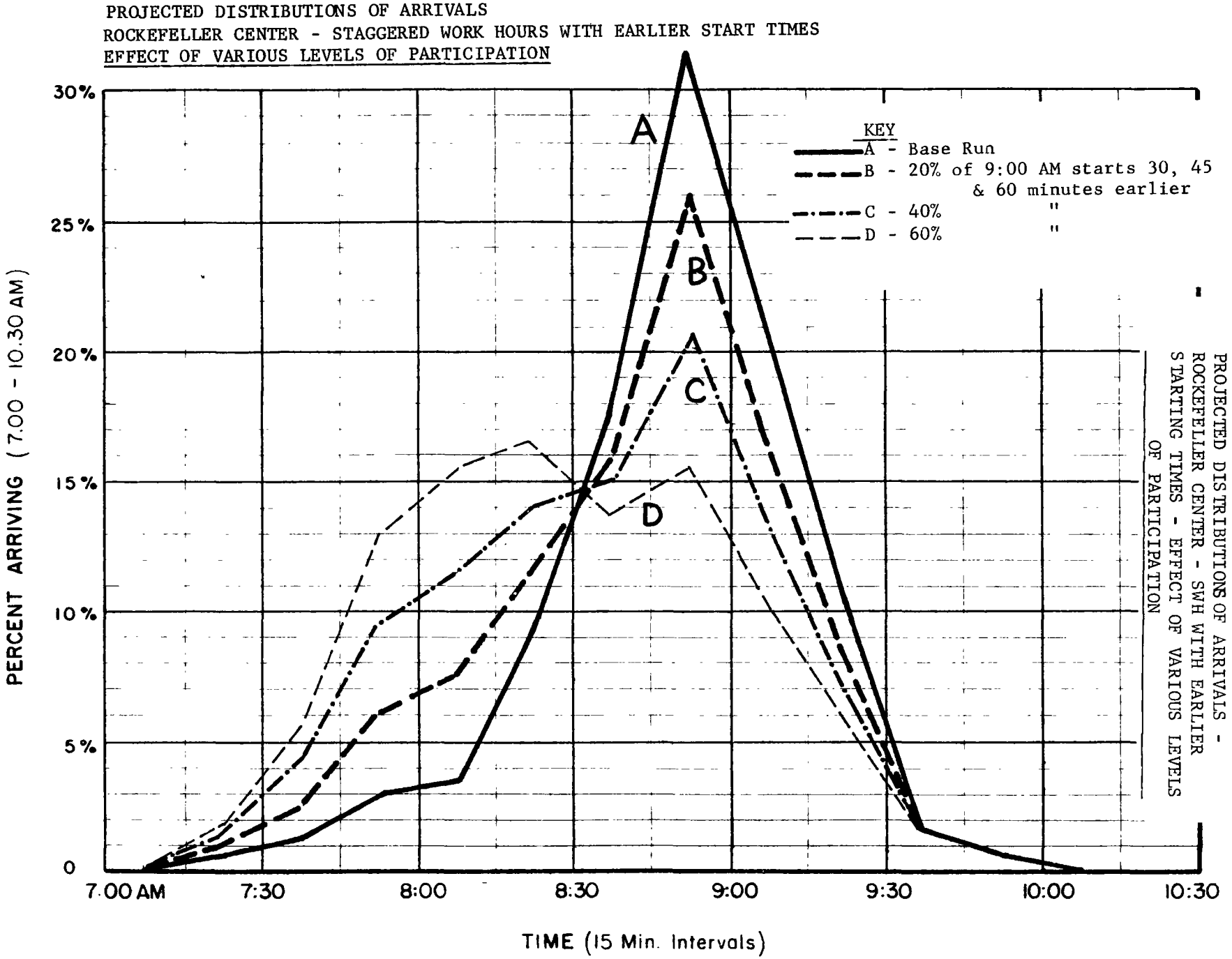
Staggered Work Hours Study

Table V-4

EVALUATION OF STAGGERED WORK HOURS ALTERNATIVES FOR ROCKEFELLER CENTER

Run #	Percent Switching From 9:00 and 5:00	Percent Switching Schedules: Minutes Earlier 0	15	30	45	60	Minutes Later 15	30	45	60	Percentage of 90-min. Peak Period: AM Arrivals Peak 15 Min.	Peak Hour	PM Departures 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	67.6
#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

Comparative Evaluation of Staggered Work Hours Alternatives

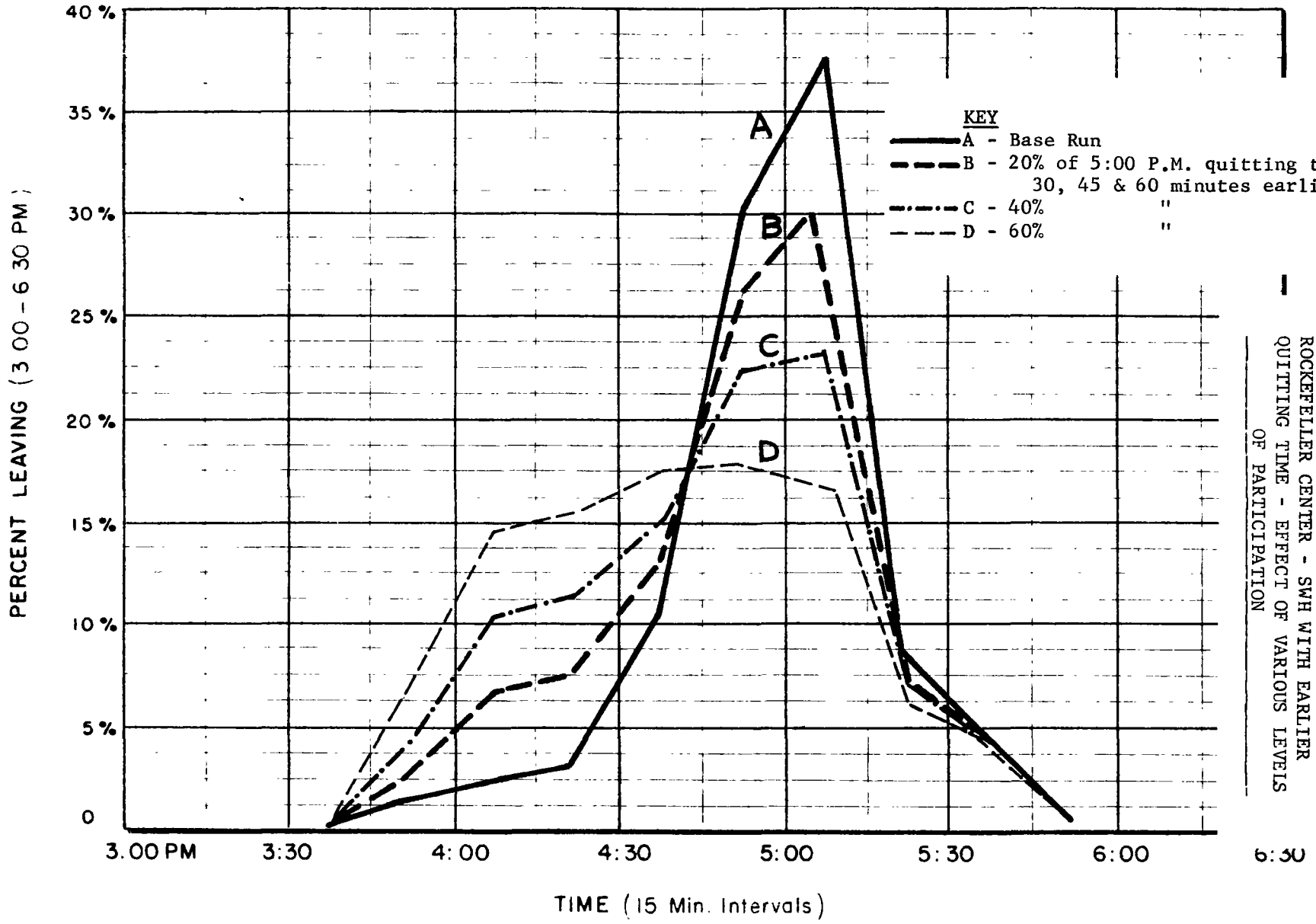


PROJECTED DISTRIBUTIONS OF ARRIVALS - ROCKEFELLER CENTER - SWH WITH EARLIER STARTING TIMES - EFFECT OF VARIOUS LEVELS OF PARTICIPATION

Staggered Work Hours Study
Exhibit V - 16

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECT DISTRIBUTION OF DEPARTURES -
ROCKEFELLER CENTER - STAGGERED WORK HOURS WITH EARLIER QUITTING TIMES
EFFECT OF VARIOUS LEVELS OF PARTICIPATION



PROJECTED DISTRIBUTION OF DEPARTURES - ROCKEFELLER CENTER - SWH WITH EARLIER QUITTING TIME - EFFECT OF VARIOUS LEVELS OF PARTICIPATION

g. Analysis of Flexible Work Hours

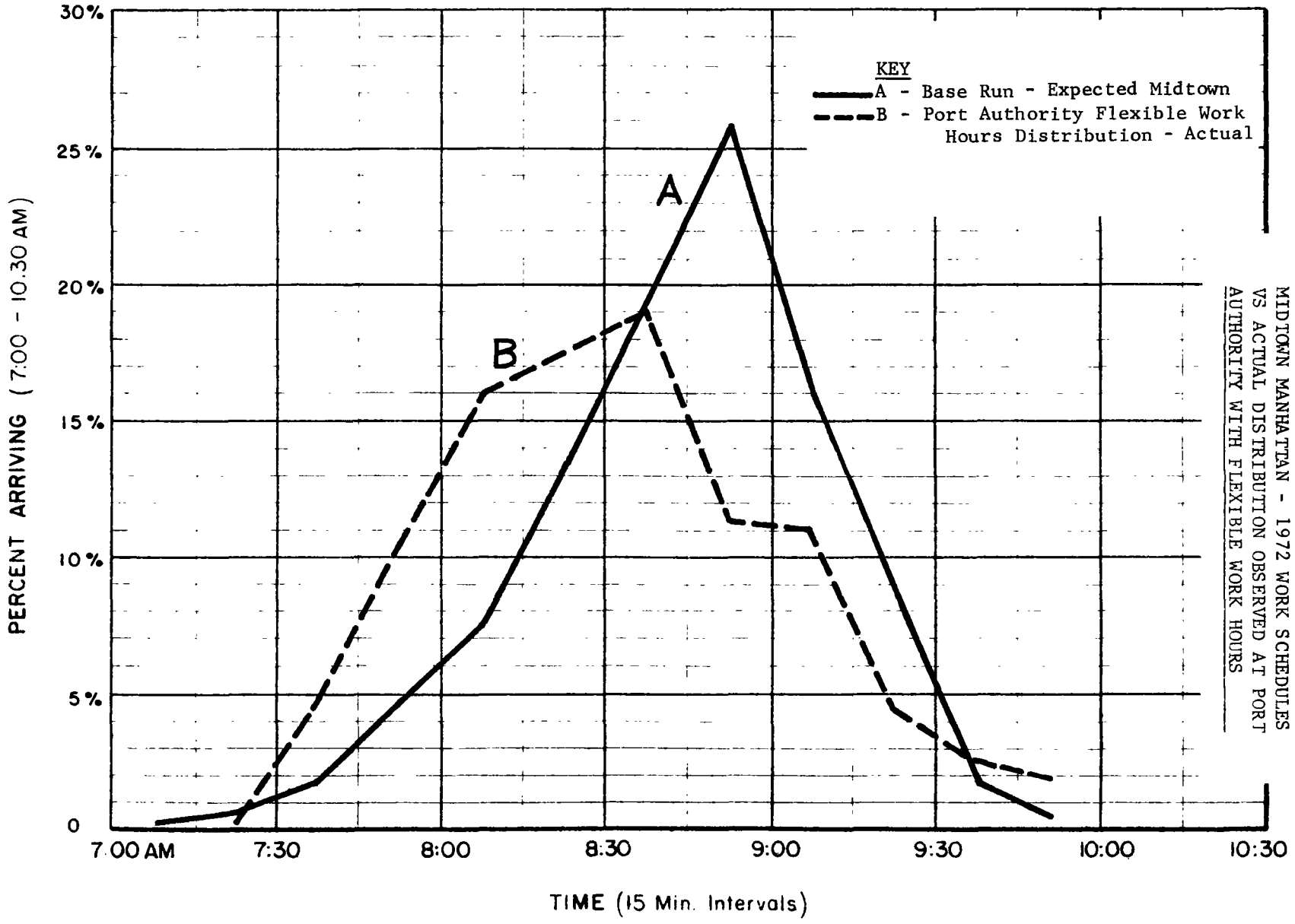
The projection of results for Flexible Work Hours will be based on observations during an experiment with the concept at Port Authority of New York and New Jersey offices during 1974-1975. (For more information about this experiment, see section IV of this Final Report.) Prior to the experiment, Staggered Hours had been in effect with employees working mainly 8:45-to-4:45, 8:30-to-4:30, 8:15-to-4:15 or 8:00-to-4:00 schedules. During the Flexible Hours experiment, employees were required to be at work during the designated "core hours" from 9:30 a.m. to 4:00 p.m. but they could begin work as early as 8:00 a.m. and quit work as late as 5:30 p.m. The basic requirement of the program was that employees had to work the required 36¼ hours each week (40 hours minus 45 minutes lunch each day) and be at work during the core hours each day.

Exhibits V-18 and V-19 show graphs of observed arrival and departure patterns for Port Authority employees participating in the Flexible Hours experiment compared to the projected Midtown Manhattan patterns under 1972 work schedules. It can be seen that both the arrival and departure patterns with Flexible Hours are less-sharply peaked. In the morning the percentage of arrivals during the peak 15-minute period is 26% for Midtown compared to 19% under Flexible Hours. In the afternoon, the peak 15-minute period departures are 29% in Midtown compared to only 20% with Flexible Work Hours.

Although individual employees on Flexible Hours chose to alter their work hours on particular days, the majority worked a standard 7¼ hour day and the variations from pre-Flexible Hours patterns of arrivals and departures largely cancelled out -- some arrived earlier, some later. The relative stability of the arrival and departure patterns may have been due to the

Comparative Evaluation of Staggered Work Hours Alternatives

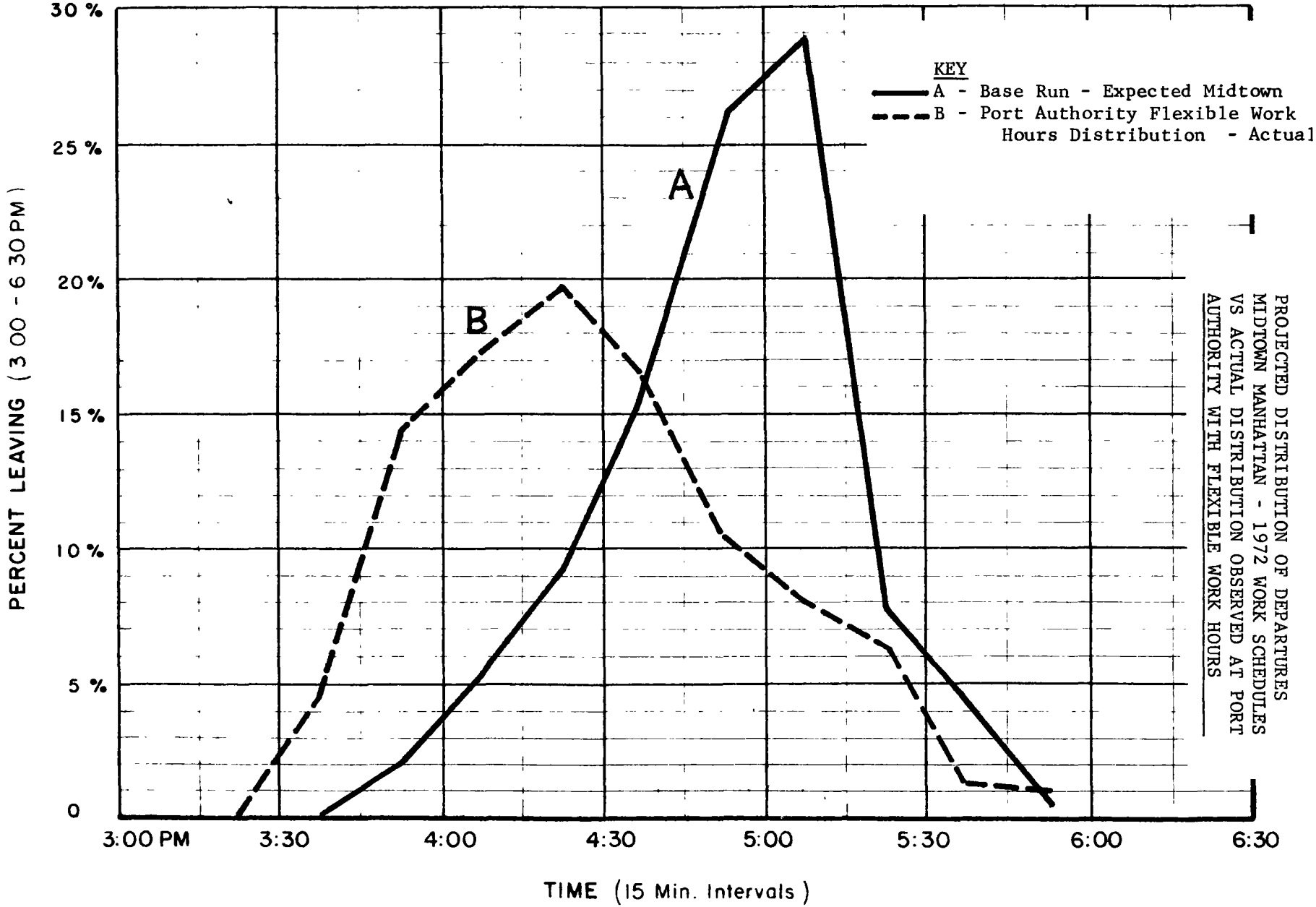
PROJECTED DISTRIBUTION OF ARRIVALS
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES VS.
ACTUAL DISTRIBUTION OBSERVED AT PORT AUTHORITY WITH FLEXIBLE WORK HOURS



PROJECTED DISTRIBUTION OF ARRIVALS - MIDTOWN MANHATTAN - 1972 WORK SCHEDULES VS ACTUAL DISTRIBUTION OBSERVED AT PORT AUTHORITY WITH FLEXIBLE WORK HOURS

Comparative Evaluation of Staggered Work Hours Alternatives

PROJECTED DISTRIBUTION OF DEPARTURES
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES VS.
ACTUAL DISTRIBUTION OBSERVED AT PORT AUTHORITY WITH FLEXIBLE WORK HOURS



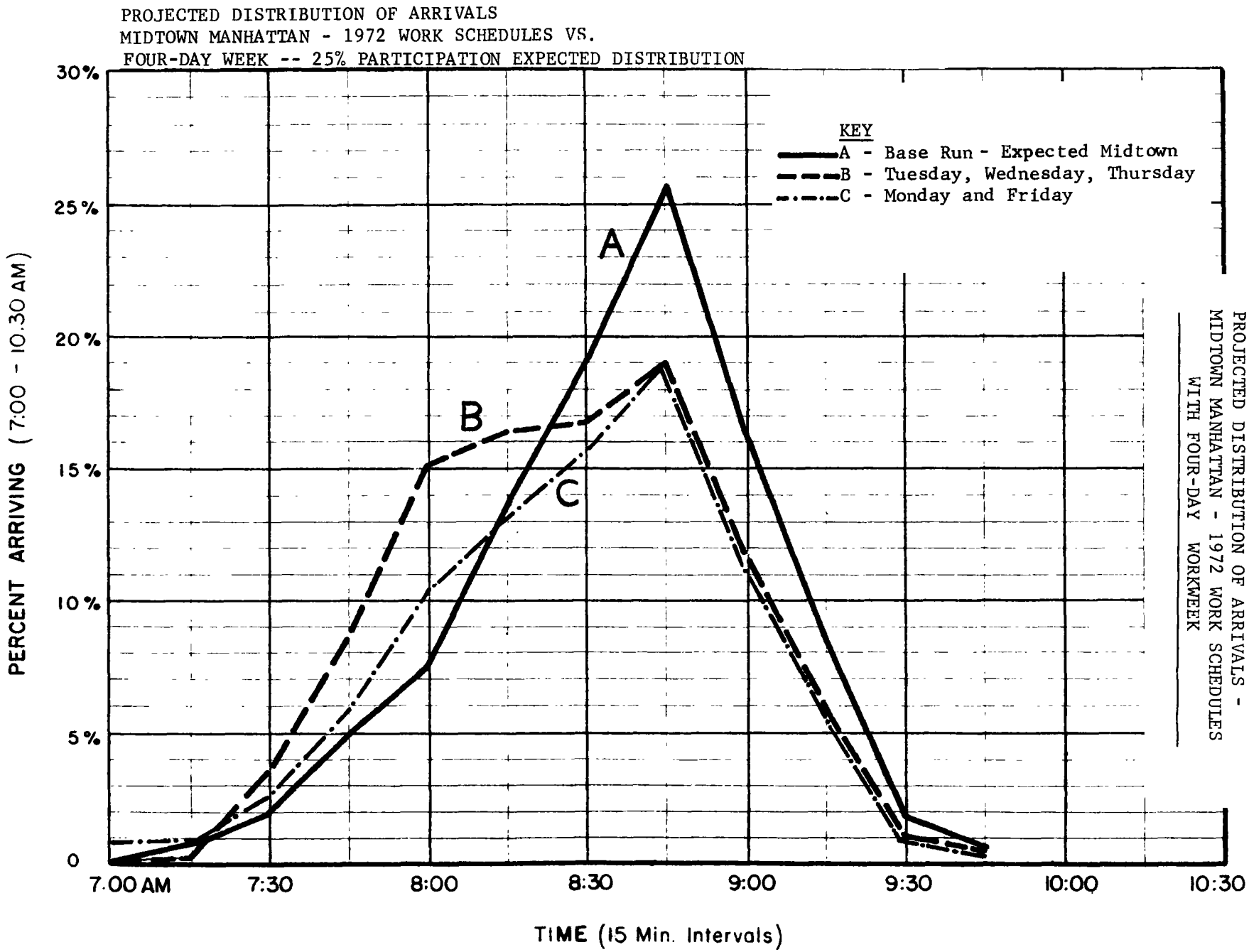
PROJECTED DISTRIBUTION OF DEPARTURES
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES
VS ACTUAL DISTRIBUTION OBSERVED AT PORT
AUTHORITY WITH FLEXIBLE WORK HOURS

fact that a variety of Staggered Hours schedules had already been implemented a few years earlier and most employees were satisfied with their pre-Flexible Hours schedule. The limited empirical evidence available indicates, therefore, that Flexible Hours may have a small effect on the overall patterns of arrivals and departures in companies where Staggered Hour schedules had been the previous norm.

h. Analysis of the Four-Day Week

An analysis was conducted to estimate the potential effects of wide acceptance of a Four-Day Week program on Midtown Manhattan arrival and departure patterns. It was assumed that 25% of the employees in Midtown would participate in the Four-Day Week and that their work schedules would be from 8:00 a.m. to 5:45 p.m. It was also assumed that half of those participating on the Four-Day Week would not work on Mondays and the other half would be off on Fridays. Exhibit V-20 shows the projected distribution of arrivals for employees in Midtown based on the 1972 work schedules versus the projected pattern with the assumed Four-Day Week participation. The percentage in the peak 15-minute interval on Tuesdays through Thursdays with the Four-Day Week ranges between 19% and 26%. On Monday and Friday when half of those workers on a Four-Day Week are assumed to be off, the peak 15-minute arrival percentage remains at 19%.

Comparative Evaluation of Staggered Work Hours Alternatives



PROJECTED DISTRIBUTION OF ARRIVALS -
MIDTOWN MANHATTAN - 1972 WORK SCHEDULES
WITH FOUR-DAY WORKWEEK

Staggered Work Hours Study
Exhibit V - 20

D. RECOMMENDATIONS

Based upon the extensive experiences in the Manhattan program as well as knowledge of Staggered Hours efforts elsewhere, we would make the following recommendations to aid in its design:

1. In order to achieve a program which may be implementable, design procedures must reflect a thorough understanding of the available work schedule concepts, as well as the degree to which the business and public sectors can be expected to comply voluntarily.

2. The technical design of Staggered Work Hours programs cannot be simply theoretical exercises. Nor can they simply be quantitative discussions or analyses of what might happen if certain conditions and participation could be achieved. Realistic, pragmatic design must be based upon what is achievable, coupled with quantitative evaluation to determine the more effective of the practical possibilities.

3. Additional research is needed to more definitively determine the transportation impacts of Flexible Work Hours variations as the concept is increasingly embraced throughout the United States and the world.

4. Further in-depth research should be done to analyze the relationship between nominal work schedules and actual arrival and departure patterns. While limited data was used herein, more precise surveys should be taken, perhaps during continuing origin and destination surveys, for example.

Chapter VI

Implementation Procedures

VI. IMPLEMENTATION PROCEDURES

A. OBJECTIVE

The objective of this section is to present a framework for organizing and implementing a successful Staggered Work Hours Program. This area is most critical since failing to achieve enough participation in the program would render meaningless any theoretical benefits.

B. WORK PERFORMED

The project staff has organized and summarized in this section many of the implementation experiences gained in the ongoing Staggered Work Hours Programs in the Central Business Districts of Manhattan and Newark, New Jersey. An excellent perspective has been gained in working with numerous public and private organizations in developing strategies, promotions, selling tools, publicity and other such efforts in advancing the successful and still-growing programs.

C. ANALYSIS

1. Introduction

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."

Thus, "selling" Staggered Work Hours can be a frustrating and demoralizing experience. Strong-willed, energetic project staff have wilted in the face of this resistance, received regularly from countless organizations.

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. This section will discuss the experiences of a variety of implementation techniques employed in the Manhattan and Newark programs which have convinced over 400 organizations to voluntarily adopt Staggered Hours schedules.

2. Organization of the Program

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.

The magnitude of staff, funding and duration for a Staggered Hours program will depend upon several factors including the absolute size of the Central Business District as well as the degree of transportation congestion. Adequate staff and material services should be available to support a major "direct selling" campaign which is usually the keystone of the promotional effort.

Although it is still difficult to approximate the cost of Staggered Hours effort, experience in the New York program suggests an annual funding of approximately $100,000 - $200,000. This could adequately finance a staff of two or three professionals, clerical support, materials and services, transportation surveys and promotional activities. This amount can vary considerably, of course, depending upon the scope of the effort as well as the amount of donated materials and services by sponsoring agencies.

Project activities should also be expected to have a duration of at least one-to-two years in order to allow a realistic amount of time to achieve the goals of the program. This time is required to perform preliminary surveys and analyses, to develop and promote recommendations, to work with large numbers of organizations and then to evaluate the impact of the program.

The Staggered Hours programs in Manhattan and Newark, and in others around the country, have been organized under a combined broad sponsorship of business, government and civic groups. In the New York area, program direction for the program is under The Port Authority of New York and New Jersey, which provides a Project Manager and other support staff and services. Many other public agencies, business groups and civic and trade organizations also contribute considerable assistance -- material, financial and moral -- in promoting various aspects of the program.

3. <u>"Selling" The Concept to Organizations</u>

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. The following pages will discuss the strategy for an effective effort and specific procedures which have worked in convincing organizations to adopt Staggered Hours. Several case studies of such organizations will then be presented. However, we should be frank in noting that while the strategies discussed have been successful in many cases, many organizations still don't wish to participate for any number of reasons.

a. Strategies and Procedures

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.

The above have been the central strategies employed effectively in promoting Staggered Work Hours. Converting these strategies into a general procedure has been as follows: After influential sponsoring organizations have been secured, organizations in the CBD are surveyed to determine their employment levels and work scheduling practices. These schedules are then compared with CBD transportation patterns and, if highly correlated, broad recommendations for work schedule changes are developed.

At this point, personalized requests are made to high-level executives of organizations which are concentrated on the predominant work schedules to consider Staggered Work Hours. If possible, a preference survey is conducted which invariably expresses an overwhelmingly favorable employee interest in Staggered Hours. Additional staff analyses of company operation may also be required.

After the work schedule change takes place, surveys study the actual effects on employee's attitudes, transportation and living habits. Management is also questioned with regard to business impact of the new

schedules, including changes in absenteeism, tardiness, productivity and internal and external communications.

Concurrently, studies are made at various CBD transportation facilities after a sufficient number of employees have shifted their hours to determine whether congestion has been reduced.

Much of the material developed with participants is used in personal solicitation with other firms that have not yet joined the program, and every effort is made to publicize and promote the program through circulating literature, newspaper articles and other media that will encourage further participation.

b. Case Studies

It is illustrative to briefly describe the case histories of a number of different Manhattan organizations which have recently adopted Staggered Work Hours. Additional information on any of the situations may be obtained from project staff.

- Union Carbide - Switched all 3,500 headquarters staff from 9-to-5 onto 8:30-to-4:30 after a preference survey showed great favor for earlier hours. Post survey indicated about 85% liked earlier hours, and Management was very pleased with Staggered Hours.

- Bristol Myers - Participation similar to Union Carbide, with a staff survey showing 84% preferring earlier hours. The company switched to 8:30-to-4:30 some time after, Bristol-Myers adopted a "floating day," which allows staff to come in between 8:00 and 9:00 AM each day, and leave the corresponding number of hours later.

• Westvaco - Management enthused about Staggered Hours and conducted a survey of staff showing 75% would like earlier hours. Shifted within one month onto 8:30-to-4:30 schedule, and the "after" survey showed a rise in popularity of Staggered Hours to 86% favorable.

• New York Life Insurance - The firm was on 9:00-to-4:30 hours, and it took a number of analyses and surveys to convince them to try 8:30-to-4:00 schedule for most staff. The post survey showed 87% of employees liked the new schedule because of more free evening time and better commuting. They've enjoyed much publicity from their participation.

• Sears, Roebuck - The nation's largest retailer shifted off the 9-to-5 onto "split" schedules of 8:30-to-4:30 and 8:45-to-4:45 after a preference survey conducted by Port Authority staff. Much publicity was accorded their participation as nominally the "400th" firm to join the Manhattan program via a press release.

• McGraw-Hill - This major publisher switched off 9-to-5 only a few weeks after a breakfast meeting promotion. Most adopted 8:30-to-4:30, although some (about 25%) chose voluntarily to go to later 9:30-to-5:30 hours.

• Montgomery Ward - Adopted "floating day" concept after moving off 9-to-5, similar to Bristol-Myers above.

• Lever Brothers - After moving onto an 8:30-to-4:30 schedule, they shaved 15 minutes off their lunch period to go to a 4:15 PM quit time.

4. Promotional Program

a. Overview

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 complimintary 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.

The following sections discuss a multitude of promotional activities conducted under the Staggered Hours programs in Manhattan and Newark. The discussion is stratified into areas of promotional materials, print media, electronic media and special promotional activities. Many project activities, of course, overlapped into several areas and few were intentionally limited to one media. Under the umbrella of a general promotional program, therefore, the project should be flexible and proficient in effectively working in all areas to try and reach the goal: informing and swaying the target audiences.

b. Promotional materials

An effective promotional campaign centers around a variety of materials used in day-to-day direct selling of Staggered Hours to organizations. These materials include specially-designed project letterhead and coordinated business cards, support literature, audio-visual exhibits and efficient files on company contact work. A selection of such materials are found on the following pages (Exhibits VI-1-12).

VI-1 Letterhead, business card & reply card

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

Midtown Task Force on Staggered Work Hours
One World Trade Center—Suite 72E
New York, New York 10048
(212) 466-8692

Andrew Heiskell, *Chairman*

Staggered Work Hours Program

Carl S. Selinger
Manager

The Port Authority of New York and New Jersey
One World Trade Center, 72E, New York, New York 10048

(212) 466-8671

First Class Permit No. 4284 New York, N.Y.

Business Reply Mail
No Postage Stamp Necessary if Mailed in the United States. Postage Will Be Paid By

Staggered Work Hours Program
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 _____
Address _____ **zip**
Telephone (_____ **)**

or, if you wish, please call (212) 466-8692 for faster service.

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 [illegible] and Development
New York City Planning Commission
New York City Transportation Administration
The Port Authority of New York and New Jersey

STAGGERED WORK HOURS

SOLICITATION SHEET

COMPANY: _____

_____

_____ ZIP _____

CONTACT: _____

TITLE: _____

_____

_____

TEL.NO: ( ) _____

BUSINESS: _____

EMPLOYEE INFORMATION

NO. OF EMPLOYEES: _____

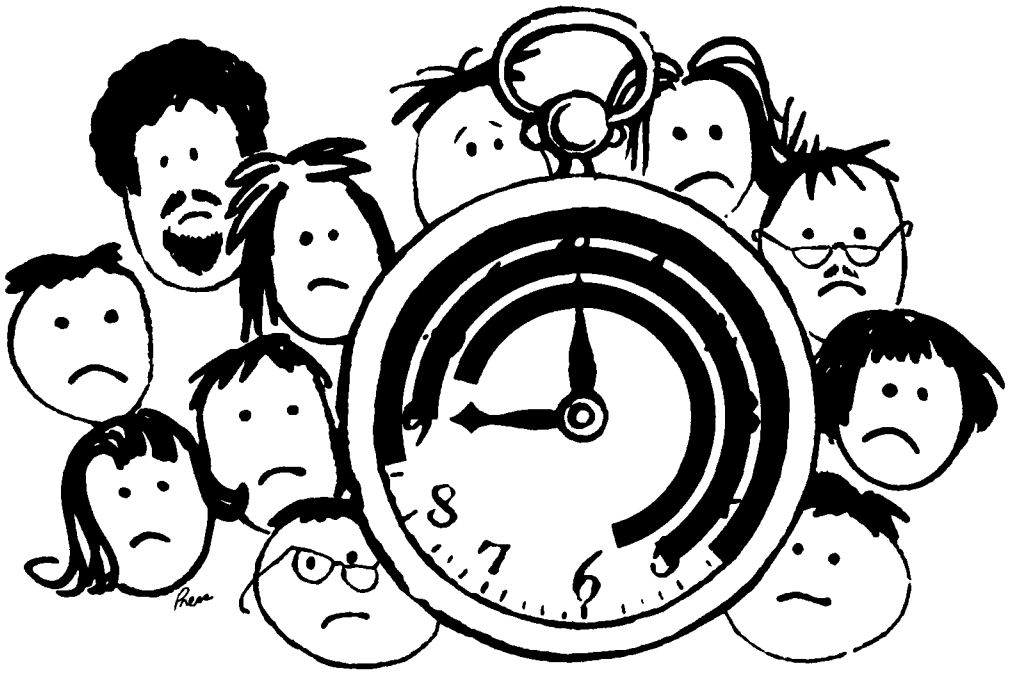
PRESENT WORK HOURS

EMPLOYEES	WORK SCHEDULE
_____	_____ to _____
_____	_____ to _____
_____	_____ to _____
_____	_____ to _____
_____	_____ to _____
_____	_____ to _____

RECORD OF CONTACTS

DESCRIPTION	DATE	COMMENTS
INITIAL CONTACT	_____	_____
FOLLOWUP CONTACT	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
ACTION DATA	_____	_____
SHIFT ONTO STAGGERED HOURS ?	_____	_____
NO. EMPLOYEES	_____	_____
TRANS. SURVEY? (COMPLAINTS)	_____	_____
CONDUCT ATTITUDE SURVEY?	_____	_____
	_____	_____

Staff Representative _____



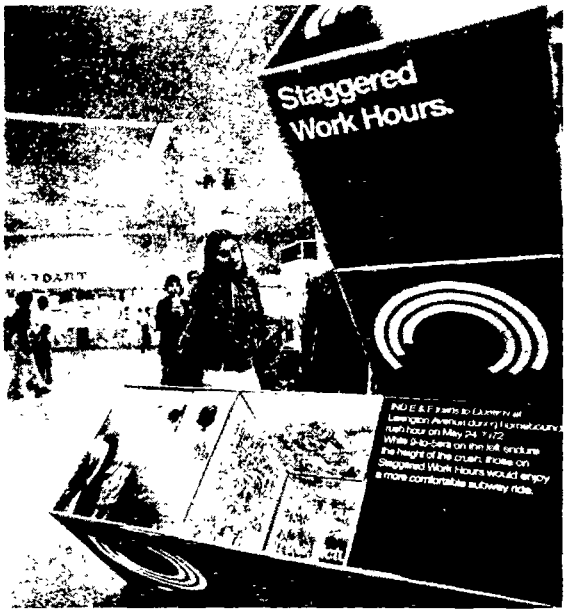
Wouldn't You Rather Switch ...Than Fight?

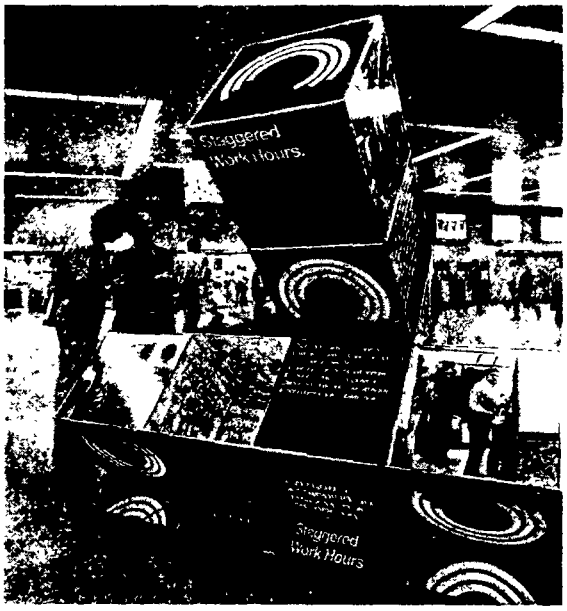
Start earlier, start later, but leave the 9 to 5 crowd. Join us in the Staggered Work Hours Project

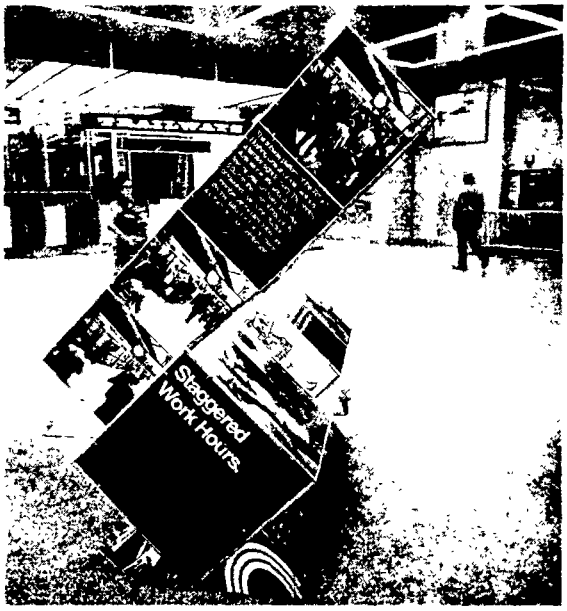
Staggered Work Hours Project
Downtown-Lower Manhattan Association
120 Broadway, New York 10005 N.Y.

VI-4 Professional Artwork

VI-5 Free-standing exhibit







VI-6 Excerpt from "Staggered Work Hours in Manhattan" brochure

"STAGGERED WORK HOURS IN MANHATTAN" Page 1

An Old Problem In Manhattan, the nation's most crowded and productive central business district, some 2,000,000 people come to work every day from New York City's five boroughs and the hundreds of communities in the surrounding Metropolitan area of three States—New York, New Jersey, and Connecticut.

Most of these people work on a 9 to 5 schedule. *Why? Largely because it's always been done that way. Just traditional.* The result is brutal congestion twice a day on the transportation facilities. The subways, highways, railroads, buses, ferries and every other mode of getting to and from work are overtaxed within the narrow time bands of morning and evening rush hours. At other times of day, even as little as 30 minutes outside these peak hours, the facilities are much less heavily traveled.

Every one of these travelers knows the discomfort and irritation in such human concentration. Time is wasted; most of the transit delays occur in the peak periods. Workers arrive late at their offices, people's spirits sag, efficiency is impaired.

There must be a better way of coping with such a costly and vexatious problem. And there is!

HOUR POWER

Report on the Manhattan Staggered Work Hours Program

VI-7 "Hour Power" Newsletter

(April, 1974)

WELCOME

Welcome to the first issue of HOUR POWER. This newsletter is designed to keep you advised on the latest developments in the Staggered Work Hours Program, (SWHP) With enough people like yourself involved in staggered hours, the Manhattan transportation crush can be reduced by shifting work schedules away from the traditional 9 to 5. On a regular basis, you will be kept up-to-date on new developments in SWHP; the benefits of staggering work schedules; other schedule practices such as the 4-day week and gleitzeit or gliding work hours, announcements of new adherents to the Program; promotional activities. testimonials, survey results, reports of activities from other cities and general interest transportation information

The Staggered Work Hours Program

April, 1974 marks the fourth year of the Staggered Work Hours Program in Manhattan The Program was introduced in the Downtown area on April 1, 1970, and has since been extended to Midtown Manhattan Downtown was considered to be a good area for the initial phase due to its compactness, and tightly knit community of business and government functions, and the extreme congestion problems on all transportation systems. Co-sponsors there have been the Downtown-Lower Manhattan Association and The Port Authority of New York and New Jersey.

Response to the Program was immediate and large. Presently, of some 450,000 + working population in lower Manhattan, approximately 110,000 now stagger their working hours The definition of staggered work hours is a work schedule at least one-half hour earlier or later than 9:00 A.M and 5:00 P.M.

The net effect in downtown Manhattan, with over one-quarter of the population participating in Staggered Hours, has produced a decline of 26% in congestion of the three busiest subway stations there and a 25% reduction in peaking at the PATH World Trade Center Terminal Ridership in the earlier part of the peak periods, where more comfortable travelling and an equal amount of trains is available, has correspondingly risen.

The natural extension of the program to Midtown began in the Fall of 1972. The Midtown Task Force on Staggered Work Hours was created to co-sponsor, along with the Port Authority, the Midtown phase, and is comprised of 26 civic and trade associations and public agencies The Task Force is presently led by Andrew Heiskell, Chairman of Time Incorporated

The Midtown problem of transportation congestion is similar in nature to Downtown but, exists on a much larger scale. Over one and a half million people work in Midtown, and almost all subway, rail and bus lines converge on the area

The success in Midtown has been growing, as some 120,000 are now enjoying the benefits of Staggered Work Hours Some reduction in transit peaking has already occurred. but there will have to be many more Midtown adherents to SWH before we can say the job is done.

Grand Central Terminal Concourse left) light traffic at 8 05 a m showing people on their way to an 8 30 a m start time right) extreme congestion at 8 30 a m for those who start at 9 00 a m

Why Stagger Work Hours?

To the 2,000,000 people who must commute to work in Midtown and Downtown Manhattan — the journey to and from the job is often not a very uplifting experience Trains and buses are often crowded and thus uncomfortable and sometimes delayed Station platforms and stairways are congested Elevator lobbies are jammed Why is it like this? To be sure, additional underground and surface transportation facilities would help to relieve the situation — and these are now being built — but this is not the only solution and certainly not an immediate one

What we need is a basic change in work habits habits which, over the years, have become almost holy The 9-to-5 syndrome is basically responsible for many of our commuter ills today Billions of dollars have been spent on equipment and services to provide transportation largely for only two hours a day. Wouldn't it be better to simply spread out peak demand periods, thus making commutation much more comfortable, reliable and efficient? This is what SWH is all about! A simple solution on the face of it, but habits are difficult to change.

It's possible however, as the SWHP has been successful in switching over 10% of Manhattan's work force to hours away from 9-to-5. 230,000 have done it and have liked it immensely.

Our aim is to convince as many companies to adopt earlier or later hours as it takes to flatten our peak demand We are not sure yet how much switching will be required to fulfill this goal, but it will take a lot more than we now have in the Staggered Work Hours Program.

Midtown Suffering Under 9 to 5

The Midtown Work Schedule Survey, conducted during 1972, indicates a very heavy concentration of 9 00 A M starting and 5 00 P M quitting times among the responding firms There is no question that this concentrated schedule is a *major cause* of the severe transportation congestion and discomfort to travelers during these time periods

The Midtown Work Schedule Survey, similar in form and results to one Downtown several years ago, was sent to all member firms of the business, civic and trade associations in the Midtown Task Force on Staggered Work Hours Of the 2,800 questionnaires sent out, 1,450 were returned, representing about 300,000 Midtown employees, or 20% of the 1 5 million working in the area The principle results were as follows

- 54% of Midtown employees begin at 9:00 A.M. and 48% quit work at 5.00 P M Only 15% were scheduled to work on 8 30-4:30 schedules, which was the next highest preferred
- 70% of the Midtown employees live within the boundaries of New York City.
- Public Transportation is the principal mode of travel for over 90% of the employees.

Analysis of the survey responses indicates an *urgent* need for an effective staggered work hours program, participated in fully by both the public and private sectors, to achieve a reduction in travelling congestion and thus giving everyone who works in Manhattan a more comfortable journey to and from work.

Andrew Heiskell Chairman of Time Incorporated is the Chairman of the Midtown Task Force on Staggered Work Hours

Staggered Work Hours Receives Federal Grant

The Federal Department of Transportation has awarded the Staggered Work Hours Program a $200,000 Technical Study Grant to investigate and advance the concept in Manhattan. The grant was awarded to the Port Authority through the Tri-State Regional Planning Commission, the agency which administers federal study funds in this area

What will be done under the grant? A number of pioneering areas will be fully documented as the Manhattan Staggered Hours effort leads the way in the nation in this endeavor Study areas will include the determination of optimum work schedules to reduce transportation congestion, personal and business benefits in adopting Staggered Hours, operating improvements with reduced peaking, and attitudinal implications

The award of Federal funds is a boost to the Staggered Work Hours Program, both in terms of financial support for expanding our efforts as well as the recognition of the Manhattan program as a leader in pioneering this concept

Guest Speakers on Staggered Work Hours and Energy

Suffering through the energy crisis? Many of us are but staggered work hours can help and it involves no suffering at all WOR-TV very aptly put it in a series of editorials in February

"Speaking of tips for saving energy during the fuel crisis, how about Staggered Work Hours? . . We see SWH as a method of conserving energy It makes public transportation more attractive . . encouraging people to shift . to more travel by rail or bus

. While many energy conservation measures simply result in belt-tightening, SWH have been found to be extremely beneficial . . workers like it, commuting has improved, punctuality has improved . . no loss in efficiency or productivity."

President Nixon in his Energy Message of November 8th said, "I am recommending that other communities follow this example. And also seek ways to stagger working hours, to encourage greater use of mass transit and car pools."

WINS Radio also broadcast their editorial as follows in part "One obvious answer to current gasoline shortages is to increase use of mass transit facilities But in the New York area subways buses and trains are often loaded until the door jams during the peak commuter hours which hardly makes for a comfortable ride On the other hand, these same facilities are often badly underutilized at other hours of the day when service must be maintained for those who do require public transportation There is one way that passenger loads could be more evenly distributed and public transportation made more comfortable and thus more attractive to people who now drive to work, and that would be for more firms, particularly those in midtown Manhattan, to stagger their work hours We hope more firms will join the Staggered Work Hours Program soon as a part of much needed local efforts to conserve fuel and improve public transportation

SWH in the Public Eye

By the time you read this, you will have seen car cards and posters in the subways, commuter railroads and transportation terminals proclaiming "Stagger Our Work Hours Before They Stagger Us". These amusing but serious displays are designed to highlight the need for Staggered Work Hours to the Manhattan business community. The more people are aware of the benefits of switching off 9-to-5, the more people will adopt Staggered Work hours.

Staggered Work Hours Program
Port Authority of New York and New Jersey
One World Trade Center - Suite 72E
New York, New York 10048

Gentlemen.

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 _____

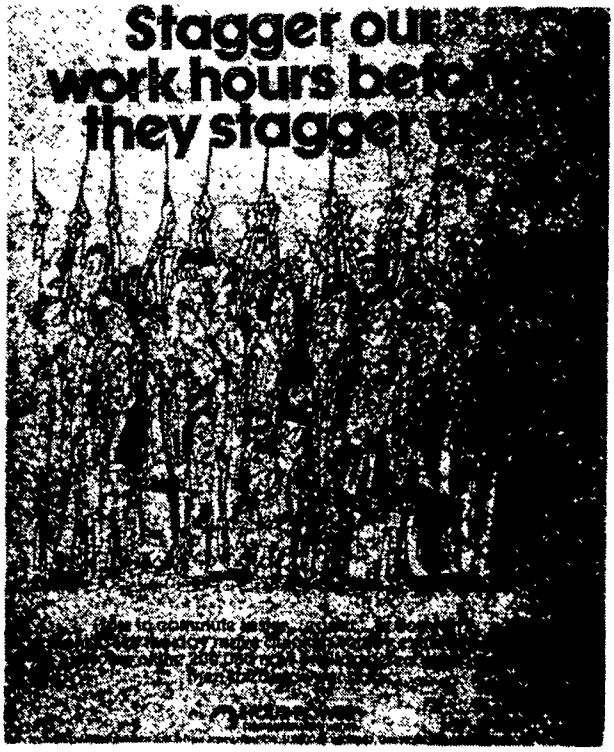
Organization _____

Address _____ zip _____

Telephone ( )

or if you wish please call (212) 466-8692 for faster service

Staggered Work Hours Car Card (above) and Poster (below) which are now appearing in the New York area transit systems.



New Hours For New York Life

An "overwhelming positive response" from 87% of employees to the new 8:30 a.m. to 4:00 p.m. Staggered Work Hours schedule has been recorded by the New York Life Insurance Company. This new schedule is the result of New York Life's 30-minute shift from their old 9:00 a.m. to 4:30 p.m. times

The new office hours were initiated after a two-month experiment last fall in an effort to ease rush-hour transportation problems and get people home earlier each day. New York Life employees on the new schedule were surveyed to determine the effects of the new hours and 87% favored the new hours for some of the following reasons:

1. **Better Transportation** - The subways, buses and trains are less crowded and travel time is reduced
2. **More Leisure Time** - There is more usable time available in the evenings to be with the family, shop, or do other things.
3. **Productivity** - Many felt the early hours were more productive, since less interruptions were encountered at the day's start.

These favorable results with the new 8:30 a.m. to 4.00 p.m. hours enabled New York Life to decide that the schedule will be "continued indefinitely".

Who's Who in Staggered Work Hours

Here are only some of the more than 400 Manhattan firms who have joined the ranks of Staggered Work Hours. Congratulations to you all

Allied Chemical
Amer. Fed. for the Blind
Americana
American Airlines
American Express
Arthur Young
Atlantic Container Line
Blue Shield
Bowery Savings Bank
Breakstone Suger Creek
Bristol-Myers
Canada Dry
CBS
Charles Pfizer
Chase Manhattan Bank
Chemical Bank
C I T Financial
Cities Service
Colgate-Palmolive
Conde Nast
Con Edison
Continental Can
Continental Insurance
Dayton, Price & Company
Dow Chemical
Doyle Dane Bernbach
Eastman Kodak
Equitable Life Assurance
Exxon
Federal Reserve Bank
First National City Bank
General Motors
J. Gerber & Company
Girl Scouts of America
Harper & Row
Hawthorn Books
Hearst Magazine
Hiram Walker
Home Insurance
Indian Head Mills
Insurance Advisory Board
International Nickel
Irving Trust
ITT World Communication
Johns-Manville
Kayser-Roth Intl
KLM Royal Dutch Airlines
Kennecott Copper
Lever Brothers
Lincoln Center
David Linzer & Son
Manhattan Life Insurance
Manufacturers Hanover Trust
McGraw-Hill
Metropolitan Life
Monsanto
Montgomery Ward
Morgan Guaranty Trust
Mutual Life Insurance
N Y Life Insurance
N Y Telephone
Otis Elevator
Phillip Morris
Random House
RCA Global Communications
Royal Globe Insurance
St. Joe's Mineral
Seagram
Sears Roebuck
Springs Mills
Standard Brands
Sterling Drug
Texaco
Time Inc.
Travelers Insurance
TWA
Union Carbide
United States Trust
Walter Reade
Warner Communications
Western Electric
Westvaco
Young & Rubicam

Staggered Work Hours Program
Port Authority of New York and New Jersey
One World Trade Center - Suite 72E
New York, New York 10048

FACT SHEET

August, 1976

MANHATTAN STAGGERED WORK HOURS PROGRAM

Objective: To relieve severe transportation congestion in Manhattan during the peak hours by persuading business and government to switch away from the predominant 9-to-5 work schedule.

Status: Begun April 1, 1970, and continuing to gain participants.

Sponsorship:
- Downtown - The Downtown-Lower Manhattan Association and The Port Authority of New York and New Jersey.
- Midtown - The Midtown Task Force on Staggered Work Hours, comprised of 26 civic and trade association and public agencies.

Participants: Over 400 private firms and government agencies, including the major banks, insurance companies, investment firms, corporate headquarters offices, and the City and State of New York and Federal offices in Manhattan.

Number of Participants:
- Downtown - Over 100,000 men and women adopting Staggered Hours, mainly an 8:30 A.M. to 4:30 P.M. schedule.
- Midtown - About 45,000 people switching off 9-to-5 since fall, 1972, joining some 80,000 who were already on Staggered Hours schedules.

Effects on Transportation: Staggered Work Hours has reduced peaking in the three busiest Downtown Manhattan subway stations by 26% in peak ten minutes. Critical peaking at PATH's World Trade Center Terminal relieved about 25% in peak 15 minutes between 5:00 and 5:15; traffic increased in more lightly-traveled 4:30-4:45 period by 57%. Elevator operations improved in buildings where Staggered Hours are in effect.

Employee Response: Attitude surveys indicate that around 85% of the men and women sampled had a favorable overall reaction to Staggered Work Hours. About half say their trips to and from work were improved under the new schedules.

Effects on Firm Operations: About 22% of participants report increased effectiveness at work while only 4% report a decrease. Supervisors generally report an increase in punctuality. A major bank has said it all: "The Staggered Hours Program has proven to be a success."

Transportation Operator Cooperation: All transit system and commuter rail operators are actively supporting the project. Service or schedule improvements have been made by the NYC Transit Authority, PATH, the Erie-Lackawanna, Jersey Central and Penn Central Railroads, and Transport of New Jersey.

For More Information:

Mr. Carl S. Selinger, Project Manager
Staggered Work Hours Program
The Port Authority of New York and New Jersey
One World Trade Center - Room 72E
New York, New York 10048
(212) 466-8671

VI-9 Cover sheet of "Summer Hours Kit"

summer hours kit

Enclosed are materials which will help your organization try Staggered Work Hours during a summer experiment.

Many of the more than 400 Manhattan firms which have adopted Staggered Hours switched onto 8:30-4:30 or other staggered schedules initially for the summer, and have remained on them permanently because of the no-cost benefits. They found:

- universal popularity
- improved punctuality
- better commuting
- increased productivity
- faster elevator service

HOUR POWER

Report on the Manhattan Staggered Work Hours Program

VI-10 "Office Memorandum" from participating company.

NEW YORK LIFE

OFFICE MEMORANDUM

DATE September 25, 1973

TO ALL HOME OFFICE EMPLOYEES

SUBJECT Office Hours

FROM J. Burkam Ferris

The responses to the recent office hours survey were overwhelmingly in favor of continuing the new 8:30 a.m. to 4:00 p.m. working hours. Better transportation and the increased leisure time in the evening were the main reasons given by employees who prefer the new schedule.

In addition to the favorable employee reaction to the new work schedule, it is gratifying to be able to report that service and productivity have been very adequately maintained during the two month experimental period.

Accordingly, the 8:30 a.m. to 4:00 p.m. schedule will be placed on a permanent basis, with the understanding that all departments will continue to provide adequate staff and service between 4:00 p.m. and 4:30 p.m. (especially with respect to policyowners, agents and field offices). Those employees who prefer the 9:00 a.m. to 4:30 p.m. schedule should be used to provide such service, and every effort will be made to accommodate individual preferences. All executive officers and certain related staff personnel will be expected to remain until 4:30 p.m.

Thank you for your interest and cooperation in completing the questionnaire. We are happy that this experiment with our office hours has been received so well by so many employees.

J. Burkam Ferris

Vice President in charge
of Personnel

HOUR POWER

Report on the Manhattan Staggered Work Hours Program

VI-11 "Communications with Westerly Time Zones"

COMMUNICATIONS WITH WESTERLY TIME ZONES

Firms which communicate regularly with westerly time zones often express concern about keeping in touch when considering earlier Staggered Work Hours schedules.

We have therefore canvassed several major New York corporations which have successfully shifted to Staggered Hours, and none has found this situation to be a serious problem. There are several reasons for this, which are included among the comments below, with the major reason simply that the new work hours required only a very small adjustment in communications habits.

CONTINENTAL CAN:

"None of the reactions have been derogatory. As a matter of fact, with only a half hour difference in our closing time, no one seems to feel the experience has been the least bit difficult. We are, therefore, inclined to agree with the observation that the concern of local businessmen about new hours is really unsubstantiated, or, that the problem, if any, relates wholly to a matter of planning properly for the placement of calls to locations within westerly time zones."

Ms. Cynthia Darrah
Personnel Manager
CONTINENTAL CAN

WESTVACO:

"Concerning the effect of our change in work hours to 8:30-to-4:30 on communications with West Coast facilities, I can report no adverse effect. I think the Staggered Work Hours Program put it well when you stated a few years ago that the biggest barrier to any change is psychological. Once we got over this and made the change, we proceeded in typical 'free enterprise fashion' and adjusted without losing efficiencies. If we were confronted with a situation where business must be handled after 4:30 P.M., manpower schedules could be arranged for a few people to accommodate the situation. We did not allow a few isolated instances to hold up the complete program."

Mr. Robert MacKenzie
Manager of Employment and
Personnel Services
WESTVACO

HOUR POWER

Report on the Manhattan Staggered Work Hours Program

VI-12 "Staggered Work Hours Attracts Job Talent"

STAGGERED WORK HOURS ATTRACTS JOB TALENT

Staggered Work Hours is catching on. In fact, take a look below at some recent classified newspaper ads and note how many employers are highlighting this no-cost but very popular employee benefit with Staggered Hours. Benefits like increased employee morale, and better punctuality and improved commuting. Its worked for them it will work for you. If you would like more information on Staggered Work Hours, call 466-8692. Or write:

Brendan O'Malley, Project Manager
Staggered Work Hours Program
One World Trade Center, Room 72E
New York, New York 10048

Secretaries

Who are the people behind products like Planters Nuts & Fleischmann's Margarine?

They are Product Managers, Home Economists, Engineers, Accountants . . . and YOU!

YOU, as a secretary are a vital part of every area in this major international food & allied products organization. Currently, we have openings in MARKETING & MANUFACTURING. If you would like to explore these interesting opportunities call:

Standard Brands, Inc.
Plaza 9-4400, Ext 495
An Equal Opportunity Employer m/f

P.S. We have a convenient midtown Madison Ave. location (near Lex Ave-59th subway stop; near major dept stores) . . . and hours to match, 5 days, 8:45 to 4:30.

EXEC secys. Work 8:30-4:15. Min 2 yrs exp $185-$200 Co pays fee. Freidman Agency, 55 W 42, 221 1780

BOOKKEEPER F/C

Exptd. Knowledge A/R. A/P procedures. Maintain schedules, post thru G/L & trial balance. Knowledge of taxes. Con serial office. Hours 9:30-5:30. Con CALL Miss Johnson 541-5650

CLERICAL Light Typing
AVOID THE RUSH HOUR
8:30 AM-4:15 PM

In addition to our early schedule, a convenient subway stop located right in the building will get you home in enough time to enjoy more summertime activities.

Our employees also enjoy a liberal benefits package.

Apply Employment Office

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51 Madison Avenue, N.Y.C.
(26th & 27th Streets)
An Equal Opportunity Employer

SECRETARY TO SR. V.P. —$180
PUBLIC RELATIONS
International co. — fast track
9:30 - 5:30, 3rd Ave at 56 St.
All skills incl TWX—heavy phone.
PHONE 593-865-

SECRETARY TO V.P.
Shorthand/typing. Diverse duties.
Gd appearance. Grand Central area. $185
Hrs. 8:30-4:30. FEE PAID.
ALBERTA SMYTH Agency 170 BWAY

KEYPUNCH/DAYS

KEYTAPE OPERATOR

Great company and surroundings

We have a rewarding job for you assisting in the data processing activities of this leading business service organization. If you're quality, you'll need at least one year of key-to-tape experience on the Honeywell 200. This permanent position offers a good salary and outstanding benefits.

For personal interview, Call Miss Dunn or Mrs Pennisi
791-8106/791-8108
An equal opportunity employer M/F

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Rock firm distributors informal atmosphere, good typing and steno required
9:30 to 5:30 477-0251

c. Print media

Gaining publicity in the print media is most valuable and usable for a long duration: Reprints of magazine articles, newspaper clippings and other written materials seem to have more credibility and authenticity, and can be targeted to appropriate audiences more closely than a TV or radio program.

In addition to general newspaper coverage, publicity can be solicited in trade publications, local area newspapers, professional personnel management journals, business magazines and other print media. These reach selected and definable audiences. Two of many items which have appeared in the print media related to the Manhattan program are shown on the following pages (Exhibits VI-13 & 14).

d. Electronic media

Radio and television are certainly the most dynamic mediums for publicizing a Staggered Work Hours effort. However, it should be frankly understood that these media are unpredictable in their type of coverage and harder to appeal to a desired audience. Publicity on radio and TV is certainly valuable on balance, and efforts to secure air time on news and public affairs programming should be a part of overall promotional activities.

Several ways of appealing to electronic media include 1) conducting press events with special attention to having "something to see" for the television eye (like holding the event at an unusual location, demonstrating something unique or having VIPs in attendance), 2) soliciting appearances on regularly-scheduled news or public affairs programs and 3) producing a Public Service Announcement for free airing on radio or TV. Several of these are covered later in this section in discussing special promotional activities the project has conducted. Two are discussed below involving company testimonials broadcast on radio and the production and airing of a television announcement.

THE NEW YORK TIMES, MONDAY, APRIL 29, 1974

Staggered Working Hours Gain Acceptance

By MICHAEL STERN

To have a better working day, start it a half hour earlier or later than everyone else.

That simple idea is one whose time has come in New York, and is coming along elsewhere.

From a slow, experimental start four years ago this month, it has gained in acceptance until now more than 200,000 people employed in Manhattan have switched to staggered work hours that permit them to travel to and from their jobs at off-peak hours.

Last week, Sears, Roebuck and Co. became the 400th Manhattan concern to sign up for the program, a total that was swelled last year by such major employers as Exxon, Seagrams, Continental Can, Trans World Airlines and Westvaco.

New Campaign in May

Early in May, the Midtown Task Force on Staggered Work Hours, a group of 26 trade associations and public agencies working under the chairmanship of Andrew Heiskell, chairman of Time, Inc., will launch a new campaign to sign up many more big companies.

In Newark, the Port Authority of New York and New Jersey, which introduced the idea here and has been its prime mover, is helping the Chamber of Commerce with a study to determine if staggered hours would ease that city's traffic problems.

And in Washington, Atlanta, Philadelphia, Ontario and elsewhere, staggering is being tried with varying degrees of success and cooperation.

Here in New York it is bringing tangible benefits — and some problems — to the people whose companies agreed to switch out of the standard 9 A.M. to 5 P.M. work pattern that puts beyond-capacity strains on subway, bus and commuter lines.

At the New York Life Insurance Company, Mary Turley said: "I love it. I wouldn't want to go back to the old way. I get home to the Bronx when it is still light, and I feel a lot safer walking the streets."

Joyce O'Connor said she likes the system because "it gets me a seat three times out of five on the F train I ride home to Brooklyn."

Victoria Matzel said: "Starting home earlier, my ride to Glendale, Queens, is 10 to 15 minutes shorter, and it gets me home while the stores are still open so I can do some shopping. It really is the better way."

A Ringing Success

All three women work in New York Life's payroll department, but satisfaction with the program is company-wide, according to Gerard McCaffrey, assistant vice president for personnel. A survey done two months after the company's working day was moved back a half hour to 8:30 A.M. last August showed that 87 per cent of the employes like the earlier time and want to continue it.

"The program works for us very well," Mr. McCaffrey said. "We plan to go on with it." But he agreed that there was a minority of employes who had problems with it.

The survey turned up one New Jersey man who could not get an earlier train home and was forced to wait around a half hour every afternoon to get his regular train. A young mother complained that the new hours upset day care arrangements she had made for her three children. Another employe said he was forced out of his car pool.

In most cases, Mr. McCaffrey said, the company was able to leave people who had problems on their old work-

Continued on Page 55, Column 1

ing schedule. They provide coverage in offices that must stay open late to serve the company's West Coast and Hawaiian branches. In all, 3,500 of the 4,700 people working in the company's two buildings on lower Madison Avenue work an 8 30-to-4 day. The others continue the old 9-to-4:30 day.

The high approval rate—87 per cent—at New York Life is consistent with an average rate of 85 per cent among all companies that have switched, according to Brendan O'Malley, the Port Authority manager who is in charge of the program. "If we were to go back later with other surveys," he said, "we might find the rate even higher because we've been able to eliminate some of the problems."

Transit Aid Cited

Mr. O'Malley and his aide, Carl Selinger, have used the survey findings to convince the Transit Authority and the operators of the major commuter lines to add trains, to change schedules, and to modify service patterns to suit the needs of people who have switched out of peak-hours travel.

"We can't solve all the problems," Mr. O'Malley said, "but transport officials have shown a real willingness to respond to the needs of people who change their working hours."

The staggered-hours program was begun in 1970 when it became apparent that the office building boom in lower Manhattan, which included the Port Authority's own 110-story twin towers in the World Trade Center, would put new strains on the already strained subway lines that serve the area.

"With the high capital cost of adding new transit capacity," Mr. O'Malley said, "it was easy to see that the more intelligent thing to do was to try to alter demand rather than trying to constantly rise to it."

After trying staggered hours with its own people and finding that they liked it, the Port Authority asked the Downtown Lower Manhattan Association to sponsor a campaign to get the banks, brokerage firms, insurance and shipping companies that dominate the area to change their hours by at least a half hour.

Most of the companies that agreed went to an 8:30-to-4:30 schedule. Some chose 8 to 4. Others opted for 9:30 to 5:30.

Subway Crush Eased

So far, 100,000 of the 480,000 people who are employed downtown are on staggered hours and the benefits have been substantial, Mr. O'Malley said. At the busiest subway stations in the area the size of the rush-hour crush has been cut 26 per cent; employers report an increase in punctuality because there are fewer delays in off-peak hours, and even elevator congestion in buildings has been eased.

Similar benefits have been reported in the midtown area, where slightly more than 100,000 people have switched since the program was introduced there in 1972.

Staggered hours were tried first on a broad scale during World War II, in Washington and in centers of munitions production. These experiments were abandoned after the war and interest did not revive until urban expansion fueled by postwar prosperity brought with it mounting traffic and transit congestion.

In Washington, action was forced by the expansion, in the nineteen-sixties, of the working population in the 40-block area between the Capitol and the Washington Monument from 30,000 to 60,000.

"You can imagine the confusion when everyone—literally thousands—poured into buildings between 8 and 9 o'clock," said I. Jack Gural, urban planner for the General Services Administration. In March, 1970, began what Mr Gural called "one of the largest changes in duty hours in the country."

A Mixed Pattern

More than 50,000 people in six Federal departments were involved, with some starting as early as 7 A.M. and others moving to their desks at 15-minute intervals until 9 A.M. The system is continuing with the need expected to grow as the working force in the area moves toward a projected size of 100,000.

In Philadelphia, some 26,000 people working in the center of the city are on staggered hours under a joint program of the Chamber of Commerce and the Delaware Valley Regional Planning Commission. Daniel Noonan, a chamber official, said most people prefer shifting to an earlier working day so they can get home earlier.

"Whether the schedules work out of not depends on how a company goes about instituting them," Mr. Noonan said. "You have to be very careful. If you go about it in the wrong way, you can get a lot of people upset."

In Atlanta, a 1970 study recommended that a staggered hours program be introduced, but city officials found flaws in the plan and rejected it. Since then, several companies have moved ahead on their own. The Retail Credit Corporation, situated at a busy downtown corner, spaces the departure of its 1,000 employes so that they avoid epic traffic battles that build up on Peachtree Street every evening from 4:30 to 6:30.

And the Lockheed Georgia Company has its 9,500 workers come and go at 30 minute intervals to avoid the traffic snarls that develop at interstate highway exchange near its installation.

The Chamber of Commerce has been urging other companies to do the same, but it reports widespread resistance among employes and concedes that little progress has been made so far.

The goal of the Midtown Task Force in Manhattan is to move 500,000 people, about a third of the 1.5 million who work in the area, out of the 9 to 5 pattern. Mr. Heiskell, the task force chairman, said the targets of the drive starting next month will be larger companies because it is easier for them to make arrangements for those who cannot switch their hours without hardship.

"We're not going to thunder at people," Mr. Heiskell said. "It is a reasonable proposition and we're just going to plug away at it until we can convince them. People don't like change, but once they try this, they quickly see the advantages and they like it."

Photographs for The New York Times by JOHN SOTO

Above: An almost deserted subway station at 50th Street and the Avenue of the Americas. Below: 55 minutes later the same station is crowded with people traveling during the evening rush hour. More than 200,000 persons employed in Manhattan are able to take advantage of less crowded transportation because they start and end their day outside the normal rush hours.

VI-14 Personnel Journal article

PERSONNEL JOURNAL

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Volume 54 *Number 2*

Contents for February, 1975

You Were Saying ...

CYNTHIA J. FIELDS

Staggered Work Hours— A Roundtable Discussion

"Wouldn't you rather switch than fight?" This is a question posed to the 2,000,000 people who commute daily into Manhattan, by the sponsors of the Staggered Work Hours Program. This was also the subject of a roundtable session recently sponsored by "Personnel Journal," focusing on the program's concepts and practical applications as viewed by personnel management. Participating in this discussion were John Cooney, Manager of Personnel Services, Lever Brothers Company; Gerard Mc Caffrey, Assistant Vice President, Personnel, New York Life Insurance Company; Thomas Welch, Manager, New York Employee Relations Office, Exxon; and Brendan O'Malley, Manager of the Staggered Work Hours Program and representative of the Port Authority of New York and New Jersey.

The Staggered Work Hours Program is a coordinated, ongoing project to encourage the voluntary staggering of work hours in the Manhattan business district. To date, better than 400 firms, including more than 220,000 employees, are participating by changing work schedules from the traditional 9:00 to 5:00 to a variety of other schedules. The staggering of work hours offers a relief from the severe problem of transportation congestion which occurs during the peak commuting hours.

The program's goal is to persuade Manhattan business and government offices to switch from the habitual 9:00 to 5:00 schedule so that peak commuting times are actually "flattened" and distributed more evenly. See Figure #1 for illustration of common employee arrival times in Manhattan. The sponsors of Staggered Work Hours questioned the reasoning behind the 9:00 to 5:00 schedule and found it popular mainly because "it's always been done that way."

Grand Central Station at 9:00 AM

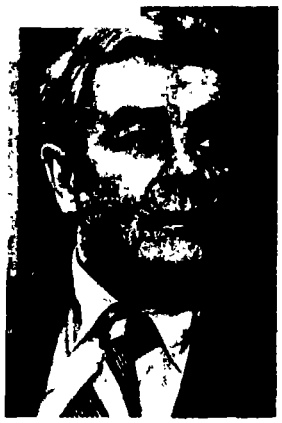
Grand Central Station at 8:30 AM

Tradition has resulted in extreme congestion twice a day during very short morning and evening rush periods, while, as little as thirty minutes outside the peak, transportation facilities are much less heavily traveled. Shifting the work hours by thirty minute segments staggers the arrival and departure times, thus spreading out the peak and alleviating transportation tie ups for commuters. The strain of commuting at peak hours can be great. During the roundtable discussion Mr. [illegible] of Lever Brothers commented, 'Commuting is a very stressful time for most people possibly more stressful than their work situation."

The program, sponsored by the Downtown Lower Manhattan Association and the Port Authority of New York and New Jersey, along with the aid of a $200,000 government grant, had its inception in lower Manhattan in April 1970. This was a response to the increase of new office buildings in that area, foremost the 110 story twin towers of the World Trade Center. Participating firms included banks, insurance and in

Gerald E. McCaffrey

Thomas M. Welch



John Cooney

Brendan O'Malley, Cindy Fields

vestment companies, corporate headquarter groups, as well as city, state and federal offices. The shifts were primarily to a new schedule, from 8:30-4:30, although the project's manager, Brendan O'Malley, noted a definite trend for firms in advertising, law and publishing to shift to a 9:30-5:30 schedule. Some companies utilized internal shifts, with different departments working different hours. Alternate schedules included 8:00-4:00, 8:15-4:15 and 8:45-4:45.

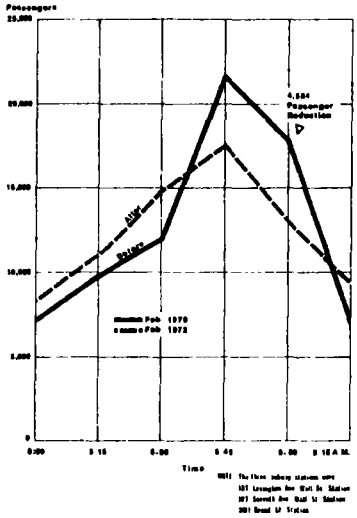
Each of the companies represented at the roundtable discussion has opted for a different time schedule Exxon's 2200 New York City Employees switched from 9:00-4:45 to 8:30-4:15. The 1000 employees at Lever Brothers were shifted from the traditional 9:00-5:00 schedule to 8:30-4:30. New York Life Insurance Company employees 4700 in their Home Office. About 3500 members of this staff changed from hours of 9:00-4:30 to 8:30-4:00. In each instance, employee response was overwhelmingly favorable.

Lever Brothers conducted an employee opinion survey after 2½ months on Staggered Work Hours, and John Cooney found, "We were so astounded at the overwhelming support—we knew we couldn't change it." New York Life employees were so enthusiastic that Mr. McCaffrey commented, "We'd have a hard time getting people back to the old schedule." Tom Welch of Exxon found, "A small number of people, about 2%, resisted, but quickly made the adjustment." In each case, accommodations were made for any employees who absolutely could not switch to the new work schedules.

The Staggered Work Hours Program was an immediate success in alleviating commuter tie-ups throughout lower Manhattan. Mr O'Malley noted, "This is a marvelous program in terms of measurement. We can identify key transportation facilities, and since Manhattan is an island, it's rather easy to measure flows in and out." There was a noticeable change in traffic patterns in the three busiest downtown subway stations. Passenger counts were taken before and after project inception; the result was a 26% reduction in congestion in the peak fifteen-minute period from 8:45 to 9:00

Effects of Staggered Work Hours

Passenger Counts at Three Major Downtown Stations



Studies also found that there is a greater percentage of rail transit delays during peak commuting hours. With employees traveling at non-peak times, there is less chance of tardiness due to transit delays. Area transportation operators work closely with the program coordinators to identify transportation difficulties and to adjust schedules, thus strengthening the program's impact on relief of congestion.

Several transportation schedules were actually changed to accommodate employees on Staggered Work Hours. Mr. Welch related Exxon's experience to the discussion group. "Actually, we had a few problems when we first started out. The Staggered Work Hours people were able to help us by coordinating transit schedule changes. We haven't heard any complaints since." Gerard McCaffrey observed, "In some cases people have a longer trip home, since trains don't run as often before 5:00, but they are much more comfortable."

The Staggered Work Hours Program has also reduced waiting times for elevators, and alleviated lobby congestion in large office buildings. Passenger counts taken at peak periods in the main lobbies of three banks demonstrated that prior to staggered hours, employees waited an average of more than 2½ minutes for elevators. After Staggered Work Hours implementation, the delay was reduced to 1 minute. Lever Brothers is planning to install automatic elevators and will use internal shifts of staggered hours to avoid elevator congestion while service is reduced during the transition phase.

In the fall of 1972, the program was expanded to include the midtown Manhattan work district. A Midtown Task Force on Staggered Work Hours was created to coordinate the program for the thousands of midtown business offices. Project results paralleled those in the downtown area.

Attitude surveys were conducted to ascertain employee response to the project. About 85% of employees sampled had a favorable over-all reaction to Staggered Work Hours. Almost half of the employees polled found their commuting improved under the new schedule. Questionnaire results also demonstrated that although employees were working the same number of hours

VI - 14 Continued

as the 9:00 to 5:00 work day, three times as many felt their day was shorter rather than longer under staggered work schedules. Additionally, four times as many people were more satisfied with their jobs than were less satisfied.

There are several factors involved in the positive response by employees. The ease of commuting without congestion is a big plus to many people. Furthermore, earlier starting times mean more time at home in the late afternoon. Mr. O'Malley explained, "Staggered Work Hours gives you recaptured time . . . those late afternoon and evening hours that formerly were given to the employer. Employees are now giving the same number of hours to their employer by losing a little time, either by sleeping less or going to bed earlier. People don't like to get up earlier, but they do like to get home earlier. In terms of weighing importance to people, recaptured late afternoon and early evening hours are very valuable." Discussion participants also pointed out that people can get home earlier to do things—enroll in courses, enjoy leisure activities and travel in safety before darkness.

Supervisors were also sampled, and 22% reported increased employee effectiveness at work with less than 4% indicating efficiency had declined. At New York Life, Mr. McCaffrey found, "We had a few people comment that 8:30 to 9:00 is a very productive time with less interruptions, especially telephone interruptions." Almost 80% of the supervisors found that employees were arriving on time or earlier under the new schedules. "I can't help but feel that because of Staggered Work Hours, people are able to get to work on time and not have the problem of crush," observed Mr. Cooney.

During the discussion, the question was asked if there was any indication of communication problems with corporate operations in other time zones due to the earlier starting times. It was unanimously agreed that there were no major problems of this kind, and that each firm had been careful to communicate schedule changes to clients, field offices, etc. Mr. Welch pointed out an advantage to starting earlier, "As an international firm, we pick up time in our dealings with Europe."

Each of the three personnel managers also agreed that Staggered Work Hours benefited their attractiveness as an employer in the community. Many Manhattan firms advertise Staggered Work Hours as part of their benefit package when trying to attract new employees.

The roundtable discussion highlighted the statistics compiled on the effectiveness of Staggered Work Hours Personnel management found implementation of staggered hours successful and rewarding for both the employees and their corporations. In recognition of the program's achievements and for further promotion of the concept, New York City's Mayor, Abraham Beame, has proclaimed February, 1975 as Staggered Work Hours Month.

The project still has far to go in alleviating all of Manhattan's commuter-time transit problems. The goal is not to convert every office to staggered hours, but to continue until there is an even distribution of arrival and departure times. As more and more firms participate, the program's slogan rings true, "Stagger our work hours before they stagger us."

About the Author: *Cynthia J. Fields*, Assistant Supervisor of Employment, Mutual Life Insurance Company of New York, New York, N.Y., graduated from Douglass College, Rutgers State University, with a B.A. in Sociology. She has been associated with MONY for the past five years, serving successively as a Methods Analyst, a Junior Staff Assistant in the Group Department, and as Employment Specialist. In her present position, Ms. Fields is responsile for employment, transfer, promotion and counseling of upper level clerical through management personnel.

• Radio testimonials - As part of "Staggered Work Hours Month," of February, 1975, (see details on page 17), all-news WCBS-Newsradio 88 featured in its regular programming every weekday testimonial announcements from chief executive officers of firms in the program. In addition to these announcements, six times each weekday, CBS news staff did a number of feature stories on Staggered Hours, one of which was a half-hour broadcast.

These 60-second announcements encouraged the greater adoption of Staggered Hours, a technique which enabled staff to gain the on the record and personal support of some of the most important and influential business executives in the country. These include people like David Rockefeller of Chase Manhattan; Walter Wriston of Citibank; J.K. Jamieson of Exxon; Andrew Heiskell of Time Inc.; Thomas A. Murphy of General Motors; and some 20 other chief executive officers of principal Manhattan corporations. Mayor Beame of New York City broadcast the first testimonial. Their willingness to record their views and have them broadcast on this subject was evidence of the degree of conviction that they themselves felt toward this program. This effort was taken to bring the Staggered Hours program to the attention of the public and sway the many fence-sitters into positive action.

Other than Mayor Beame, WCBS significantly suggested that principal public officials not participate in the testimonial campaign. They felt that a strong orientation toward the business community in the campaign would make the entire effort more credible. We didn't agree, since without the leadership of public agencies, nothing would have transpired, but in this the radio station prevailed. Materials related to the testimonials are shown in Exhibits VI-15 and VI-16.

VI-15 Partial List of Testimonials
Broadcast on Radio

Executive	Organization	Industry	Testimonial cites benefits of Staggered Hours in:							
			Overall benefit	Popularity	Commuting	Elevators	Punctuality	Communications	Productivity	Other
Mayor Beame	New York City	Government	X	X	X					
Andrew Heiskell	Time, Inc.	Publishing	X	X	X	X	X			
Thomas Lovejoy Jr.	Manhattan Life	Insurance	X	X	X		X			
John McGillicuddy	Manufacturers Hanover Trust	Banking	X	X	X				X	
Frank R. Milliken	Kennecott Copper	Manufacturing	X	X	X			X		Energy
David L. Luke III	Westvaco	Paper	X	X	X				X	
Jack Yogman	Seagrams	Distiller	X	X	X					
Bill McGough	Springs-Mills	Textile	X	X	X					
William Ellinghaus	New York Telephone	Communications	X	X	X	X			X	
John H. Washburn	Home Insurance	Insurance	X	X	X		X			
Charles F. Luce	Con Edison	Utility	X	X	X	X				
David R. Foster	Colgate-Palmolive	Cosmetics	X	X	X				X	
J. Henry Smith	Equitable Life	Insurance	X	X			X		X	
Richard R. Shinn	Metropolitan Life	Insurance	X	X	X					Flexi
Dr. W. C. Wescoe	Sterling Drug	Pharmaceutical	X	X	X	X	X		X	

HOUR POWER

Report on the Manhattan Staggered Work Hours Program

-16 Testimonial by Celanese Corporation

Statement in support of Staggered Work Hours
by John Brooks, Chairman and Chief Executive Officer
of Celanese Corporation
Broadcast on WCBS-Radio during February, 1975

Celanese people like Staggered Work Hours. Satisfaction with the program is company-wide. A survey done about two months after our working day was moved back a half an hour to 8:30 A.M. last July showed that 82% of the employees liked the earlier time and wanted to continue it.

Among reasons Celanese employees gave for preferring Staggered Work Hours are: "I can get a seat in the subway". "I feel better early in the morning and work better"; and "I don't have to rush as much to get to my evening Chemistry class". Clearly the program works well for Celanese and we plan to go on with it. We think it works well for everyone by helping to make our City a more pleasant place in which to work and live.

* * *

For more information contact:
Staggered Work Hours Program
Port Authority of New York and
New Jersey
One World Trade Center - Suite 72E
New York, New York 10048
(212) 466-8692

• TV Announcement - Also in connection with "Staggered Work Hours Month," the advertising agency of Young & Rubicam prepared a 30-second television Public Service Announcement (PSA) promoting Staggered Hours which is still running on local TV stations. The agency prepared the PSA at an out-of-pocket cost of approximately $11,000. The PSA featured movie star Elliott Gould, a native New Yorker, on the platform of a Manhattan subway station showing actual travel conditions at various parts of the peak period. The text of the PSA is given in Exhibit VI-17.

A brief chronology of how the TV spot was created is of interest. Following the retention of Mr. Andrew Heiskell, Chairman of Time Inc., as the non-paid Chairman of the Midtown Task Force on Staggered Work Hours, he suggested that we attempt to use the medium of television for promoting the program. Staff then corresponded with each of the major networks in New York and asked if they would be willing to run Public Service Announcements on a no-cost basis promoting Staggered Hours. After meeting with operating officials of each network and receiving pledges of support from each, an attempt was made to secure an advertising agency which would prepare a sound and color PSA of the professional quality demanded by the networks.

Discussions were conducted with two advertising agencies. Staff sought cost estimates from these agencies on the basis of out-of-pocket costs only, since it was felt that the Staggered Hours Program was a public benefit program which could be accorded special financial treatment by such advertising agencies. Each agreed to prepare a PSA fully delivered for a cost of no more than $10,500 plus or minus 10%. Industry sources have advised us that sound and color commercials employing professional talent can run up to $50,000, if all agency overheads and profits are included. Young & Rubicam was selected because they offered the most promising theme for the PSA.

Elliot Gould:

This is a Manhattan subway station

at eight fifteen in the morning.

Same place at quarter to nine.

Take another look.

This is eight fifteen.

This is quarter to nine.

Eight fifteen.

Quarter to nine.

The point is, 30 minutes can make

a big difference--in the way you get

to work...and in the way you feel when

you get there.

That's why many companies are staggering

their work hours. Yours can do it too.

After all, getting to work shouldn't

be a job. Should it?

SUPER: GETTING TO WORK SHOULDN'T
BE A JOB.

...For information write: The Port Authority, Staggered Work Hours, One World Trade Center, New York, New York.

SUPER: THE PORT AUTHORITY, STAGGERED WORK HOURS
ONE WORLD TRADE CENTER, NEW YORK, N.Y.

Staggered Work Hours
TV : 30
Gould
As recorded

When the PSA was completed, prints were made and transmitted to each TV station at a screening arranged by the agency. Soon after most stations began airing the spot as part of their public service requirements. While occasionally the spot would be shown at what staff considered a"prime" viewing time when our target audience might be watching, such as weekday evenings, the PSA was more often relegated to odd filler times of midday or very late night showings. Exhibit VI-18 shows the broadcast itinerary and approximate dollar value (which was waived) on WOR-TV Channel 9 for a three-month period. WNBC-TV Channel 4 of the National Broadcasting Company aired the spot a total of 108 times in 1975 through June, 1976, at a waived total cost of $65,675 (or $608 average per 30-second airing).

Several prints of the TV PSA have been effectively utilized at presentations to organizations considering Staggered Hours. Copies of other visuals from occasional TV coverage have similarly been employed, the most influential being a 10-minute feature presentation on a Channel 4 news program.

e. Special Promotional Activities

Special promotional activities for a Staggered Hours Program can be effective in instantly catalyzing recognition and interest, spur wide publicity in all media and, of most significance persuade many "fence-sitting" organizations to either favorably consider or actually implement new work schedules. Such activities should be professionally developed and have logical tie-ins with alternative work schedules relieving CBD transportation congestion.

A selection of major promotional endeavors conducted as part of the Manhattan and Newark efforts is discussed below. They include Staggered Hours "months," cramming VIPs into subway cars and conducting meetings in unusual and attractive locations.

WOR AM • FM • TV

RKO GENERAL

(212) 764-6685

1440 BROADWAY • NEW YORK, N. Y. 10018 • XXXXXXXXXXX

CONTRACT NUMBER	INVOICE NUMBER
9701	TV

INVOICE DATE MO	DAY	YR.
6	30	75

N Y C PORT AUTHORITY
ONE WORLD TRADE CNTR
NEW YORK NEW YORK

ON ACCOUNT OF
NYC PORT AUTH STGGRD

PAGE 1

TERMS: NET CASH

PLEASE MAKE CHECKS PAYABLE TO WOR DIVISION, RKO GENERAL, INC. AND RETURN COPY OF INVOICE WITH REMITTANCE.

LENGTH	DESCRIPTION		DATE BROADCAST MO.	DAY	BEGINNING TIME HR.	MIN.	SEC.	A/M P/M	PAY LAST AMOUNT SHOWN IN THIS COLUMN	CR.
30S	NYC PORT AUTH	Tuesday	4	01	11	59		A		
30S	NYC PORT AUTH	Saturday	4	05	11	16		A		
30S	NYC PORT AUTH STA	Wednesday	4	09	12	51		P		
30S	NYC PORT AUTH	Saturday	4	12	6	08		P		
30S	NYC PORT AUTH	Monday	4	14	10	59		A		
30S	NYC PORT AUTH	Tuesday	4	29	8	24		A		
30S	NYC PORT AUTH	Monday	5	05	9	59		A		
30S	NYC PORT AUTH	Monday	5	19	9	58		A		
30S	NY PORT AUTH	Sunday	5	25	9	58		A		
30S	NY PORT AUTH	Tuesday	5	27	10	59		A		
30S	NY PORT AUTH	Saturday	6	07	11	28		P		
30S	NY PORT AUTH	Tuesday	6	10	9	31		A		
30S	NY POST AUTH	Wednesday	6	18	2	11		P		
30S	NY PORT AUTH	Monday	6	23	3	59		P		
30S	NY PORT AUTH	Wednesday	6	25	2	43		P		

app dollar value
$5,250

FOR YOUR RECORDS ... [illegible]
THE PERIOD INDICATED.

TOTAL CHARGES CURRENT PERIOD

AGENCY COMMISSION	TOTAL LESS AGENCY COMM.

FACILITIES AND OTHER CHARGES

WE WARRANT THAT THE BROADCASTING ON THE DATES AND AT THE TIMES INDICATED ABOVE IS IN ACCORDANCE WITH THE CERTIFIED STATION LOGS

1) "Subway Car Cramming" - A most unusual promotion, and possibly first of it's kind, was conducted on May 7, 1974, to highlight the installation of some 12,000 Staggered Hour car cards and posters of a cartoon showing crowded conditions on transit systems during peak hours. Mayor Beame and other public and corporate officials along with several hundred people from firms on Staggered Hours simulated the crowded conditions shown on the posters by crushing into one subway car. The posters had been designed by an advertising agency, produced by the Port Authority and were placed in subway and commuter rail cars and in other areas on a public service basis. Among those taking part in the promotion included Mayor Beame, John Hirten of the Urban Mass Transportation Administration, David L. Yunich, Chairman of the Metropolitan Transportation Authority, Dr. William J. Ronan Chairman of the Port Authority, Andrew Heiskell, Chairman of the Midtown Staggered Hours effort and Edmund F. Wagner, President of the Downtown-Lower Manhattan Association. The nature of the event and the participation of key individuals attracted wide coverage by TV and radio stations and newspapers. A sample of this coverage is shown in Exhibit VI-19. It led to broad recognition for the program as well as a tangible solidarity of support among all the sponsors. And everyone had a good time.

2) "Staggered Work Hours Month" - Such "months" were officially proclaimed by the Mayors of New York City (February, 1975) and Newark (March,1976) in separate month-long drives to increase participation in Staggered Hours. Such promotions have several advantages in that they usually attract a guaranteed level of publicity simply because the Mayor is involved. Further, this promotion gives a month-long duration to achieve certain "blood-bank-type" goals and other

VI-19 Sample Coverage of Staggered Hours "event"

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

Midtown Task Force
on Staggered Work Hours
One World Trade Center—Suite 72E
New York, New York 10048
(212) 466-8692

Andrew Heiskell, *Chairman*

May 6, 1974

INFORMATION TO NEWS MEDIA

Mayor Abraham Beame will ride a crowded New York City subway car in a simulated "rush hour" ceremony beginning at 10 o'clock Tuesday morning, May 7, to promote Staggered Work Hours in Manhattan. The Mayor and other officials will ride an IND-6th Avenue local train from 50th Street to 57th Street, where they will place a colorful new poster in the lead car.

The ceremony, to mark the placement of some 12,000 Staggered Work Hour car cards and posters in subways and commuter railroad cars, will simulate the rush hour crowding which the program is striving to relieve.

Dr. William J. Ronan, Chairman of The Port Authority of New York and New Jersey; David L. Yunich, Chairman of the Metropolitan Transportation Authority; and Andrew Heiskell, Chairman of the Midtown Task Force on Staggered Work Hours, will accompany the Mayor.

Also participating will be A. Gerdes Kuhbach, Acting Executive Director of the Port Authority, Edmund F. Wagner, President of the Downtown-Lower Manhattan Association, and John Hirten, Deputy Administrator of the Urban Mass Transportation Administration, and several hundred employees of Midtown firms on Staggered Work Hours.

The group will board the first two cars of a northbound local train at the 50th Street Station of the IND-6th Avenue line, and travel to the 57th Street Station. There the officials will place the poster in the lead car before debarking.

REPORTERS AND PHOTOGRAPHERS ARE CORDIALLY INVITED

Please report to Subway Concourse at 57th Street and the Avenue of the Americas at 10:15 A.M. to cover arrival of special train.

(Please see attached schedule of events.)

CONTACT: THOMAS C. YOUNG, PORT AUTHORITY (212) 466-7777 or (201) 622-6600, Ext. 7777

# # #

appropriate tie-ins. A number of tie-ins were exploited particularly in the New York "month" by a kick-off Proclamation ceremony with VIPs and the commencement of airing of the Staggered Hours television spots and radio testimonials (both discussed earlier). In addition a number of meetings among target groups were held during the "month". Several items covering the promotion are shown in Exhibit VI-20 and VI-21 .

3) Breakfast meetings - One of the most effective mechanisms for conducting meetings has been to hold them in the early morning at an attractive location and offer breakfast. Project staff has conducted almost a score of such meetings which usually begin at 8:30 AM and never last for longer than one hour.

There are many advantages to holding breakfast meetings if the only reason is to ensure excellent attendance. A most logical reason, and the only tie-in, is to begin the meeting at the time which you'd like the firm to adopt as their start time. Attending the meeting will then give the executive a taste of hopefully a better commuting to the CBD. Other significant attractions of breakfast meetings, especially when compared with lunch or other mid-day times, involve less disruption of the business day and thus fewer opportunities for an executive to defer from attending. The one-hour limit, which should be assured in the invitation, underscores the respect which must be given to the time of high-level people who would attend.

The location of the breakfast meetings have been in high-class eating facilities and, particularly, hotels which are willing to waive room charges to show off ther conference facilities to a group of local VIPs. Other suitable

Remarks by Mayor Abraham D. Beame
At the Proclamation of Staggered Work Hours Month
Blue Room, City Hall, Manhattan
Monday, January 27, 1975, 11:00 A.M.

I am very pleased to proclaim the month of February as Staggered Work Hours Month, and I want to thank all of you for coming here and for pledging to work hard to spread the Staggered Work Hours Program.

We all know how subways and buses and elevators and streets are jammed every day around 9 A.M. and 5 P.M. For years, people in government and business have been talking about staggering the beginning and end of each work day.

But, before 1970, nothing was done about it. Before 1970, congestion around nine and five was just accepted, like the weather, with the general public attitude that nothing could be done about it.

Two million people poured into the central business district of Manhattan, south of 59th Street, day after day to reach their place of work at precisely 9 A.M., and they left work at precisely 5 P.M.

Then, in 1970, the Port Authority and the Downtown-Lower Manhattan Association sponsored the Staggered Work Hours Program to relieve peak hour transportation congestion. In 1972, the program moved to the midtown area under the sponsorship of the Port Authority and the Midtown Task Force on Staggered Work Hours.

(more)

OFFICE OF THE MAYOR

VI-21 Proclamation of "Staggered Work Hours Month"

CITY OF NEW YORK

P R O C L A M A T I O N

The economic and environmental well-being of the City and the Region depends on an efficient transportation system.

More than three-quarters of the people who enter or leave mid-town and lower Manhattan during the morning and evening rush hours ride public transportation on subways, railroads, buses or ferry.

We will continue our fight to save the 35¢ fare, to expand transit service and reduced fare programs, and to make our existing transit systems safer, more comfortable and convenient.

Surveys indicate more than half of the workers in midtown and lower Manhattan are scheduled to start at 9:00 A.M. and quit at 5:00 P.M., causing severe transportation congestion at those times.

The four and a half year old Staggered Work Hours Program in Manhattan has made the trip to and from work more comfortable for those shifting off the 9-to-5 hours by reducing peak period congestion.

NOW, THEREFORE, I, ABRAHAM D. BEAME, Mayor of the City of New York, do hereby proclaim the month of February, as

"STAGGERED WORK HOURS MONTH"

in New York City and encourage all public and private organizations in Manhattan to join this meaningful project.

IN WITNESS WHEREOF I HAVE HEREUNTO
SET MY HAND AND CAUSED THE SEAL OF
THE CITY OF NEW YORK TO BE AFFIXED.

Mayor, the City of New York

locations have been the executive dining rooms of major corporate participants or project sponsors. A recent series of breakfast meetings was followed by complimentary admission to the Observation Deck atop the World Trade Center in Lower Manhattan.

The agenda for a breakfast meeting should be carefully planned, Project Staff has felt the best agenda to be a welcome by a business VIP sponsoring the Staggered Hours program, followed immediately by breakfast service to allow for latecoming guests. This also gives a chance for informal icebreaker conversation. Following the breakfast (which takes between 20-30 minutes), the business VIP or project manager should make a brief presentation saying why a firm should adopt Staggered Hours. Use of any graphic or audio-visual materials (like charts, slides or movies) in greatly encouraged. After the presentation, at least one or two executives from participating firms should be present to make a breif testimonial statement. The program should then be concluded with a question-and-answer period, and then adjourn promptly after one hour.

A meeting like this is probably the single-most effective activity a project can hold with prospective participants. It's usually the initial face-to-face meeting and every effort must be made to secure the attendance of a high-level executive or, at the very least, a representative of the firm. At the meeting it is critical to make an <u>interesting</u> and <u>persuasive</u> presentation, give hand-out materials, display successful examples of firms on Staggered Hours and ask each firm to <u>do something</u>. (This latter action can be to provide further work schedule information to the project or to arrange for a presentation to their managers). After the meeting, <u>intensive follow-up with each firm is of prime importance to securing its eventual participation in Staggered Hours.</u>

D. Recommendations

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 pro bono publico, that is, 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.

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.

Chapter VII

Transportation Surveys and Analysis

VII. TRANSPORTATION SURVEYS AND ANALYSIS

A. OBJECTIVES

A major objective of conducting an extensive transportation survey program was to evaluate the impact of Staggered Work Hours on transportation patterns in the Manhattan CBD. To do this, surveys were conducted both prior to and during the implementation of Staggered Hours. The survey data obtained focused upon the impact of the work schedule changes reducing "peaking" conditions lending to congestion.

Another objective of the survey program was to define and develop effective procedures in order to better evaluate peaking of demand. A further area involved producing clearer ways to display this information for the lay public as well as for professionals.

B. WORK PERFORMED

The work performed in this section consisted primarily of conducting a series of transportation surveys over several years at key transportation facilities in the Manhattan CBD, principally in the Midtown area. Surveys were performed twice in 1972 to document a situation "before" wide-scale promotion and implementation of Staggered Hours in the Midtown community.

These surveys were repeated in 1973 to begin to document any effects of an implemented Staggered Hours program. As will be seen, however, the level of participation at that time in the program was not large enough to have a measurable impact on transportation systems. Thus, in June 1974 another set of surveys was conducted to

address the impact of the program -- this time with some success. Finally, in October 1976, the most recent series of surveys was performed on a smaller scale, with the same purpose of studying changes in peak demand.

Most of these surveys were in a "time series" form which can be repeated regularly as increasing numbers of Manhattan employees adopt Staggered Hours. The analysis of these surveys reflects changing patterns of work schedules and their effect on different modes and in various geographic areas. In addition, similar surveys were conducted in Lower Manhattan and in Downtown Newark, New Jersey.

1. Design of surveys

a. Objectives -- When transportation data were neither readily available nor usable, specialized surveys had to be conducted. The objectives of the survey design were to ensure that the date collected would be a reliable representation of the patterns and peaking for a given mode of transportation or location and for the specifid time periods. Further, the survey data would have to accurately depict the "peaking" pattern within the peak hour.

b. Design -- The surveys were designed so that comparable information could be obtained both "before" and "after" implementing staggered work schedules. The survey program had to include locations where peaking characteristics were observable and pronounced, and data had to be collected in intervals small enough to be sensitive to any significant changes due to Staggered Hours. The survey methods used involved manual counts, subway

turnstile readings, toll register readings, dispatcher records and other means.

c. Locations -- Since the goal of Staggered Work Hours was to adjust work schedules in such a way so as to reduce congestion on the major transportation system serving Manhattan, the surveys were designed to identify the impact of the program at various specific locations where this congestion exists.

It should be noted that the locations selected to conduct surveys generally had severe congestion resulting from "peaking" as opposed to simply a capacity overload. As discussed in Chapter II, if congestion is due to a lack of capacity, then shifting work schedules by a relatively short time will probably not show a measurable impact at that location. However, in a location with a short-time peaking condition, the same shift in work schedules will reduce the peak, and will increase the volumes in the time intervals immediately prior to or following the peak interval. This impact would be picked up by a "before and after" survey program.

Many rail transit stations in the Manhattan CBD are examples of congested systems due to peaking -- especially around the 9 a.m. and 5 p.m. times. Several busy transit stations in both Downtown and Midtown were selected for the survey, including those located in areas with large office employment -- the "target market" for those adopting Staggered Hours. The data collected at these stations included entrance and exit counts, pedestrian

flows, and, in some cases, passenger queuing at selected escalators and stairways. Furthermore, train operations were surveyed by measuring travel times and station dwell times for selected trains between various stations to determine the impact of work rescheduling on actual operations.

Commuter railroad trains entering Grand Central Station and Penn Station were included in the survey program. The train arrivals and departures during peak periods were recorded including scheduled versus actual arrival times, passengers per train and cars per train. From these data, shifts in rail commuter travel patterns could be identified.

Transit buses traveling through Midtown Manhattan were surveyed on a sampling basis to examine the impact on bus service. Both passenger volumes and travel times were recorded for several selected bus routes.

Data on pedestrian movements both related to as well as outside the transit system were analyzed to see any impact of the Staggered Hours program. Surveys were made of pedestrian flows on sidewalks along busy streets, passageways, escalators and stairs, as well as passenger volumes on elevators in buildings where a work schedule change was made.

Several auto facilities were also surveyed. However, these surveys were not very useful since only about 10% of those working in Manhattan drive a car to their place of work. In addition, many highways experience "flat" peaks due to capacity restraint congestion rather than peaking, and it was therefore

difficult to measure any change in traffic due to the Staggered Hours program. Several auto routes at the CBD cordon were surveyed to determine basic auto patterns. (This situation is, of course, not typical of the usually significant percentage of auto commuting in most American cities.)

d. Dates of surveys -- The objective of picking suitable dates for the surveys is to select "typical" weekdays not influenced by vaction time, holidays, special city events, "shopping nights" or any other conditions that might contribute to unusual transportation patterns. With these factors in mind, survey days are usually selected in the spring or fall since they are the least likely to be affected by vacations, holidays and adverse weather conditions. The specific days of the week for a survey exclude Mondays and Fridays, since many people may use a different means of transportation on these days than they do for their regular work trips. Also, there is a higher percentage of worker absence on these days. Further, some systems may be more congested on these days than during midweek due to the influence of weekend travel patterns. In New York City, finally, Thursday evening is traditionally a "shopping night" since most of the large department stores remain open late, and so the Thursday afternoon peak was avoided for surveys.

Thus, in designing the survey program for Midtown Manhattan, Tuesdays, Wednesdays and, if necessary, Thursday mornings were selected from the months of May, June, September

and October as the best time to conduct the surveys. Usually, survey data were collected over at least two and preferable three days, to validate that the days were "typical". If weather conditions were unfavorable, the data selected was rescheduled, since characteristics of pedestrian and vehicle movements on bad weather days would generally not be normal. For example, transit service might be more subject to delays, and pedestrians tend to use an alternate "dry" route to get to their destination.

e. Time periods -- The time periods during which data were collected completely included the twice-daily peak periods. Further, they included all major time periods covering possible new work schedules. The data were collected by five-minute intervals -- one minute in some cases involving extreme peaking -- so that the travel pattern changes due to work schedule adjustments could be identified. With five-minute counts, the data could also be easily aggregated into any other groupings. With data collected at longer intervals it becomes difficult to identify severe peaking as well as to measure any change after the program is implemented.

In surveys conducted in Midtown Manhattan, the time periods covered were generally from 7:30-to-9:30 in the morning and from 4:00-to-6:00 in the afternoon. In nearly all cases, as discussed, the data were collected at five-minute intervals. As will be seen in the analysis section of this chapter, this was sufficient to measure the impact of Staggered Hours and provided an excellent basis for preparing charts and graphs to

clearly illustrate the spreading of the peak demand at various locations.

f. Available valid data -- To the extent that one uses available data, rather than conduct specialized surveys, it is important that the data meet the various criteria described previously. For example, system data on an hourly basis will not be sufficient to identify existing peaking characteristics, or any changes in the peaking due to, say, a half hour change in a work schedule.

Based on experiences in Manhattan, much of the available data were not in the detailed format that is required for a Staggered Hours transportation impact study. However, available data could be used for "control" purposes, i.e., for verifying that the selected survey days are "normal" for the specific time period and location. For example, daily or hourly turnstile readings could be used to verify that the days selected for the survey at a particular subway station were representative of an average day at that location. Existing data found to be usable were "raw" transit information collected by surveys or dispatchers of individual train and bus operations.

2. Surveys conducted

Table VII-I shows the various surveys which were conducted to evaluate the Staggered Work Hours Program.

C. ANALYSIS

1. Analysis Factors

In determining how to measure and analyze the effect of

TABLE VII-I

STAGGERED WORK HOURS STUDY

MIDTOWN MANHATTAN SURVEY PROGRAM

Unless otherwise noted, all surveys conducted were on Tuesdays, Wednesdays and/or Thursday AM between 7:30 - 9:30 AM and 4:00 - 6:00 PM, by 5-minute intervals.

I. Mass Transportation

1. Subway cordon counts - Regularly conducted 20-minute passenger counts of all Transit Authority subway lines entering and leaving Manhattan CBD cordon.

2. Subway station counts - Entering (PM) and exiting (AM) at nine (9) stations throughout Midtown.

3. Pedestrian flow - Pedestrian flow and queue size at three key subway stations involving escalators, stairs and/or passageways.

4. Train operations - Travel time of trains through CBD and dwell times at end stations on four (4) subway lines.

B. Commuter railroads - Recorded train arrivals and departures showing number of passengers and cars per train for commuter services using Grand Central Station.

C. Transit buses - Travel time through CBD, number of passengers at cordon for seven (7) selected Transit Authority routes.

D. Major Midtown Terminals - Selected counts as Grand Central Station, Penn Station, PATH-33rd Street Terminal and the Port Authority Bus Terminal.

II. Pedestrian Transportation - Pedestrian counts at three (3) sidewalk locations in Grand Central Station vicinity. (Other pedestrian counts done in relation to several above surveys).

III. Auto Transporation - Vehicular traffic volumes in 15-minute intervals through the Lincoln and Queens-Midtown Tunnels (supplemented by continuing time series counts at the Holland Tunnel and George Washington Bridge).

Staggered Work Hours on transportation systems, it became apparent that no one analytical tool was suitable for all systems and situations.

The Peak Hour Factor (PHF)*, a measure of the degree of peaking during the peak hour, was determined for all modes but found to be a valid indicator only for several aspects of rail and bus transit. Highway congestion, in may cases, is attributable to capacity limitations rather than peaking problems and the PHF was not especially useful in highway analysis because it is insensitive to capacity constraints. Similarly, many pedestrian systems cannot be analyzed using the PHF. For example, pedestrian flows at the Port Authority Bus Terminal are fairly uniform throughout the morning peak period since the flow is metered by bus arrivals.

Volume measures were taken for all modes and may reflect the magnitude of changes brought about by Staggered Work Hours. However, volumes alone say nothing about peaking or capacity problems.

For certain modes, a volume/capacity measure could be derived to indicate how changes in peak period volumes affect capacity, and thus affect level of service factors. Such capacity or supply indices were easy to calculate for rail, bus, auto and elevator systems but more difficult for the pedestrian mode. For modes already operating at or above "capacity", the effect of

*The Peak Hour Factor (PHF) is equal to the total peak hour volume divided by four times the highest 15-minute volume. The lower the ratio, the higher the peaking.

Staggered Work Hours could be to reduce peak period volumes to a point below capacity, thereby increasing the comfort and convenience levels -- even while an index like the PHF remained unchanged. Therefore, it is important to look at both peaking and the volume/capacity constraint.

One factor that effected rail transit operations -- subway dwell times -- was carefully analyzed. Increased dwell times in the height of peak periods often result from riders holding car doors open, slowing down the entire system during maximum operations and minimum headways. Peak travel times were also measured to determine any delays caused by the peaking phenomenon.

2. Mode

The journey-to-work can take many forms. In most cases, it involves combinations of several modes -- for example, walk or driving to a commuter railroad station, taking the train to Penn Station or Grand Central Terminal, walking or taking a subway to the office. For others, only one mode may be necessary.

For the purpose of this analysis, the work trip is broken down into its component modes.

a. Rail Rapid Transit

A 1972 survey showed that 62% of Midtown employees use the subway as their main mode of transportation, and many others use it as a secondary mode.

During the course of this study, numerous surveys were undertaken to determine the effect of work schedules changes on rail transit operation.

Methodology

Data about the impact of Staggered Work Hours on subway and PATH operations were gathered in several ways, namely 1) turnstile counts at subway station entrances and exits, 2) on-board counts of selected trains, 3) cordon counts, 4) a "Transportation Tardy Study" (discussed later in this chapter) and 5) subway speeds and run times. Each of these studies will be explained in detail below.

Results

Passenger Counts

The data collected at subway stations in Lower Manhattan and Midtown clearly indicate a short-term congestion problem due to peaking. This is evidenced by queues an platforms, stairways, turnstiles and escalators at or around 9 a.m. and 5 p.m. -- the traditional end points of the work day.

In Table VII-2 shows the results of 1972 surveys at eight Midtown stations, presented as the Peak Hour Factors (PHF) for both passenger demand and train service. In most cases, the two correspond, reflecting the fact that, in the morning, trains arriving at the station deliver the passengers who make up the "demand". In the afternoon, train service is somewhat peaked to accomodate concentrated passengers demand around 5 p.m.

The exceptions to this are at stations such as 50th Street, in Rockefeller Center, where the passenger demand is highly peaked in the afternoon right after quitting time (PHF = 0.74), whereas the train service is steady throughout

Exhibit VII-1
STAGGERED WORK HOURS STUDY
STATION COUNT
IND D. F. 50th ST. - ROCKEFELLER CENTER - PM

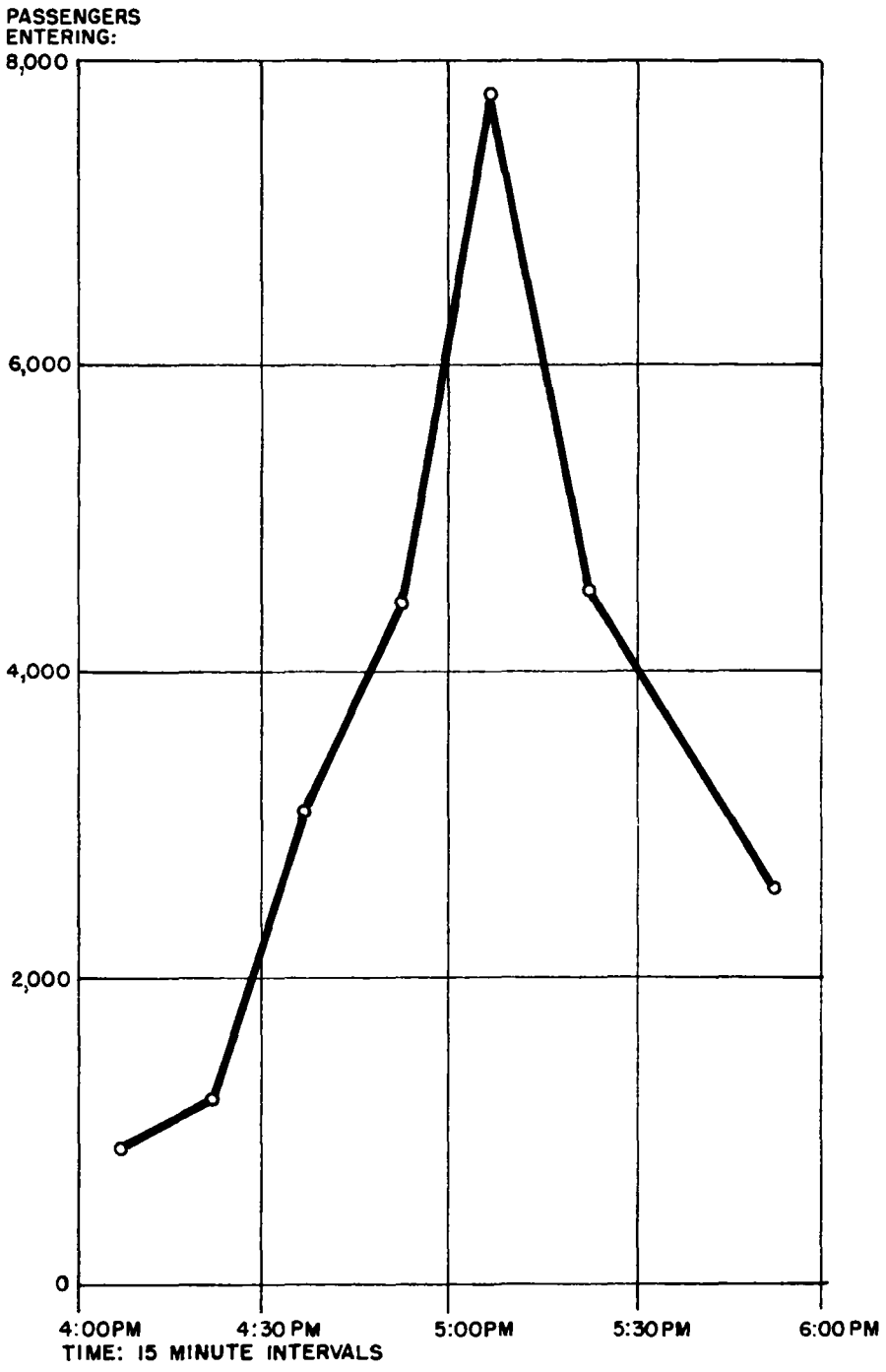


TABLE VII-2

STAGGERED WORK HOURS STUDY

PEAKING AT 8 SUBWAY STATIONS (1972)

15-MINUTE PEAK HOUR FACTORS (PHF)

	AM PEAK		PM PEAK	
Station (Routes)	Passengers Demand	Train Service	Passengers Demand	Train Service
Grand Central (#7)	0.89	0.84	0.86	0.86
51st St. (#6)	0.75	0.78	0.67	0.76
59th St. (#4,5,6)	0.77	0.78	0.79	0.76
34th St. (#1,2,3)	0.88	0.76	0.83	0.78
49th St. (EE, RR)	0.85	0.68	0.70	0.66
Fifth Ave. (E, F)	0.84	0.72	0.75	0.72
Lexington Ave. (E, F)	0.89	0.72	0.68	0.72
50th Street (B,D,F,KK)	0.90	0.93	0.74	0.99

the hour (PHF = 0.99, virtually an equal number of trains in each 15 minute interval). In fact, as can be seen in Exhibt VII-1, more than 8,000 passengers enter the station between 5 and 5:15 p.m., almost double those entering in adjacent time intervals. This type of situation was found to be typical of station located in high density employment centers such as Rockefeller Center, Wall Street and the World Trade Center.

Exhibit VII-2 shows the impact of a substantial Staggered Work Hours Program in Lower Manhattan. The number of passengers exiting the Lexington Avenue, Wall Street station in the peak 15 minute period from 8:45-9:00 a.m. fell from 6139 in 1972, before Staggerd Hours, to 5442 in 1974 -- that is, from 29% of the total peak demand to less than 25%. Correspondingly, passengers volumes in the adjacent time periods increased over 1972 levels. The net result was a spreading out of passenger demand within the peak period.

Subway Speeds and Travel Times

Running times between stations and station dwell times were also measured at intervals throughout the peak; from this information, average speeds and travel times were calculated and arrayed by time interval. Actual travel times were compared with the scheduled rush hour running times to determine the impact of peaking on train speeds.

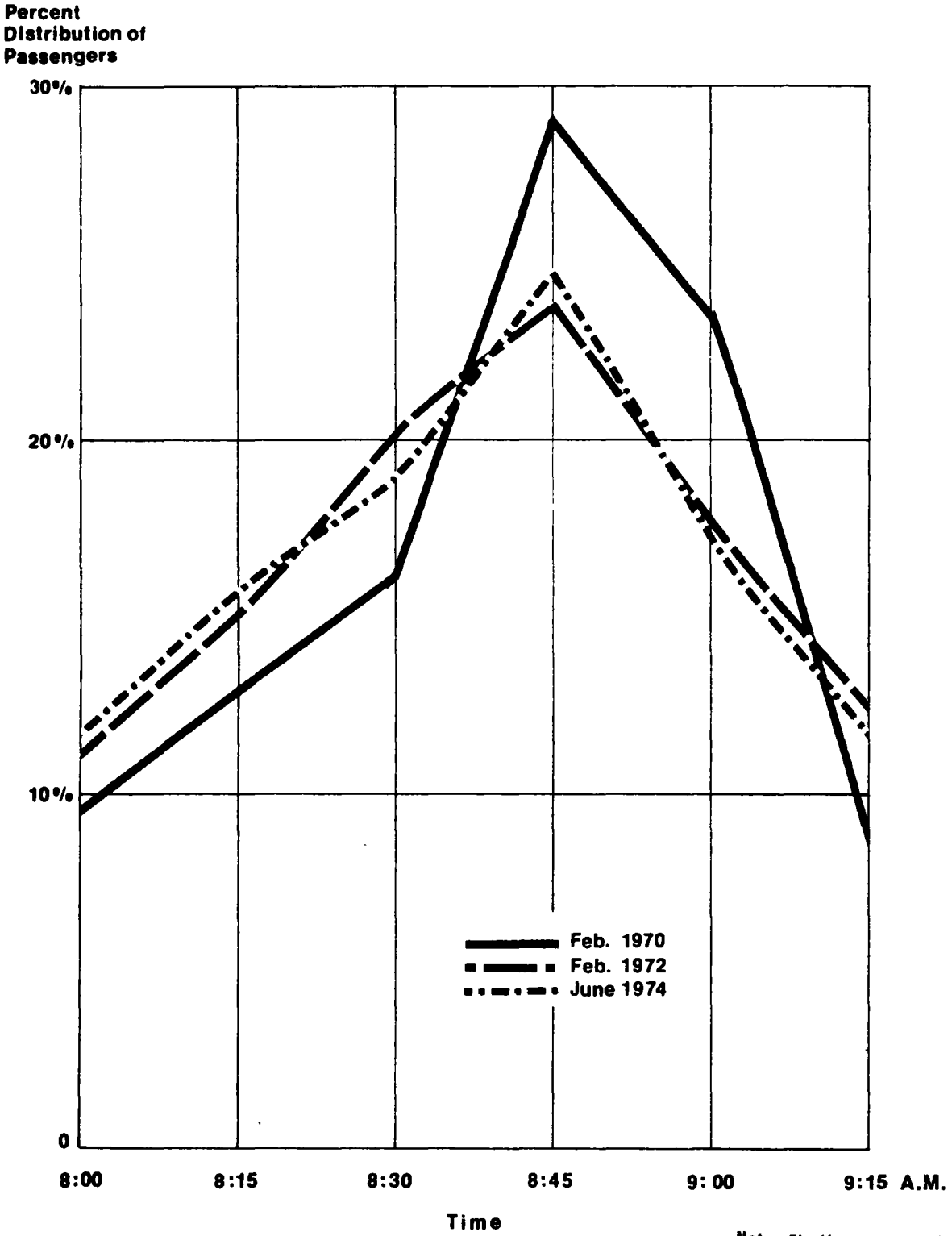
For all but one line surveyed, there was a 20 to 30 percent drop in average speed and a corresponding increase in

Exhibit VII-2

Staggered Work Hours Study

Effects of Staggered Work Hours

Passenger Counts at Three Major Downtown Stations



Note: The three subway stations were:
IRT Lexington Ave. Wall St. Station
IRT Seventh Ave. Wall St. Station
BMT Broad St. Station

travel time during both the morning and evening peak travel periods. (Exhibit VII-3) Scheduled travel times were maintained prior to and after the peak periods.

Analysis

Arrivals at subway stations, are highly peaked around 9 a.m. and especially 5 p.m., due to people leaving or arriving at work. This is especially evident at stations serving major employment centers or transportation terminals. The passenger demand peak is higher than the train service peak, and the result is platform and escalator crowding, lines at token booths and crush capacity on board transit vehicles. As so many people try to board the trains, station dwell times become longer due to increased loading and unloading times and doors being held. Travel times increase and speed decreases as more people load or unload at each station. (See Exhibit VII-4 for a "case study" of the peaking problem.)

With a significant number of employees on staggered hours, the peak 15-minute demand falls off and the resultant problems decrease. The more the peak is levelled out, the less travel times increase and the more the level of comfort at transit stations and aboard vehicles increases.

b. Commuter Railroad

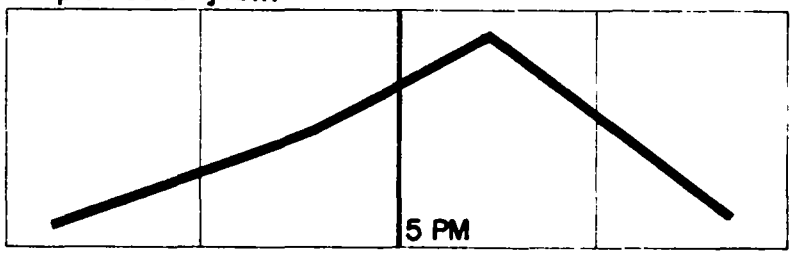
Many Manhattan commuters use the railroad for at least part of their journey-to-work trip, walking or taking transit for their trip. This analysis concentrates on the on-train part of those trips; pedestrian flows and connecting transit systems are treated separately.

Exhibit VII - 3
STAGGERED WORK HOURS STUDY
ACTUAL vs. SCHEDULED A.M. PEAK RUN TIMES
EE & RR Southbound - 59th & Lex. Ave. to 14th St.

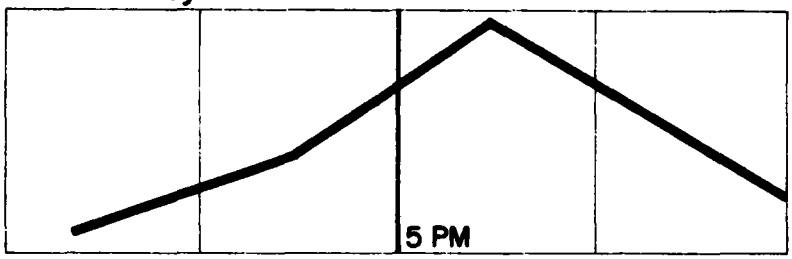
A CASE STUDY OF THE PEAKING PROBLEM

IND E & F SUBWAY TO QUEENS-AFTERNOON PEAK PERIOD

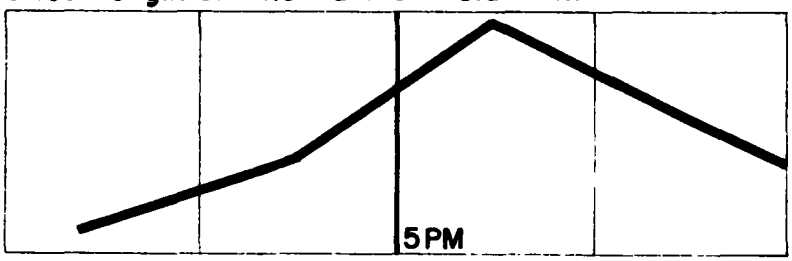
People leave job...



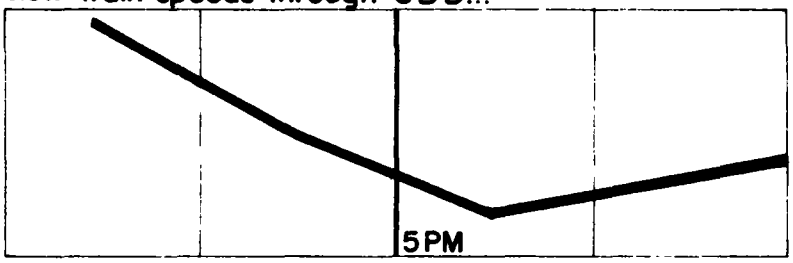
enter subway station...



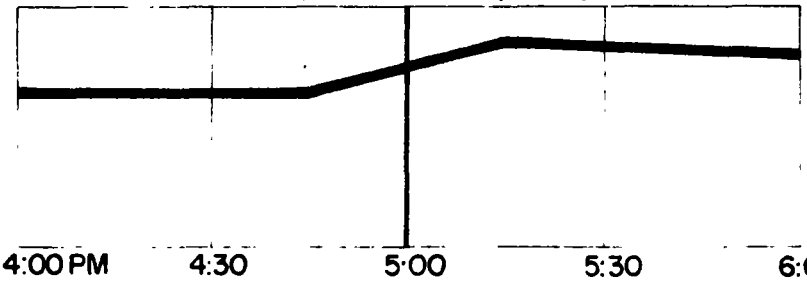
affect length of time train is in station...



slow train speeds through CBD...



even as trains are spread out in peak period.



Methodology

Passenger counts were obtained for Penn Central trains leaving or arriving at Grand Central Station during the month of September 1972. These counts were tabulated according to train number, time of Grand Central departure or arrival, date and division. Trains are grouped in 15-minute intervals for the peak-usage periods 7:30-9:30 A.M. and 4:00-6:00 P.M. Monday and Friday counts were excluded to avoid misleading figures generated by weekend rail usage. Those counts which did not appear to conform to general usage because of daily schedule disruption, holidays, lack of equipment, etc., were not used in arriving at average passenger use.

Results

For each train and each Penn Central division, an average number of daily riders and number of riders per car was found. The number of passengers, trains, and railway cars passing through the terminal is presented in quarter-hour intervals, as shown in Tables VII-4 and VII-5, was derived from the quarter-hour counts.

TABLE VII-3

PEAK HOUR FACTORS - COMMUTER RAILROADS

	PHF For Service Offered		PHF For Passenger Demand -----AM -------- Pre SWH	Post SWH		-----PM-------- Pre SWH	Post SWH		PHF For Service vs. Demand Before SWH	
	AM	PM							AM	PM
PC - Harlem Division	.74	.74	.74	.65	-.09	.75	.87	.12	0	.01
PC - Hudson Division	.82	.79	.83	.75	-.08	.80	.77	-.03	.01	.01
PC - New Haven Division	.75	.80	.84	.82	-.02	.84	.81	-.03	.09	.04
PC - All above services	.83	.83	.86	.79	-.07	.85	.89	.04	-.03	.02

PASSENGER USAGE OF GRAND CENTRAL TERMINAL
(Before Staggered Work Hours)
September, 1972

AM Exiting	Penn Central Division			Total				Avg. No. Pass. Per Car	% of Total Passengers
	Harlem	Hudson	New Haven	%	Pass.	Trains	Cars		
7:30-7:45	1534	257	905	5.3	2696	6	32-33	83	5
7:45-8:00	1795	1176	1738	9.3	4709	9	49	96	9
8:00-8:15	2470	2006	3630	16.0	8124	11	91	89	16
8:15-8:30	4712	1763	3562	19.8	10037	14	97	103	20
8:30-8:45	3843	2342	4416	20.9	10601	16	118-119	89	21
8:45-9:00	2712	1694	3152	14.9	7558	14	87	87	15
9:00-9:15	1153	339	1617	6.1	3109	6	33	94	6
9:15-9:30	1250	803	1857	7.7	3910	10	50	78	8
TOTAL	19469	10380	20895	100.0	50744	86	557-559	91	100
PM Entering									
4:00-4:15	1071	200	887	5.4	2158	6	32	67	5
4:15-4:30	1023	164	320	3.8	1507	5	21	72	4
4:30-4:45	1302	799	1232	8.3	3333	7	39	85	8
4:45-5:00	673	646	1626	7.3	2945	6	32	92	7
5:00-5:15	3051	2063	3257	20.9	8371	14	96	87	21
5:15-5:30	3567	1580	3695	22.1	8842	12	103-104	85	22
5:30-5:45	2200	2161	3149	18.8	7510	13	82	92	19
5:45-6:00	1941	1091	2327	13.4	5359	10	64	84	13
TOTAL	14828	8704	16493	100.0	40025	73	469-470	85	99

STAGGERED WORK HOURS STUDY
TABLE VII-4

PASSENGER USAGE OF GRAND CENTRAL TERMINAL
(After one year of Staggered Work Hours)
September, 1973

AM Exiting	PENN CENTRAL DIVISION 1 Harlem	2 Hudson	3 New Haven	% 1	2	3	Pass.	TOTAL Trains	Cars	Avg. No. Passengers Per Car	% of Total Passengers
7:30-7:45	1535	260	1825	8.6	2.8	9.2	3620	7	42	86	8.7
7:45-8:00	2557	1099	998	14.3	11.9	9.0	4654	9	48	97	9.9
8:00-8:15	1603	1651	3794	8.9	17.9	19.1	7048	9	66	107	15.0
8:15-8:30	4841	1432	3323	27.0	15.5	16.7	9596	14	98	98	20.4
8:30-8:45	3614	2295	4401	20.1	24.8	22.1	10310	16	120	86	21.8
8:45-9:00	1155	1508	2914	6.4	16.3	14.7	5577	10	67	83	11.9
9:00-9:15	1493	566	938	8.3	6.1	4.8	2997	7	34	88	6.4
9:15-9:30	1142	438	1662	6.4	4.7	8.4	3242	7	41	79	6.9
TOTAL	17940	9249	19855	100.0	100.0	100.0	47044	79	516	91	100.0
PM Entering											
4:00-4:15	1092	119	965	8.3	1.5	5.9	2176	5	28	78	5.8
4:15-4:30	709	355	343	5.4	4.5	2.1	1407	3	14	101	3.8
4:30-4:45	1345	519	1305	10.2	6.6	8.0	3169	7	41	77	8.5
4:45-5:00	1143	636	1791	8.7	8.1	11.0	3570	7	43	83	9.6
5:00-5:15	2250	1899	3465	17.1	24.2	21.3	7614	12	82	93	20.4
5:15-5:30	2557	1415	3643	19.4	18.1	22.4	7615	11	83	92	28.4
5:30-5:45	2171	2035	2502	16.5	25.9	15.4	6708	13	77	87	18.0
5:45-6:00	1904	872	2271	14.4	11.1	13.9	5047	8	65	78	13.5
TOTAL	13171	7850	16285	100.0	100.0	100.0	37306	67	433	86	100.0

TABLE VII-5
STAGGERED WORK HOURS STUDY

Analysis

The flow of passengers on trains through Grand Central Terminal is fairly uniform, as evidenced by a morning Peak Hour Factor (PHF) of 0.86 and an evening PHF of 0.85, before Staggered Work Hours, and 0.79 and 0.89, respectively, after one year of Staggered Work Hours.

There are several reasons for this. Commuter rail passengers generally form the habit of taking the same trains every day. The actual scheduling of the trains thus acts as a meter of passengers into the terminal. Peak hour trains are scheduled at close intervals, but the actual number of trains is constrained by the station capacity. What does vary, however, is the number of cars per train and the loadings per car.

From 1972 to 1973, the rail lines operating into Grand Central experienced a loss of approximately 3,000 passengers a day, and cut service in the 8-8:15, 8:45-9:00, 5-5:15 and 5:45-6 p.m. periods, the time frames in which the decreased passenger demand shows up most prominently. Unfortunately, operating changes of such magnitude make comparisons of the before and after data speculative at best, but a general method of analysis can be outlined in any case.

Had the service levels and passenger counts remained the same, a comparison of car loadings would have been a good indicator of changing travel patterns due to different work schedules. It is necessary to look at trains serving the same lines -- or at least the same divisions -- to make such an evaluation. If, after adoption of Staggered Work Hours, the train from New Haven arriving in New York at 8:33 showed decreased car loadings and the 8:12 increased loadings, that is a clear picture of the effect of Staggered Work Hours.

Another consideration which comes into play when evaluating commuter rail lines is the unique nature of their ridership. Rail commuters are generally more affluent, travel farther distances and hold higher status jobs than transit

users in general. Many are managers or executives who do not follow the prescribed work schedules of their firms, instead working longer days or coming and going as they please. Given this assumption, even excellent data might not have shown any major changes in ridership patterns under Staggered Work Hours.

A second point in the evaluation is the frequency of service offered to a given point. If, for instance, there is only one train from Stamford which arrives in Grand Central between 8 and 8:45, even a half-hour change in work schedules, from 9 to 8:30, would not affect the travel patterns of these commuters.

c. Bus

Transit buses play an important role in distributing commuters within the CBD. Many commuters arrive at one of the rail stations and then board a bus for a short trip to their work place. Transit buses also serve Manhattan residents who work in the city. Because of the general lack of crosstown subway lines, buses also serve those commuters who must traverse the borough to reach their jobs.

This analysis deals specifically with transit buses; commuter bus routes from New Jersey, Long Island and outlying boroughs were not included, primarily because of the small number of people using commuter buses (85,000) in comparison to other modes.

Methodology

Six Manhattan bus routes representing crosstown routes, north-south routes and combinations of the two were analyzed. Bus dispatchers obtained the vehicle number, counted the passengers on board and noted the time at which the bus passed the CBD cordon point. The survey was conducted during both a.m. and p.m. peak travel periods in October 1972 and again in June 1974.

Results

Passenger counts and bus arrivals on departures were grouped into 15-minute intervals. Average travel time, speed, number of passengers, buses in service and passenger loadings per vehicle were determined for each 15-minute period. Peak Hour Factors (PHF) were calculated for each line.

Table VII-6
PEAK HOUR FACTORS-BUS

	PHF for Service		PHF for Passenger Demand — AM			PHF for Passenger Demand — PM			PHF Service vs. Demand 1972	
	AM	PM	1972	1974	Δ	1972	1974	Δ	AM	PM
M15 @ 61st St.	.79	.75	.74	.81	.07	.84	.75	-.09	-.05	.09
M101-101A @ 14th St.	.90	.89	.76	.80	.04	.89	.87	-.02	-.14	0
M101-101A @ 61st St.	.87	.70	.95	.81	-.14	.74	.88	.14	.08	.04
M104 @ 60th St.	.85	.85	.82	.83	.01	.76	.88	.12	-.03	-.09
M106 @ 8th Ave.	.96	.88	.88	.90	.02	.73	.87	.14	-.08	-.15
M5 @ 63rd St.	.88	.69	.88	.84	-.04	.68	.77	.09	0	-.01

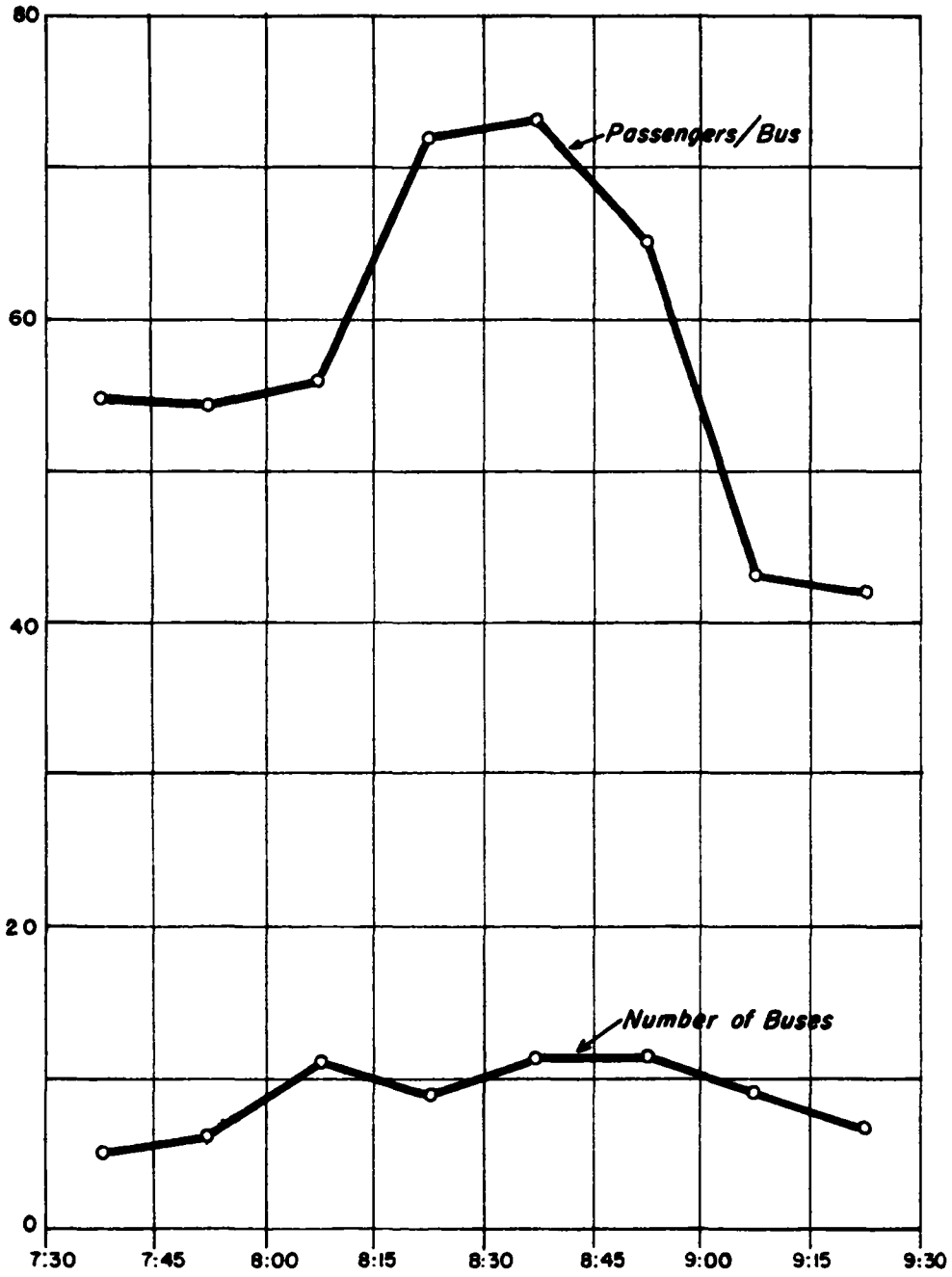
Analysis

The 1972 and 1974 data are not true "before" and "after" data because of the limited participation in the Staggered Work Hours Program in Midtown at the time. Both should be viewd as "before" situations.

The data show that transit buses experience moderate peaking, both in ridership and in service offered. In general, travel times increased and speed decreased as the rush hour progressed, with the slowest speeds coming in the afternoon peak. Because buses operate on city streets rather than exclusive rights of way, much of this delay can be attributed to vehicular and pedestrian congestion along the route and would not be affected by staggered work hours.

The element which shows the greatest change during the peak hour is the number of passengers per bus. Exhibit VII-5 depicts the loadings of the M106 crosstown bus. As can be seen, even though the number of buses in service increases, the loadings per bus climb

Exhibit VII-5
STAGGERED WORK HOURS STUDY
PASSENGER LOADINGS DURING THE MORNING PEAK
TRANSIT BUS M106



M-106 Eastbound (1974)
42nd St. & 8th Ave. to 42nd St. & 1st Ave

as the peak progresses. During the height of the rush hour, from 8:15 to 8:45, more than 70 people squeeze into each bus. (Seating capacity of NYCTA buses is 45). Just before and just after that 30-minute interval, loadings fall off sharply.

A wide-scale implementation of staggered work hours would help smooth out this peak in passenger loadings by switching some passengers who now ride in the peak to earlier or later times, when buses are less crowded.

d. Auto

Although most Manhattan-bound commuters rely on transit to get to and from the CBD, a hardy minority do drive. In the course of this analysis, the impact of Staggered Work Hours on auto facilities was investigated.

Methodology

Counts were taken at major Manhattan access/egress points -- the Midtown Tunnel, the Lincoln Tunnel, the George Washington Bridge -- every 15 minutes from 7 - 10 a.m. and 4 - 7 p.m. Existing origin and destination data were scrutinized. An attempt was also made to determine if the tunnel and bridge peak periods corresponded to the peak period of midtown arrivals.

Results

The Peak Hour Factors for the highway facilities surveyed all approaches (1.0), indicating that they do not experience peaking. However, all operate at capacity for almost the entire 3-hour peak, resulting in the same type of severe congestion normally associated with the phenomenon of peaking.

Table VII-7
PEAK HOUR FACTORS FOR HIGHWAY SYSTEMS
Before and After Staggered Work Hours Programs

	PHF for service offered		PHF For Pax Demand AM			PHF For Pax Demand PM			PHF Service vs. Demand BEFORE SWH	
	AM	PM	Pre SWH	Post SWH	Δ	Pre SWH	Post SWH	Δ	AM	PM
Lincoln Tunnel	(1.0)	(1.0)	.98	.99	.01	n.a.	n.a.	---	-.02	---
Queens-Midtown Tunnel	"	"	.98	.96	-.02	.97	.97	0	-.02	-.03
Holland Tunnel	"	"	n.a.	.96	---	n.a.	n.a.	---	---	---
Geo. Wash. Bridge	"	"	n.a.	.99	---	n.a.	n.a.	---	---	---
Nwk. Broad @ Erie RR	"	"	.92	---	---	.95	---	---	-.08	-.05
Nwk. Broad @ Linc. Pk.	"	"	.87	---	---	.90	---	---	-.13	-.10
Nwk. Market @ Wash.	"	"	.91	---	---	.88	---	---	-.09	-.12
Bklyn-Battery Tunnel	"	"	.92	.91	-.01	.89	.87	-.02	-.08	-.11

According to a 1972 Origin and Destination survey, only 45.6 percent of peak trips through the Lincoln Tunnel are work trips to Midtown Manhattan. Other facilities showed similar splits.

In addition, there was little correspondence found between Lincoln Tunnel traffic and arrival patterns at midtown work places. The 5 peak 15-minute periods of traffic at the tunnel (7:15 to 8:30 a.m.) are offset by an hour from the peak 5 periods of midtown arrivals (8:15 - 9:30 a.m.).

In spite of this, the surveys did reveal a small shift of cars from the 8:00 - 9:00 travel period and a significantly larger shift of cars to the 7:00 - 8:00 time slot. A decrease in the 5:00 - 6:00 slot was reflected as an increase in the 4:00 - 5:00 period.

Analysis

The data indicate that Staggered Work Hours will not improve traffic conditions on auto facilities for the three reasons outlined below.

1) The extended peak indicates that drastic changes in work schedules would be required to shift people out of the peak.

2) The lack of correspondence between traffic and arrival times makes it difficult to gauge the impact of schedule changes on traffic; the O/D split hampers the effectiveness of schedule changes in reducing congestion, since fewer than half of the vehicles are CBD work-oriented.

3) The capacity constraint is the largest factor in the analysis. The facilities surveyed did not have any excess shoulder capacity, and thus staggering work schedules would only shift the peak around, rather than

spread it out. Since Staggered Work Hours helps to alleviate peaking problems by using excess capacity in other time periods, this capacity is vital.

Staggered Work Hours proved to be ineffectual in altering traffic patterns on Manhattan highway facilities.

e. **Pedestrian Systems**

A significant component of any commuter trip is by foot -- at station access or egress points, between modes, or at the destination. Pedestrian systems investigated included walkways, stairs and escalators, as well as related queues.

Methodology

Before and after counts were taken at Pennsylvania Station, Grand Central Terminal, Vanderbilt Avenue and 46th Street, the Port Authority Bus Terminal and the 53rd Street and Lexington Avenue Subway station. Five-minute counts were noted and accumulated into average 15-minute counts, and then the Peak Hour Factor (PHF) was determined. All measurements were done between 7:30 and 9:30 a.m. and between 4 and 6 p.m.

Results

The peak hour factors were determined to be:

Table VII-8
PEAK HOURS FACTORS - PEDESTRIAN SYSTEMS

	PHF for service Offered		PHF For Pax Demand AM			PM			PHF Service vs. Demand Before SWH	
	AM	PM	Pre SWH	Post SWH	Δ	Pre SWH	Post SWH	Δ	AM	PM
Penn Station	(1.0)	(1.0)	.92	.90	-.02	.92	.89	-.03	-.08	-.08
GCT - Pan Am Bldg	"	"	.80	.83	.03	.93	.89	-.04	-.20	-.07
PABT - Subway doors	"	"	.85	.82	-.03	.84	.89	.05	-.15	-.16
PABT - PM to platforms	"	"	---	---	---	.85	.86	.01	---	-.15
GCT - Park Ave. @ 46th St.	"	"	.87	.84	-.03	.76	.75	-.01	-.13	-.24
AVERAGE	(1.0)	(1.0)	.87	.85	---	.85	.86	---	---	---

Analysis

In general, the pedestrian facilities surveyed had high PHF's indicating that traffic flow is relatively uniform during the peak hour. This is not to say that overcrowding and congested conditions do not exist during the peak, but the PHF is not sensitive to capacity problems.

The high PHF's can be attributed to the "metering" of passengers by their arrival modes. One major exception to this is the p.m. peak at the Port Authority Bus Terminal and Grand Central Terminal, where at 5 o'clock workers descend in droves to catch their trains or buses home. These two facilities show a high degree of peaking on pedestrian facilities at 5-5:15.

In general, walkways and escalators are used uniformly throughout the peak, and Staggered Work Hours has little impact on their operations.

Pedestrian elements of subway stations are discussed in a separate part of this section.

f. Building Systems

i. Elevators

The element of office buildings most affected by Staggered Work Hours is the elevator system, which under typical 9-to-5 schedule experiences severe peaking and capacity problems at start and quit times.

Methodology

Counts were taken at one-minute intervals from 8 to 9:30 a.m. at elevator lobbies in the Morgan Guaranty Trust, Chase Manhattan and Federal Reserve Bank buildings in Downtown Manhattan. Both the number of arriving employees and the number of employees waiting for elevators were noted. Counts were taken before and during the Staggered Work Hours program.

Results

The number of employee arrivals was:

(Employee Arr. (8:01-9:15 a.m.)

Building	Before	During	Change
Morgan Guaranty	1371	1244	-127
Chase Manhattan	1488	1004	-484
Federal Reserve	1213	886	-327

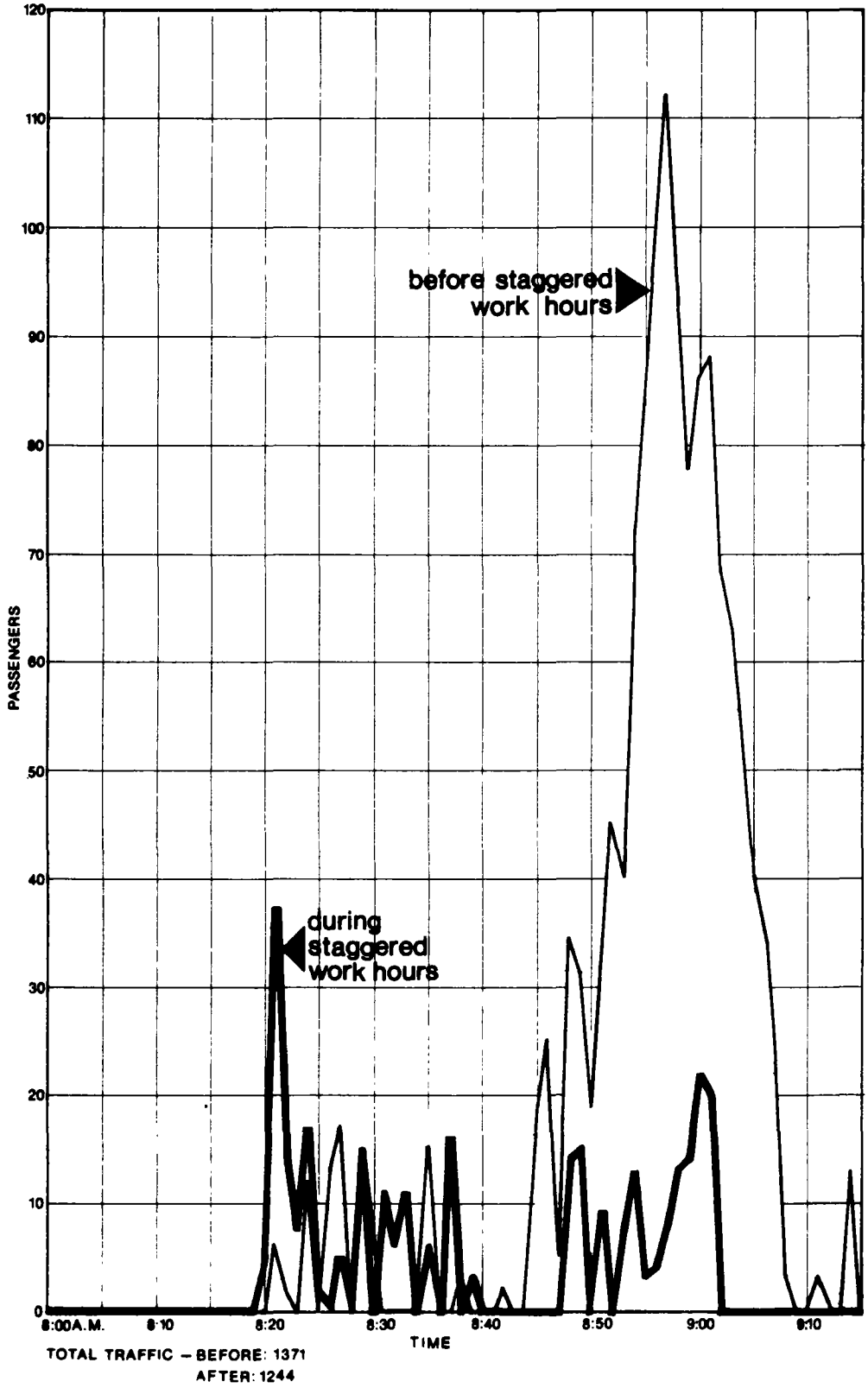
The number of persons waiting for elevators during the peak minute of demand dropped sharply. At Morgan Guaranty, only 37 employees were counted outside the elevators, compared with 112 before Staggered Work Hours (Exhibit VII-6). At Chase and Federal Reserve similar patterns emerged, although a significant decline in the number of arriving employees probably reduced peak elevator demand just as much as staggered hours.

A detailed examination of the Morgan Guaranty Trust data indicates that only 278 persons were delayed during the project, compared to 673

Exhibit VII-6

Staggered Work Hours Study

MORGAN GUARANTY TRUST BANK
ELEVATOR OPERATIONS
PASSENGERS WAITING FOR SERVICE



TOTAL TRAFFIC – BEFORE: 1371
AFTER: 1244

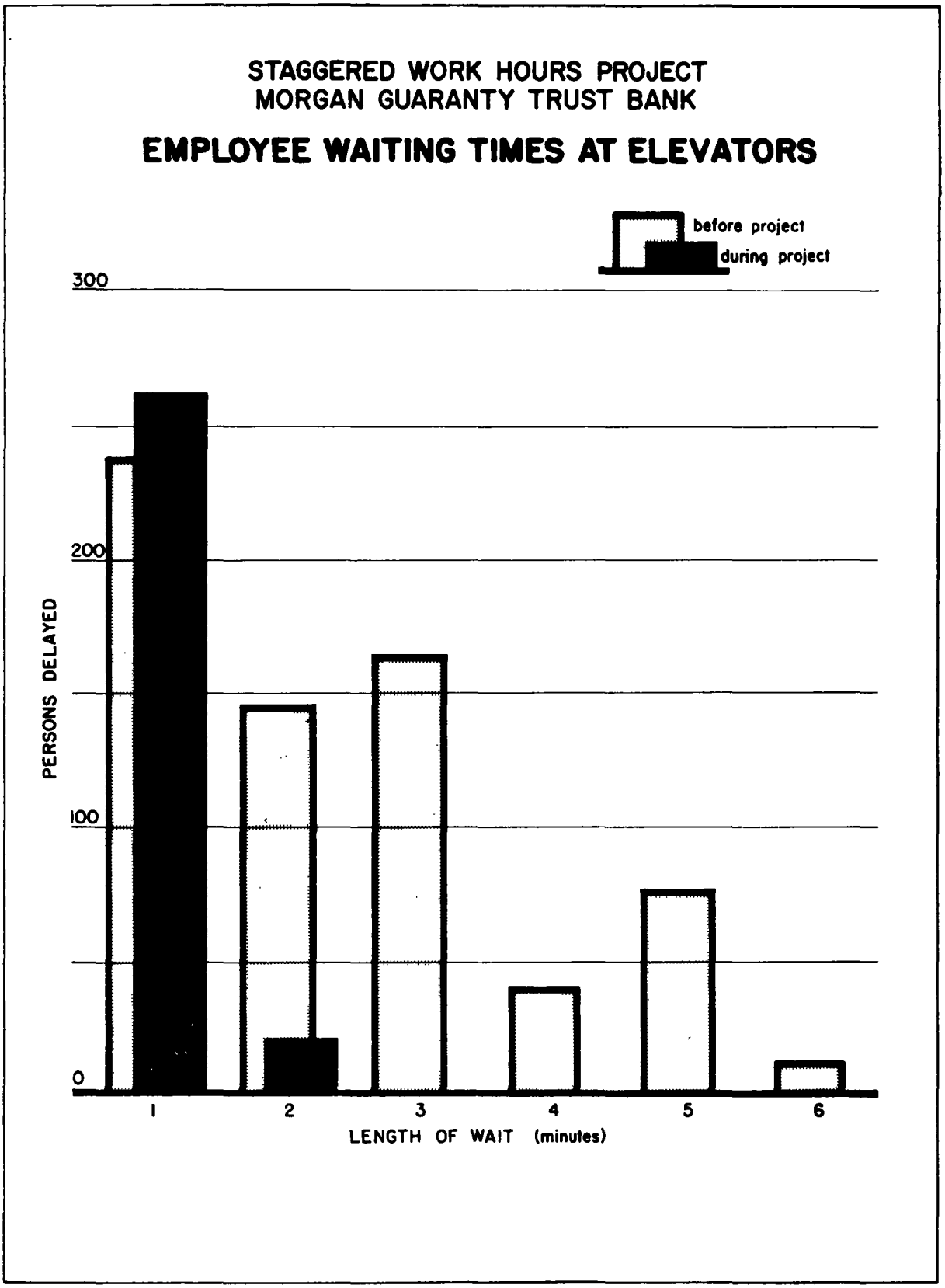
previously. For those who were delayed, the spreading of employee arrivals meant a decline of 81 seconds in average waiting time, from 145 seconds to 64 seconds. Moreover, the maximum wait declined from 6 minutes to 2 minutes. This data is shown in Exhibit VII-7.

Analysis and Conclusions

The reduction in elevator peaking at Morgan Guaranty Trust occured because employees shifted out of the peak 15 minutes (8:43-8:58). The capacity of these elevators averages 14 employees per elevator and 1.5 elevator departures per minute, or 315 persons in 15 minutes. The new arrival pattern reduced persons arriving during the peak 15 minutes from 514 passengers to 328 passengers. Delays were greatly reduced because the arrival demand with staggered shifts was only slightly higher than the elevator capacity.

It is concluded that when properly applied, a staggered work hour program can significantly reduce elevator crowding. Benefits to the employee are most apparent, and include fewer lobby delays and a significant reduction in the duration of the delay. The employer benefits because his people arrive more promptly, and the building operator benefits to the extent that his elevators and lobby areas are more evenly utilized.

The design of a proper program for elevator usage requires that persons using each elevator group are on staggered starting times. The number of persons who are shifted to other starting times may, in some instances, be relatively small. All that is required is a reduction of employee arrivals to a point where peak demand equals the elevator capacity.


STAGGERED WORK HOURS PROJECT
MORGAN GUARANTY TRUST BANK
EMPLOYEE WAITING TIMES AT ELEVATORS
before project
during project
300
200
100
0
PERSONS DELAYED
1
2
3
4
5
6
LENGTH OF WAIT (minutes)

ii. Lobbies

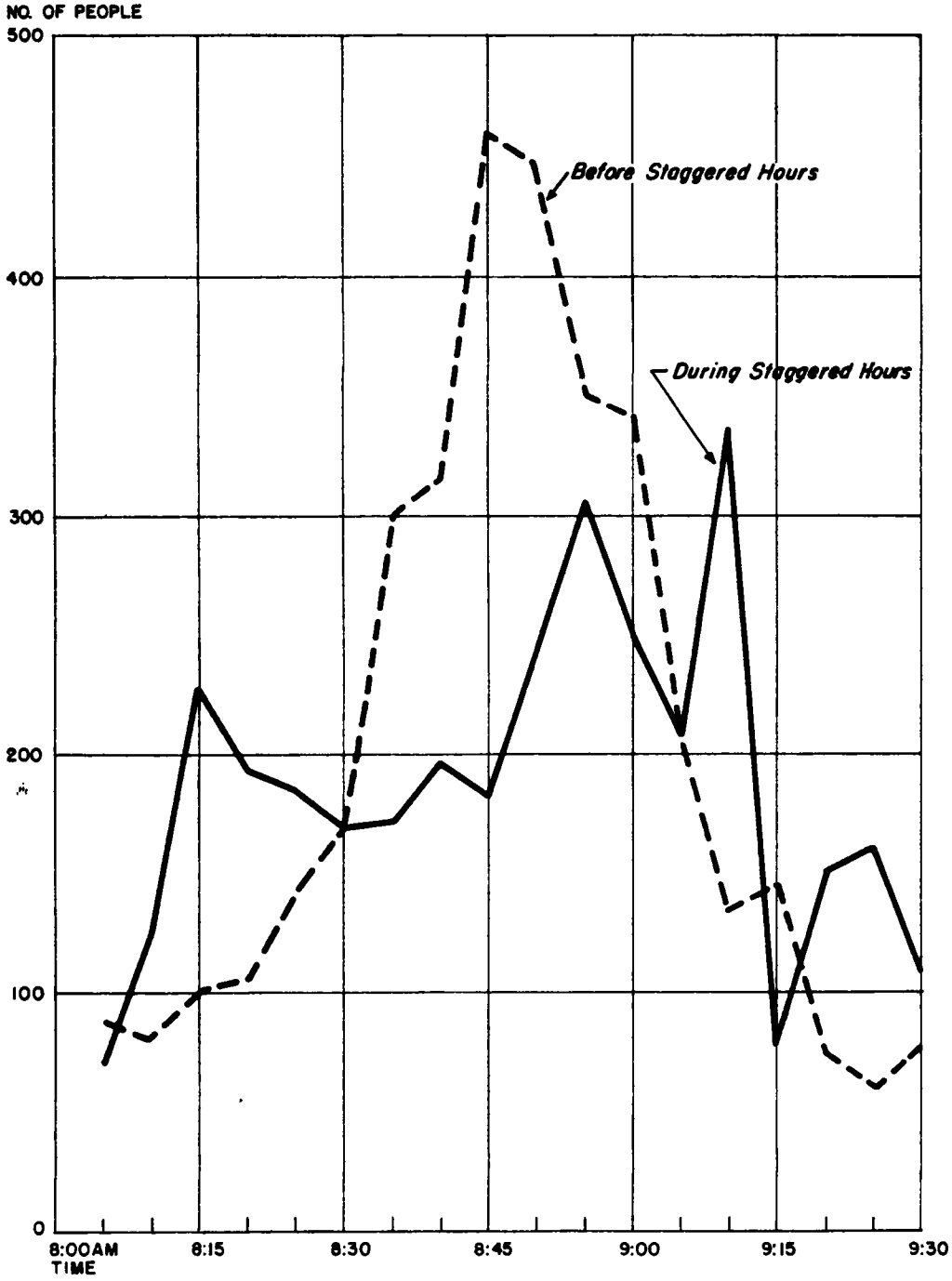
The success of Staggered Work Hours in reducing lobby congestion depends upon the work schedule distribution of employees using the lobby. In a one-firm building, with all departments on the same schedule -- even if it is an 8:30 - 4:30 "staggered schedule"-- congestion will not be reduced.

However, in a multi-firm building, staggering work schedules away from the predominant one will ease the peak flows (Exhibit VII-8). The same result can be achieved in a single tenant building by staggering hours by departments.

The survey methodology and benefits are the same as for the elevator analysis.

Exhibit VII - 8
STAGGERED WORK HOURS STUDY

ARRIVAL RATE OF PERSONS ENTERING THE PAB LOBBY



3. Special Analyses

In the course of the Staggered Work Hours project, several very specific analyses were conducted either to provide basic information or to monitor the success of the program. These were: the "Transportation Tardy Study"; an analysis of service adjustments required because of the new work schedule patterns; and a series of photographic monitoring studies. These are discussed in detail in the following section.

a. Transportation Tardy Study

During the course of Staggered Work Hours in Lower Manhattan, the managerial staffs of a number of participating organizations reported increased employee punctuality as a result. This was apparently due to fewer and less severe transportation delays earlier in the morning peak period. To look into this in greater detail, the "Transportation Tardy Study" investigated the relative reliability of rail transportation systems during various parts of the morning peak period. For instance, would a person working a schedule earlier than a 9-to-5 schedule be less likely to incur a transit and/or commuter rail delay in going to work in the morning? This is of obvious importance to the Staggered Work Hours Program since, if patterns of train delay were found to build up during the morning peak period, more employees could be expected to arrive at work on time if they started at 8:30 rather than 9:00.

Methodology

The Tardy Study was limited to commuter and transit rail transportation systems, since 85 percent of Lower Manhattan employees use a rail mode for a significant portion of their journey-to-work trip. With the cooperation of the rail transportation operators in the region, train "on-time" arrival data was collected for each morning peak period train for a sample of 18 randomly-selected days in 1970. Rail systems surveyed included all New York-New Jersey area commuter lines at their inbound terminals, several selected New York City Transit Authority subway lines at key stations, and the interstate Port Authority Trans-Hudson (PATH) transit system. Since train "delay" is the basic unit

being investigated, for the purpose of this study a train is considered "delayed" if it arrived at its checkpoint terminal or station at least five (5) minutes or more after its scheduled arrival time.

Results

The major findings of the Tardy Study are as follows:

- Significant relationships were found on many individual New York-area rail systems studies -- both commuter and transit -- which indicate an increasing pattern of train delays as the morning peak period progresses. These patterns represented either an increasing likelihood (or probability) of train delay, or increasing amount of train delay, or both, over the major portion of the peak period. Generally, rail delays are minimal prior to about 7:30, and subside rapidly after 9:30 a.m.
- Manhattan employees using the rail systems studies encountered greater and more frequent delays for a 9:00 a.m. starting time compared to an 8:30 start, for example. In addition, rail delays are even less before an 8:30 start. Findings for the transit systems studied indicate more than a 25 percent greater likelihood of train delay, and over a 40 percent increase in the average length of delay time for a 9:00 start versus an earlier 8:30 beginning.

  The commuter railroad system serving Manhattan exhibited similar relationships when comparing 8:30 against 9:00 a.m. starting times. The chance of being delayed is two-thirds

greater for the later starting time, while the average delay is one-half greater for the 9:00 start.

The difference in length of time delay means, in other words, that Manhattan employees untilizing rail systems were found on the average to save more than one full hour of commuting time every month during the morning if they started work at 8:30 a.m. compared to 9:00 a.m. Commuters would save additional travel time for a pre-8:30 start, since delays before 8:30 are even lower.

- Rail transit service for the systems surveyed is almost as fre- for an 8:30 start time as it is for a 9:00 start. In the 20-minute time period between 8:10 and 8:30 a.m., 2369 trains were scheduled, while 2427 were scheduled between 8:40 and 9:00 a.m.
- Train "annulments" on transit systems studied were 17 percent more frequent for a 9:00 start than for an 8:30 arrival. Rail transit system annulments, such as cancelled or out-of-service trains, are a measure of passenger crowding rather than delay, for example, since fewer trains than scheduled are actually in operation. For 21 transit lines examined, the percentage of annulled trains increased for a 9:00 vs. 8:30 start on 13 of the 21 lines, stayed essentially the same on three routes, and decreased on five lines.

b. Service Adjustments

Since most transit schedules are set up to serve commuters who work 9-to-5, project staff realized that workers on earlier or later schedules might experience some service problems.

In anticipation of these, "Transportation Survey" forms were prepared and distributed to firms going on Staggered Work Hours (Exhibit). Any employee who was having commuting problems on the new hours only had to fill in the form, specifying the nature of the complaint, and mail the post-paid folder back to the Port Authority project team.

Of all Manhattan employees on staggered hours, only 5 percent felt it necessary to return the forms. This low response rate seems to indicate that the New York transportation systems can absorb such changes without major difficulties.

Analysis

Questionnaires were reviewed by Port Authority staff members as they were returned, and classified as follows: N.J. Commuter Railroads, Northern(NY) Commuter Railroads, Long Island Railroad, Bus, IRT Subway, BMT-IND Subway. Surveys which were incomplete, favorable, or dealt with personal problems or those caused by the PATH strike -- or complaints registered by employees still on 9-to-5 -- were placed in an unclassified category. The responses were so tabulated in order to pinpoint which lines or services posed the most problem for Staggered Work Hours participants.

Once such problems were identified, a Project Staff member would contact the appropriate transportation agency and seek a solution.

Service Changes

The transportation agencies involved were most responsive to changing service needs under Staggered Work Hours. Most adjustments

concerned adding earlier service in the morning or evening peaks, adding extra cars to existing scheduled trains, or coordinating connecting services. A sample of service adjustments is shown in Table VII-9.

General Approach

The philosophy of the Manhattan Staggered Work Hours Project Staff was that service adjustments would be made only if participants specifically requested them. This approach worked very well as operators did not add unnecessary service in anticipation of demand which never materialized. In most cases, transportation systems have enough excess capacity in the peak shoulders to absorb Staggered Work Hours participants.

Table VII-9

STAGGERED WORK HOURS STUDY
TRANSPORTATION SERVICE ADJUSTMENTS

Examples of adjustments made by transportation operators in support of requests in the Manhattan Staggered Work Hours Program from participants:

NEW YORK CITY TRANSIT AUTHORITY

- Earlier "RR" train (BMT) added in both morning and afternoon service beginning January, 1971.
- Two trains added to Brooklyn-bound "E" service (IND) in the afternoon, making earlier service available (before 4:44 p.m.) and allowing 4-minute rather than 6-minute headways, as of June 22, 1970.

PATH (PORT AUTHORITY TRANS-HUDSON)

- Morning service expanded from Newark-to-World Trade Center to allow 3-minute headways over a longer period. Three-minute departures were available from 7:45 a.m. as of April, 1970, and from 7:42 a.m. starting in July, 1973.
- Evening service expanded from World Trade Center-to-Newark by two additional trains in July, 1973, with departures every three minutes from 4:37 to 5:19 p.m. and from 5:25 to 5:40 p.m. A previous expansion in service was the addition of a 4:40 departure (June, 1970).
- Earlier afternoon express service from World Trade Center-to-Hoboken, beginning at 4:38 p.m., started January 21, 1974.

ERIE-LACKAWANNA RAILROAD

- Train 425 added to schedule on July 6, 1970, leaving Hoboken at 5:02 p.m. and serving major Gladstone Branch stations, to complement existing 4:46 departure.
- Train 1601 rescheduled on the Pascack Valley Line from a 4:46 p.m. to a 4:52 departure in July, 1970.

Table VII-9 (Con't.)

STAGGERED WORK HOURS STUDY

PENN CENTRAL RAILROAD (NEW JERSEY DIVISION)

- Train 3814 service improved when three cars began stopping in Princeton Junction in Summer 1970 to provide earlier morning service, and two additional cars were subsequently added by November 1970, a sixth in November 1972, and one more on a day-to-day basis in June, 1973, to accommodate increasing patronage.
- Amtrak Train 180 began departing Princeton Junction at 6:30 am. on June 10, 1973.
- Revised afternoon schedule and added one train on Mainline, effective October 29, 1973.

PENN CENTRAL RAILROAD (NEW HAVEN DIVISION)

- One car added to New Canaan branch train connecting with Train 1928 (leaving Grand Central at 4:38 p.m.), beginning May 14, 1973.
- One car added to Train 1358 (leaving Grand Central at 4:41 p.m.) as of May 14, 1973, to relieve overcrowding.
- One car added to Train 1337 (arriving Grand Central at 8:10 a.m.) on May 14, 1973 to relieve overcrowding.

CENTRAL RAILROAD OF NEW JERSEY

- Additional Mainline train introduced by State of New Jersey and CNJ to arrive at Newark at 7:45 a.m., effective April 12, 1973, adding to existing service provided by a Mainline train arrival at Newark at 7:27 a.m.
- Extended route of Train 5921 (departing Newark at 4:59 p.m.) to provide service to Raritan (filling the gap to Train 5923, a 5:17 departure for Raritan).

TRANSPORT OF NEW JERSEY

- Added 4:45 p.m. bus departure to Matawan/Marc Woods beginning September 10, 1973.

c. Photographic Techniques

Various methods of photography were employed during the course of this study to both monitor and document the peaking phenomenon.

i. Still Photography - In order to depict the phenomenon of peaking, it is necessary to take a series of photographs over time. For example, to show the peak congestion on a subway platform, pictures were taken at short intervals throughout the peak in order to show the progression of passenger flows. A clock was included in each frame to give a time reference. Whenever possible, the shots were framed to include the arriving or departing train, to prevent misleading comparisons. The camera angle remained constant throughout the period.

Still pictures were also taken aboard vehicles, both to check the estimated car loadings and to present a visual documentation of the level of crowding corresponding to various car loadings.

ii. Movie Photography

A number of time lapse movie films were taken in subway stations and on sidewalks; this technique collapsed the two-hour peak period into a fifty-foot film by clicking off one frame every second. When shown in slow motion, these films accurately portrayed the rise and fall of demand during the peak. Again, a clock was included in the frame to give a time reference.

iii. Aerial "Skycount" Photography

This technique involves taking aerial time-series still photographs of major highway arterials. It was investigated but not used in the Manhattan analysis because of the unusually small number of peak-hour commuters who drive into the CBD, and because of the capacity problems on the arterials. It would be a very effective tool in those cities with a high percentage of automobile work trips.

Basically, aerial "skycount" photography requires pictures to be taken every 10 or 15 minutes so that a manual count of demand can be taken. A series of shots in one location over the peak two or three hours would identify the 15-minute periods when demand is highest, as well as the periods when excess capacity exists.

D. RECOMMENDATIONS

After extensive analysis of the impact of work schedule changes on transportation systems, one conclusion stands out clearly - Staggered Work Hours can help most transportation systems function more efficiently. Staggered Hours is most beneficial to systems which experience congestion due to peaking, rather than capacity problems.

In summary, staggered hours can spread out demand during the peak period and thus reduce the peak load. This, in turn, reduces passenger loadings per vehicle, increases average speed, and generally results in a better level of service, as well as more efficient operation of the system.

Specifically, staggered work hours is recommended in the following situations:

1) In areas served by systems (such as the New York City subways) with a high degree of peaking due to work trips being concentrated around 9 a.m. and 5 p.m.

2) In areas with heavy concentration of employment (Rockefeller Center, World Trade Center), where building systems, sidewalks and transportation terminals are congested at the normal starting and quitting times.

3) In small cities where a predominant work schedule exists, resulting in a very high "peak load" which must be met by the transportation system.

Specific benefits of Staggered Work Hours in these situations are discussed in Chapters IX and X.

Chapter VIII

Attitudes

Staggered Work Hours Study

VIII. ATTITUDES

A. OBJECTIVE

The objective of this section is to present pertinent documentation on the attitudes of employees and management to Staggered Work Hours. Some of the material was also presented earlier in Section IV of this report in comparing various work schedule concepts.

B. WORK PERFORMED

Project staff has reviewed and coordinated a number of detailed attitude surveys conducted by the Port Authority or other organizations in evaluating their Staggered Work Hours efforts. In many cases, staff assisted in the design, conduct and/or analysis of these surveys.

C. ANALYSIS

1. Introduction

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. Via formal or informal questionnaires, they can assess the feelings about the desirability of changing work schedules, preferred hours, the potential or actual effect of revised hours toward an employee's job, productivity, the effect upon home life and community activities, and the employee's feeling about transportation. Attitude surveys can be extremely comprehensive or relatively short. It is possible to eliminate formality and merely record feedback from supervisory staff as elicited by them from their subordinates. It is probable, however, that the best returns as well as assistance in furthering Staggered Hours programs is achieved by soliciting detailed responses from large segments of the employees on new schedules. In most cases these surveys should be anonymous in order to allow the respondent to put down his frank thoughts on the program without fear of exposure.

The attitude survey attempts 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? Does he experience changes in crowding or delay under the new schedule as contrasted with the old schedule?

If he has not yet started on a Staggered Work Schedule, what does he think about trying or experimenting with staggered hours?

2. What hours does he prefer to work? Earlier, later or no preference?
3. What are the characteristics of his commuting trip? What is his residential point of origin, principal mode and typical length of time for the trip?
4. Does he anticipate any potential problems if Staggered Work Hours are adopted? Or, in the event Staggered Hours are in effect, what has been the effect on his travel to work, his home life and his business productivity.

The Port Authority has participated in or is aware of numerous attitude studies involving Staggered Hours. One of the most detailed and formal surveys was conducted by the Port Authority jointly with the Downtown-Lower Manhattan Association in 1970. The organizations, in order to investigate as objectively as possible employee reaction to Staggered Work Hours, retained Dr. Derek L. Phillips then Associate Professor of Sociology at New York University. The primary goal of Dr. Phillips' investigation, discussed below, was to ascertain the impact of the Staggered Work Hours Project in Downtown Manhattan. Other formal surveys include one conducted by Mr. Henry Cohen, Director of the Center for New York Affairs, New School for Social Research, to evaluate the affect of Staggered Hours on employees of the Port Authority. In this project as well Dr. Derek Phillips, was retained as Research Leader.

Several organizations in New York City made their own surveys of employee reaction to Staggered Hour programs. Some firms which undertook surveys among their own employees include Bristol-Myers Company, New York Life Insurance Company, Union Carbide, Westvaco, Ogilvy & Mather and Sears, Roebuck & Company.

2. Lower Manhattan Survey (1970)

To study the attitudes of Lower Manhattan employees and management to the growing Staggered Work Hours Program, the Port Authority and the D-LMA engaged Dr. Phillips who designed questionnaires which were distributed to the employees of 27 of the companies participating in the Downtown project. These firms ranged from the largest with some 5,000 or more employees, to smaller firms employing 400 or fewer individuals. The survey returns totalled some 27,000 and included ample representation from firms in the four major segments of the Lower Manhattan business community: banking, insurance, investment and corporation headquarters groups. The questionnaire employed in the study is shown in Exhibit VIII-I.

About half of those who returned questionnaires were actually participating in Staggered Hours, while more than 80% were familiar with the project's existence. More importantly, almost 85% of the respondents provided a favorable overall reaction to Staggered Work Hours. Some effects on the various aspects of their lives are as follows:

- 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

EXHIBIT VIII-1

DOWNTOWN LOWER MANHATTAN ASSOCIATION STAGGERED WORK HOURS QUESTIONNAIRE

NEW YORK UNIVERSITY
Graduate School of Arts and Science
Department of Sociology
19 UNIVERSITY PLACE, ROOM 300, NEW YORK, N.Y. 10003
AREA 212 598-2858

September, 1970

Dear Downtown Manhattan Employee:

As many of you know, almost fifty firms and organizations in the Downtown Lower Manhattan area have been participating since April in a "staggered work hours project" sponsored by the Downtown Lower Manhattan Association and The Port of New York Authority. The purpose of this project, in which some employees in your organization are participating, is to help alleviate overcrowding and congestion on transportation systems in the area during the peak period travel times of 9:00 A.M. and 5:00 P.M.

At the request of the project's sponsors, I have prepared the accompanying questionnaire as part of a broad-scale investigation of the effects of the staggered work hours project on people who work in lower Manhattan. The questionnaire is designed to give you the opportunity to assess and evaluate various work schedules as they affect your everyday life—at work, at home, and in commuting. In addition, we are asking you in your capacity as a department manager or unit head to complete a special section of the questionnaire dealing with the possible effects of the changed hours on your firm's operations.

Some of you who receive this questionnaire will not have been directly affected by the staggered work hours project. That is, you will not be on a new schedule. Nevertheless, it is important that you too complete the questionnaire, so that your views and experiences can be compared and contrasted with those of persons working new schedules.

It will be seen that a few of the questions are somewhat personal and private in nature. Because of this, considerable care has been taken to assure that the identity of the persons filling out these questionnaires cannot be determined. Moreover, your answers will be used only to assess the staggered hours project and for no other purpose.

There are, of course, no "right" or "wrong" answers or responses. We just want to know how your work schedules have affected you. I know that many of you are frequently asked to take time from a busy schedule to answer questionnaires. Your views in this case are extremely important, however, since we have no way of knowing the full effects of the project if we don't hear from you. I would, therefore, appreciate your trying to find time to complete and return this questionnaire within 2 days. A return envelope is enclosed for your convenience. Thank you for your help.

Sincerely,

Derek L. Phillips
Associate Professor of Sociology
New York University

EXHIBIT VIII - 1 (cont.)

STAGGERED WORK HOURS PROJECT

SPECIAL QUESTIONNAIRE - UNIT HEADS ONLY

INSTRUCTIONS: MOST OF THE QUESTIONS IN THIS QUESTIONNAIRE CAN BE ANSWERED BY PLACING A CHECKMARK NEXT TO THE APPROPRIATE ITEM. IN A FEW CASES, THOUGH, YOU WILL FIND DIFFERENT INSTRUCTIONS. PLEASE READ THESE SPECIAL INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTIONS.

YOUR ANSWERS TO THIS QUESTIONNAIRE WILL BE POOLED WITH THOSE OF OTHER PERSONS AND NOT IDENTIFIED WITH YOUR NAME. IN FACT, YOU WILL NOTICE THAT THERE IS NO PLACE FOR YOUR NAME ON THE QUESTIONNAIRE. PLEASE DO NOT WRITE IN YOUR NAME! ALL ANSWERS WILL BE COMPLETELY CONFIDENTIAL, AND USED ONLY FOR THE PURPOSE OF ASSESSING THE EFFECTS OF THE STAGGERED WORK HOURS PROJECT. PLEASE ANSWER EACH QUESTION AS CAREFULLY AND ACCURATELY AS YOU CAN. UNLESS THERE ARE DIFFERENT INSTRUCTIONS, PLEASE CHECK ONLY ONE ANSWER FOR EACH QUESTION.

1) PLEASE LIST THE NAME OF THE FIRM FOR WHOM YOU WORK:_____

_____

2) WHAT IS THE ADDRESS WHERE YOU WORK?_____

_____

3) HOW LONG HAVE YOU BEEN WORKING THERE?

____(1) Less than 1 month
____(2) Between 1 month and 1 year
____(3) Between 1 and 5 years
____(4) Between 5 and 10 years
____(5) Between 10 and 15 years
____(6) Between 15 and 20 years
____(7) 20 years or longer

4) WHAT IS YOUR PRESENTLY ASSIGNED SCHEDULE OF WORK HOURS (AS OF TODAY)?

____(1) 8.00 A.M. to 4:00 P.M.
____(2) 8.15 A.M. to 4:15 P.M.
____(3) 8:30 A.M. to 4.30 P.M.
____(4) 8:45 A.M. to 4:46 P.M.
____(5) 9:00 A.M. to 5:00 P.M.
____(6) 9:15 A.M. to 5.15 P.M.
____(7) 9:30 A.M. to 5:30 P.M.
____(8) Other_____
Please specify

5) WHAT IS YOUR AGE?

____(1) 17–25
____(2) 26–35
____(3) 36–55
____(5) Over 55

6) YOUR SEX IS?

____(1) Male
____(2) Female

7) WHICH OF THE FOLLOWING APPLIES TO YOU?

____(1) Not married
____(2) Married, with no children
____(3) Married, with no children living at home
____(4) Married, with one child living at home
____(5) Married, with two or more children living at home
____(6) Other _____
Please specify

8 10) PLEASE INDICATE YOUR CITY, COUNTY, AND STATE OF RESIDENCE

_____ _____ _____
City County State

11) ARE YOU FAMILIAR WITH THE STAGGERED WORK HOURS PROJECT THAT IS OPERATING IN MANY FIRMS IN DOWNTOWN MANHATTAN?

____(1) Yes, familiar
____(2) No, unfamiliar

12) ARE YOU, PERSONALLY, PARTICIPATING IN THE STAGGERED WORK HOURS PROJECT?

____(1) Yes, participating
____(2) No, not participating

QUESTIONS 13–21 ARE TO BE ANSWERED ONLY BY THOSE PERSONS WHO HAVE HAD THEIR SCHEDULES CHANGED SINCE APRIL 1, 1970. THOSE WHOSE SCHEDULES HAVE NOT BEEN CHANGED ARE ASKED TO SKIP TO QUESTION 22

13) IF YOUR SCHEDULE HAS BEEN SWITCHED DURING THE PERIOD SINCE APRIL 1, WHAT WAS YOUR ORIGINALLY ASSIGNED SCHEDULE?

____(1) 8:00 A.M. to 4:00 P.M.
____(2) 8:15 A.M. to 4:15 P.M.
____(3) 8:30 A.M. to 4:30 P.M.
____(4) 8:45 A.M. to 4:45 P.M.
____(5) 9:00 A.M. to 5:00 P.M.
____(6) 9:15 A.M. to 5:15 P.M.
____(7) 9:30 A.M. to 5:30 P.M.
____(8) Other:_____
Please Specify

14) HOW LONG HAVE YOU BEEN ASSIGNED TO WORKING YOUR PRESENT SCHEDULE (AS OF TODAY)?

____(1) Less than 1 week
____(2) 1–2 weeks
____(3) 2–3 weeks
____(4) 3–4 weeks
____(5) 4–6 weeks
____(6) 6–8 weeks
____(7) More than 8 weeks

15) COMPARING YOUR COMMUTING EXPERIENCE ON YOUR PREVIOUS SCHEDULE WITH YOUR COMMUTING EXPERIENCE ON THE PRESENT SCHEDULE, ARE YOU:

____(1) More satisfied with commuting experience now
____(2) Less satisfied with commuting experience now
____(3) No change in commuting experience

16) HAS THE AMOUNT OF TIME YOU SPEND WITH YOUR FAMILY OR FRIENDS AND RELATIVES IN THE EVENING HOURS BEEN CHANGED BY THE NEW SCHEDULE?

____(1) No changes
____(2) Amount of time changed, satisfied with changes
____(3) Amount of time changed; dissatisfied with changes
____(4) Amount of time changed, doesn't make any difference

EXHIBIT VIII - 1 (cont.)

17) HAS THE NEW SCHEDULE MADE ANY CHANGES IN YOUR INVOLVEMENT OR PARTICIPATION IN VARIOUS KINDS OF ACTIVITIES IN THE EVENING?

___(1) No changes
___(2) Changes, satisfied
___(3) Changes, dissatisfied
___(4) Changes, doesn t make any difference

18) HAS YOUR BEING ON A NEW SCHEDULE CAUSED ANY PROBLEMS WITH REGARD TO THE SCHEDULES (FOR WORK OR WHATEVER) OF OTHER PEOPLE IN THE HOUSEHOLD?

___(1) No other persons in household
___(2) No problems
___(3) Minor problems
___(4) Major problems

19) COMPARED TO THE WAY YOU GENERALLY FELT ABOUT YOUR JOB BEFORE THE NEW SCHEDULE BEGAN, ARE YOU NOW:

___(1) More satisfied
___(2) Less satisfied
___(3) Equally satisfied

20) IN YOUR OPINION, HAS THE NEW SCHEDULE MADE YOU:

___(1) Much more effective at work
___(2) Somewhat more effective at work
___(3) No change from the old schedule
___(4) Somewhat less effective at work
___(5) Much less effective at work

21) ON THE NEW SCHEDULE, DOES THE WORKDAY SEEM TO YOU TO BE LONGER, SHORTER, OR ABOUT THE SAME?

___(1) Longer
___(2) Shorter
___(3) About the same

QUESTIONS 22–42 ARE TO BE ANSWERED BY ALL PERSONS, WHETHER OR NOT THEY ARE ON A NEW SCHEDULE. IF YOU ARE NOT WORKING NEW HOURS, AN ASSUMPTION IS MADE IN THESE QUESTIONS THAT THE NEW SCHEDULES MIGHT HAVE AFFECTED YOU–EVEN THOUGH YOU PERSONALLY HAVE NOT CHANGED YOUR WORK SCHEDULE.

22) IN YOUR VIEW, HAS THE STAGGERED WORK HOURS PROJECT LESSENED THE CONGESTION AND OVERCROWDING IN THE ELEVATORS IN THE BUILDING WHERE YOU WORK?

___(1) Yes
___(2) No

23) HAS THE STAGGERED WORK HOURS PROJECT LESSENED THE CROWDING IN THE LOBBY OF THE BUILDING?

___(1) Yes
___(2) No

24) HAS IT LESSENED THE CROWDING AND CONGESTION IN THE STREETS AROUND THE BUILDING?

___(1) Yes
___(2) No

25) IN YOUR VIEW, HAS THE PROJECT ALLEVIATED THE OVERCROWDING IN RESTAURANTS AND STORES DURING YOUR LUNCH HOUR?

___(1) Yes
___(2) No

26) IN YOUR OPINION, HAS THE NEW SCHEDULE MADE MOST PEOPLE YOU KNOW

___(1) Much more effective at work
___(2) Somewhat more effective at work
___(3) No change from old schedule
___(4) Somewhat less effective at work
___(5) Much less effective at work

27) COMPARED TO THE OLD SCHEDULE, HOW DO YOU FEEL THE NEW SCHEDULE AFFECTS GETTING IN TOUCH WITH PEOPLE AT WORK?

___(1) Much easier to get in touch with people now
___(2) Somewhat easier to get in touch with people now
___(3) Same as before
___(4) Somewhat more difficult to get in touch with people now
___(5) Much more difficult to get in touch with people now

28) BEFORE THE STAGGERED WORK HOURS PROJECT WENT INTO EFFECT, WHAT WOULD HAVE BEEN YOUR REACTION TO BEING TEMPORARILY ASSIGNED TO WORK AN 8:30 to 4:30 SCHEDULE?

___(1) Strongly favorable
___(2) Somewhat favorable
___(3) Somewhat unfavorable
___(4) Strongly unfavorable
___(5) No reaction

29) WHAT WOULD HAVE BEEN YOUR REACTION TO BEING TEMPORARILY ASSIGNED TO WORK A 9:30 to 5:30 SCHEDULE?

___(1) Strongly favorable
___(2) Somewhat favorable
___(3) Somewhat unfavorable
___(4) Strongly unfavorable
___(5) No reaction

30) WHAT DO YOU FEEL IS THE OVERALL REACTION OF MOST PEOPLE YOU KNOW IN THE ORGANIZATION WHERE YOU WORK TO THE STAGGERED WORK HOURS PROJECT?

___(1) Strongly favorable
___(2) Somewhat favorable
___(3) Somewhat unfavorable
___(4) Strongly unfavorable
___(5) No reaction

31) WHETHER OR NOT YOU WOULD LOOK FAVORABLY UPON BEING PERMANENTLY ASSIGNED TO VARIOUS SCHEDULES, HOW WILLING WOULD YOU BE TO ACCEPT EACH OF THE FOLLOWING SCHEDULES AS PERMANENT? PLEASE INDICATE HOW YOU WOULD FEEL ABOUT EACH OF THE SEVEN (7) SCHEDULES LISTED BELOW:

	A.M.	8:00	8:15	8:30	8:45	9:00	9:15	9:30
	P.M.	4:00	4:15	4:30	4:45	5:00	5:15	5:30
(1)	Very willing	___	___	___	___	___	___	___
(2)	Somewhat willing	___	___	___	___	___	___	___
(3)	Somewhat unwilling	___	___	___	___	___	___	___
(4)	Very unwilling	___	___	___	___	___	___	___

32) IF YOU WERE ASKED TO RECOMMEND A STAGGERED WORK HOURS SCHEDULE TO PEOPLE IN NEW YORK OTHER THAN THOSE IN THE ORGANIZATION WHERE YOU WORK, WOULD YOU GIVE A:

___(1) Strongly favorable recommendation
___(2) Somewhat favorable recommendation
___(3) Somewhat unfavorable recommendation
___(4) Strongly unfavorable recommendation

33) NOW THAT THE STAGGERED WORK HOURS PROJECT HAS BEEN IN EFFECT FOR SEVERAL WEEKS, WHAT IS YOUR OVERALL REACTION TO IT? (WHETHER OR NOT YOU ARE ON A NEW SCHEDULE).

___(1) Strongly favorable
___(2) Somewhat favorable
___(3) Somewhat unfavorable
___(4) Strongly unfavorable

34) DO YOU FEEL THAT THE "REGULAR" SCHEDULE IN YOUR FIRM WAS CONVENIENT FOR MOST PEOPLE WHOM YOU SUPERVISE?

___(1) Very convenient
___(2) Somewhat convenient
___(3) Somewhat inconvenient
___(4) Very inconvenient

EXHIBIT VIII - 1 (cont.)

35) IF THAT SCHEDULE WAS CHANGED, DO YOU FEEL THAT THE PRESENT WORK SCHEDULE IS CONVENIENT FOR MOST PEOPLE WHOM YOU SUPERVISE?

___(1) Schedule has not changed
___(2) Very convenient
___(3) Somewhat convenient
___(4) Somewhat inconvenient
___(5) Very inconvenient

36) COMPARED TO THE PREVIOUS SCHEDULE, DO MOST PEOPLE NOW ARRIVE AT WORK EARLIER, AT THE SAME TIME, OR LATER THAN THEIR ASSIGNED SCHEDULE FOR ARRIVING?

___(1) Not under new schedule
___(2) Earlier
___(3) Same time
___(4) Later

37) COMPARED TO THE PREVIOUS SCHEDULE, DO MOST PEOPLE NOW LEAVE WORK EARLIER, AT THE SAME TIME, OR LATER THAN THEIR ASSIGNED SCHEDULE FOR LEAVING?

___(1) Not under new schedule
___(2) Earlier
___(3) Same Time
___(4) Later

38) COMPARED TO THE OLD SCHEDULE, IS THERE INCREASED EFFICIENCY, DECREASED EFFICIENCY, OR NO CHANGE IN THE EFFICIENCY OF THE PEOPLE WHOM YOU SUPERVISE?

___(1) Not under new schedule
___(2) Increased efficiency
___(3) Decreased efficiency
___(4) No change

39) HAS THE NEW SCHEDULE CREATED ANY COMMUNICATIONS PROBLEMS INTERNALLY IN YOUR ORGANIZATION WHICH AFFECT PRODUCTIVITY AND/OR EFFICIENCY?

___(1) Whole department on same schedule
___(2) Yes, communication problems
___(3) No communication problems

40) HAS THE NEW SCHEDULE CREATED ANY COMMUNICATIONS PROBLEMS EXTERNALLY BETWEEN YOUR ORGANIZATION AND OTHER ORGANIZATIONS WHICH AFFECT PRODUCTIVITY AND/OR EFFICIENCY?

___(1) Yes, communication problems
___(2) No communication problems

41) WHAT IS THE GENERAL OPINION OF THE PEOPLE WHOM YOU SUPERVISE AS TO THE STAGGERED WORK HOURS PROJECT, WHETHER OR NOT THEY HAVE BEEN DIRECTLY AFFECTED BY IT? WHY DO THEY FEEL THAT WAY?

_____

_____

_____

_____

42) WE WOULD WELCOME ANY OTHER COMMENTS YOU MIGHT WANT TO MAKE ON THE STAGGERED HOURS PROJECT.

_____

_____

_____

_____

PLEASE PUT IN THE ATTACHED ENVELOPE AND DROP IN THE MAIL.
THANK YOU FOR YOUR HELP.

64169

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. On the question of home life two items pertaining to the effects of the project are of interest and were highly favorable. 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.

- The willingness of employees to work permanently on new schedules found the greatest support for the 8:30-to-4:30 time frame, the most popular work schedule, rather than the old 9:00-to-5:00.

- The respondent's reports with regard to the Staggered Work Hours Projects effects on such things as congestion and overcrowding, work life, home life, commutation and schedule preference are essentially the same for both unit heads and employees, for both men and women, and for people of different age, marital and parental status. There was also little difference in attitude among persons working in different industries or residing in different parts of the tri-state region.

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. Dr. Derek Phillips inquired into this aspect and it is gratifying to report that:

- Six times as many supervisors reported gains in productivity under the new hours than reported losses.
- The punctuality of employees increased in many cases.

In summary, all surveys have indicated that the changed hours had very few negative affects.

One of the important findings on the question of work efficiency was whether shifted starting times affected communications internally and/or externally among participating firms. 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.

In discussions with company representatives prior to the experiment, many commented on current problems of employee punctuality and asked that this area be studied. For this reason, unit heads were specifically asked about punctuality and they reported that Staggered Hours appeared to have a beneficial effect. Compared to previous experience, almost 80% of the supervisors said their employees were arriving on time or earlier under the new schedules. Only 12% reported they were arriving later. This generally corroborates the findings of the Transportation Tardy Study discussed in greater detail in Section VII of this report. In the Tardy Study, characteristics of rail delays were reviewed and analyzed during the

and stores during the lunch hour.

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morning peak period and it was determined that earlier arriving trains were less likely to be delayed and, if they were, they were delayed for a shorter duration.

3. Port Authority Survey (1969)

A forerunner to the Staggered Hours Program in Manhattan was the staff experiment conducted in the Port Authority in 1969. At that time Henry Cohen, Director of the Center for New York City Affairs, New School for Social Research and Dr. Derek Phillips evaluated the effects of Staggered Hours on P.A. employees who had shifted from their former 8:45-to-4:45 schedule onto 8:15, 8:45 and 9:15 starting times, (one third onto each). They concluded that:

- Approximately 70% of the persons sampled had a favorable overall reaction to the Staggered Hours experiment. However, a far smaller percentage of those on a 9:15-to-5:15 schedule had a generally favorable reaction to the experiment than those on the 8:45-to-4:45 schedules.
- As in the case with their overall reactions, people on the 9:15-to-5:15 schedule also report greater dissatisfaction than do others with respect to the experiments effects on commutation, home life and life at work.

Although the effects of working the 8:15 and 9:15 schedules were approximately the same for men as for women, for clerical as for non-clerical personnel, for supervisors as for non-supervisory employees, and for line and staff personnel, there were some differences between married and unmarried persons and among people with different places of residence. Unmarried persons generally expressed somewhat more positive attitudes and feelings about Staggered Hours programs than did married persons. Residents of suburban

Nassau and Suffolk counties were consistently less satisfied with the 9:15-to-5:15 schedule than persons from New York City, New Jersey or Rockland County. But for people working the 8:15-to-4:15 schedule, place of residence has no effect on their degree of satisfaction or dissatisfaction. This points up the rather universal preference for earlier hours. Almost 85% of the 8:15 supervisors saw the schedule as convenient, whereas only 35% of the supervisors on the 9:15-to-5:15 schedule regarded that as a convenient schedule for work.

In conclusion, considering the favorable reactions of most people to the project, it was concluded that the experiment was a success and almost all P.A. employees remained on Staggered Hours on an earlier 8:30-to-4:30 schedule.

4. Surveys by Other Organizations

The project staff has worked closely with other public and private organizations to survey, monitor and analyze their experiences on Staggered Work Hours.

It is also worthwhile to note some testimonials of major firms in adjusting to the new work schedules. These have been used frequently in persuading other organizations to try 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". When adopting a permanent Staggered Work Hours Program, the Bristol-Myers Company, Union Carbide, Inc., Westvaco and Sears, Roebuck, Inc. made similar comments. (Several attitude surveys conducted by these firms are discussed later in this section).

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."

Firms which communicate regularly with westerly time zones often express concern about keeping in touch on earlier Staggered Work Hours schedules. The project staff, therefore, canvassed several major New York corporations which have successfully shifted to Staggered Hours, and none has found this situation to be a serious problem. There are several reasons for this, which are included among the comments below, with the major reason simply that the new work hours required only a very small adjustment in communications habits.

Westvaco: "Concerning the effect of our change in work hours to 8:30-to-4:30 on communications with West Coast facilities, I can report no adverse effect. I think the Staggered Work Hours Program put it well when you stated a few years ago that the biggest barrier to any change is psychological. Once we got over this and made the change, we proceeded in typical 'free enterprise fashion' and adjusted without losing efficiencies. If we were confronted with a situation where business must be handled after 4:30 P.M., manpower schedules could be arranged for a few people to accommodate the situation. We did not allow a few isolated instances to hold up the complete program."

Union Carbide: "Employees at both ends began planning their telephone calls. Also, more letter writing began to take place. This incidentally, saved us some money. We now have adjusted to the time differences and communicating with the West Coast is no more difficult than before."

Continental Can: "None of the reactions have been derogatory. As a matter of fact, with only a half hour difference in our closing time, no one seems to feel the experience has been the least bit difficult. We are, therefore, inclined to agree with the observation that the concern of local businessmen about new hours is really unsubstantiated, or, that the problem, if any, relates wholly to a matter of planning properly for the placement of calls to locations within westerly time zones."

Exxon: "Obviously, our change of only one-half hour could not have had very serious impact. What we lose in communication time to the west, we pick up on communications time to Europe. Actually, the communications question has never even become a problem in our operations."

Most noteworthy, and indicative of the positive management towards Staggered Hours, was a radio campaign involving one minute testimonials by 35 top executive officers of major firms participating in the Manhattan Staggered Work Hour Program. The testimonials were prepared and broadcast by WCBS Newsradio 88 during the winter months of 1975.

A number of surveys of organizations considering and/or evaluating Staggered Hours is presented below.

- Westvaco - This large paper company conducted surveys of employee preference prior to and following a four-month trial period of an experimental 8:30-to-4:30 schedule. It was favored by 75% of its employees before, a percentage which grew to 85% of staff after the experiment. From the first survey to the second, dissatisfaction with the proposal decreased from 15% of employees to 10%, and those expressing no preference declined from 10% to 5% of the work force. (See Exhibit VIII-2). On the strength of the second survey, the 8:30-to-4:30 schedule has been made permanent.

- New York Life Insurance Company - Like Westvaco, New York Life made its experimental earlier hours permanent because of the overwhelming affirmation the company's employees expressed in the post-trial survey. These affirmative attitudes to their 8:30-to-4:00 hours were registered by in excess of 80% of employees, whether the groupings were made by department, age group, sex, home location or salary class. A copy of their detailed report is in the Appendix to this report.

Exhibit VIII-2

Westvaco
Intra-Company Correspondence

TO: All New York Office Employees

FROM: Robert R. MacKenzie

SUBJECT: CHANGE IN WORK HOURS - NEW YORK OFFICE

DATE: September 26, 1973

The following are the results of the surveys concerning employee preference to a change in work hours during the four month trial period beginning June 4th, 1973:

	Before Trial Period	After Trial Period
In Favor	75.0%	85.7%
No Preference	9.5%	4.6%
Not in Favor	15.5%	9.7%

Based upon the results, it has been decided to continue permanently on the 8:30 AM to 4:30 PM office hours for the New York Office. If you should have any major problems with the new schedule, please discuss them with your superiors.

RRM:sf

• Sears, Roebuck & Company - Sears' New York office adopted Staggered Hours after conducting an attitude survey in which approximately 65% of its staff took part. Of these participants, about 85% were initially reporting for work at 8:45 A.M. or 9:00 A.M. The attitude survey recorded that three-quarters of the whole work force would prefer to report earlier. For example, some 30% expressed a desire to work an 8:00-to-4:00 schedule. The company chose to split their staff on 8:30 and 8:45 starting times as an initial approach.

• City of New York - An illustration of an informal but nonetheless informative survey was that conducted by the Public Employee Press, an employee union's newspaper, citing an experimental Staggered Hours Program would be initiated among some City employees. Readers were asked to use a survey form printed in the paper to advise the editors of their reaction to the proposal. In a very short period some 300 readers responded. Of this number, 74% expressed a desire to work an earlier than 9:00-to-5:00 tour, 17% desired later hours and 9% were satisfied with their present hours. All in all, 98% of the respondents classed Staggered Hours as a good idea.

D. RECOMMENDATIONS

Project staff is generally satisfied that ample study has been conducted regarding the attitudes of employees and managements to the concept of Staggered Work Hours.

A few recommendations are appropriate however:

1) Since the conduct of 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, may entertain such a survey which has led invariably to their switching schedules.

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 experience from attitude surveys would suggest to be unpopular.

Chapter IX

Benefits

Staggered Work Hours Study

IX. BENEFITS

A. OBJECTIVES

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

The objectives of this section are, therefore, to identify the qualitative and quantitative benefits accruing from a Staggered Work Hours Program. Unfortunately, it has been difficult in most cases to assign definitive dollar benefits, since the benefits involve many subjective measures, including the value of increased comfort and of travel time saved. On the other hand, it may be appropriate to assign as a Staggered Work Hours benefit the dollar value of a new capital project that need not be built if the demand can be sufficiently spread as to be adequately handled by the existing system.

B. WORK PERFORMED

The work performed in determining the range and degree of benefits from a Staggered Work Hours Program included surveys at New York City subway stations to determine the number of seats available in arriving cars, the number of passengers arriving at particular stations, the varying lengths of

time that subway cars would dwell in a station and the calculation of the cost of delay in terms of man-hours. In addition, surveys were made in the lobbies of several Manhattan office buildings to learn the effects of Staggered and Flexible Work Hours on elevator demand and scheduling. Research of published material on peaking and highway and rail travel was also conducted.

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. These 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 long-run benefits are easier to quantify in terms of dollar values than the short-run benefits involving as they do improved levels of service. Each of the areas of benefit are discussed and, where appropriate, illustrated with the results from the Manhattan Staggered Work Hours Program.

C. ANALYSIS

Many cities throughout the world are faced today with ever increasing transit deficits, rush hour congestion and delay on roadways and mass transit systems. While the construction of new facilities can alleviate some of these problems, this is often economically prohibitive because of spiralling construction costs coupled with the likelihood of further operating deficits once the facilities are completed. The heavily "peaked" demand that occurs when many many journey-to-work trips are made only intensifies transit equipment and manpower requirements, which are usually underutilized at all other times.

According to David L. Yunich, Chairman of New York's Metropolitan Transportation Authority, "There's a direct relationship between the success of the Staggered Work Hours Program and improved service on the subway system. A better distribution in passenger flow during the rush-hours will not only relieve congestion, but lead to smoother, more comfortable riding, better operating efficiency, and hopefully increased ridership."

Staggered Work Hours may provide an improved level of transportation service since work hours are shifted to times just outside the height of the peak when there is less demand for transportation service. Ideally, Staggered Hours can result in a uniform demand pattern for an extended time during peak period travel.

The following potential areas of benefit that can accrue to a city as the result of a successful Staggered Work Hours Program were analyzed as to

- Short-run improvements in the Level of Service on transportation facilities, including:
  1) Reduced levels of crowding on transit vehicles, elevators and pedestrian facilities,
  2) Increased operating speeds on transit systems, thereby reducing travel time and the probability of delay.
  3) Reduced congestion on highways, thereby increasing operating speeds while reducing travel times, air and noise pollution and energy consumption, and
  4) Increased overall capacity on transit systems, roadways and pedestrian facilities because of a reduction in peak demands.
- Long-run benefits in that the need for future expansion of transportation systems including roadways, transit vehicles and transit right-of-way may be obviated due to reduced demand levels.

1. Short-Run Benefits

   a. Reduction in Crowding

The degree of crowding encountered in transportation facilities is an important component of the users experience which helps to determine overall satisfaction. A "National Survey of Transportation Attitudes and Behavior", Report 49 of the National Cooperative Highway Research Program,

has shown that almost 35% of respondants had very little or no satisfaction resulting from the crowding on public transit vehicles while only 14% were very much or completely satisfied. For autos, in contrast, about 80% had equal or greater degree of satisfaction than transit riders.

Observations of passenger boarding patterns at the World Trade Center Station of the Port Authority Trans-Hudson (PATH) rail transit system further demonstrates the importance of crowding to public transit users. The proportion of passengers who choose to board the cars as a function of the average number of square feet per standee available was observed. The results clearly indicate, as expected, that the percent who board declines as the number of square feet per standee is reduced.

Although the significance of crowding is widely recognized, it has proven difficult to quantify its impact and to provide valid and consistent measures that are useful to those responsible for planning, designing and operating transportation facilities. There is, however, a body of information which has been reviewed, developed by anthropologists, psychologists, zoologists and other scientists describing human and animal behavior as it is affected by crowding.

More is known about spatial behavior for animals than for humans although, in many cases, studies of animal behavior provide valuable insights into human behavior. Animals have exhibited a territorial need for a certain amount of space and suffer acute stress when minimum individual space cannot be maintained. Although food and water are in ample supply, the death rate of animals tends to rise when population density infringes on space requirements.

The concept of personal space has been developed concerning human behavior. Robert Sommer and others have described personal space as "an area with invisible boundaries surrounding a person's body into which intruders may not come" as well as "a buffer zone which serves as protection against perceived threats to one's emotional well being". Studies by various psychologists have tended to support the hypothesis that extreme crowding has a negative influence on social behavior.

Among the efforts to develop measurement scales for crowding is Hall's Anthropology of Space. His categories of Informal Space are described as intimate, personal, social and public. These breakdowns were based on observations and interviews, and the categories range from less than six inches to twenty-five feet. Fruin has developed level of service standards for use in the design of pedestrian facilities including walkways, stairways and queueing spaces. His standards are based on pedestrian area occupancies and the psychocological and traffic flow impact of these occupancies. Fruin also gives design recommendations for the use of his level of service standards. (A more detailed discussion of these and other materials can be found in the Appendix (L) to this report).

In plain terms, of course, people do not like to be crowded. In addition to the physical discomfort associated with heavy crowding, many feel that crowding lessens their sense of personal dignity and evidences a lack of respect. This is indicated in such common comments concerning crowded transit as "we were packed in like sardines" or "it was like a cattle car". Many residents in urban areas refuse to ride transit during peak periods because "its inhuman".

Besides the excessive crowding that people often take as a personal (or impersonal) affront, it also seems reasonable that comfort and satisfaction can only increase as crowding is reduced (more square footage of space per passenger). People are happier about their trips when they have space to move, to read their book or newspaper and to reduce or eliminate bodily contact. This intuitive feeling that people prefer less crowding is also supported by psychological studies and by direct observations of passengers' boarding behavior.

Riders on the PATH system perceived the increased comfort on service to the World Trade Center terminal as demand in the peak time interval was reduced there by some 25% due to the Staggered Work Hours Program. This meant that one out of every four riders was shifted to a more comfortable traveling period, while those who didn't switch enjoyed a considerable increase in comfort too.

An ideal situation can be characterized as a seated ride for each passenger, which can be considered as "zero" crowding level. While this may be possible -- and indeed necessary -- on premium-fare rail and bus systems, it is economically infeasible to provide everyone a seat on high-volume rapid transit line. For example, on the New York City Transit Authority's IND-BMT system transit cars, there are only from 50 to 70 seats while peak loadings approximate some 220 to 350 passengers. When standing occurs, a convenient general measure of crowding is the average number of square feet of standing area per passenger. This provides a common measure that can be used for any type of transit vehicle. Of course, the interpretation of the measure and setting of a service standard will depend on the particular vehicle design, trip length, and transit system. The same level of moderate crowding that

might be totally unacceptable on a commuter railroad or express bus service in one city could serve as a long-range goal for an overloaded rapid transit system in another city. Each individual city and transit system must establish its own goals and standards based on its own unique characteristics.

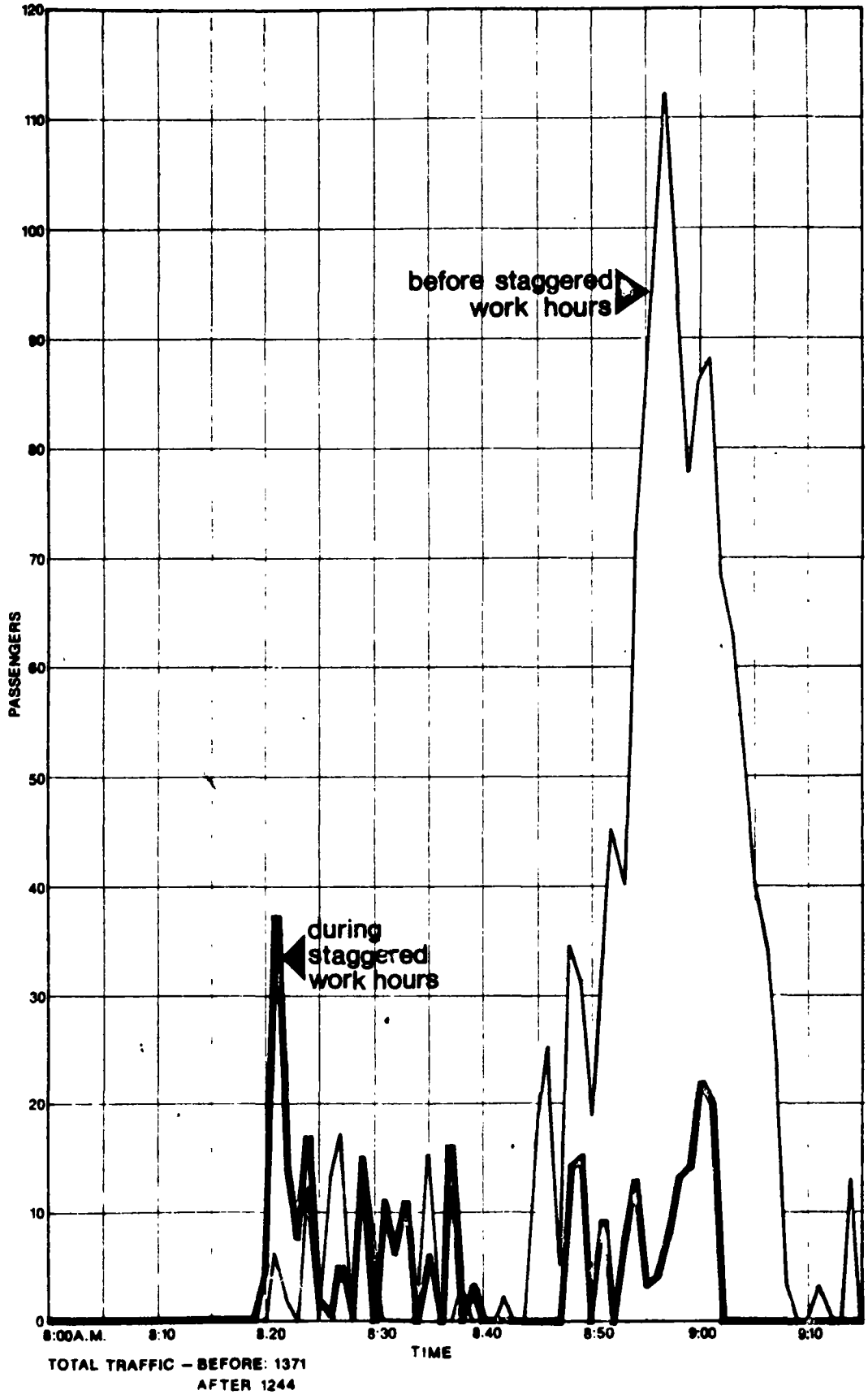
There are several kinds of crowding reductions, and hence benefits, that can be effected through a Staggered Hours Program. These reductions in crowding may favorably affect both the internal systems (within the place of work, e.g., elevators) as well as the external means of travel to work. Such improvement would indicate a successful program, with the maximum crowding reduction for all travelers.

Exhibit IX-1 shows reductions in elevator queues obtained at Morgan Guaranty Trust Company after a large segment of their office building switched to Staggered Hours. The maximum number of passengers waiting for elevators in the lobby was reduced from 110 persons just before 9:00 a.m. to less than 40 after Staggered Hours.

Table IX-1 illustrates external crowding improvements on a transit system for participants in the initial Port Authority experiment with Staggered Hours. It involved an analysis of the likelihood of obtaining a seat as well as the expected crowding for P.A. employees using the 14th Street IND subway station directly beneath their office at the time. Both the chance of obtaining a seat and the opportunity for reduced crowding were improved by adopting earlier departure times in the afternoon peak period.

Exhibit IX-1
Staggered Work Hours Study

MORGAN GUARANTY TRUST BANK
ELEVATOR OPERATIONS
PASSENGERS WAITING FOR SERVICE



TOTAL TRAFFIC – BEFORE: 1371
AFTER 1244

TABLE IX-1

CROWDING ON A, CC & E LINES AT 14th STREET

P.M. Peak Period

Time Period (P.M.)	----Availability of Seats----		Standees
	Likelihood	Average Number	Per Car
4:16-4:30	2/3	15	Up to 30
4:31 4:45	1/2	15	Up to 30
4:46-5:00	1/8	11	Up to 40
5:01-5:15	1/8	10	Up to 70

In general, the trains become increasingly crowded during the period from 4:15 through 5:15 P.M. Until 4:30, 2/3 of the trains have empty seats and an average of 15 seats are available per car. By 5:15, only one train in eight had some available seats and the number of standees increased greatly. The same pattern holds for both the "A" and "E" line trains. This pattern of crowding favors the 8:15-4:15 group.

Commuting questionnaire results were used to obtain corresponding subjective data on subway comfort. Table IX-2 shows the comfort rating of the three schedule periods for the Queens (E train) riders. While there was only a small difference in results for "E" train riders on each of the three schedules, more riders gave a good comfort rating on an 8:15-4:15 schedule then the other two schedules which were in the height of the peak period.

TABLE IX-2

COMFORT RATING FOR THE "E" TRAIN - MORNING

	Poor	Fair	Good
8:15-4:15	47%	26%	27%
8:45-4:45	50%	29%	21%
9:15-5:15	54%	30%	15%

It is difficult to measure changes in crowding directly. Data collection procedures for determining crowding often require extensive manpower and are subject to errors in human judgment. In many cases, however, measurements of arrival and departure patterns at work locations or transit facilities provide an estimate of the reductions in crowding attributable to a Staggered Work Hours Program. This is discussed below.

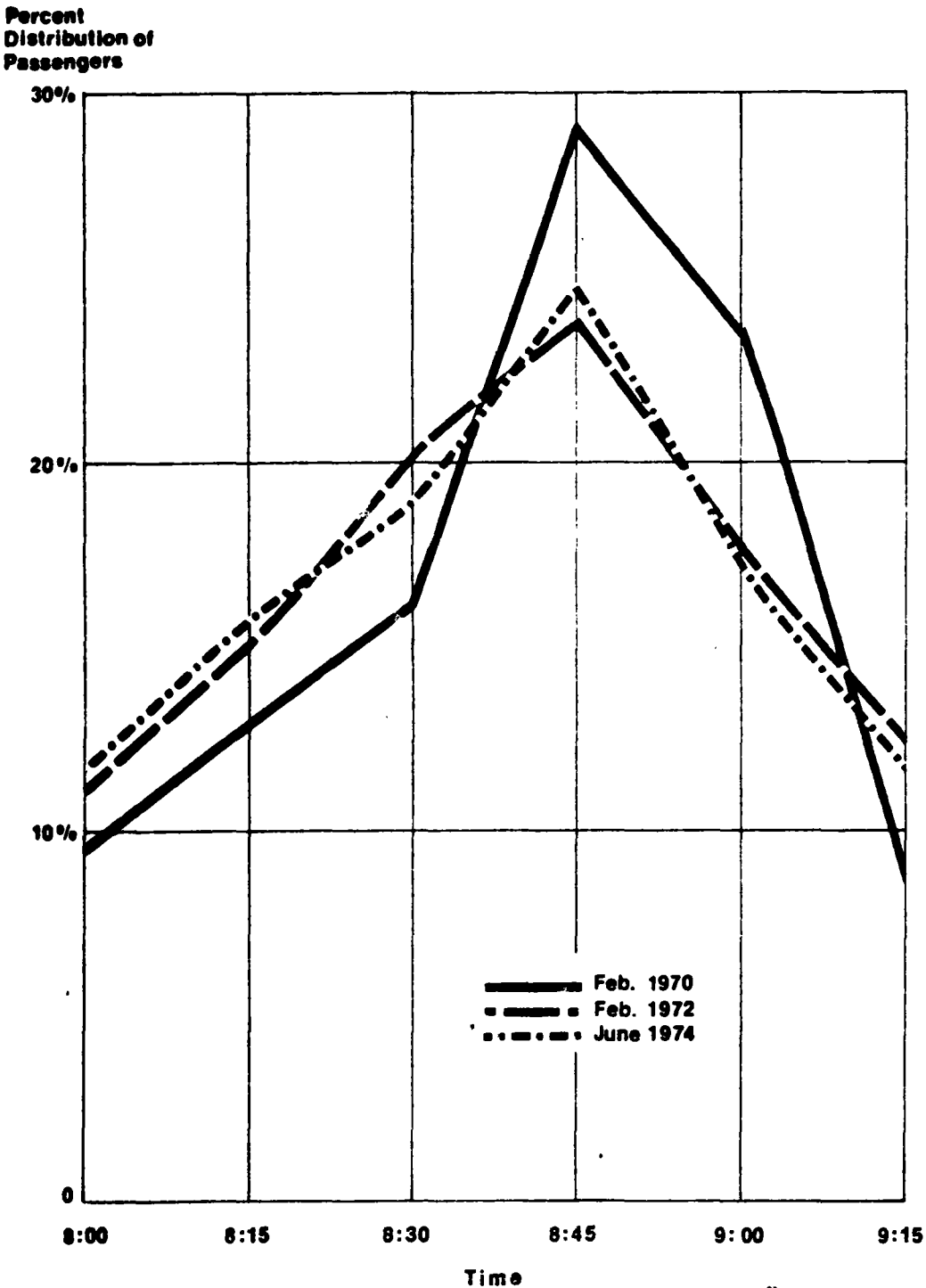
If a large enough participation can be obtained, then benefits of the program will spread to include non-participants as well as those directly involved in Staggered Hours. Theoretically, there will be favorable effects for non-participants as soon as any transportation users are removed from the peak periods. This impact may be so small as to be difficult to perceive or measure. Even the staggering of over 100,000 employees in lower Manhattan did not have a very significant impact on the total pattern of New York City subway traffic into Manhattan's CBD (from Upper Manhattan and the Bronx, Queens, and Brooklyn) which totals over 1.6 million daily with over 500,000 arriving during the 8-to-9 a.m. peak hour. While 100,000 participants may seem like a sufficient number compared to 8-9 subway count of 524,000, it must be remembered that the 100,000 participants include many employees who live outside the city, city residents who use modes other than subway (auto, bus, and ferry) as well as some residents of the CBD itself. In any case, congestion was reduced and measurable "depeaking" was achieved at three subway stations in the heart of the heaviest staggered hours participation as shown in the next section.

i. Changes in Arrival Patterns - Exhibit IX-2 shows how the pattern of arrivals at three subway stations in the area of the Lower Manhattan program were altered between 1970 and 1974 because of participation in Staggered

Exhibit IX-2
Staggered Work Hours Study

Effects of Staggered Work Hours

Passenger Counts at Three Major Downtown Stations



Note: The three subway stations were:
IRT Lexington Ave. Wall St. Station
IRT Seventh Ave. Wall St. Station
BMT Broad St. Station

Work Hours. It can be seen that the sharp peaking that existed between 8:45 a.m. and 9:15 a.m. has been reduced.

Exhibit IX-3 shows arrivals at the Port Authority Building (PAB) before and during the Port Authority's Staggered Hours Experiment. Reduced peaking of arrivals is evident. It permitted the P.A. to eliminate the use of freight elevators as a supplement to regular elevator service when all employees worked an 8:45-to-4:45 work day.

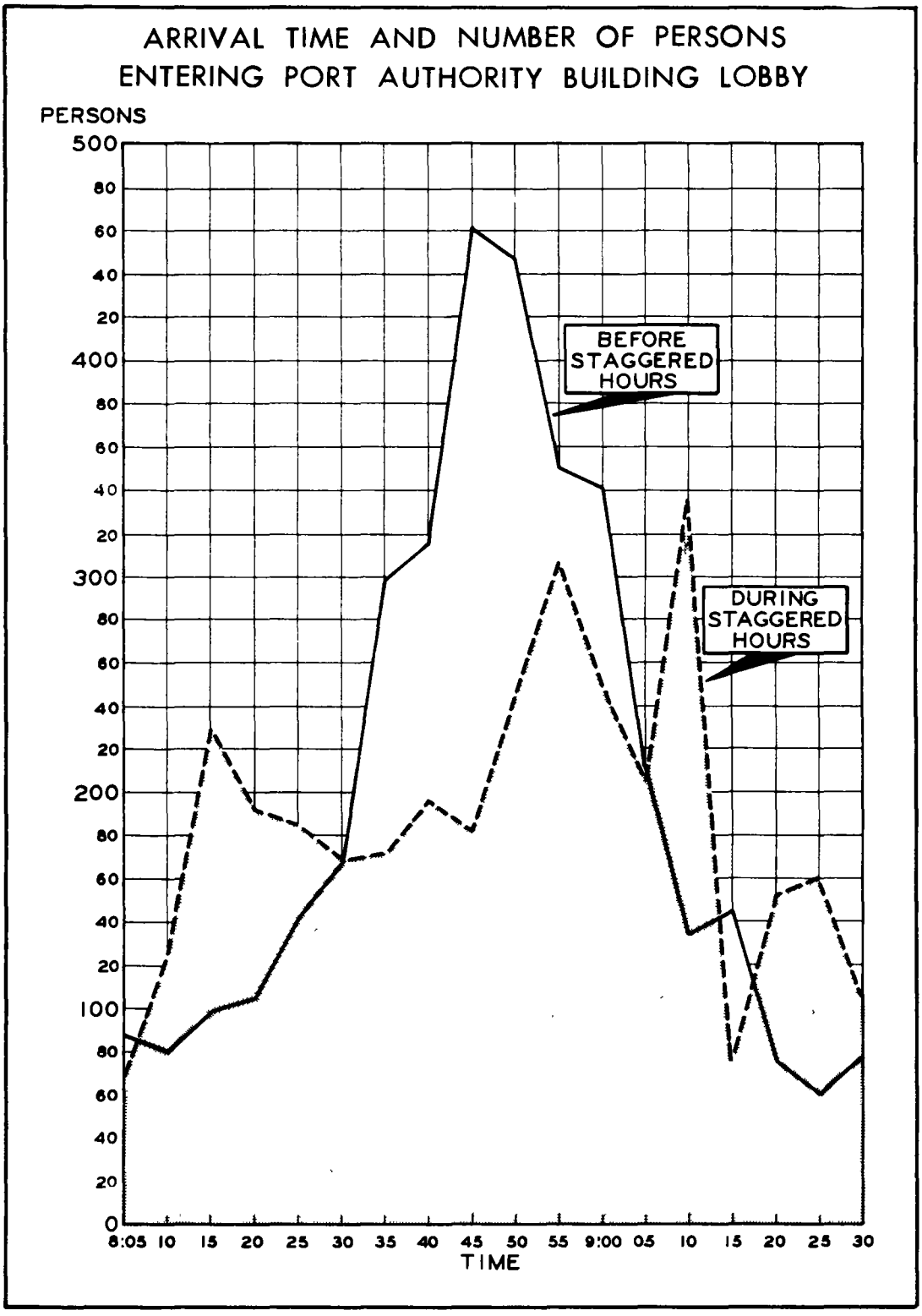
ii. Changes in Departure Patterns - Generally, evening peak departures from work are more intense than the morning arrivals. With a single quitting time, a very large percentage of employees may leave in the peak five minutes since they are concentrated at the work location. In the morning, in contrast, they are arriving from many origin points, leave home at different times and arrive only after a trip which varies somewhat from day to day. Changed Port Authority work schedules impacted the departure patterns at the Port Authority Building and at the World Trade Center. Staggered Work Hours will invariably improve the pattern of departures from work place by spreading demand. It is interesting that while Flexible Work Hours did not significantly affect morning arrival patterns at the World Trade Center, it nevertheless had significant benefits in spreading the evening peak departure pattern. (See Section IV of this report for more details).

b. Increased Transit Operating Speed and Reduced Delay

Employees utilizing mass transit who stagger their work hours outside the peak may realize additional benefits of reduced levels of transit delay, in addition to reduced crowding.

In New York City, a "Transportation Tardy Study" analyzed delays on many different subway and railroad routes and showed that both the

Exhibit IX-3
Staggered Work Hours Study



likelihood and duration of delays increased as the morning peak period progressed. (The Tardy Study is discussed in Section VII of this report.) If 50,000 of the commuter rail riders in the metropolitan New York area moved from 9:00 A.M. to 8:30 a.m. starting times, an estimated 8,500 fewer employees would be delayed each day since the probability of delay was found to be 0.17 less (from .42 to .25). The average reduction in delay per person was determined by the Tardy Study to be 3.1 minutes (from 9.3 to 6.2 minutes) and therefore represents an expected eaily reduction of 440 man-hours. At 200 working days per year per person, this represents over 85,000 man-hours per year. This is, of course, based only on participants in the study and does not take into account further time-saving at other locations due to the potential reduction in crowding (on streets, corridors, and elevators) or reductions in delay in the evening and for non-participants.

One of the reasons Staggered Hours can reduce delays on mass transit systems is that "dwell times" (the period in which a transit vehicle stands at a station with its doors open) are shorter when demand levels are below peak volumes. In a study of dwell times on several subway lines in New York City, discussed also in Section VII of this report, dwell times increase during the peak period as demand increases. This increase in station dwell time indicates that the time for passenger loading and unloading increases due to crowding in the transit vehicles, and that, above a certain length of dwell time, following trains begin to be delayed at shorter peak period headways. This then reduces train speeds. Thus, the peak period passenger often experiences a more crowded ride for a longer time period than his fellow passenger travelling on either side of the peak period. The employee on Staggered Hours on earlier work schedules will benefit most

of all in this regard, since delays and longer travel times are less frequent at the beginning of the peak period but tend to carry over beyond the peak. (A more detailed discussion of the factors influencing rail transit operating speeds is given in Appendix M to this report.)

c. Reduced Roadway Congestion

i. Effects on Delays

The amount of reduction in delay for auto traffic can be estimated from the relationship between average vehicle speed and traffic density. As one moves to a reduced density of traffic, speed will be increased and delay will be correspondingly reduced. (A more detailed discussion of roadway speeds and capacities is discussed in Appendix N to this report.)

An example of the benefits accruing to reduced road delay by Staggered Hours was developed in Riverside, California, where in 1972 some 3,200 persons switched from the predominant 8:00 a.m. starting time to 7:30, 7:45, and 8:15 a.m. starts. This represented about 45% of the 7,000 commuters scheduled to arrive at 8:00 a.m. before Staggered Hours. It was estimated that the time saved through reduced delay for the 12-month period was 140,000 hours of commuter time and $230,000 in vehicle operating costs (including almost 100,000 gallons of gasoline). These estimates are based on traffic counts taken at key ramps and street intersections and on the freeway before and after the implementation. The estimated total daily reduction in travel time was a modest 2-1/2 minutes per trip, or 5 minutes per day per commuter. Yet this small amount for 7,000 commuters over 235 days

per year represents 140,000 hours of commuter time. Even if this time is valued at a low estimate of only $1.00 per hour, the benefit in reduced delay is worth some $140,000. There are also benefits to non-commuter auto drivers and intangible benefits including reduced tension, less wear on vehicles and better conditions for pedestrians on the streets involved.

4. Effects on the Environment

With increasing efforts to improve the quality of our environment, several affirmative action programs have been undertaken both at Federal and local levels. Although major changes in the quality of the environment will result from other broad changes in our society, several work schedule approaches -- including Staggered Work Hours -- may help reduce the level of air pollution from vehicular emissions and thus better the environment. By increasing the speed of vehicles, reducing the number of speed changes, and spreading traffic to avoid peaking conditions, some reductions in the level of air pollution can potentially be achieved. At the same time, fuel consumption, which has lately become another major concern, may also be reduced with higher operating speeds during the peak period.

Noise is another source of environmental pollution, and is basically defined as "unwanted" sound. Though unwanted sound to one person may not be unwanted sound to another perion, there is general agreement on traffic sound being unpleasant to most people. Noise is mainly a subjective considerati and its effects are largely psychological, such as interference with

concentration, hearing, learning or the inducing of secondary phychological stress. There are, however, some objective impacts of high noise levels, such as loss of hearing ability and of sleep. Little relationship was found though in the speeds of traffic and noise level and therefore a Staggered Hours program could not expect to reduce noise levels appreciably.

d. Increased Capacity of Roadway and Rail Transit System

Roadway capacity figures have been developed for relationships between average speed and average lane volumes for various highway configurations and speed limits. In each of these relationships, the average lane volume increases as speed decreases. According to the Highway Capacity Manual. "This relationship holds true throughout the range of free flow and impending congestion, up to the point of critical density, or the density at maximum flow. At and beyond this point, however, it no longer applies; both rate of flow and space mean speed then decrease with an increase in density". Thus, whenever the demand upon a highway creates a condition in which the critical density is exceeded, the actual capacity of the roadway is reduced. If a Staggered Work Hours Program can reduce the peak demand upon a roadway to less than this critical density, the actual ability of the roadway to handle traffic over an extended time can be increased as well as the average speed of vehicles operating on it.

A similar phenonmenon is true on rail transit systems. As the passenger demand level increases, so does the station dwell time for trains since it takes passengers longer to load and unload. As H. Brown

points out in an article, "The Signalling of a Rapid Transit Railway," "The time required for the station stop is the most important of the various factors which influence (headway), and...the value of the factor is mainly dependent on the amount of traffic at the station considered...". As station dwell times increase, the average speed of trains tend to decrease, not only because of increased dwell, but also due to the interaction of following trains which are more closely spaced within the system.

Staggered Hours can also increase the ability of transit vehicles to handle total passenger loads more comfortably if work schedules are spread out sufficiently to utilize a vehicle a second time or more during a peak period. "Getting a second run out of equipment" is most often heard from operators as a real benefit a Staggered Hours Program would have for them. Too often -- in fact, almost always -- transit equipment can only be used once at maximum load during a peak period due to short peak duration and/or long routes travelled. With a spreading of demand to earlier and later schedules, and short-enough "turn-around" times, this benefit can be realized at no cost to the operator. Although transit systems in the New York area have generally long-travel-time runs, a number of systems now operate with a short enough "turn-around time" to begin to take advantage of the spreading of work schedules. These include the IRT #7 Flushing Line subway and the PATH rail transit system connecting New York and New Jersey.

2. Long-Run Benefits

The short-run benefits previously mentioned tend to improve the level of service on various modes of transportation. The long-run potential benefits are that the need for future capital facilities -- roadways, transit facilities or transit vehicles -- may be obviated by the implementation of a successful Staggered Work Hours Program. The reduction in demand effected by such a program may be significant enough so that an acceptable future level of service may be provided without the construction of additional facilities.

The long-run benefits are much easier to quantify in terms of dollar volues than the short-run benefits of improved level of service. It is appropriate, for example, to assign the total capital cost of a new facility as a benefit of Staggered Hours if the revised work schedules will obviate the need for the facility itself. This is not a spurious argument since the traditional concept of building for a design volume incorporates the prevailing peaking characteristics of the flow, where a Staggered Hours effort could evenly spread this flow in many cases. This is discussed further in Section X of this report in the "real" impact of Staggered Hours on the design of transportation facilities.

(Appendix P to this report includes recent costs and trends on vehicle, right-of-way and operating and maintenance costs for new rail transit, bus and highway systems.)

3. Possible Negative Effects of Staggered Work Hours

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. If carpools are widely used for CBD trips and are composed of riders from various organizations, this would lessen the number of carpool riders with a possible resultant increase in the total number of vehicles.

2. If road congestion and delay are significantly reduced, this might in some circumstances lead to a change of travel mode to increased auto usage, which then may cause road congestion to rise again toward its previous levels at the possible expense of ridership on mass transit systems.

3. A significant spreading of demand may increase equipment and/or manpower needs on transit systems due to schedule changes needed to accommodate the new demand patterns.

4. Some employees in areas with infrequent service may experience delays due to longer intervals between trains or buses.

5. Some employees who transfer from one mode to another may similarly experience delays due to schedule deficiencies outside of the peak hours.

D. RECOMMENDATIONS

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 and implement work staggering programs. As an adjunct to this, further efforts should be made to define benefits of reduced crowding and other subjective factors into comparable quantitative values.

Chapter X

Impact on Transportation Design

X. IMPACT ON TRANSPORTATION DESIGN

A. OBJECTIVE

The objective of this section is to obtain a perspective on the impact that the ability to effectively Stagger Work Hours in a CBD has on the design of transportation facilities. In other words, while the ability of Staggered Hours to alleviate operational problems has been amply demonstrated in this Technical Study, this section will examine how one can modify the traditional design procedures used for new facilities assuming work hours are effectively staggered or spread.

B. WORK PERFORMED

A narrative has been developed which broadly examines how transportation facilities are designed, particularly with respect to both the functional as well as the operational design. Several areas were studied, particularly in operations design, which could lead to modifying certain design procedures if the designer could shift demand patterns with Staggered Work Hours. Specifically investigated were operational areas including scheduling, headways, equipment utilization, length of trains and surge loads.

C. ANALYSIS

1. Introduction

The thrust of the urban transportation planning process is to determine the patterns and characteristics of the demand to be served and then to design, implement and operate transportation systems and services to accommodate that demand.

Traditionally, design efforts have thoroughly determined the existing demand patterns and then considered them inviolate except as to magnitude. Relatively little effort, until recently, has been focused on the altering of existing demand patterns to better accommodate existing transportation systems.

In the design of new facilities, therefore, why continue to take this existing demand pattern as a given, especially if it represents excessive peaking within the peak hour? What transportation design factors are important, therefore, if a program like Staggered Hours can be enlisted to revise demand patterns to more efficiently design a system? These areas will be focused upon in the following narrative.

Urban transportation demand has a tendency to concentrate at certain times or in certain locations.

For example, the tradition of concentrated end points of work schedules being correlated with twice-daily commuting peaks has been amply demonstrated throughout this Final Technical Report. Further, in most cities, the demand on transportation systems -- especially in radially-oriented CBD trips -- has an high directionality of flow heavily either to or from the CBD compared with the much lighter flow in the reverse direction.

Recent national efforts to implement Transportation System Management (TSM) techniques make use of the concept of economizing on the travel space and the time of travel. For example, using such innovations as contra-flow exclusive bus lanes, a greater utilization can be made of existing highway facilities instead of building new highway lanes to alleviate the traffic congestion situation. Similarly, work scheduling variations can also reap dividends in spreading out this transportation demand.

While a physical change in a transportation system can be directly controlled by the operators and planners in a region, the concept of adjusting the times when people utilize a transportation system requires an organized Staggered Work Hours program. Given, therefore, that Staggered Hours can be implemented, what is to be discussed in this section is this impact on the design to transportation facilities. The narrative here focusses upon the functional design of a facility and then several areas of the operational design.

2. Functional design

Every transportation system has to be designed for a certain function. Broadly speaking, the function of a freeway, for example, is be to rapidly move people and goods over a medium-to-long distance in a safe manner. Contrastingly, the function of a rail rapid transit line may be to move heavy loads of passengers over a relatively short distance at a moderate speed. There are, of course, many subtleties in the functional design for various systems. In highway design, for example, there are designs for varying "levels of service" to handle certain variations of traffic flow, plus any priorities which are set to expedite multi-occupancy vehicles in the traffic stream.

Since most urban transportation systems suffer from demand exhibiting sharp peaking, causing inefficiency and congestion, a concept like Staggered Work Hours and other work scheduling techniques might be effectively used to modify the functional design of transportation facilities. The various design elements that are used for any new transportation system should therefore incorporate the concept of revised 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.

What are some of these functional design elements? In the design of a new highway, as an illustration, several essential design elements comprise the so-called "design designation". One element is a future peak hour volume called a "Design Hourly Volume (DHV)". The DHV is commonly regarded as the thirtieth highest hourly volume during the year for a future forecast year. Since this DHV is based upon current patterns of peaking with prevailing work schedules, research should be undertaken to see how Staggered Hours could lead to a DHV that was lower if demand could be spread, which could then result in reducing the number of lanes required on the new highway.

Many congested highways already operate under a self-enforcing spreading of the demand when capacity limitations in themselves restrict the absolute number of vehicles for a large portion of the peak period. Increases in flow during the entire peak period during time intervals adjacent to those at capacity suggest a practical desire of motorists to avoid the height of peak congestion rather than a shift in work schedules. Since there is no other growth possible during the height of the peak because of the capacity "lid", any growth in demand would have to be accommodated

during other time periods. Thus, implementation of a Staggered Hours or other work schedule program could be regarded as a practical medium-or-long-range factor into the design of new highways, in order to spread the demand to a level that a highway with fewer lanes can accommodate it.

The Highway Capacity Manual discusses in detail the many aspects involved in capacity determinations including, of course, the concept of peaking within the peak hour. This is determined by calculating the Peak Hour Factor (PHF). The PHF has an impact upon traffic signal timing design which has been effectively incorporated into improved operation of fixed-time traffic signals. Research is therefore needed as to the benefits of reduced travel time delay and "loaded" signal cycles if the peaking can be reduced and timing changes incorporated in the fixed-time signal. (Of course, peaking becomes relatively unimportant for "real time" traffic signal controllers using either actuated equipment or digital computer-control which are both based on actual flow conditions).

The use of reversible bus roadways, priority lanes for multi-occupancy auto vehicles and other techniques are highway applications which may take precedence over work scheduling strategy. This is because, as discussed in Section VII of this report, highways exhibit less peaking than other transportation systems, and therefore will benefit less, if at all, from work schedule changes unless they are relatively major shifts.

Concepts which do have greater ramifications for highway design are future applications in this country of the Four-Day Week and Flexible Work Hours. The impact of these concepts on transportation demand patterns have been discussed in several sections of this report, although the question remains as to the level of acceptance of each in the future. There can

either be transportation advantages or disadvantages for each concept depending on how they are instituted. For example, a Four-Day Week involving everyone receiving Friday off -- which is the most common variation -- would, in the long run, do little to relieve transportation congestion since there would result in no change for the daily commuting on Monday through Thursday, Further, peaking might be more severe since the longer workdays would allow for less range of staggering of starting and quitting times. On the other hand, Four-Day Week applications with staggered days off might be beneficial and substantially reduce the highway's DHV. But, conversely, such a staggered scheme might adversely influence the trend towards forming carpools which, in itself, also has an impact upon highway design in terms of future design hourly volumes.

Flexible Work Hours has implications on the positive side by theoretically allowing people to travel in periods where there is less congestion and more available transportation capacity. Any widespread movement to Flexible Hours, however, should be monitored closely by transportation authorities in order to try to work with the employees in suggesting optimum times to travel. This would reduce the possibility of many people choosing to come at approximately the same time and exacerbating the situation. On the disbenefit side, the wider the flexibility incoming or going, the more encouragement may be given to use the private auto at relatively uncongested times instead of public transportation.

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 many sophisticated models which are currently available. 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. Functionally, public transit systems are better able to handle a spread out, even flow over an extended period. With such a spread flow, a transit system on a close-headway service would be better able to handle demand than at present with severe peaking. The only thing preventing this is acceptance of staggered work schedule adjustments of a feasible nature. As discussed earlier in Section VIII of this report on the benefits of Staggered Hours, reduction of the peak hour volume, or the peak therein, can perhaps on a long-range basis obviate the need for expensive capital additions to incrementally increase system capacity.

What is suggested here is that research should be undertaken to determine an assortment of potential peak hour volume distributions based upon reasonable assumptions of achieving spread out demand with Staggered Work Hours or other potential work scheduling concepts. Of course, sufficient spreading of the demand will theoretically be limitless. In other words, the more the demand is spread, the lower the demand in any given interval. A crucial point which has been made repeatedly in this technical study is that one can reasonably expect only a moderate shift in demand using the work schedule concepts discussed. Fortunately, that degree of shift, usually a half hour, is probably adequate in many cases to benefit transportation

systems to a great degree. Therefore, one can use the adjustment of work schedules, up to a certain degree, as a direct and important input into future facility planning. Of course, if plans are promulgated based in part on a spreading of the demand using work schedule techniques, sufficient funds will have to be allocated to organize and implement a formal and successful work schedule adjustment program to achieve such results.

Another interesting functional design is that for elevators in office building design. Specifically, increased elevator capacity has been mentioned often as possible because of Staggered Hours. The argument assumes that with a Staggered Hours system, or other successful work schedule program, that the number of elevators needed in a building might be reduced since the peaking at any one time would be lower. While elevators certainly can be "decongested" with Staggered Hours schedules, one overriding factor that is overlooked is that elevators are designed for the complete evacuation of a building in the event of fire or other emergency situations. Since this requires a large number of elevators for rapid evacuation capacity, Staggered Hours programs when implemented greatly increase the level of service of elevator operations by spreading out of the arrivals and, particularly, the departures.

3. Operations Design

The following discussion centers on different categories of operations and how they can be more efficiently handled with a spreading of demand by Staggered Work Hours or other work scheduling techniques. The factors are largely pertinent to public transportation systems, since highway and traffic signal systems operate somewhat "on their own" with much less traffic control hardware that is sensitive to peaking characteristics.

a. Scheduling

The scheduling of public transportation systems is a complicated procedure to develop an intricate web of departures and arrivals into a coherent operating schedule. Although there are many factors involved in scheduling, some observations will be made about how altered work schedules can effect the procedure. Ideally, scheduled service should match the existing demand patterns. Depending upon how much work hours are altered, there should be public transit availability for all reasonable staggered hours possibilities. Adjustments can be made, or additional service can be provided, after participation in a program is significant and has resulted in some evidenced problems. Schedule revisions which are usually done periodically through the year should be cognizant of revised work scheduling patterns.

Interestingly, a more exciting prospect is that a Flexible Hours system would have the benefit of allowing the operator to optimize his scheduling with the assurance that individuals could use that schedule on a flexible basis. In other words, persons on Flexible Hours could start and quit work at times convenient to the posted schedules. This is in contrast with Staggered Work Hours, and also the Four-Day Week, where public transit schedules may be hard-pressed to handle riders desiring to travel just outside this time period.

b. Headways

The headway is that time between one vehicle or train and the following one. This approaches a minimum headway as one reaches the operating capacity of that system. At a minimum-headway operation, the slightest delay can cause a breakdown in flow for the duration of the peak period.

When this headway is longer than the minimum, it means that the system can handle the volume satisfactorily. The potential of Staggered Hours and other concepts can allow for the lengthening of headways to a point where operations can improve on these systems and allow for an increased margin for any absorption of delays. For example, a minimum-headway operation on rail transit, which may depend upon the signal system, may be as little as 60 seconds, but may be lengthened to approximately two or more minutes if the demand can be spread sufficiently throughout the entire peak hour. This would not greatly lessen the convenience of service in terms of time frequency but would have many benefits in increasing the operating efficiency of the system in terms of speed and, perhaps, reduced power consumption by the system. Increasing peak hour headways on rail transit systems also benefits operations of complicated switching.

c. Equipment utilization

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. This factor is discussed more fully in section VIII of this report on benefits.

The two factors involved in attaining a second run of equipment are the duration of the peak period and the total "turn-around time" on a specific route. The latter is the time it takes to make one complete cycle. It can be demonstrated that where the peak period is spread sufficiently, transit systems can begin to get two runs out of equipment during a single peak period on certain routes. In theory, this can save the need for buying additional equipment.

Design and operation of transit systems should become cognizant of these factors, particularly as staggering hours or other methods of spreading the demand may enhance the ability to get increased runs out of equipment needed for the peak period. For example, the maximum feasible spread of a peak period in a given urban area should be taken into consideration so as to design shorter travel-time runs on new or existing transit routes. Also, if the spreading of demand can result in less system congestion and therefore improved travel times, especially during the height of the peak, then this in itself may shorten the turnaround time for equipment utilization. An example of this, unrelated to staggered hours, the institution of an exclusive bus lane approaching New York City saved approximately fifteen minutes of travel time for buses. This shortened the turnaround time of a loop park-and-ride bus service an enabled two buses to be as remaining buses provided the same service level since they were operating more efficiently.

While peak periods in a given area probably will not be spread by an unreasonably long amount--since the resistance to this could be great--it can be sufficiently spread to be able to have a significant percentage of equipment used twice. Usually this equipment will run at the start and end of the peak period, in effect straddling the height of the peak. In the case of New York City, if the peak commuting period is sufficiently spread to a time before 8:00 A.M. and through 9:15 to 9:30 A.M., then vehicles and systems having a turnaround time of approximately one hour can be well-utilized both at the earlier and later portions of the peak. Unfortunately, many systems in urban areas are of the variety where there are long turnaround times, characterized usually by a route starting from one part of the city to the CBD and out through it to another part of the city. This is the case on most New York City subway routes. This through routing precludes getting this increased utilization and therefore might be investigated on some routes so as to take advantage of getting double runs during the peak period.

d. Length of trains

The maximum number of cars on a train is a determining factor of the operating capacity of a rail system. On most systems, the trains usually have a constant number of cars, usually constrained by the length of the stations. Length of trains is not usually a capacity problem since headways are adjusted to meet the existing or planned deamnds. However, excess demand can necessitate increasing the length of trains which would, in many cases, requiring the costly lengthening of station platforms. Staggered Work Hours could spread the demand enough to obviate this need to lengthen trains.

Another benefit which Staggered Hours might have is where train length is varied greatly on commuter railroads. While demand patterns on these commuter railroads are less sensitive to having their peak patterns effected by Staggered Hours, as discussed in Section VII, the car length of a train is usually a variable. In the case of extremely long commuter railroad trains, the length in itself can adversely effect speed of operations, and particularly acceleration and deceleration performance aspects. This is especially done with diesel propulsion, although less of a factor for high-performance multiple-unit self-propelled electric equipment.

Another aspect of commuter railroad train length is in the adjustment of transporation services to meet new work patterns. Where single-bus departures and regularly scheduled transit service might require some additional equipment to handle new numbers of people outside the height of the peak, it is a simpler task to adjust the number of cards on a varying-length commuter railroad train to service a different demand pattern. For example, if there is a shift in ridership from a 5:00 P.M. departure to an earlier time period, the train consist can be reused to remove a car from the 5:00 P.M. departure and add it to an earlier train.

e. Surge loads

Many transportation facilities and other places where people congregate periodically suffer from what is commonly called a "surge" loading or movement of people. This comprises a sudden, tremendous volume of passengers, such as emanate from a train discharging passengers at a major station or terminal. Other facilities handling surge loads can be pedestrain walkways, escalators, and elevators in office buildings. At the outset it should be stated that it would be inefficient to design major facilities to handle a surge load which would result in no delay to people. However, surge loads must be a consideration in the design of such systems.

Work scheduling concepts which spread the demand in general can have a profound impact on reducing surge loads and resulting queres experienced at key locations. Where the origin of the demand surge can be specifically determined, that location can be concentrated on to try to spread the demand. For example, a series of escalators in New York's Grand Central Terminal have been a major source of congestion by the surge demand of passengers coming to and from Grand Central Terminal. This is particularly true when a commuter train disgorges passengers. The number of escalators required could be reduced if demand could be sufficiently spread by Staggered Hours or another scheduling concept. In a major transportation terminal, such reduced train loadings combined with even slightly longer headways, could achieve significant results in reducing surge loads and related queueing on fixed stairway and escalators accessing these facilities.

D. RECOMMENDATIONS

The following recommendations are made on the overall impact of revised work schedule concepts on the design of transportation facilities:

1. More research is necessary to determine how the design principles which are used to plan and implement new transportation facilities would be impacted by work schedule strategies which would greatly revise the prevailing demand patterns. Such strategies include staggered and flexible work hours and the Four-Day Week.
2. Where operations are traditionally geared to existing demand patterns, guidelines should be developed which would optimize operational benefits if a certain practical demand pattern could be achieved.

Chapter XI

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STAGGERED WORK HOURS STUDY

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