

STAGGERED HOURS FOR WARTIME

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SYNOPSIS

While this paper is concerned primarily with the alleviation of traffic congestion caused by the national war effort, it is true that basic faults exist which make American cities unsatisfactory places in which to live. It is difficult to move about freely and the inadequacy of transportation facilities is a principal factor in the crisis that has been reached in the affairs of American cities

On top of the ordinary congestion which constitutes such a serious problem is imposed the increased traffic due to war effort in the plants and on the home front

Any transportation facility has a limit to its capacity. Since to carry 1,000 persons to work at nine o'clock requires twice as many vehicles as to carry 500 at seven and another 500 at nine, the staggering of work hours is an obvious method of relieving peak traffic congestion.

The staggering of work hours is applicable to three situations: (1) to a single establishment as a unit, (2) to two or more adjacent plants or to a group of plants in a specific area; (3) to different types of activities such as industrial plants, stores and office buildings. Any or all of these may be used in a complete plan for a city.

Experience in Washington has demonstrated that by this means traffic conditions can be improved; peaks can be lowered and rush hour traffic better distributed. Also allowance can be provided for future increases in employees. Staggering working hours makes it possible to move many more people without increase in facilities.

This paper is primarily concerned with traffic congestion and wartime activity. However this problem would not have arisen if basic faults had not already existed. Let us face this fact; American cities are not satisfactory places in which to live. Traffic and transportation congestion must assume a large share of the blame for this obnoxious but true conclusion. Congestion has distorted and, in some cases, destroyed social and economic values. The mere mention of any American city calls to mind an ugly picture; of an inefficient environment, of snail-pace traffic, tall buildings, commercial activity of all kinds, crowds of people, congestion on the sidewalks, in the streets and on the public transportation lines. It is difficult to move from home to work, from residential areas to employment areas. In short, a crisis in the affairs of American cities has been reached; a crisis produced in large part by inadequate transportation facilities.

Imposed upon this panorama of congestion is America's war effort with its attendant increases and concentrations of workers. There has been a change in the war front, from the field to the factory. Modern war is a battle of machine tools, of production, and it has been conservatively estimated that for every soldier in the field there must be seven production workers in the factories.

Superimposed on the ever increasing problem of congestion in American cities is the problem created by these millions of production soldiers and defense workers. Men must arrive at their work before they can start production. Adequate transportation is vital to war effort, and transportation facilities, already overtaxed, are asked to absorb millions of additional persons.

The present tremendous increases in employees would not be serious if these increases came during the off-peak hours. In recent years the shortening of hours

for industrial employment has further accentuated the peak conditions. It is during these hours that facilities are required, which may be unnecessary during hours of lesser traffic.

It is perfectly obvious that any transportation facility has a limit to its capacity. It is, also, obvious that to carry 1,000 persons to work at 9:00 a.m. requires twice as many vehicles as to transport 500 at 7:00 a.m. and another 500 at 9:00 a.m. It is true that with the putting into service of many additional vehicles, and the provision of the necessary road space and rights of way, the entire working population can be transported simultaneously. This method requires expenditures of billions of dollars and years of construction effort, which is at present vitally needed in war production.

An immediate means of relief, however, is afforded through the staggering of working hours. The primary object of any staggered working hour plan is the reduction of acute peak loads with all its related benefits. This does not mean the removal of any persons or units of conveyance from the streets, but that a portion of those persons and units which cause extreme peaks in the traffic load will be shifted from those peak periods and placed on other times when the load is not so acute.

In the present emergency, the war effort must not be retarded by a breakdown of transportation through congestion. At the present time large-scale construction is out of the question and working hours must be staggered to obtain the use of the same transportation facilities several times during the day. In applying this remedy automobiles and the mass transportation vehicles may make far better use of the streets and move between their points of origin and destination at greater overall speeds. The population will be moved at greater speed and the vehicles themselves will have more facility of movement. The entire community

will benefit from the relief and the prevention of growth of intolerable conditions of rush-hour travel. The demand for transportation will not be concentrated in one particular period but will be spread over several hours and fewer vehicles will be required to carry the same number of persons due to the utilization of many units for a second, third or even fourth trip. Thus the service of transportation, vital for the national war activities, will be materially aided to do its part.

Many objections have been raised to the staggering of working hours. These objections, however, are in the main based on personal reasons and established habits and are not essentially valid. Nevertheless these objections point to the necessity of a competent organizational and educational effort to overcome misunderstandings, bring out the advantages to all, and meet valid objections regarding details. In developing large scale plans, it is usually advisable that the public traffic authorities and the war authorities assume the leadership and sponsor the plans. The aid of chambers of commerce, boards of trade, citizens' organizations and other groups, should be enlisted in the public relations problem. Public understanding of the plan can be promoted through personal contact with the larger employers, through the radio, forum discussions and the press. This job of selling a staggered hour plan to those involved is as vital, and must be handled as carefully, as the surveys on which the plan is based.

Plans for staggering of working hours, and therefore the basic surveys, may vary from the simplest, involving only one or two establishments, to the most complicated, embracing a whole city or industrial region. Consultation and technical assistance in making the surveys and developing the plan should be obtained from all traffic and highway authorities and transit companies involved.

Some staggering of business hours has resulted from a natural process through

which industry, business and Government offices have from time to time individually adopted opening and closing hours with special regard to the comfort, convenience, health and safety of their employees and patrons. Good results have been obtained from this natural process, but, thus far, relatively few are the instances of staggered hours through concerted effort. The war program and the prospect of still worse traffic conditions makes mandatory the efforts of all toward the relief of serious congestion on the streets and highways and the overburdening of mass carriers.

There are three distinct ways in which staggering of hours can be applied. One method may be sufficient, or all three may be required. This depends on the magnitude of the problem and the different types of establishments, such as industrial, commercial and business office, occupying the congested areas.

The staggering of business hours may be first applied to each industrial plant or commercial establishment as a unit. In this case a group of employees may arrive for work at 7:00 a.m. and another at 8:00 a.m. instead of having all arrive at the same hour. This means the staggering of the working hours by departments or divisions within the industrial unit.

Secondly, staggering of working hours may be applied to two or more adjacent establishments or to many plants distributed over an extensive area. Such a plan where adjacent plants have different working hours may be integrated with the staggering within each individual plant.

The third application is to stagger working hours as to type of activity. For instance, industrial plants may open at one time, business establishments at another, office buildings at still another, etc.

These three methods have been called:

1. Intraplant
2. Interplant
3. Interindustry

Any comprehensive, large scale plan for the staggering of working hours may embrace all three methods and have their parts correlated and integrated one with the other.

As a concrete example of the effect on traffic and transit of a comprehensive plan of staggered hours, I wish to cite briefly what was accomplished in Washington, D. C., a city which is a vital link in the war effort and whose efficiency is totally dependent on its transportation system. Washington is a unique city in the fact that a large community has developed which is devoted almost exclusively to the business of government. It was, therefore, comparatively simple to "sell" a plan of staggered hours, as only one employer—the Government—was concerned, although several of the heads of Federal departments objected strenuously for personal reasons.

In December, 1939, there were 126,345 employees of the executive branch of the Federal Government in the District of Columbia, with approximately 30,000 more in the legislative, judicial and military branches. Of this number 113,423, with an additional 76,106 employees of private business, were concentrated in the downtown section. By December 31, 1940, employment in the executive branch alone had in one year risen from 126,345 to 154,680, with 151,507 employees of all three branches of the Federal Government concentrated in the downtown area.

Anticipating these increases, the traffic officials began in the fall of 1939 to collect data on which a comprehensive plan of staggered working hours for the Government could be based. Population growth of the city itself and its metropolitan area was explored, and it was demonstrated how the traffic and transit facilities were affected. Surveys of locations of employment and number employed were conducted over the congested areas of the city. In addition to this an origin and destination survey, including modes of travel of the working population, was

conducted and the information correlated with the existing traffic and transit facilities, car and bus lines and points of congestion.

On the basis of facts developed, the plan for the staggering of Government hours was worked out and estimates made

group in the so-called Federal Triangle, located just south of Pennsylvania Avenue between 4th and 15th Streets, N. W. All of the employees, however, are either in the downtown shopping center or on the fringe of it, so that it would appear that riding to and from the government

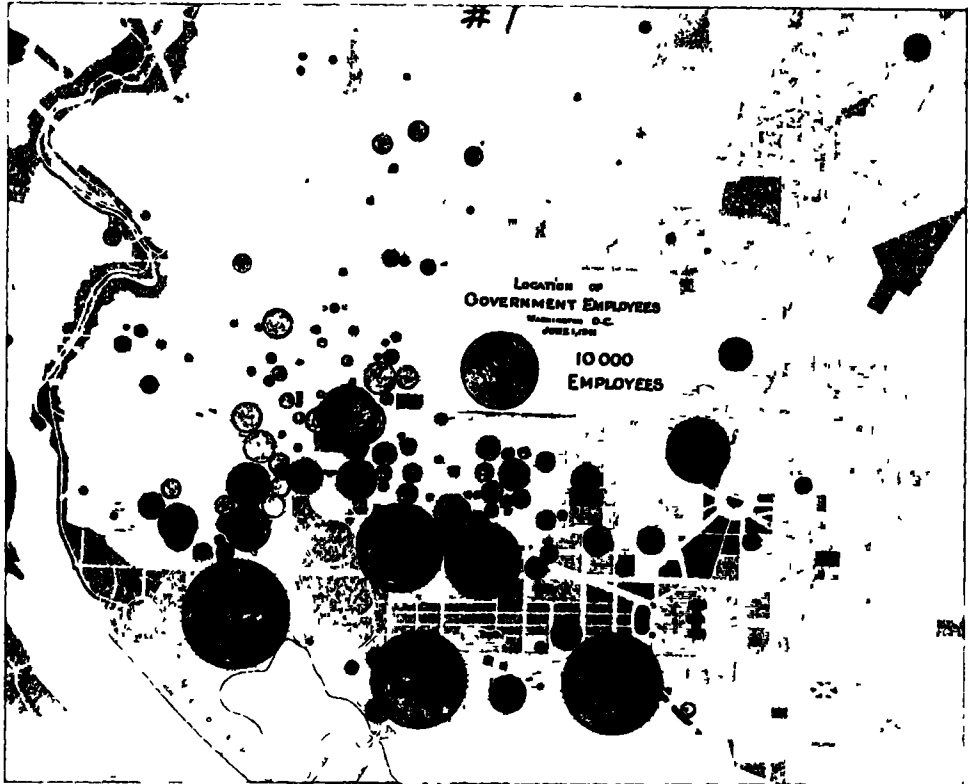


Figure 1

of the reduction and spread of peaks to be expected. After consultation with the heads of the Federal departments, which led to some slight revisions and reassignment of hours, the final schedule of opening and closing hours was signed by President Roosevelt on March 19, 1941, to be made effective on March 31, 1941.

The locations of the principal offices of the Federal Government are indicated on Figure 1. It will be noted that there are four main divisions, the largest being the

offices is superimposed upon the riding to and from stores and offices in the downtown area. However, as early as 1937 the major department stores cooperated with the traffic authorities by setting their opening hour at 9:30 a.m., which is later than the opening hour of any Government department.

As downtown Washington lies in the southern portion of the city, close to the banks of the Potomac River, those concentrations of employees on the fringe of

the central district presented a problem, in that many had to pass through that district in reaching their places of employment, and care to avoid interference between the various groups had to be exercised.

Figures 2 and 3 show the total number of employees in downtown Washington on each starting and closing time before and after the adoption of the staggered hour plan. It is revealed that, in

very substantial change on the chart, the reduction for the morning peak half hour is 16 per cent and for the afternoon 11 per cent, and such a reduction at critical periods is a real improvement. This lowering of the peaks allows the handling of future increases in personnel, but it must be admitted that the decreases were not so much as expected.

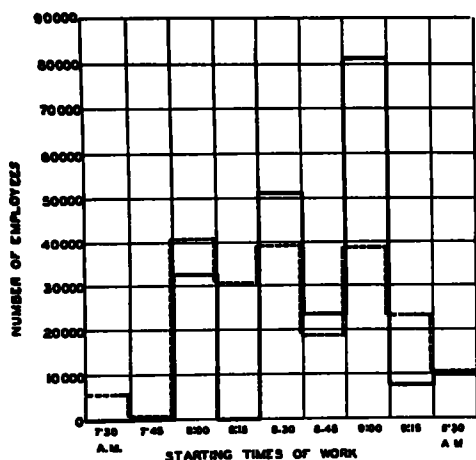


Figure 2. Total Number of Employees, Government and Private, Starting Work by 15 Minutes, in Downtown Washington, for Winter 1940-41, and for Recommended Hours.

Legend

—— Present Hours
 ----- Proposed Hours

both opening and closing hours of business, the peak reporting and quitting times have been reduced from over 80,000 employees to a peak slightly in excess of 40,000 employees.

Figures 4 and 5, show the volumes of vehicular traffic at nine heavy traffic key points before and after the change in working hours. Notice how a more even distribution of traffic was obtained over the morning and evening rush periods, and how the peak half hours were reduced. While this does not look like a

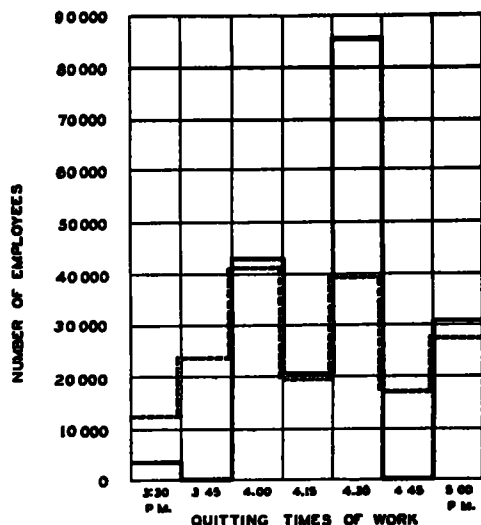


Figure 3. Total Number of Employees, Government and Private, Quitting Work by 15 Minutes, in Downtown Washington, for Winter 1940-41, and for Recommended Hours.

Legend

—— Present Hours
 ----- Proposed Hours

By August, 1941, employment in the executive branch of the Government had risen to 186,931, or an increase from December to August of approximately 32,000, and further increases are expected. These increases have substantially used up the gains brought about by the staggered hours, and it appears that the spreading of working hours should be over longer time periods than those used.

Figures 6 and 7 show the appearance of the traffic at a point on 14th Street before and after the change. Notice the

vast difference in the number of street cars and automobiles. An attempt was made to make the pictures representative of conditions, although it is recognized that there is always a doubt about the representative character of instantaneous pictures. However, a long series of photographs of before and after conditions were taken throughout the down-

car passengers at a typical location in the morning rush hours, on the Mt. Pleasant car line, at 17th and H Streets, N. W. The number of passengers in the maximum 15-min. period, which happens to be in this case 8:15 to 8:30 a.m., was reduced from about 1,350 to 1,050, or by about 22 per cent. On the other hand

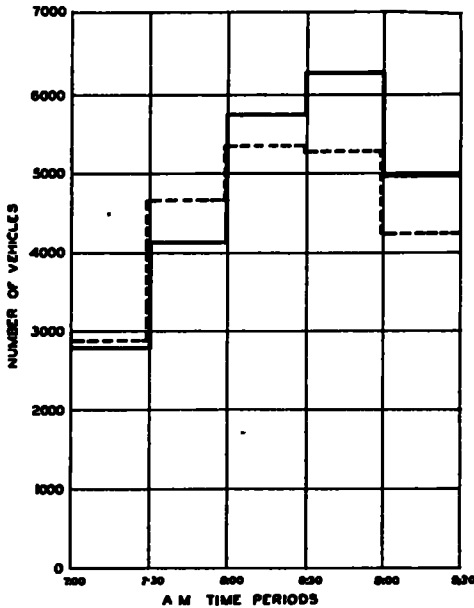


Figure 4. Total Traffic Volumes at Nine Key Points Before and After the Staggering of U. S. Government Working Hours.

—— Before
----- After

Morning Rush Periods

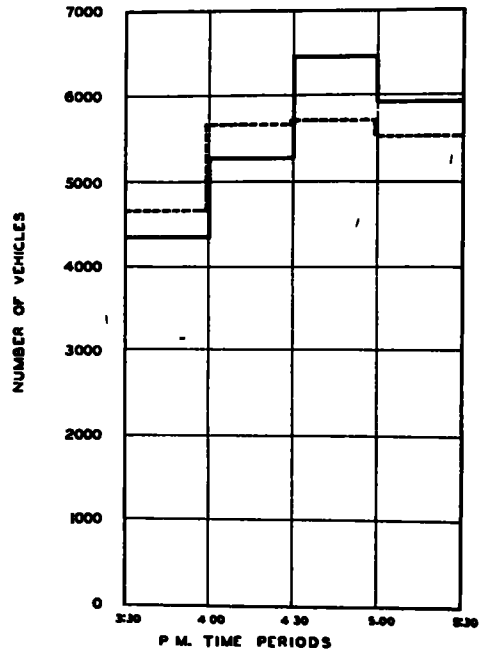


Figure 5. Total Traffic Volumes at Nine Key Points Before and After the Staggering of U. S. Government Working Hours.

—— Before
----- After

Evening Rush Hours

town area, of which these two are considered typical.

Figures 8 and 9 are views of 12th Street, N. W., just north of Pennsylvania Avenue, on Saturday afternoons before and after. These pictures reveal the same conditions as Figures 6 and 7.

The following figures show what happened on principal bus and car lines. The results correspond to the effect on automobile traffic.

Figure 10 shows the number of street

the earlier periods show substantial increases. Notice that there is no sharp 15-min. peak in the after curve as in the before curve. These curves illustrate the two important points—the reduction of peak volumes and the much greater uniformity of the volumes in the several 15-min. periods after the change.

The total passenger load for the 3-hr. period increased by 2 per cent, but the average number of passengers per trip was reduced from 47.5 to 44.2 by the



Figure 6. Looking North on 14th Street, N.W., from New York Avenue, March 28, 1941, at 8:28 A.M.



Figure 7. Looking North on 14th Street, N.W., from New York Avenue, April 22, 1941, at 8:28 A.M.



Figure 8. Looking North on 12th Street, N.W., from F Street, March 29, 1941, at 1:20 P.M.



Figure 9. Looking North on 12th Street, N.W., from F Street, May 3, 1941, at 1:20 P.M.

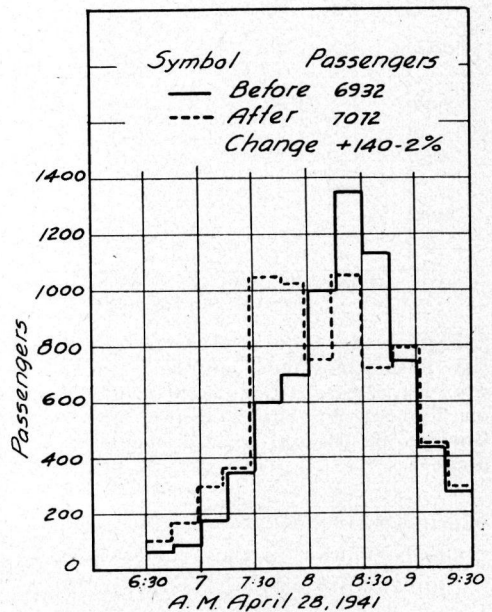


Figure 10. Capital Transit Co. Street Car Passengers Inbound at 17th and H Sts., N.W., Mt. Pleasant Cars, 6:30 to 9:30 A.M., on Typical Weekdays Before and After Change in Hours of Government Employees.

operation of more trips with the same number of street cars.

Figure 11 shows similar changes at the same location for the afternoon period. The reduction in number of passengers in this case for the maximum 15 min. was 16 per cent, from about 1,260 to 1,060. The total number of passengers carried after the change, increased by 6 per cent,

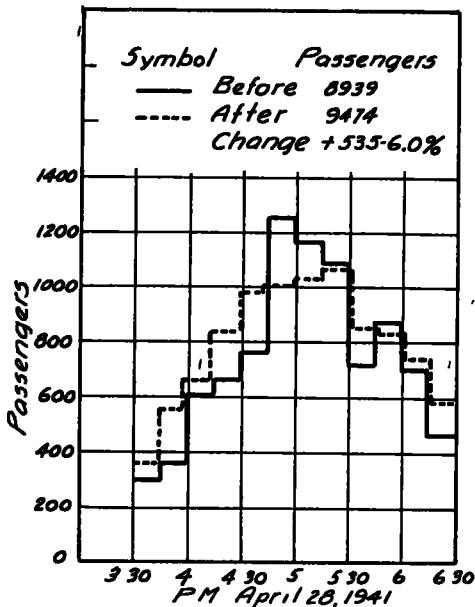


Figure 11. Capital Transit Co. Street Car Passengers Outbound at 17th and H Sts., Mt. Pleasant Cars, 3:30 to 6:30 P.M., on Typical Weekdays, Before and After Change in Hours of Government Employees.

which was readily absorbed by the more even distribution of the load.

Similar information is shown in Figure 12 on one of the heavy bus routes—the Connecticut Avenue line—at Connecticut Avenue and Calvert Street from 6:30 to 9:30 a.m. The 15-min. peak here was approximately 1,380 passengers, which was reduced to a little under 1,100 or by 21 per cent. The same spreading of the peak is apparent, giving more uniform loading over longer periods. The num-

ber of passengers carried for the full period increased 6.9 per cent, whereas the number of passengers per bus declined from 36.8 to 33.2.

Figure 13 shows the same location for the afternoon rush periods with a lowering of the peak by 27 per cent, from 1,145 passengers to 835, with a more even distribution over the entire period, despite

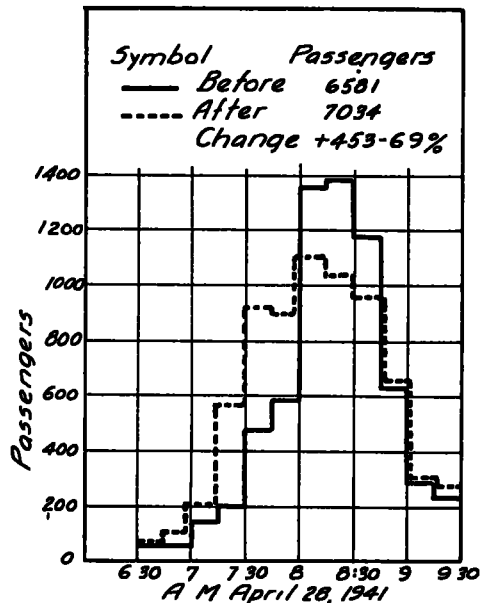


Figure 12. Capital Transit Co. Bus Passengers Inbound at Connecticut Ave. and Calvert St., Connecticut Ave. Buses, 6:30 to 9:30 A.M. on Typical Weekdays, Before and After Change in Hours of Government Employees.

an 11.3 per cent increase in total passengers carried.

Figure 14 illustrates the conditions which prevailed in the so-called Potomac Park area. It will be noted that the opposite to what was illustrated in the other figures took place. The peak 15-min. period increased from 630 to 880, or by 40 per cent. It may be stated, however, that this is not a main line and that passengers carried are still below the estimated capacity of the line.

Corresponding information for the afternoon period is given in Figure 15. Here again the peak has been intensified.

An important consideration from the standpoint of transit patrons and in rendering an attractive service is the question whether the running time was substantially improved during the critical periods. We are all familiar with the slowing up of transit service which occurs during

after the change. The number of trips on time was increased from 17.6 per cent of the total to 56.6 per cent. At the same time the length of trip in minutes over the 3.4-mile section of route to the point of observation was reduced by 17.1 per cent.

The lower portion of Table 1 gives the

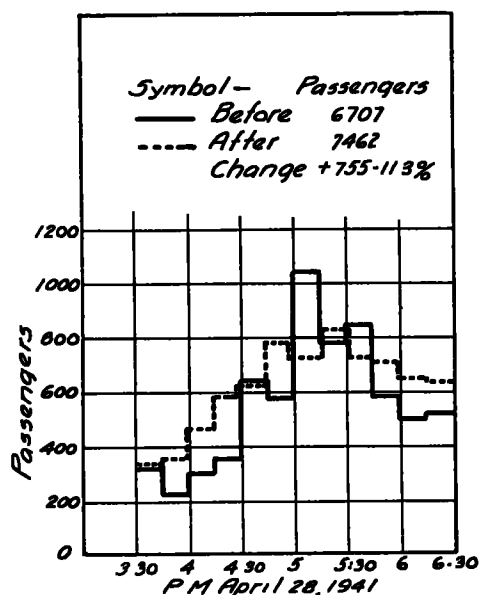


Figure 13. Capital Transit Co. Bus Passengers Outbound at Connecticut Ave. and Calvert St., All Buses, 3:30 to 6:30 P.M. on Typical Weekdays, Before and After Change in Hours of Government Employees.

hours of peak travel due to congestion and frequent stops. Improvement in this condition is greatly to be desired.

Table 1 shows the number of trips on time, late and ahead during the morning rush periods on the Connecticut Avenue bus line before and after the change to staggered hours.

It will be noted that the number of late trips was reduced from 80.1 per cent in March, just before the change in office hours, to 36.4 per cent in August, 1941,

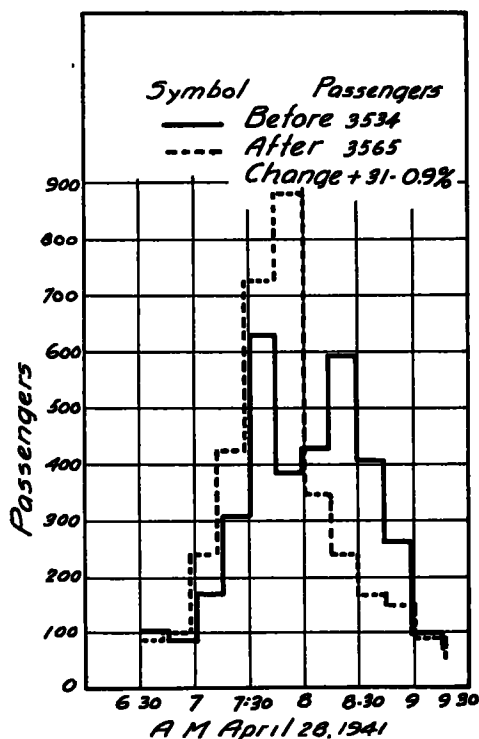


Figure 14. Capital Transit Co., Street Car Passengers to Potomac Park Area at 19th St. and Pennsylvania Ave., N.W., 6:30 to 9:30 A.M. on Typical Weekdays Before and After Change in Hours of Government Employees.

changes between August, 1940, and August, 1941, during which period the service was increased by 45 per cent. During this interval, because of the increased traffic of all kinds, the trips late increased from 19.4 to 36.4 per cent, and the number of trips on time declined from 73.5 to 56.6 per cent. Comparing the March, 1941, figures with the August,

TABLE 1
COMPARISON OF OPERATIONS CONNECTICUT AVENUE BUS LINE
INBOUND AT CONNECTICUT AVENUE AND CALVERT STREET, 7:30 A. M. TO 9.00 A. M.
Before and After Change in Hours of Government Employees

Trips	(Before)		(After)		Change	
	March 1941		August 1941			
	Number	Per cent	Number	Per cent	Number	Per cent
Late	105	80 1	52	36 4	—53	— 50 5
On Time	23	17 6	81	56 6	+58	+252
Ahead	3	2 3	10	7 0	+ 7	+233
Total	131	100 0	143	100 0	+12	+ 9 2
Trip minutes	17 5	.	14 5	. .	— 3 0	— 17 1
Miles per hour..	11 7	.	14 2	. . .	+ 2 5	+ 21 4

Trips	(Before)		(After)		Change	
	August 1940		August 1941			
	Number	Per cent	Number	Per cent	Number	Per cent
Late	19	19 4	52	36 4	+33	+174
On time	72	73 5	81	56 6	+ 9	+ 13
Ahead	7	7 1	10	7 0	+ 3	+ 43
Total	98	100 0	143	100 0	+45	+ 46
Trip minutes	14 0			14 5		+ 0 3
Miles per hour	14 7			14 2	..	— 0 3

TABLE 2
COMPARISON OF OPERATIONS GEORGIA AVENUE-7TH STREET CAR LINE
INBOUND AT 7TH STREET AND MASSACHUSETTS AVENUE, N W., 7:30 A.M. TO 9.00 A.M.
Before and After Change in Hours of Government Employees

Trips	(Before)		(After)		Change	
	March 1941		August 1941			
	Number	Per cent	Number	Per cent	Number	Per cent
Late	45	67 2	19	26 4	—26	— 57 8
On Time	21	31 3	46	63 9	+25	+119
Ahead	1	1 5	7	9 7	+ 6	+600
Total	67	100 0	72	100 0	+ 5	+ 7 5
Trip minutes	30 75		28 25	.	— 2 5	— 8 1
Miles per hour	9 8		10 7		+ 0 9	+ 9.2

Trips	(Before)		(After)		Change	
	August 1940		August 1941			
	Number	Per cent	Number	Per cent	Number	Per cent
Late .	22	37 3	19	26 4	— 3	— 13 6
On time	36	61 0	46	63 9	+10	+ 27 8
Ahead.	1	1 7	7	9 7	+ 6	+600
Total .	59	100 0	72	100 0	+13	+ 22 0
Trip minutes	28 5		28 25		— 0 25	— 0 9
Miles per hour	10 6		10 7		+ 0 1	+ 0 9

1940, figures, we note that operation was relatively bad in March, 1941, and that this situation was corrected to a large degree by the staggering of the office hours, as indicated by the August, 1941, figures.

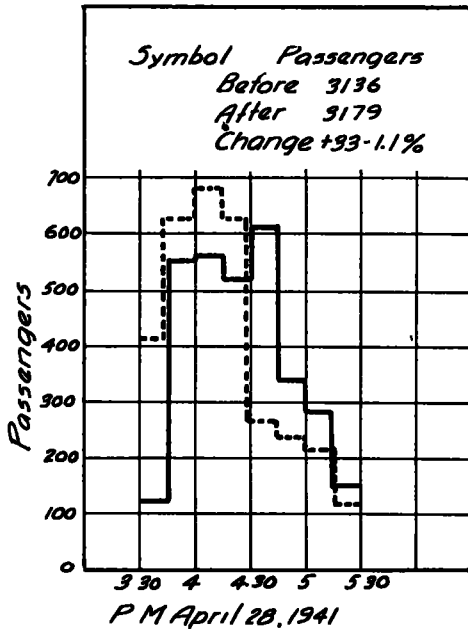


Figure 15. Capital Transit Co. Street Car Passengers for Potomac Park Area at 18th and G Sts., N.W., 3:30 to 5:15 P.M. on Typical Weekdays Before and After Change in Hours of Government Employees.

Table 2 gives similar data relating to operations of the Georgia Avenue-7th Street car line during the morning rush periods of dates before and after the change of office hours. In this tabulation it is noted that 37.3 per cent of the trips

were late in August, 1940, that the situation became worse in March, 1941, with 67.2 per cent late, and that this was largely corrected in August, 1941, after the staggering of office hours, when only 26.4 per cent were late. Again during August, 1940, 61.0 per cent of the trips were on time. This punctuality had declined to 31.3 per cent in March, 1941, and was corrected to 63.9 per cent in August, 1941.

Notwithstanding the fact that service was increased from 59 trips in August, 1940, to 67 in March, 1941, and 72 in August, 1941, the trip time for the five miles was reduced by 8.1 per cent between March and August, 1941.

The sum total of experience with staggered hours in Washington is improved traffic and transit conditions, a reduction in peaks and the spreading of rush-hour travel, allowance for the accommodation of new increases in employees and the transportation of a tremendously increased number of employees without drastic increases in street area, equipment and men to operate the equipment.

Such a program better the life of the whole community besides its importance in the war program and should have the hearty cooperation of all. In these times a long range view or the assurance of a final solution of the problem of transportation is not enough. Immediate relief and the provision of additional facilities for the transportation of the tremendous employee increases are necessary. Staggered working hours—quick, efficient and inexpensive—should be a large item in any such program.

DISCUSSION ON STAGGERED HOURS

MR. ARNOLD VEY, *New Jersey Department of Vehicles*: Which of the three methods of staggering—intraplant, interplant or interindustry—is most objectionable to the employees.

MR VAN DUZER: What do you mean

by objectionable,—the probability of disturbing their domestic life?

MR. VEY: Assuming it is not possible to employ all three types of staggering, which of the three is the least objectionable to the employees or to employers

themselves. I was thinking of whether or not they would seriously object to the staggering of hours intraplant.

MR. VAN DUZER: We are doing both of these. Our intraplant staggering plans are governed by reasons of elevator service, etc. There is one department of 4,500 people with 2,000 who come at 8 a.m. and 2,000 who come at 8:15. It has gotten to the point in Washington where lunch periods must be staggered and even some of the departments have gone back to one-hour lunch periods because it takes so long for employees to get lunch. We used to have an average over all work day in government departments of $7\frac{1}{2}$ hours with one-half hour for lunch, but now some departments have gone to 45 min. and one hour.

We had some objection to this staggered hour plan at first from some men and a few women. Where the husband and wife both work and they both went to work at the same time, there was objection on the part of one or the other, when one had to go to work at 8 and the other at 9. At first it was thought that there would be objections from the parents of children who were taken to school by their parents on their way to work. However, when our survey was made we found that out of 150,000 Government employees in Washington there were only 755 cars that took children to school in the morning.

CHAIRMAN MICKLE: Mr. Braun is Traffic Engineer in Baltimore and may have some comments.

MR. WALLACE L. BRAUN, *Traffic Engineer, Baltimore Police Department*: I don't know the details of what has been done in our lower southeast sections. The heavy industrial area is there. I think there has been some interplant and some intraplant staggering of hours. The West-

ern Electric Company got together with the shipbuilding companies and some co-operation was developed with the Glenn Martin Company to stagger some of the starting times of their employees. I have no figures on definite results. I know that one particular point in the route which most of these workers take has been relieved somewhat.

MR. JOHN B. ECKER, *Research Engineer, Capital Transit Company, Washington*. In Washington it is my impression that there has been no organized disapproval of the plan. There was a slight disapproval in the area of the Bureau of Engraving in the beginning. I think the opposition to it has simmered down now and those opposed have resigned themselves to its operation and there is no material objection at present.

MR. VAN DUZER: Mr. Ecker worked with our engineers on the preparation of the plan. What he said is so, especially of the Bureau of Engraving and Printing. They objected to starting at 7:30 in the morning which is early, in the winter. I was talking to the Director of the Bureau of Engraving one day before the staggered hours were put into effect changing their hours from 8 a.m. to 7:30 a.m. The woman who runs the cafeteria on the top floor of the building and who furnishes breakfast for 1,000, had just happened in to ask him if he could move the elevator service up from 7 to 6:30 a.m. because there were so many employees who came down early to park their cars and get breakfast. I think they are all in favor of the plan now.

MR. BRAUN: A representative of one of the unions in a section of Baltimore where there is a lot of shipbuilding activity was in my office recently and said his union would not listen to any such proposal. I do not know what their objections would be.