# OPERATING RESULTS with

CARS



(W)

Published by Westinghouse Electric & Manufacturing Company

East Pittsburgh, Pa.

# **Results Show . . .**

- Average Revenue INCREASED per car per year 10.1%
- Average Schedule Speed INCREASED 6.8%
- Platform Expense REDUCED
- Accident Expense Trend DOWNWARD up to 30%
- Power Consumption REDUCED

- LOWER Cost Maintenance Indicated
- Transit Industry Standing in Communities ENHANCED
- IMPROVED Employe Morale
- Five Years SUCCESSFUL Operation
- MEETS the Present Day REQUIREMENTS for Operation in Congested Streets

# FOREWORD

The previous edition of "Operating Results with PCC Cars" was accepted by the transit industry with such interest that it was considered desirable to bring the data up to July 1, 1941 and republish it. This, in the interest of promoting a broader use of the PCC car in transit service.

Grateful appreciation is expressed to the transit companies for the data included on the respective PCC car operations.

Credit is hereby given to Mr. W. T. Rossell, President, St. Louis Public Service Company for having started the preparation of this data with the presentation of a paper at the 1938 ATA Convention at Toronto, Canada on "Summary of Results of PCC car operation".

The Westinghouse Electric & Manufacturing Company does not manufacture complete PCC cars but is prepared to furnish proven electric motor and control equipment to car builders who assemble the complete units. Westinghouse engineers cooperated actively in the development of this modern electric street car and will make studies of transit service regarding its application. For additional details request copies of "PCC Cars" B 2152 and "Taking America to Work in PCC Cars" B 3018 from the nearest district office.

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# PCC CARS IN NORTH AMERICA

ransit Company	1940 Population	Total No.	On Order	In Operation	Reported Total Revenue Mileage	To Date	Approximat Average Mileage
Baltimore, Maryland	854,144	200	45	155	11,080,442	7-1-41	71,500
ston, Elevated Railway Boston, Massachusetts	769,520	21		12	429,539	L#-L-7	20,300
icago Surface Lines Chicago, Illinois	3,384,556	83		83	14,302,750	7-1-41	173,000
ncinnati Street Kallway Uo. Cincinnati, Ohio	452,852	28		28	1,371,467	7-1-41	49,000
nsas City fubile Service Co. Kansas City, Missouri	400,175	24		24	1	1	1
s Angeles Kallway Corp. Los Angeles, California	1,496,792	66		95	13,827,058	7-1-41	146,000
cific Electric Railway Los Angeles, California		30		30	474,093	7-1-41	23,015
w York City Transit System Brooklyn, New York	7,380,259	100		100	19,922,662	7-1-41	199,226
iladelphia Transportation Co. Philadelphia, Penna.	1,935,086	260	110	150	3,924,600	7-1-41	26,000
ttsburgh Railways System Pittsburgh, Penna.	665,384	104	100	301	50,657,976	7-1-41	168,500
.Louis Public Service Co. St. Louis, Missouri	813,748	200	100	100	5,131,800	7-1-41	51,318
n Diego Elec. Rwy. Co. San Diego, California	147,897	28		28	4,972,291	7-1-41	177,000
pital Transit Company Washington, D.C.	663,173	232	30	202	17,278,294	7-1-41	85,700
ronto Transportation Commission Toronto, Canada	648,309	250	60	190	18,145,796 (	6-30-41	95,500
itish Columbia Elec. Ky. Co. Vancouver, Canada	246,593	4		4	169,124	7-1-41	42,281
		1956	445	1511	161,904,273		107,000

**Operating Results with PCC Cars** 



# PCC CARS IN OPERATION

The PCC car was developed, designed and built to meet the requirements in cities for superlatively speedy, safe, comfortable electric railway transit service operating under the present day conditions of street traffic, congested or otherwise. The general public, in spending its income, patronizes, in greatest numbers, the theatres, department stores, restaurants, newspapers, etc, and transit services offering the best and most satisfactory value. The PCC car is the transit industry's development to satisfy the appeal of the public for the best in performance, convenience and appearance.

PCC cars have been operating for 5 years and 1511 cars on 15 properties have rolled up a total of more than 161 million car miles in revenue service. In Chicago, New York, and Pittsburgh where substantial numbers of PCC cars are in use, average mileage totals per car of from 168,000 to 199,000 have been made. This indicates the stability of the design and the ability to withstand continuous service.

The table lists the 15 properties and total approximate average mileage to date.

It will be noted that in addition to the 1511 cars in operation that there are 445 PCC cars in process of manufacture and delivery to 6 properties. This is the largest number of PCC cars ordered in any one year.



#### **Revenue and Traffic Increase**

The most satisfactory result of operation with the PCC car continues to be the very definite ability to attract new passengers and thereby increase the gross revenue. Now in operation on some properties the fifth year, the gross earnings on lines operated with the PCC cars are not only holding the gains of previous years but are making still further increases.

In fact the PCC car has proven a most excellent "silent salesman" for the transit industry in that where operated it has reversed the downward trend of the street railway traffic curve.

In the table at left, 14 properties operating 1486 PCC cars show an average increase in revenue per car operated of 10.0 per cent. While the actual cash increase in receipts varies somewhat for different lines, it has amounted to \$5,725 per car per year for a 33-car route in Brooklyn and to \$4,000 per car per year for a 40-car route in Los Angeles. In St. Louis, Mo. a 34-car line with the inauguration of PCC car operation developed an increase of \$2004 per car in receipts for the first 6 months. These are excellent returns on the cost by new PCC cars.

In Baltimore a very small increase is indicated on two lines because modern cars were replaced. However, the modern cars replaced undoubtedly increased receipts on another line in replacing still older cars. On a third line in Baltimore traffic increased 10% with the introduction of PCC cars.

In Washington, D.C. only a slight intangible increase was reported. However, both Washington and Baltimore have recently purchased additional PCC cars.

Other properties viz: Shicago, Philadelphia, Pittsburgh, San Diego and Toronto have reported substantial increases in receipts varying from 6 per cent up to 23.15 per cent from new PCC cars operated.

#### Schedule Speed Increase

The PCC car was designed for the prime purpose of affording to the public, the maximum of transit speed operating safely in frequent stop service under the conditions of congested street traffic in the business districts and as much speed "as the law allows" in the residential sections. That this result has been achieved is testified to by the universal increase in speed with the PCC car on all routes except where old type cars operating on the same lines prevent the utilization of the speed characteristic of the PCC cars.

The table at left indicates the results of 14 properties operating 1486 cars. An average increase in schedule speed, including all stops and slow downs, of 6.8 per cent is indicated. Of the 85 routes in various cities, 17 routes in 8 different cities reported no increase in speed due to operation of older cars on the same routes. 68 routes out of 85 reported increases in speed varying from 2 per cent up to 15 per cent.

Increased schedule speed, with the safety and comfort as afforded by the FCC car, means more satisfied passengers, and less cars to perform the same gross daily car mileage. It also means that more mileage per car per day is possible and less minutes between cars passing a given point on a route at no increase in platform expense.

#### Platform Cost Decrease

PCC cars offer possibilities of reducing platform cost in two different ways.

- 1. Substantial savings in platform expense are possible on lines where old cars running on all or part of the same trackage do not retard the operation of the high speed PCC equipment. The PCC car performs a given schedule easier and faster than possible with old cars due to the high yet smooth rates of acceleration and braking and a balancing speed comparable to modern automobile performance in city traffic.
- 2. One-man operation of street cars was made legal and standard railway practice about twenty years ago with the invention and perfection of the safety car devices. Forced on the transit industry by the "Jitney" and the gas bus it has become almost universal practice in the United States. On some of the few properties remaining where two-man operation has been the operating practice, it has been possible to change over to one-man operation with the introduction of PCC cars. The standard PCC car is designed for safe operation by one man.

Data tabulated below gives typical savings percentages reported on platform expense reduction on fifty routes in five cities with 718 cars operating.

Location	Route	No. PCC Cars	% Reduction Platform Expense Due To PCC Cars
New York	Smith-Coney Island McDonald Vanderbilt	45 38	5.5 10.
Chicago, Ill.	Madison Street	83	10.8
Pittsburgh, Pa.	40 different	301	11.7
Washington, D.C.	14th Street Mt. Pleasant 7th Georgia Ave. Maryland Cabin John	50 55 39 20 15	37. 35. 35. 22. 43
Philadelphia, Pa.	53-Wayne 56	23 49	1.3 2.6
	Total	718	

Due to the improved design of the PCC car boarding and alighting accidents have decreased sharply on most properties. In some cities, due to the higher accelerating and braking rates and running speeds of the PCC cars compared to the older type cars, accidents with pedestrians and automobile drivers have increased slightly. However, with the public and the street traffic becoming familiar with the speedier characteristics of the PCC car accidents have later decreased. On the whole accident and damage expense has decreased with PCC car operation.

The improvement in the accident situation is attributable to:

- 1. Improvement in rolling equipment.
- 2. Greater expertness on part of operators.
- 3. Carefully designed entrance and exit features of car.
- 4. Street traffic becomes accustomed to quieter and speedier street cars.

In the table below will be found data reported on accident reduction by three properties operating a total of 476 cars on 44 routes.

Location	Route	No. PCC Cars	% Reduction In Accidents Due To PCC Cars
New York, N.Y.	Smith-Coney Island McDonald Vanderbilt	33 37	24 16
Pittsburgh, Pa.	40 different	301	24
Washington, D.C.	14th Street Mt. Pleasant	50 55	30 15
	Total	476	

Although a number of properties have not segregated and made available the accident data on the routes operated with PCC cars, it is apparent from the tabulated data that there should be considerably less injury and damage to persons and property, less litigation and accident expense from lines operated with the PCC type car than with older equipment.

#### Energy Consumption

The kilowatt hours per car mile for propulsion purposes, with the operation of PCC cars has in general increased slightly due to the higher schedule speeds and the use of parallel control. This is particularly evident in tests made during the summer months and on the Pacific Coast where electric heat is not required during the winter. When electric heat is required, the energy from the accelerating and dynamic braking resistance is used to heat the cars with the net result that in colder climates during the winter months, the PCC car actually requires less total kilowatt hours per car mile of power than older cars.

#### Maintenance Expense

Approximately 1486 PCC cars have been in service on 85 different routes in 14 cities for varying periods of time up to five years. Operating a total of over 161 million revenue car miles of service with the average mileage per car over 175,000 car miles on four properties; it has been desirable to undertake general overhauling programs as well as to carry on current inspection and maintenance.

However, from the experience to date, superintendents of equipment and managers indicate that they are securing substantial savings in the maintenance of PCC cars as compared with older cars. This is particularly so on properties where there are sufficient PCC cars with which to operate an appreciable percentage of the base schedules.

Operating and maintenance personnel throughout the respective departments of the different properties have universally shown pride, pleasure and technical interest in operating and maintaining the PCC cars in the approved manner and at the lowest possible cost.

#### General

In the following pages will be found a brief detailed report on the results of PCC car operation on transit properties in the following cities: Baltimore, Md.; Boston, Mass,; Chicago, Ill.; Cincinnati, Ohio; New York, N.Y., Kansas City, Mo.; Los Angeles, California; Philadelphia, Pa.; Pittsburgh, Pa.; St. Louis, Mo.; Vancouver, British Columbia; San Diego, California; Toronto, Canada; and Washington, D.C.

PCC CARS were not operating in Kansas City, Mo. on July 1, 1941 so results are not included in the previous tables.



# **OPERATING FEATURES OF NEW PCC CARS**

The photograph above shows the operating mechanism at the operator's position on the new "PCC" cars as noted by the various numbers and letters as follows:

1. Gong. Push forward to ring. 2. Front right door. Push forward to

- open and back to close. 3. Right hand center door. Push for-
- ward to open and back to close. 4. Left center door. Push forward to
- open and back to close. Car cannot be operated with center doors open. 5. Track switch for operation of elec-
- tric track switches. To operate electric switch to go to the right, operator must push the switch forward. To go to the left, car should coast under the electric switch pan.
- Spare switch. Not used.
  Auxiliary heater switch. Push forward to obtain additional heat.
- Motor generator. Must be kept in "on" position at all times when car is in service.
- 9. Headlight and markers.
- 10. Dimmer.

- 11. Sander. Push forward to sand rail.
- Cab heater.
  Interior lights on left side of car.
- 14. Interior lights on right side of car.
- 15. Spare switch. Not used.
- A. Operators Ventilating Sash Holder.
- B. Windshield Wiper Valve.
- C. Volt Meter.
- D. Air Gauge.
- E. Door Signal Light.
- F. Sensitive Door Edge Signal Bell.
- G. Passenger Signal Buzzer.
- H. Interlock Pedal.
- J. Brake Pedal.
- K. Power Pedal.
- L. Hand Brake Lever.
- M. Hand Brake Release Lever. N. Reverse Lever.
- P. Adjustable Seat Pedestal.
- R. Fare Box.
- S. Fuse Cabinet.
- T. Operator's Curtain.

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# **BALTIMORE TRANSIT COMPANY**

Baltimore, Maryland

Total	No.	of	PCC ca:	rs					
Total	PCC	car	miles	run	to	July	l,	1941	

155 11,080,442

PURCHASED AND ORDERED

No.	of Cars	Date	Car Builder
	27 40 39 49	Dec., 1936 July, 1939 Dec., 1940 1941	St. Louis Car Co. Pullman Standard Car Mfg. Co. Pullman Standard Car Mfg. Co. Pullman Standard Car Mfg. Co.
	45 200	On Order	Pullman Standard Car Mfg. Co.

#### ASSIGNMENT

Lines	PCC Cars Assigned	Service	Round Trip Miles	Territory
31 25 15 19 32 5 14	17 10 40 20 21 21 11 15	Base Base Base Base Base Base Base Base	14.68 19.36 32.56 18.50 17.72 19.98 16.84 16.82	5 mi. congested 5-1/2 mi. congested 8 mi. congested 4 mi. congested 6 mi. congested 5 mi. congested 7 mi. congested 4 mi. congested

#### FIRST GROUP OF 27 CARS:

These cars are assigned to base service on the Nos. 31 and 25 lines. Cars added for peak operation are one-man high speed cars with automatic control, purchased in 1930, the same type operated prior to installation of the PCC cars. For this reason there was no appreciable increase in schedule speed. There was apparently a small increase in revenue, despite the fact these two lines were relatively modern before the PCC cars were added. Both the speed and revenue were materially increased at the time of the installation of the 1930 cars. The 27 PCC cars have averaged 217485 revenue miles per car to July 1, 1941.

#### SECOND GROUP OF 40 CARS:

These cars were placed in base service on the No. 8 line, a through-routed line extending into the country on each end. The added peak service is supplied by the same cars formerly operated, which are of the two-man semi-convertible type. There was a slight increase in schedule speed and about 10% increase in revenue in the first year as a result of the operation of the PCC cars.

#### LATER GROUPS:

Of the remaining five lines equipped for base operation with PCC cars, the 19 and 32 were previously equipped with the 1930 high speed cars, which now supply the peak service. The 15 and 5 were previously equipped with remodeled one-man cars of the semi-convertible type, which now supply the peak, and the 14 line was previously equipped with two-man cars of the semi-convertible type, which now supply the peak. All of these lines have shown an appreciable increase in revenue and a slight increase in schedule speed.



On the Watertown Line 33 cars are required in A.M. and P.M. rush hours and 18 in normal hours. During middle of day and after 7:00 P.M. the route is fully equipped with PCC cars. For rush hours, another type of car is used to make up the car requirement.

Because of comparatively short time in operation, operating in rush hours, with other types of cars, and at all hours over a substantial part of the route with cars and trains on other routed, specific figures as to revenue, speed, costs, accidents, etc. are not available.

# **BOSTON ELEVATED RAILWAY**

Boston, Mass.

	Arborway Sta.	Watertown Sta. Total
Date PCC Service Started Total No. PCC cars	July, 1937 1 (Sample Car)	March, 1941 20 21
Total PCC Car Miles run to July 1, 1941	158,988	270,551 429,539
Routes on which PCC cars are used	2251 Chas.River to Forest Hills	3200 Watertown to Park St. Sub.
Service (Headway)	Rush 2 Min. Normal 8 Min.	Rush 2 Min. Normal 4 Min.
Round Trip Miles	8.878	15.255
Territory	Residential through two local shop- ping areas to rapid transit terminal	Residential Two local shipping areas open reservation 4-1/4 miles Boylston St. Subway 4 miles



# CHICAGO SURFACE LINES Chicago, III.

Total No. of PCC Cars Total PCC Car-Miles run to J	uly 1, 1941	83 14,302,750
Lines Equipped	Madison Austin	Madison 5th Ave.
No. of PCC cars assigned Service Round-trip miles Territory	83 Complete 15 Level;2 miles of congested territory	 Base 10.24
Revenue increase, per cent Reduction in platform cost per passenger carried, per Schedule speed increase per A.M. rush. Base P.M. rush. Evening.	r cent	17.5 10.8 7.60 8.20 9.70 7.25 8.80
Headways, minutes A.M. rush Base. P.M. rush. Evening	Befor PCC 1.14 1.76 1.20 2.44	With PCC 0.96 1.58 0.86 2.23

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The first PCC Cars were placed in service November 13, 1936; all in service February 18, 1937.

The Chicago car is the largest and heaviest of the PCC cars built to date. It is 50 feet 5 inches in length and 8 feet 9 inches in width and is provided with center exits and a rear automatic exit door. Weight 35,640 lbs. in comparison with approximately 33,000 lbs. for the standard PCC car. All operations with two men. Seating capacity 58 passengers.

The Madison Street Line operates on level streets; double track throughout. Street width one third route, 80 feet; balance varies 52 to 38 feet. The increase in traffic of 11.5 per cent due to PCC cars was reflected equally in the number of new revenue and transfer passengers. Platform cost reduction per passenger of 10.8 per cent on these 2-man cars was 8 per cent due to improved speed characteristics of the PCC cars and 2.8 per cent to greater seating capacity. The average all day schedule speed increased from 11.48 to 12.35 m.p.h. or 7.6 per cent. The accident record has been at least as favorable as with the older cars. Power consumption shows a slight increase for the PCC cars as compared with the older cars during the summer. During the winter this condition is reversed in favor of the PCC car.

The Chicago Surface Lines are going through legal proceedings leading to the unification of transit services in Chicago. The City of Chicago is active in the conclusion of this reorganization

An ordinance providing for a unified local transportation system was passed by the Chicago City Council on June 19, 1941. This ordinance, contingent on its acceptance by the companies, provided for the acquisition of 950 new street cars of modern design and, in addition, a sufficient number (estimated at more than 1,000) of new street cars or motor vehicles to replace all of the older street cars now operated in Chicago.



# THE CINCINNATI STREET RAILWAY COMPANY

Cincinnati, Ohio

Total No. P.C.C. Cars Total P.C.C. Car Mile	s run to July 1,	28 , 1941 1,371,467
Lines Equipped	Route 4 Kennedy Height	Route 21 Route 69 Sestwood Madisonville
No. of Cars Assigned Used in Base Service	9 8	11 8 10 7
Other Cars added for rush hour service	6	11 13
Round Trip Miles	17.05	15.23 19.00
Territory Served (all routes terminate in down- town Cincinnati)	Residential some industrial thru 4 business sub centers Bus competition	Residential Residential some large industrial, high school thru 4 thru 6 business business sub centers sub centers Bus Bus competition competition
Schedule Speed, carhouse to carhouse Schedule Speed, terminal to terminal (a) rush hours (b) midday base (c) night base	11.26 11.53 12.52 13.50	11.03  12.17    11.25  12.42    12.16  13.93    12.85  15.22
Grades	3250 ft. 5.73%	6830 ft. 5400 ft. 4.28% 5.86%
	2300 ft.	500 ft.

Following a short period of experimental operation with 3 modern cars by three manufacturers 26 additional P.C.C. Cars were ordered in December, 1939. These cars were placed in service beginning in September, 1940 following Civic celebrations and demonstration rides to the heads of the local Civic Clubs.

The plan followed in Cincinnati is to place the cars in base service to secure the P.C.C. car advantages for as many passengers over as many miles as possible. Rush hour service is added by older equipment, most of it by one-man cars and some of it by cars with rewound motors which are fully as fast though not as smooth in performance as the P.C.C. cars.

The Madisonville line was already being operated by high speed one-man cars and no economy was effected either through higher speed or conversion from two-man to one-man operation. Revenues improved slightly but this factor was adversely affected by a cut in fare on a competing bus line.

The Kennedy Heights line was converted from two-man old-style slow cars to P.C.C. cars operating with one-man. Due to joint operation with other lines over more than twothirds of the route, no very great increase in speed could accomplished. The economy of one-man vs. two-man operation was secured. A competing bus line installed new equipment about the same time so that the increased revenue was only nominal.

The Westwood line was converted from two-man to one-man operation upon the installation of P.C.C. cars but a new bus line serving part of the territory and some disturbance due to a long stretch of track rebuilding adversely affected the revenue showing.



# LOS ANGELES RAILWAY CORP. Los Angeles, California

Total No. of PCC C Total PCC Car-Mile	95 13,827,058		
Lines Equipped "P E	"-West Pico ast First	"3"-West Sixth Larchmont	"J"West-Jef- ferson Hunt- ington Park
No. of cars assigned Service,% of base Service,% of rush Territory C B di c	40 100 68 rosstown usiness strict in enter	23 100 57 From residen- tial district S.P U.P. terminal	32 100 57 Crosstown and Outlying
Rev.increase,%	12	10	10
yr.	\$4000	\$ 3000	\$ 3000
speed mph.	11.22	11.35	11.54
sp.	10.10	10.24	11.20
incr. % Sundays	10-12	10-12	10-12

Sixty PCC cars were placed in service August 24, 1937; thirty-five additional cars were placed in service February, 1939.

The "P" Line operates from a west terminal through the central business district to an east end terminal. The entire line is heavily traveled and through congested streets with extremely heavy automobile traffic. Streets are 56 feet wide with parking permitted. The 12 per cent revenue increase is "new business".

The "J" Line operates from a west terminal through the central business district to an east end terminal. The entire line is heavily traveled and through congested streets with extremely heavy automobile traffic. Streets are 56 feet wide with parking permitted. The 10% increase in revenue is new business.

The No. "3" Line operates from a west end terminal into the central business district. The line has heavy auto traffic in the residential district and in the business district streets are narrow and very congested. The revenue increase of 10 per cent is due to new passengers, not taken from other lines.

Schedule speeds due to the use of PCC cars on these lines shows little increase except on Sundays when 10 to 12 per cent increase is accomplished. This is due to operation of old cars of other lines over part of the routes, frequent traffic signals outside the business district and heavy automobile traffic. Accidents have a tendency to decrease on the property although not directly creditable to PCC car operation. Energy consumption shows some increase due to parallel control and faster accelerating rates. Savings due to dynamic braking energy being used for heating the cars is not a factor in Los Angeles as heat is not required.



# PACIFIC ELECTRIC RAILWAY COMPANY

Los Angeles, California

Total Number of P.C.C.	Cars	30
Total P.C.C. Car Miles	Run to 7/31/41	690,474
Lines Equipped G	Los Angeles- lendale-Burbank	Hollywood- Venice Short Line
No. P.C.C. Cars Assigned	17	13
Service (percent of total requirements)	44%	21%
Round-trip Miles	24.60	51.36
Territory	Level - Half congested, Balance Open.	Level - Operation through congested downtown Los Angeles and Hollywood business districts.
Schedule Speeds:	16.0 m.p.h.	14.2 m.p.h.
*Peak	14.6 m.p.h.	13.0 m.p.h.

\* During peak periods cars are operated in two and three car trains.

The first P.C.C. cars received were placed in service on the Los Angeles-Glendale-Burbank Line during November,1940 and during January and February, 1941 P.C.C. equipment was in successive stages placed in service on the Hollywood-Venice Short Line.

Neither of the two operations are fully equipped with P.C.C. cars, but are operated in conjunction with remodeled Hollywood type cars which have had their motors re-wound to provide additional horsepower capacity and improved performance ability, in addition to general rehabilitation.

The P.C.C. equipment is operated in two of the heaviest Pacific Electric services.

The Los Angeles-Glendale-Burbank Line, starting at the Pacific Electric Subway Terminal in Los Angeles, traverses heavily congested streets for approximately half the distance of the line, partly in Los Angeles and the balance in the Cities of Glendale and Burbank. A portion of the line is on private right-of-way. The total length of the line is 12.30 miles.

The Hollywood-Venice Short Line traverses a heavily congested district via a circuitous route over the densely travelled Hollywood Boulevard, Hill Street in downtown Los Angeles and thence to Venice and Santa Monica districts. Total length of the line is 25.68 miles

No special study has been undertaken to date to determine the relative accident hazard of the P.C.C. cars as compared with the conventional type used in the same service, nor has it'been possible to accurately determine the effect of the new equipment on revenues, due to the marked improved trend on all lines on the system.

Power consumption was found by test to be practically the same as for the conventional type cars used in the same services. The higher unit consumption rate for the light P.C.C. cars practically offset the lower unit consumption for the heavier old cars.



# NEW YORK CITY TRANSIT SYSTEM

Brooklyn, New York

Total No. of PCC Total PCC Car-Mil	Cars es Run to July l	, 1941	100 19,922,662
Lines Equipped	Smith Coney Isl.	McDonald- Vanderbilt	Seventh Avenue
No. of Cars Assigned Service Round-Trip Miles Territory	75 Complete 20.9 Half Congested balance open	37 Complete 20.05 Through fringe of Business district, remainder residential	17 Complete 9.32 Congested
Revenue increase, one year	\$ 189,000	\$ 105,927	
percent	33	*37	
per year	5,725	3,310	
increase % in peak periods in base periods	14 10.8 12.7	13.1 13.3 13.3	
Platform cost de- crease,%	5.5	10	
Accident decrease %	24	16	

\*Increased due to Navy Yard increases and additional patronage to subway. The New York City Transit System actively cooperated in the extensive tests preliminary to the development of the PCC car and placed the first order for 100 cars in 1935. In October, 1936 the first cars were placed in service and during December, 1936 the four lines were completely operated with PCC cars. All routes are double track throughout, over a flat terrain.

The Smith-Coney Island Line in congested business district operates over narrow streets with frequent stops. In residential districts, long blocks and wide streets permit use of the improved operating characteristics of the PCC car. Near the Brooklyn Bridge other lines use the same track jointly.

The popularity of the cars is reflected in the 33 per cent increase in gross revenue. The average schedule speed increase of 14 per cent permitted the operation of this line with two less cars than formerly required. Total car mileage reduced 5.5 per cent. Accidents decreased 24 per cent due to better operation and to the carefully designed features of the car reducing sharply "boarding and alighting" and "door" claims.

The McDonald-Vanderbilt Line operated through the fringe of the central business district for 8 miles; the balance through a residential district. Gross receipts increased 27 per cent considered to be all "new business". The average schedule speed increased 13.3 per cent. There were indications that the speed should be increased 20 to 25 per cent but the increased number of stops, due to heavier patronage, prevented this. Platform cost per car mile decreased 10 per cent. Accidents decreased 16 per cent. Increases in receipts have been sustained through five years of operation.

The Seventh Avenue Lines are in the congested area over routes jointly used by other lines. With the inauguration of PCC car operation, the Seventh Avenue Line was extended over the Brooklyn Bridge to Park Row, New York. Due to operation over routes used by other lines with old cars, the increased gross receipts on the Seventh Avenue Line of 18 per cent are not as indicative of the effect of the PCC car as on the other lines. Schedule speeds due to operation over the same routes as used by old cars did not change materially. Platform expense decreased 10.8 per cent on the Seventh Avenue Line. Cars formerly assigned to Erie Basin are now used on McDonald-Vanderbilt and Smith-Coney Island lines due to increased patronage and other changes.

During the period of comparative data, there was no substantial change in the average wage rate of train men so no adjustments are necessary.

Power consumption was found by test to be practically the same as for old cars during the summer but during the winter months the old cars used 6 per cent more energy per car mile due to the utilization of the dynamic braking heat on the PCC cars. The results of tests indicate that if PCC cars were used on the entire system, the amount of power required would be reduced.



	Total Regular Lines	Route 6 (Glenside - Willow Grove)	Route 40 (Parkside- South Street)
START OF P.C.C. OPERATION	(4)	4-20-41	4-20-41
P.C.C. CAR MILES OPERATED TO JULY 1, 1941	3,842,600	46,300	35,700
NUMBER OF P.C.C. CARS Assigned On order	153 110	14	17.
INCREASE IN REVENUE On Route Net System Increase		+ 33.9%(A)	+ 15.6%(B) -
INCREASE IN OPERATING SPEED		+ 6.6%	+ 6.0%
PLATFORM COST		+ 12.5%	+ 1.6%
HEADWAYS (Minutes) AM Rush Base PM Rush Evening		5-1/4	4
ROUND TRIP MILES	49.17	18.94	11.56
TERRITORY		Operates thru two Suburban Zones and Feeds Broad Subway terminal. Heavy park riding in summer.	Residential. Feeder line to Elevated and Subway. Heavy park riding in summer.

(A) Route 6 - Sundays - Increase in Suburban Zones - (affected by Willow Grove Amusement Fark riding).
 (B) Route 4G - Sundays - Gross increase in passengers carried (affected by Woodside Amusement Park riding).

# PHILADELPHIA TRANSPORTATION COMPANY

# Philadelphia, Penna.

	Route 53 (Wayne Ave.)	Routes 13 and 42 (Chestnut-Walnut Sts.)	Route 56 (Erie - Torresdale Ave.)
START OF P.C.C. OPERATION	8-14-38	1-12-41	3-16-41
P.C.C. CAR MILES OPERATED TO JULY 1, 1941	2,280,900	1,110,900	450,800
NUMBER OF P.C.C. CARS Assigned On Order	23	80	50
INCREASE IN REVENUE On Route Net System Increase	+ 16% (C)	+ 18.5% + 8.2%	+ 10.1% + 7.4%
INCREASE IN OPERATING SPEED	+ 14.8%	+ 5.0%	+ 10.1%
PLATFORM COST	- 1.3%	+ 12.8%	- 2.6%
HEADWAYS (Minutes) AM Rush Base PM Rush Evening	2-1/2 6-1/4 3-3/4 7	Route 13 1-1/2 2 4 1-1/2 2 1-1/2 2-1/4 7 7	1-1/2 6 1-1/2 6-1/2
ROUND TRIP MILES	8.89	13.90 11.34	15.04
TERRITORY	Largely high class residential. Line feeds Subway at im- portant interchange junction where there is considerable vehicular congestion.	Residential and central business district lines. About 29% of total car miles are operated in the very congested cen- tral business district.	Residential and heavy industrial district crosstown line. Feeds both Elevated and Sub- way at important inter- change junctions.

(C) Route 53-No apparent diversion from other routes.



# PITTSBURGH RAILWAYS SYSTEM

# Pittsburgh, Pa.

#### 301 P.C.C. Cars in Operation and 100 On Order in 1941

By August 1, 1940, 301 P.C.C. cars were in operation. An additional 100 were ordered in 1941, which when delivered will bring the total P.C.C. cars in Pittsburgh to 401.

#### Method of Installing

The 301 P.C.C. cars in operation were assigned to the 18-hour base service of routes and the peaks were filled out with speeded-up old cars. The old cars had been speeded up by rewinding the motors, improving the brakes, and making other improvements so that they can be used to fill out peak schedules on P.C.C. routes without materially affecting the speed of schedules. The same policy will be followed in assigning the fourth hundred new cars, which will practically complete the coverage of urban base schedules with P.C.C. cars.

#### 301 P.C.C. Cars have Operated over 50 million miles

As of July 1, 1941, the 301 P.C.C. cars had operated a total of 50,657,976 miles. This represented operation of the first hundred P.C.C. cars for about 4-1/4 years, the second hundred for about 3-1/2 years, and the third hundred for about one year.

Routes Using 401 P.C.C. Cars Will Operate 87% of Urban Car Mileage

The 301 P.C.C. cars in operation during 1941 provide base service on about 40 lines with round-trip mileages ranging from about 6 to about 30 miles and including practically every type of route on the system. The total mileage operated by the 40 P.C.C. routes represents about 76 percent of the urban system car mileage. When the fourth hundred P.C.C. cars are delivered about 56 new cars will be assigned to the base service of 8 additional routes, which operate about 11 percent of the urban system mileage, bringing the total mileage of P.C.C. routes to about 87 percent of the Urban System mileage. The other 44 cars of the fourth hundred will be used to make up shortages of P.C.C. cars on base service of present P.C.C. routes.

Routes Using 401 P.C.C. Cars Will Account for 92% of Urban Revenue

The 40 routes whose base service is furnished with 301 P.C.C. cars account for about 80 percent of the Urban System revenue. The additional 8 routes whose base service will be equipped with 56 of the fourth hundred P.C.C. cars account for about 12 percent of the Urban System revenue, so that with the fourth hundred P.C.C. cars the P.C.C. routes will account for about 92 percent of the Urban System revenue.

#### Riding Gain of 5% to 10% with Partial P.C.C. Car Operation

P.C.C. cars, operated in base service only, have demonstrated an ability to improve or hold traffic at levels 5 to 10 percent higher than speeded-up old cars. When compared with old slow speed cars the percentage improvementis greater.

#### Faster Schedules with P.C.C. Cars - Reduced Platform Cost

Experience shows that due to the higher schedule speeds attainable with the P.C.C. cars about9 P.C.C. cars will furnish the same service which requires 10 speeded-up old cars and about 7 or 8 P.C.C. cars will do the work of about 8 or 9 old low-speed cars.

#### 24% Reduction in Accidents

For the first full year of operation of the first 301 P.C.C. cars, the number of accidents involving P.C.C. cars was 24 percent less than the number involving old cars on urban routes (excluding shuttle routes). Subsequent comparisons of the accident records of P.C.C. cars and old type cars show that the P.C.C. cars have continued to maintain this improved accident performance.

#### Saving in Maintenance Costs

Experience to date indicates that a substantial saving in the cost of maintenance of equipment and track will be obtained.

#### General

Practically all routes in Pittsburgh and vicinity are over the hilly terrain typical of the locality. Operation is almost 100 percent double track. Streets in both downtown and residential districts are rather narrow and of varying widths, which does not permit traffic to pass street cars where automobiles are parked at the curb. Due to considerable variation in the length of blocks, car stops are made at convenient locations along the routes designated by signs.



# ST. LOUIS PUBLIC SERVICE COMPANY

St. Louis, Mo.

Total No. of P.C.C. Cars in	operation		100
Total No. of P.C.C. Cars on	order		100
Total P.C.C. Car Miles run	(9-1-40 to 7	-1-41)	5,131,800
Lines Equipped	University	Delmar	Broadway
No. of Cars Assigned	34	34	32
Service	Base	Base	Base
Round Trip Miles	15.22	14.37	28.93
Revenue Increase (6 months)	\$65,965	\$68,132	\$55,027
Revenue Increase Percent	25.4	21.1	15.1
Increase Per Car (per 6 Months)	\$1940	\$2004	\$1720
Schedule speed Increase %	5.2	4.3	5.3

One of the first acts of the St. Louis Public Service Company, following its reorganization in November, 1939, was the placement of an initial order for 100 P.C.C. Cars. Several refinements of the original P.C.C. design brought significant changes to enhance the appearance of the cars, add to passenger comfort and improve performance.

The complete replacement of the compressed air system on these cars has brought about many interesting results from an operating standpoint and has attracted widespread interest throughout the industry. A spring applied, solenoid released drum brake takes the place of conventional air applied brake shoes on the wheel treads. The objectives sought, namely, quieter operation, more uniform retardation, a reduction in the occurrence of flat wheels and the elimination of heat generation for protection of rubber wheel inserts have been achieved to a very gratifying degree.

Revenue service on the Broadway line began on Sunday, June 23, with 35 cars. The week-day schedule placed these cars on base runs augmented during the peaks with Peter Witt type cars. Starting out with a travel increase of from 25 to 30 per cent the Streamliners were overwhelmingly popular. In the accompanying table we have shown the 6-month period, September 1, 1940 to March 1, 1941, which represents more fairly the performance of these cars after curiosity riding had ceased to be a factor and before the national defense activity was significantly reflected in the revenues. During these six months the revenue increase amounted to 15.1% over the same period of a year ago, a considerable share of which must be attributed to the new equipment.

On September 1, 1940, the Streamliners were inaugurated on the Olive lines, Delmar and University. As in the case of the Broadway line they were assigned to base service supplemented by 2-man cars during the peaks. The territory served by these lines proved to be a more fertile field evidenced by the revenue increases from 20 to 25% during the 6month period shown. The service cars or "jitneys" which operate in this section were, and still are, hard pressed to compete with the appeal of the smartly groomed appearance and the luxurious comfort of the new cars. Also, the residential districts of the western ends of these lines are of newer, apartment-dwelling type offering greater potential support to the improved service.

One of the most convincing testimonials of the universal popularity of the Streamliners was shown in the postcard poll conducted on the cars shortly after their introduction. Many of the commentators chose to pick certain features suchas windows, steps, doors, illumination, seats, etc. to praise, but a greater portion expressed their approval in general terms predicated upon civic pride.



# SAN DIEGO ELECTRIC RAILWAY CO.

#### San Diego, California

Total No. of PCC cars			28
Total PCC Car-Miles run	, approx. to	July 1, 194	1 4,972,291
Lines Equipped	1	2	· <u>3</u>
No. of cars assigned	7	11	9
Service	Complete	Complete	Complete
Round-trip miles	6.88	11.10	8.98
Territory	0.71 mi. business; 1 mile of grades	l.2 mi. business; l/2 mile of grades	0.7 mi. business l mile of grades
*Revenue increase,%	18.16	23.15	6.0
Schedule speed increase	% 6	6	6

\* These percentages for period prior to 50% increase in San Diego population.

Service with 28 PCC cars started July 12, 1937 with 100 percent operation on three lines and night service after P.M. peaks and all day Sundays and Holidays on the fourth line. The three routes are double track with no interference from older cars save for down town terminal space. Route No. 1 has a round trip length of 6.88 miles through wide streets with rather severe traffic congestion. Stops frequent because of short blocks. Grades in residential section from 6 to 9 per cent.

Route No. 2 has a round trip length of 11.10 miles The half mile of grades in reisdential section run up to 12 per cent.

Route No. 3 has a round trip length of 8.98 miles. Has same grade as on Route No. 1.

Due to the rapid increase in population incidental to the Defense Program it is impossible to compare the increase in riding or revenue due to the P.C.C. car, inasmuch as the business over our entire system for the past year has increased in excess of 40%.

The schedule speeds, including "spot" time, have been increased some 6 per cent on the three lines. The fourth line has had schedule speed increased so that the line is operated with one less car than formerly with the same headway. The schedule speed increase is undoubtedly a factor in the increased traffic resulting with these cars.

Platform cost and accident information is not available.

Energy consumption required for propulsion has shown some increase due to higher schedule speeds.

Heat is not used in San Diego cars so no opportunity exists to recover the energy from the dynamic braking.

San Diego offers a splendid example of economic possibilities of transit operation with PCC cars in a moderate sized city.



# CAPITAL TRANSIT COMPANY Washington, D. C.

TOtal Number of F.C.C. C	ars = 202 (90 audit	stonat on order)		
Total P.C.C. Car Miles O	perated to July 1,	1941 - 17,278,294		
Lines Equipped	14th Street	Mt. Pleasant	7th St Ga. Ave.	Maryland
Operation Started	10/4/37	10/31/38	10/23/39	10/23/39
P.C.C. Cars assigned	50	55	39	20
P.C.C. Cars Scheduled Ease Peak	44 47	50 52	33 36	17 18
Other Cars, Base Peak	58	0 62	10 57	3 38
Round Trip Miles	9.15, 9.74, 14.07	8.58, 11.29, 12.49	12.18, 12.74, 14.83	12.34, 12.94
Miles Scheduled Annually	2,184,302	2,116,503	1,815,422	875,765
Territory	Residential Shopping Office	Residential Shopping Office	Residential Shopping Office	Residential Shopping Office
Revenue Increase	Some	Some	Some	Some
Schedule Speed Increase	4.6%	3.8%	3.2%	4.6%
Platform Cost Decrease	37%	35%	35%	22%
Accident Decrease	30%	15%	Some	Some

Lines Equipped	Cabin John	You Street	Tenleytown	Total
Operation Started	9/9/40	9/9/40	9/9/40	
P.C.C. Cars assigned	15	17	6	202
P.C.C. Cars Scheduled Base Peak	11 14	15 15	4 4	174 186
Other Cars, Base Peak	0	38	16 49	34 324
Round Trip Miles	8.81, 22.68	10.77, 10.82	18.92	
Miles Scheduled Annually	950,617	833,312	289,104	9,065,025
Territory	Rural Residential Shopping Office	Residential Shopping	Residential Shopping Office	
Revenue Increase	Some	Some	Some	
Schedule Speed Increase	None	None	Some	
Platform Cost Decrease	43%	Previously 1-man	Previously 1-man	
Accident Decrease	Some	Some	Some	

The first 45 PCC cars were placed in service August 29, 1937 and full scheduled operation began October 4, 1937. The Fourteenth Street Line is divided into four basic routes using underground trolley type double track. North of Pennsylvania Avenue all operate on 14th Street. Fourteenth Street provides one automobile lane and one street car track in each direction and the traffic is heavily congested especially during the rush hour. On Pennsylvania Avenue and south, the lines operate over broad thoroughfares with numerous traffic lights and frequent stops. This is the heaviest line in the national capital.

Indications are that with the inauguration of PCC car operation on 14th Street Line there was a slight improvement in passenger traffic. However, it is difficult to ascertain the amount of the increase in receipts due to the fact that this line operates in a territory highly competitive with express bus service. Also, one month after the installation of PCC cars, the universal fare was adopted which lowered the fare on many bus lines and caused traffic to shift from rail to bus and affected the traffic and revenue on the rail lines.

Schedule speeds were increased 4.6 per cent. Platform cost decreased 37 per cent, chiefly due to one-man operation on the PCC cars instead of two-man operation as on the old cars.

Detailed data is not available on the Mount Pleasant Line, 7th Street Georgia Avenue Line, Maryland Line, Cabin John Line, U Street Line and Tenleytown Line other than in the accompanying table. Mount Pleasant Line operates slightly more cars but less car miles than 14th Street Line.

Thirty five PCC cars have but recently gone into service and thirty additional cars are on order.



# TORONTO TRANSPORTATION COMMISSION

## Toronto, Canada

Total number of P.C.C. cars			250
Total P.C.C. car miles run to J	une 30, 1941 (190 c	ars)	18,145,797
Lines Equipped	St. Clair <sup>A</sup>	Bloor	Dundas <sup>A</sup>
No. of Cars Assigned	13	68	25
Service Headway: Normal Rush	7.00	4.00 2.00	4.15 1.35
Round Trip Miles	11.69	20.09	11.89
Territory	Light Business & Residential	Fairly heavy Business	Heavy, Enters down-town shopping dist.
Revenue Increase, per cent due to P.C.C. cars	13.9	8.7	8.0
Schedule Speed Increase, %	10.1	8.7	6.3
Platform Cost decrease, %	2 <u>, 8</u>	-	-
Accident Decrease, per cent			-
Lines Equipped	Carlton <sup>B</sup>	King <sup>B</sup>	Queen <sup>B</sup>
No. of Cars Assigned	26	20	38
Service Headway: Normal Rush	6.00 2.30	6.00 1.15	3.45 1.45
Round Trip Miles	19.26	15.95	18.06
Territory	Fairly heavy Business	Fairly heavy crosses down- town business section	Heavy, crosses down-town Shopping Dist.

Revenue Increase, per cent. due to P.C.C. cars	N	Clear-cut Cor	nparison
Schedule Speed Increase, %	N	Clear-cut Cor	parison
Platform Cost decrease, %	÷	-	
Accident Decrease, per cent.	-	-	

A - Partly operated with converted Witt cars speeded up. B - Partly operated with older types of cars.

# **BRITISH COLUMBIA** ELECTRIC RAILWAY CO., LTD.

# Vancouver, B. C., Canada

Total No. of PCC Car	°S	••••• 4
Total PCC Car Miles	run to July 1/41	169,124
Line equipped		Kitsilano
No. of cars assigned	l	4
Service: Headway:	Normal 12 min Rush 10 min	3 cars 4 cars
Territory: Summer Rest of	year	Beach Travel Light Business & Residential

The four PCC cars operate in service on a line a con-siderable portion of which line cars of the older type also operate over. For this reason it is impossible to make a comparison of the new cars with the old cars in this service.

The cars are popular with both the traveling public and the operators.

#### PAGE THIRTY-NINE



PAGE THIRTY-EIGHT



# KANSAS CITY PUBLIC SERVICE CO.

## Kansas City, Mo.

Service with 24 PCC cars was inaugurated on the Troost Avenue Line on July 20, 1941. The operation furnishes 2 to 3 minute headways during weekday rush hours and 5 to 6 minute headways at other times of the day. Schedule speed was increased to 12.75 mph. including all stops and slowdowns.

The PCC cars have been extremely popular with the riding public as evidenced by substantial and sustained increases in the gross receipts of the line.

