ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
EPA-330/1-77-012

Coke Battery Survey
Procedures Description & Data Presentation
United States Steel Corporation
Fairfield Works
Fairfield, Alabama

(NOVEMBER 30-DECEMBER 9,1976)

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
DENVER, COLORADO

DIVISION OF STATIONARY SOURCE ENFORCEMENT
WASHINGTON, D.C.
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
DURHAM, NORTH CAROLINA
REGION III PHILADELPHIA, PENNSYLVANIA

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Durham, North Carolina

Region III
Philadelphia, Pennsylvania

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I. INTRODUCTION

BACKGROUND

During the spring of 1976, personnel from the Environmental Protection Agency (EPA), Division of Stationary Source Enforcement (DSSE) and EPA Region III recognized a need to obtain a "standardized" data base of visible emission and process observations for well operated byproduct coke batteries. Such a data base would enable the various EPA Regional offices to conduct, more effectively, negotiations with coke battery operators who are not in compliance with applicable State Implementation Plan (SIP) regulations. In addition, failing to arrive at a negotiated settlement, an EPA Regional Office would then have a creditable technical data base for litigation against the non-complying coke battery operator. Furthermore, the Office of Air Quality Planning and Standards (OAQPS) had, and still has, an interest in obtaining visible emissions and process observation data for use in, or in conjunction with, the task of developing performance standards for byproduct coke batteries. Thus, the idea of a national coke battery evaluation program was initiated. Later, with the combined Regional Office/DSSE/OAQPS responsibility to define reasonably available control technology, best available control technology, and lowest achievable emission rates for byproduct coke batteries, in conjunction with the Agency policy for new source review, the data obtained from the program had still another use.

The first step of the national coke battery evaluation program was to establish an inspection team of visible emissions and process observers to conduct observations at selected coke batteries throughout the United States. EPA's National Enforcement Investigations Center (NEIC) was requested to assist in the development of the program because of the enforcement objectives of the program and the NEIC's ability to provide a sizeable manpower pool with which to conduct the individual coke battery evaluations.

As a second step, the scope of the program was restricted to gathering visible emissions and process observation data pertaining to only charging, door leaks, pushing, and topside leaks. Collectively, the program participants agreed upon the methods which would be used in gathering visible emissions data [Appendix A]. With the assistance of a statistician consultant, a data gathering strategy for the first field survey was developed.

The first field survey was designed to introduce the inspection team to coke battery operations and to gather visible emissions data with which to determine inspector variance in side-by-side visible emission observations. This field survey was conducted in September 1976 at the Bethlehem, Pennsylvania plant of the Bethlehem Steel Corporation. The results of this work are contained in a report entitled "Coke Battery Visible Emissions Observation Corroboration, Bethlehem Steel Corporation, Bethlehem, Pennsylvania (September 1976) and United States Steel Corporation, Fairfield, Alabama (December 1976)."

Following the Bethlehem coke plant survey, process observation procedures and field data sheets were developed and agreed upon by the program participants. While the Bethlehem data were being evaluated, a second field survey was planned for the United States Steel Corporation's (USSC) Fairfield Works, Fairfield, Alabama.

SURVEY OBJECTIVES

The Fairfield survey was designed to fulfill the following objectives:

1. Field evaluate process observation procedures and data sheets which had never been used before.

2. Acquire a visible emissions data base at batteries 5 and 6 for use in establishing new source performance or hazardous pollutant standards for charging.

3. Acquire visible emissions data at batteries 5 and 6 for pushing, door leaks, and topside leaks.

4. Acquire visible emissions data at battery 9, a taller battery than batteries 5 and 6, for door leaks.

5. Determine whether the visible emissions observation teams corroborated in the two charging emission observations methods, since the charging data acquired at Bethlehem was not considered to be sufficient.

From November 29 through December 10, 1976, a team of inspectors from EPA Region III, DSSE, OAQPS, NEIC, and the Jefferson County Alabama Health Department conducted the Fairfield survey. November 29 was an assignment/orientation day, principally for process observers, and to familiarize all inspectors with the plant layout, equipment, observation positions, etc. Visible emissions and process observation data were gathered November 30 through December 9, with the exception of Sunday December 5. On December 10, a person from each organization mentioned above met with coke plant management personnel to conclude arrangements on exchange of data. A log of activities during the entire survey is contained in Appendix B [Table B-1].

REPORT PURPOSE

This report describes the methods and procedures used at Fairfield to make visible emission and process observations. It contains numerous figures and tables which have been developed from the field data for use by data analysts, regulation developers, and enforcement case developers.

No correlation of parameters, cause/effect, etc., are contained in this report; however it does contain conclusions on the utility of gathering specific data by the methods and procedures used at Fairfield.

For ease of reading the text of the report, all figures have been placed in Appendix C and all tables in Appendix D.

II. SUMMARY AND CONCLUSIONS

Between November 29 and December 10, 1976, a team of inspectors from EPA Region III, Division of Stationary Source Enforcement, Office of Air Quality Planning Standards, National Enforcement Investigations Center, and the Jefferson County Alabama Health Department conducted a coke plant survey at the United States Steel Corporation Fairfield Works, Fairfield, Alabama. The purpose of the survey was to gather visible emissions data for charging, door leaks, topside leaks, and pushing at batteries 5 and 6, and for door leaks at battery 9, and to field evaluate process observation procedures and data sheets. This report describes the process and visible emissions observation procedures employed during the survey and presents the resultant data.

Most of the process data gathered was useful to document various operations while visible emissions observations were being made; however, the true utility of the data can only be evaluated following a thorough analyses. No attempt was made in this report to correlate the process data with the visible emissions data to determine if the conclusions or correlations which are hypothesized or suggested are supported. These data are presented for data analysts, regulation developers, and enforcement case developers to analyze or use as they deem fit.

Process data gathered which required that a diagram be drawn (e.g., charge port carbon buildup, gooseneck and standpipe carbon buildup, roof carbon, oven cold spots), were difficult to interpret and did not meet the desired goal, to objectively identify the nature and extent of the situation. Carbon buildup should be monitored by having the observer compare the actual situation against a preselected criterion, such as whether the cross-sectional area is at least 80% open. The existence of oven cold spots and a brief narrative description of the general location should be brought to the attention of the inspection team leader. The team leader could then check oven flue temperature records to determine if there is a logical explanation.

The following table summarizes the number of visible emissions observations (VEO's) conducted during the Fairfield survey:

Unit Operation	VEO Method	Battery 5	Battery 6	Battery 9	Total Observations
Charging	A	135	135		270
	B	345	345		690
			Total Charging		960
Doors	C	44	59	30	133
Topsides	H	36	30		66
Pushing	D	54	75		129
	E	52	55		107
	F	52	74		126
			Total Pushing		362

The following summarizes the ranges of the average daily visible emissions observed during the Fairfield survey:

VEO Method (Units)	Range of Average Daily Emissions Battery 5	 6	 9
Charging			
A (seconds ≥20% opacity)†	4.4-15.6	7.6-12.5	
B (seconds of any leaks)†	11.5-40.9	6.2-26.8	
Doors			
C (% CS doors with leaks)	1.5-6.5	2.0-3.3	2.4-3.6
C (% PS doors-1/side with leaks)	6.7-10.4	0.6-6.5	0.5-5.4
C (% PS doors-2/side with leaks)	3.3-5.6	0.3-3.3	0.4-3.0
C (% chuck doors with leaks)	4.5-9.8	0.6-6.1	0.5-3.4
C (% total doors - 2/oven with leaks)	4.0-7.4	1.5-4.4	1.6-4.5
C (% total doors - 3/oven with leaks)	2.7-5.1	1.0-3.1	1.0-3.2
C (% ovens with leaks)	7.6-13.8	2.4-8.0	2.8-7.7
Topsides			
H (% standpipe leaks)	3.0-16.9	3.9-7.0	
H (% standpipe leaks ≥1 m long)	0.2-2.8	0.0-2.0	
H (% lid leaks)	0.1-1.0	0.0-0.3	
Pushing			
D (seconds ≥20% opacity)††	11-30	22-35	
E (seconds ≥60% opacity)††	12-14	0-2	
F (average % opacity)††	40-48	18-24	

† *During the charge period which begins when coal is first introduced into an oven and ends when the last charge port lid is replaced.*

†† *During the period from when coke face movement by the ram begins until all coke is in the quench car.*

III. PLANT DESCRIPTION

At USSC Fairfield Works there are currently seven operating coke batteries, designated batteries 3 through 9 [Figure 1]. Of interest for this survey were batteries 5, 6, and 9, for the objectives stated under SURVEY OBJECTIVES.

Batteries 5 and 6 are Koppers design and consist of 77 ovens each; ovens are numbered 1 through 85 (without zeros) from the coal bunker. These two batteries were rehabilitated in 1973. Batteries 5 and 6 are operated as individual operating units; the only equipment common to both is the hot (quench) car, although all other equipment is interchangeable. Other equipment for each battery includes a larry car, coke side door machine, pusher machine, and a pusher side door machine which is a separate unit from the pusher machine, but can be remotely controlled by the pusher machine operator. The coal bunker is common to both batteries. Batteries 5 and 6 have a gun-fired combustion system and both are equipped with a single collector main on the coke side.

Each oven in batteries 5 and 6 has four charge ports numbered 1 through 4 from coke to pusher side. Approximately 13.42 m. tons (14.78 tons) of coal are charged to an oven with 31%, 12%, 25%, and 32% of the volume charged through charge ports 1 through 4, respectively. The ovens have a theoretical volume of 16.6 m^3 (587 ft^3), are approximately 3.4 m (11 ft) tall, and are nominally 46 cm (18 in) wide. All ovens are pushed and charged by the "Koppers" sequence (1's, 3's, 5's, 7's, 9's; 2's, 4's, 6's, 8's; 1's, 3's, etc.).

The ovens for batteries 5 and 6 are equipped with self-sealing, screw-latch doors. The chuck door is not an integral part of the pusher side door, but is a separate unit.

Battery 9 is Koppers-Becker design and consists of 63 ovens numbered 1 through 69 (without zeros) from south to north. Battery 9 was rehabilitated in 1974. Ovens for battery 9 are slightly taller -- 4.0 m (13 ft) -- and slightly narrower -- 41 cm (16 in) -- than batteries 5 and 6. The doors are also self-sealing, but are cam-latch, and like batteries 5 and 6, the chuck door is separate from the pusher side door.

IV. SURVEY PROCEDURES

As previously stated, the objectives of the Fairfield survey were to evaluate process observation procedures and field data forms and to acquire visible emissions data on charging, door leaks, pushing, and topside leaks. This section first presents the various observer positions employed. Secondly, this section discusses the process observation field data forms, describes the procedures used and the inspectors responsible for their completion, and briefly, where appropriate, describes the reason why such data were gathered. Finally, this section presents the visible emissions observation field forms and briefly describes the methods employed to observe the visible emissions.

OBSERVER POSITIONS

At the start of each day the designated team leader handed the USSC contact a copy of the completed personnel placement form [Figure 2], which indicated by name each inspector's observation position and task for that day, i.e., a visible emissions observer or a process observer. The Company could then assign, at its discretion, the appropriate number of guides for the EPA inspectors. Normally the 15 person inspection team consisted of three visible emissions observers reading charging on either battery 5 or 6; three other visible emissions observers reading charging on the other battery or pushing on the same battery; one visible emissions observer reading door leaks on batteries 5 and 6, 5 and 9, or 6 and 9, and also topside leaks on either battery 5 or 6; a team leader who was the Company contact for the day and overall supervisor; a topside inspector who made process observations on the battery where charges, pushes, and topside leaks were being observed; a larry car inspector who made process observations from the larry car on the battery where charges were being observed; a pusher machine inspector on the battery where charges and pushes were being observed; and two pusher side door machine inspectors and two coke side door machine inspectors who made process observations from the door machines on the batteries where door leaks were being observed. Each day the topside, larry car, pusher machine, one door machine, and one door machine inspector were on the same battery; the other pusher side and coke side door machine inspectors were on another battery. In addition, a second larry car inspector conducted a time study of the charging unit operations. Table B-2 (Appendix B) presents which data sheets were completed at each process observer position.

PROCESS OBSERVATION PROCEDURES

Daily, each process observer was required to complete a personnel activities form [Figure 3] on which the number of workers at the position, their job titles, a brief description of their duties, and a notation of personnel changes (numbers of workers, principally) as made throughout the day. These data were gathered in an attempt to determine the crew size associated with individual battery operation.

The team leader was daily responsible to go to the reversing room and askania chart room at each of the batteries where observations were being made to initial and record the time and date on each of the charts listed in the chart log [Figure 4].

At the start of the survey the team leader completed the combustion/exhaust setting form [Figure 5]. These data were gathered, along with part of the information in Figure 4, primarily for an EPA contractor who was investigating combustion stack emissions for DSSE.

The team leader did not complete the combustion data form [Figure 6] daily, but was provided these data at the completion of the survey.

The team leader completed the photography log [Figure 7] on those days [Appendix B] on which movies and/or still shots were taken. He logged the approximate footage of movie film and number of still shots, as well as the subject of the photography.

The remaining process observation forms and procedures are discussed in the context of the emission source (charging, doors, topsides, and pushing) for which the process parameter is believed to be of some consequence. In each case, the reason why such data were gathered is discussed first, followed by a presentation of the form and a brief description of the procedure used in completing the form.

Charging

Larry Car Alignment

Proper alignment of the larry car drop sleeves with the charge ports is necessary to assure sufficient oven aspiration, and proper flow of coal into the oven. Misalignment can create an orifice through which oven aspiration can be lost, causing charging emissions. No form was developed on which to note this phenomenon. However, visible emissions observers observing charging were asked to make such notations, when larry car misalignment occurred.

Charge Port Openings

Charge ports partially blocked with carbon or any other material buildup can interfere with the continuous flow of coal into the oven, a condition necessary for successful stage charging. The topside inspector used the oven port carbon form [Figure 8] with which to diagram material buildup in the oven ports after the oven was pushed.

Gas Passage

Proper volumetric distribution of coal introduced into the oven ensures that sufficient space will remain above the coal to expedite removal of evolved gases. To accomplish this, Fairfield officials report that the coal volume distribution between larry car hoppers was designed to provide a 30.5-cm (12-in) free space in the oven after leveling for gas exit. To obtain these volumes required installation of apron hoods and modifications to enlarge the outside hoppers. Each hopper was provided with an adjustable apron (inverted cone) to control the angle of repose of the coal in the hopper as it is loaded from the bunker. This minimizes volume fluctuations due to changes in flow characterisitics. Since experience indicated that the angle of repose never exceeded 45°, the aprons were set at this angle. These aprons extend from the base of the individual stationary sleeves to the perimeter of the hoppers. The resultant hopper volumes as a percent of oven volume are as follows:

Hopper #1	31%
Hopper #2	12%
Hopper #3	25%
Hopper #4	32%

These hopper percentages will vary with changes in coal flow properties due to the resultant coal volume change. As moisture, size distribution and hence bulk density change, the peak height of the coal as it drops into the oven changes. Since the clearance above the peak of the coal in the oven is of prime importance, the coal volumes are adjusted by changing the height of the apron on a regular basis by supervisory personnel to compensate for these major changes in coal flow properties.

Thirteen sets of peak and channel height measurements* were made during the inspection. In most cases, larry car coal volume hopper settings were revised after peak and channel height measurements and were observed and recorded by the larry car inspector [Figure 9]. When the coal volume hopper settings were revised, the team leader requested the Company contact to make another peak and channel height measurement as soon as possible.

Roof carbon buildup can effectively reduce the channel height if it is thick enough. Both the coke side door machine and pusher side door or pusher machine inspector used the coke oven condition form [Figure 10] to diagram location and extent of roof carbon buildup.

Since batteries 5 and 6 at Fairfield have a single gas collector main, a second gas exit on the other side (offside) from the standpipe was provided to allow gas passage by an alternate route. This second exit was provided over two paths. This was done by installing on the larry car a smokepipe, and a jumper pipe to a companion, or jumper oven. The smokepipe runs the width of the larry car and connects the pusher side and coke side charging ports. An extension was added to the smoke-pipe, away from the larry car, so that it provides a jumper from the fourth charging port of the oven being charged to the corresponding charging port of the oven two away.

The smokepipe is a 30.5 cm (12 in) diameter pipe connecting the first and fourth boot assemblies on the larry car. The boot castings are designed so that there is air space around the path of coal dis-charge. This provides an exit for gases into the smokepipe. Suction through this pipe is provided by the aspiration on the oven being charged.

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* *Peak and channel heights are defined as the distances between the top of the coal and the roof of the oven before (for peak) and after (for channel) leveling. They are measured by placing a measuring rod into the charge ports.*

Gas movement is from the oven, up through the offside charging hole and boot casting, into the smokepipe, across and down through the standpipe side charging hole, through the standpipe, and into the gas collector main.

The jumper pipe, or fifth boot as it is called, permits the aspiration of the jumper oven, which is nearly at the end of its coking cycle, to be used during charging to provide suction and an additional gas exit. The path of gas movement is from the oven being charged, up through the fourth charging port and boot casting, into the jumper pipe, down and through the jumper oven, and up through the standpipe on the jumper oven and into the gas collector main.[1]

Gooseneck and Standpipe Openings

The passageway through the goosenecks and standpipes must be kept clear to obtain maximum aspiration from the ovens. Figure 11 shows the effect of reducing the gooseneck area on gas flow from the oven. As an example, a 3.8-cm buildup of carbon around the inside perimeter of a 33-cm diameter gooseneck reduces the area by 41% and the aspiration by 25% [Figure 11[2]].

During the survey, all standpipes and goosenecks were inspected by the larry car inspectors with the aid of a mirror. The Company gooseneck cleaning procedure calls for machine cleaning with the reamer by the larry car oprator in his assigned area (one-third of the battery's ovens). The larry car operator manually cleaned the remaining goosenecks during his shift with a chisel-headed steel bar. The larry car inspector noted on the larry car inspector form [Figure 9] whether the goosenecks were manually or machine cleaned and whether the standpipes were cleaned; he also diagrammed the gooseneck and standpipe carbon buildup remaining after cleaning. Finally, the larry car inspector noted the time any standpipe cap was sealed or resealed with luting material on the standpipe sealing form [Figure 12]. Sandpipe sealing not only assures maximum effectiveness of steam aspiration during charging, but also minimizes the possibility of standpipe cap leaks.

Charge Sequence

Stage charging requires controlled flow of coal into the oven to allow the gas evolved to be evacuated effectively. Therefore, strict operating and cleaning practices must be followed to minimize charging emissions. The typical steps of the stage charging operation at the Fairfield Works are as follows:

Step 1. The larry car is loaded at the coal bunker with the controlled volume in each hopper and then travels to the oven to be charged. The operator performs the required standpipe gooseneck cleaning and inspection. A mechanical gooseneck cleaner is used at times to cut hard carbon from the gooseneck opening. As the next oven is being pushed, the larryman spots the larry car on the oven to be charged and lowers the boot sleeves over the open charge ports. The lidman turns steam on and places the oven on the main. He then turns steam on the jumper oven and removes the offside lid from this oven. The larryman lowers the fifth boot into place securely onto the battery top.

Step 2. The hoppers are then discharged in the order 1, 4, 2, 3. The #1 hopper is started first, then #4 hopper is started. Hopper #4 can reportedly be started prior to #1 hopper running clear without significant interaction of coal within the oven. However, these two hoppers will be emptied completely before the next hopper is discharged. Each slide gate is closed immediately after the coal clears the hopper to seal the hopper discharge opening and prevent a decrease in aspiration. Boot sleeves are not raised until all hoppers are emptied to keep the smokepipe suction path open.

Step 3. Hopper #2 is then independently discharged. Since the volume is small, the coal peak should not block the free space at the oven roof.

Step 4. The #3 hopper is then discharged. After the coal stops running, sufficient coal reportedly remains within the hopper to assure a level charge after the leveling operation. At this time, the channel space is blocked at the same point as it will be each charge. The only exit for the gas on the offside of the blockage is up and out through the smokepipe and jumper pipe. The chuck door is then opened and the leveler bar levels the remainder of the coal from the #3 hopper. Once the #3 hopper is emptied, the charge is leveled, the leveler bar is removed, the chuck door is closed, the lidman raises the boot sleeves one at a time, beginring from the standpipe and working outward. Each lid is pushed into place on the charge port as the individual boot sleeve is raised. The fifth boot is then raised and its lid pushed into place. The larry car leaves the oven, excess coal is swept up, and the lids are securely replaced and luted. Then the aspiration steam is turned off.[1] The average charge time* during the survey for battery 5 was about 5 min 55 sec, whereas for battery 6 it was about 5 min 30 sec.

The sequence for each charge was always monitored by the larry car inspector [Figure 9]. For a few days, there was an extra larry car inspector whose responsibility was to time the individual unit operations as described in the charging time study form [Figure 13].

Chuck Door and Lid Operations

The time the chuck door is open, prior to the entry of the leveling bar and after the leveling bar is withdrawn, should be kept to a minimum to prevent the introduction of air into the oven and the resultant loss

* *Charge time is defined as the length of time between when coal begins to flow into an oven to when the last lid is pushed into place.*

of steam aspiration effectiveness. Those times the chuck door was open, prior to the entry of the leveling bar, were documented by the pusher machine inspector on the pusher machine inspector form [Figure 14] while charging emissions were being observed.

Lids should be replaced on open charge ports once the drop sleeves are raised following the charge period to minimize the introduction of air into the oven and the escape of emissions from the oven. The sequence for replacement of lids at the Fairfield Works was #1 through #4 consecutively and finally the jumper pipe charge port (#4 lid two ovens away). As the larry car returned to the coal bunker, the lidman swept excess coal into the nearest charge port and reseated and luted the lids before turning off the aspiration steam. The topside inspector documented the time each or all lids were luted or reluted on the oven port sealing form [Figure 15]. In addition, he also recorded the elapsed time of the charge period in the second column of the form.

Coal Sample Collection and Analysis

As stated previously, coal moisture, grind distribution, and hence bulk density affect the coal angle of repose and the peak height of the coal as it enters an oven. In general, if the bulk density of the charged coal is low, the potential for charging emissions increases.

Each day the larry car inspector collected three separate samples of coal from the larry car hoppers and recorded the pertinent information on the coal sample collection form [Figure 16]. One sample was collected as a spot sample, i.e. small amounts of coal were taken from the four larry car hoppers only once during the turn (shift). The other two samples were collected as composite samples, i.e. small amounts of coal were taken from the four larry car hoppers several times during the shift. One of the two composite samples was then given to the Company for analysis for the parameters contained in the Company coal/ coke/tar analysis form [Figure 17]. The other two samples were analyzed by the EPA laboratory at Research Triangle Park, North Carolina for the same parameters. The Company continued to analyze the routine composite sample it obtains at various times during the entire day (all three turns) from the belt which transfers coal from storage to the coal bunker servicing batteries 5 and 6.

Aspiration Steam Pressure

Sufficient aspiration steam pressure at the oven is necessary to evacuate air and evolved gas from the oven during charging. Insufficient aspiration steam pressure can be due to low header pressure, excessive pressure drop in the lines, blocked or partially blocked nozzles, and/or improperly sized nozzles or header pipes.

At Fairfield, steam pressure was measured at three locations each for batteries 5 and 6 and recorded at one of the three locations each.

Steam header pressure was measured by a gauge and recorded on a circular chart downstream of the regulator. These gauges for batteries 5 and 6 are located between the reversing room and the battery pinion wall at the bench level.

The other two locations for steam pressure gauges were in the steam line on the upstream side of oven 1 and on the downstream side of oven 85. Static (between charges) and dynamic (during charging) pressures at these two locations were recorded during charging observations by the larry car and topside inspectors, and in some cases, the team leader on the steam data form [Figure 18]. In addition, the team leader initialed the circular chart and recorded the steam header pressure at least once each day on the same form.

According to the Company, all steam gauges were calibrated and the upstream and downstream gauges were installed just prior to the survey. The steam nozzles were reported to be constructed of standard grade steel pipe with an inside diameter of 1.4 cm (9/16 in); no data was requested as to the size of the steam header pipes, although they appeared to be about 5 cm (2 in) inside diameter.

One study[2] shows that 3.7 m (12 ft) ovens require about 48 std m^3/min (1,700 scfm) aspiration capacity to assure a smokeless charging operation. According to Figure 19[2], a steam nozzle pressure of at least 5.6 kg/cm^2 (80 psig) would be required at the gooseneck of the oven being charged and of the oven on which the jumper pipe (fifth boot) is placed in order to assure an aspiration capacity of 48 std m^3/min (1,700 scfm).

Standpipe and gooseneck geometry and location of steam nozzles can also affect the aspiration capacity.

Doors

Door Design

As discussed previously, the ovens on batteries 5, 6, and 9 at Fairfield Works are equipped with self-sealing doors. The doors on batteries 5 and 6 are screw-latch and those on battery 9 are cam-latch. At all three bateries the chuck door is separate from the pusher side door.

The most unique design feature of doors at Fairfield Works is the knife edges. These knife edges are constructed from structural steel channel shapes. The channels are cut in half to form two "L" shaped pieces. A piece is then welded to the door and the angle leg forms the knife edge and gas channel. Fairfield personnel favor the structural steel to sprung steel used at other facilities; they believe the structural steel fabricated shape is much more resistant to damage and deformation, hence would form a better seal over a longer time period. The doors are equipped with a series of adjustment bolts which can be used to adjust small gaps in the knife edge.[4] This differs from the spring and plunger arrangement that is normally employed on doors with spring steel knife edges.

Door Damage

Both the coke side door and pusher side door inspector used the door process list [Figure 20] on which to record the condition of the door on removal. The condition of a door, especially the knife edge and gas channel, is a factor important in controlling door leaks. The inspectors were asked to record whether the knife edge and/or refractory were damaged, i.e. were there cracks, deformations, missing sections, etc., whether the gas channel contained carbon or heavy tar (not light tar) deposits, and whether the door was replaced with a fresh door. The door was visually divided into six sections, as shown in Figure 20 and the inspector recorded damage/no damage/carbon deposits data by section.

Door Cleaning

Adequate door cleaning prior to each coking cycle is necessary to reduce door leaks.[5] The door knife edge and jamb need to be reasonably clean to allow the door to fit well for sealing. It is generally believed that all carbon deposits should be removed, but light (less viscous) tarry substances probably promote faster door sealing. All carbon and heavy tar should be removed from the gas channel to allow gases evolved at the bottom of the oven pass to the top and out the standpipe and gooseneck into the collector main. Gas pressures as high as 710 mm of water can be present in the gas channel at the bottom of an oven shortly after charging.[6] Any restrictions in the gas channel can therefore contribute to door leaks.

The door machine operators and their helpers at Fairfield Works cleaned every door and jamb as a normal practice. They always used long and short chipping bars with chisel heads on doors and jambs and mechanical "pogo sticks" (pneumatic chisels) on the doors at the discretion of the operator. In most cases, all sections of the door and jamb were cleaned. Seldom were the knife edges cleaned, as Fairfield supervisory personnel believe that the benefits of any tar, whether light or heavy on the knife edge exceed the risk in removing the tar and the potential for knife edge damage.

Both the coke side door machine and the pusher side door machine inspectors, and in some cases the pusher machine inspector, recorded the extent of door and jamb cleaning and the extent of deposits remaining using Figure 20. The pusher side door machine inspector also recorded similar information for the chuck door, although treating it as one section instead of six. Where the inspector could observe either door or jamb cleaning, but not both, door cleaning and condition of the jamb before the door was replaced were observed.

Spare Door Availability

At least twice each day the team leader checked the spare door racks at the ends of each of the three batteries. The inspector recorded the time of the observation and number of spare pusher side and coke side doors on the spare door form [Figure 21]. No attempt was made to ascertain the number of doors available at the central repair station located elsewhere in the plant since these doors were not considered readily available to replace a damaged door at the batteries. The number of available spare doors required per battery is determined from operating experience, but 1 to 2 spare doors could be considered normal.

Collector Main Pressure

During coking, an oven is kept under a slight positive (back) pressure to prevent air from entering. Since this pressure is higher than atmospheric, there is a potential for the oven to leak at any opening. The magnitude of leakage is directly proportional to the oven pressure and number and size of openings. Therefore, for a given opening, increase pressure would increase emissions.

Sealing Times

Following the replacement of doors and the charging of that oven, a door will leak for a period of time because the pressures inside the oven are at a maximum, the askania valve which controls the collector main pressure does not reach equilibrium instantaneously, and the knife edge/jamb sealing edges, where the mating is not flush, have not filled with tar. The topside inspector recorded the time of charge completion; that time combined with the door visible emissions data give one an idea of door sealing time.

Topsides (Lids and Standpipes)

Physical Condition

Battery charge port lids, charge port castings, and standpipes in poor structural condition due to warping, cracking, holes, etc. contribute to topside leaks. Inspection of the battery topsides at Fairfield Works did not indicate that the structural condition was a problem.

Some standpipe base, flange, and saddle leaks were observed, as will be discussed in Section V. At Fairfield structural leaks on standpipes, for the most part, were dealt with promptly by a patcher. Charge port castings which tilted enough to impede a seal with the larry car drop sleeve were taken up and relaid by brick masons.

Luting Practices and Sealing Times

Fairfield Works uses a sealing mud which consists of a mixture of 40% hydrated lime and 60% powdered fire clay. This mixture is mixed with water to form a slurry, herein referred to as luting material.

Luting lids and standpipe caps has been shown to greatly reduce the number and extent of leaks from these sources. At Fairfield the larry car operator lutes each standpipe cap prior to charging the oven. All charge port lids are luted immediately after the charge and cleanup periods. Aspiration steam is left on until luting of the lids is completed. Standpipe caps and lids are reluted when leaks are observed and as time permits.

As discussed previously, luting practices of the larry car operator were observed by the larry car inspector and those of the lidmen were observed by the topside inspector. The topside inspector also recorded the time of charge completions; that time combined with the topside visible emissions data give one an idea of standpipe cap and charge port lid sealing times.

Collector Main Pressure

The effect of collector main pressure on standpipe and lid leaks, and the results of the collector main pressures observed at Fairfield were discussed in the section entitled Doors.

Pushing

Coking Times

Coking time is a function of the coal mixture, moisture content of the coal, rate of underfiring (oven temperatures), the desired properties of the coke, and, in some cases, production schedules. A strong correlation has been demonstrated between coking time and particulate emissions during pushing.[7] The Company was requested to supply daily coking time data [Figure 17].

Oven Temperatures

Interrelated with coking time is the temperature of the oven or heating rate. Within some range, the time required for the distillation of coal volatiles to be nearly complete decreases as the heating rate increases, and vice versa. However, a good correlation between oven heating flue temperatures and emissions during pushing has not yet been shown.[7] The Company was requested to supply copies of the Heater Foreman's oven wall flue temperature recordings for batteries 5 and 6 at Fairfield.

Offtake Opacity

Just prior to the time an oven is pushed, the standpipe cap is raised and the lids are removed to begin the decarbonization period. At Fairfield this is done 2 to 3 ovens ahead of the pusher machine. The offtake (standpipe) opacity following the raising of the standpipe cap is an indicator of the severity of ensuing pushing emissions from that oven; i.e. if the opacity is low, pushing emissions will be low, and vice versa. The topside inspector used the topside inspector form [Figure 22] on which to record the offtake opacity at 15 second intervals for the first minute after the standpipe cap was raised.

Coke Face Appearance

Coke face appearance, like offtake opacity, is also an indicator of the extent of pushing emissions. As the door was removed prior to pushing, the pusher machine inspector, and later in the survey also the coke side door machine inspector, observed the coke face and recorded whether it was smoking and/or flaming and to what extent [Figure 14].

Oven Condition

Cold or dark spots along oven walls indicate something is wrong with the oven heating system, whether it be a plugged gas nozzle, a dead flue, etc. Improper heating, thus improper coking of the coal, will take place in the vicinity of such cold spots. Spalled (pitted) or broken refractory in the oven walls, especially near the end flues (door jambs) can also cause improper heating of the coal in its vicinity. Broken door refractory can reduce insulation of the oven from external ambient conditions, thus reducing heating effectiveness at the coke face.

All these conditions were inspected for at Fairfield by the pusher side and coke side door inspectors. Any dark or cold spots along oven side walls and/or broken refractory at the door area (jamb) were recorded on the coke oven condition form [Figure 10]. Broken door refractory was noted on the form depicted as Figure 20.

Coke Sample Collection and Analysis

Coking time, as previously stated, is a function of the desired coke properties. Therefore coke quality is a measure of the correctness of the coking time.

The Company routinely collects a composite sample of coke on a periodic basis over the entire day from both batteries 5 and 6 wharfs. At EPA's request, additional coke samples were composited over the B turn (7 a.m. to 3 p.m. shift) from each wharf and analyzed for the parameters shown in Figure 17.

VISIBLE EMISSIONS OBSERVATION PROCEDURES

In this subsection, all seven visible emissions observation methods used in the Fairfield survey are briefly described and the field data sheets for visible emissions observations are presented. As previously stated, each visible emissions observation method is completely described in Appendix A.

Charging

Two observation methods were used --- Methods A and B --- to read charging emissions. For Method A the inspectors timed the number of seconds of visible emissions $\geq$ 20% opacity during the charge* and cleanup/seal** periods. For Method B the inspectors timed the number of seconds of any visible emissions during both time periods; Method B is identical to the proposed Method 12 for charging. For Method A the inspectors also read the maximum opacity during the charge period. The Method A inspectors recorded their observations on Figure 23 and the Method B inspectors recorded their observations on Figure 24.

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* *The charge period begins when coal is first introduced into an oven and ends when the last charge port lid is replaced.*

** *The cleanup/seal period begins when the charge period ends and ends when the last charge port lid is permanently sealed.*

Each time charging emissions were observed, three inspectors were used. All three were positioned about ten ovens away from the larry car, on the opposite side from the coal bunker, to make their observations on batteries 5 and 6.

Doors

Method C was the door emissions observation method used at Fairfield at batteries 5, 6, and 9. The inspector began at either end of the battery on either the pusher side or coke side and walked along a line parallel with the battery a comfortable distance outside the pusher machine or hot car tracks. As the inspector walked, he identified the leaking doors and made an opacity observation at the lintel. Once the inspector completed his traverse along one side of the battery he proceeded to the other side and made a similar traverse. Observations were recorded on Figure 25.

Topsides (Lids and Standpipes)

Topsides inspectors during the Fairfield survey used Method H as the observation method on batteries 5 and 6 to read standpipe and lid leaks. Method H is, with some exceptions, identical to the proposed Method 12 for topsides. The inspector began at either end of the battery and walked along a line between the #2 and #3 charge port lids. In one direction lid leaks, and in the opposite direction standpipe leaks, were read. The inspector usually read standpipe leaks in the direction where the sun was at his back. Observations were recorded on Figure 26.

Pushing

Three observation methods were used --- Methods D, E, and F --- to read pushing emissions at batteries 5 and 6 during the Fairfield survey. For each method the inspector was located on the coke side of the battery outside the hot car tracks in order to obtain a clear view. For Method D, the inspector timed the number of seconds of visible emissions $\geq$ 20% during the push cycle.* For Method E, the inspector timed the number of seconds of visible emissions $\geq$ 60% during the push cycle. For Method F, the inspector made a Method 9-like observation of opacity each 15 seconds. For Methods D and E, the inspectors also read the maximum opacity from the time the coke in the oven began to move toward the hot car to the time all the coke was in the hot car. The Method D, E, and F inspectors recorded their observations on Figures 27, 28 and 29, respectively.

* *The push cycle begins when the coke side door is removed and ends when the quench occurs.*

V. SURVEY RESULTS

PROCESS OBSERVATION DATA

One-half of the personnel participating in the Fairfield survey collected process data. The reason for gathering these data was discussed in Section IV. The results of process parameter data gathering and the merits of the effort are discussed in this subsection; unless otherwise discussed, the gathering of the data in further coke battery surveys is considered important for the reasons discussed in Section IV.

General Process Observations

The personnel activities form [Figure 3] was completed differently, by each process observer, thus the data were of little use for comparative purposes. The most relevant parameter (crew size) can be obtained more easily by the team leader contacting the Company each morning and reviewing the list during the day as he makes his rounds. To obtain cause/effect relationships (e.g., millwright adjusts door at a specific time and door stops leaking within a stated period of time thereafter), this form would need to be more specific (e.g., checklist) for each process observer.

The chart recordings form [Figure 4] served as a daily checklist for the team leader as he initialed and noted time and date on the pertinent charts. The utility of individual chart data are discussed later in this report.

Combustion data [Figures 5 and 6] were gathered solely for use by an EPA contractor who was investigating combustion stack emissions for DSSE. Their utility is unknown.

Charging Process Observations

Larry Car Alignment

As mentioned previously, no form was developed on which to note when the drop sleeves on the larry car misaligned with the charge ports. Few misalignments were observed by the visible emissions observers. However, the absence of misalignment observations does not indicate that during all other charges the larry car drop sleeves were properly aligned. Since this parameter (larry car alignment), could be of significant importance to smokeless charging, effort should be made to document, perhaps on the charging visible emissions observation forms, that proper larry car alignment occurred prior to the initiation of a charge.

Charge Port Openings

These data [Figure 8] proved difficult to interpret; a diagram of the material buildup drawn by the topside inspector did not provide objective data. In general, refractory material buildup was oberved in most charge ports, but no carbon buildup was seen in any charge ports. From all the diagrams of charge port blockage made during the Fairfield survey, the area of all charge port openings was estimated to be at least 80% open. Another technique should be developed to measure charge port blockage or openings, and parameters measured similarly if more definitive information is required.

Gas Passage

Peak and channel height measurements are a generally accepted technique with which to "photograph" the coal as it resides in an oven. Thirteen sets of peak and channel height measurements* were made during the inspection [Table 1].

The larry car inspector attempted to record larry car hopper settings [Figure 9]. However, only the number of notches on the apron control turn-screw showing above the connecting rod could be recorded. A different measurement may be necessary on other larry cars because of the mechanical configuration of the car itself. In addition, the resultant peak heights following charging, are true indicators of the gas passage situation. The surrogate measures of hopper volume settings are unnecessary to record; the inspector is interested in whether the settings were changed in order to request a peak height measurement.

Roof carbon diagrams [Figure 10], for the identical reasons discussed for charge port openings, were difficult to interpret. However, no significant roof carbon buildup $\geq$ 20% of the design channel space blocked was observed.

Gooseneck and Standpipe Openings

Data gathered on the cleaning of goosenecks and standpipes prior to each charge [Figure 9], documents Company operating practice, but provides little in the analysis of individual charges. However, the diagrams drawn to show the extent of carbon buildup in goosenecks and standpipes following cleaning were difficult to interpret. The data show that all standpipes and goosenecks were free of significant carbon buildup; i.e., all had at least 80% of the cross-sectional area open.

Charge Sequence

Charge sequence data [Figure 9] in all cases demonstrated that the Fairfield operators performed the charge sequence established by the Company. However, the time varied by which the larry car operator accomplished specific unit operations. The results of the days in which time of larry car operations were conducted are contained in Table 2. These data are of little known value in analyzing individual charges, but are useful in comparing Fairfield charging operations with similar operations at other coke plants.

Chuck Door and Lid Operations

The pusher machine inspector records [Figure 14] showed that the time the chuck door was open, prior to the entry of the leveling bar, averaged 10 seconds for battery 5 and 17 seconds for battery 6 during the survey. Since a smoke boot* is not used at Fairfield, these times should be used with care in any data interpretation. In order to measure the usefulness of this parameter, time-synchronized, simultaneous measurement of charging emissions should be made.

In every case, charge port lids were replaced once the drop sleeves of the larry car were raised. Following sweeping up excess coal, all lids were resealed and luted prior to the aspiration steam being turned off.

* *Since a leveling bar does not fill the chuck door opening during leveling, emissions may evolve to the atmosphere and unnecessary loss of oven aspiration occurs. A smoke boot provides a seal between the leveling bar and the chuck door jamb during the time the leveling bar is in the oven.*

Coal Sample Analysis

Table 3 contains the analytical results [Figure 17], of the four separate coal samples [Figure 16], gathered daily during the survey.

Aspiration Steam Pressure

In all cases the dynamic steam pressures recorded by either the topside or larry car inspectors, or team leader, exceeded 5.6 kg/cm^2 (80 psig). However, since these pressures were measured in the steam supply lines and not as actual nozzle pressures, care should be taken in drawing conclusions. The strip chart recorded hourly average steam pressures as measured downstream of the regulators for batteries 5 and 6, are listed in Table 4.

The static and dynamic steam pressures recorded by the larry car and topside inspectors [Figure 18], were not reduced and are not presented in this report. The data were used in analysis of individual charging visible emissions observations to determine if values were within the range 6.3 to 8.1 kg/cm^2 (90 to 115 psig).

Door Process Observations

Door Damage

The inspector's findings for damage/no damage to knife edges and refractory [Figure 20], are shown in Figures 30 to 46. These histograms show the number of doors (ordinate) as a function of the number of sections of a door damaged (abscissa). In cases where no data were available, the no data section along the absicissa was used. For example, on November 30, 1976, twenty-six doors each were inspected on the pusher side and coke side of Battery 5 [Figure 30]: thirteen coke side doors had no refractory damage; four had refractory damage to just one section of the door; two had refractory damage to two sections; three had refractory damage to three sections; three had refractory damage over the entire door (six sections); and, for one door there was no data.

Door Cleaning

The inspector's findings [Figure 20], are shown in Figures 47 to 80. These histograms show, first for the pusher side, and then for the coke side, the number of doors (ordinate) as a function of the number of sections of a door or jamb cleaned, whether a section needed it or not, and also the number of sections of a door or jamb with deposits remaining, whether cleaned or not. In cases where no data were available, the no data section along the abscissa was used. These figures are interpreted in the same manner as the door damage histograms discussed above.

Spare Door Availability

Usually there were 0 to 2 readily available spare doors per side per operating unit at Fairfield [Figure 21].

Collector Main Pressure

Table 5, developed from Company-supplied circular recorder charts, lists the average hourly collector main pressures for each day of the survey for batteries 5, 6, and 9. At no time did these pressures exceed 12 mm of water except instantaneously.

Sealing Times

In the Visible Emissions Observation Data subsection of this section, the results of door emissions observations are presented. In the graphical displays of these observations [Figures 81 to 116], the charge completion time is plotted so that the reader can make an empirical assessment of door sealing times.

Topside Process Observations

Luting Practices and Sealing Times

In the Visible Emissions Observation Data subsection of this section, the results of the topside emissions observations are presented. In the graphical displays of these observations [Figures 117 to 136], the standpipe cap luting or reluting [Figure 12], charge port lid luting or reluting [Figure 15], and charge completion time are plotted. From the charge completion time the reader can make an empirical assessment of standpipe cap and charge port lid sealing times.

Collector Main Pressure

As discussed above, Table 5 summarizes average hourly collector main pressures for each day of the Fairfield survey.

Pushing Process Observations

Coking Times

Net coking times (the time lapse between the time of charging and pushing an oven), were supplied by Fairfield Works personnel [Figure 17], for each oven pushed during turn B for batteries 5 and 6 each day of the survey. These daily average net coking times for batteries 5 and 6 are presented in Table 6.

Oven Temperatures

Average oven wall flue temperatures for the pusher sides and coke sides of batteries 5 and 6 at Fairfield are shown in Figure 137.

Offtake Opacity

The results of the topside inspector's observations of offtake opacity [Figure 22] are presented in Table 7.

Coke Face Appearance and Oven Conditions

The results of the inspector's observations of coke face appearance and oven conditions [Figure 10], are also presented in Table 7. The utility of these data can only be measured by determining a correlation between them and the pushing emissions observations. However, the ability of an inspector, without considerable experience, to objectively determine the existence and extent of a smoking and/or flaming coke face and to identify oven cold spots is questionable. The diagrams drawn by the inspectors were only used to determine the existence of the phenomena, not the location, as was originally intended.

Coke Sample Analysis

The results of the Company's coke sample analyses [Figure 17], are contained in Table 6.

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Average oven wall flue temperatures for the pusher sides and coke sides of batteries 5 and 6 at Fairfield are shown in Figure 137.

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Coke Sample Analysis

The results of the Company's coke sample analyses [Figure 17], are contained in Table 6.

VISIBLE EMISSIONS OBSERVATION DATA

The data from the visible emissions observations made during the Fairfield survey are presented in Tables 8 through 18, as follows:

- Table 8. Method A-Charging Emissions Data
- Table 9. Method B-Charging Emissions Data
- Table 10. Topside Emissions Data
- Table 12. Pushing Emissions Data

In addition, door leak data, along with charge times and leak identification, are presented in Figures 81 and 116. Topside leak data, including leak identification, luting information, and charge times, are presented in Figures 117 to 136.

The acquisition of charging visible emissions data at batteries 5 and 6 fulfilled the second and partially fulfilled the fifth survey objectives; new source performance development and corroborative study, respectively. The results of the corroborative study are not included in this report, but rather are included in the report entitled "Coke Battery Visible Emissions Observation Corroboration, Bethlehem Steel Corporation, Bethlehem, Pennsylvania (September 1976), and United States Steel Corporation, Fairfield, Alabama (December 1976)." The third and fourth objectives of the Fairfield survey were fulfilled by the acquisition of door leak, pushing and topside leak data at batteries 5 and 6, and door leak data at battery 9.

Of particular interest as a result of the Fairfield survey was a review of the Method B charging data. Representatives of DSSE, OAQPS, EPA Region III, and the NEIC met in Denver the week of April 4, 1977 to, among other things, review the Method B data set to determine whether best available control technology (BACT) was employed for each charge.

All the applicable process data were analyzed and the visible emission observers' comments were reviewed. The parameters used in the analyses were as follows:

1. Whether charge ports were at least 80% open.
2. Whether blockage by roof carbon was <20% of the theoretical tunnel head (channel space).
3. Whether the standpipe area, at least around the top of the opening, had been cleaned.
4. Whether the gooseneck had been cleaned.
5. Whether the standpipes were at least 80% open.
6. Whether the goosenecks were at least 80% open.
7. Whether the jumper pipe was used.
8. Whether aspiration steam had been turned on.
9. Whether the #1 and #4 larry car coal hoppers were dropped prior to the other two.
10. Whether the #2 and #3 hoppers were dropped individually.
11. Whether the slide gates were closed after each hopper was empty.
12. Whether the length of time the chuck door was open, prior to the time the leveling bar entered the oven, was $\pm$ 20% of the average time.
13. Whether the charge time was between 4 to 6 minutes.
14. Whether the dynamic (during charging) steam pressure was 6.3 to 8.1 kg/cm^2 (90 to 115 psig).
15. Visible emissions observer did not identify a process problem (e.g. larry car alignment) in his comments on the data sheet.

At the completion of the analyses there was only a small data set for which all the above information was available and/or which met the established criteria. However, it was determined that it was not sufficient to identify a charging observation as "non-BACT" for any one of the above parameters, except two; if the jumper pipe was not used or if a visible emissions observer identified a process problem. It was also agreed that no one could really identify, at present, which combination(s) of the above parameters might also make a charge non-BACT. Therefore, the resultant data set, removing the non-BACT charges for either of the two aforementioned criteria, is termed "Not Unacceptable." These data are presented in Table 13.

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3. *Coal, Coke, and Coal Chemicals*, Wilson and Wells, McGraw Hill, 1951.

4. Dion, J. A. and Brooman, D.L., "Trip Report - U.S. Steel, Fairfield, Alabama, Coke Works," memorandum, July 22, 1976.

5. *Federal Register*, 41 (Oct. 22, 1976), 46765-46767.

6. Seals, Lownie, et al, Battelle Columbus Labs, Ohio, "Study of Concepts for Minimizing Emissions from Coke Oven Door Seals," EPA-650/2-75-064, July 1975.

7. Clayton Environmental Consultants, Inc., Draft Report: "Study of Coke-Side Oven Emissions," EPA Contract No. 68-02-1408, Task No. 14, Volume 1, January 16, 1976.

APPENDICES

Appendix A

Visible Emissions Observation Methods

METHOD A

PROCEDURE FOR OBSERVING VISIBLE EMISSIONS EQUAL TO OR GREATER THAN 20% OPACITY DURING CHARGING

PRINCIPLE

The visible emissions equal to or greater than 20% opacity emitted from the charging system and oven ports are timed by an observer located on the topside of the battery. In addition, the maximum opacity observed during the charge period is recorded.

DEFINITIONS

(a) Charging System - any apparatus used to introduce coal into a coke oven (e.g., a larry car).

(b) Charge Period - the period of time commencing when coal starts to enter the oven and ending when the last charge port lid is replaced.

(c) Clean-up/Seal Period - the period of time commencing when the charge period ends and ending when the last charge port lid is either dry- or wet-sealed whichever is later. This period includes reopening the lids and sweeping spilled coal into the oven.

(d) Opacity - the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

PROCEDURE

(a) Position - The observer stands on the topside of the battery such that a good view of all charge ports of the oven being charged and the charging system is possible. A position in the center of the battery at a distance of 10 to 15 ovens from the oven being charged is recommended. However, the observer may move from side to side, going from pushside to cokeside and back again; standing in a single spot is not required. If multiple observers are recording the same emissions, the observers should be positioned as closely to each other as feasible; i.e., a situation where oven 42 is being charged and one observer is positioned at oven 32 and one observer is positioned at oven 52, with the larry car between them, is not acceptable. Observer position is recorded on the data sheet.

(b) Observations - During the charge period the observer watches all the potential emission sources. For larry car charging the observer watches the entire charging system, including the larry car hoppers, and the charge ports. Upon observing any visible emission with an opacity equal to or greater than 20% opacity, as determined against any contrasting background, an accumulative stopwatch is started. The watch is stopped when the visible emission goes below 20% and is restarted when a visible emission equal to or greater than 20% reappears. The observer continues this procedure for the entire period. Visible emissions equal to or greater than 20% may occur simultaneously from several points; e.g., from around all drop sleeves at the same time. In such a case the visible emissions are timed collectively, not independently. Also visible emissions equal to or greater than 20% may start from one source immediately after another source stops. These are timed as one continuous visible emission equal to or greater than 20%. The time recorded on the data sheet at the end of the charge period is the total time on the stopwatch for that period. In addition to the above, the observer also mentally notes the densest opacity occuring during the charge period and at the end of the period records on the data sheet the maximum opacity observed, During some inspections, emissions during the clean-up/seal period may also be required. Using a second accumulative stopwatch, the inspector records the total emissions equal to or greater than 20% opacity during this period, in a manner identical to that used for the charge period.

The following visible emissions are not timed:

(1) Steam vapor;

(2) Visible emissions from burning coal spilled on top of the oven or oven lid;

(3) Visible emissions emitted from any equipment other than the charging system or oven ports. Standpipe emissions should not be timed during these periods;

(4) Visible emissions from coke oven doors which may rise above the battery and which may be windblown across its topside; or

(5) Visible emissions that drift from the top of a larry car hopper, but have already been timed as a visible emission from the drop sleeve below the hopper.

Three stations will probably be encountered:

1. Non-mechanical lifters; lidman. By definition, the charge period ends when the lidman slips the last lid onto the oven port (whether or not the lid is properly or totally sealed). The clean-up/seal period begins at this point and continues until the lids are either dry- or wet-sealed, whichever is later. It is conceivable, if wet-sealing is not used, that no clean-up/seal period will exist.

2. Mechanical lifters; wet-sealing. In this case, the charge period ends when the last lid is replaced mechanically by the larry car.

The seal period begins at this point and ends when the last lid is wet-sealed.

3. Mechanical lifters; no wet-sealing. In this case, the charge period ends when the larry car mechanically replaces the last lid. More than likely, there will be no clean-up/seal period in this situation. However, if a lidman is present to reopen the lids and sweep spilled coal into the oven, or reseal the lids which are not properly replaced, the emissions equal to or greater than 20% opacity during this period are timed as clean-up emissions.

METHOD A

CHARGING OBSERVATIONS

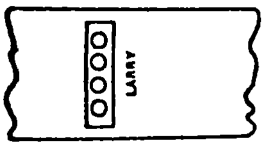
Company ______________________ Date ______________________
Location ______________________ Sky Condition ______________________
Company Rep. ______________________ Wind Speed ______________________
Inspector ______________________ Ambient Temp. ______________________
Background ______________________

Battery/Oven __________/__________
Time of Charge: Start __________
End __________

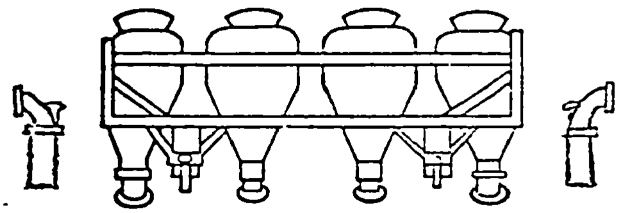
Time ≥ 20% (seconds) Opacity
Charge period __________
Seal period __________
Total __________
Maximum opacity __________

Comments:

Indicate sun position, observation position, and wind direction:



Mark dominant emission points:

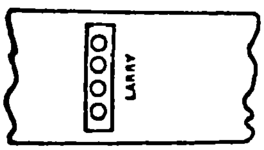


Battery/Oven __________/__________
Time of Charge: Start __________
End __________

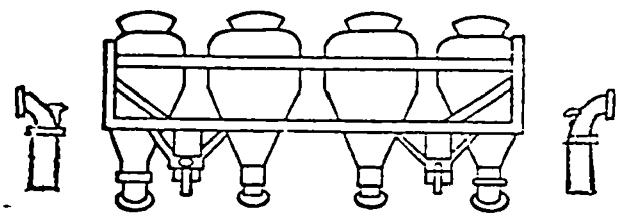
Time ≥ 20% (seconds) Opacity
Charge period __________
Seal period __________
Total __________
Maximum opacity __________

Comments:

Indicate sun position, observation position, and wind direction:



Mark dominant emission points:

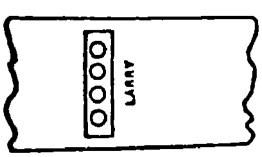


Battery/Oven __________/__________
Time of Charge: Start __________
End __________

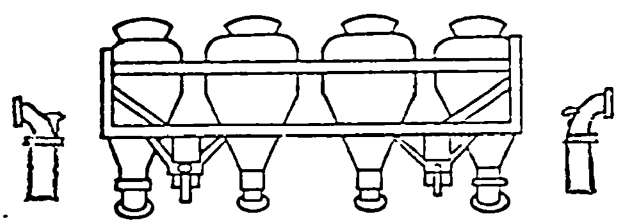
Time ≥ 20% (seconds) Opacity
Charge period __________
Seal period __________
Total __________
Maximum opacity __________

Comments:

Indicate sun position, observation position, and wind direction:



Mark dominant emission points:



A

METHOD B

PROCEDURE FOR OBSERVING ANY VISIBLE EMISSIONS DURING CHARGING

PRINCIPLE

Any visible emissions emitted from the charging system and oven ports are timed by an observer located on the topside of the battery.

DEFINITIONS

(a) Charging System - any apparatus used to introduce coal into a coke oven (e.g., a larry car).

(b) Charge Period - the period of time commencing when coal starts to enter the oven and ending when the last charge port lid is replaced.

(c) Clean-up/Seal Period - the period of time commencing when the charge period ends and ending when the last charge port lid is either dry- or wet-sealed whichever is later. This period includes reopening the lids and sweeping spilled coal into the oven.

PROCEDURE

(a) Position - The observer stands on the topside of the battery such that a good view of all charge ports of the oven being charged and the charging system is possible. A position in the center of the battery at a distance of 10 to 15 ovens from the oven being charged is recommended. However, the observer may move from side to side, going from pushside to cokeside and back again; standing in a single spot is not required. If multiple observers are recording the same emissions, the observers should be positioned as closely to each other as feasible; i.e., a situation where oven 42 is being charged and one observer is positioned at oven 32 and one observer is positioned at oven 52, with the larry car between them, is not acceptable. Observer position is recorded on the data sheet.

(b) Observations - During the charge period the observer watches all the potential emission sources. For larry car charging the observer watches the entire charging system, including the larry car hoppers, and the charge ports. Upon observing any visible emission, an accumulative stopwatch is started. The watch is stopped when the visible emission stops and is restarted when a visible emission reappears. The observer continues this procedure for the entire period. Visible emissions may occur simultaneously from several points during a charge; e.g., from around all drop sleeves at the same time. In such a case the visible emissions are timed collectively, not independently. Also visible emissions may start from one source immediately after another source stops. These are timed as one continuous visible emission. The time recorded on the data sheet at the end of the charge period is the total time on the stopwatch for that period.

During some inspections, emissions during the clean-up/seal period may also be required. Using a second accumulative stopwatch, the inspector records the total visible emissions during this period, in a manner identical to that used for the charge period.

The following visible emissions are not timed:

(1) Steam vapor;

(2) Visible emissions from burning coal spilled on top of the oven or oven lid;

(3) Visible emissions emitted from any equipment other than the charging system or topside ports. Standpipe emissions should not be

timed during charging;

(4) Visible emissions emitted from coke oven doors which may rise above the battery and which may be windblown across its topside; or

(5) Visible emissions that drift from the top of a larry car hopper, but have already been timed as a visible emission from the drop sleeve below the hopper.

Three stations will probably be encountered:

1. Non-mechanical lifters; lidman. By definition, the charge period ends when the lidman slips the last lid onto the oven port (whether or not the lid is properly or totally sealed). The clean-up/seal period begins at this point and continues until the lids are either dry- or wet-sealed, whichever is later. It is conceivable, if wet-sealing is not used, that no clean-up/seal period will exist.

2. Mechanical lifters; wet-sealing. In this case, the charge period ends when the last lid is replaced mechanically by the larry car. The seal period begins at this point and ends when the last lid is wet-sealed.

3. Mechanical lifters; no wet-sealing. In this case, the charge period ends when the larry car mechanically replaces the last lid. More than likely, there will be no clean-up/seal period in this situation. However, if a lidman is present to reopen the lids and sweep spilled coal into the oven, or reseal the lids which are not properly replaced, the emissions during this period are timed as clean-up emissions.

METHOD B

CHARGING OBSERVATIONS

Company ______________
Location ______________
Company Rep. ______________
Inspector ______________

Date ______________
Sky Condition ______________
Wind Speed ______________
Ambient Temp. ______________
Background ______________

[Indicate sun position, observation position, and wind direction on diagrams.]

Batt/Oven ____/____
Time Start ______
Time End ______
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ______
Seal Period ______
Total ______

Batt/Oven ____/____
Time Start ______
Time End ______
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ______
Seal Period ______
Total ______

Batt/Oven ____/____
Time Start ______
Time End ______
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ______
Seal Period ______
Total ______

Batt/Oven ____/____
Time Start ______
Time End ______
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ______
Seal Period ______
Total ______

Batt/Oven ____/____
Time Start ______
Time End ______
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ______
Seal Period ______
Total ______

GPO 840-869

METHOD C

PROCEDURE FOR OBSERVING VISIBLE EMISSIONS FROM COKE OVEN DOORS

PRINCIPLE

The coke oven doors that are leaking are recorded by an observer making a traverse around the battery. In addition, the opacity at the lintel of each leaking door is recorded.

DEFINITIONS

(a) Cokeside Doors - those doors on the side of a battery from which pushed coke empties into the hot car.

(b) Pushside Doors - those doors on the side of a battery where the pusher machine is lodated. Push side doors usually contain the chuck door.

(c) Chuck Door (or leveler bar door) - a small door on the pushside which is opened to allow the leveler bar to enter the oven and level coal during charging.

(d) Jamb Leak - a leak which occurs between the oven brick and the jamb.

(e) Buckstay Leak - a leak which occurs between the buckstay and the oven brick.

(f) Lintel - the area from just above the door to the edge of the top of the battery.

(g) Traverse - the movement from one end of the battery to the other, inspecting all ovens in the battery.

PROCEDURE

(a) Position - The inspector makes his observations of door emissions during a traverse as close to the battery as safety and visibility conditions permit, but generally outside of the pusher machine or quench (hot) car tracks. The inspector may move to a closer observation point to determine the source of an emission.

(b) Observation - The inspector starts the observation with an oven at either end of the battery and on either the pushside or the cokeside of the battery. The inspector observes and records any visible emissions from a door. Visible emissions from the sealing edge around the perimeter of a door, or, in the case of the pushside, from the door and/or chuck door are considered as door emissions. Visible emissions from structural leaks, such a jambs, buckstay or lintel leaks, are not considered as door emissions. After the inspector has made a visible inspection of the perimeter for door emissions, a single determination of the opacity of the door emissions is made at a point above the door, using the battery as a background. This area is commonly referred to as the lintel.

The inspector then moves to the adjacent door, if possible, and checks for door emissions in a like manner. The inspector continues this procedure down the entire length of the battery. If a temporary machine obstruction occurs blocking the view of a series of ovens, the inspector may bypass those ovens and continue down the remainder of the battery, returning to check the bypassed ovens when that side has been completed.

After the inspector has observed the doors on one side of a battery, he proceeds directly to the opposite side of the battery. He again starts at one end of the battery repeating the same procedures as for the previous side.

A row of two or more continuous batteries is inspected battery by battery and not, as e.g., all the pushsides and then all the cokesides.

METHOD C

DOOR OBSERVATIONS

Company ____________________
Location ____________________
Company Rep. ____________________
Inspector ____________________
Battery __________
No. of Ovens ______

Date ____________________
Sky Condition ____________________
Wind Speed ____________________
Ambient Temp. ____________________
Background ____________________
[Indicate sun position, observation traverse, and wind direction.]

CS

PS

OVEN NO	ID OF LEAK*	PS or CS	OPACITY %	TIME: START FINISH	COMMENTS

*D=door, C=chuck door, B=both door and chuck door

C

METHOD D

PROCEDURE FOR OBSERVING VISIBLE EMISSIONS EQUAL TO OR GREATER THAN 20% OPACITY DURING PUSHING

PRINCIPLE

The visible emissions equal to or greater than 20% opacity emitted during the push cycle are timed by an observer located on the cokeside of the battery. In addition, the maximum opacity observed during the coke fall period is recorded.

DEFINITIONS

(a) Push Cycle - the period of time commencing when the cokeside oven door is removed and ending when the coke is quenched. Further, the push cycle is divided into three periods, as follows:

A to B = 1: Period from time door comes off to time start of ram movement

B to C = 2: Period from time start of ram movement to time all coke is in hot car

C to D = 3: Period from time all coke is in hot car to time of quench

(b) Coke Fall Period - the period of time B to C or 2, above.

(c) Quench - cooling the red hot coke to a temperature below its ignition temperature at the quench tower.

(d) Quench Tower - the structure, where the quench is carried out, normally made of wood or brick and designed to conduct the steam plume generated during the quench into the atmosphere.

(e) Hot Car - the railroad car into which the coke is pushed; sometimes called the quench car.

(f) Opacity - the degree to which emissions reduce the transmission light and obscure the view of an object in the background.

PROCEDURE

(a) Position - The observer makes the observation from the cokeside of the battery, where a clear view of the push can be obtained. In general, a location on the ground, in the cokeside yard, outside the hot car tracks approximately perpendicular to the observed oven is acceptable. However, the observer is not restricted to being on the ground level, but may make the observation from some elevated level. If multiple observers are recording the same emissions, the observers should be positioned as closely to each other as feasible. Observer position is recorded on the data sheet.

(b) Observations - During the push cycle the observer watches all the potential emission sources. These include the oven and the hot car. Upon observing any visible emission with an opacity equal to or greater than 20% opacity, as determined against any contrasting background, an accumulative stopwatch is started. The watch is stopped when the visible emission goes below 20% and is restarted when a visible emission equal to or greater than 20% reappears. The observer continues this procedure for the entire push cycle; using either separate stopwatches for each of the three periods of the cycle or noting the time for each period and recording on the data sheet while employing one or two stopwatches. The time recorded on the data sheet at the end of each period is the total time on the stopwatch for that period. In addition to the above, the observer also mentally notes the densest opacity occurring during the coke fall period and at the end of the push cycle records on the data sheet the maximum opacity observed.

The following visible emissions are not timed:

(1) Steam vapor;
(2) Visible emissions generated from jamb cleaning;
(3) Visible emissions from the removed door; or
(4) Visible emissions from the pushside of the oven.

In some cases, coke battery operators will keep the standpipe cap open during the push cycle. These emissions should be regarded as pushing emissions.

METHOD D

PUSHING OBSERVATIONS

Company ____________________ Date ____________________
Location ____________________ Sky Condition ____________________
Company Rep. ____________________ Wind Speed ____________________
Inspector ____________________ Ambient Temp. ____________________

[Indicate sun position, observation position, and wind direction.]

CS

PS

A-door off
B-ram moves
C-coke in hot car
D-quench

ttery/oven					
Time door moved (A)					
me of push (B)					
Time of ench (D)					
me > 20% between (A-B)					
me > 20% tween (B-C)					
Time > 20% between (C-D)					
x. opacity during (B-C)					
sition					
ckground*					
mment mber					

* *No mark for sky*
X for battery
✓ for other (specify)

Comments:

D

GPO 840-867

METHOD E

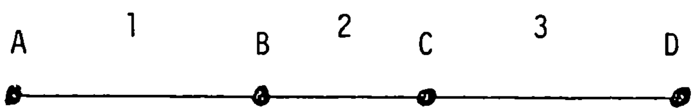
PROCEDURE FOR OBSERVING VISIBLE EMISSIONS EQUAL TO OR GREATER THAN 60% OPACITY DURING PUSHING

PRINCIPLE

The visible emissions equal to or greater than 60% opacity emitted during the pushing cycle are timed by an observer located on the cokeside of the battery. In addition, the maximum opacity observed during the coke fall period is recorded.

DEFINITIONS

(a) Pushing Cycle - the period of time commencing when the cokeside oven door is removed and ending when the coke is quenched. Further, the pushing cycle is divided into three periods, as follows:



A to B = 1: Period from time door comes off to time start of ram movement

B to C = 2: Period from time start of ram movement to time all coke is in hot car

C to D = 3: Period from time all coke is in hot car to time of quench

(b) Coke Fall Period - the period of time B to C or 2, above.

(c) Quench - cooling the red hot coke to a temperature below its ignition temperature at the quench tower.

(d) Quench Tower - the structure, where the quench is carried out, normally made of wood or brick and designed to conduct the steam plume generated during the quench into the atmosphere.

(e) Hot Car - the railroad car into which the coke is pushed; sometimes called the quench car.

(f) Opacity - the degree to which emissions reduce the transmission of light and obscure the view of any object in the background.

PROCEDURE

(a) Position - The observer makes the observation from the cokeside of the battery, where a clear view of the push can be obtained. In general, a location on the ground, in the cokeside yard, outside the hot car tracks approximately perpendicular to the observed oven is acceptable. However, the observer is not restricted to being on the ground level, but may make the observation from some elevated level. If multiple observers are recording the same emissions, the observers should be positioned as closely to each other as feasible. Observer position is recorded on the data sheet.

(b) Observations - During the push cycle the observer watches all the potential emission sources. These include the oven and the hot car. Upon observing any visible emission with an opacity equal to or greater than 60% opacity, as determined against any contrasting background, an accumulative stopwatch is started. The watch is stopped when the visible emission goes below 60% and is restarted when a visible emission equal to or greater than 60% reappears. The observer continues this procedure for the entire push cycle; using either separate stopwatches for each of the three periods of the cycle or noting the time for each period and recording it on the data sheet while employing one or two stopwatches. The time recorded on the data sheet at the end of each period is the total time on the stopwatch for that period. In addition to the above, the observer also mentally notes the densest opacity occurring during the coke fall period and at the end of the push cycle records on the data sheet the maximum opacity observed.

The following visible emissions are not timed:

(1) Steam vapor;
(2) Visible emissions generated from jamb cleaning;
(3) Visible emissions from the removed door; or
(4) Visible emissions from the pushside of the oven.

In some cases, coke battery operators will keep the standpipe cap open during the push cycle. These emissions should be recorded as pushing emissions.

METHOD E

PUSHING OBSERVATIONS

Company ____________________ Date ____________________
Location ____________________ Sky Condition ____________________
Company Rep. ____________________ Wind Speed ____________________
Inspector ____________________ Ambient Temp. ____________________

[Indicate sun position, observation position, and wind direction.]

CS

PS

A-door off
B-ram moves
C-coke in hot car
D-quench

ttery/oven					
ıme door removed (A)					
me of sh (B)					
Time of ench (D)					
me ≥ 60% between (A-B)					
me ≥ 60% tween (B-C)					
me ≥ 60% between (C-D)					
x. opacity ıring (B-C)					
Position					
ckground*					
mment ımber					

* *No mark for sky*
X for battery
✓ for other (specify)

Comments:

GPO 840 - 866

METHOD F

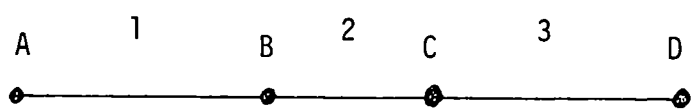
PROCEDURE FOR OBSERVING VISIBLE EMISSIONS USING A METHOD 9 TYPE OBSERVATION DURING PUSHING

PRINCIPLE

The opacity of visible emissions emitted during the push cycle is recorded at fifteen second intervals by an observer located on the cokeside of the battery.

DEFINITIONS

(a) Pushing Cycle - the period of time commencing when the cokeside oven door is removed and ending when the coke is quenched. Further, the push cycle is divided into three periods, as follows:



A to B = 1: Period from time door comes off to time start of ram movement

B to C = 2: Period from time start of ram movement to time all coke is in hot car

C to D = 3: Period from time all coke is in hot car to time of quench

(b) Coke Fall Period - the period of time B to C or 2, above.

(c) Quench - cooling the red hot coke to a temperature below its ignition temperature at the quench tower.

(d) Quench Tower - the structure, where the quench is carried out, normally made of wood or brick and designed to conduct the steam plume generated during the quench into the atmosphere.

(e) Hot Car - the railroad car into which the coke is pushed; sometimes called the quench car.

(f) Opacity - the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

(g) Method 9 - the visible emissions observation technique published in 40 CFR Part 60, Appendix A.

PROCEDURE

(a) Position - The observer makes the observation from the cokeside of the battery, where a clear view of the push can be obtained. In general, a location on the ground, in the cokeside yard, outside the hot car tracks approximately perpendicular to the observed oven is acceptable. However, the observer is not restricted to being on the ground level, but may make the observation from some elevated level. If multiple observers are recording the same emissions, the observers should be positioned as closely to each other as feasible. Observer position is recorded on the data sheet.

(b) Observations - During the push cycle the observer watches all the potential emission sources at 15 second instances. These include the oven and the hot car. The observer determines the opacity of the pushing emissions at every 15 second instance at the densest point of the emissions, as read against any contrasting background. Reading commences when the door is removed. In addition to recording the opacity, the inspector records at the period of the push cycle and the specific background used for the opacity determination. The observer continues this procedure until the coke is quenched.

The following visible emissions are not timed:

(1) Steam vapor;
(2) Visible emissions generated from jamb cleaning;
(3) Visible emissions from the removed door; or
(4) Visible emissions from the pushside of the oven.

In some cases, coke battery operators will keep the standpipe cap open during the push cycle. These emissions should be recorded as pushing emissions.

METHOD F

PUSHING OBSERVATIONS

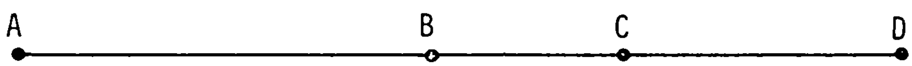
Company ______________ Date ______________
Location ______________ Sky Condition ______________
Company Rep. ______________ Wind Speed ______________
Inspector ______________ Ambient Temp. ______________

[Indicate sun position, observation position, and wind direction.]

CS

PS

A-door off
B-ram moves
C-coke in hot car
D-quench



ttery/oven	Time door removed	Min	0	15	30	45
		0				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		8				
		9				

Position ______________

Background* ______________

* No mark for sky
X For battery
/ For other (specify)

Note: During observation enter designations A, B, C, and D in the block during which the event occurred.

Comments:

F

METHOD F

PUSHING OBSERVATIONS

(Continued)

Battery/oven ____/_____

Min	0	15	30	45
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

GPO 840-865

METHOD H

PROCEDURE FOR OBSERVING VISIBLE EMISSIONS FROM TOPSIDE LEAKS USING A MULTIPASS TRAVERSE

PRINCIPLE

The visible emissions emitted from offtake systems and charge port lids are determined visually by an observer making a separate traverse for the offtake system and for the charge port lids.

DEFINITIONS

(a) Offtake System - the apparatus for each oven that provides a passage for gases from an oven to the collection main.

(b) Collection Main - the apparatus connected to one or more offtake systems that provides a passage for conveying gases from the offtake system to the byproduct plant cross-over collection main.

(c) Charge Port - Any opening in the topside of an oven, provided by a masonry casting.

(d) Chart Port Lid - any apparatus used to cover an open charge port.

(e) Stationary Jumper Pipe - any apparatus permanently connecting two ovens for the purpose of increasing oven aspiration during charging.

(f) Decarbonization Period - a period of time for combusting oven carbon that commences when oven lids are removed from charge ports no no earlier than 30 minutes before the oven is pushed and ends with the initiation of the next charge of that oven.

(g) Luting - a process by which charge port lids are wet-sealed to retard escape of emissions to the atmosphere.

(h) Traverse - the movement from one end of the battery to the other, inspecting all oven in the battery.

(i) Significant Leak - any offtake system leak which is greater than one meter in length.

(j) Total Leak - any offtake system or charge port lid leak.

PROCEDURE

(a) Position - The observer makes the observation from the topside of the battery, traversing the battery near the centerline. During the traverse, the observer may stray from the centerline of battery if the observer believes an investigation is required to determine whether or not a leak exists. If the observer does deviate from the battery centerline during a traverse to look at a particular source, this is noted on the data sheet.

In performing a traverse, the inspector observes offtake system leaks in one direction and charge port lid leaks in the return traverse. The offtake system leak traverse is conducted in the direction where the sun is most behind the inspector's back.

(b) Observations - The observer traverses the coke battery at a steady pace, pausing only to make appropriate entries on the data sheet. The inspector may use a stopwatch to record the time required for the traverse. If the observer is delayed by the larry car, the watch is stopped and restarted. The time required for the traverse is recorded on the data sheet.

The inspector should stand back far enough from the offtake system(s) or charge port lids in order to provide a clear view of them. If for some reason the centerline cannot be used to provide such a clear view, the observer should select a viewing location on the topside further from (rather than closer to) the units being inspected; this situation may occur if the standpipes are extremely tall (greater than 15 feet). In such cases, for example, the observer may traverse along the cokeside edge in order to observe a pushside offtake system. If a double offtake system battery has extremely tall offtakes, it is conceivable that two traverses may be required for each run, i.e., one traverse along the cokeside edge of topside to observe the pushside offtake system and one traverse along the pushside edge of topside to observe the cokeside offtake system. In such a case, the two traverses may be required, whereas a single traverse is preferred.

During any one traverse, the observer may record on the data sheet total leaks from charg port lids, or may record total and significant leaks from offtake systems (and stationary jumper pipes).

The numbers for all ovens with lids and offtakes open for decarbonization are noted on the data sheet with the appropriate comment. In addition, if a leak from one of the open sources exists, the number of significant and/or total leaks are recorded in the appropriate columns of the data sheet; however, the oven number is circled to indicate the oven was decarbonizing.

The following visible emissions are not recorded:

(1) Steam vapor;

(2) Coal smoldering on the topside; or

(3) Visible emissions from flue caps.

METHOD H

TOPSIDE OBSERVATIONS

Company ____________ Date ____________
Location ____________ Sky Condition ____________
Company Rep. ____________ Wind Speed ____________
Inspector ____________ Ambient Temp. ____________
Background ____________

CS
PS
[Indicate sun position, observation traverse, and wind direction.]

Battery number ________ Total number of: Ovens ________ Lids ________ Offtake systems ________

Time ıspection _tarted/ Completed	Oven Number	Visible Emissions				Comments
		Total Leaks			Significant Leaks	
		Collection Mains	Number of Lids	Number of Offtake Systems	Number of Offtake Systems	

ndicate location of leak: Base = B, Cap = C, Saddle = S, Flange = F, Other = O

.f decarbonizing indicate: Ignited = I, Ignited with Emissions = IE, Emissions only = E

ıeck (✓) oven number if excursion made.

ʻircle oven number if standpipe(s) and/or lids are open

H

Appendix B

Daily Activities and Process Observer Requirements

Table B-1

DAILY ACTIVITIES
USSC FAIRFIELD WORKS

Date	Method A	B	C	H	D	E	F	Photography Movies ft.	Stills No.
		(Battery/No. of VEO Readings)							
Nov 29	← O R I E N T A T I O N D A Y →								
Nov. 30	5/33 6/30	5/45 6/45	5/7 6/7	5/7 -	- -	- -	- -	140	13
Dec. 1	5/45 6/45	5/30 6/30	5/8 6/8	6/8	- -	- -	- -	50	13
Dec. 2	5/12 6/15	5/60	5/8 6/8	5/8	5/24	5/24	5/24	10	41
Dec. 3	- -	5/75	5/7 6/7	5/7	- -	5/28 -	5/28	-	-
Dec. 4	-	5/75	5/7 9/7	5/7	5/30	-	-	-	-
Dec. 5	← D A Y O F F →								
Dec. 6	-	6/75	6/7 9/7	6/7	6/25	6/25	6/25	-	-
Dec. 7	6/45	6/45	6/8 9/8	6/8	6/30	6/30	6/29	-	-
Dec 8	-	5/15 6/75	6/7 9/8	6/7	6/20	-	6/20	90	11
Dec. 9	5/45	5/45 6/75	5/7 6/7	5/7 6/7	-	-	-	-	-
Dec. 10	← E X I T I N T E R V I E W →								
Total	5/135 6/135	5/345 6/345	5/44 6/59 9/30		5/54 6/75	5/52 6/55	5/52 6/74	290	78

Table B-2

PROCESS OBSERVER REQUIREMENTS
USSC FAIRFIELD WORKS

Position / Data Sheets	TL[a]	TS[b]	LC[c]	PSP[d]	PSE[e]	CSD[f]
Personnel Placement	X					
Personnel Activities		X	X	X	X	X
Chart Log	X					
Combstn/ Exhst Sttngs	X					
Combustion Data	X					
Photography	X					
Oven Port Carbon		X				
Larry Car Inspector			X			
Coke Oven Condition				X	X	X
Standpipe Sealing			X			
Charging Time Study			X[g]			
Pusher Machine Inspector				X		
Oven Port Sealing		X				
Coal Sample Collection			X			
Coal/Coke/Tar Analysis	X					
Steam Data	X	X	X			
Door Process List					X	X

a - Team leader
b - Topside inspector
c - Larry Car inspector
d - Pusher machine inspector
e - PS door machine inspector
f - CS door machine inspector
g - Performed by extra larry car inspector

Appendix C

Figures

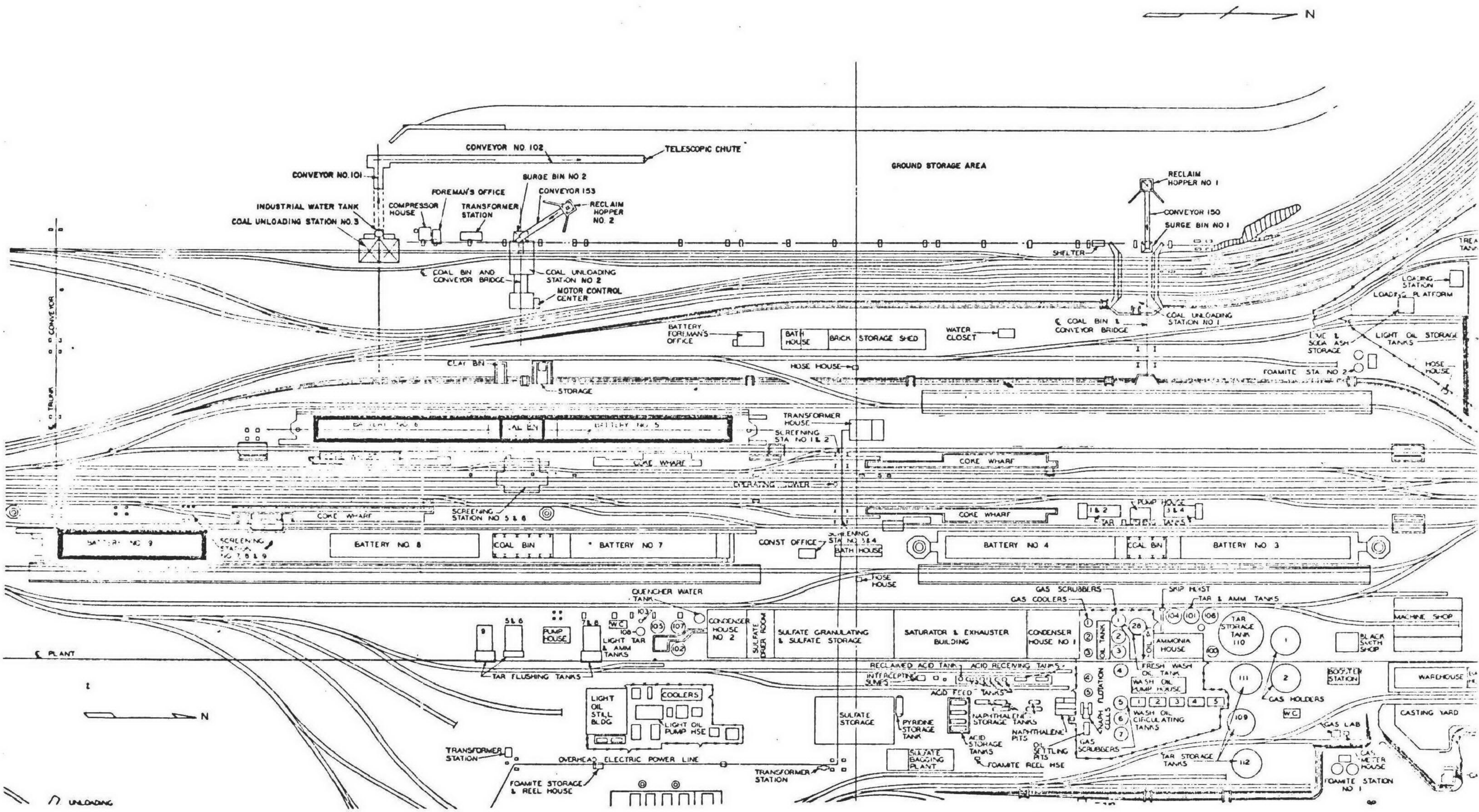


Figure 1. USSC Fairfield Works Coke Plant

TEAM LEADER

Page_____of______

INSPECTOR______________________________

DATE______________________________

PLANT______________________________

PERSONNEL PLACEMENT

VEO'rs	LOCATION		PO'rs	LOCATION	
	BATTERY	POSITION		BATTERY	POSITION

CODE: TS = topside inspector, LC = larrycar inspector, PSD = push side door machine inspector, PSP = pushside pusher machine inspector, CSD = coke side door machine inspector, CW = catwalk inspector

Figure 2. Personnel Placement Form

Page ____ of ____

PROCESS DATA
PERSONNEL ACTIVITIES

Larry car Inspector
Topside Inspector
Coke Side Inspector
Push Side Inspector

COMPANY ______________________ INSPECTOR______________________

LOCATION ______________________ DATE ______________________ BATTERY__________

Indicate worker job title, number of persons working at this job and brief job description, at the beginning of each day and when personnel changes are made. Indicate spells provided by relief man.

TIME	Worker Title	Description of Operations Performed

Figure 3. Personnel Activities Form

TEAM LEADER

INSPECTOR________________________

DATE________________________

PLANT________________________

BATTERY________________________

CHART LOG

Chart	Requested	Acquired
Stack Flue Temperature CS		
Stack Flue Temperature PS		
Stack Draft Pressure CS		
Stack Draft Pressure PS		
Coke Oven Gas Pressure CS		
Coke Oven Gas Pressure PS		
Flue Gas Temperature		
Pusher Machine: Turn________		
Turn________		
Turn		

✓ - Yes X - No

Figure 4. Chart Log

TEAM LEADER

INSPECTOR____________________________

DATE____________________________

PLANT____________________________

BATTERY____________________________

COMBUSTION/EXHAUST SETTINGS

(Sketch Combustion Air Damper Setting Configuration)

(Sketch Exhaust Gas Damper Setting Configuration)

Combustion Air Settings			Exhaust Gas Settings		
Oven	PS	CS	Oven	PS	CS

Figure 5. Combustion/Exhaust Settings Form

TEAM LEADER

INSPECTOR____________________

DATE____________________

PLANT____________________

BATTERY____________________

COMBUSTION DATA

Time	Underfire Fuel BTU Content	Number of Dead Flues	Location of Dead Flues

Figure 6. Combustion Data Form

TEAM LEADER

INSPECTOR________________________ Page_____ of______

DATE________________________

PLANT________________________

PHOTOGRAPHY LOG

STILL	MOVIE	QUANTITY	WHEN	WHAT

Figure 7. Photography Log

PROCESS DATA
OVEN PORT CARBON

COMPANY ______________________ INSPECTOR ______________________

LOCATION ______________________ DATE ______________ BATTERY __________

Indicate carbon buildup for each oven port prior to charging. If no carbon is present indicate same with (OK).

Oven	Time	Carbon CS PS	Comment Number

COMMENTS:

Figure 8. Oven Port Carbon Form

PROCESS DATA
LARRY CAR INSPECTOR

COMPANY ____________________ INSPECTOR ____________________ BATTERY ______ ________

LOCATION ____________________ DATE ____________________

Oven Charged	Coal Hopper Volume Settings				Check Sheet - Indicate Yes (✓) or No (0)						Gooseneck Carbon (Illustrate Carbon Buildup after cleaning)		Comment Number
	1	2	3	4	Steam on (Both ends for dual mains)	#4 and #1 hoppers dropped first	#3 and #2 hoppers dropped individually	Slide gates closed after discharging hoppers 1 2 3 4	Goosenecks cleaned* PS	CS	Pusher Side	Coke Side	

COMMENTS:

*M - machine
H - hand tool

Figure 9. Larry Car Inspector Form

PROCESS DATA
COKE OVEN CONDITION

Coke Side Inspector
Push Side Inspector

COMPANY ______________ INSPECTOR ______________ BATTERY ______________

LOCATION ______________ DATE ______________

OVEN	BROKEN REFRACTORY AT DOOR AREA		DARK (COLD) SPOTS ON SIDE WALLS		OVEN ROOF CARBON BUILDUP Illustate:	
	Check: Yes(✓) No (x)	Indicate Location:(X) (End View)	Check: Yes(✓ No (x)	Indicate Location: (X) (Top View)	End View	Side View (best estimate) (Indicate standpipe and oven holes)
				cs ps		cs ps
				cs ps		cs ps
				cs ps		cs ps

COMMENTS:

Figure 10. Coke Oven Condition

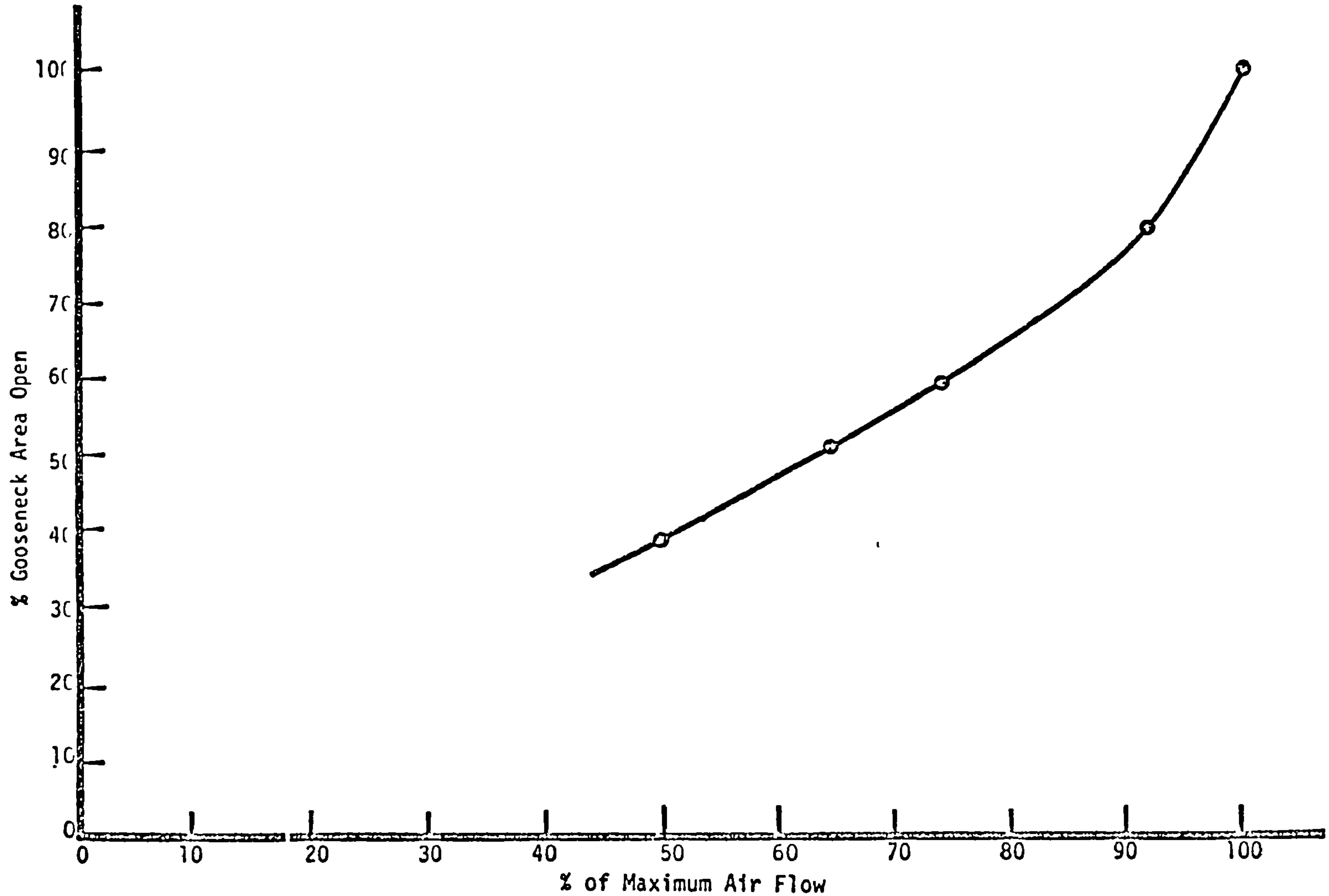


Figure 11. Percent Air Flow vs. Percent Gooseneck Area Open[2]

PROCESS DATA
STANDPIPE SEALING

COMPANY ______________________ INSPECTOR ______________________

LOCATION ______________________ DATE ________________ BATTERY ________

Indicate clock time that any standpipe lid is either sealed or resealed.
Indicate cokeside (CS) or push side (PS).

OVEN	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME

Figure 12. Standpipe Sealing Form

Page ______ of ______

Larry car inspector
Topside Inspector

CHARGING TIME STUDY

COMPANY ____________________ INSPECTOR ____________________ . ________

LOCATION ____________________ DATE ____________________ BATTERY ________

Order	OVEN CHARGED Process Operation \ Timing	Time Start	Elapsed Min.	Elapsed Sec.	Time Start	Elapsed Min.	Elapsed Sec.	Comment Number
	Remove oven lids.							
	Fill larry car at coal bunker.							
	Move car to oven.							
	Spot car on oven, drop sleeves.							
	Clean goosenecks, standpipe caps and seats. CS							
	PS							
	Close Standpipe, damper oven, turn on aspirating steam. CS							
	PS							
	Charge coal to oven: #1							
	#4							
	#3							
	#2							
	Lute standpipe cap.							
	Replace oven lids.							
	Damper oven, turn off steam.							
	Return car to bunker.							

COMMENTS:

Figure 13. Charging Time Study Form

Page ______ of ______

PROCESS DATA
PUSHER MACHINE INSPECTOR

COMPANY ______________________ INSPECTOR ______________________ BATTERY ______________

LOCATION ______________________ DATE ______________________

OVEN	APPEARANCE OF COKE FACE Check Yes (✓) or No (X) Partial (P) or Whole(W)		TIME OF PUSH	ELAPSED PUSH PERIOD (sec)	CHUCK DOOR OPERATION Check Yes (✓) or No (X)					COMMENT NUMBER
	SMOKE	FLAME			CLOSED	LATCHED	TIGHTENED	LEAKING	ELAPSED TIME DOOR OPEN BEFORE LEVEL BAR STARTS (sec)	

COMMENTS:

Figure 14. Pusher Machine Inspector Form

Page _____ of _____

PROCESS DATA
OVEN PORT SEALING

COMPANY ______________________ INSPECTOR ______________________________

LOCATION _____________________ DATE ___________________ BATTERY ________

Indicate clock time that any lid is either sealed or resealed. Indicate lid(s) sealed (i.e., lid closest to push side is # 1 lid).

OVEN	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME

Figure 15. Oven Port Sealing Form

TEAM LEADER

Page______of______

INSPECTOR____________________________

DATE_________________________________

PLANT________________________________

COAL SAMPLE COLLECTION

Battery	Sampling Point	Sample No.	Time	Sample No.	Time	Sample No.	Time

Figure 16. Coal Sample Collection Form

TEAM LEADER

INSPECTOR________________

DATE________________

PLANT________________

STEAM DATA

Battery	Oven Charged	Static Steam Pressure (psig)	Dynamic Steam Pressure (psig)		
			1*	2**	3***

*Location________________

**Location________________

***Location________________

Figure 18. Steam Data Form

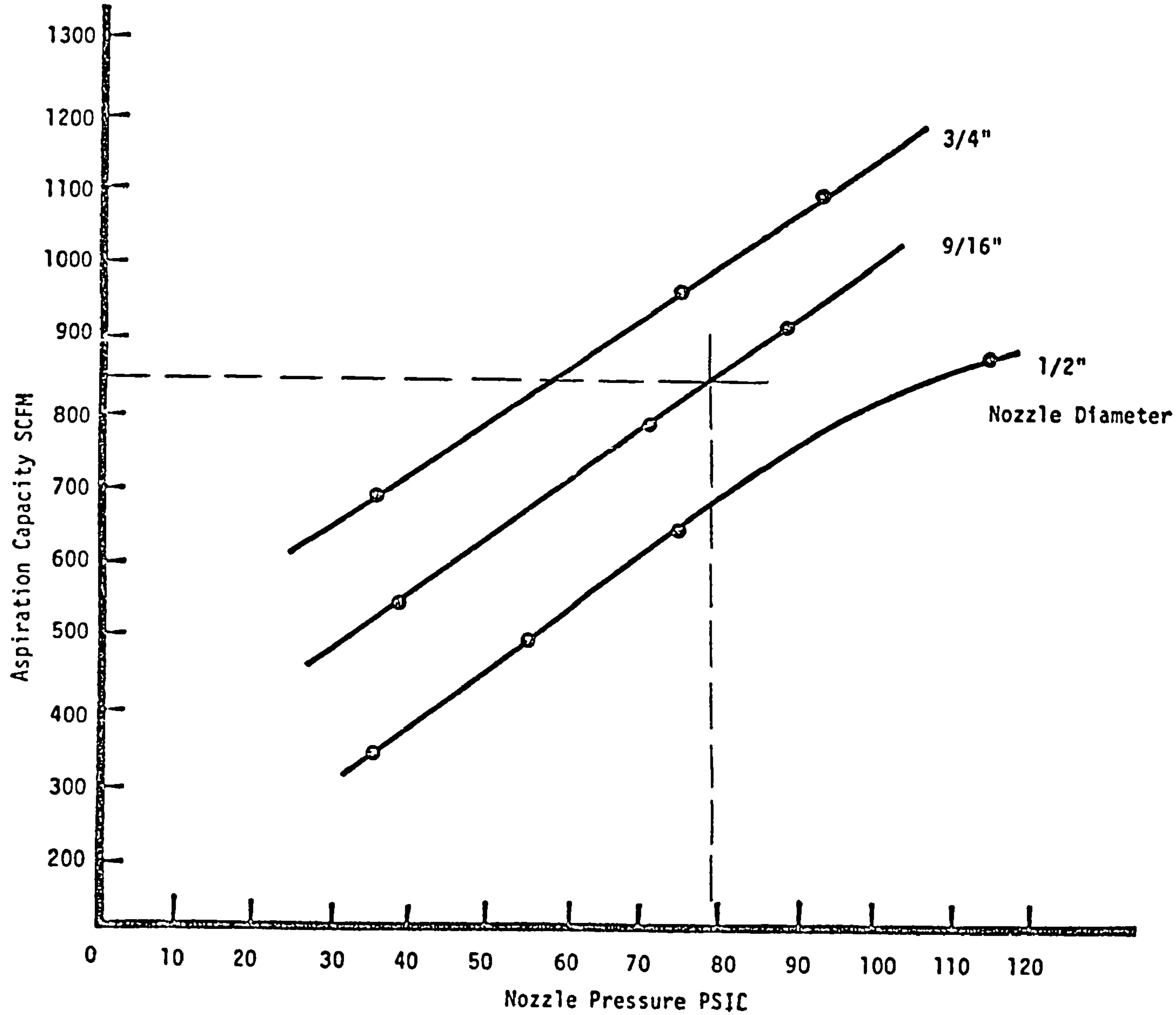
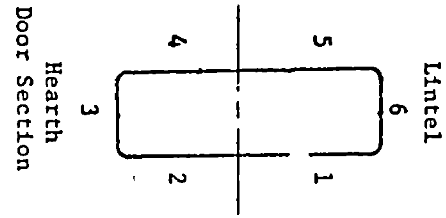


Figure 19. Nozzle Pressure vs. Aspiration Capacity for Single Sandpipe[2]

Door Process List

Observer ____________
Date ____________
Plant ____________
Battery ____________



Door Machine Push Side
Door Machine Coke Side

Time of Removal[a]	Oven No.	Sect.	Condition of Door on Removal			Cleaning								Latching Seq.			Adjustments	
						Knife Edge		Gas Channel		Chuck Door		Jamb						
			Refractory	Knife Edge	Gas Chan	Clean	Depos Remain	Gas Clean	Depos Remain	Clean	Depos Remain	Clean	Depos Remain	Top Bot.	Bot. Top	Both @Once	Time Start	Time Finish
		1																
		2																
		3																
		4																
		5																
		6																
		1																
		2																
		3																
		4																
		5																
		6																
		1																
		2																
		3																
		4																
		5																
		6																

Enter:
1-No damage on door, knife edge (no dents, cracks, missing sect.)
2-Physical damage (cracks, deformations, missing sect.)
3-Carbon deposits
[a]4-If door is replaced with a fresh door in this cycle

✓ - yes
X - no

✓ - which applies

Figure 20. Door Process List

TEAM LEADER

Page_____of_____

INSPECTOR______________________________

DATE______________________________

PLANT______________________________

SPARE DOORS

Battery	Time	Number		COMMENTS
		PS	CS	

Figure 21. Spare Door Form

Page ____ of ____

PROCESS DATA: PUSHING OPERATION
TOPSIDE INSPECTOR

Company ____________________ Inspector ____________________

Location ____________________ Date ____________________

Battery # ____________________ CS

Sky Condition ____________________

Background ____________________ PS

Indicate sun position, observer position, wind speed and direction.
Denote ignited offtake gas with *

OBSERVATION TIME →		0	15	30	45	60				comment
OVEN____ TIME____	OFFTAKE OPACITY CS									
	PS									
OVEN____ TIME____	OFFTAKE OPACITY CS									
	PS									
OVEN____ TIME____	OFFTAKE OPACITY CS									
	PS									
OVEN____ TIME____	OFFTAKE OPACITY CS									
	PS									
OVEN____ TIME____	OFFTAKE OPACITY CS									
	PS									
OVEN____ TIME____	OFFTAKE OPACITY CS									
	PS									

COMMENTS:

Figure 22. Topside Inspector Form

METHOD A

CHARGING OBSERVATIONS

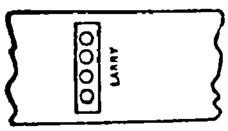
Company ____________ Date ____________
Location ____________ Sky Condition ____________
Company Rep. ____________ Wind Speed ____________
Inspector ____________ Ambient Temp. ____________
Background ____________

Battery/Oven ______/______
Time of Charge: Start ______
End ______

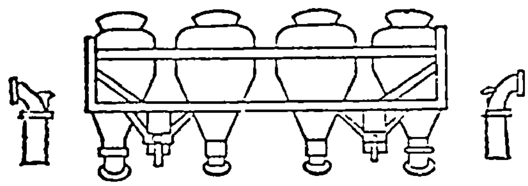
Time ≥ 20% (seconds) Opacity
Charge period ______
Seal period ______
Total ______
Maximum opacity ______

Comments:

Indicate sun position, observation position, and wind direction:



Mark dominant emission points:

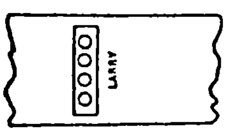


Battery/Oven ______/______
Time of Charge: Start ______
End ______

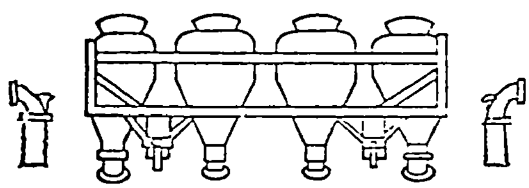
Time ≥ 20% (seconds) Opacity
Charge period ______
Seal period ______
Total ______
Maximum opacity ______

Comments:

Indicate sun position, observation position, and wind direction:



Mark dominant emission points:

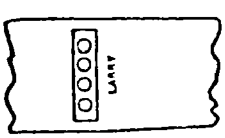


Battery/Oven ______/______
Time of Charge. Start ______
End ______

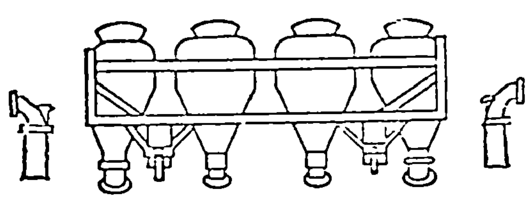
Time ≥ 20% (seconds) Opacity
Charge period ______
Seal period ______
Total ______
Maximum opacity ______

Comments:

Indicate sun position, observation position, and wind direction:



Mark dominant emission points:



GPO 840-870

A

Figure 23. Method A-Charging Emissions Data Form

METHOD B

CHARGING OBSERVATIONS

Company ____________________ Date ____________________
Location ____________________ Sky Condition ____________________
Company Rep. ____________________ Wind Speed ____________________
Inspector ____________________ Ambient Temp. ____________________
Background ____________________

[Indicate sun position, observation position, and wind direction on diagrams.]

Batt/Oven ______ / ______
Time Start ________
Time End ________
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ________
Seal Period ________
Total ________

Batt/Oven ______ / ______
Time Start ________
Time End ________
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ________
Seal Period ________
Total ________

Batt/Oven ______ / ______
Time Start ________
Time End ________
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ________
Seal Period ________
Total ________

Batt/Oven ______ / ______
Time Start ________
Time End ________
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ________
Seal Period ________
Total ________

Batt/Oven ______ / ______
Time Start ________
Time End ________
Comment:

CS

PS

Total Emissions, Seconds
Charge Period ________
Seal Period ________
Total ________

B

GPO 840-869

Figure 24. Method B-Charging Emissions Data Form

METHOD C

DOOR OBSERVATIONS

Company ____________________ Date ____________________

Location ____________________ Sky Condition ____________________

Company Rep. ____________________ Wind Speed ____________________

Inspector ____________________ Ambient Temp. ____________________

Battery __________ Background ____________________

No. of Ovens ______ [Indicate sun position, observation traverse, and wind direction.]

CS

PS

OVEN NO	ID OF LEAK*	PS or CS	OPACITY %	TIME: START FINISH	COMMENTS

*D=door, C=chuck door, B=both door and chuck door

C

GPO 840-868

Figure 25. Method C-Door Leak Data Form

METHOD H

TOPSIDE OBSERVATIONS

Company ______________________ Date ______________________

Location ______________________ Sky Condition ______________________

Company Rep. ______________________ Wind Speed ______________________

Inspector ______________________ Ambient Temp. ______________________

Background ______________________

CS / PS [box] [Indicate sun position, observation traverse, and wind direction.]

Battery number ________ Total number of: Ovens ________ Lids ________ Offtake systems ________

Time Inspection Started/ Completed	Oven Number	Visible Emissions				Comments
		Total Leaks			Significant Leaks	
		Collection Mains	Number of Lids	Number of Offtake Systems	Number of Offtake Systems	

Indicate location of leak: Base = B, Cap = C, Saddle = S, Flange = F, Other = O

If decarbonizing indicate: Ignited = I, Ignited with Emissions = IE, Emissions only = E

Check (✓) oven number if excursion made.

Circle oven number if standpipe(s) and/or lids are open

H

GPO 840-864

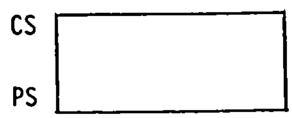
Figure 26. Method H-Topside Leak Data Form

METHOD D

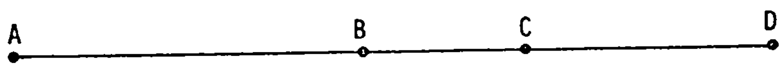
PUSHING OBSERVATIONS

Company ______________ Date ______________
Location ______________ Sky Condition ______________
Company Rep. ______________ Wind Speed ______________
Inspector ______________ Ambient Temp. ______________

[Indicate sun position, observation position, and wind direction.]



A-door off
B-ram moves
C-coke in hot car
D-quench



Battery/oven					
Time door removed (A)					
Time of push (B)					
Time of quench (D)					
Time > 20% between (A-B)					
Time > 20% between (B-C)					
Time > 20% between (C-D)					
Max. opacity during (B-C)					
Position					
Background*					
Comment number					

* *No mark for sky*
X for battery
✓ for other (specify)

Comments:

D

GPO 840-867

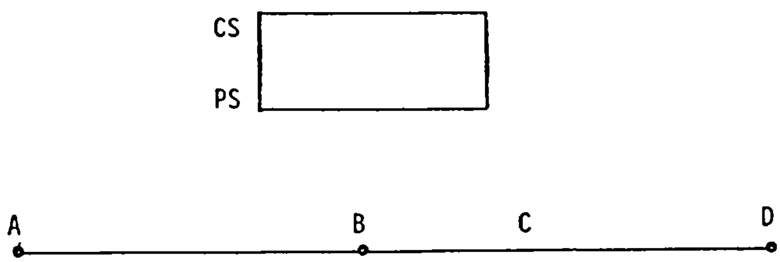
Figure 27. Method D-Pushing Emissions Data Form

METHOD E

PUSHING OBSERVATIONS

Company ______________ Date ______________
Location ______________ Sky Condition ______________
Company Rep. ______________ Wind Speed ______________
Inspector ______________ Ambient Temp. ______________

[Indicate sun position, observation position, and wind direction.]



A-door off
B-ram moves
C-coke in hot car
D-quench

Battery/oven					
Time door removed (A)					
Time of push (B)					
Time of quench (D)					
Time ≥ 60% between (A-B)					
Time > 60% between (B-C)					
Time > 60% between (C-D)					
Max. opacity during (B-C)					
Position					
Background*					
Comment number					

* *No mark for sky*
X for battery
✓ for other (specify)

Comments:

E

GPO 840-866

Figure 28. Method E-Pushing Emissions Data Form

METHOD F

PUSHING OBSERVATIONS

Company ____________________ Date ____________________
Location ____________________ Sky Condition ____________________
Company Rep. ____________________ Wind Speed ____________________
Inspector ____________________ Ambient Temp. ____________________

[Indicate sun position, observation position, and wind direction.]

CS

PS

A-door off
B-ram moves
C-coke in hot car
D-quench

A B C D

Battery/oven	Time door removed	Min	0	15	30	45
		0				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		8				
		9				

Position ____________

Background* ____________

* No mark for sky
X For battery
/ For other (specify)

Note: During observation enter designations A, B, C, and D in the block during which the event occurred.

Comments:

F

Figure 29-a. Method F-Pushing Emissions Data Form

METHOD F

PUSHING OBSERVATIONS

(Continued)

Battery/oven ____/_____

Min	0	15	30	45
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

Figure 29-b. Method F-Pushing Emissions Data Form

GPO 840-865

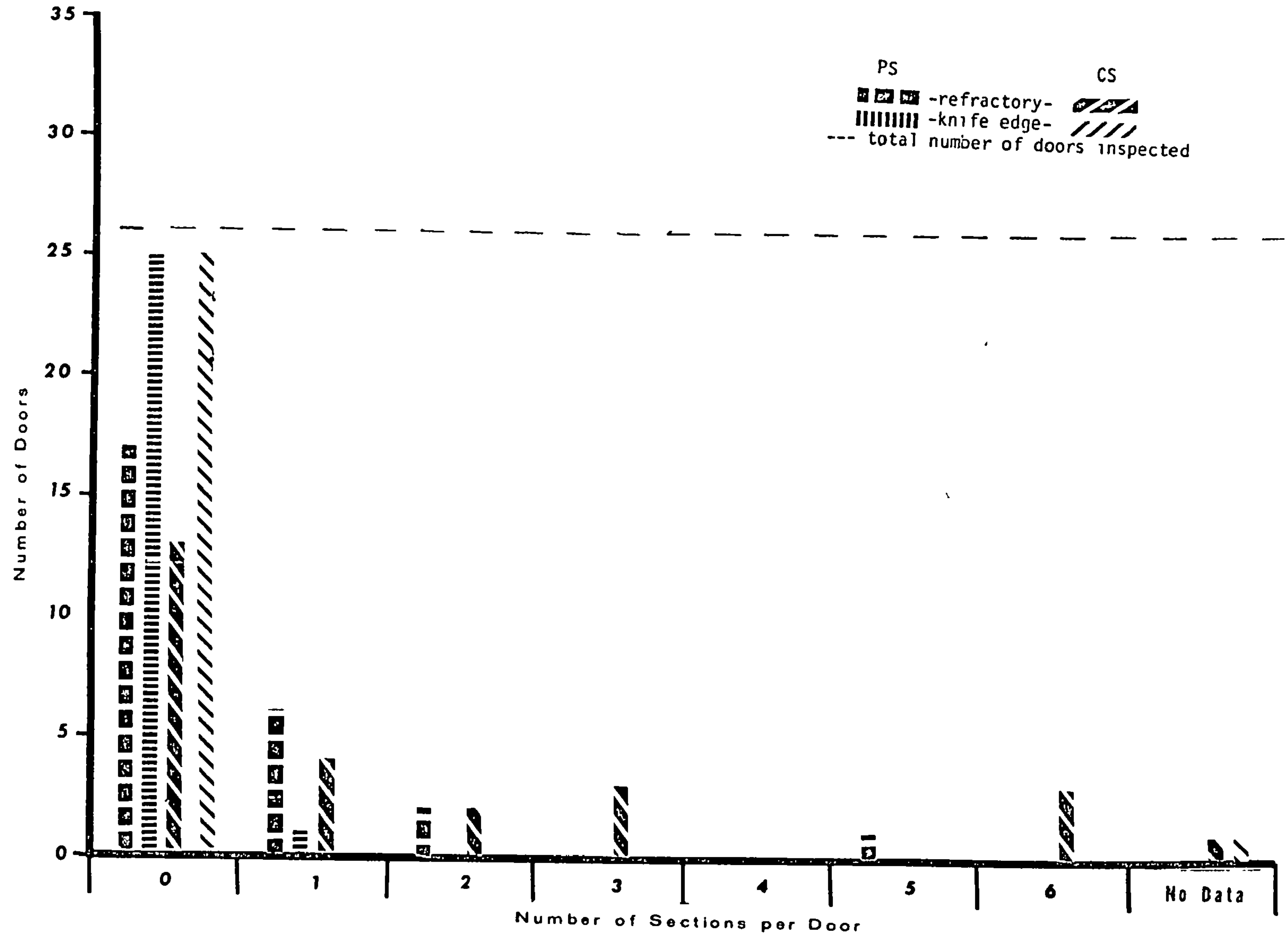


Figure 30. Door Damage Histogram

Battery 5

'JSS⁻ ⁻ irfi ¨ Wo ˙ No er ⁻⁻ 197

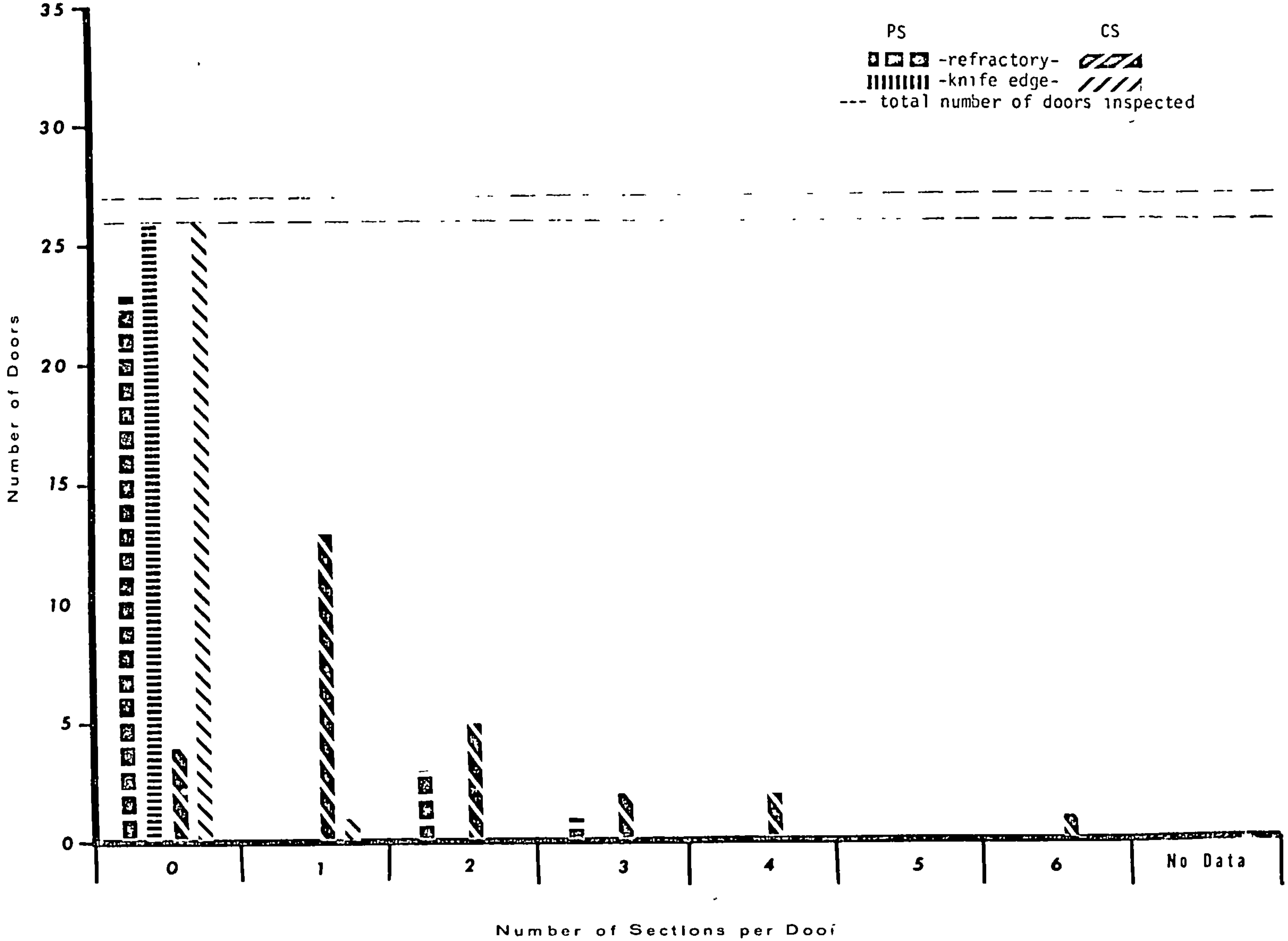


Figure 31. Door Damage Histogram
Battery 6
USSC Fairfield Works November 30, 1976

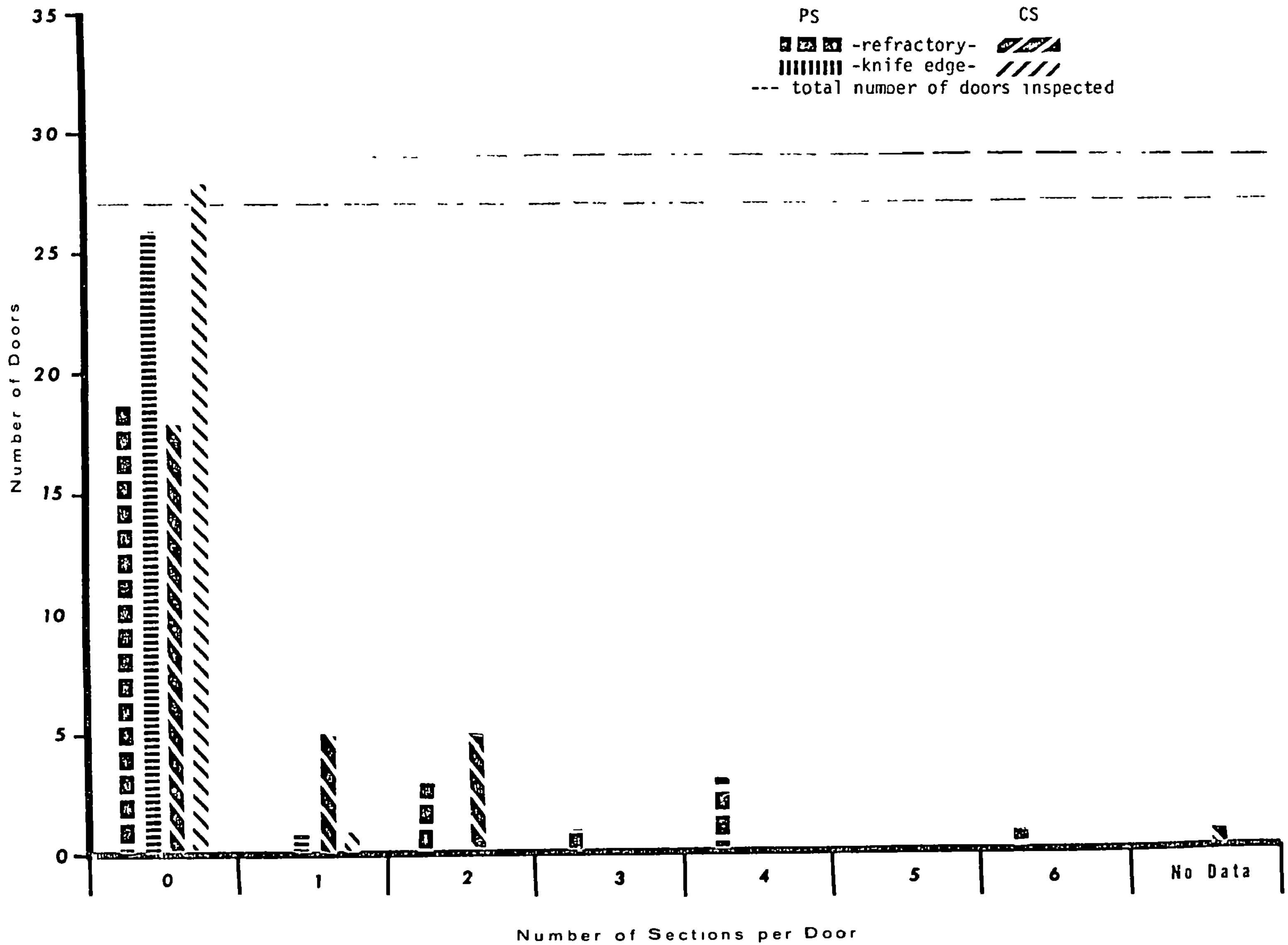


Figure 32. Door Damage Histogram
Battery 5
USSC Fairfield Works December 1, 1976

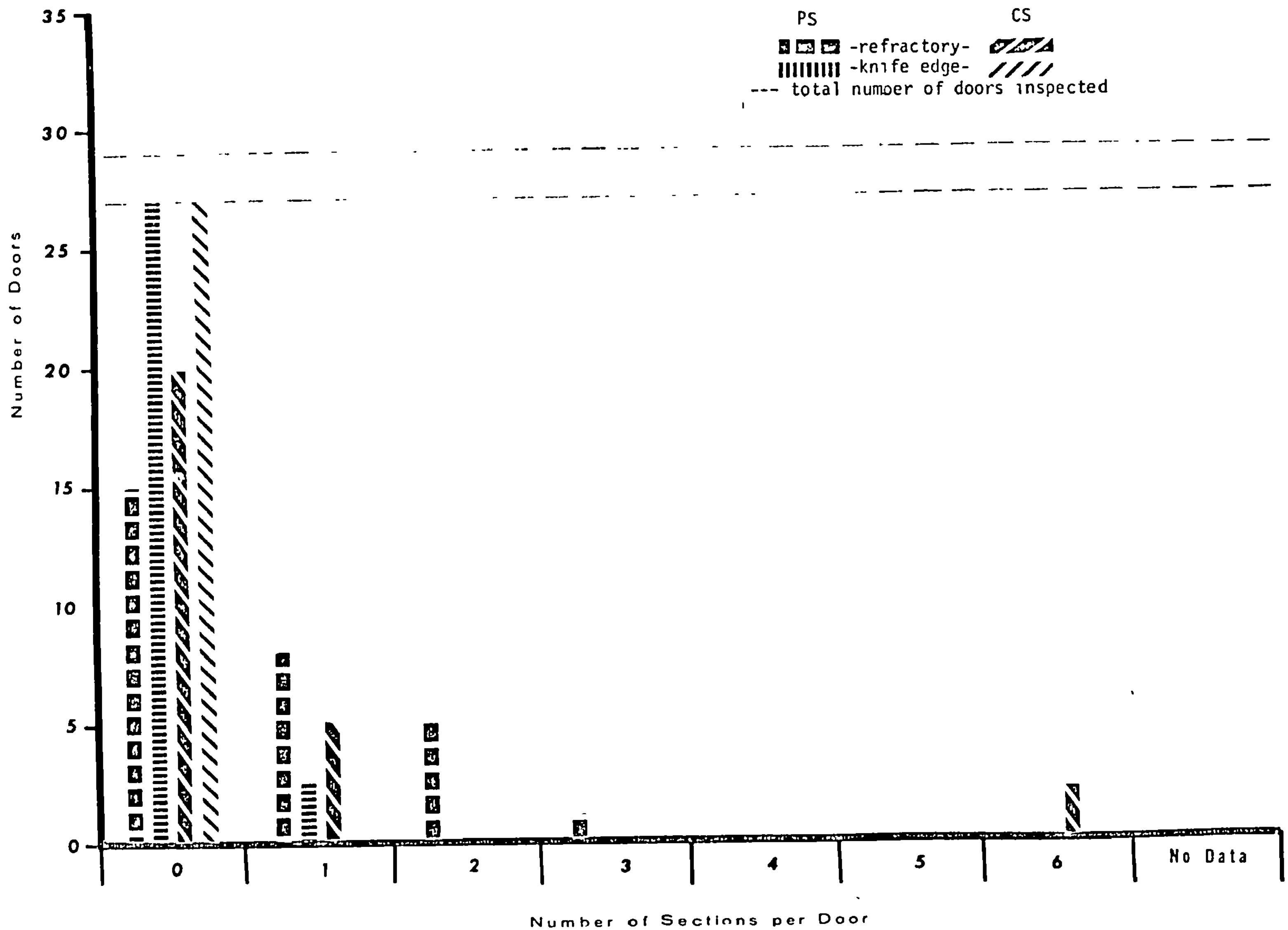


Figure 33. Door Damage Histogram
Battery 6

USSC Fairfield Works December 1, 1976

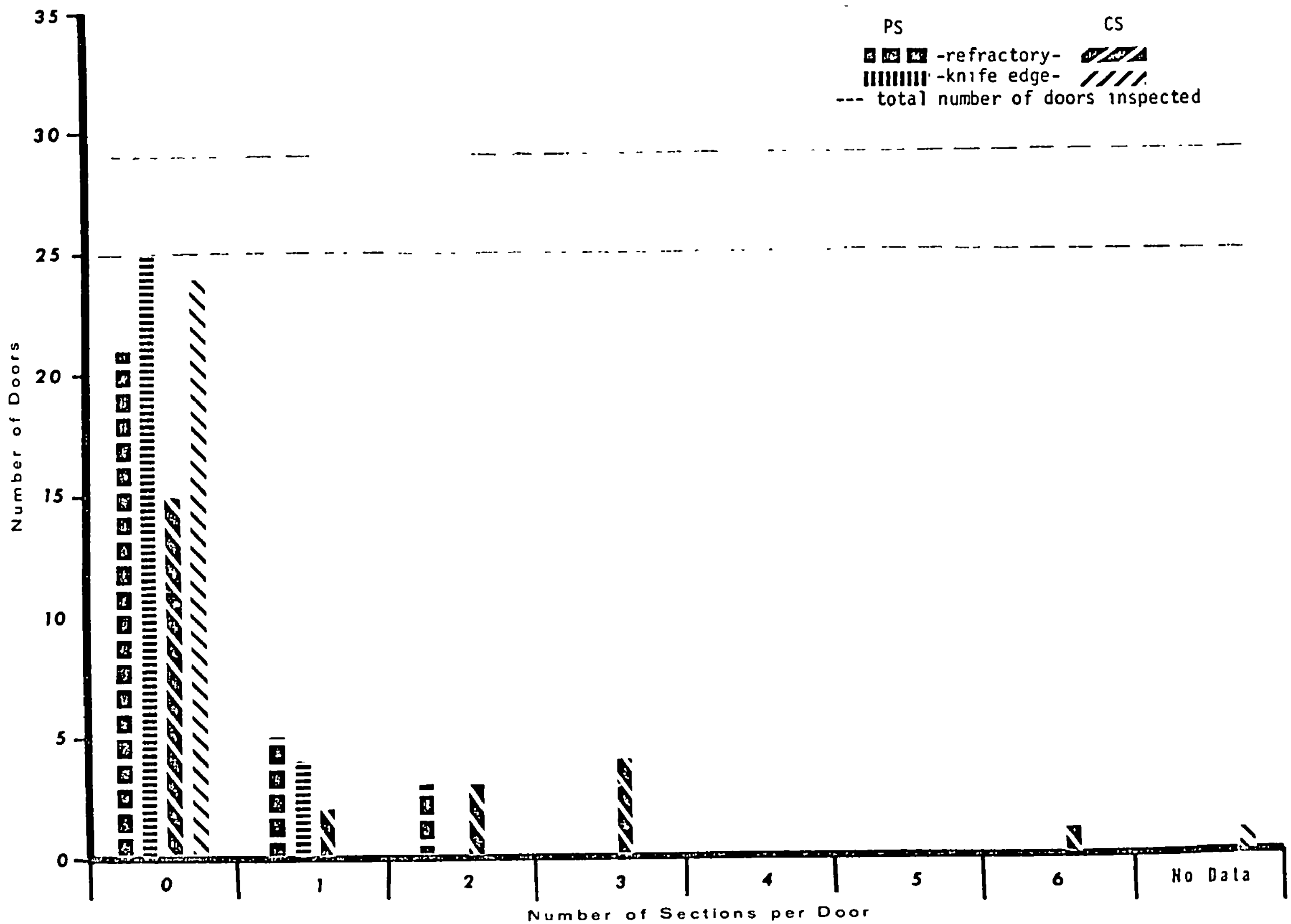


Figure 34 Door Damage Histogram
Battery 5

USSC Fairfield Works December 2, 1976

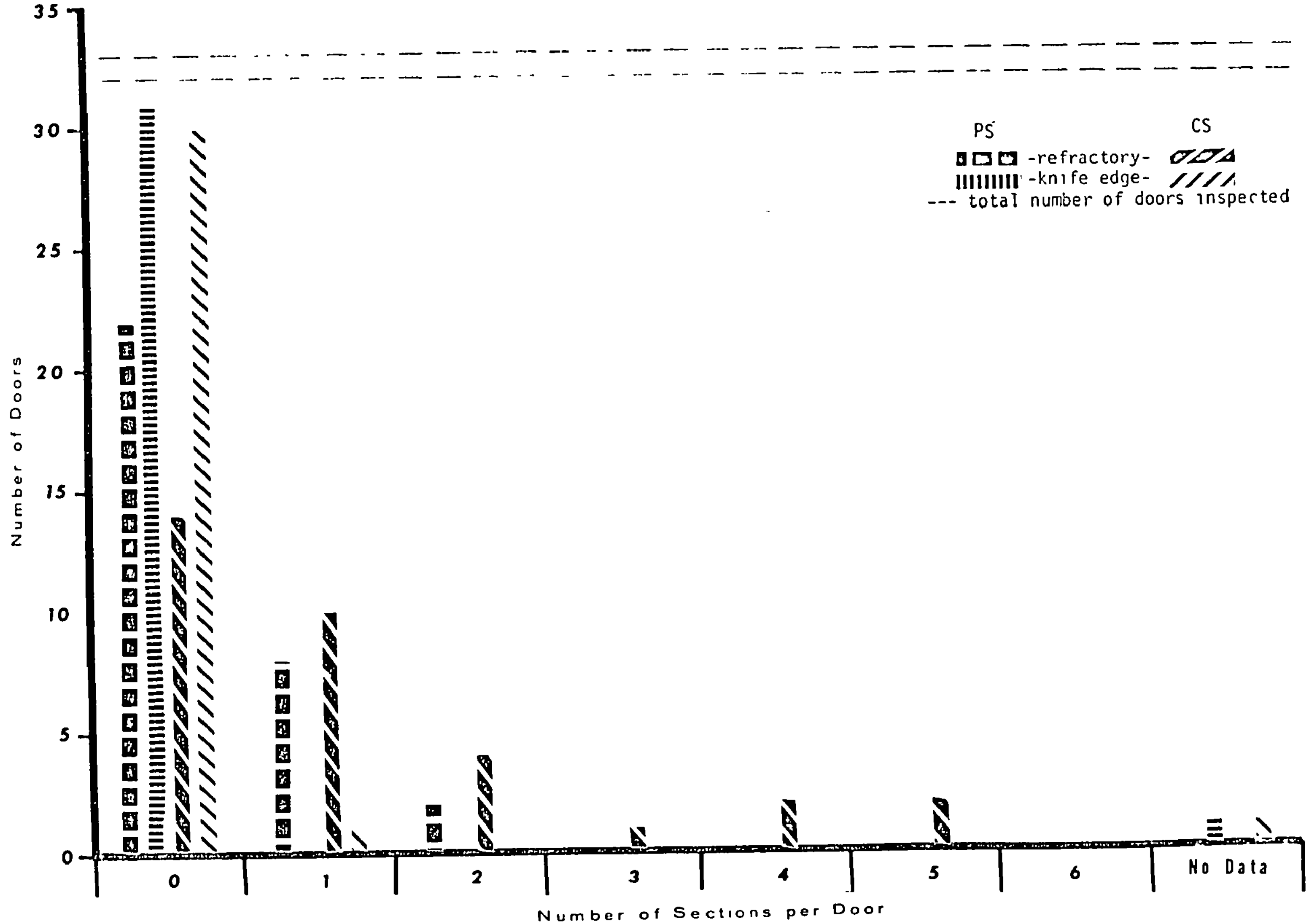


Figure 35. Door Damage Histogram

Battery 6

USSC Fairfield Works December 2, 1976

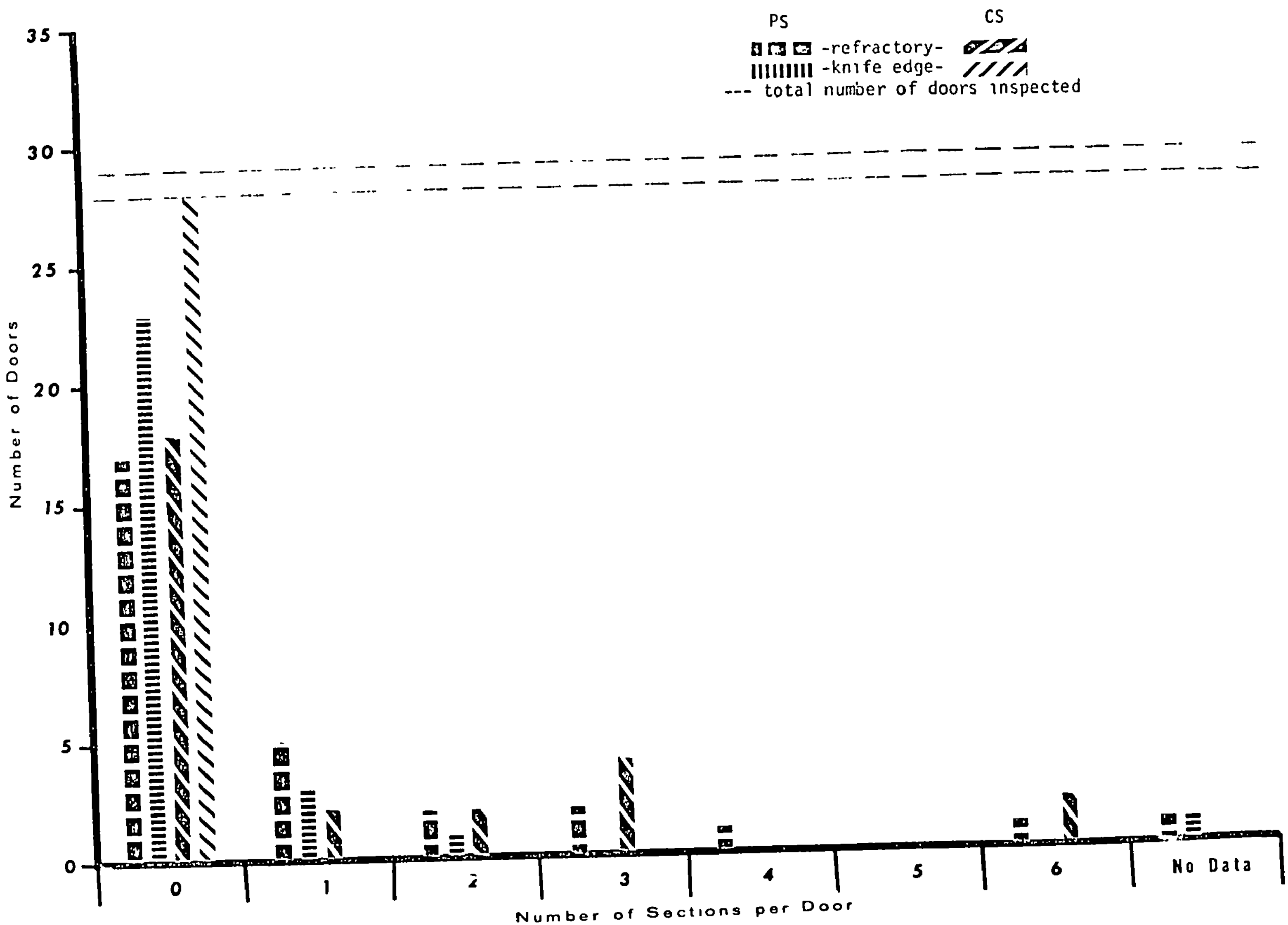


Figure 36. Door Damage Histogram
Battery 5
USSC Fairfield Works December 3, 1976

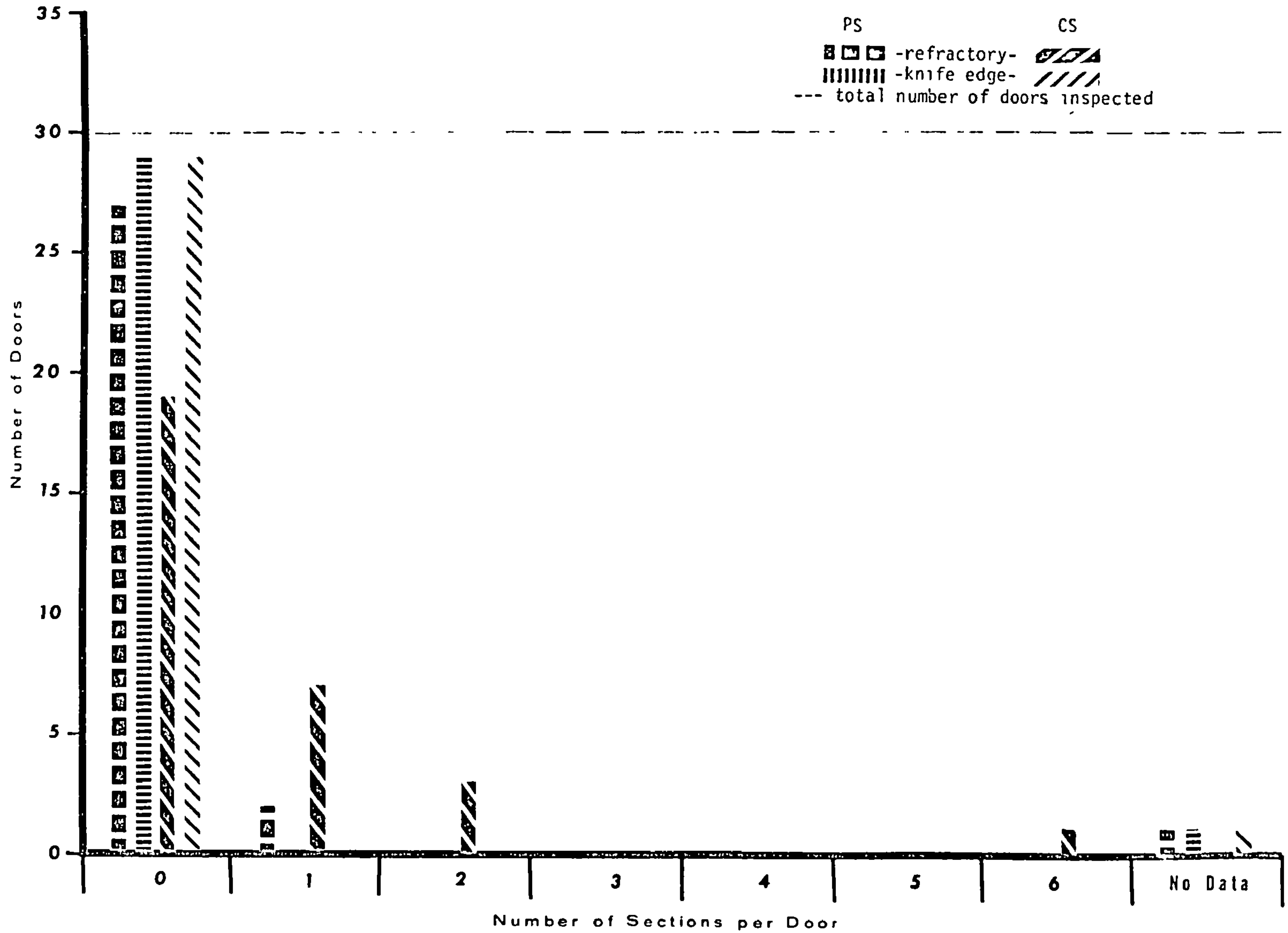


Figure 37. Door Damage Histogram
Battery 6
USSC Fairfield Works December 3, 1976

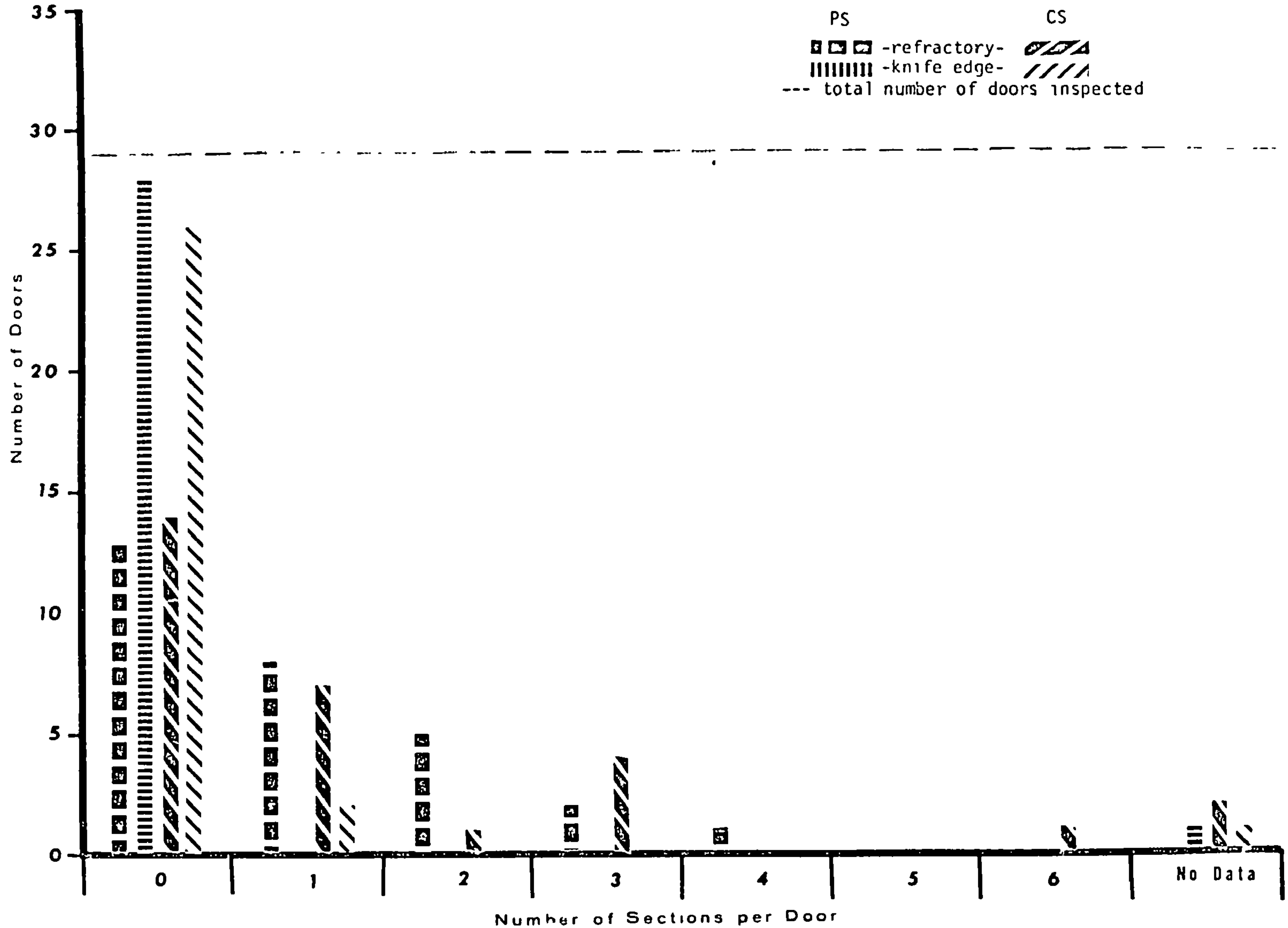


Figure 38. Door Damage Histogram
Battery 5

USSC Fairfield Works December 4, 1976

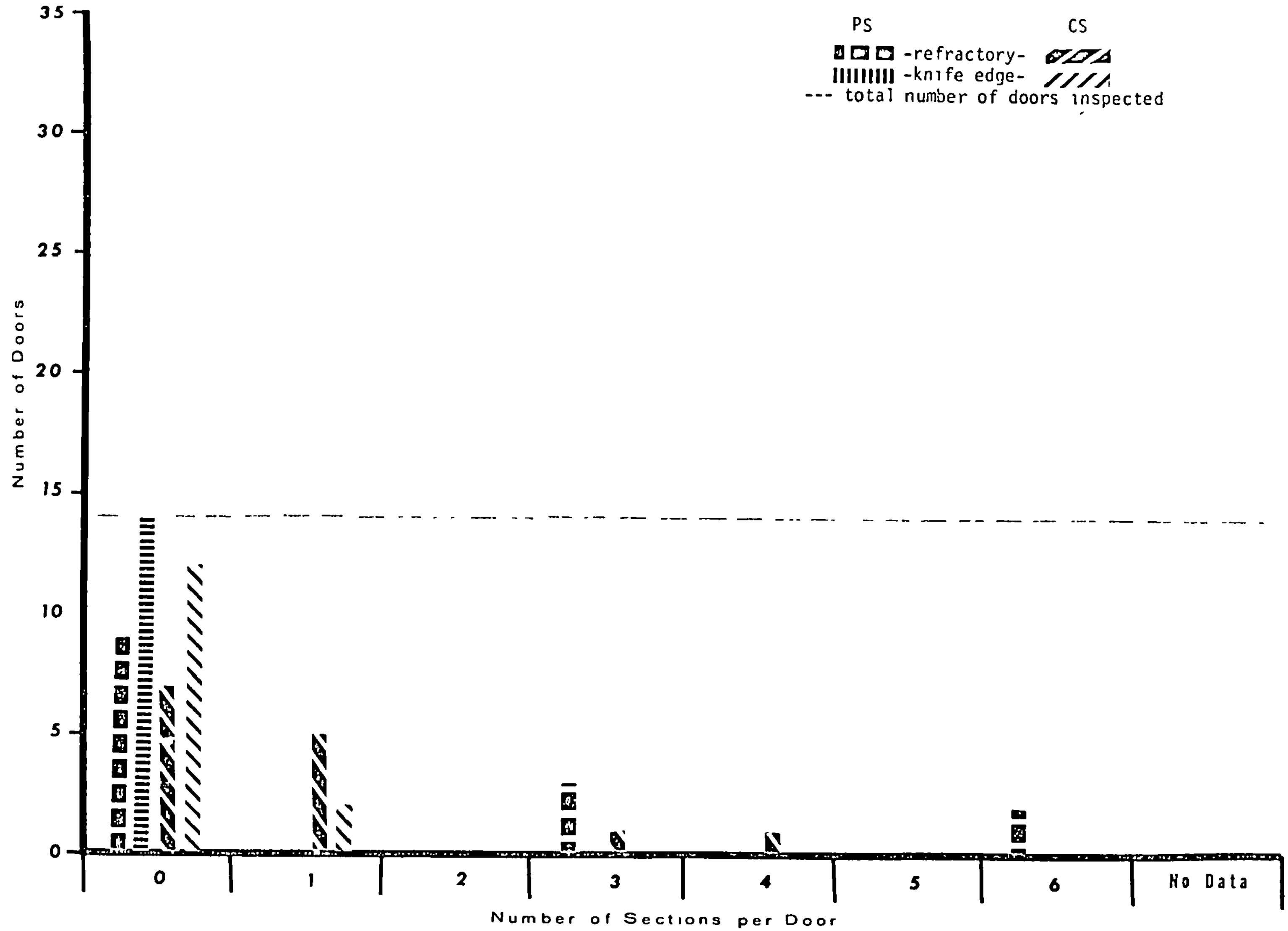


Figure 39. Door Damage Histogram
Battery 9
USSC Fairfield Works December 4, 1976

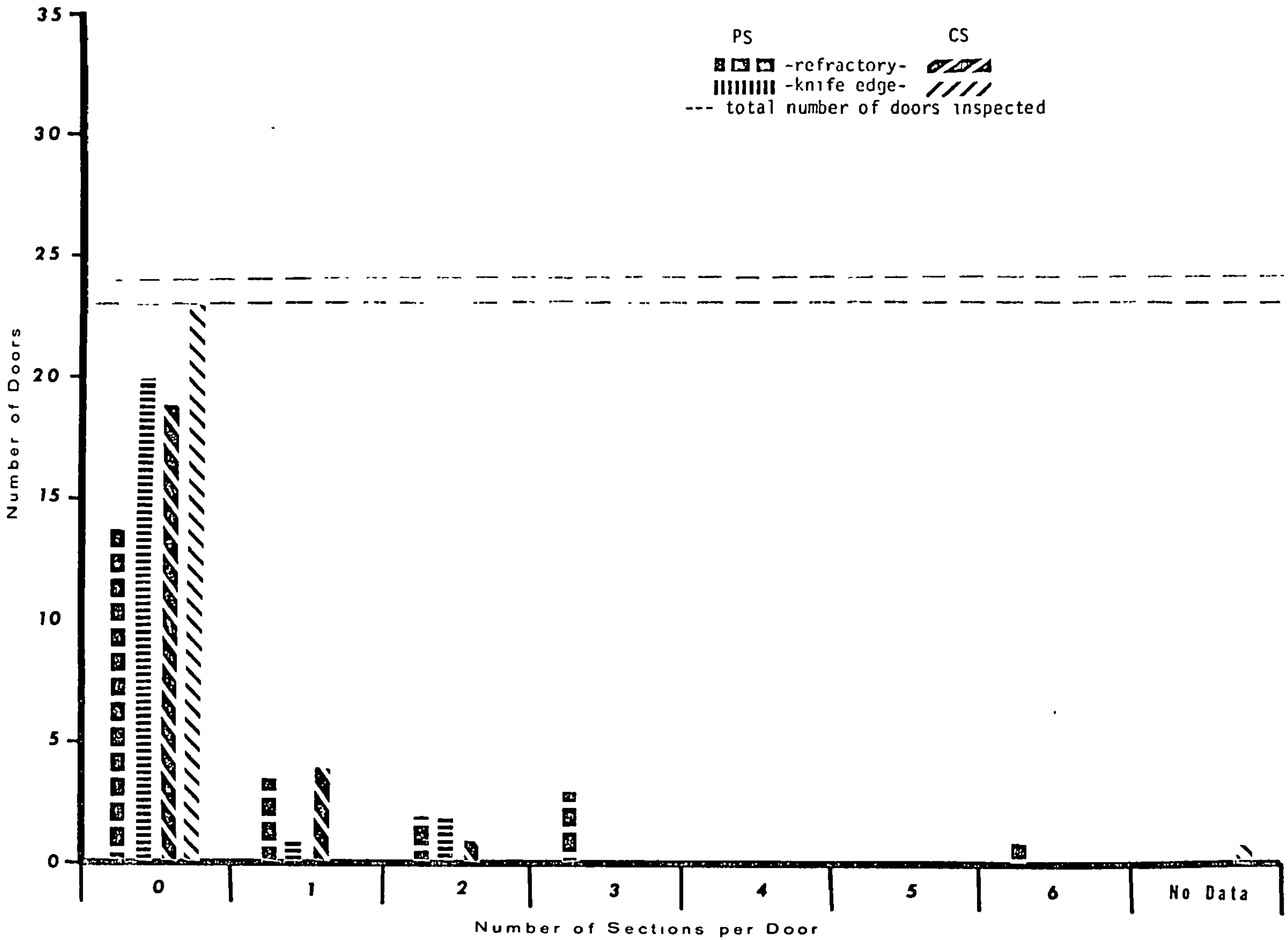


Figure 40. Door Damage Histogram
Battery 6
USSC Fairfield Works December 6, 1976

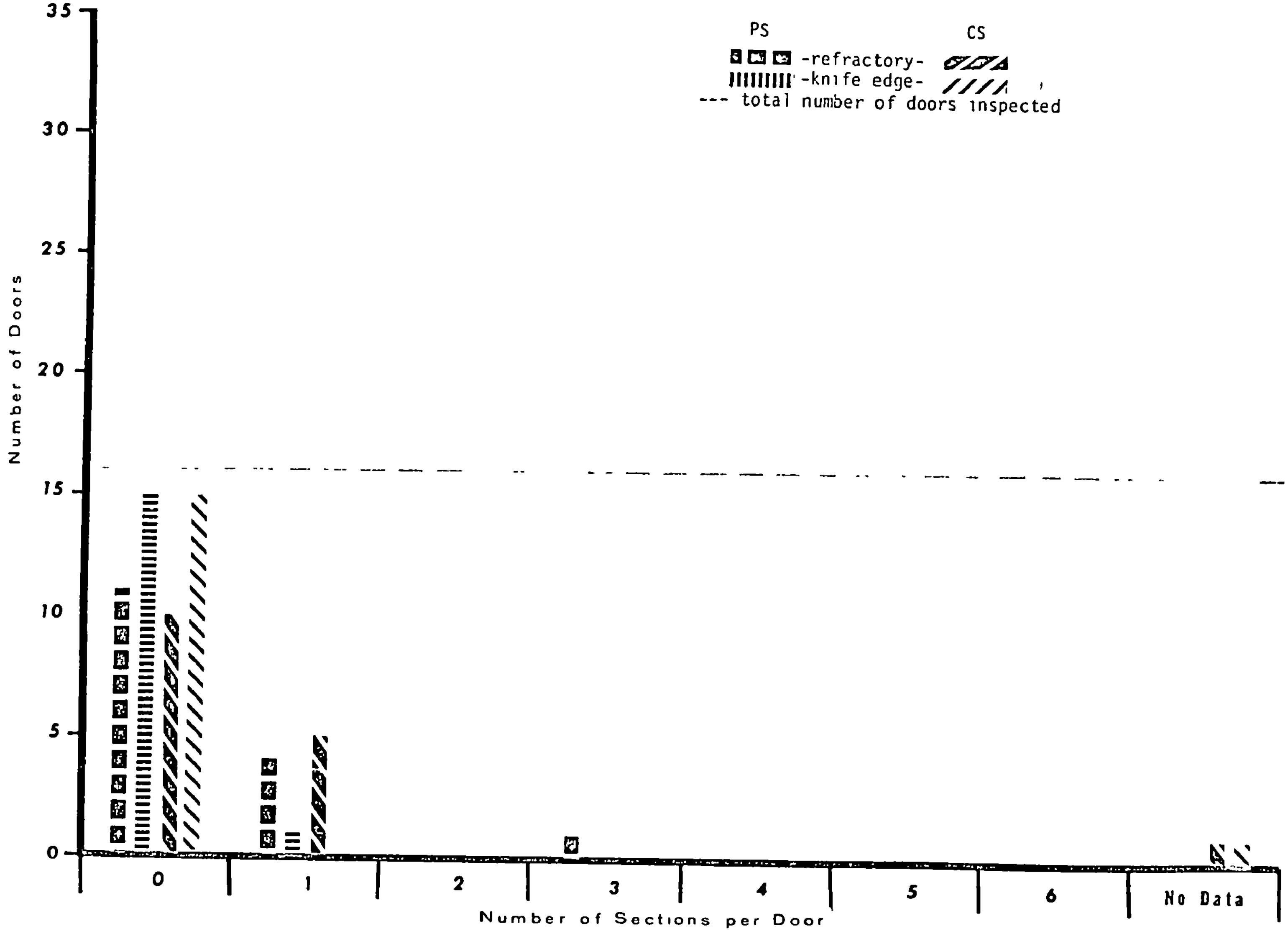


Figure 41. Door Damage Histogram

Battery 9

USSC Fairfield Works   December 6, 1976

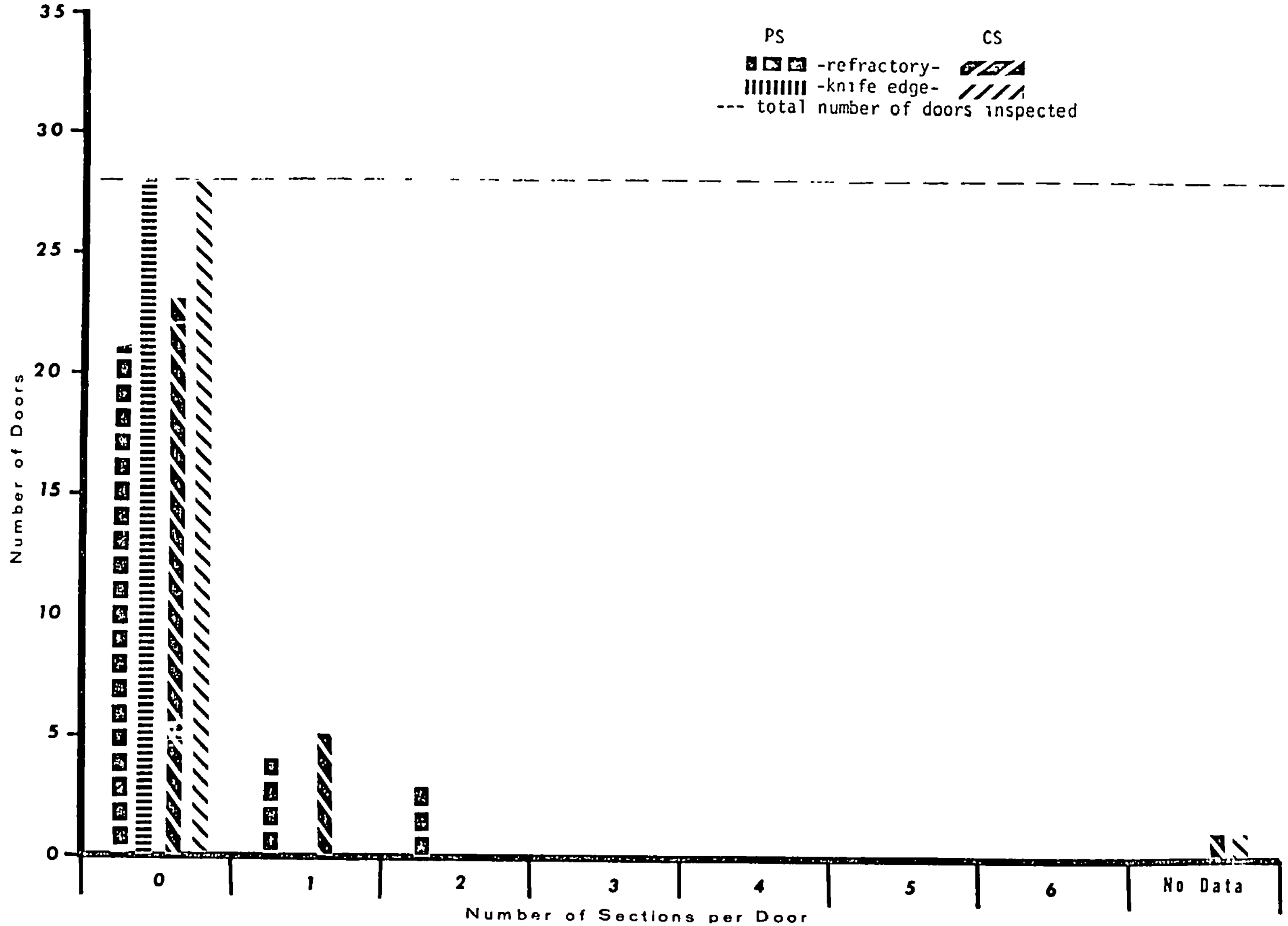


Figure 42. Door Damage Histogram
Battery 6
USSC Fairfield Works December 7, 1976

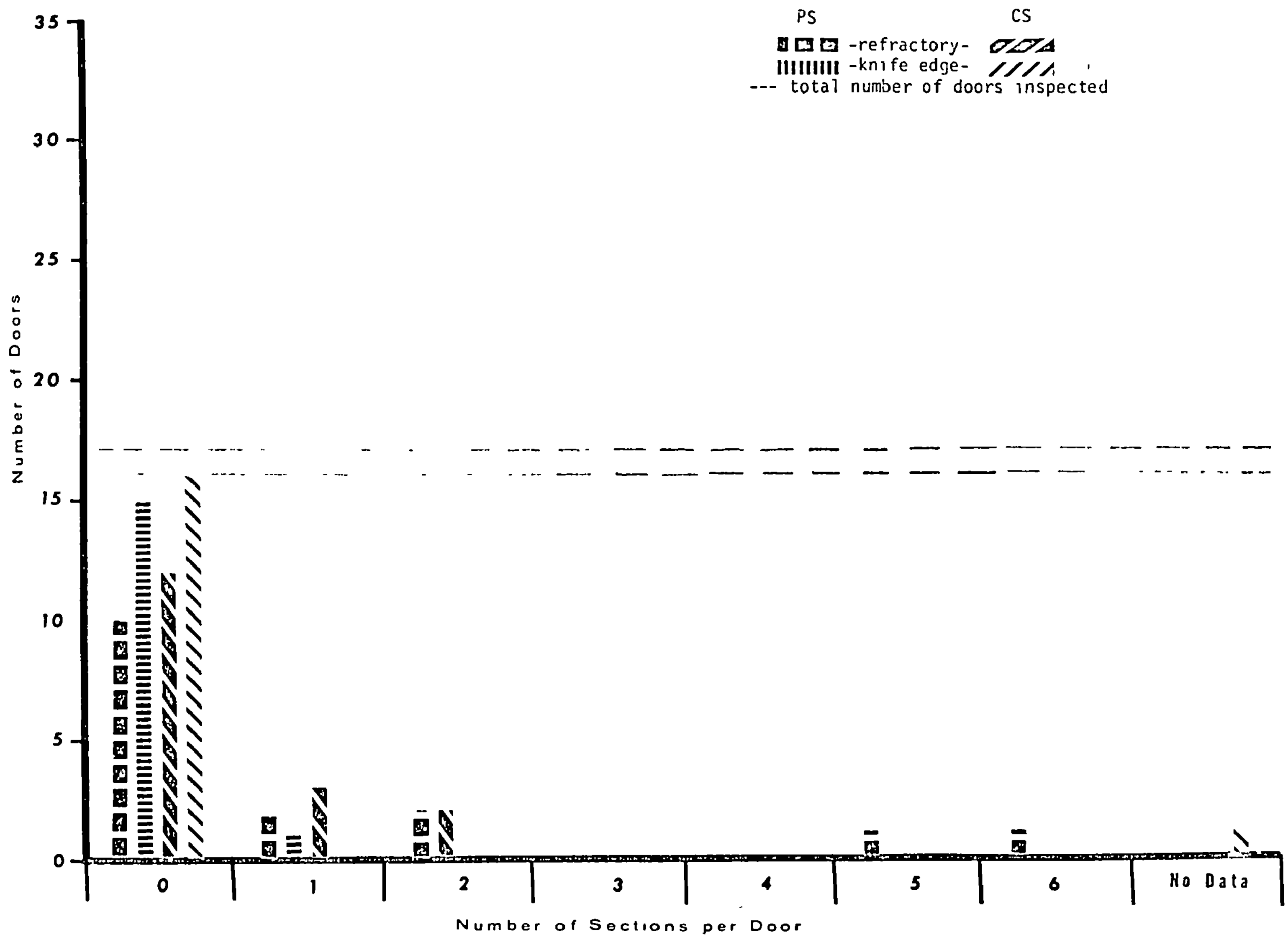


Figure 43. Door Damage Histogram
Battery 9
USSC Fairfield Works December 7, 1976

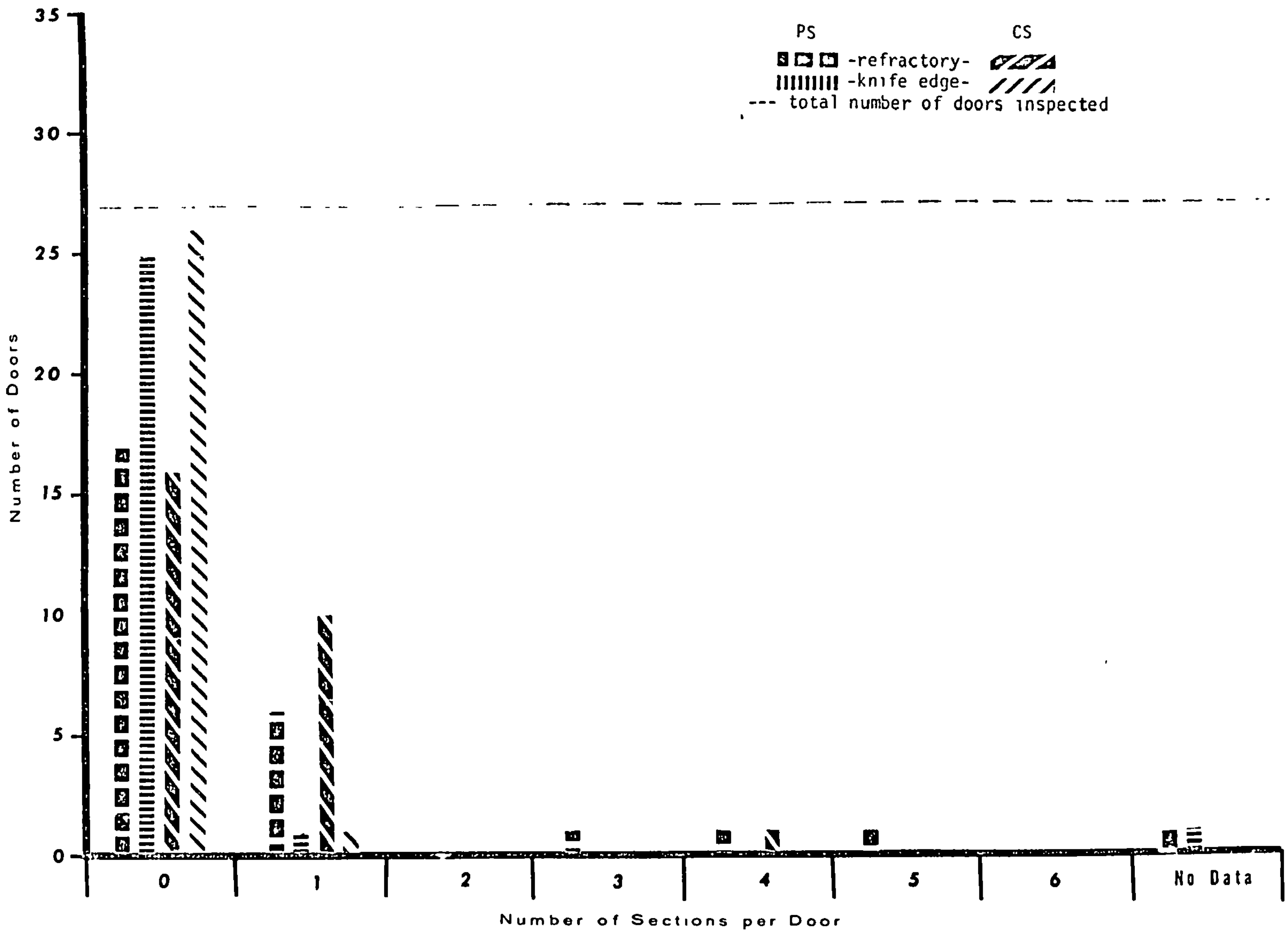


Figure 44. Door Damage Histogram
Battery 6
USSC Fairfield Works December 8, 1976

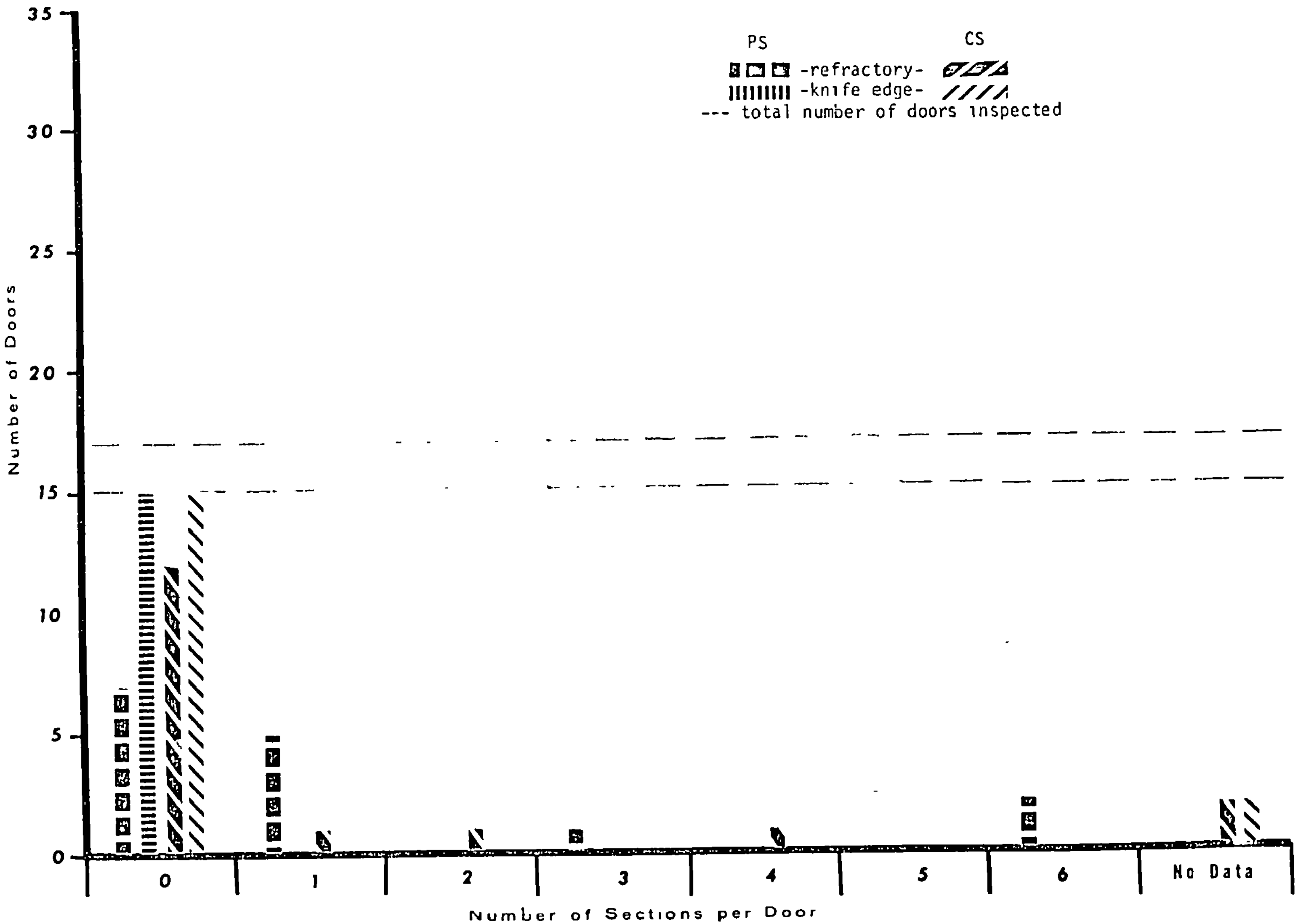


Figure 45. Door Damage Histogram
Battery 9

USSC Fairfield Works December 8, 1976

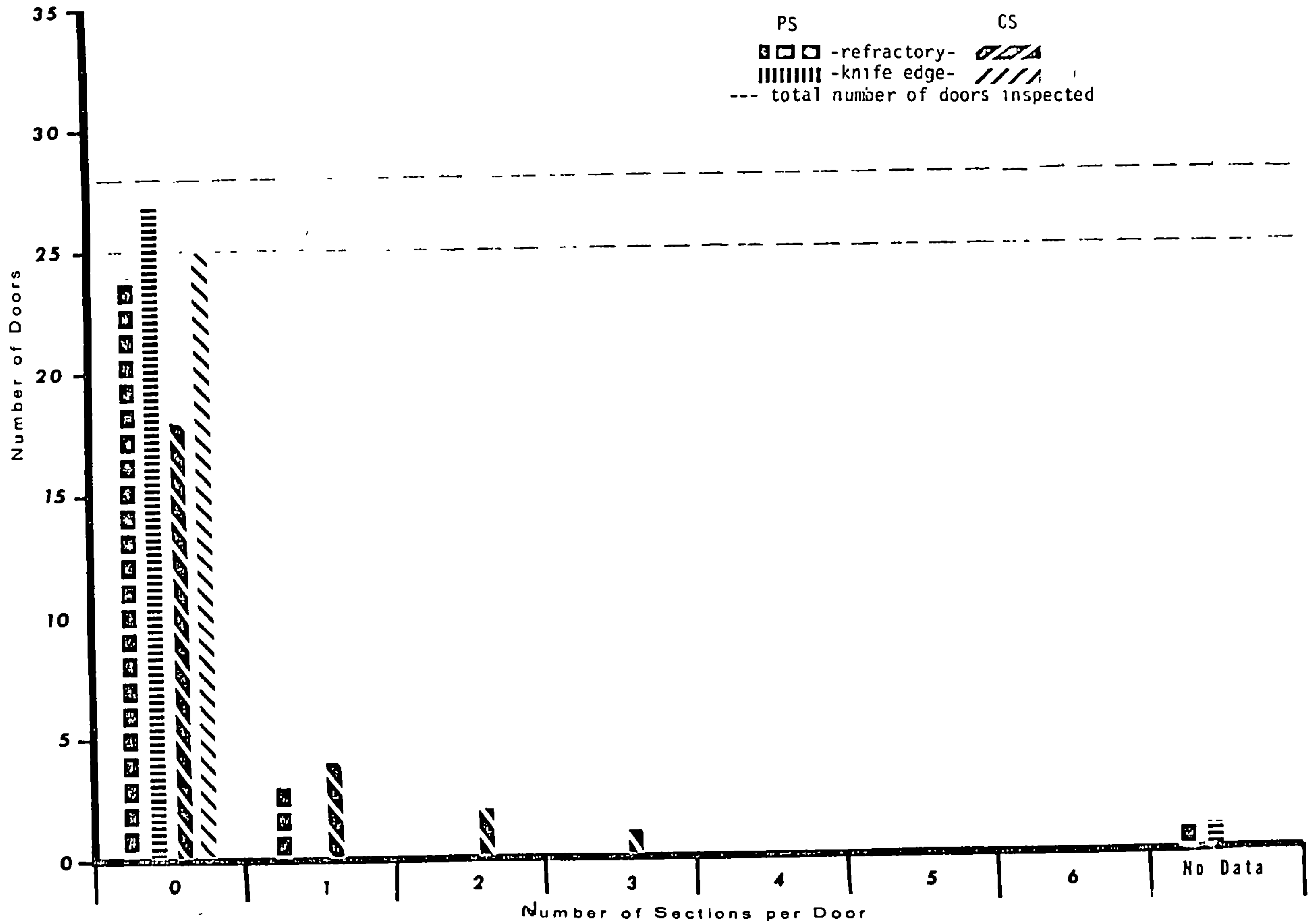


Figure 46. Door Damage Histogram

Battery 6

USSC Fairfield Works December 9, 1976

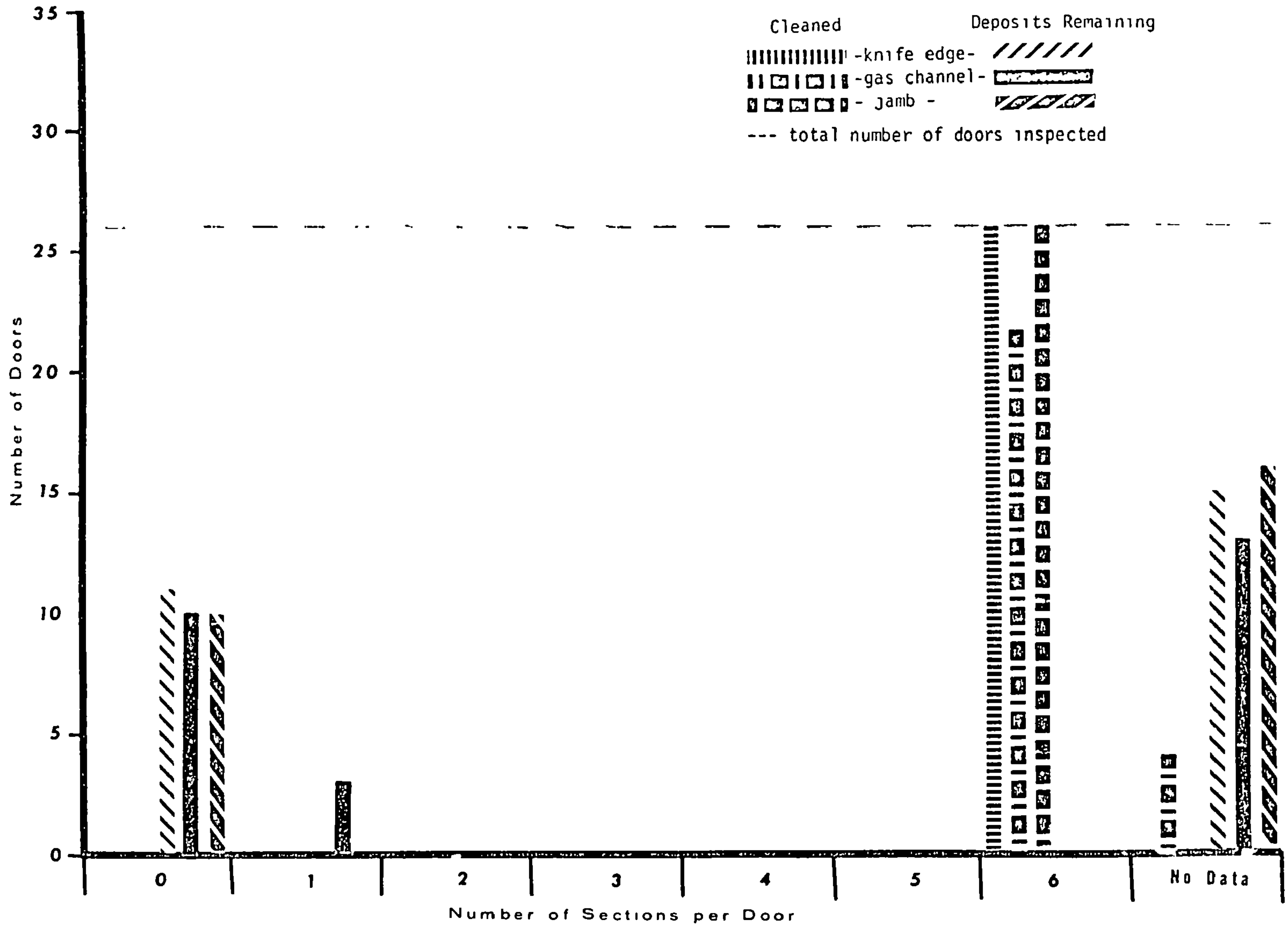


Figure 47. Door Cleaning/Effectiveness Histogram

Battery 5 - Pusher Side

USSC Fairfield Works November 30, 1976

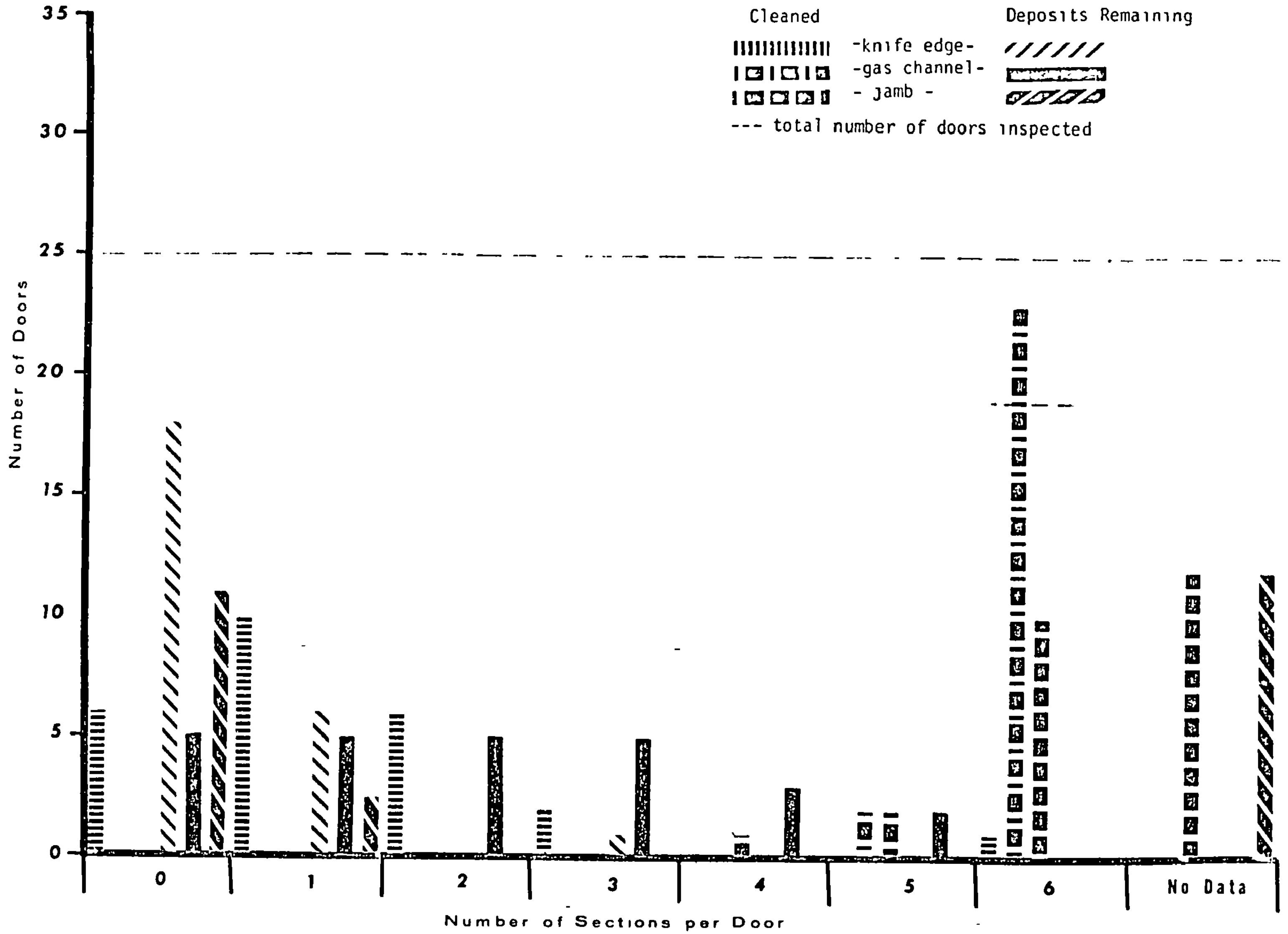


Figure 48. Door Cleaning/Effectiveness Histogram

Battery 5 - Coke Side

USSC Fairfield Works November 30, 1976

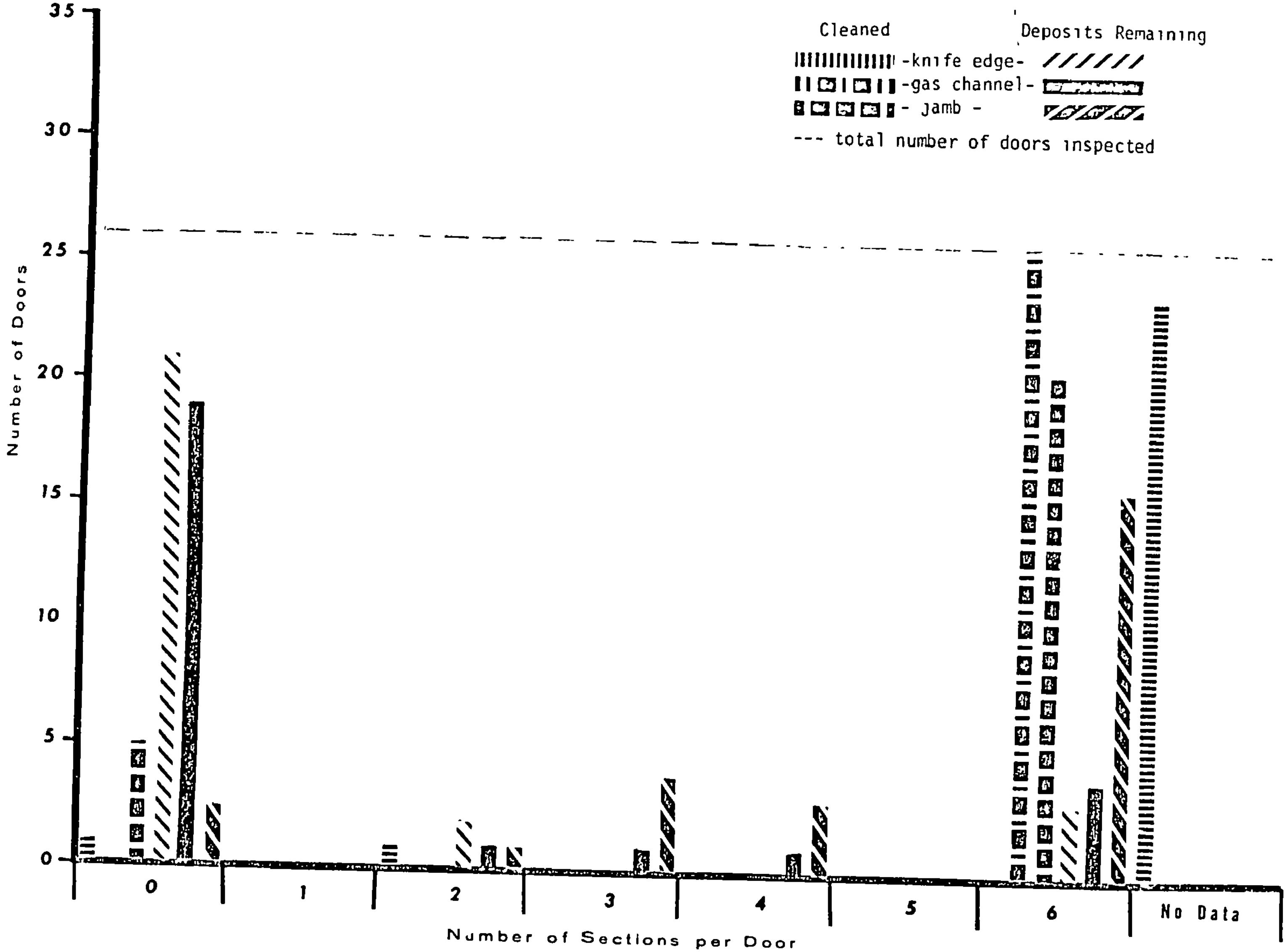


Figure 49. Door Cleaning/Effectiveness Histogram
Battery 6 - Pusher Side
USSC Fairfield Works November 30, 1976

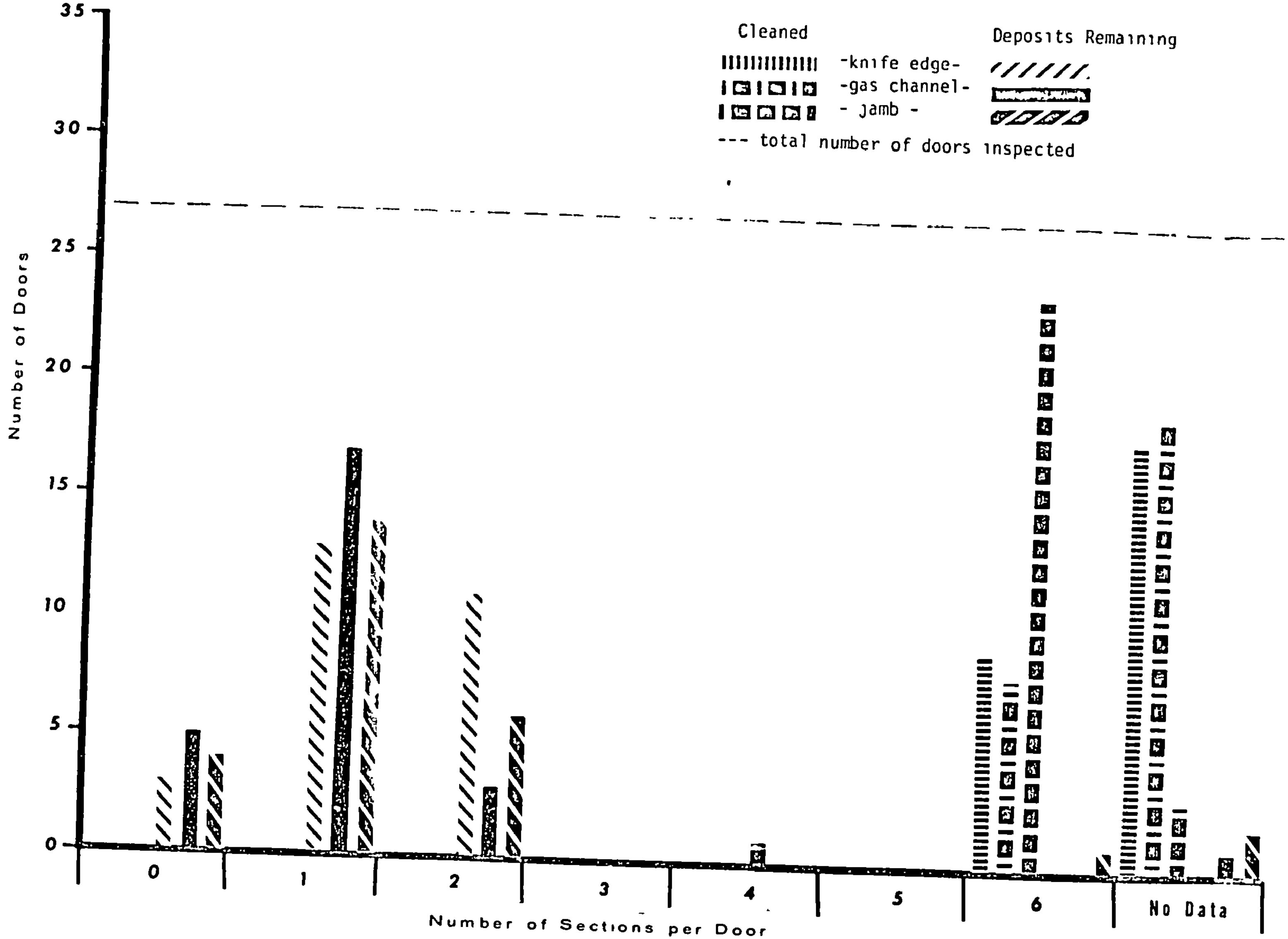


Figure 50. Door Cleaning/Effectiveness Histogram

Battery 6 - Coke Side

USSC Fairfield Works November 30, 1976

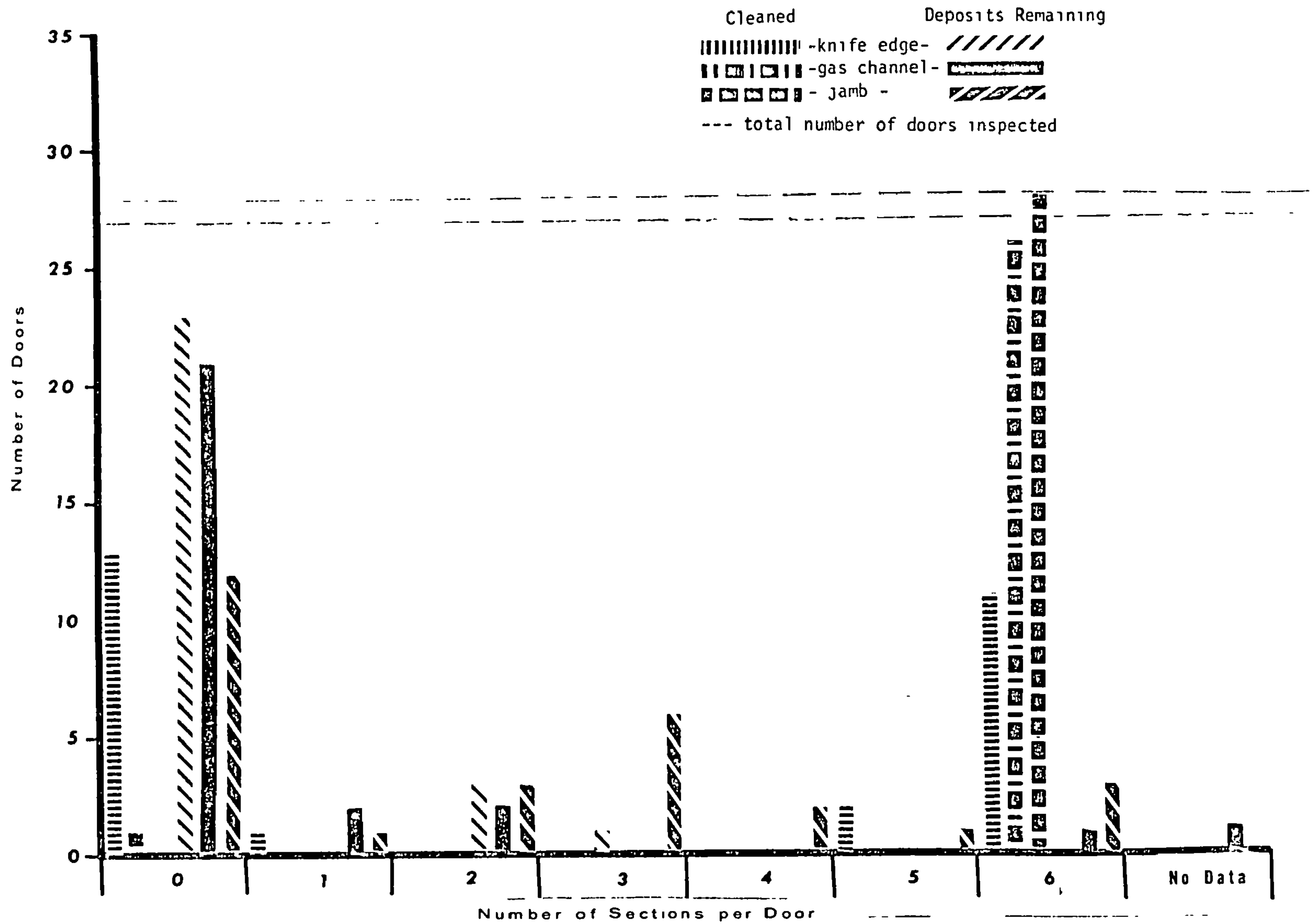


Figure 51. Door Cleaning/Effectiveness Histogram

Battery 5 - Pusher Side

USSC Fairfield Works December 1, 1976

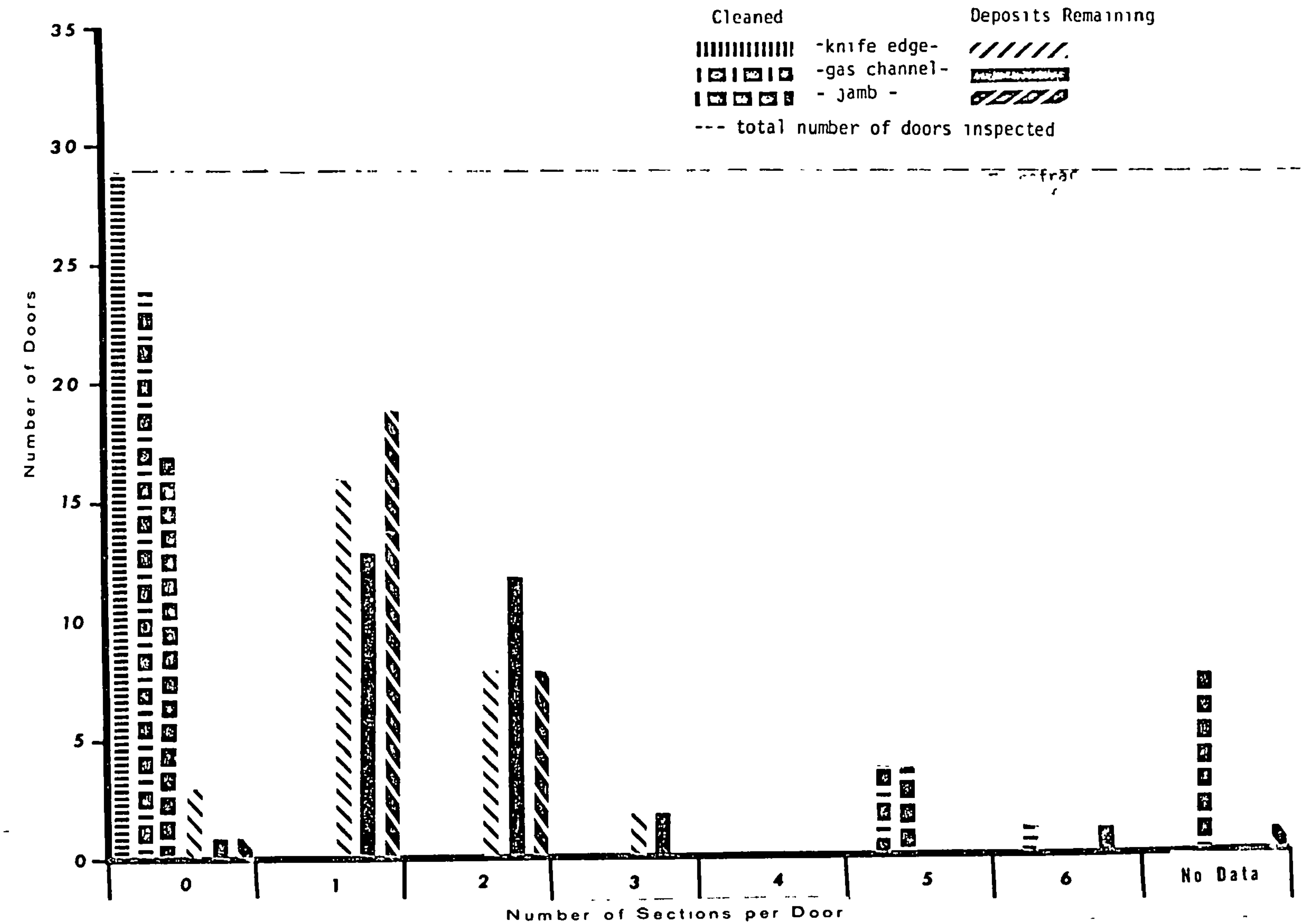


Figure 52. Door Cleaning/Effectiveness Histogram
Battery 5 - Coke Side
USSC Fairfield Works December 1, 1976

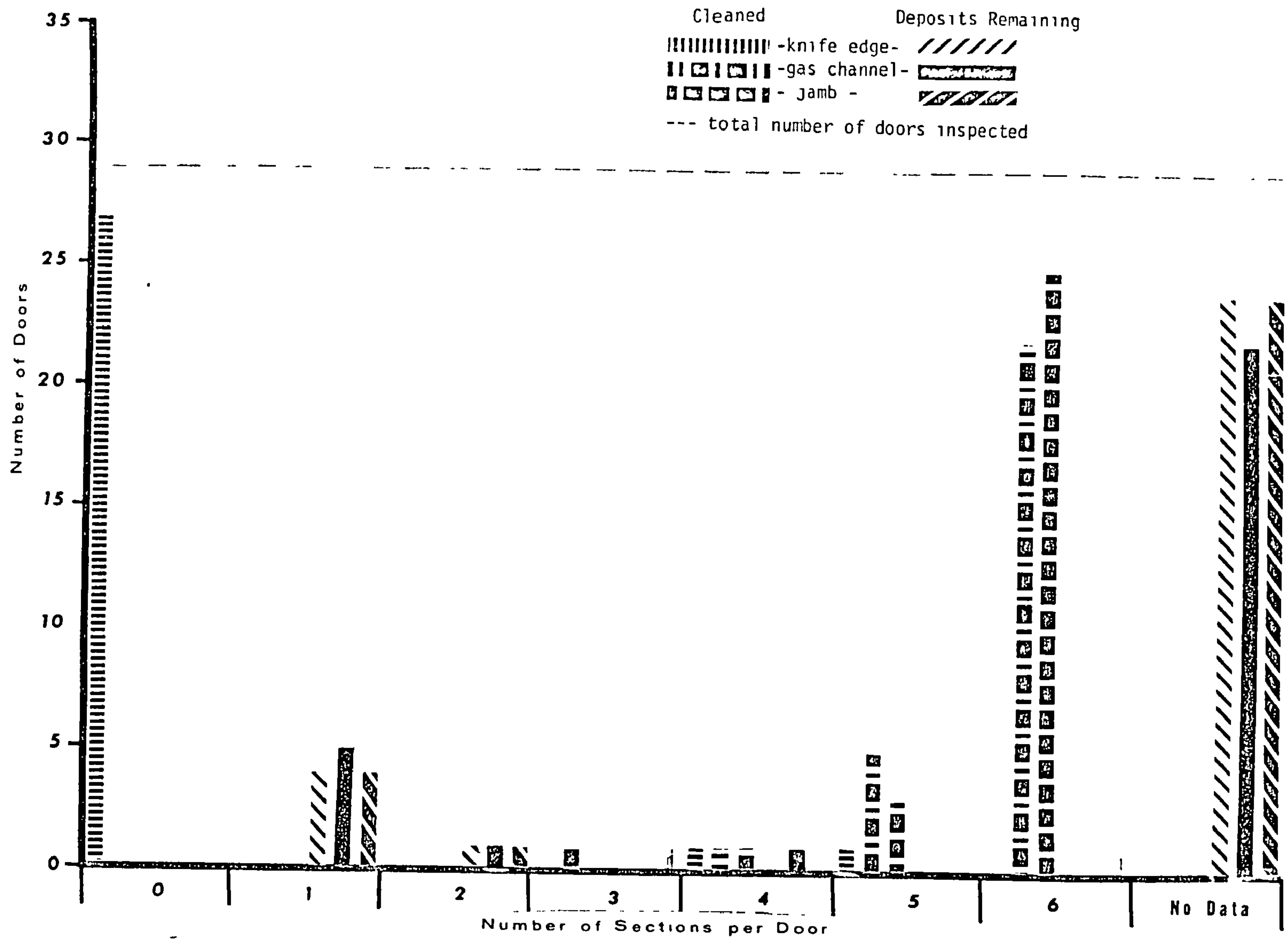


Figure 53. Door Cleaning/Effectiveness Histogram

Battery 6 - Pusher Side

USSC Fairfield Works December 1, 1976

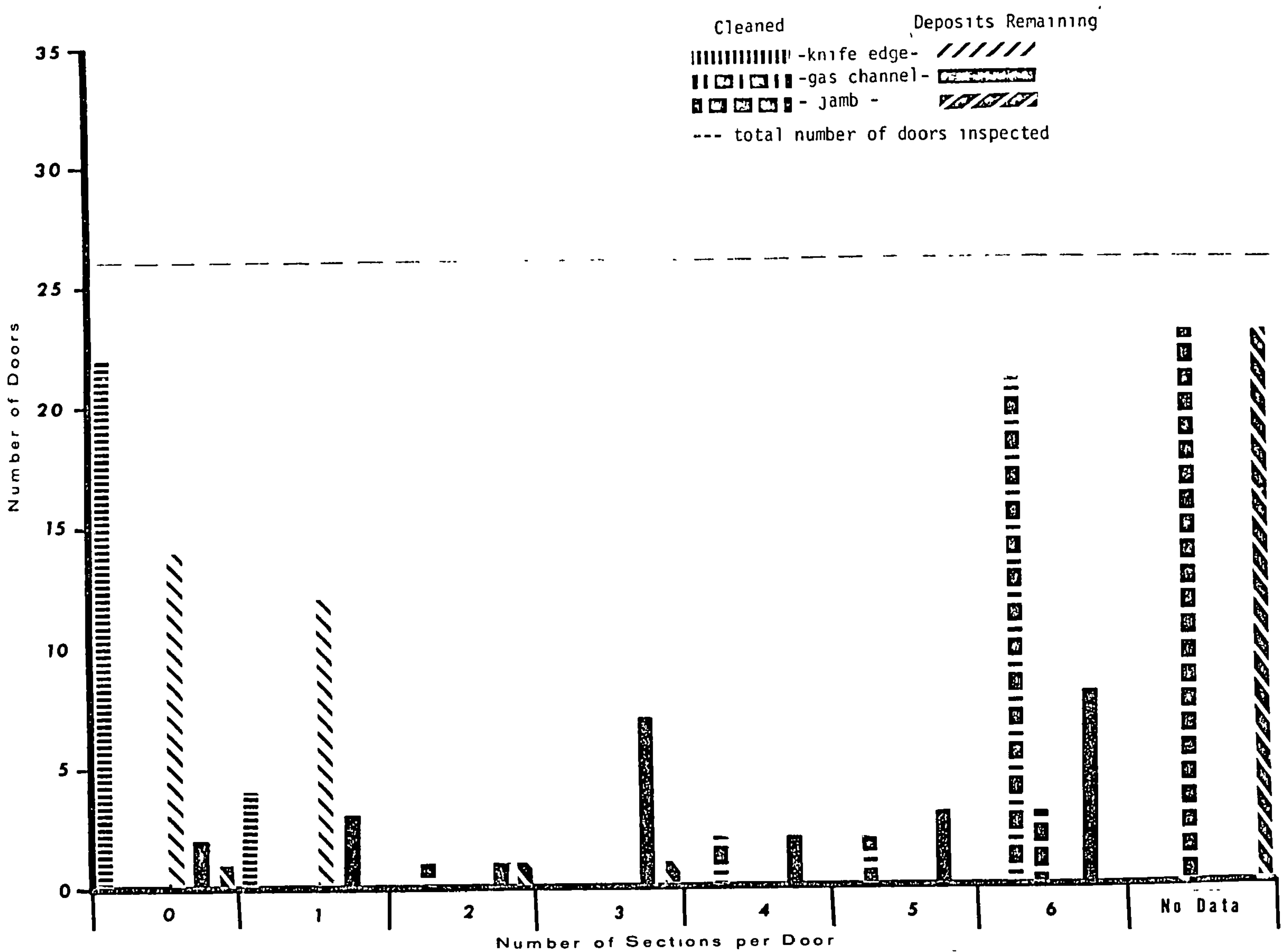


Figure 54. Door Cleaning/Effectiveness Histogram

Battery 6 - Coke Side

USSC Fairfield Works December 1, 1976

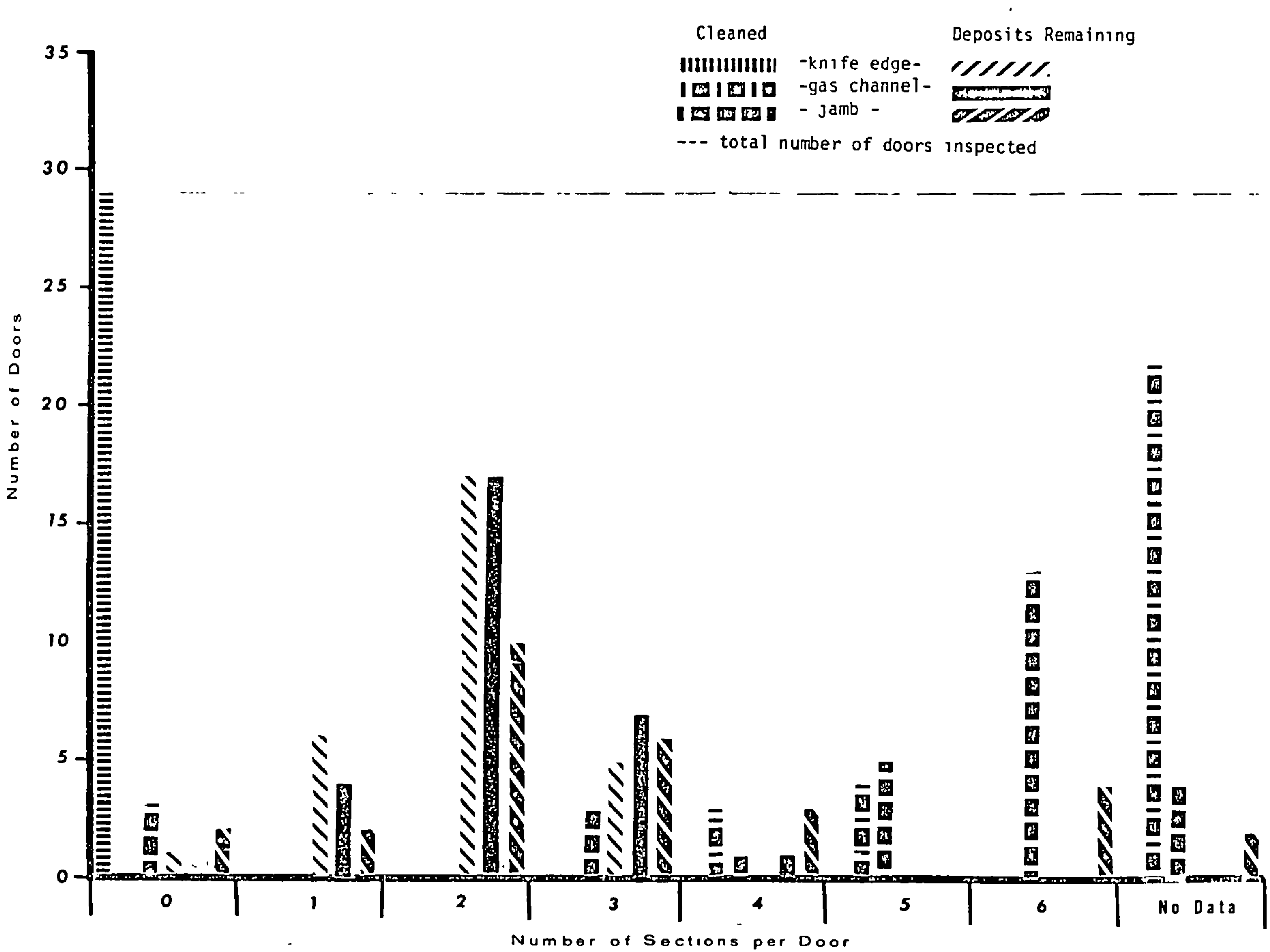


Figure 55. Door Cleaning/Effectiveness Histogram

Battery 5 - Pusher Side

USSC Fairfield Works December 2, 1976

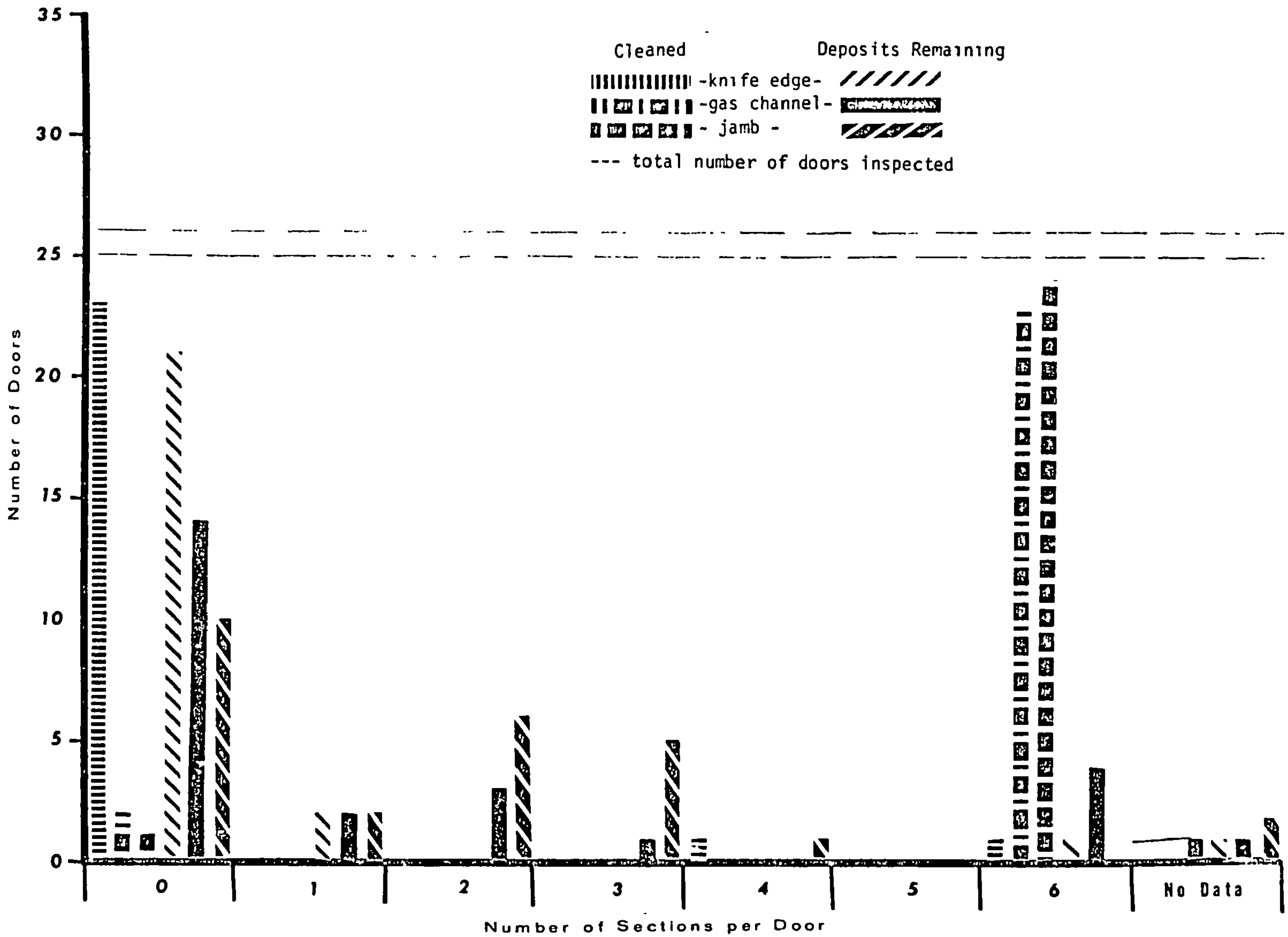


Figure 56. Door Cleaning/Effectiveness Histogram

Battery 5 - Coke Side

USSC Fairfield Works December 2, 1976

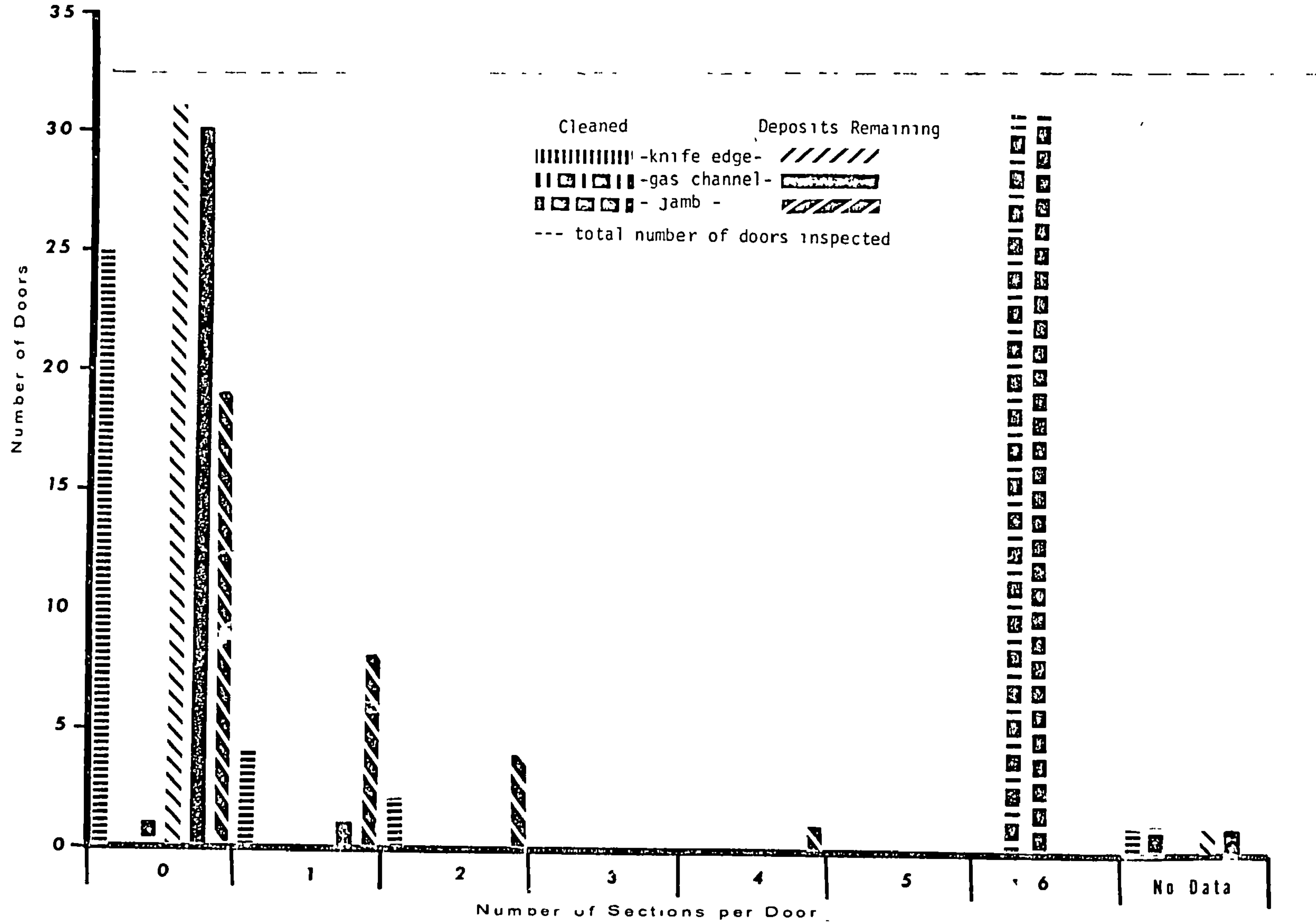


Figure 57. Door Cleaning/Effectiveness Histogram

Battery 6 - Pusher Side

USSC Fairfield Works December 2, 1976

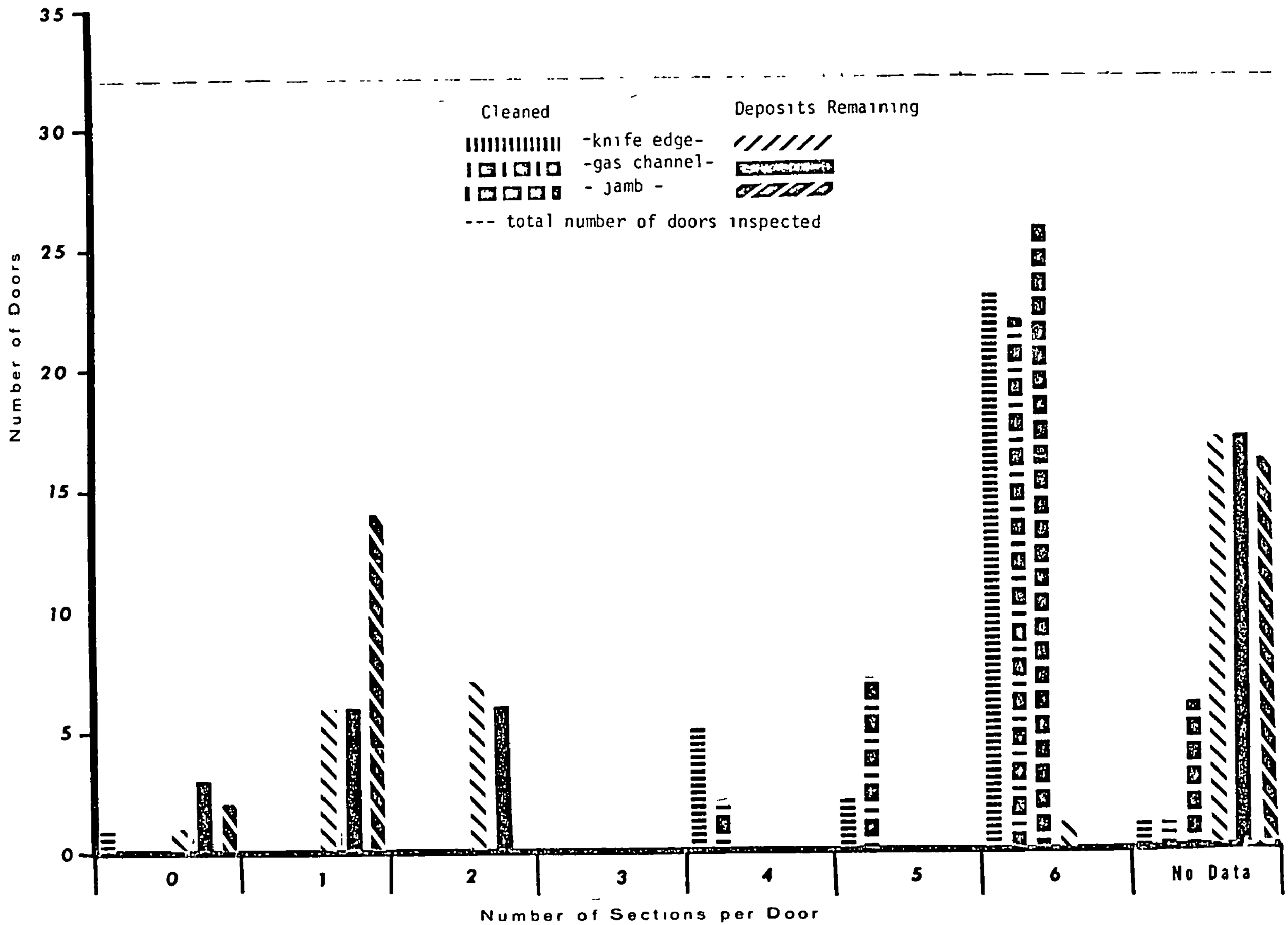


Figure 58. Door Cleaning/Effectiveness Histogram

Battery 6 - Coke Side

USSC Fairfield Works December 2, 1976

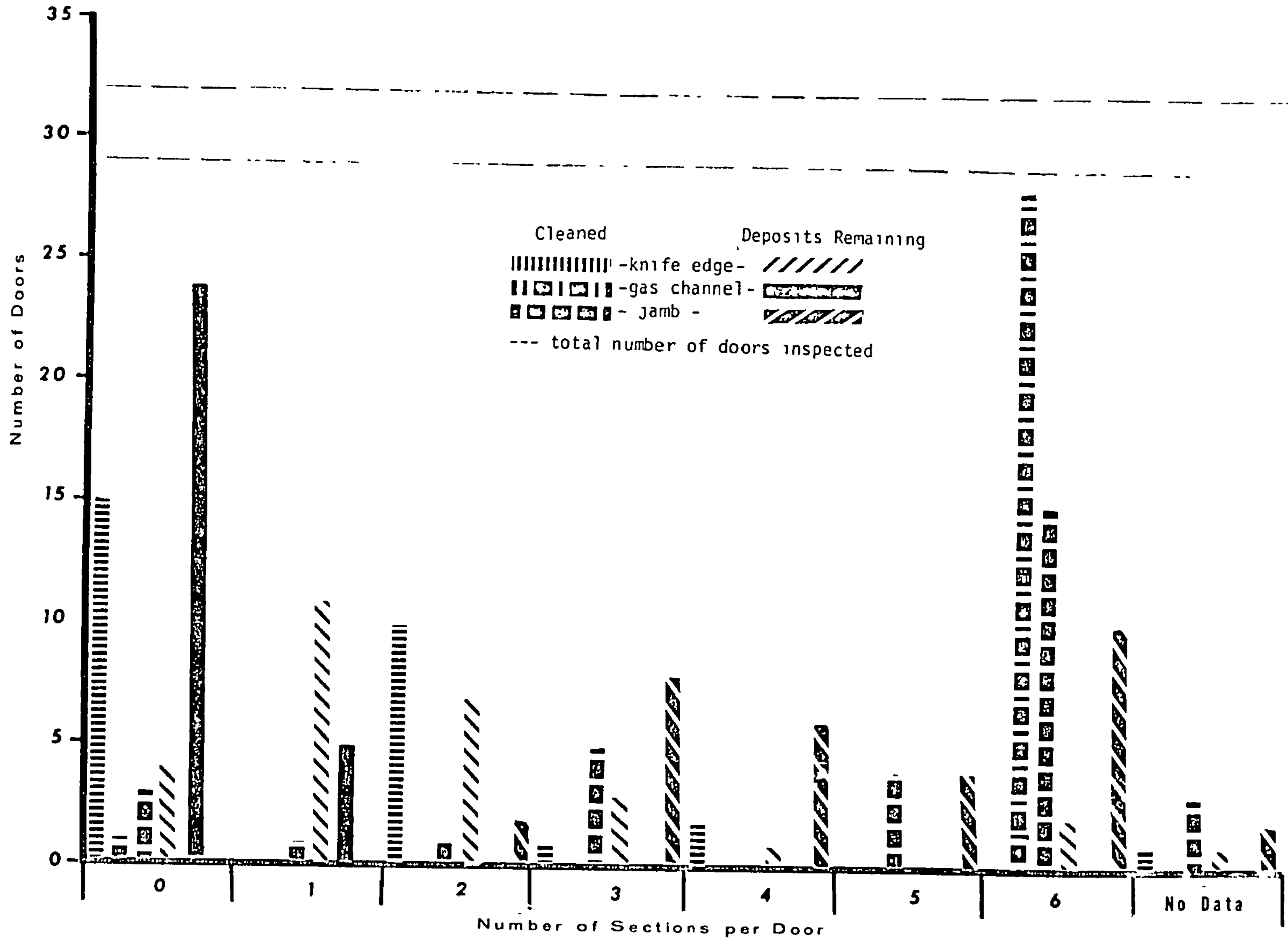


Figure 59. Door Cleaning/Effectiveness Histogram

Battery 5 - Pusher Side

USSC Fairfield Works December 3, 1976

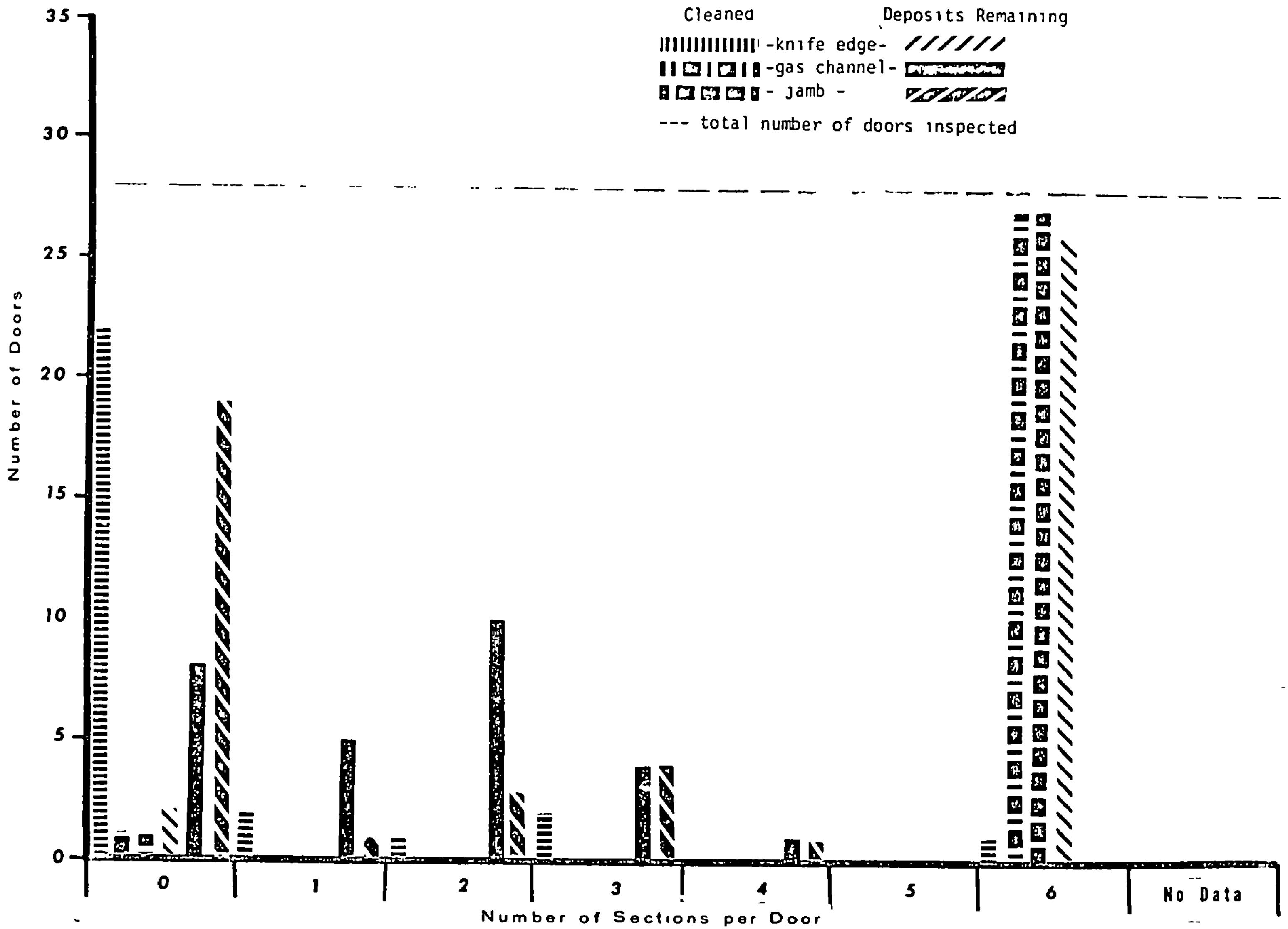


Figure 60. Door Cleaning/Effectiveness Histogram
Battery 5 - Coke Side

USSC Fairfield Works December 3, 1976

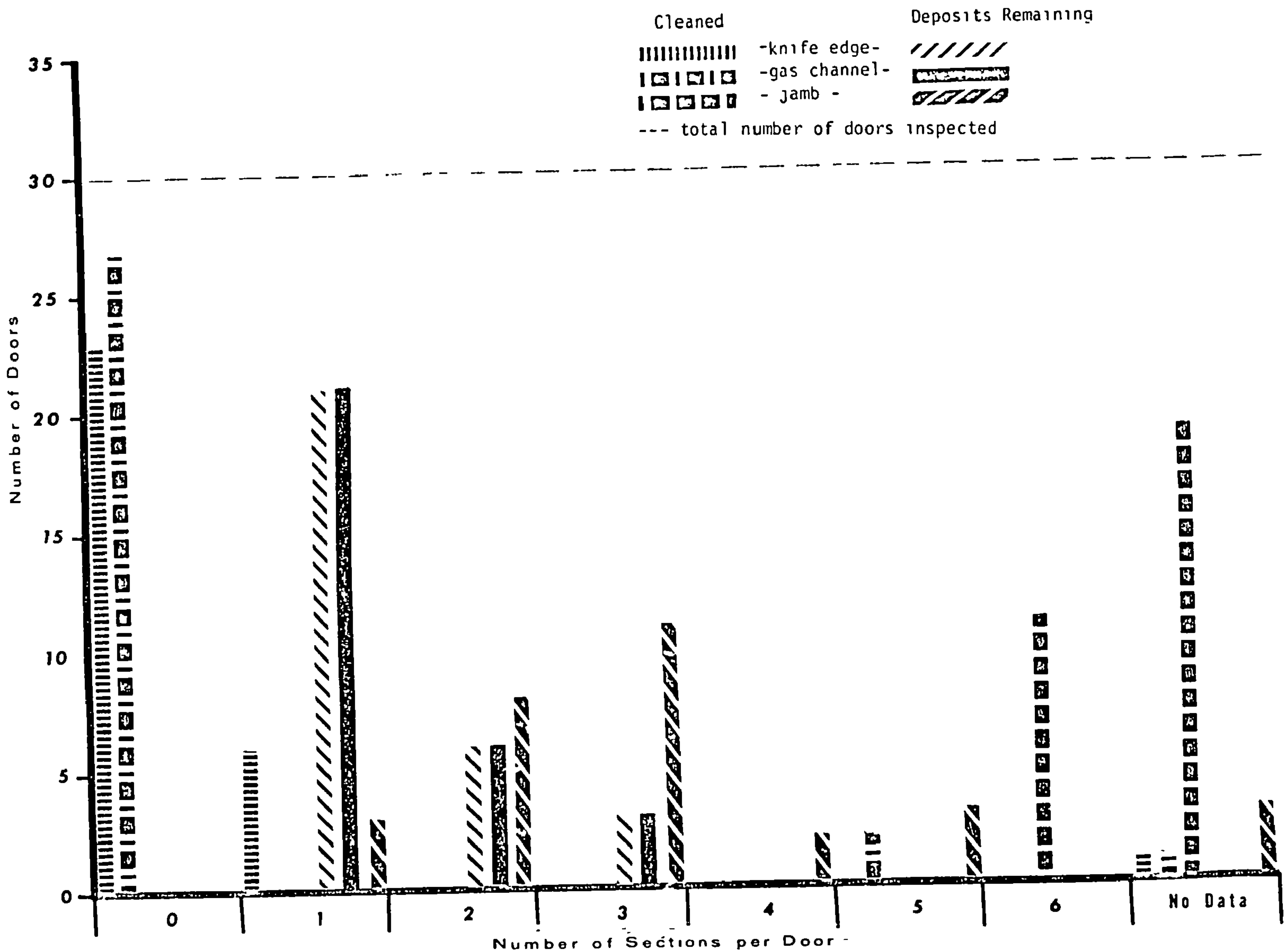


Figure 61. Door Cleaning/Effectiveness Histogram
Battery 6 - Pusher Side

USSC Fairfield Works December 3, 1976

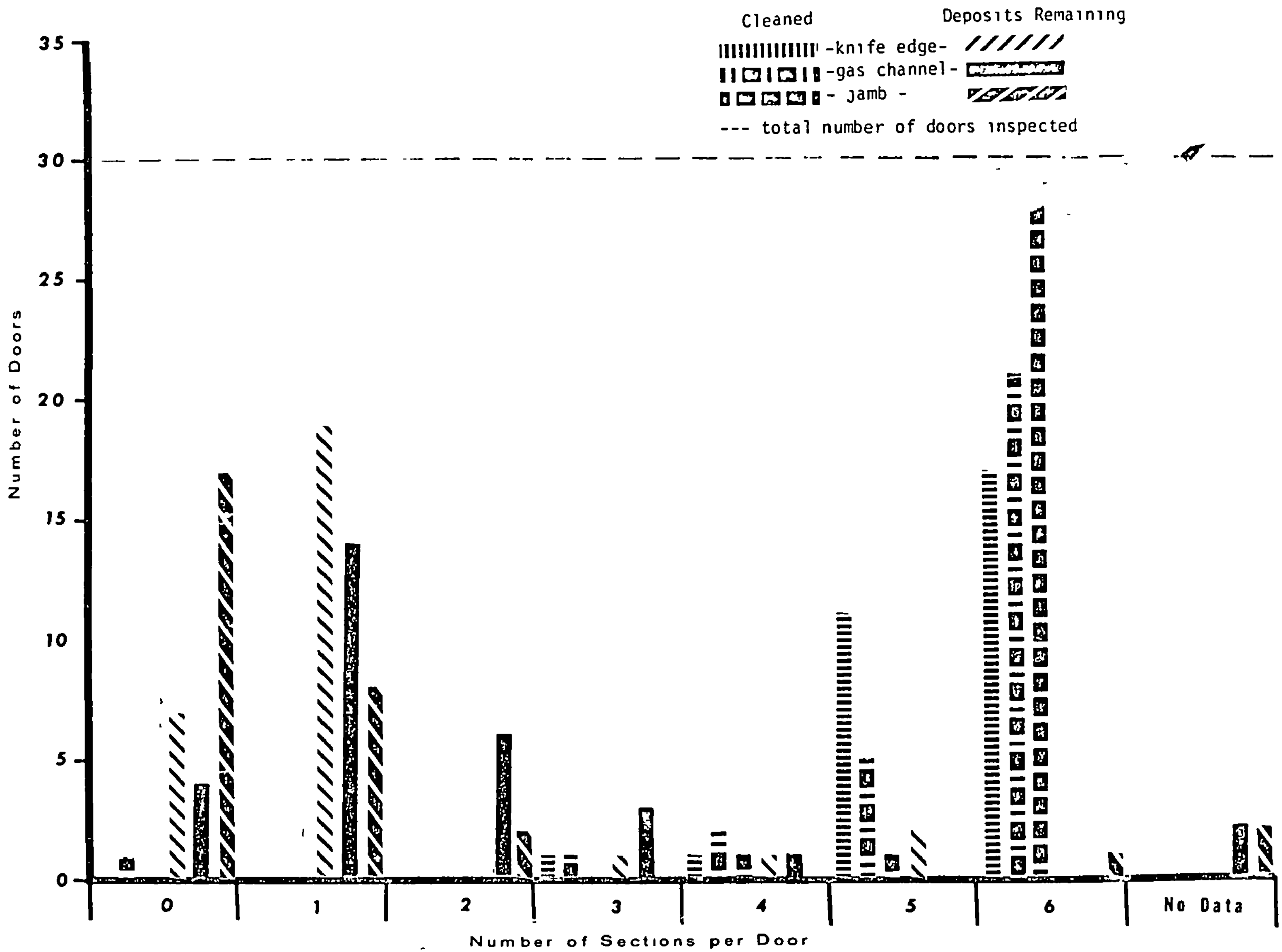


Figure 62. Door Cleaning/Effectiveness Histogram

Battery 6 - Coke Side

USSC Fairfield Works December 3, 1976

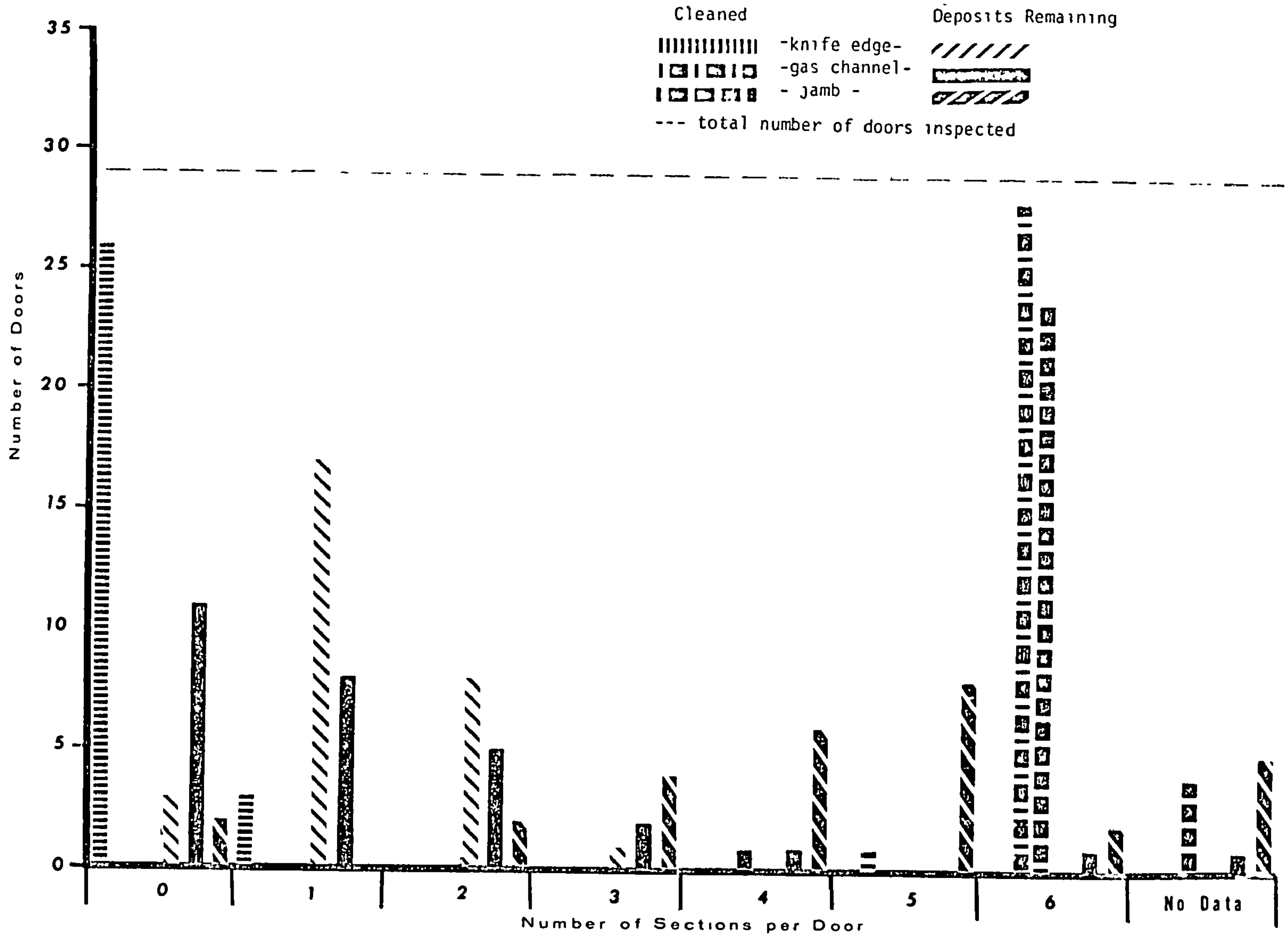


Figure 63. Door Cleaning/Effectiveness Histogram

Battery 5 - Pusher Side

USSC Fairfield Works December 4, 1976

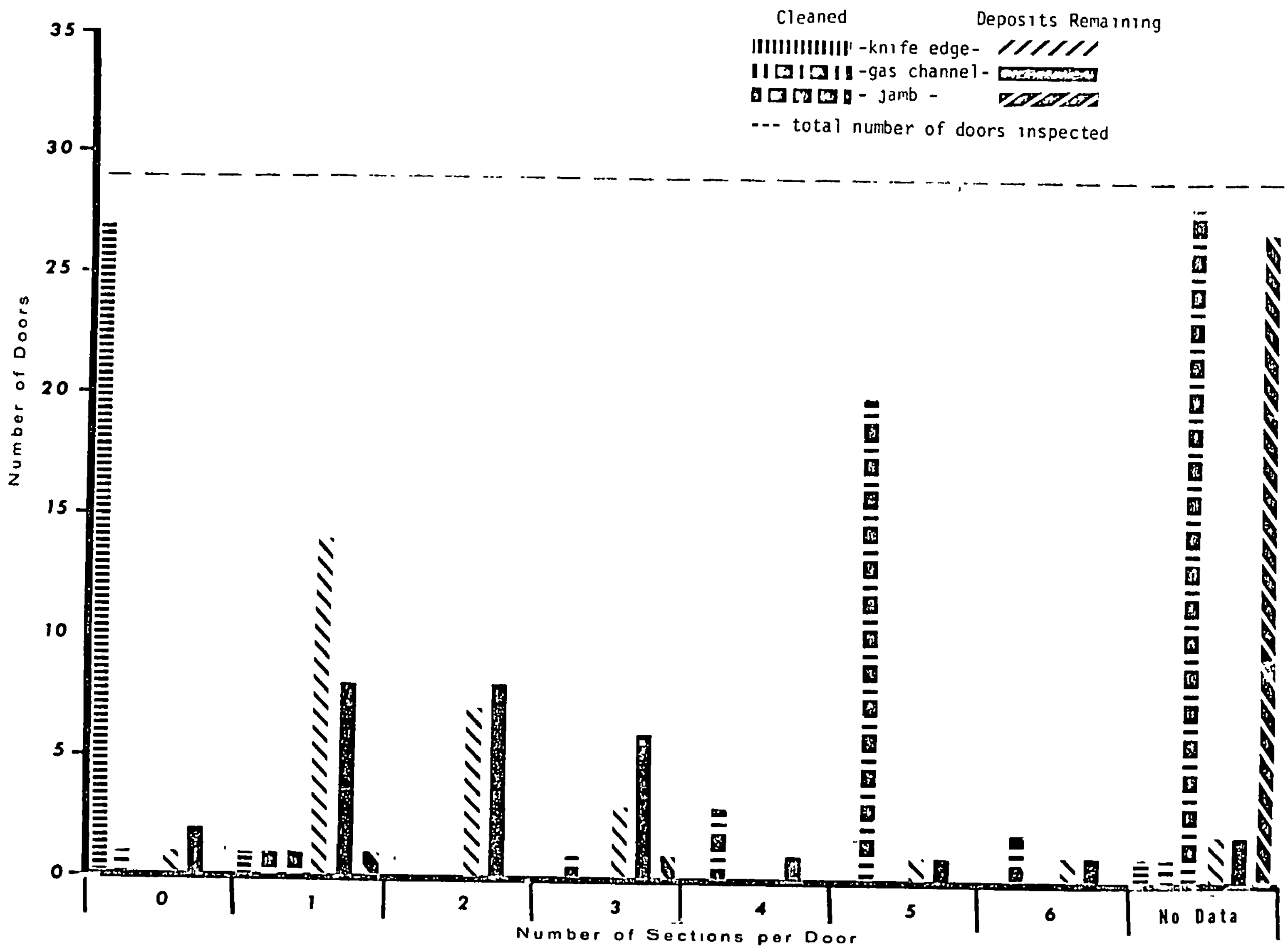


Figure 64. Door Cleaning/Effectiveness Histogram

Battery 5 - Coke Side

USSC Fairfield Works December 4, 1976

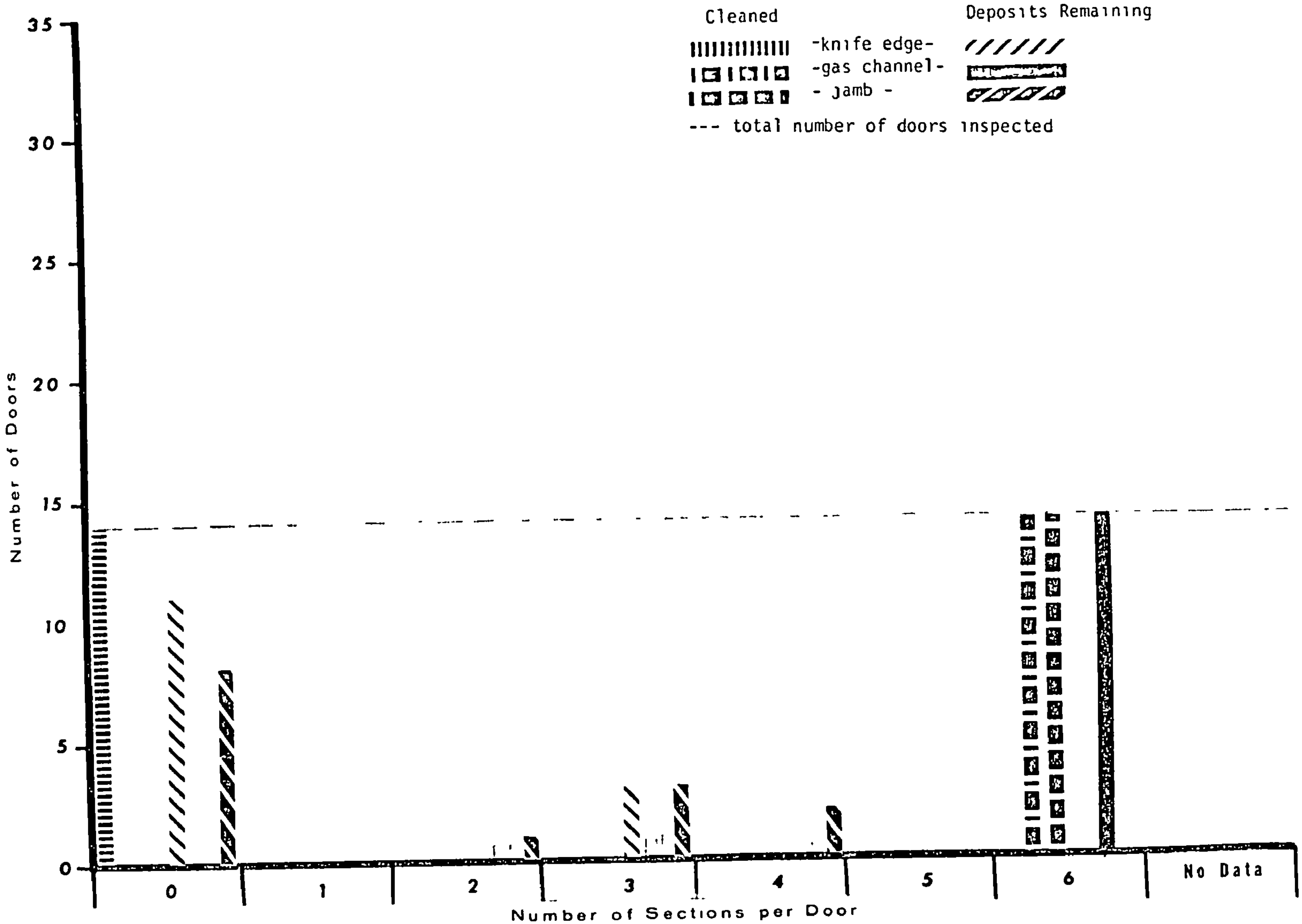


Figure 65. Door Cleaning/Effectiveness Histogram

Battery 9 - Pusher Side

USSC Fairfield Works December 4, 1976

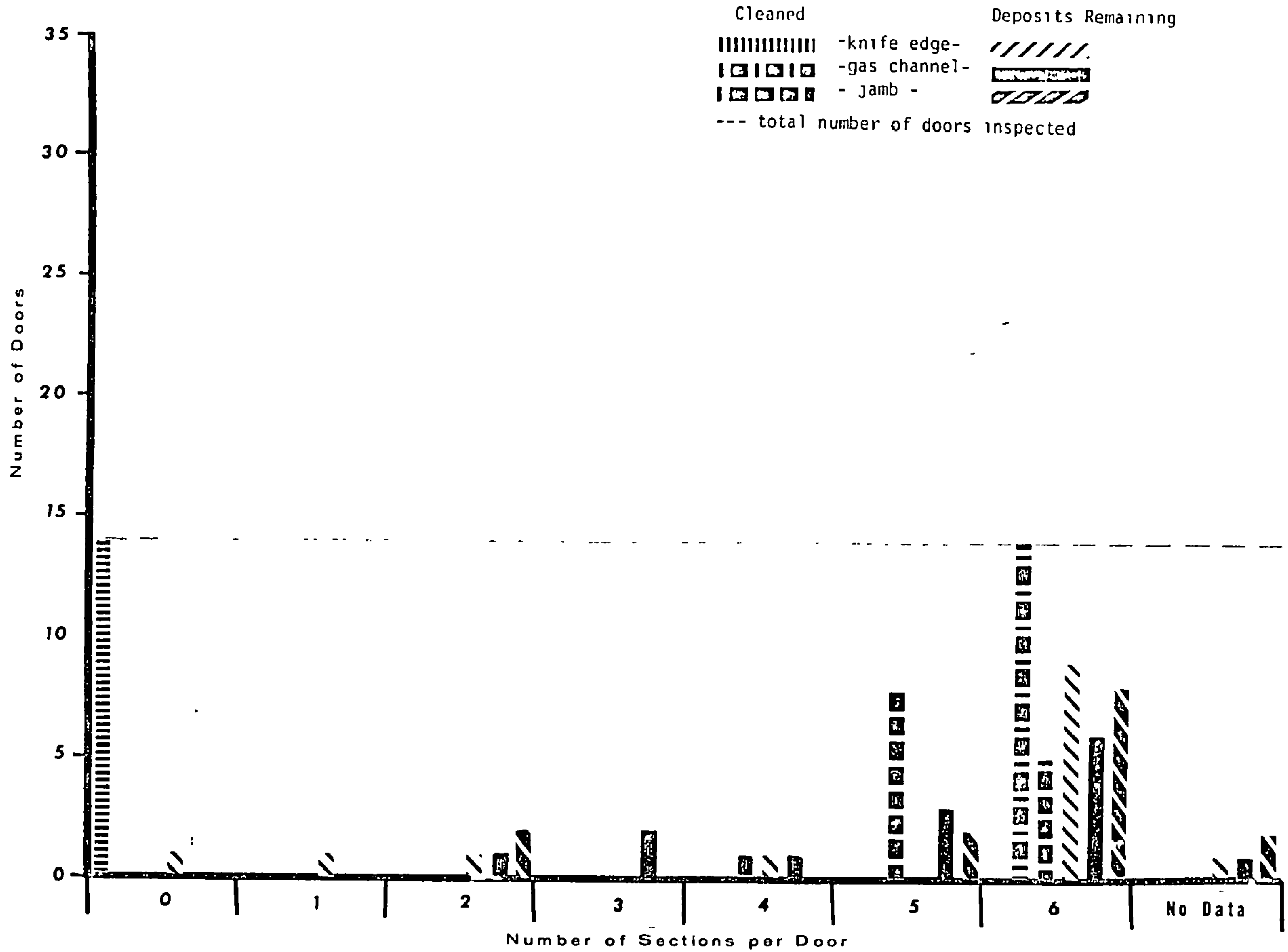


Figure 66. Door Cleaning/Effectiveness Histogram
Battery 9 - Coke Side
USSC Fairfield Works December 4, 1976

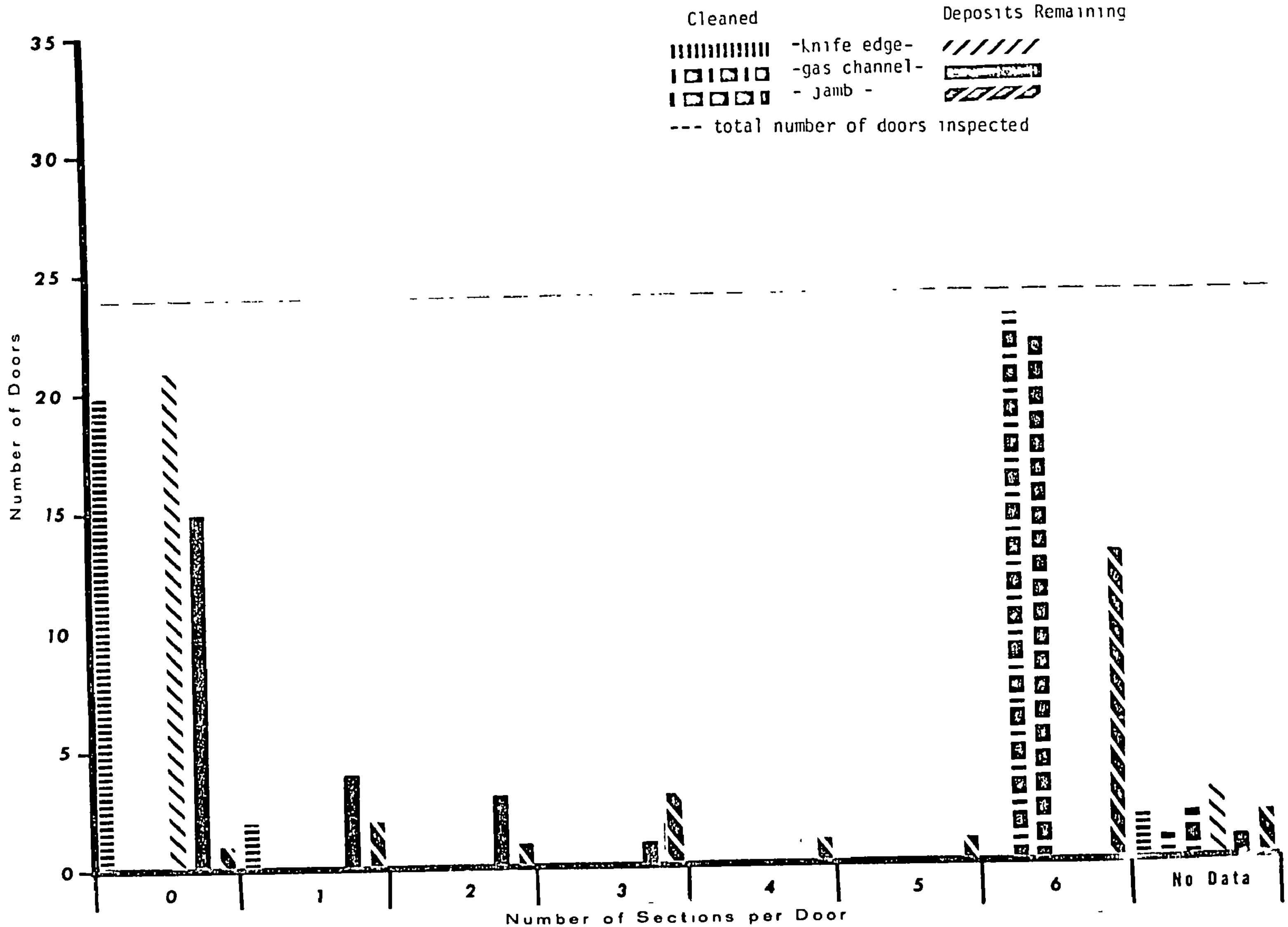


Figure 67. Door Cleaning/Effectiveness Histogram

Battery 6 - Pusher Side

USSC Fairfield Works December 6, 1976

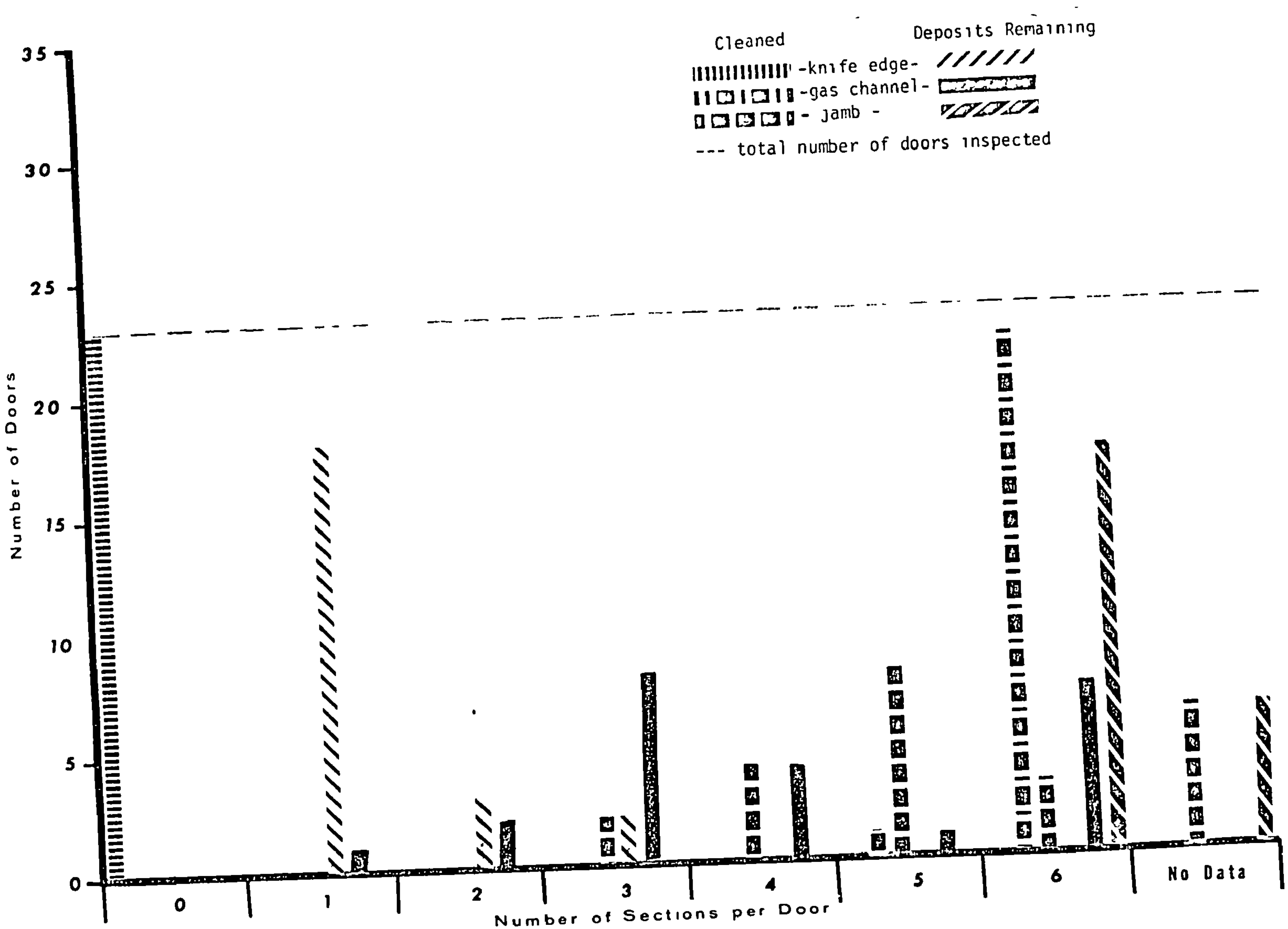


Figure 68. Door Cleaning/Effectiveness Histogram
Battery 6 - Coke Side
USSC Fairfield Works December 6, 1976

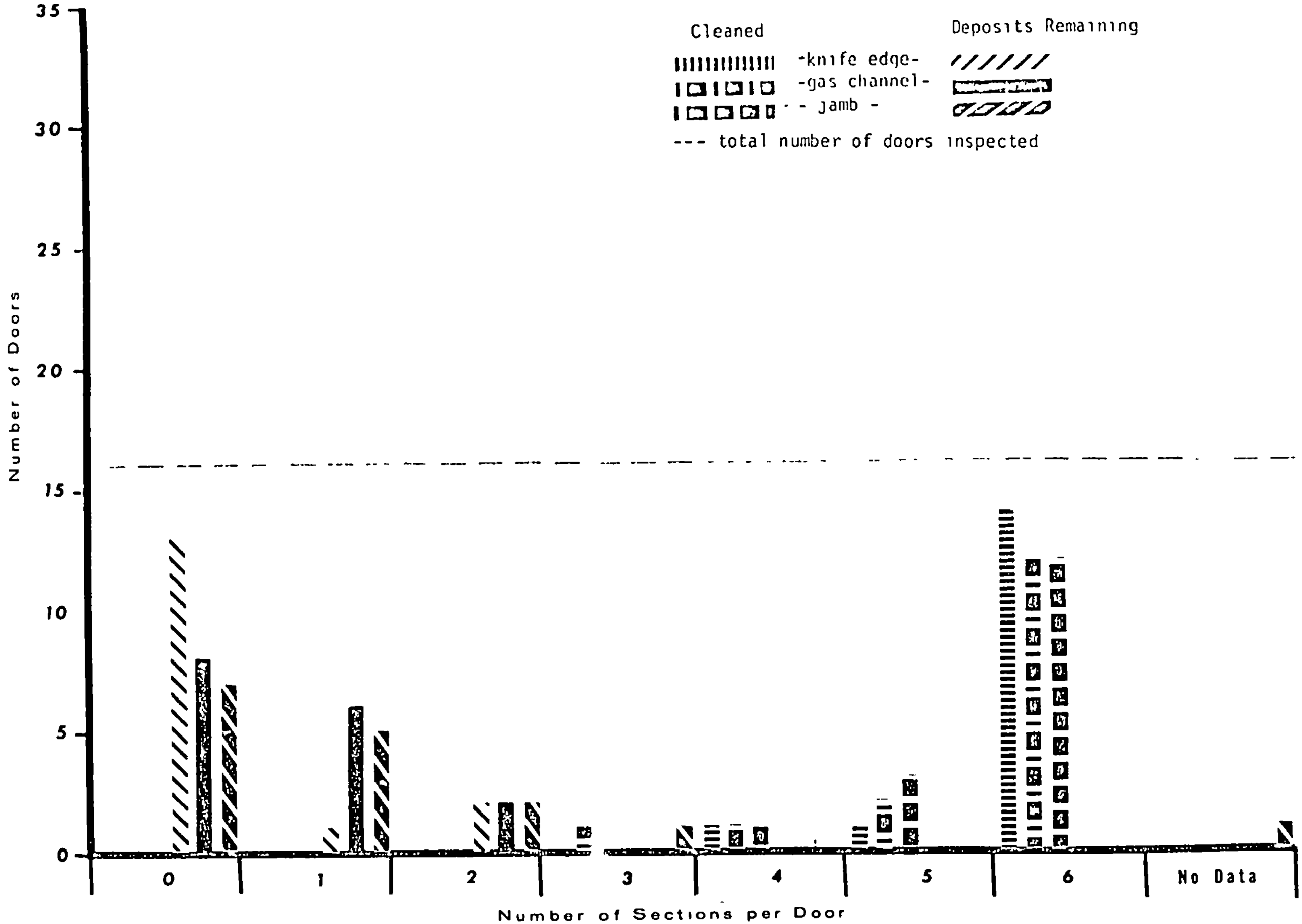


Figure 69. Door Cleaning/Effectiveness Histogram
Battery 9 - Pusher Side
USSC Fairfield Works December 6, 1976

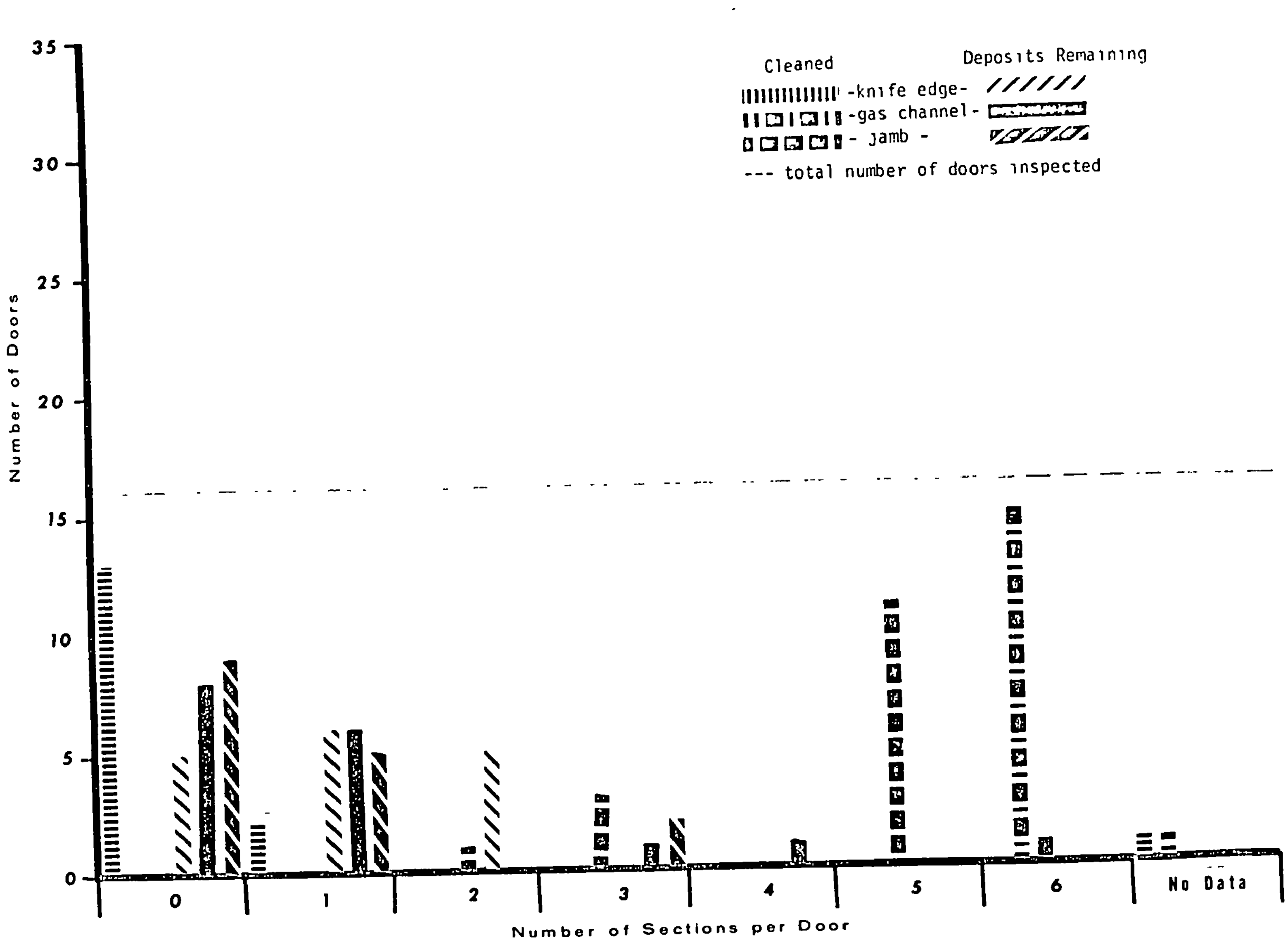


Figure 70. Door Cleaning/Effectiveness Histogram
Battery 9 - Coke Side
USSC Fairfield Works December 6, 1976

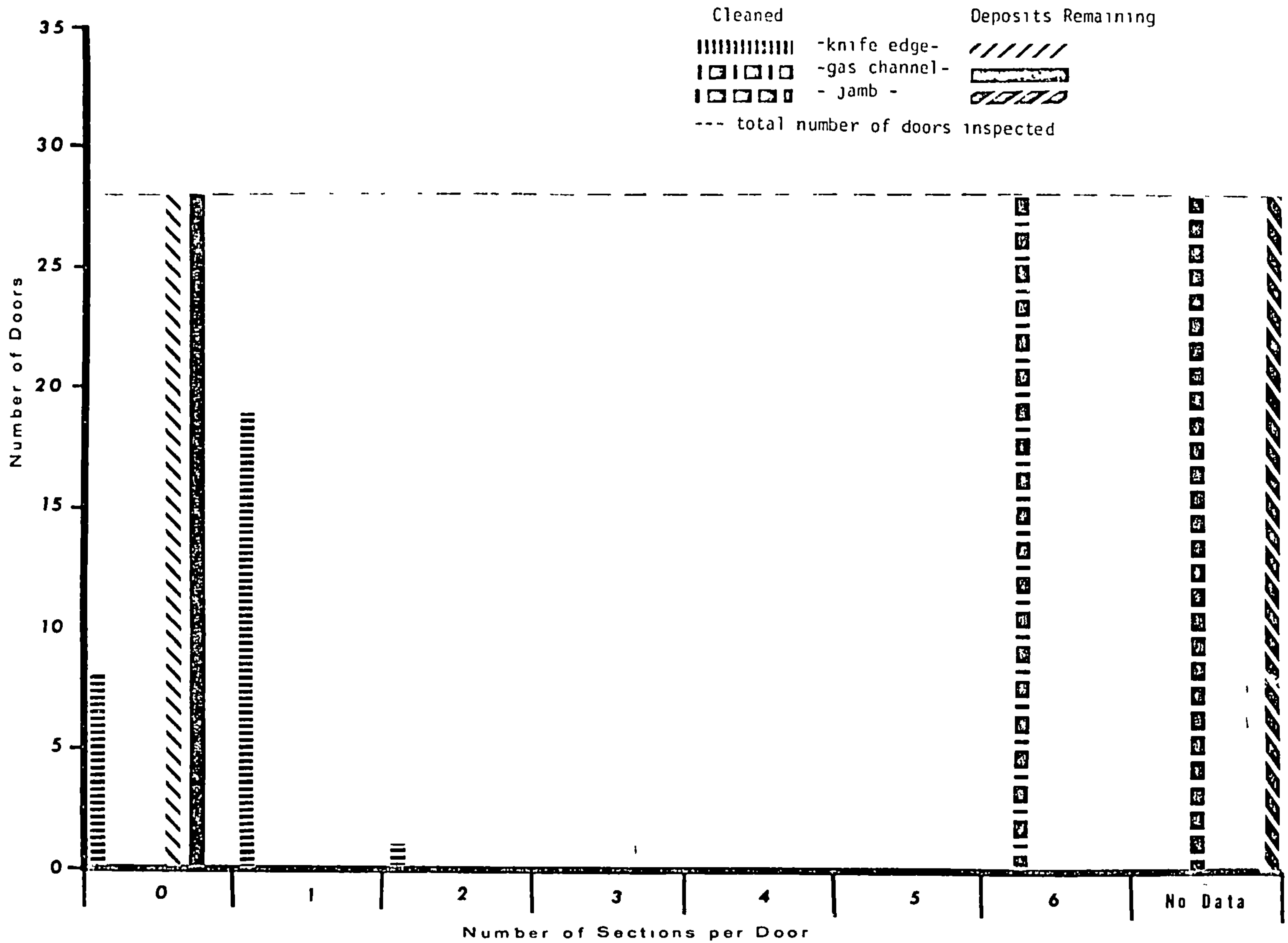


Figure 71. Door Cleaning/Effectiveness Histogram

Battery 6 - Pusher Side

USSC Fairfield Works December 7, 1976

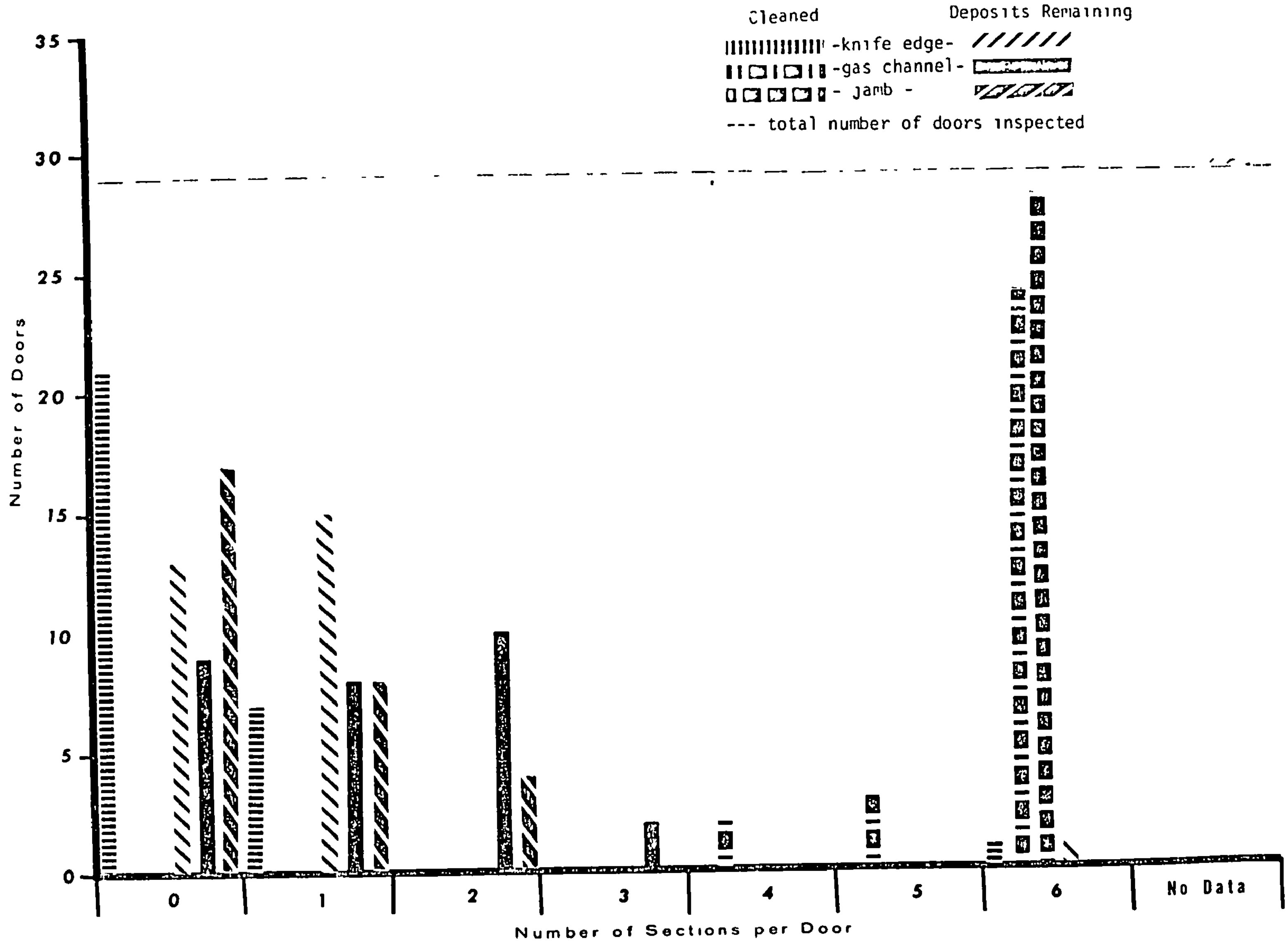


Figure 72. Door Cleaning/Effectiveness Histogram

Battery 6 - Coke Side

USSC Fairfield Works December 7, 1976

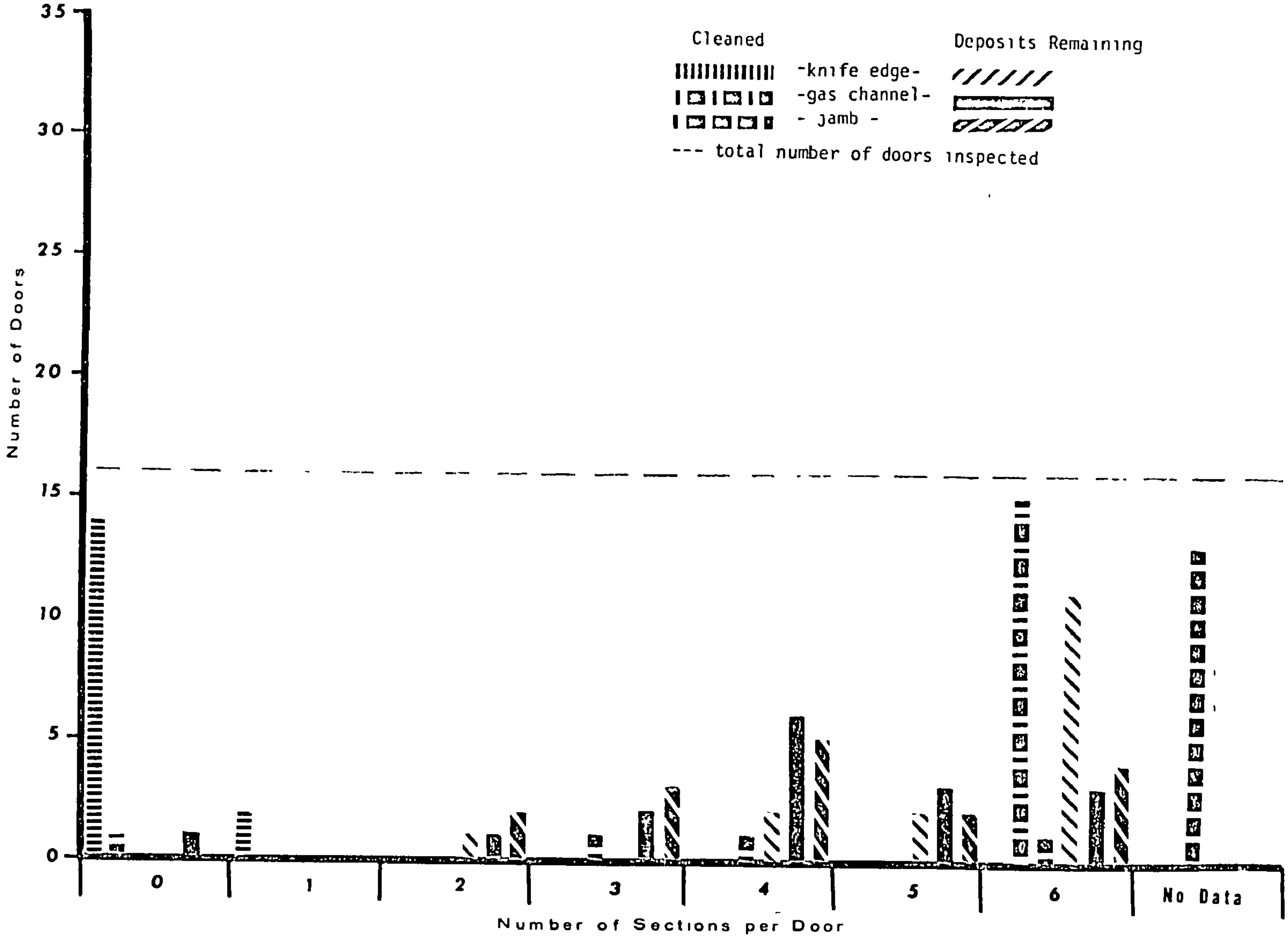


Figure 73. Door Cleaning/Effectiveness Histogram
Battery 9 - Pusher Side
USSC Fairfield Works December 7, 1976

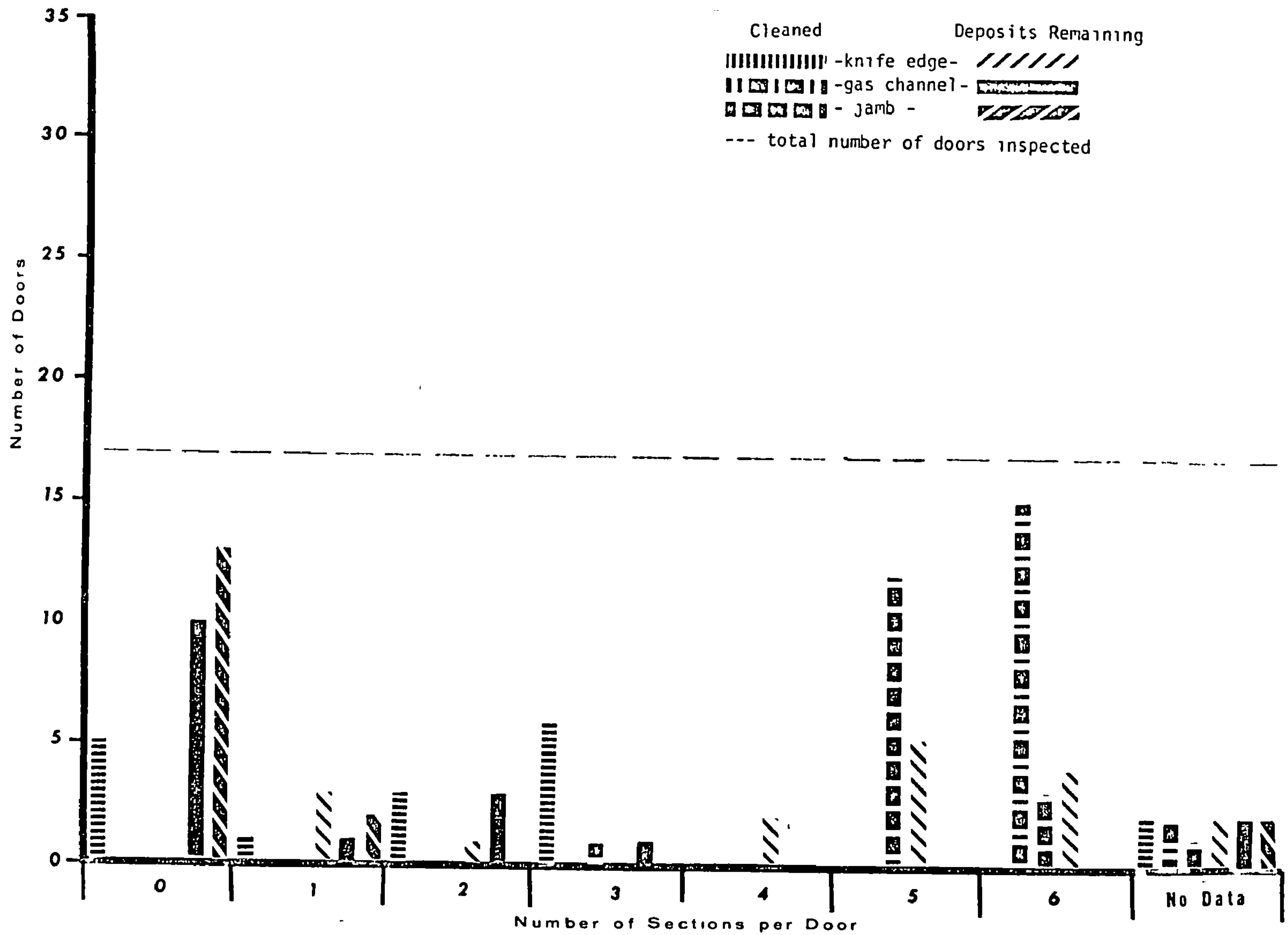


Figure 74. Door Cleaning/Effectiveness Histogram
Battery 9 - Coke Side
USSC Fairfield Works December 7, 1976

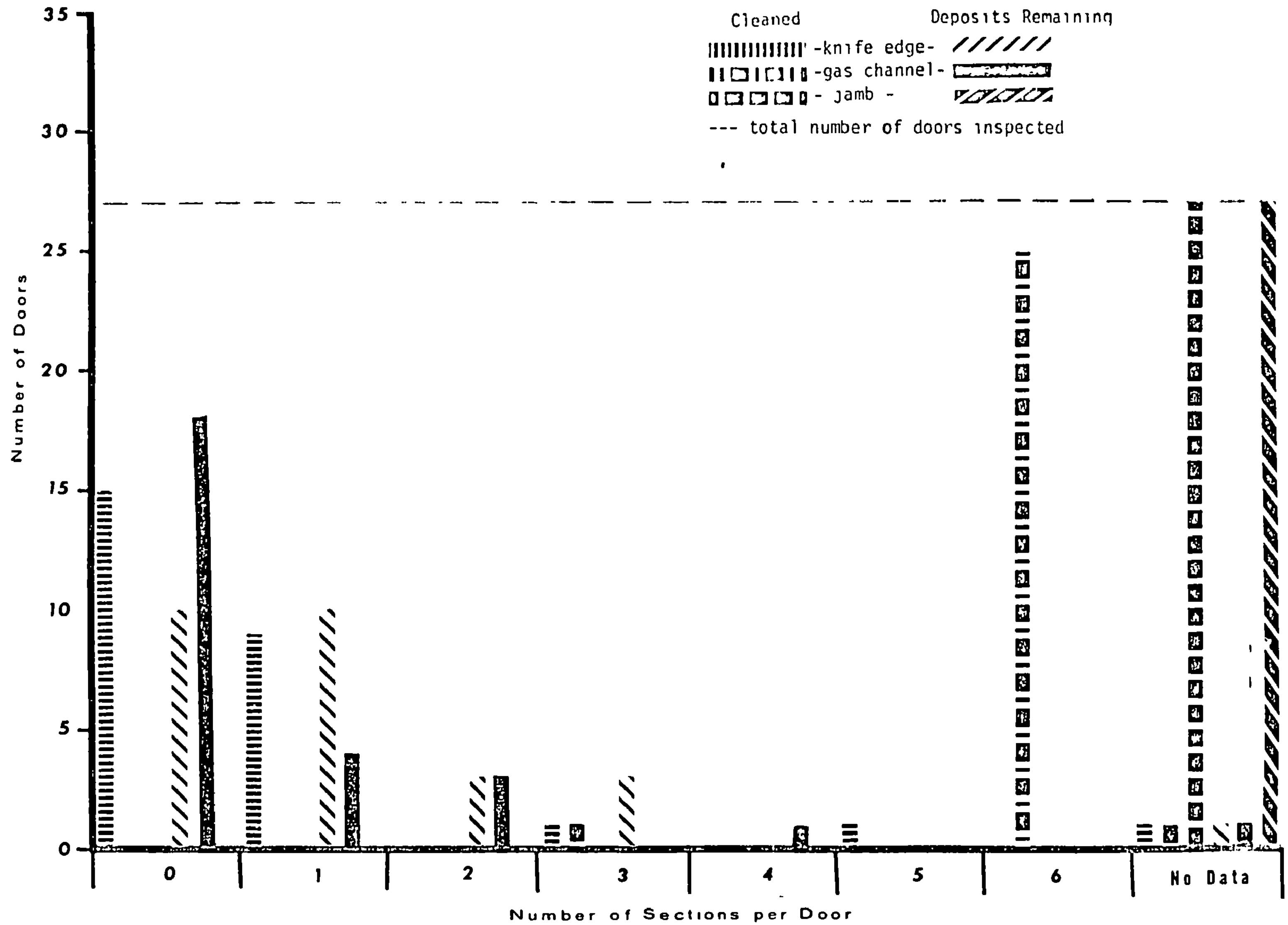


Figure 75. Door Cleaning/Effectiveness Histogram
Battery 6 - Pusher Side
USSC Fairfield Works December 8, 1976

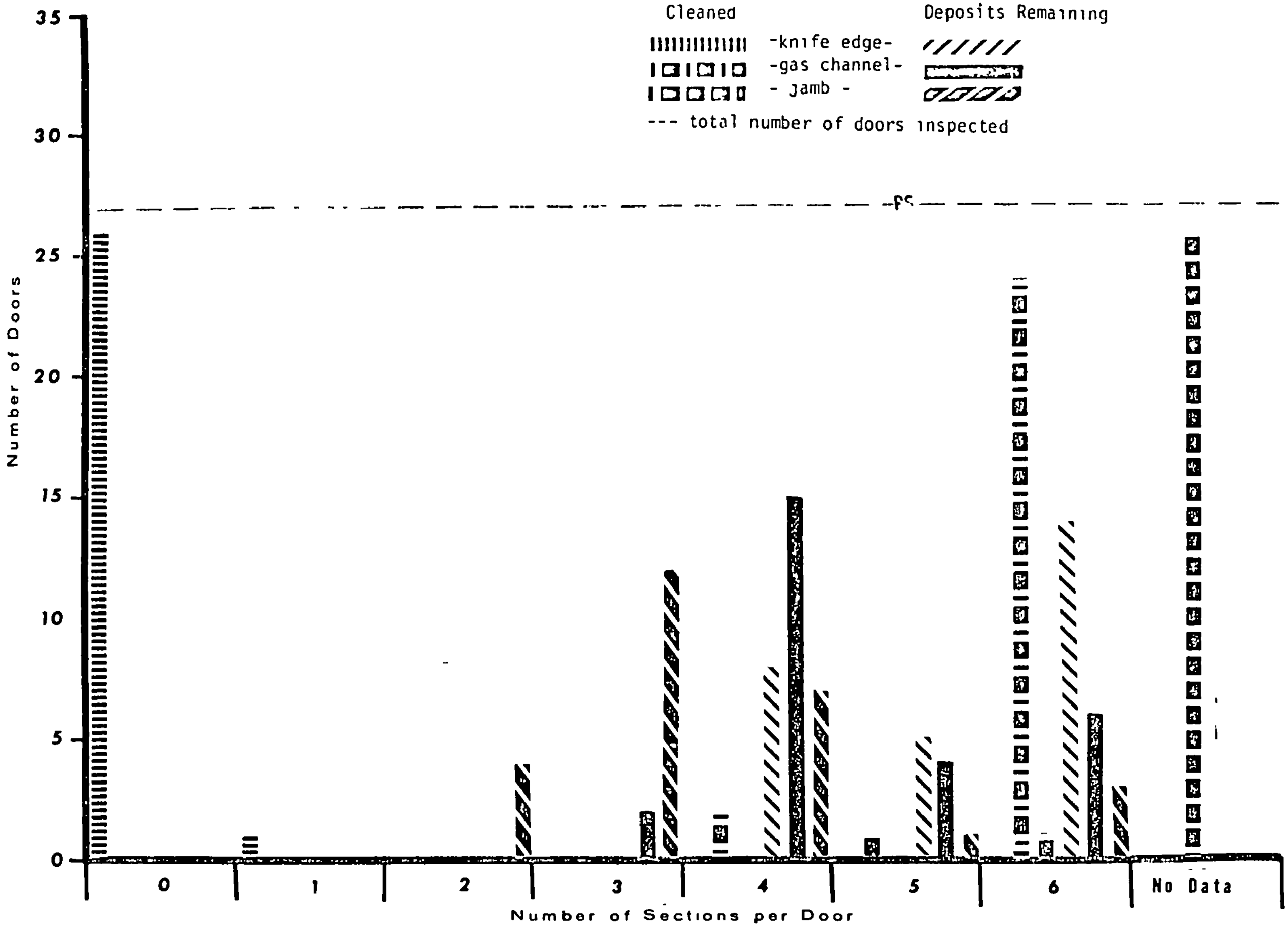


Figure 76. Door Cleaning/Effectiveness Histogram

Battery 6 - Coke Side

USSC Fairfield Works December 8, 1976

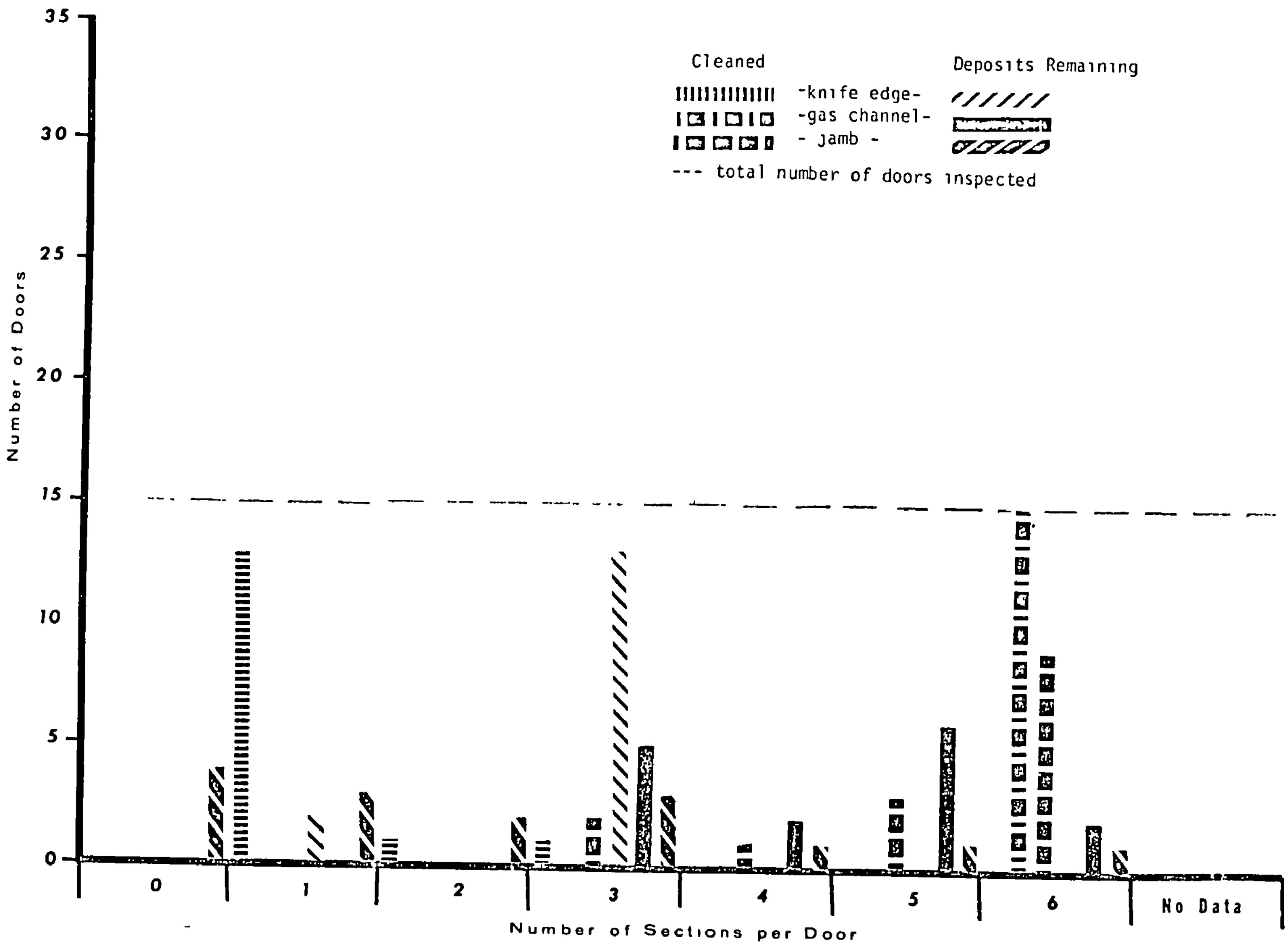


Figure 77. Door Cleaning/Effectiveness Histogram

Battery 9 - Pusher Side

USSC Fairfield Works December 8, 1976

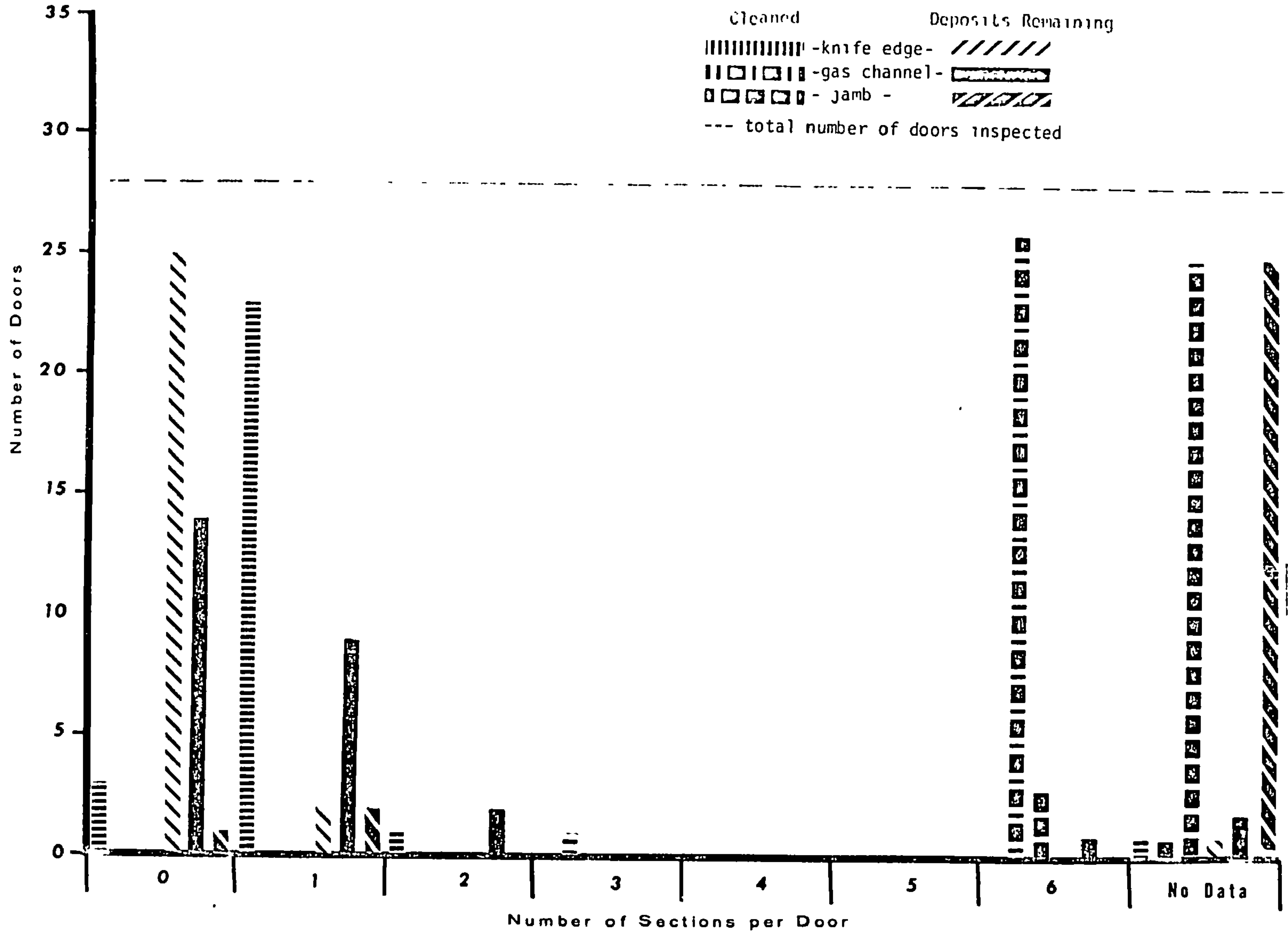


Figure 79. Door Cleaning/Effectiveness Histogram

Battery 6 - Pusher Side

USSC Fairfield Works December 9, 1976

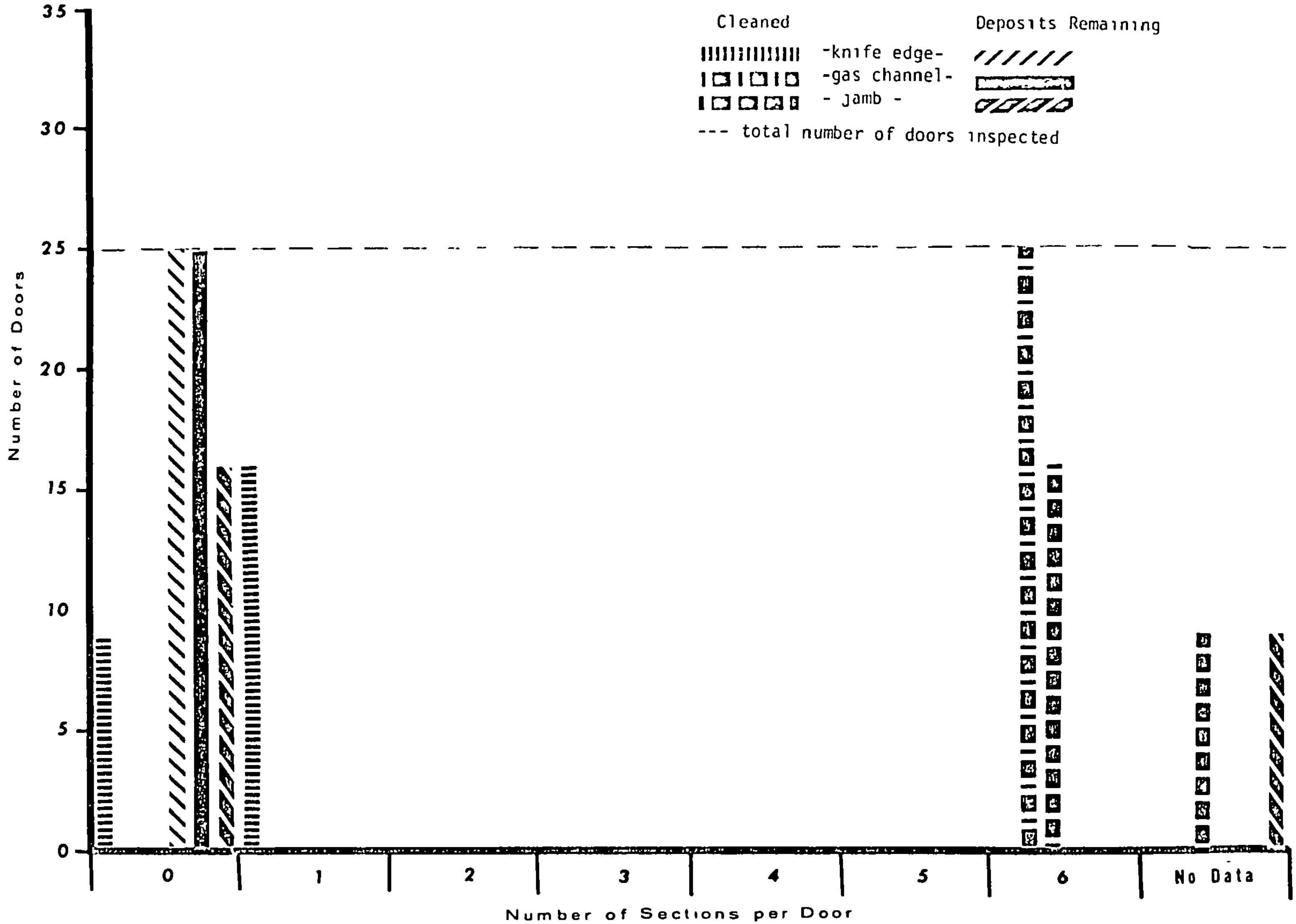


Figure 80. Door Cleaning/Effectiveness Histogram

Battery 6 - Coke Side

USSC Fairfield Works December 9, 1976

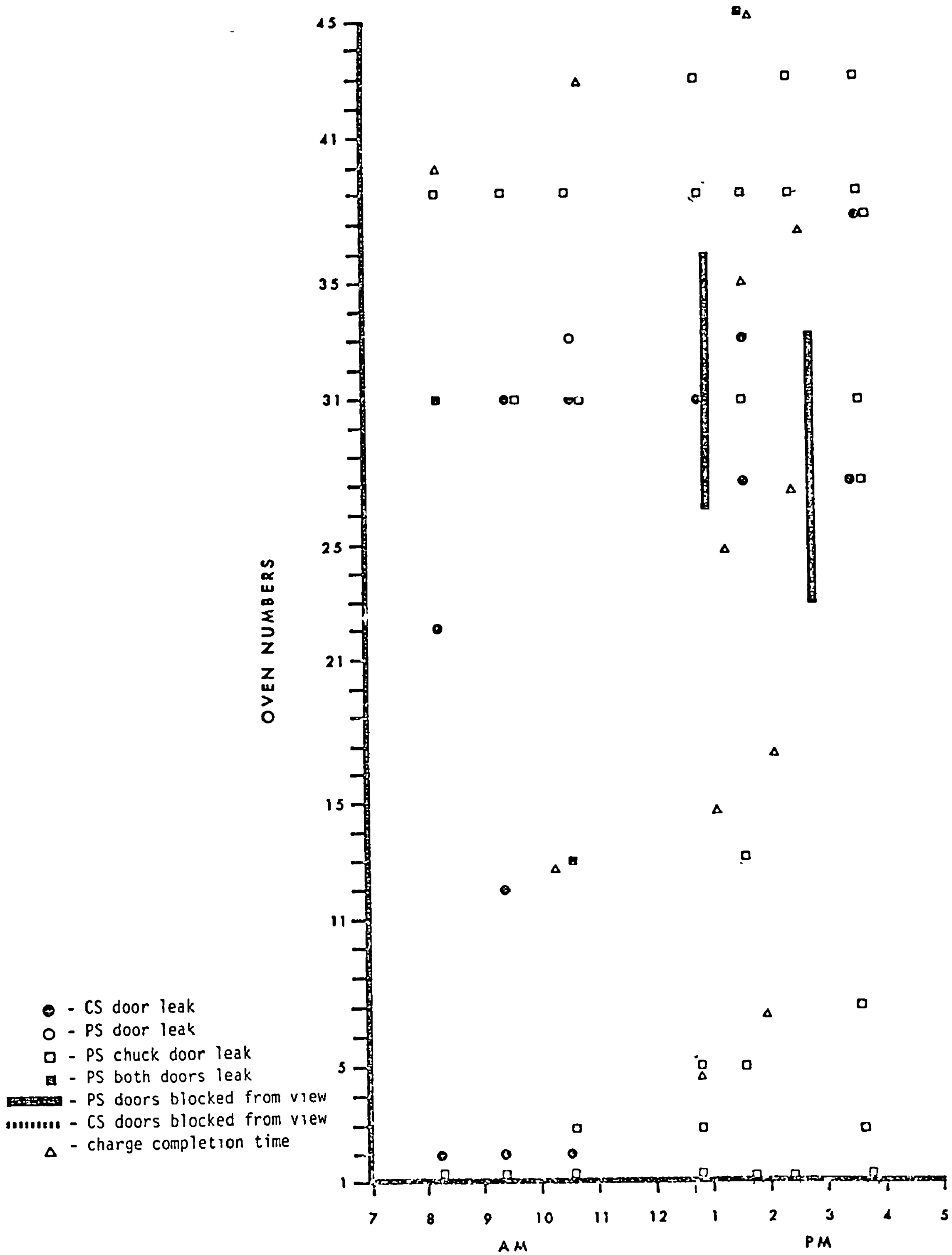


Figure 81. Door Leak Data
Battery 5
USSC Fairfield Works November 30, 1976

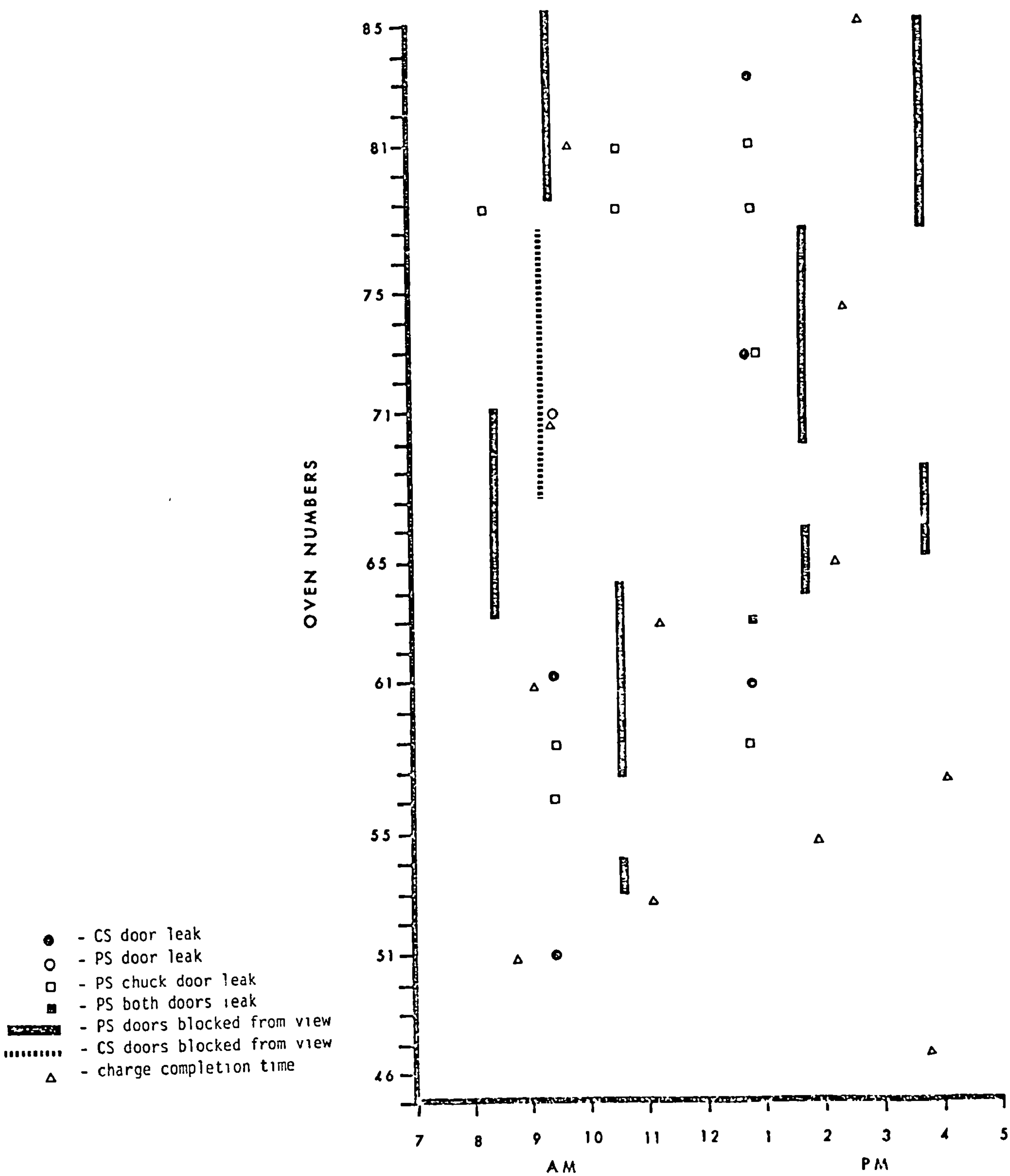


Figure 82. Door Leak Data

Battery 5

USSC Fairfield Works November 30, 1976

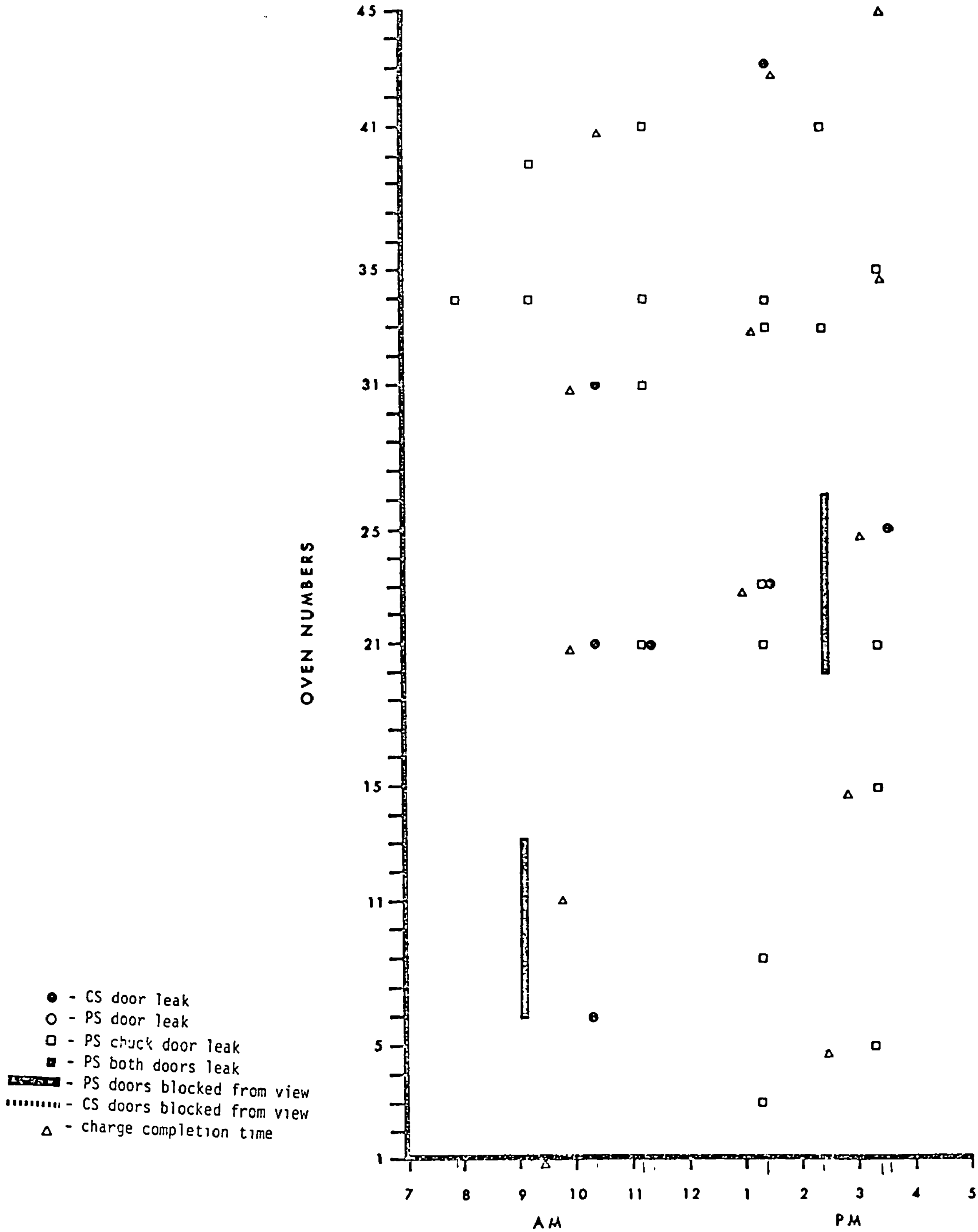


Figure 83. Door Leak Data

Battery 6

USSC Fairfield Works November 30, 1976

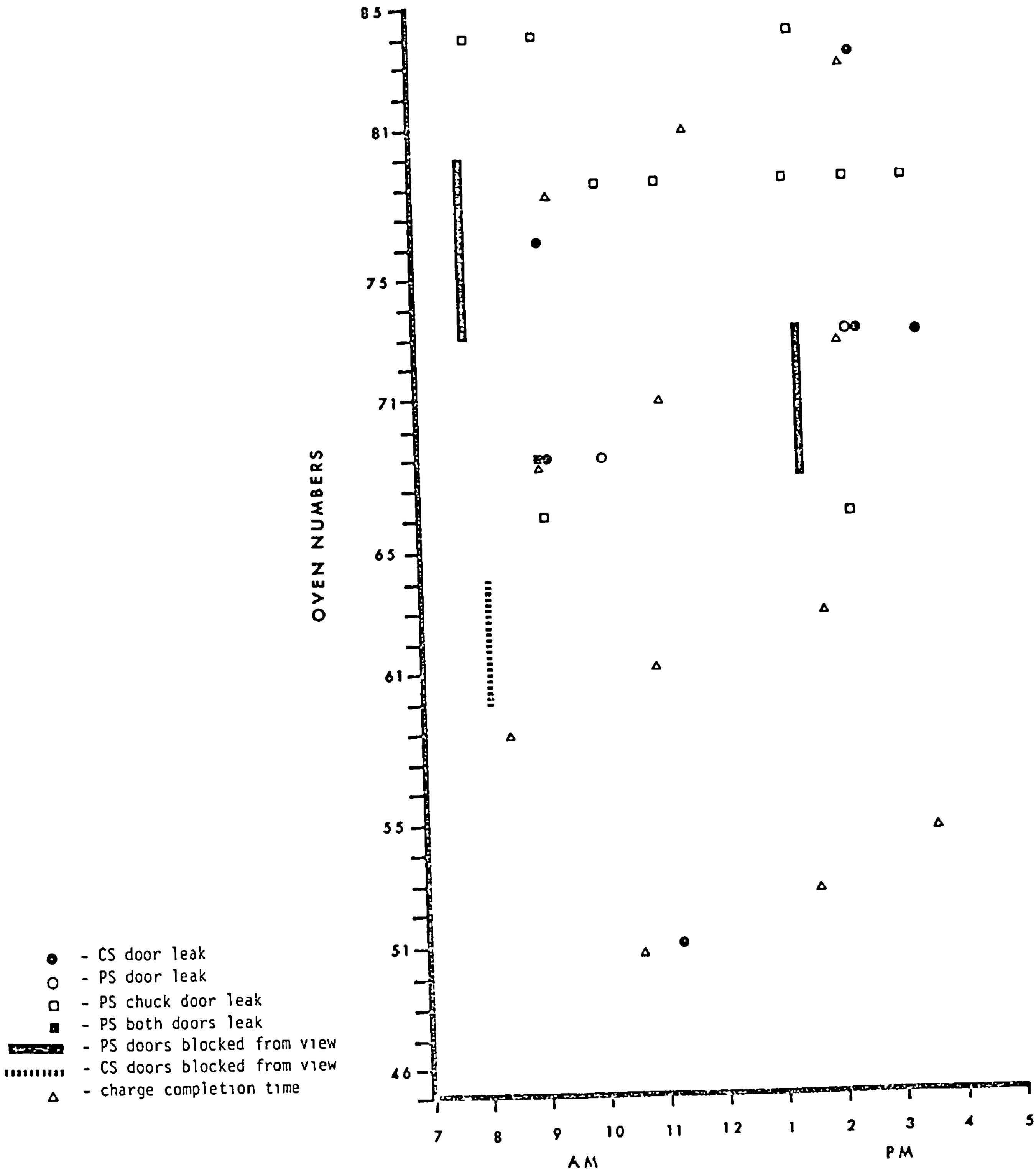


Figure 84. Door Leak Data

Battery 6

USSC Fairfield Works November 30, 1976

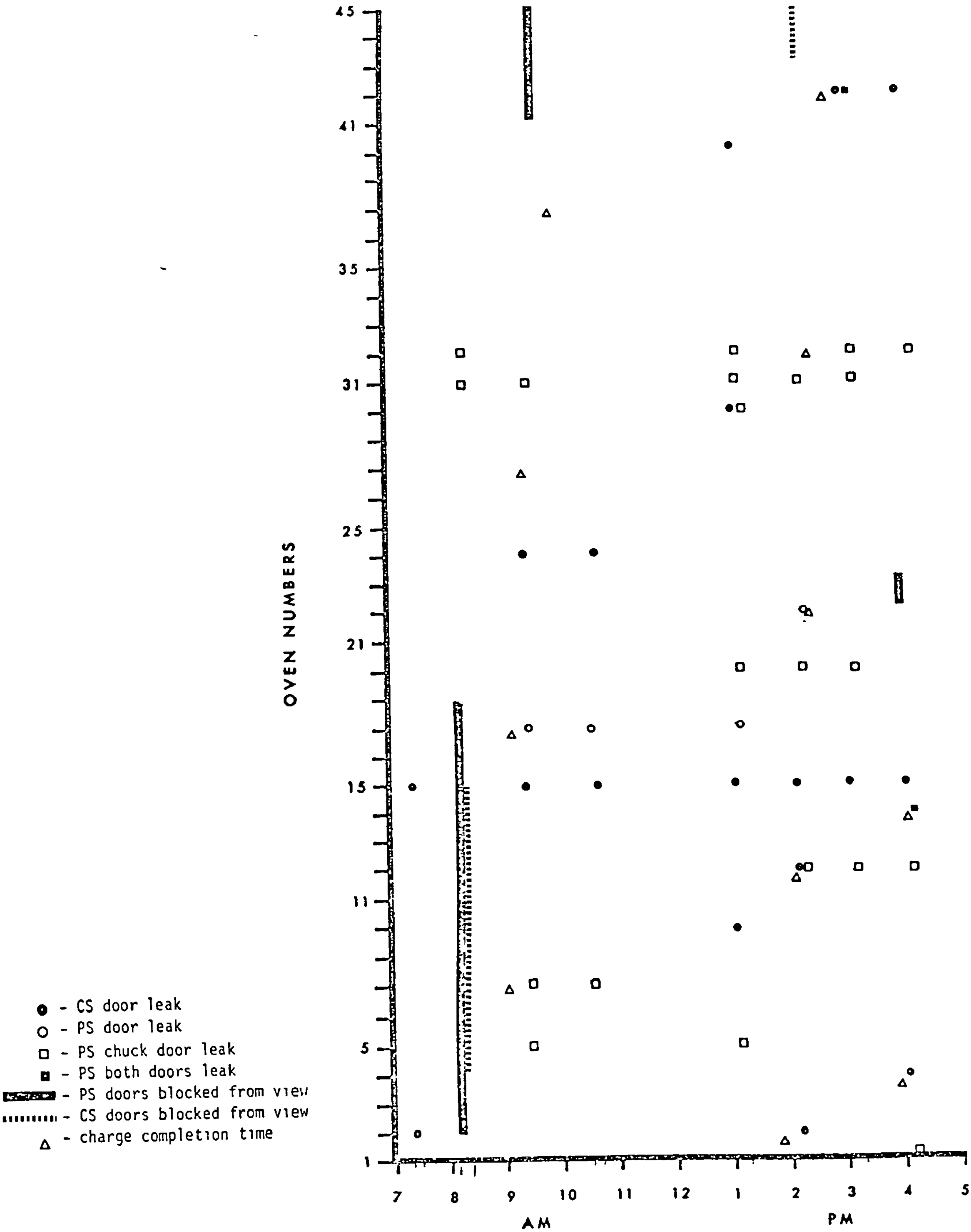


Figure 85. Door Leak Data

Battery 5

USSC Fairfield Works December 1, 1976

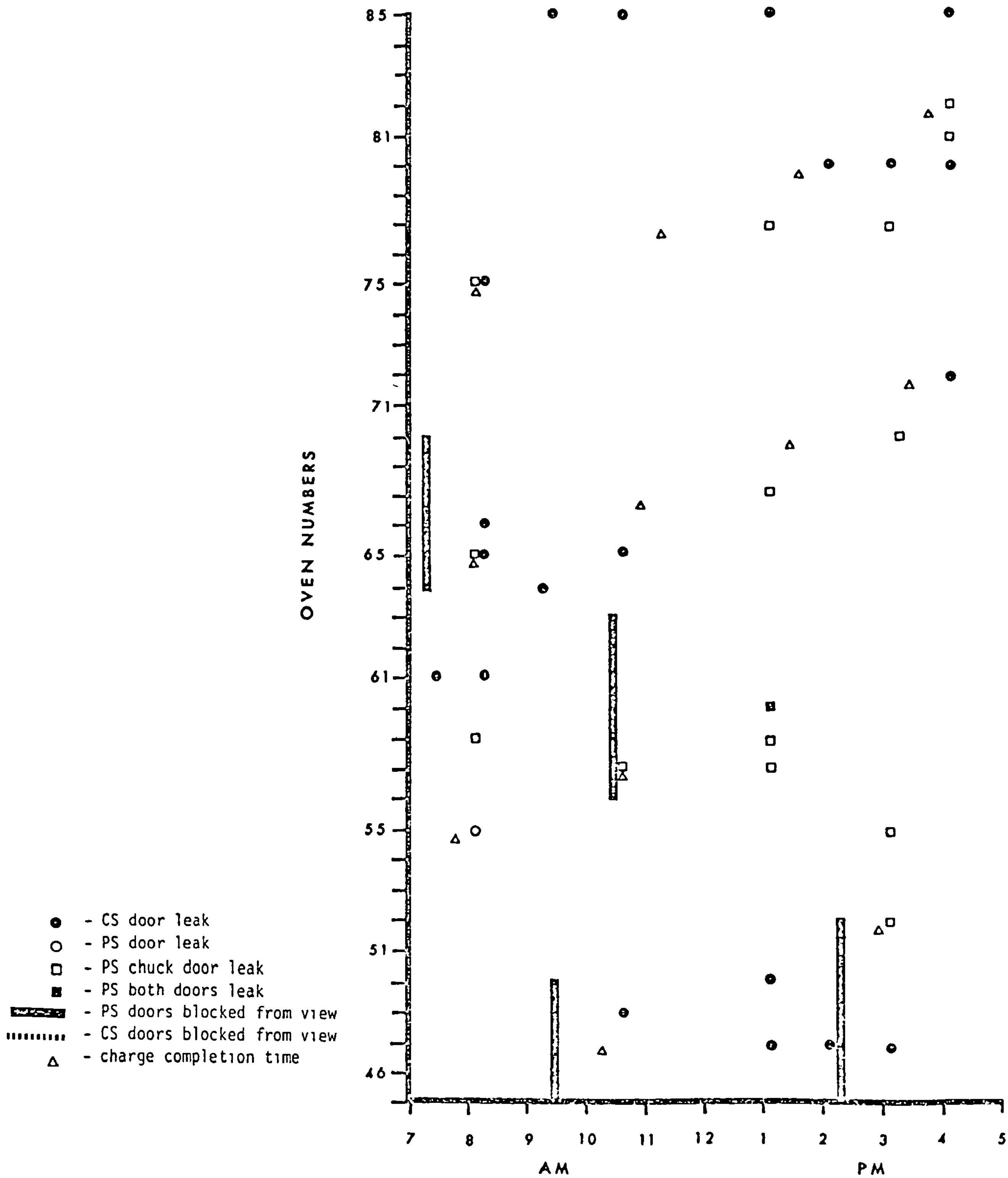


Figure 86. Door Leak Data

Battery 5

December 1, 1976 USSC Fairfield Works

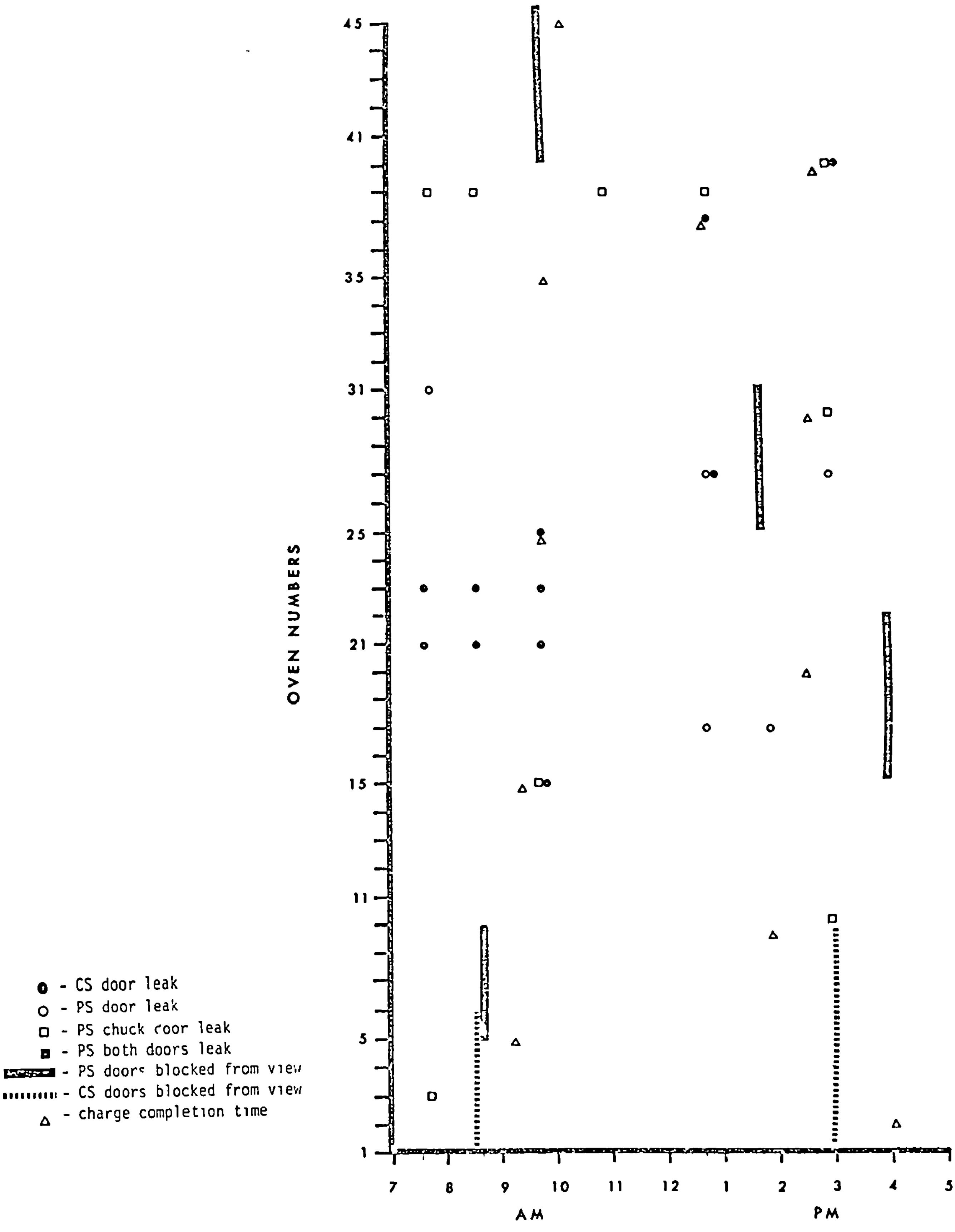


Figure 87. Door Leak Data

Battery 6

December 1, 1976 USSC Fairfield Works

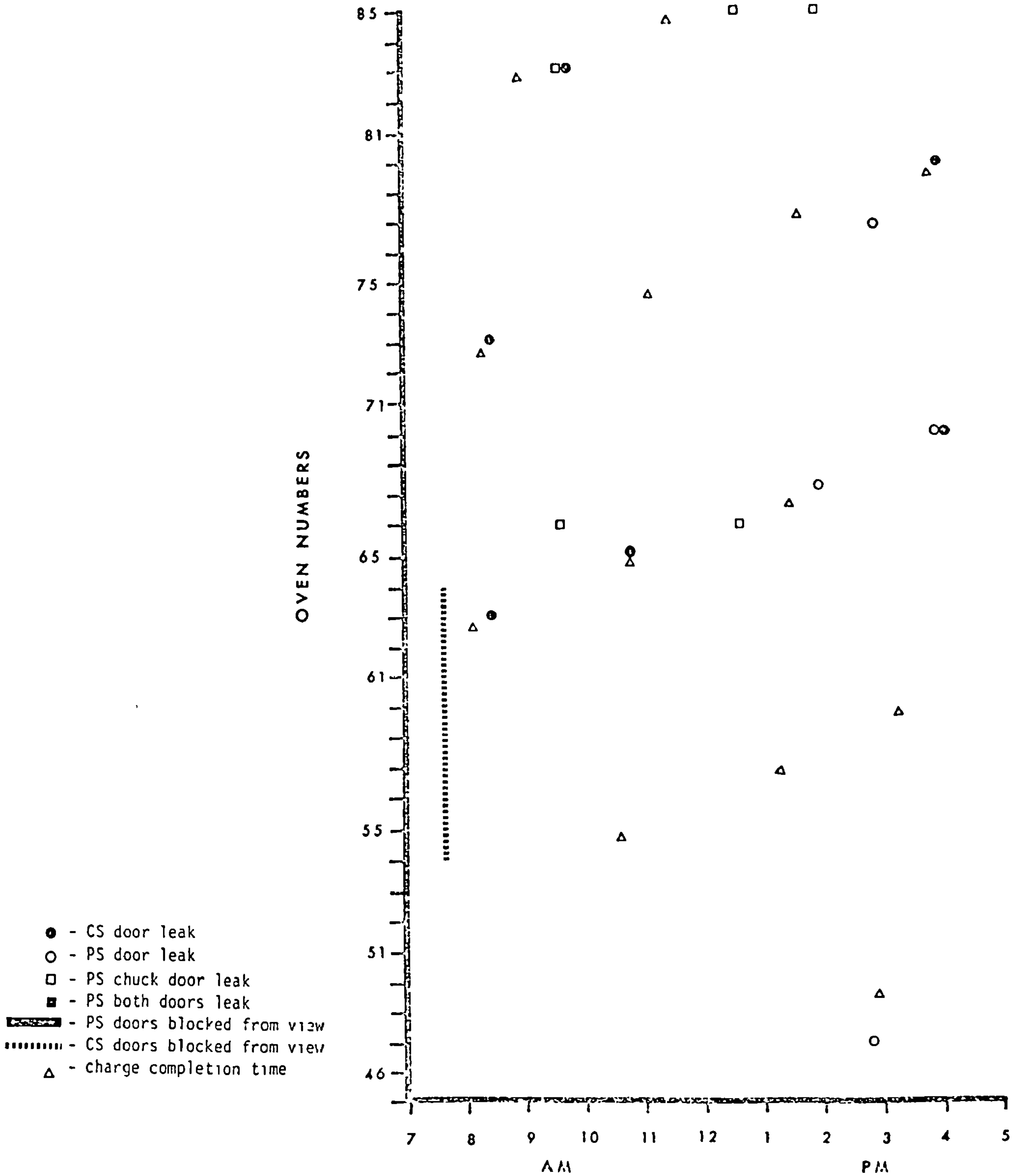


Figure 88. Door Leak Data
Battery 6
December 1, 1976 USSC Fairfield Works

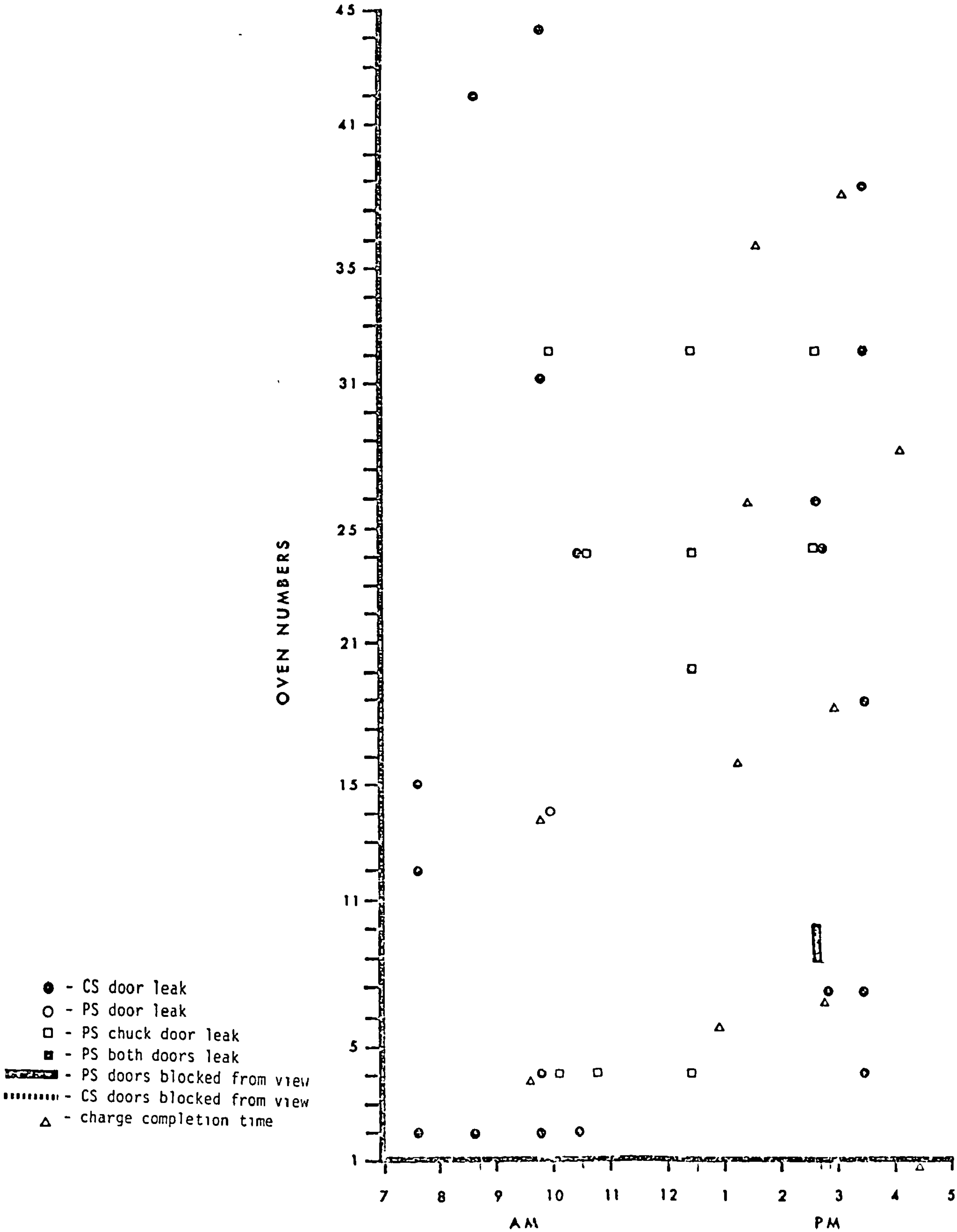


Figure 89. Door Leak Data

Battery 5

December 2, 1976 USSC Fairfield Works

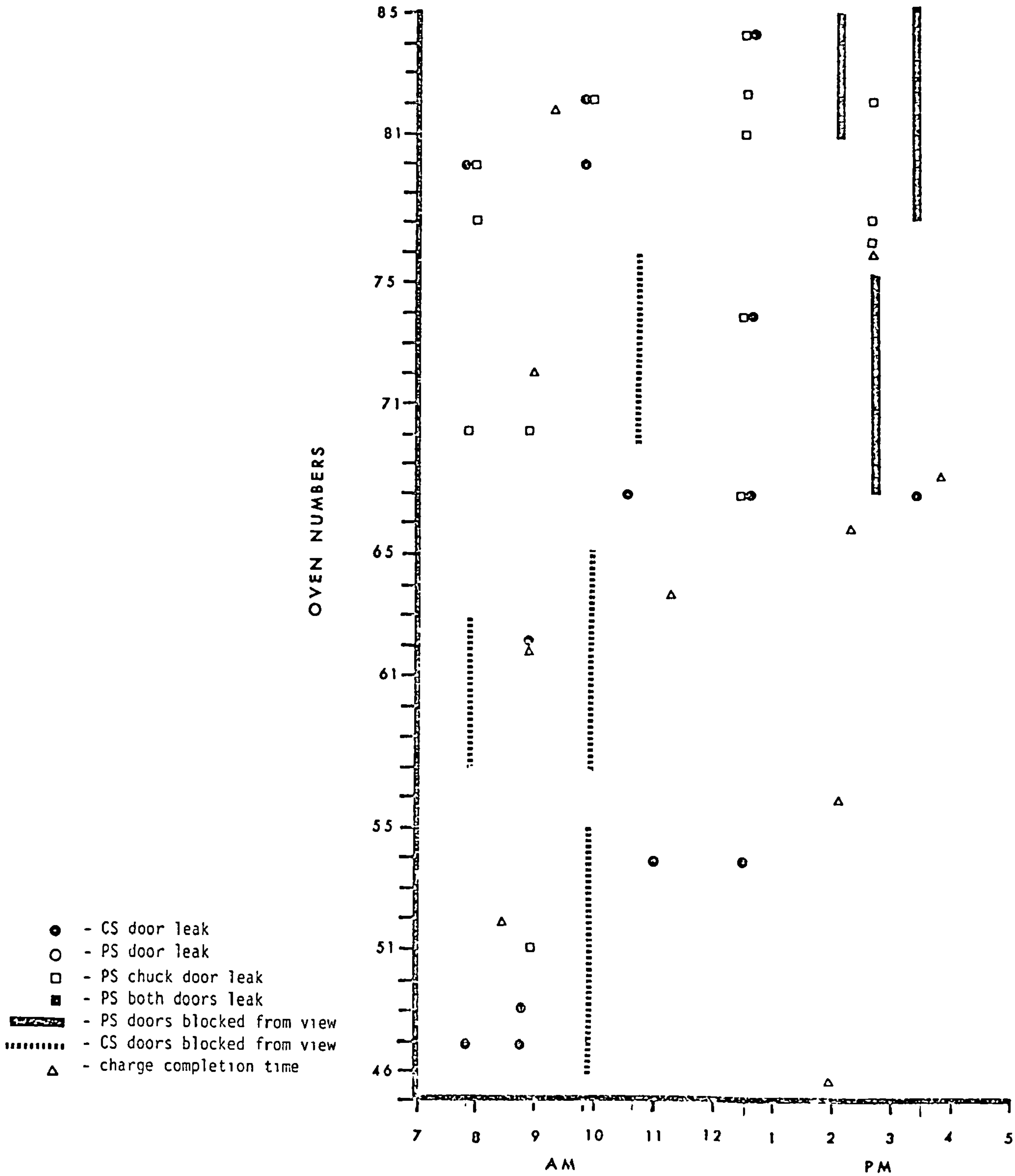


Figure 90. Door Leak Data

Battery 5

December 2, 1976 USSC Fairfield Works

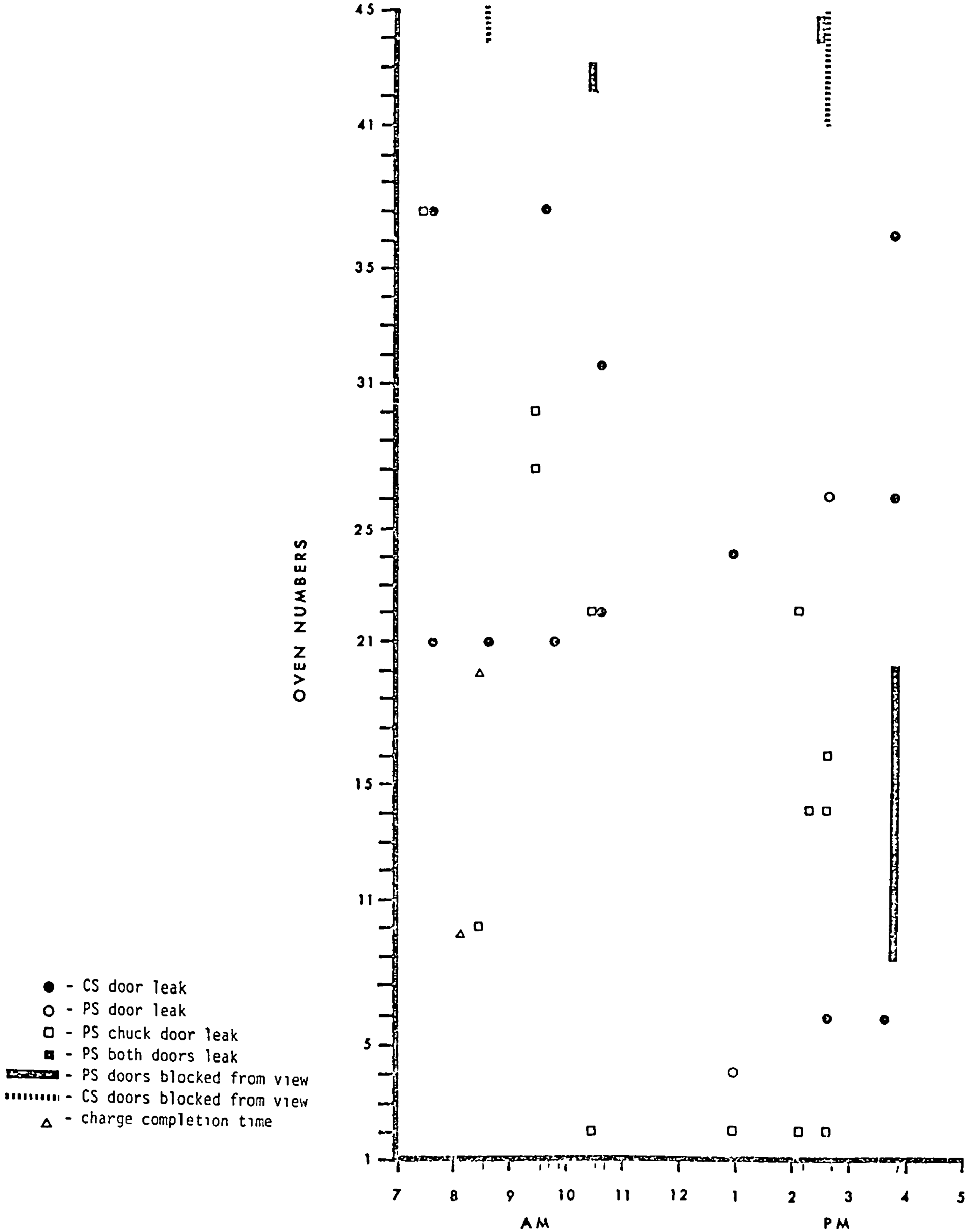


Figure 91. Door Leak Data

Battery 6

USSC Fairfield Works December 2, 1976

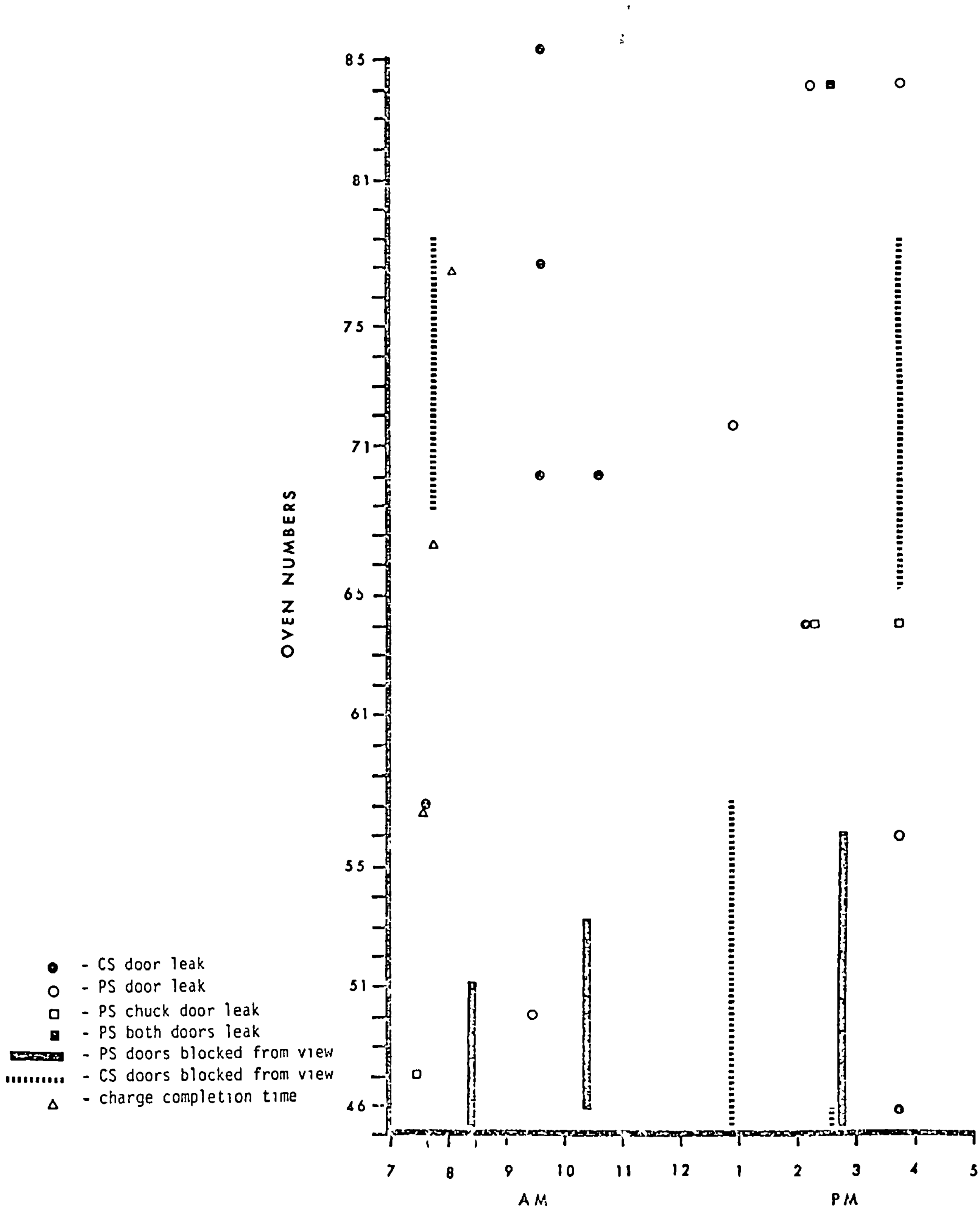


Figure 92. Door Leak Data
Battery 6
USSC Fairfield Works December 2, 1976

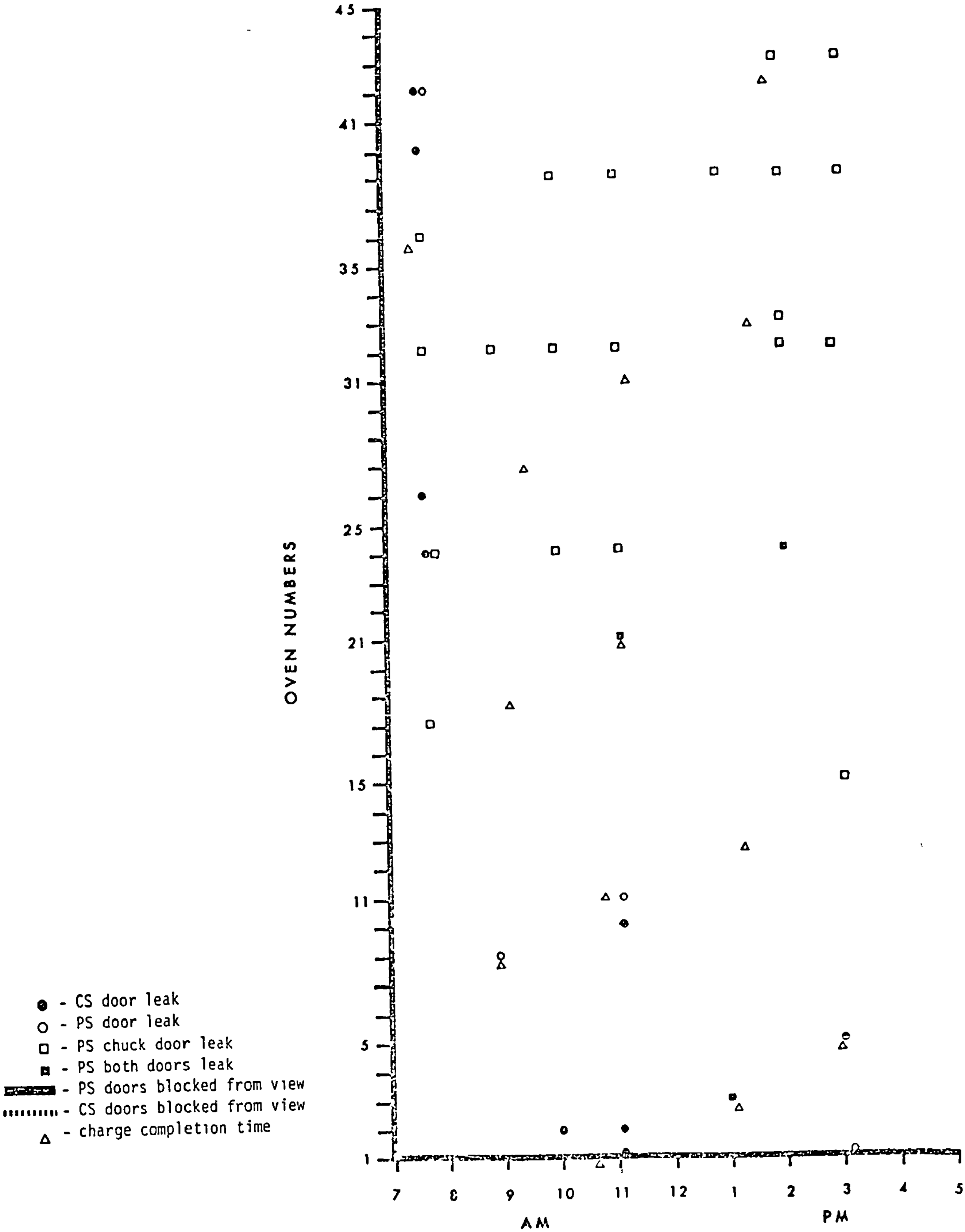


Figure 93. Door Leak Data

Battery 5

USSC Fairfield Works December 3, 1976

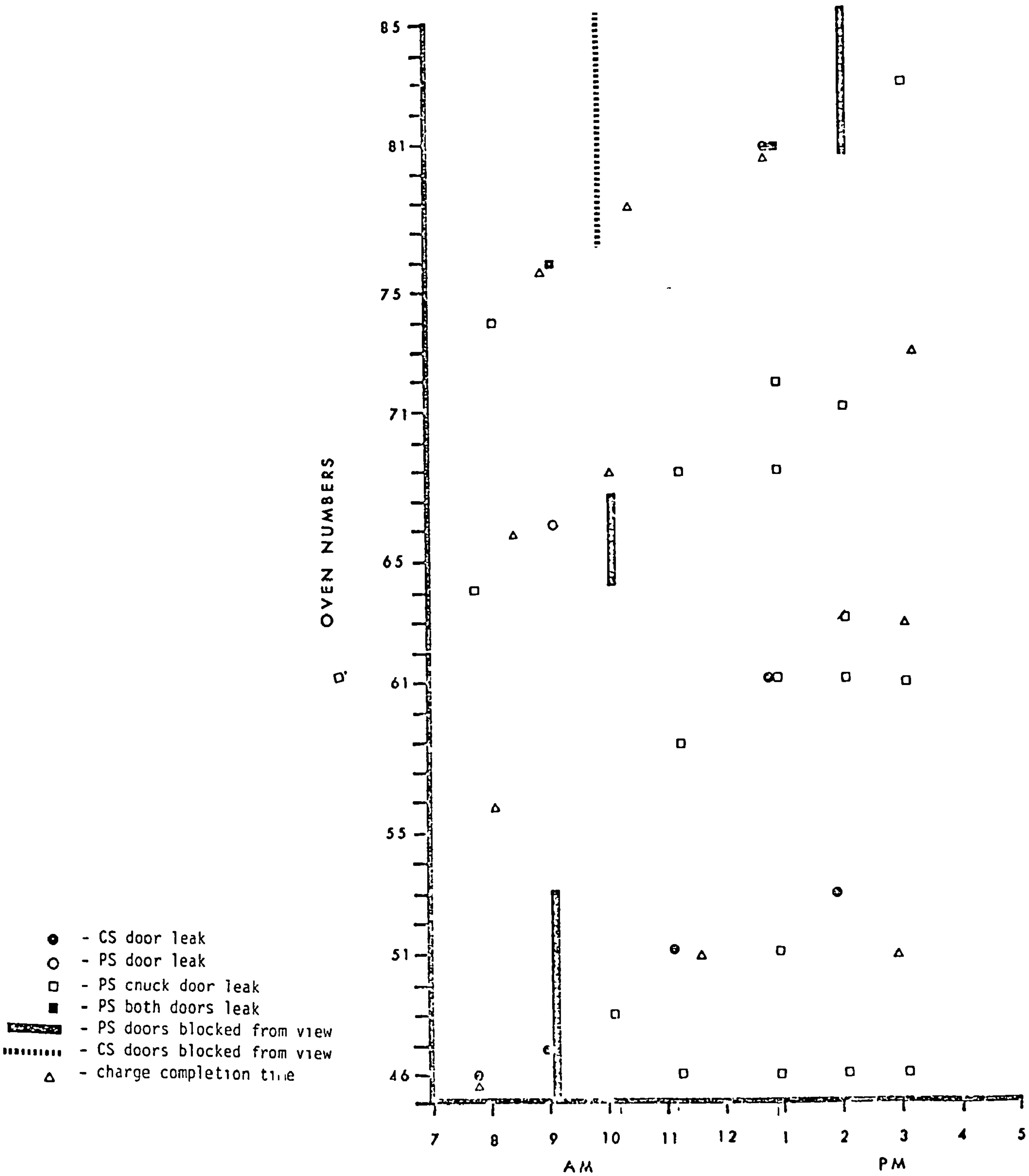


Figure 94. Door Leak Data

Battery 5

USSC Fairfield Works   December 3, 1976

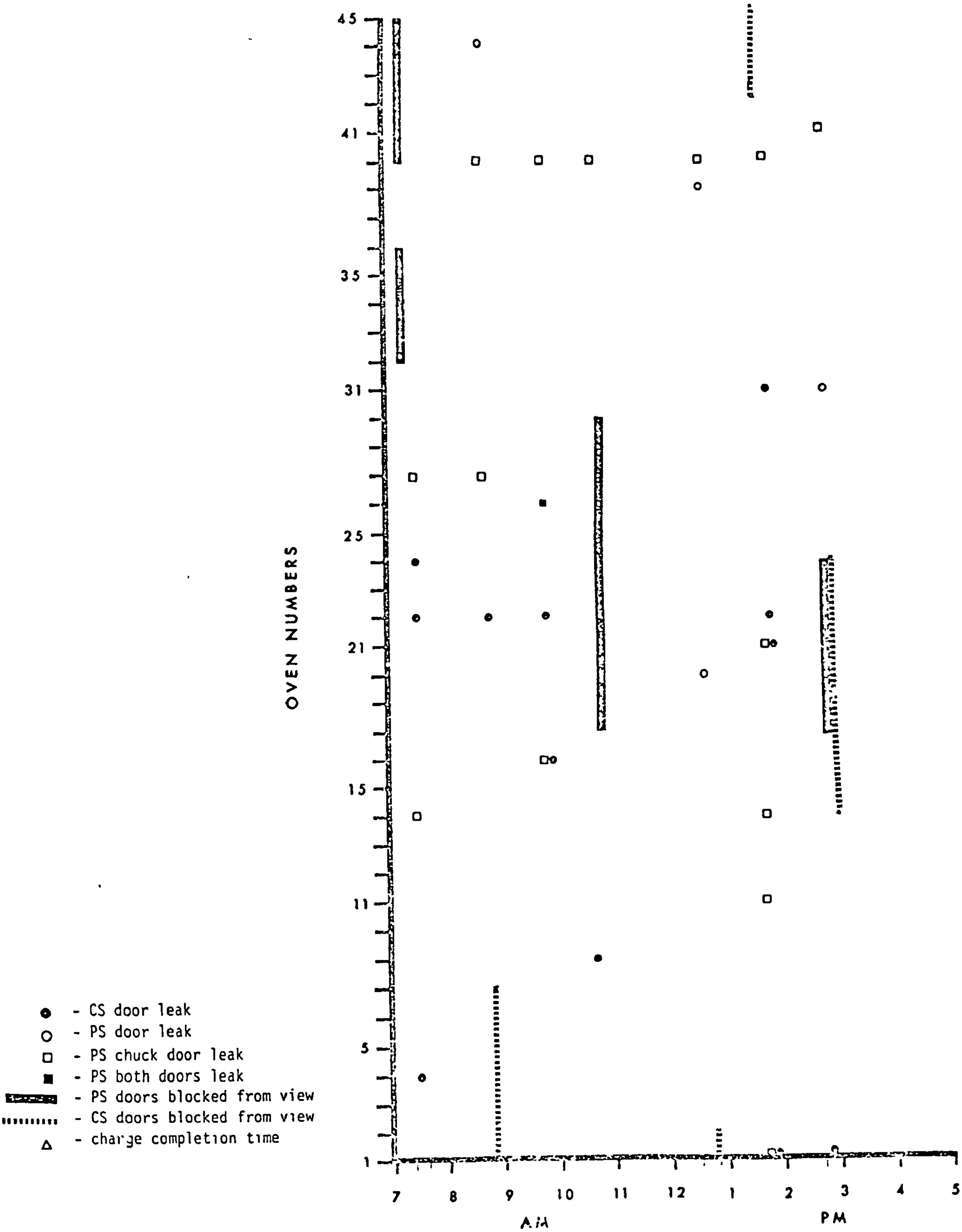


Figure 95. Door Leak Data

Battery 6

USSC Fairfield Works December 3, 1976

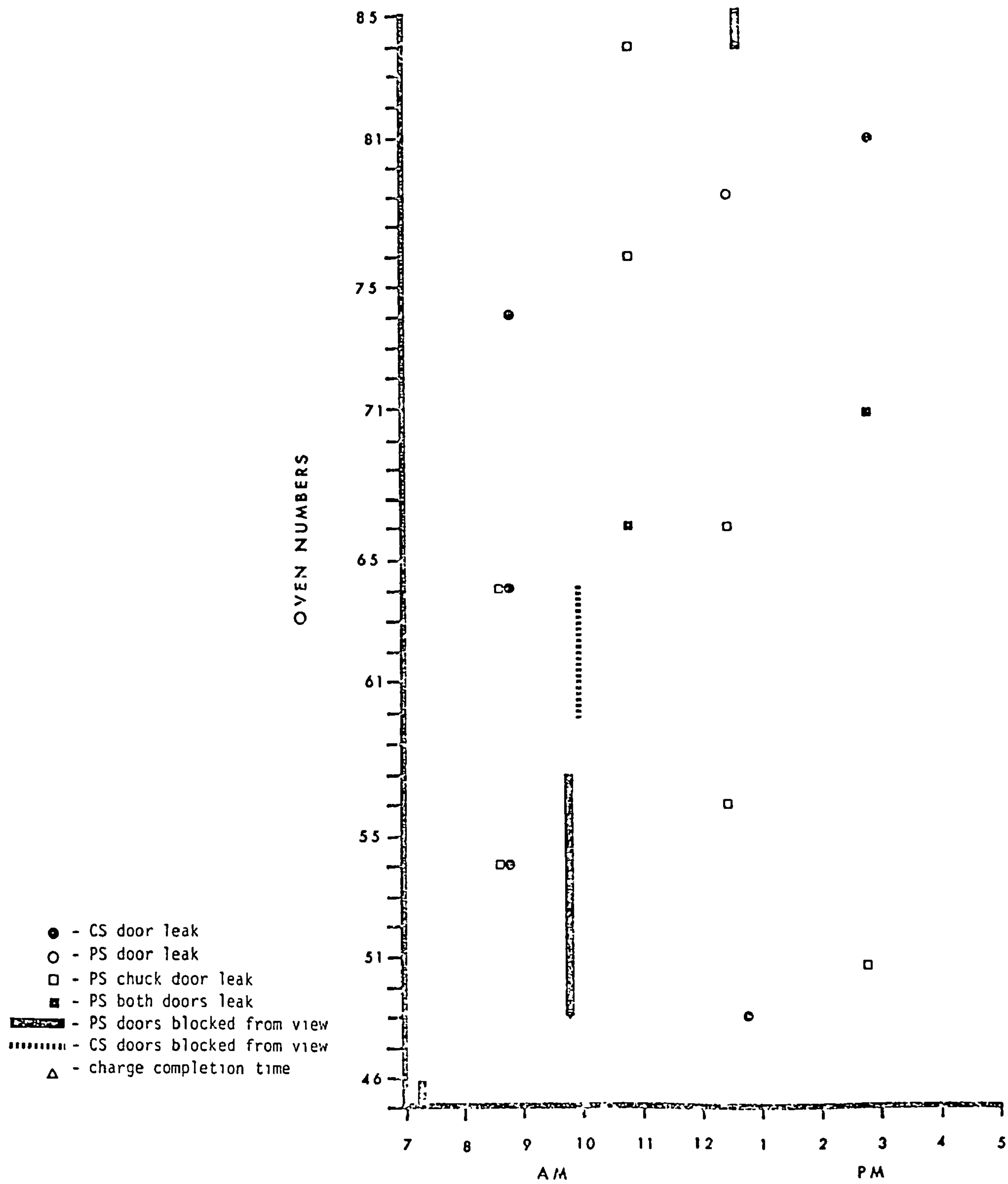


Figure 96. Door Leak Data

Battery 6

USSC Fairfield Works December 3, 1976

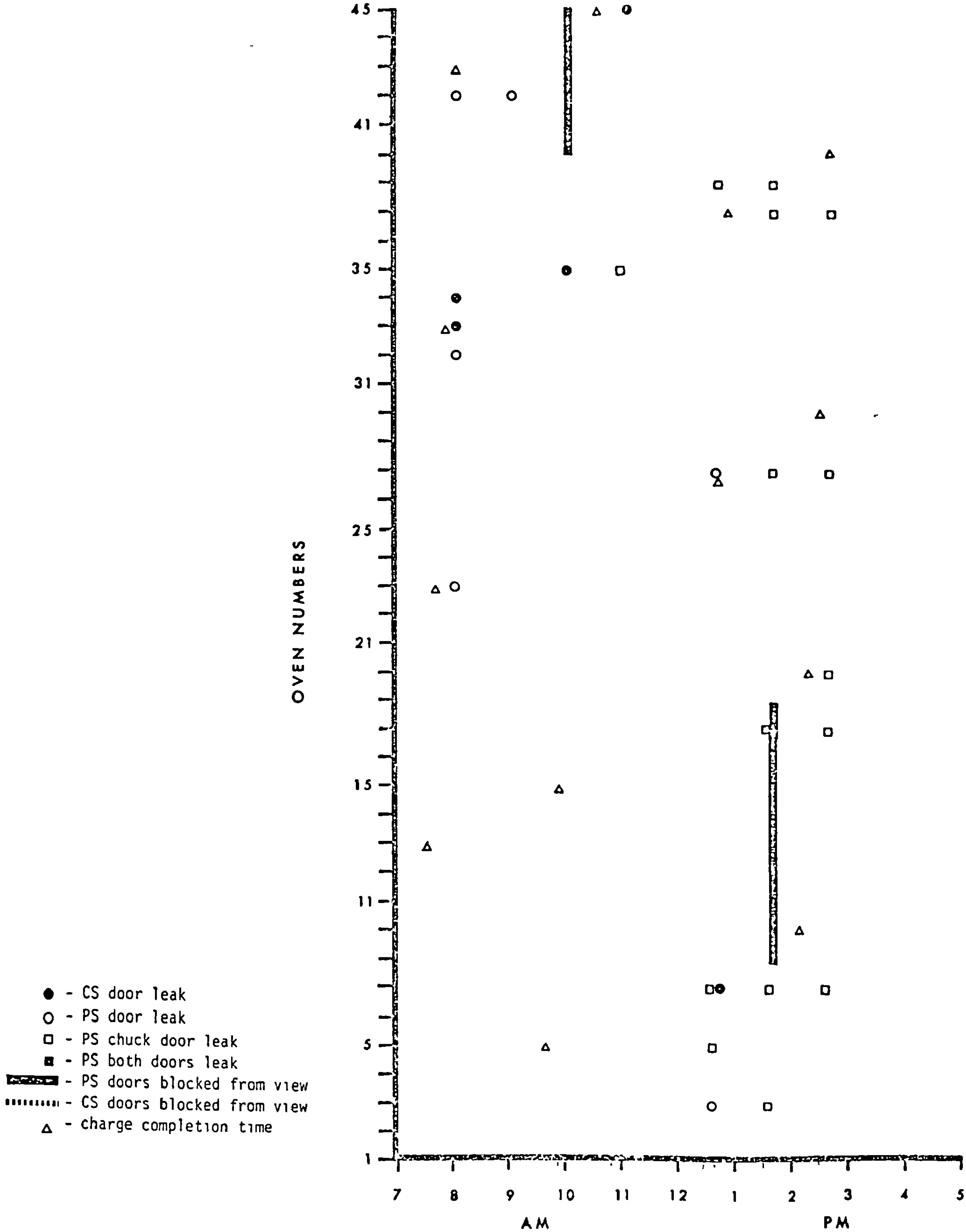


Figure 97. Door Leak Data

Battery 5

USSC Fairfield Works December 4, 1976

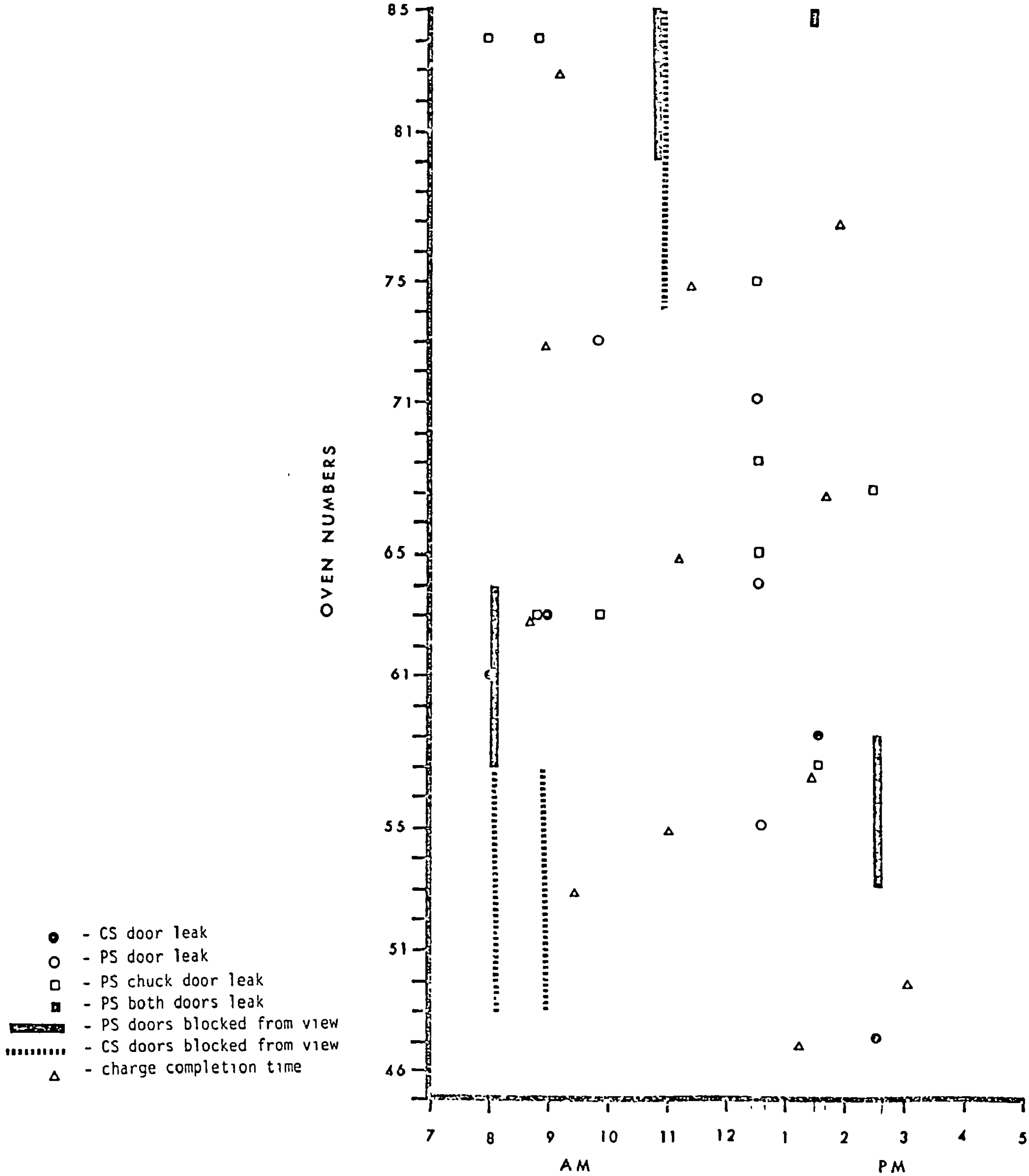


Figure 98. Door Leak Data

Battery 5

USSC Fairfield Works December 4, 1976

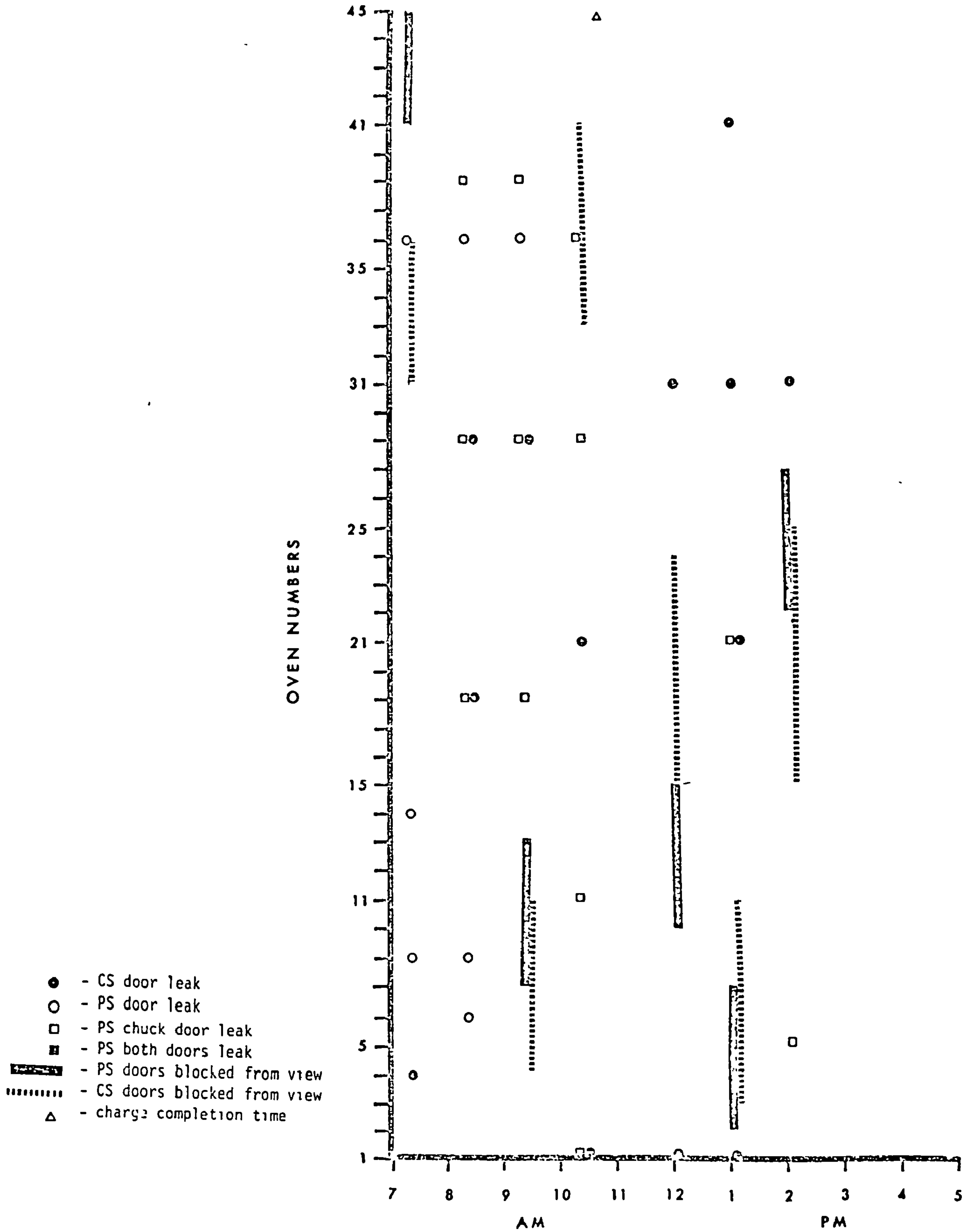


Figure 99. Door Leak Data

Battery 9

USSC Fairfield Works December 4, 1976

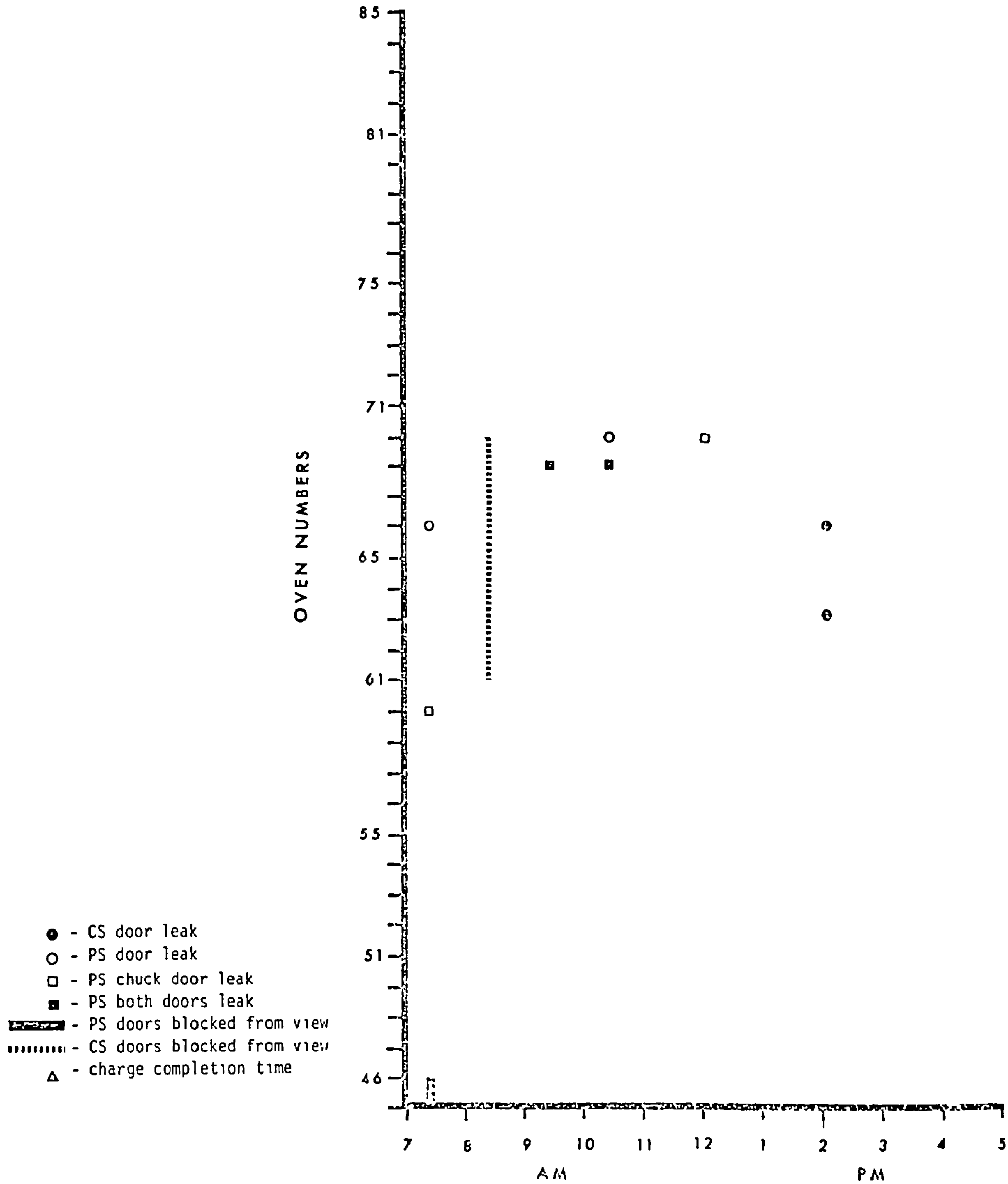


Figure 100. Door Leak Data

Battery 9

USSC Fairfield Works December 4, 1976

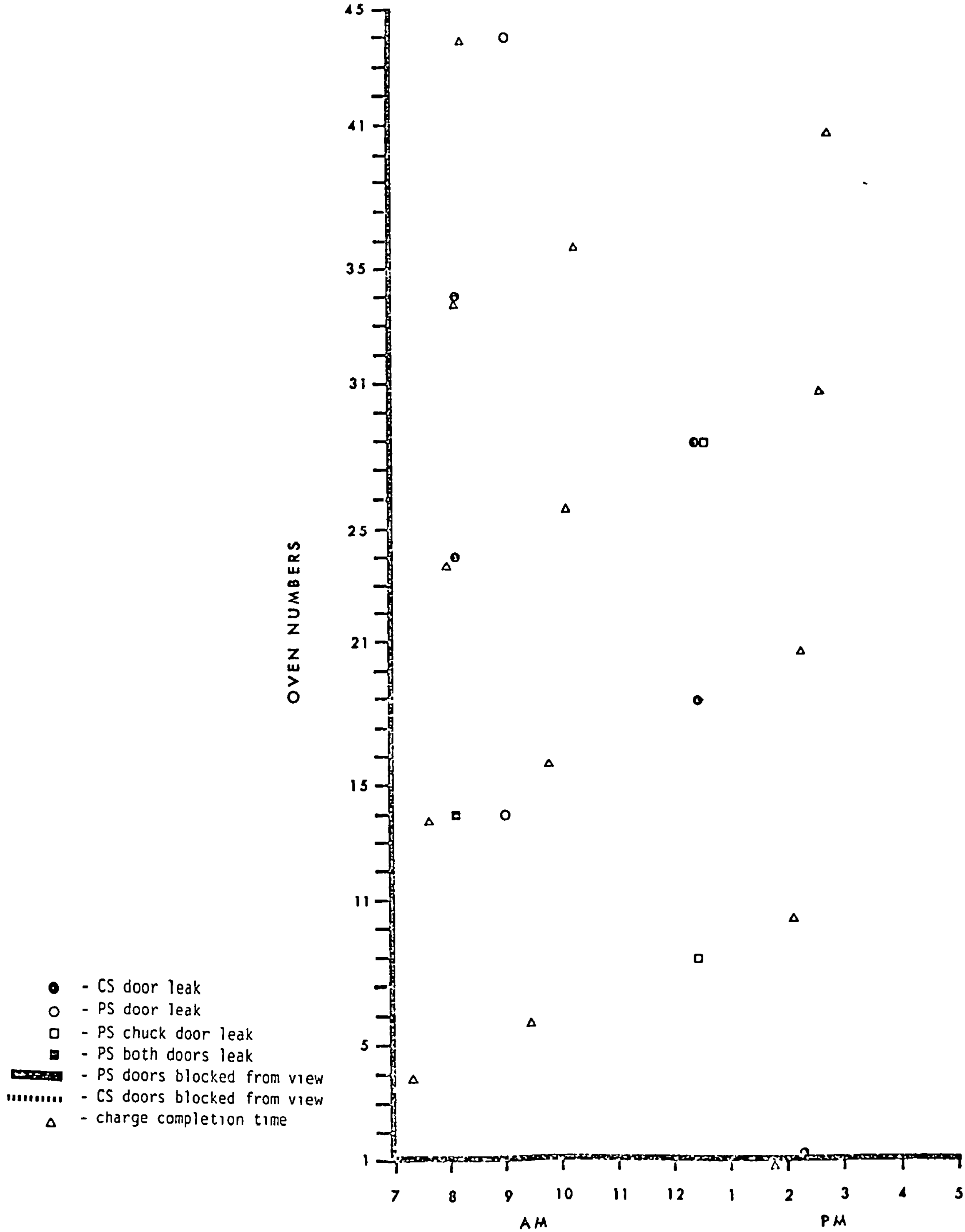


Figure 101. Door Leak Data

Battery 6

USSC Fairfield Works December 6, 1976

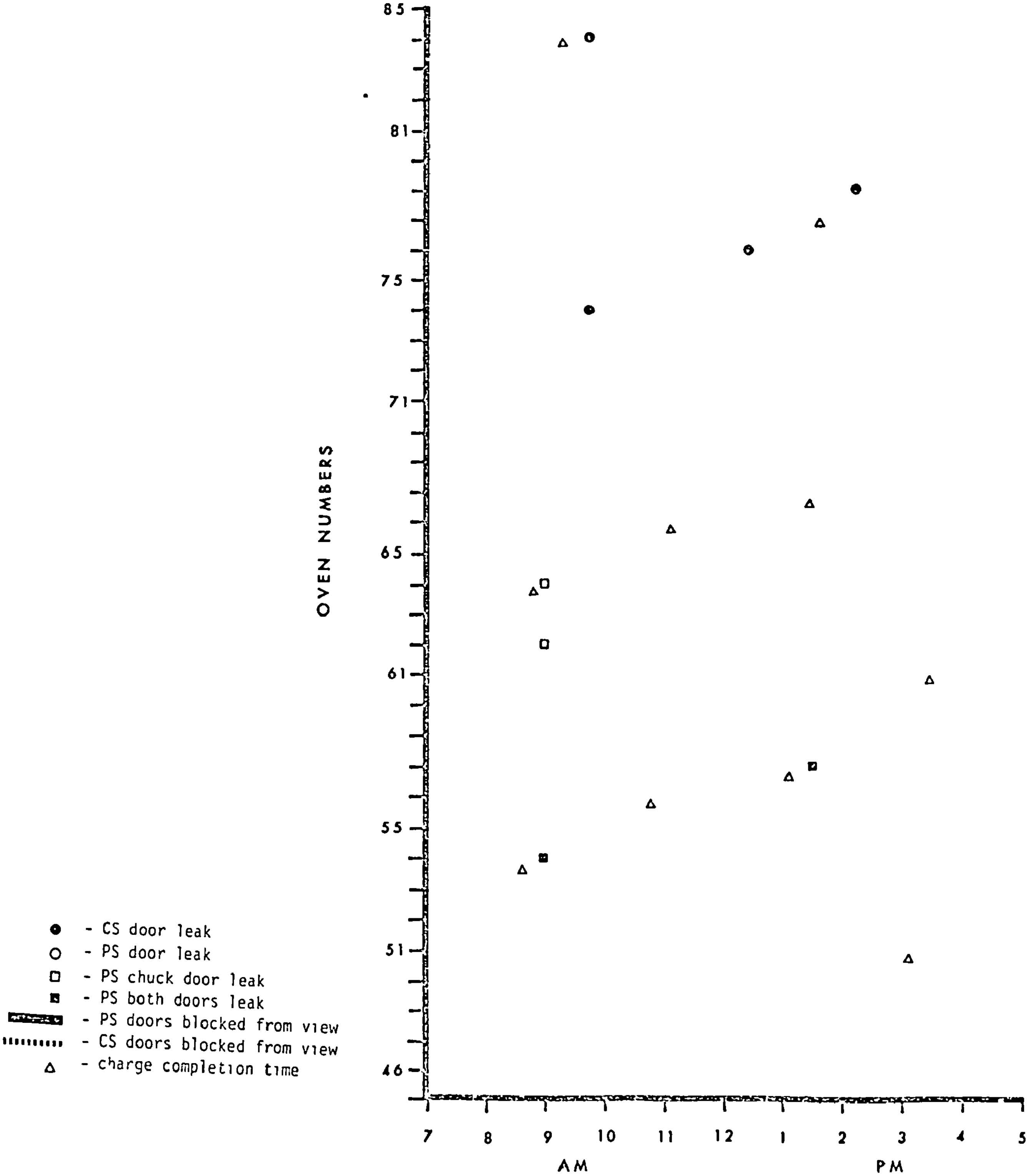


Figure 102. Door Leak Data

Battery 6

USSC Fairfield Works December 6, 1976

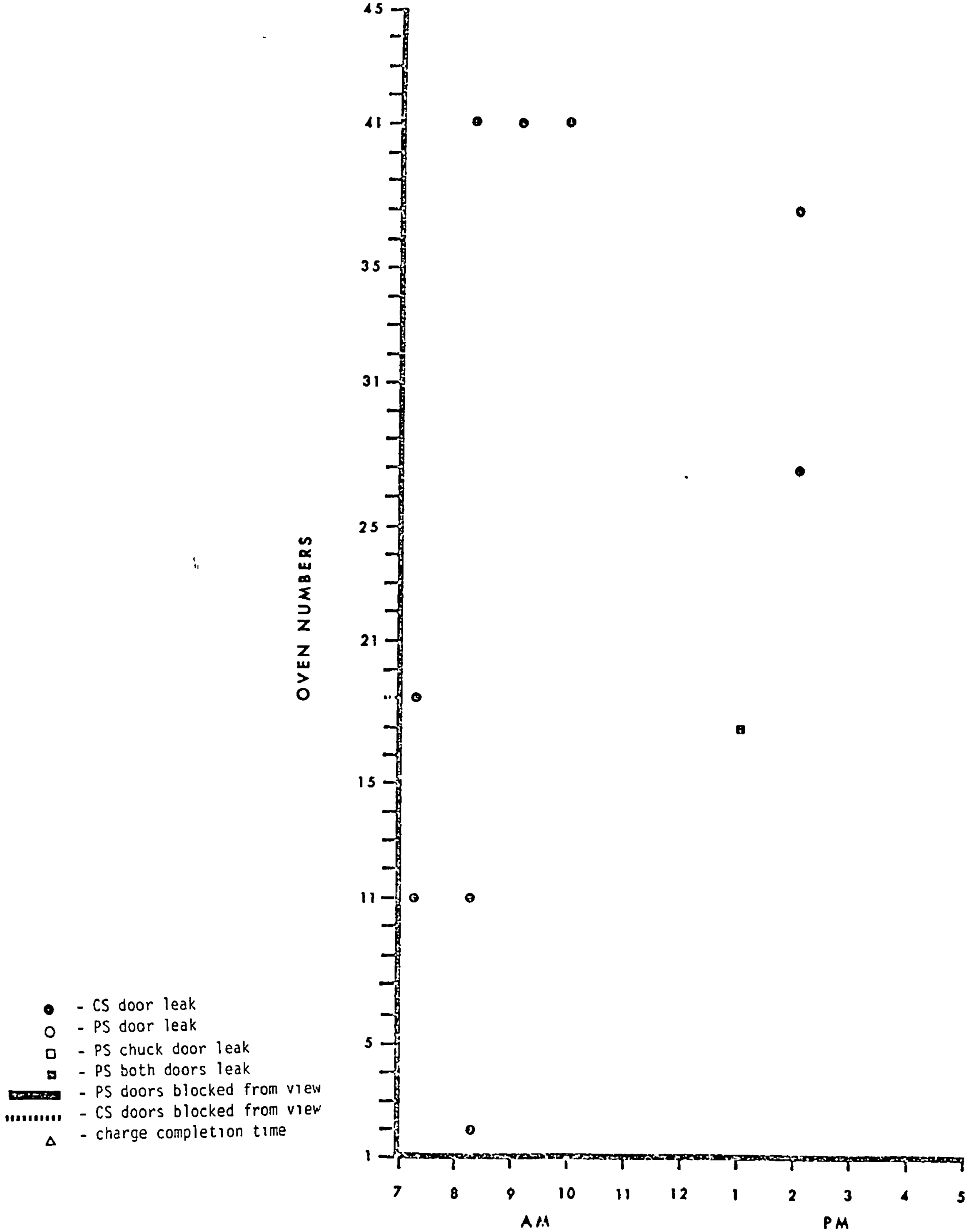


Figure 103. Door Leak Data

Battery 9

USSC Fairfield Works December 6, 1976

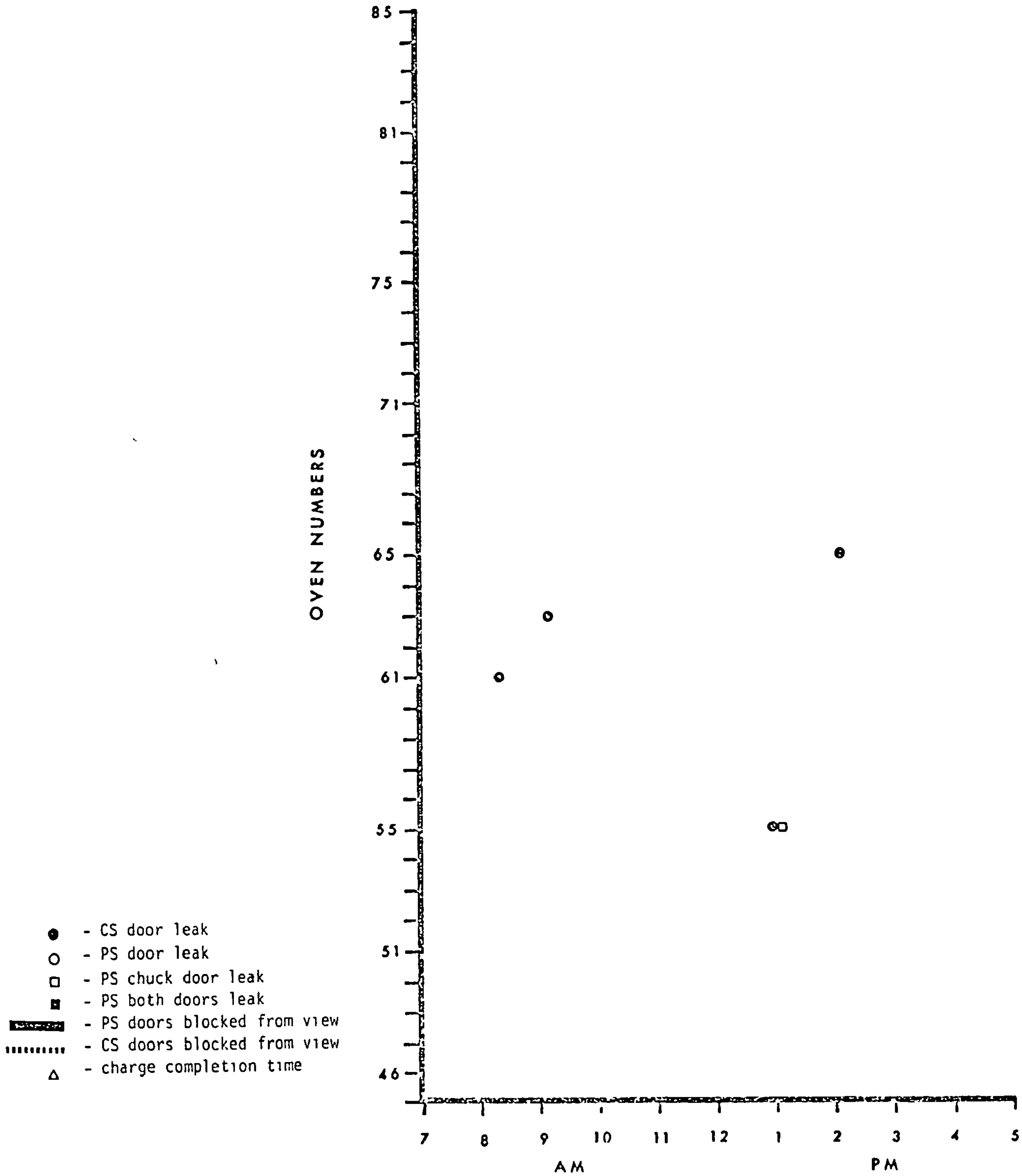


Figure 104. Door Leak Data

Battery 9

USSC Fairfield Works December 6, 1976

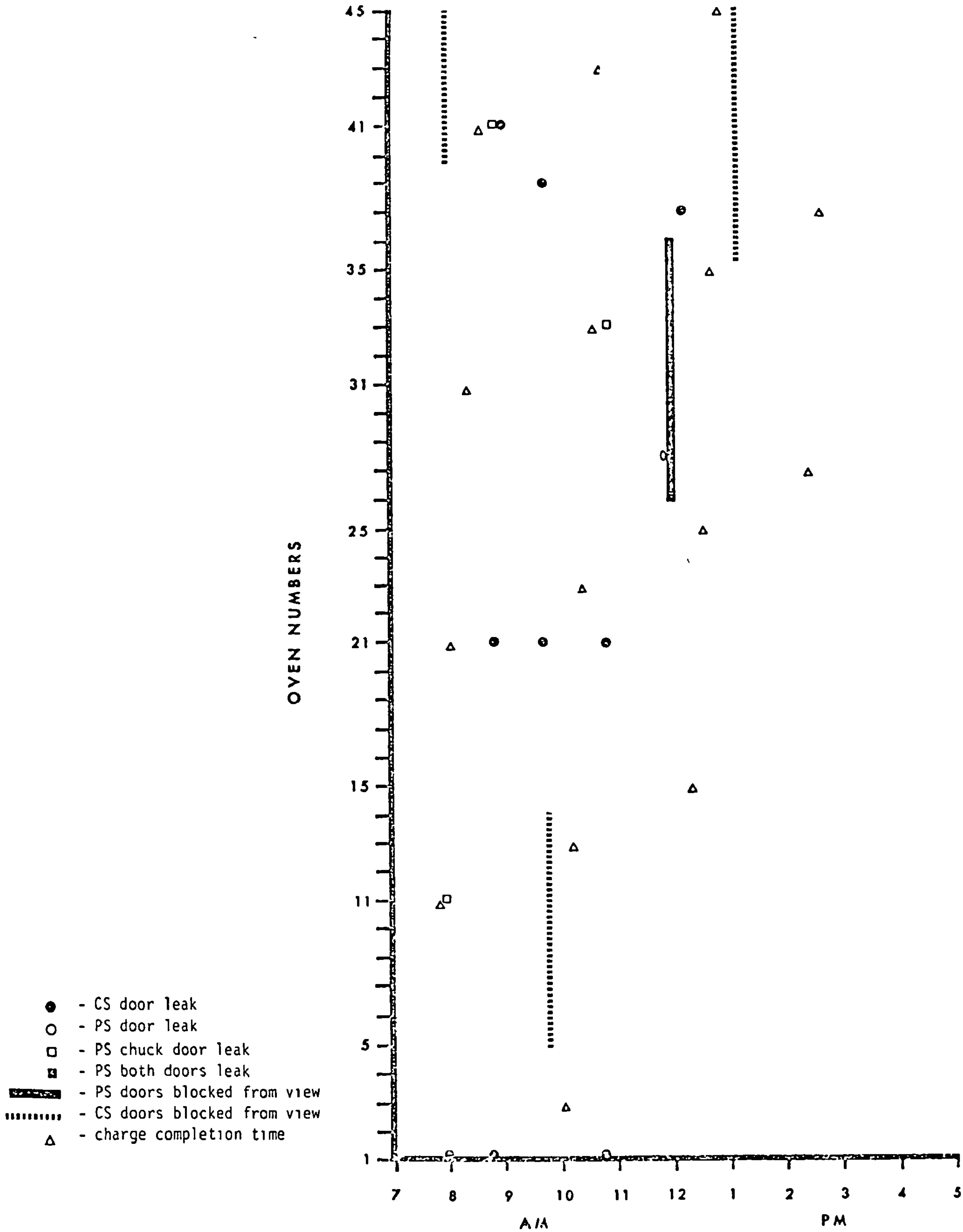


Figure 105. Door Leak Data
Battery 6
USSC Fairfield Works December 7, 1976

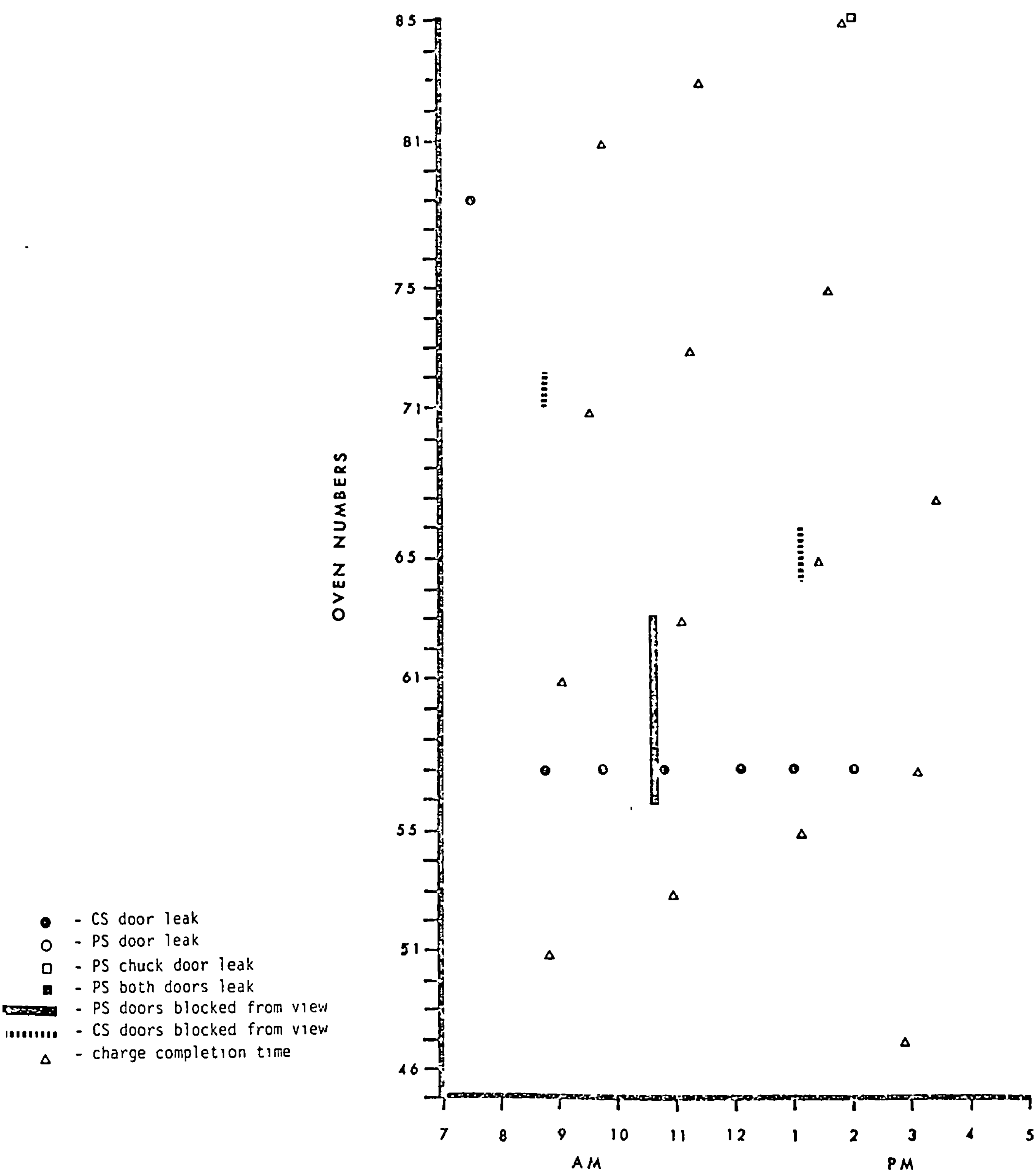


Figure 106. Door Leak Data

Battery 6

USSC Fairfield Works December 7, 1976

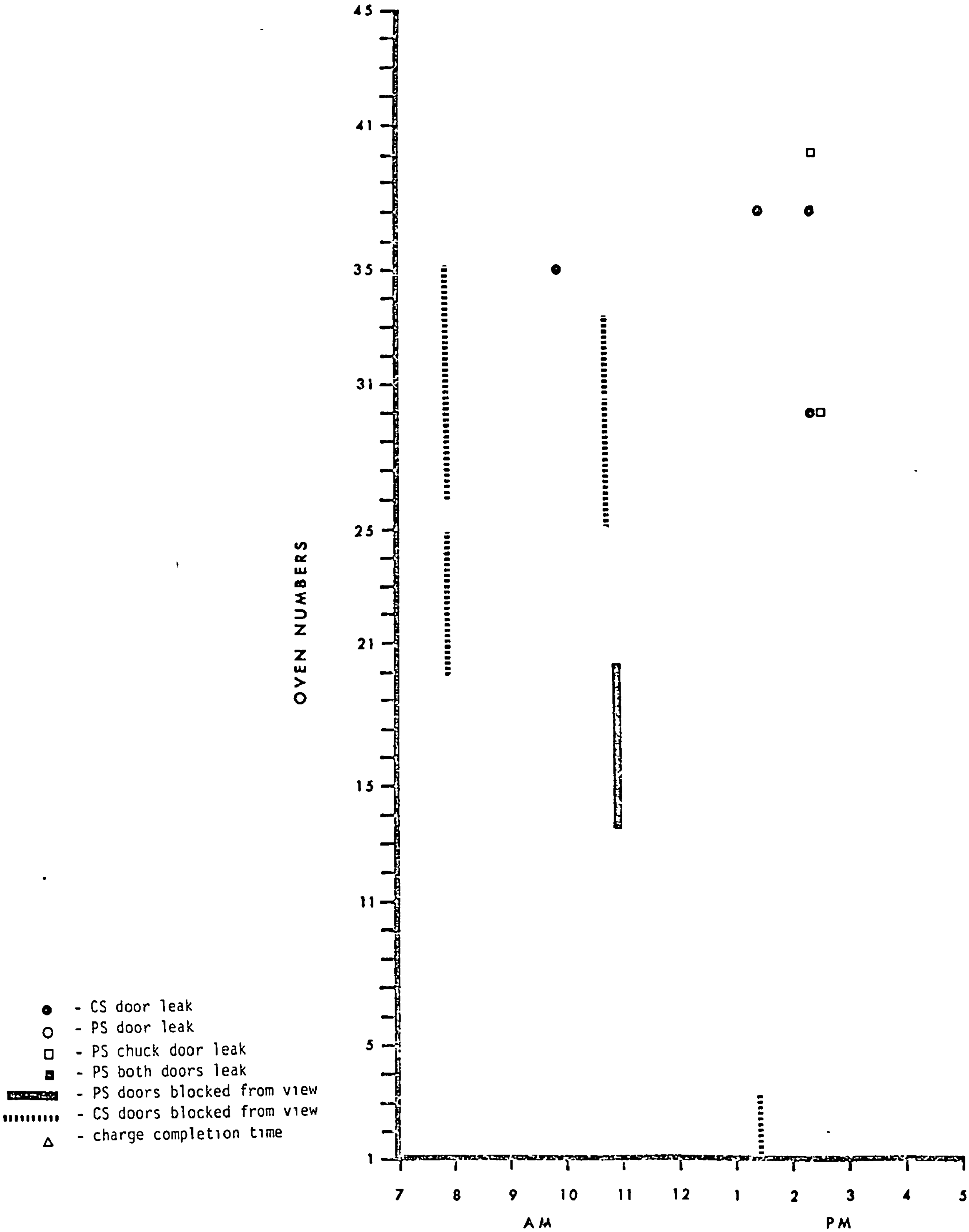


Figure 107. Door Leak Data

Battery 9

USSC Fairfield Works December 7, 1976

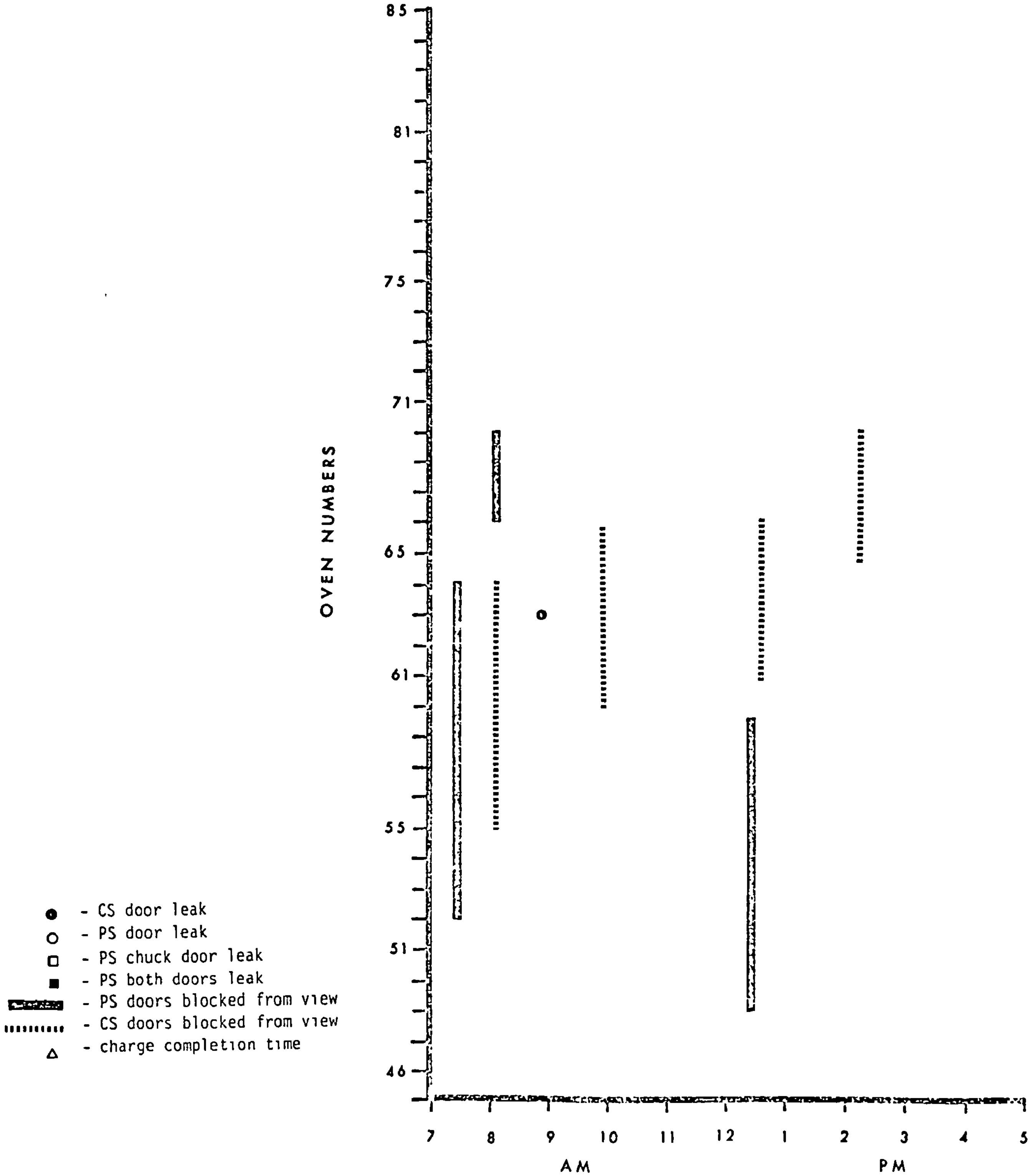


Figure 108. Door Leak Data

Battery 9

USSC Fairfield Works December 7, 1976

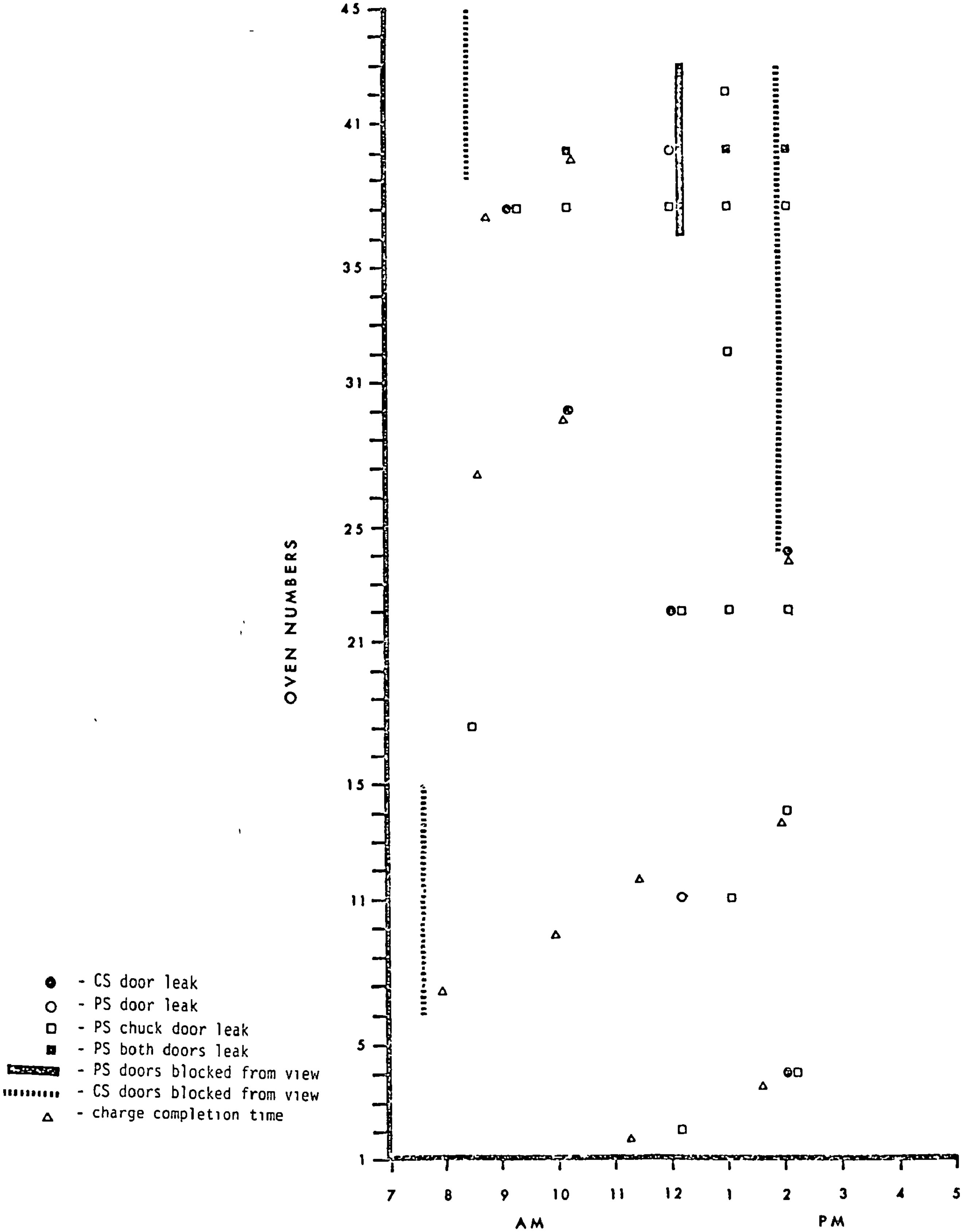


Figure 109. Door Leak Data

Battery 6

USSC Fairfield Works December 8, 1976

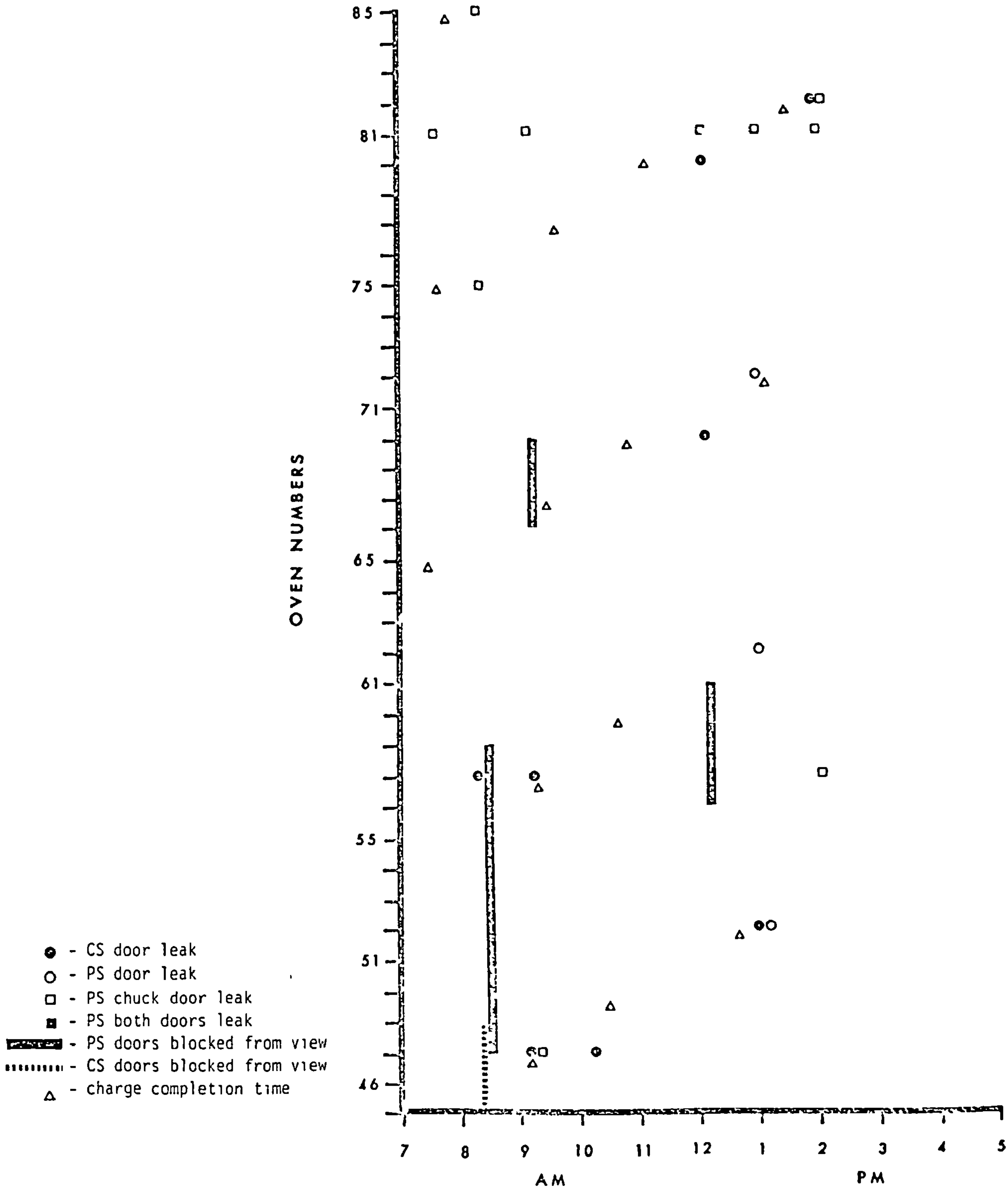


Figure 110. Door Leak Data

Battery 6

USSC Fairfield Works December 8, 1976

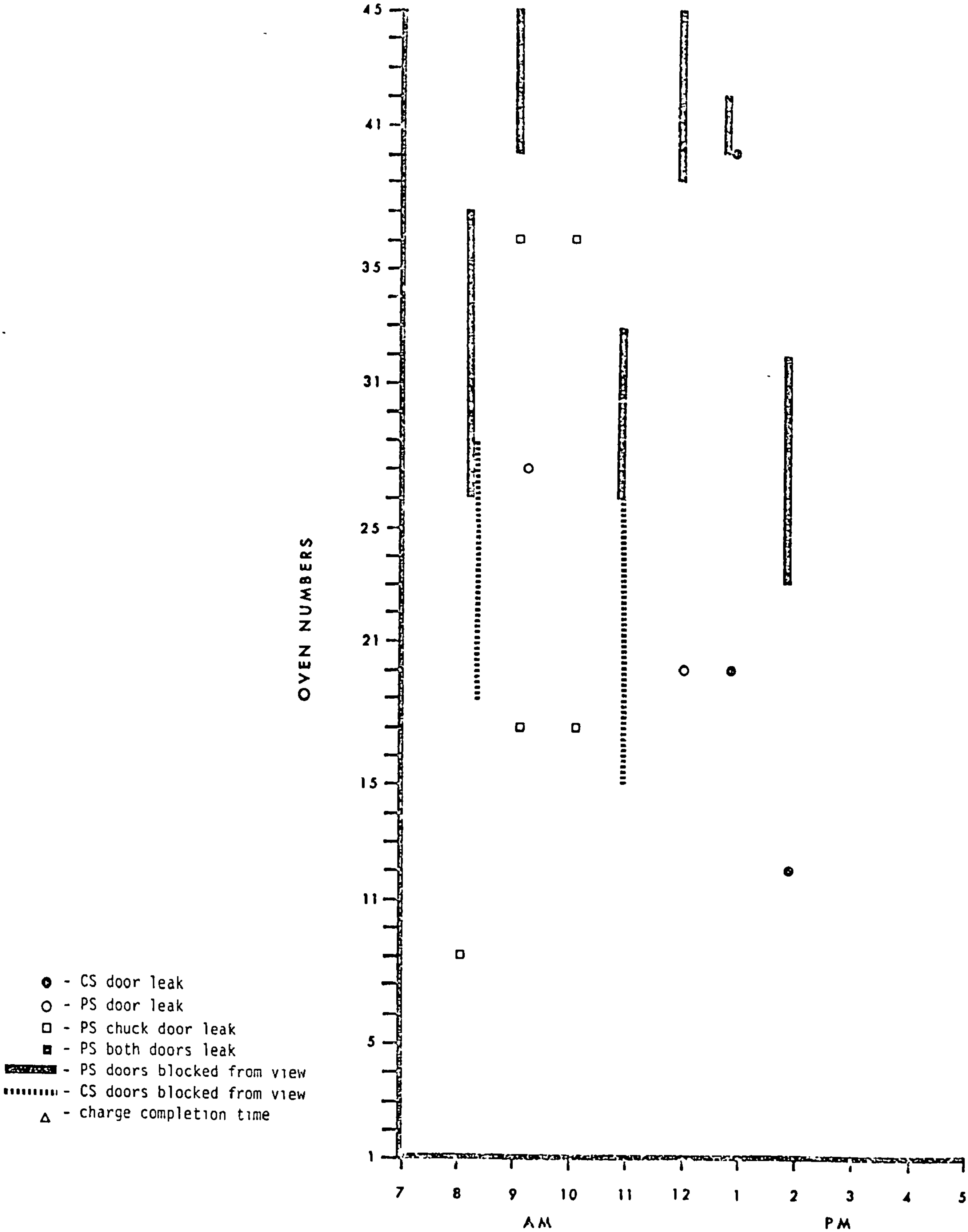


Figure 111. Door Leak Data

Battery 9

USSC Fairfield Works December 8, 1976

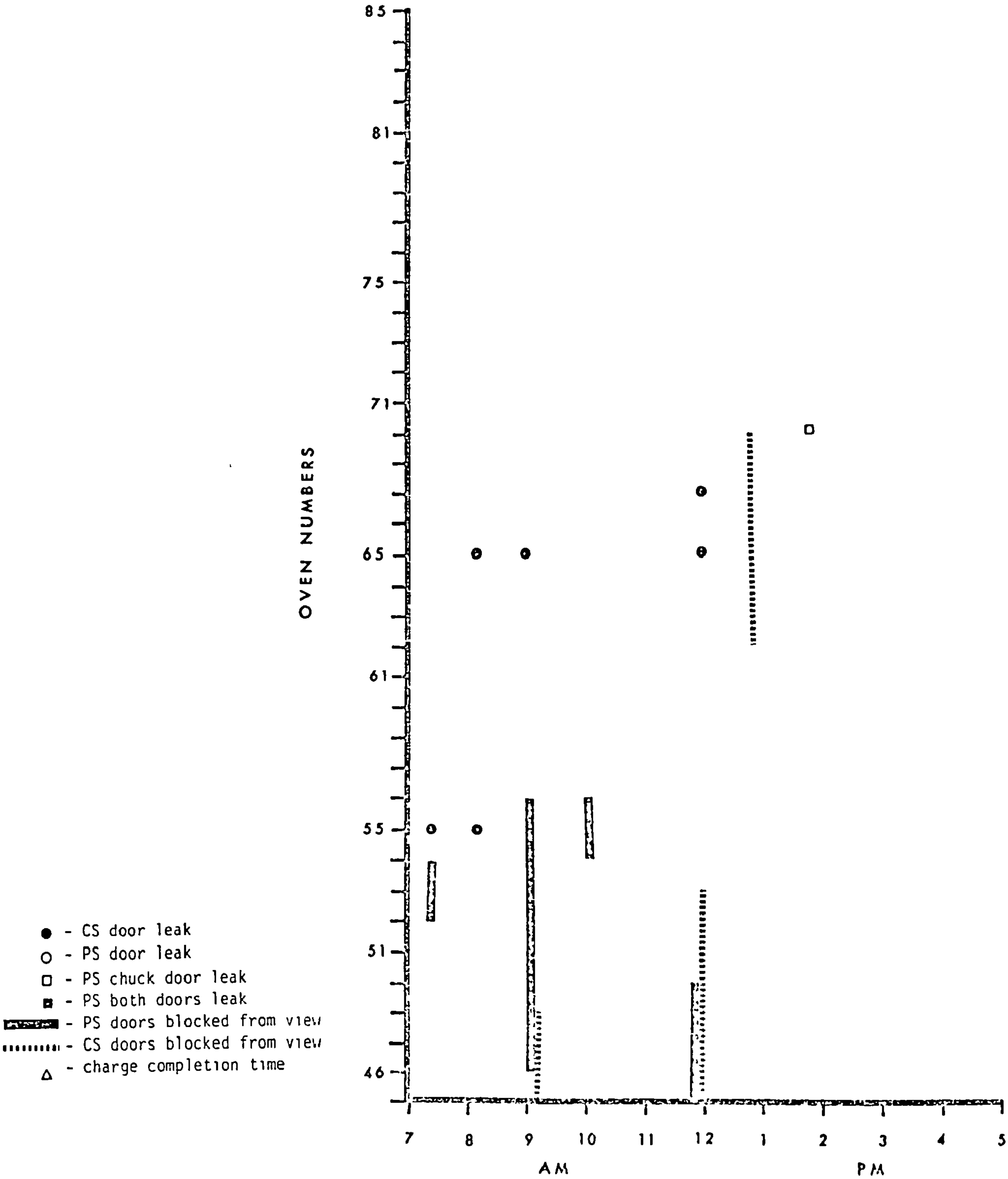


Figure 112. Door Leak Data

Battery 9

USSC Fairfield Works December 8, 1976

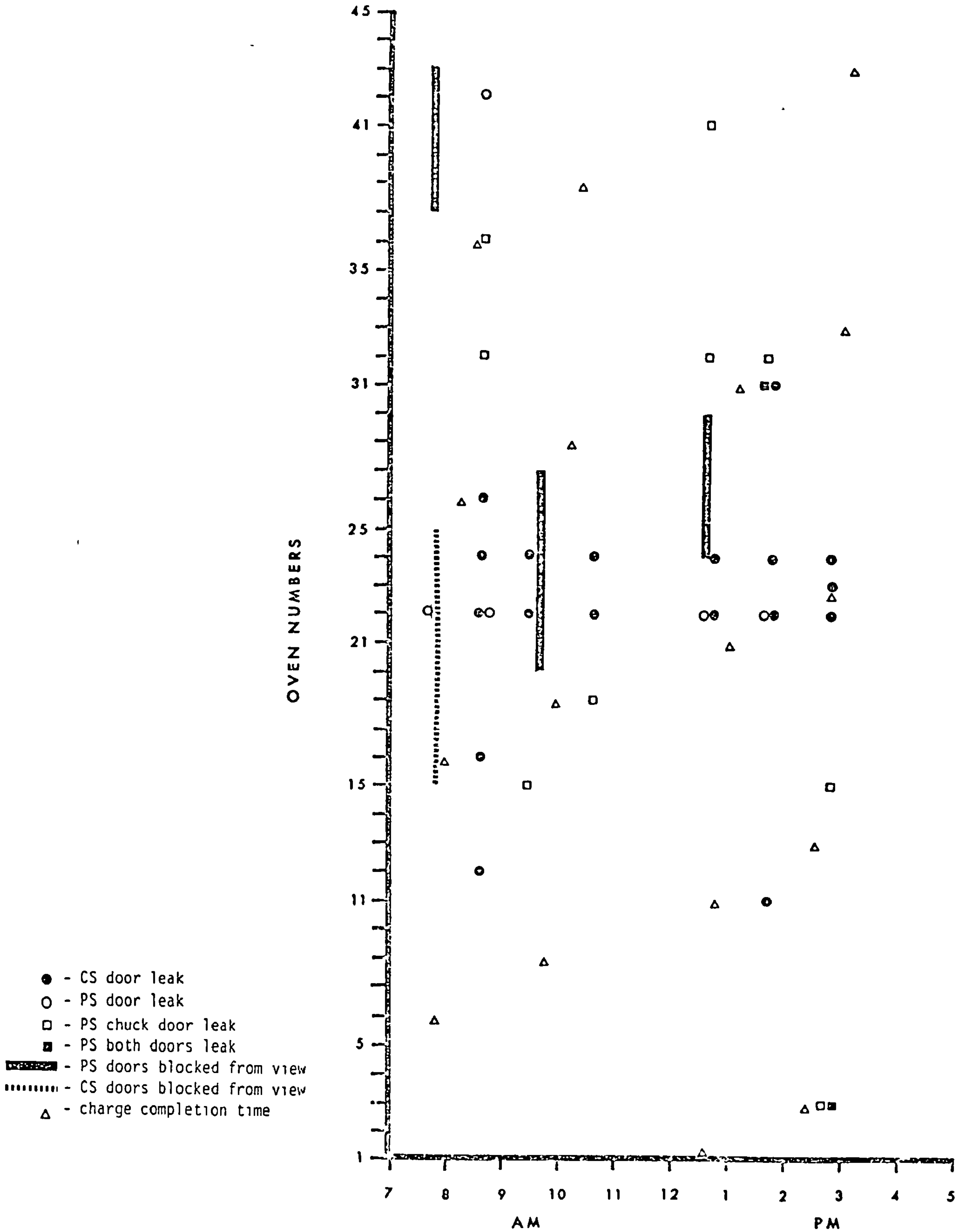


Figure 113. Door Leak Data

Battery 5

USSC Fairfield Works December 9, 1976

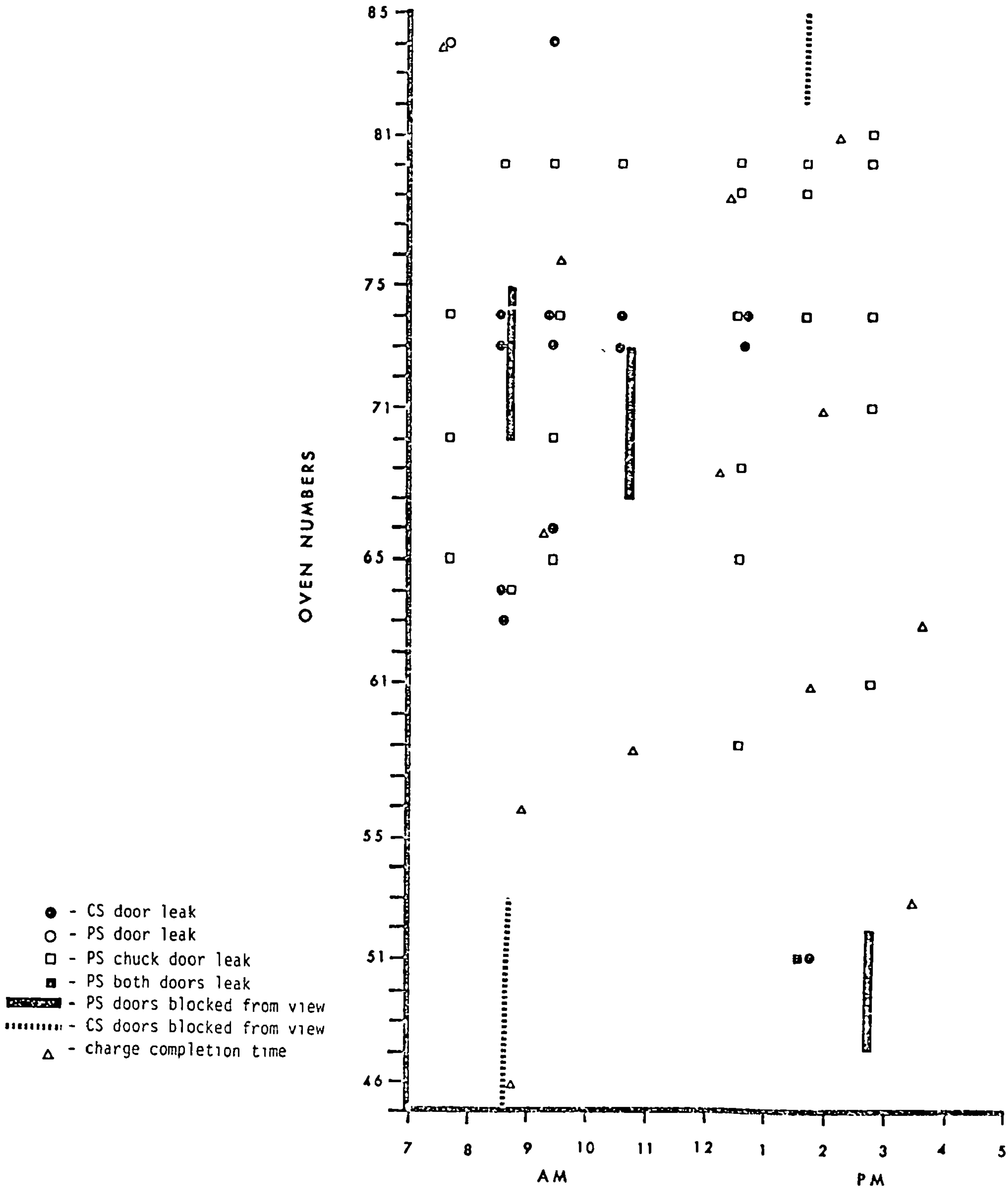


Figure 114. Door Leak Data

Battery 5

USSC Fairfield Works December 9, 1976

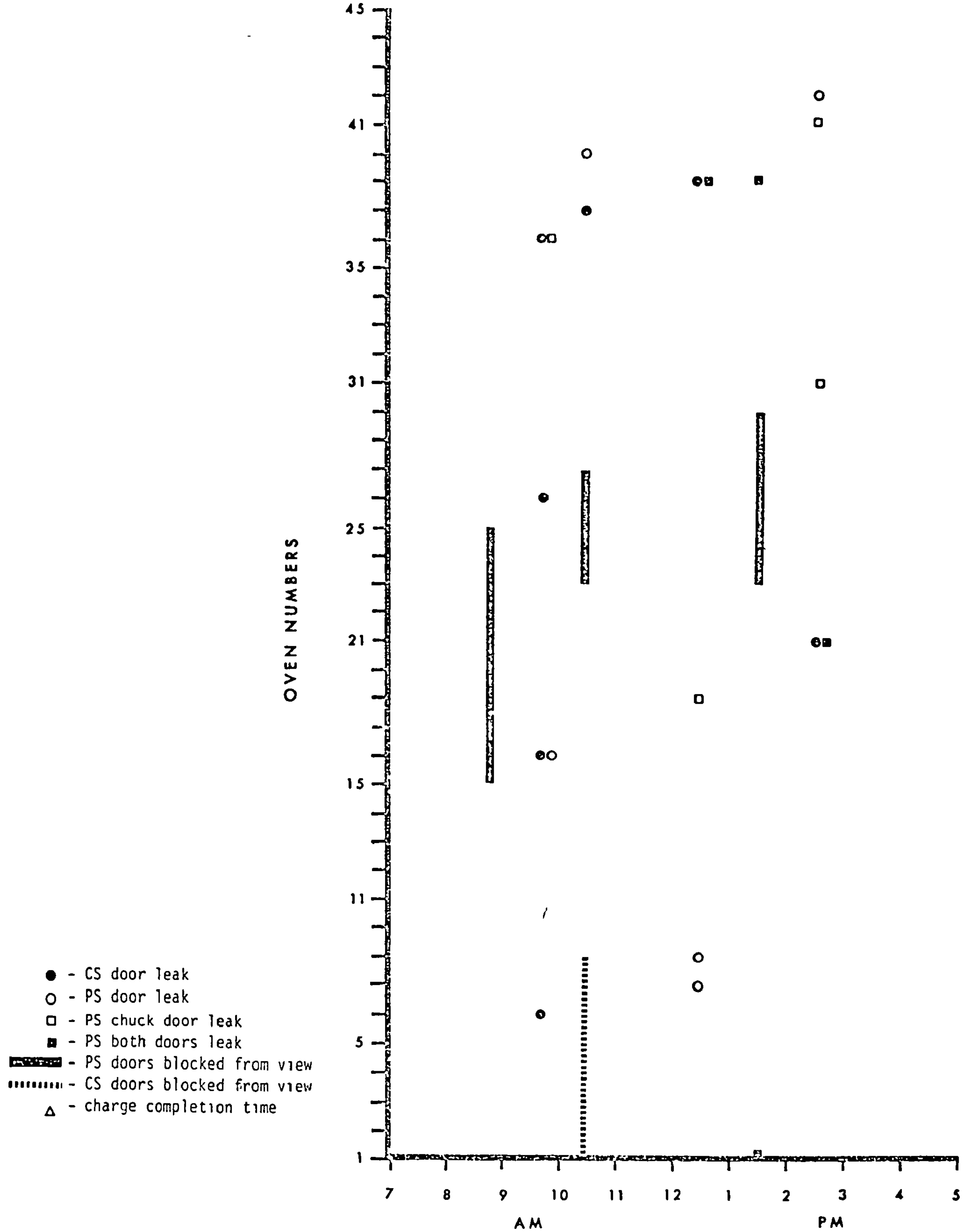


Figure 115. Door Leak Data

Battery 6

USSC Fairfield Works December 9, 1976

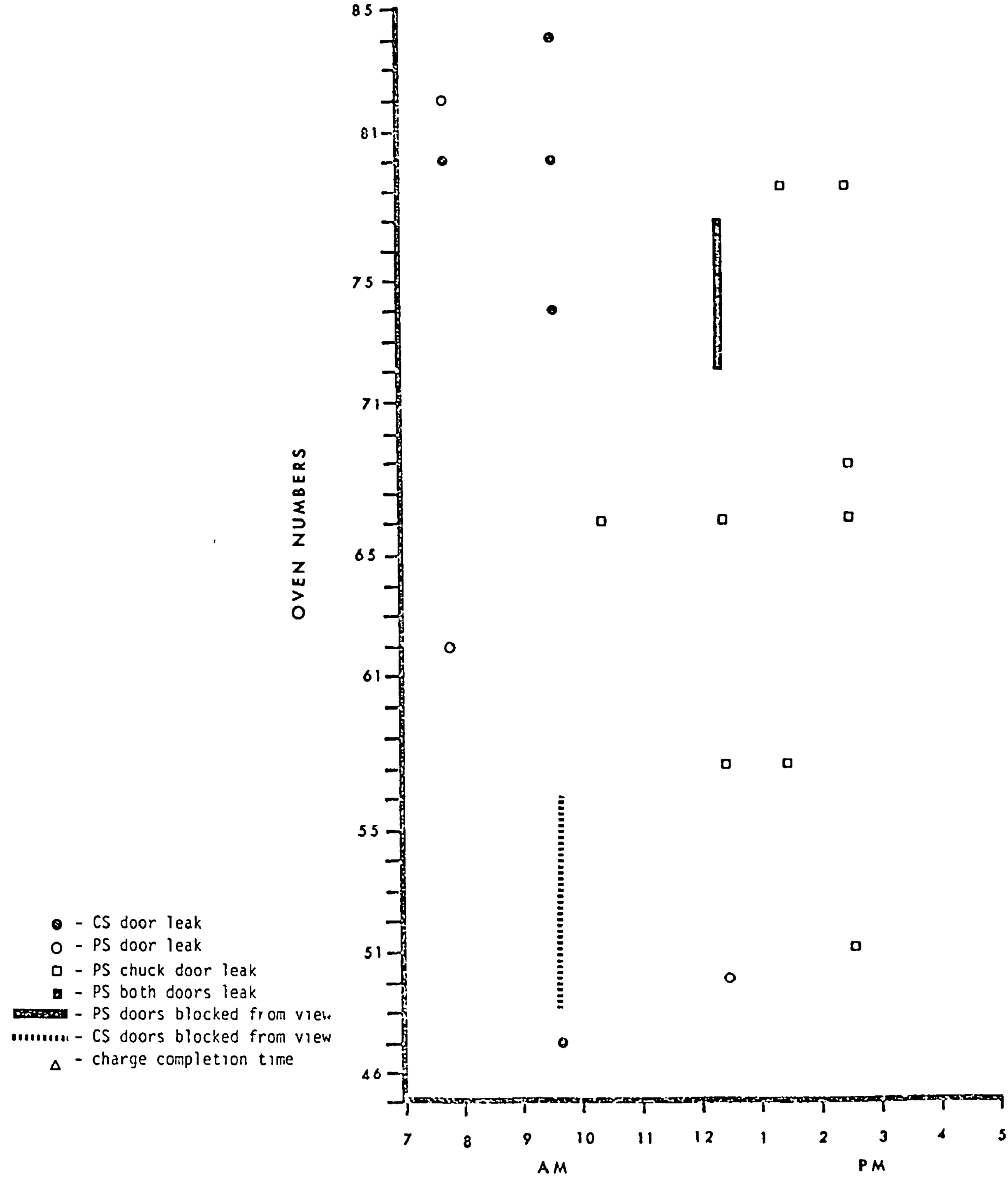


Figure 116. Door Leak Data

Battery 6

USSC Fairfield Works December 9, 1976

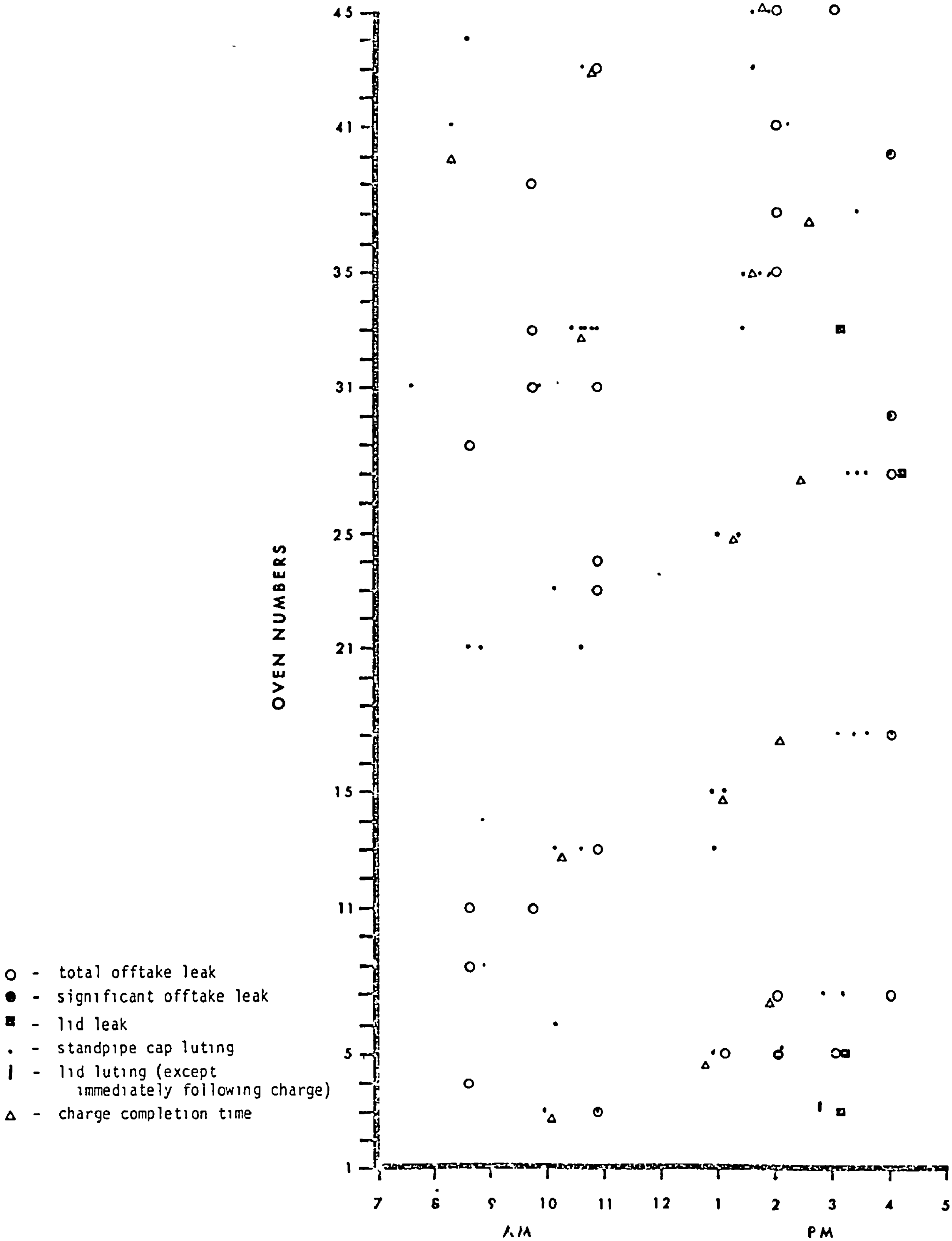


Figure 117. Topside Leak Data

Battery 5

USSC Fairfield Works November 30, 1976

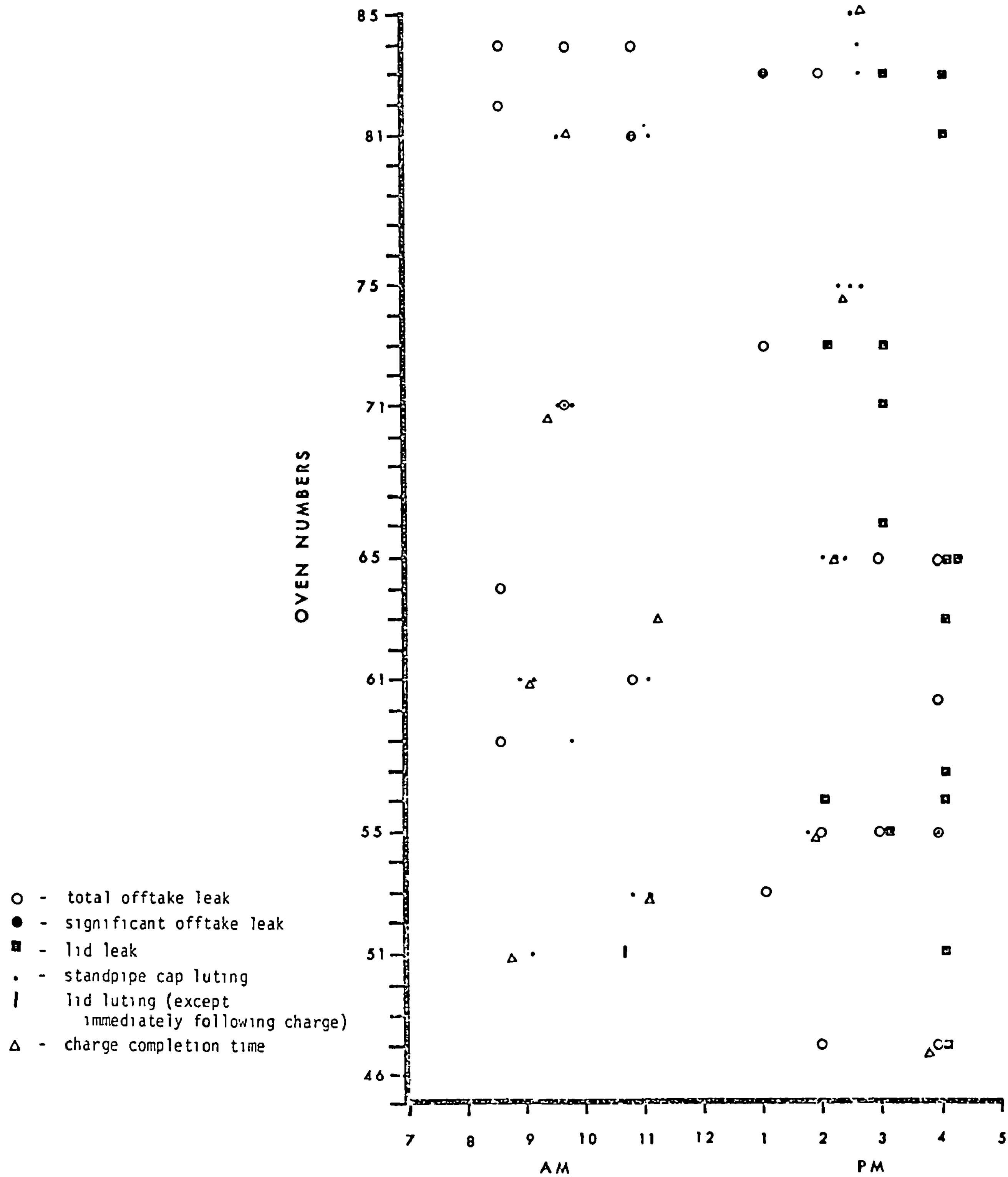


Figure 118. Topside Leak Data

Battery 5

USSC Fairfield Works November 30, 1976

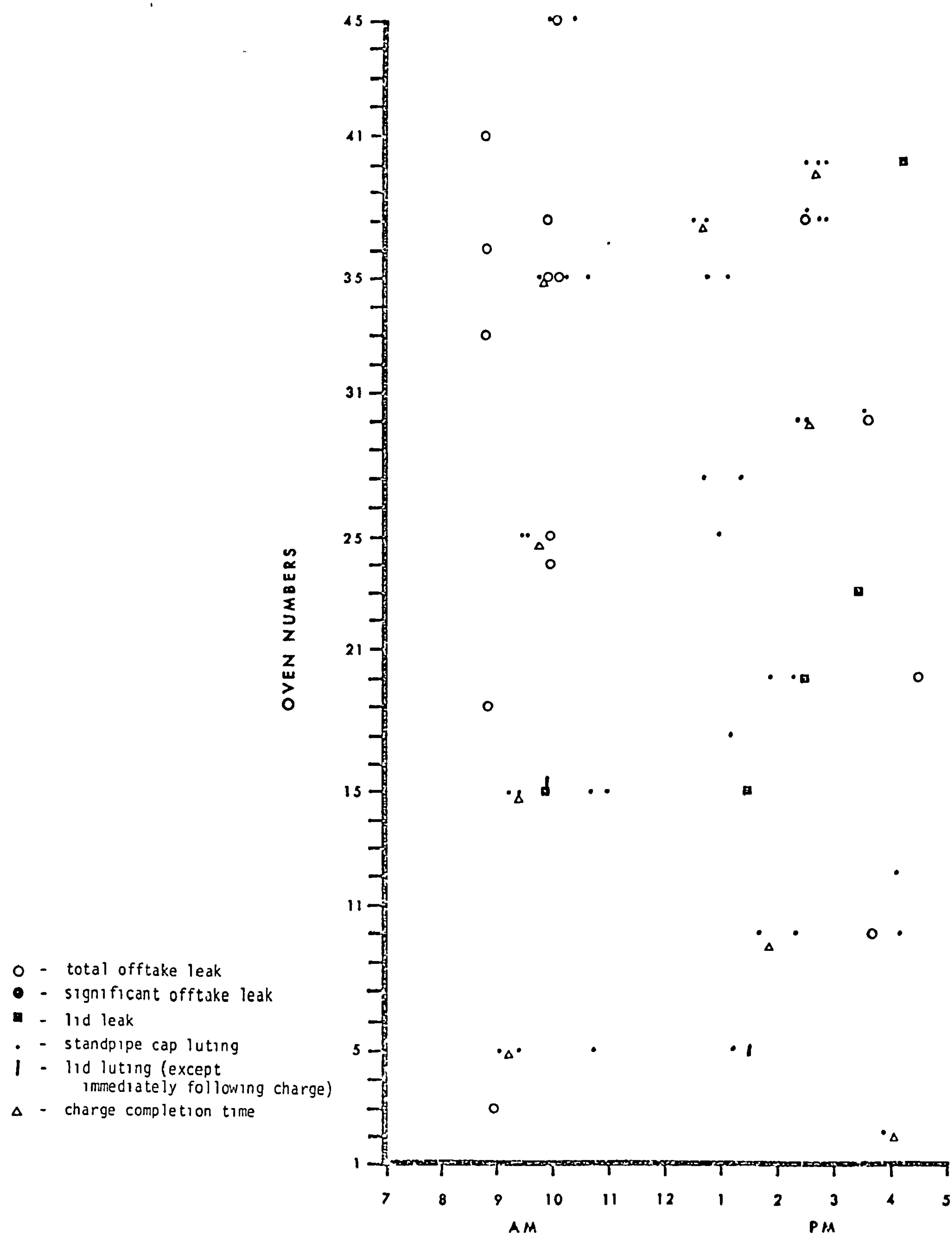


Figure 119. Topside Leak Data

Battery 6

USSC Fairfield Works December 1, 1976

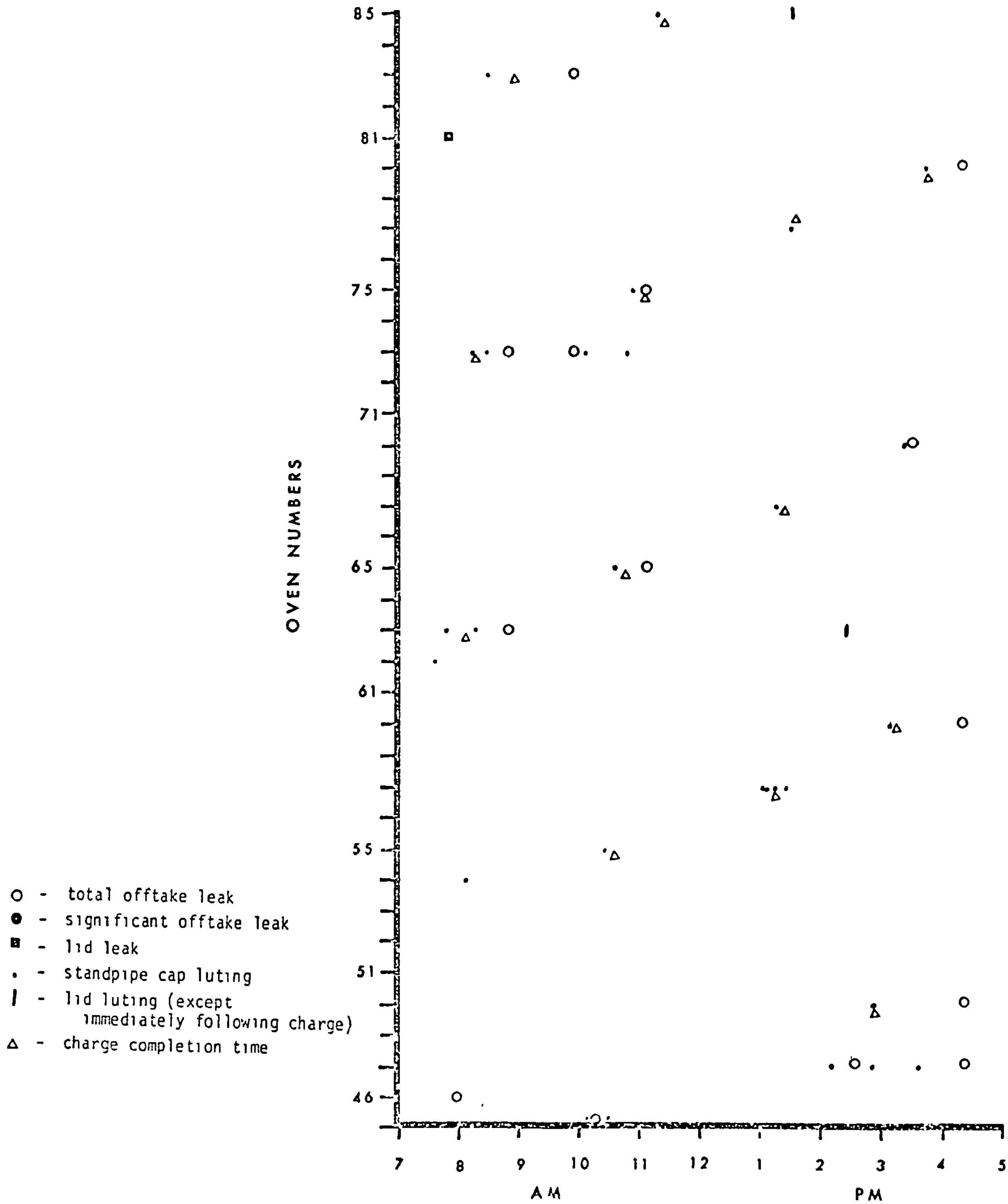


Figure 120. Topside Leak Data

Battery 6

USSC Fairfield Works December 1, 1976

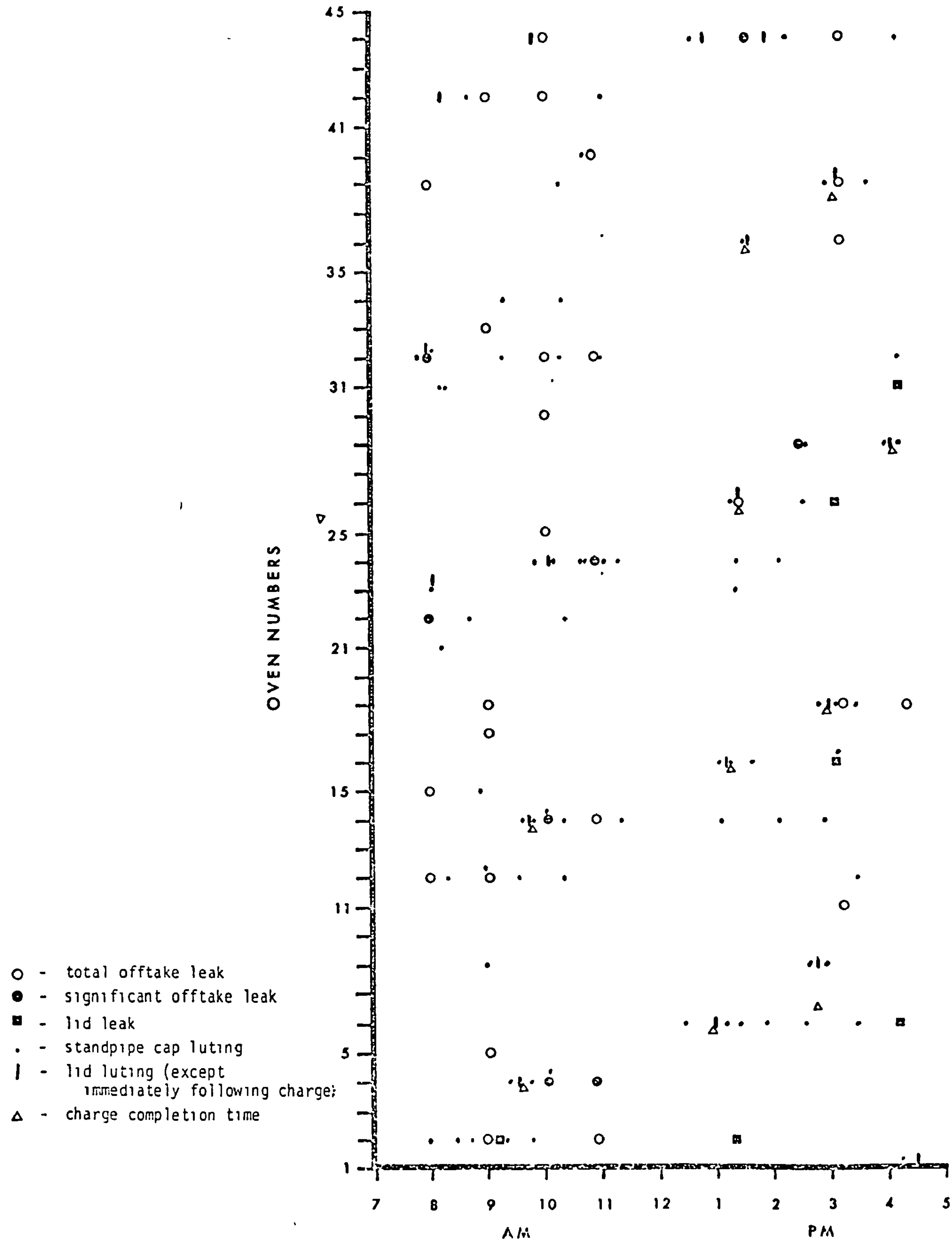


Figure 121. Topside Leak Data

Battery 5

USSC Fairfield Works December 2, 1976

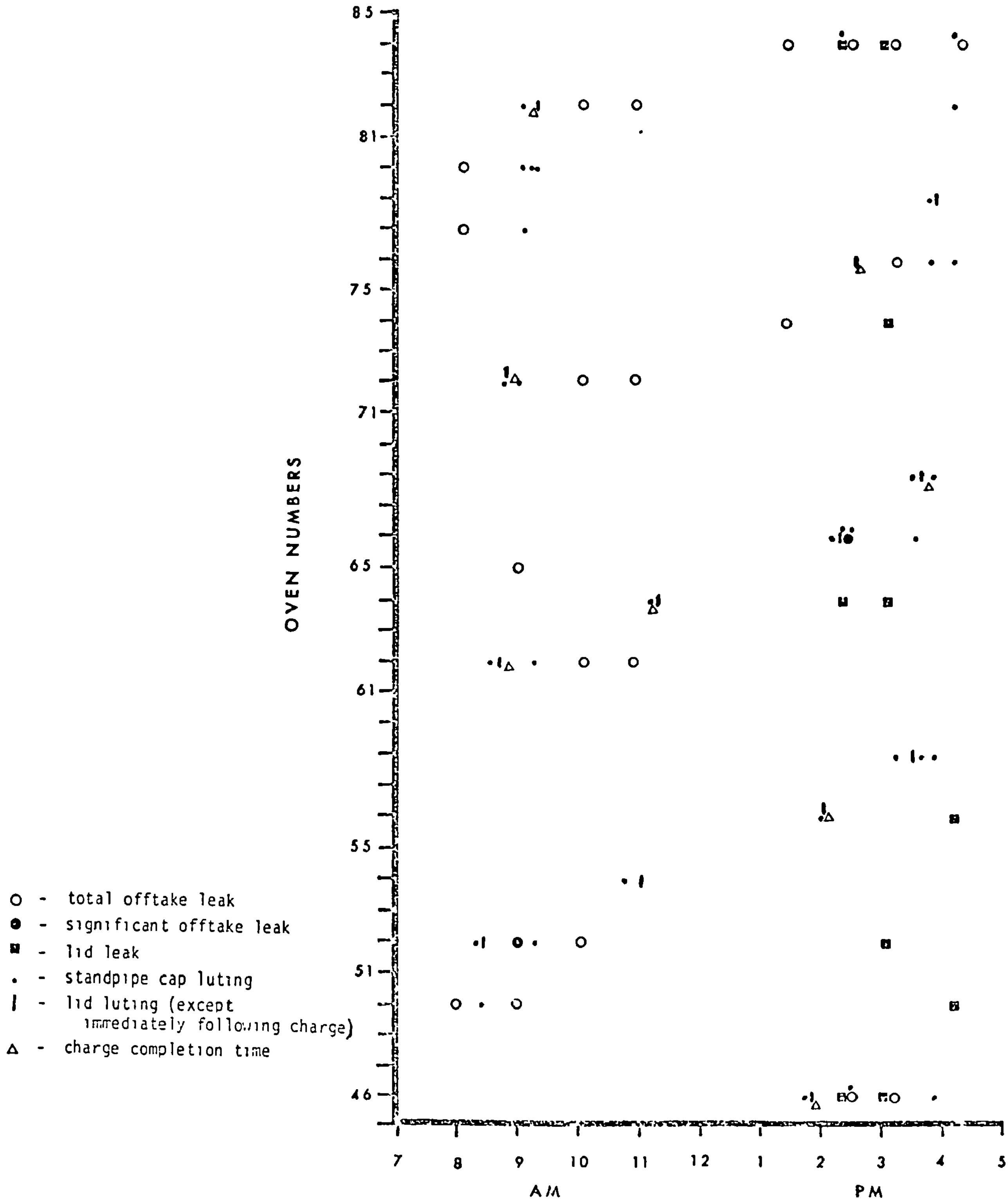


Figure 122. Topside Leak Data

Battery 5

USSC Fairfield Works December 2, 1976

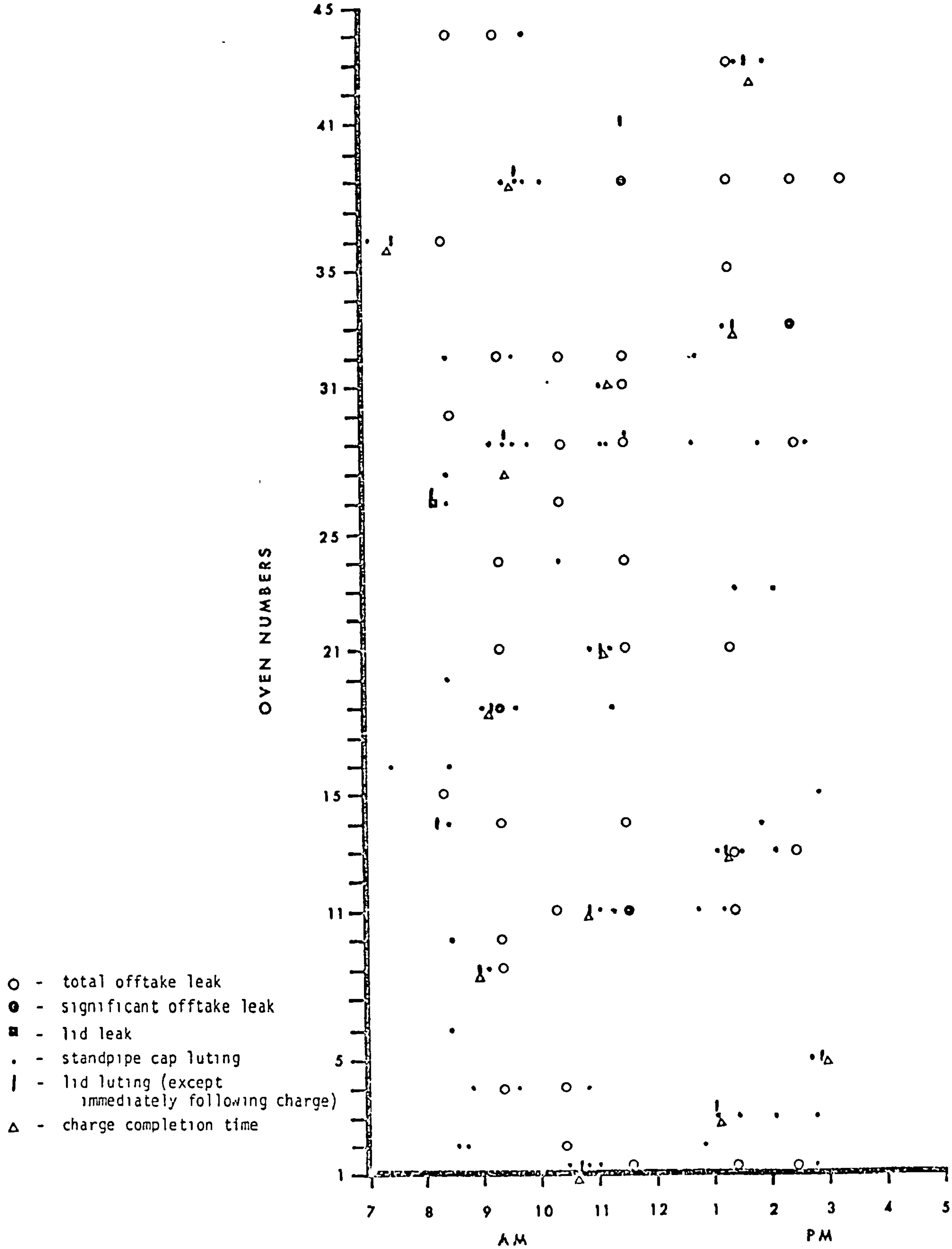


Figure 123. Topside Leak Data

Battery 5

USSC Fairfield Works December 3, 1976

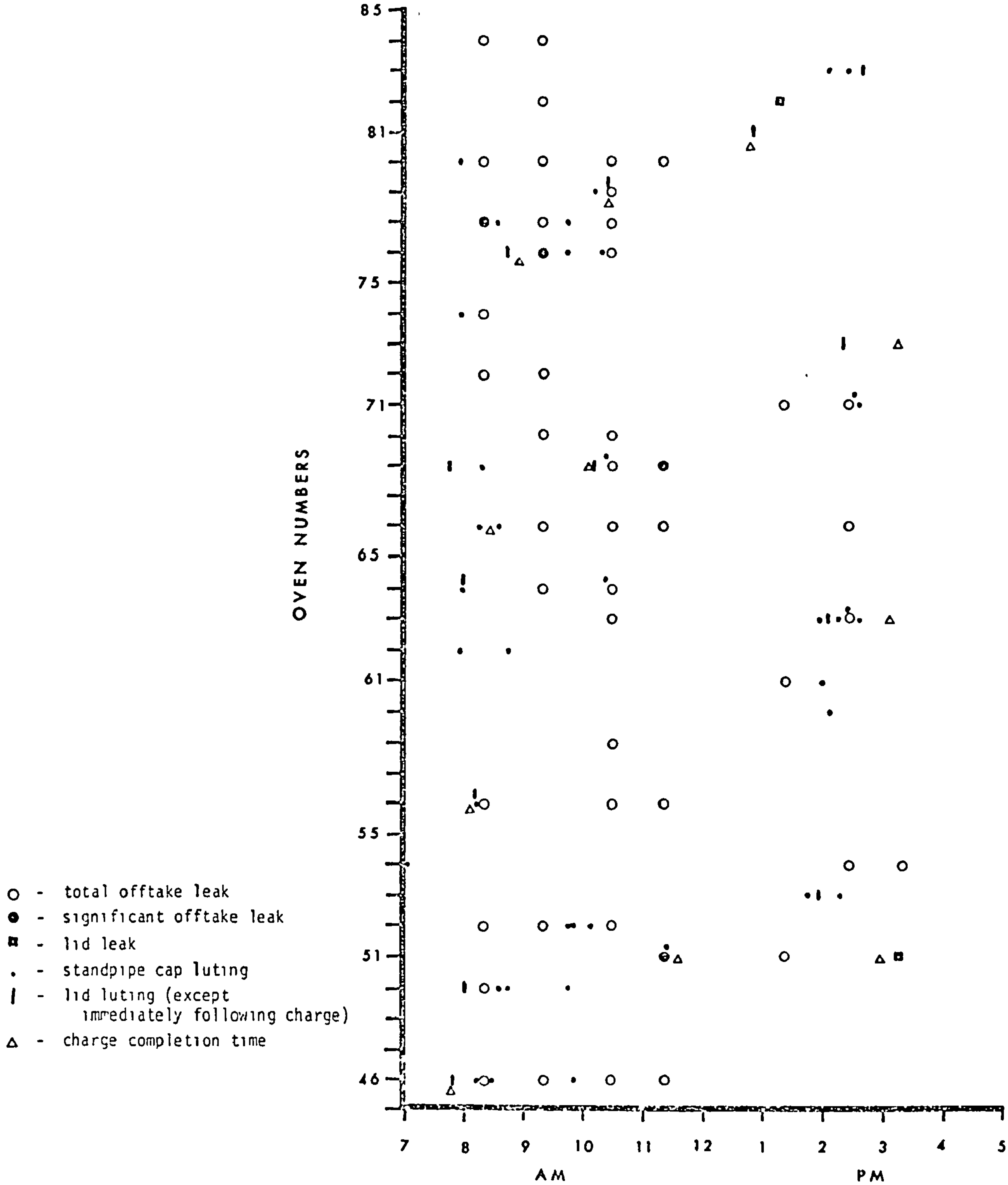


Figure 124. Topside Leak Data

Battery 5

USSC Fairfield Works December 3, 1976

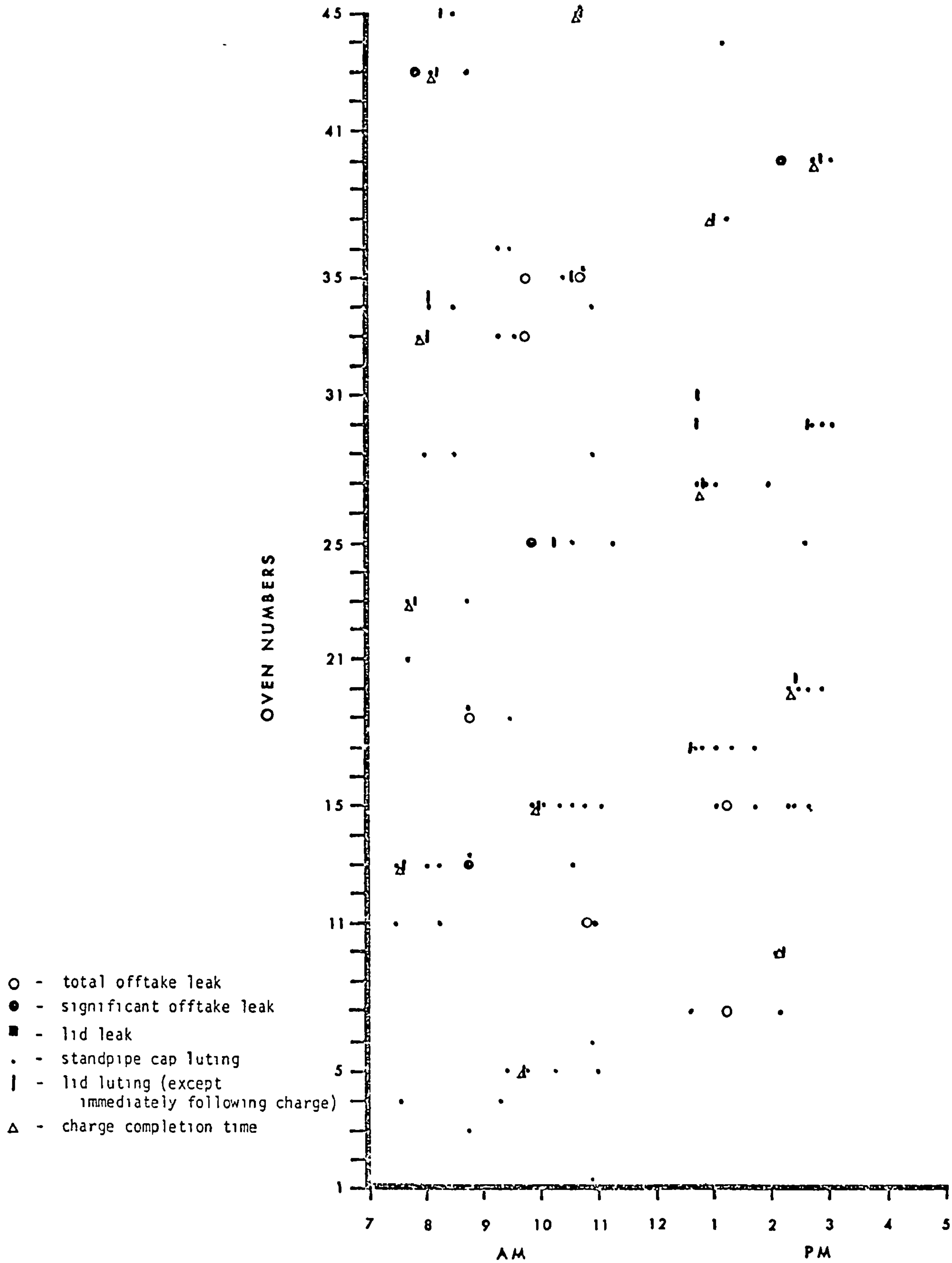


Figure 125. Topside Leak Data

Battery 5

USSC Fairfield Works December 4, 1976

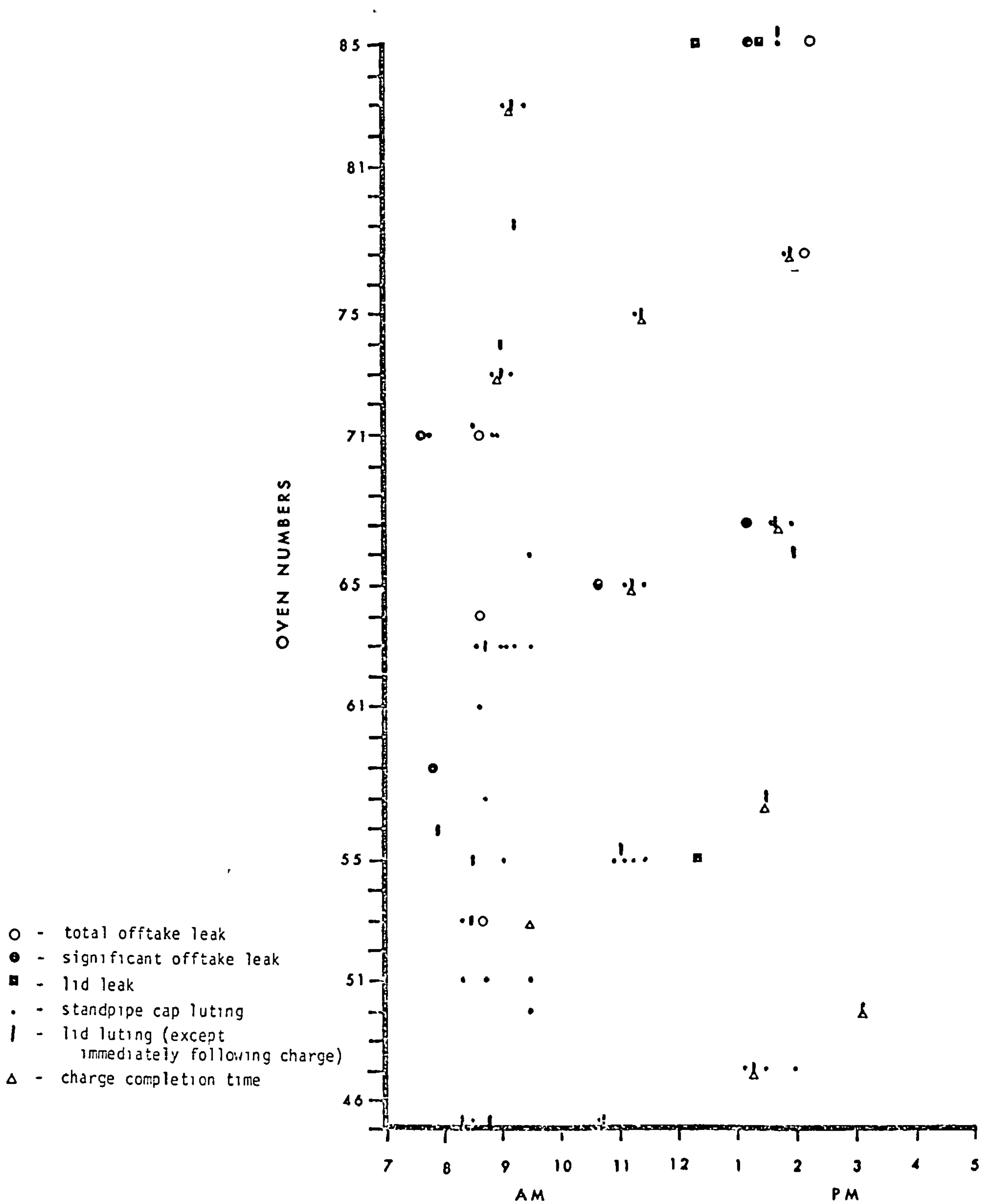


Figure 126. Topside Leak Data
Battery 5
USSC Fairfield Works December 4, 1976

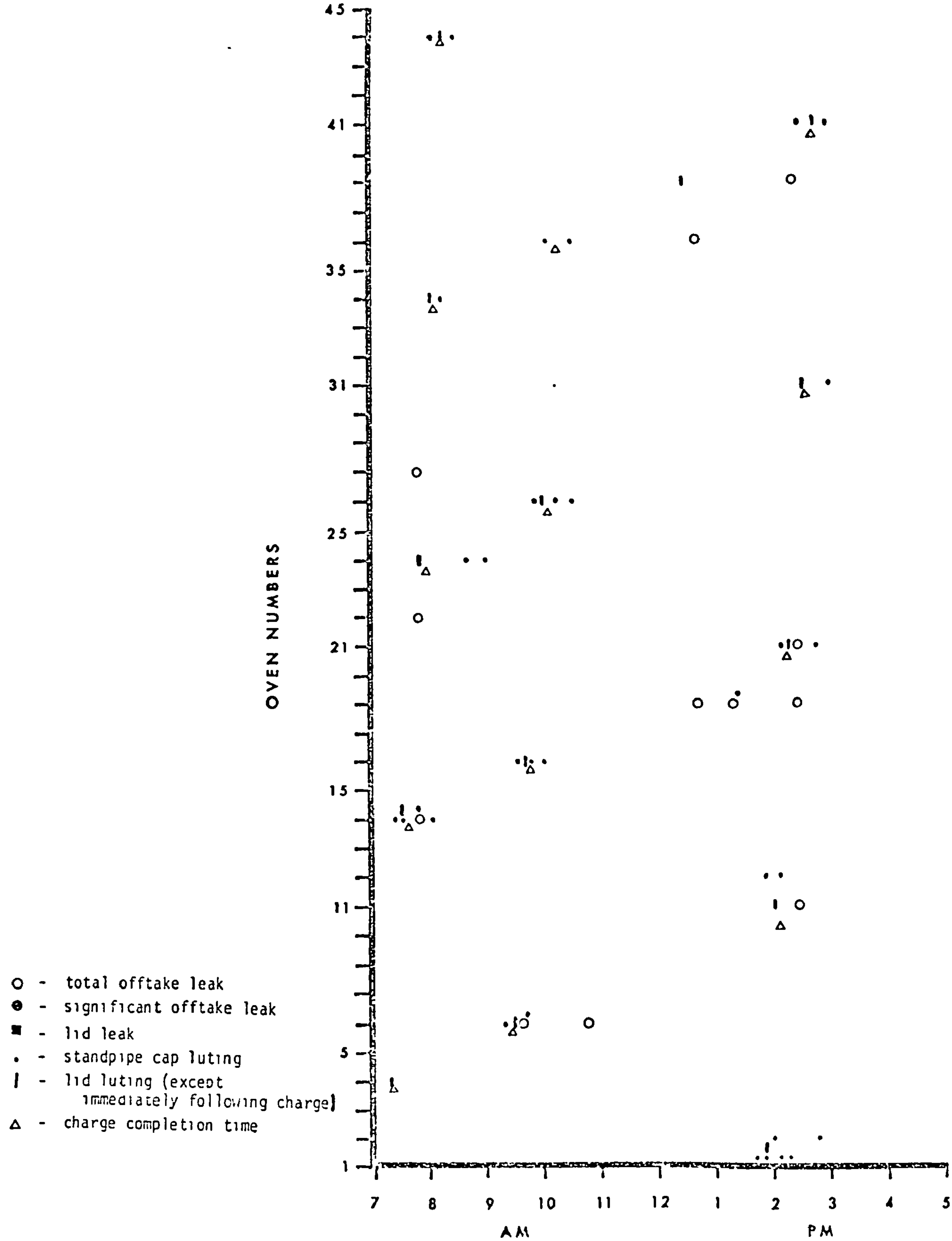


Figure 127. Topside Leak Data

Battery 6

USSC Fairfield Works December 6, 1976

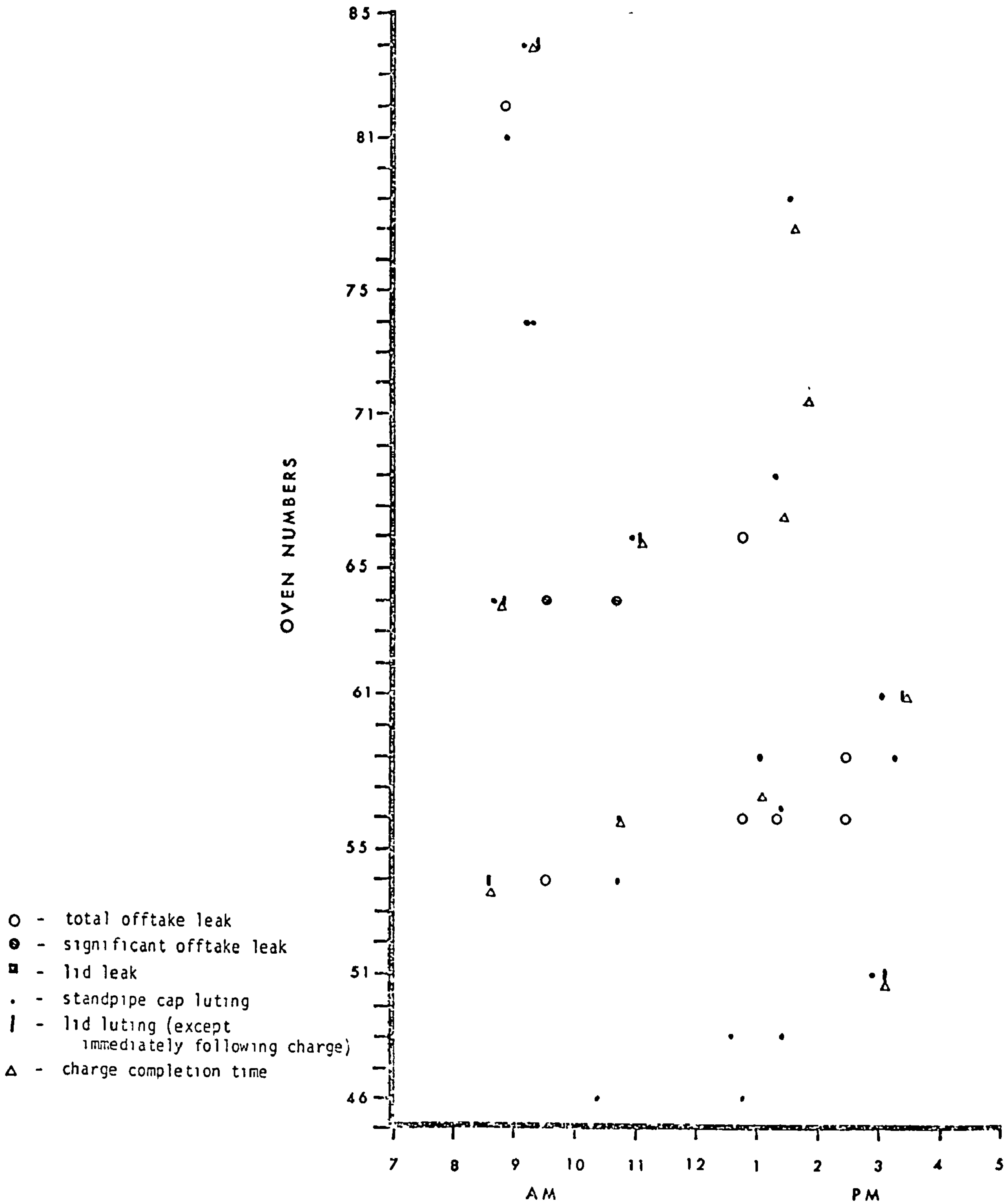


Figure 128. Topside Leak Data

Battery 6

USSC Fairfield Works December 6, 1976

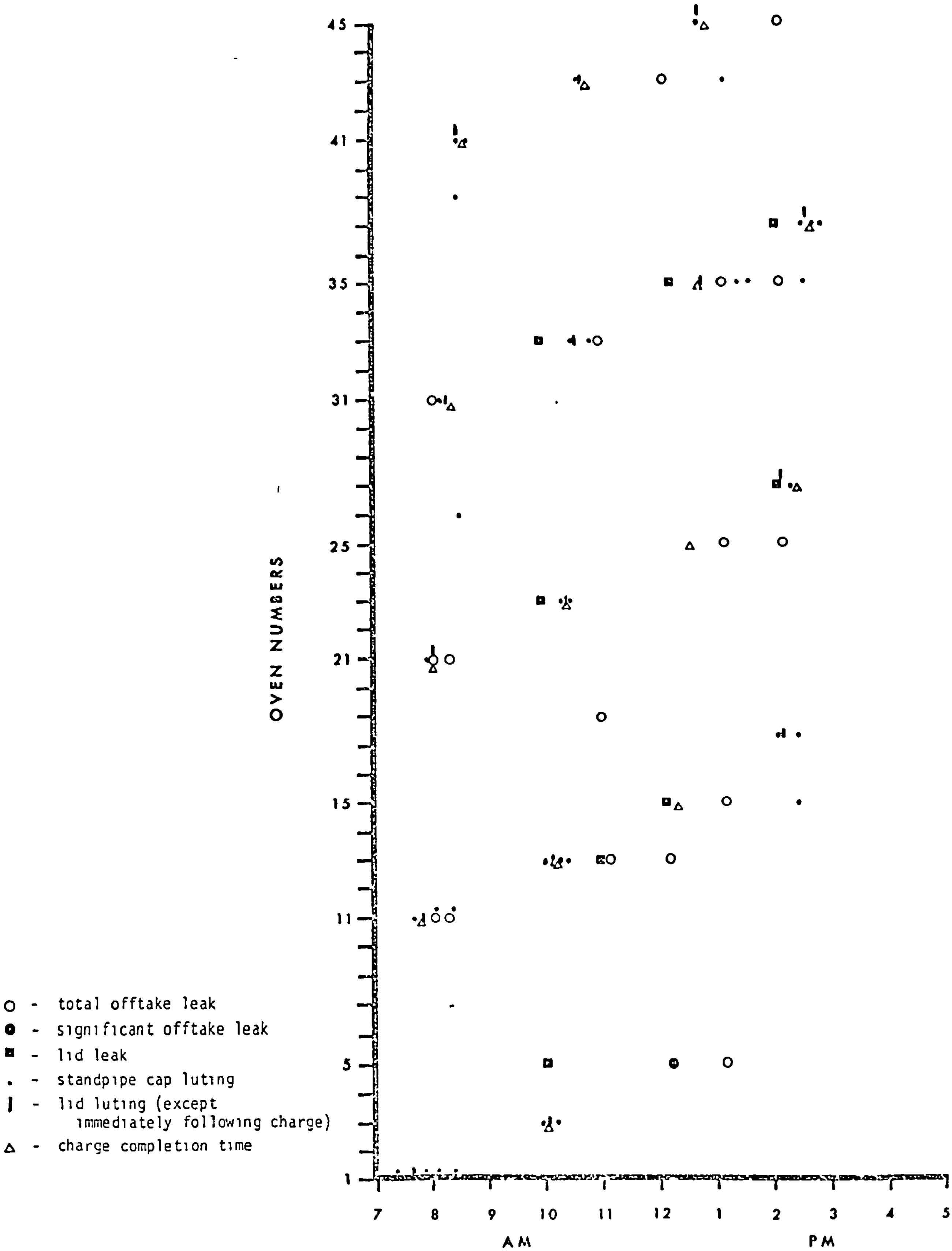


Figure 129. Topside Leak Data

Battery 6

USSC Fairfield Works, December 7, 1976

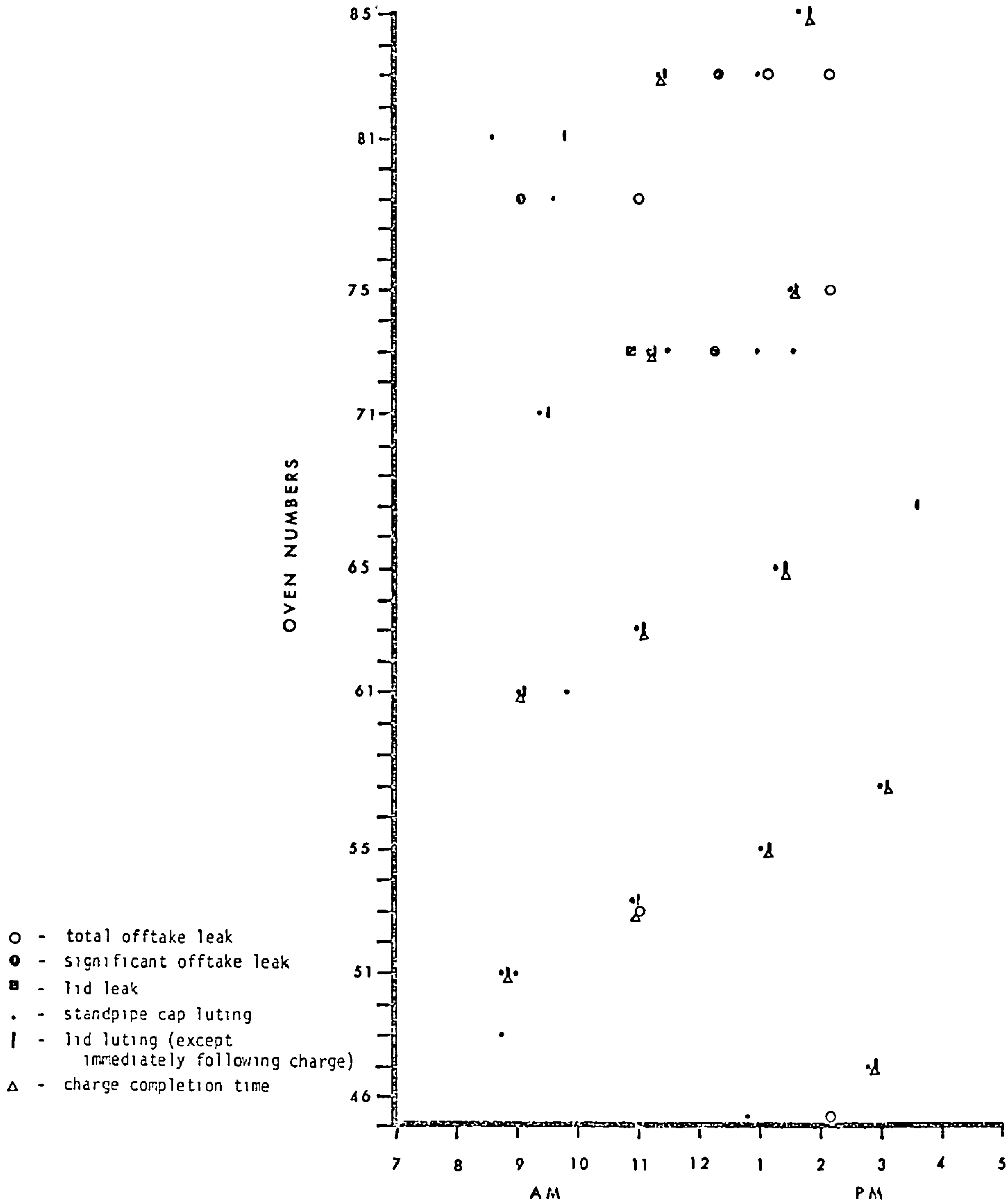


Figure 130. Topside Leak Data

Battery 6

USSC Fairfield Works December 7, 1976

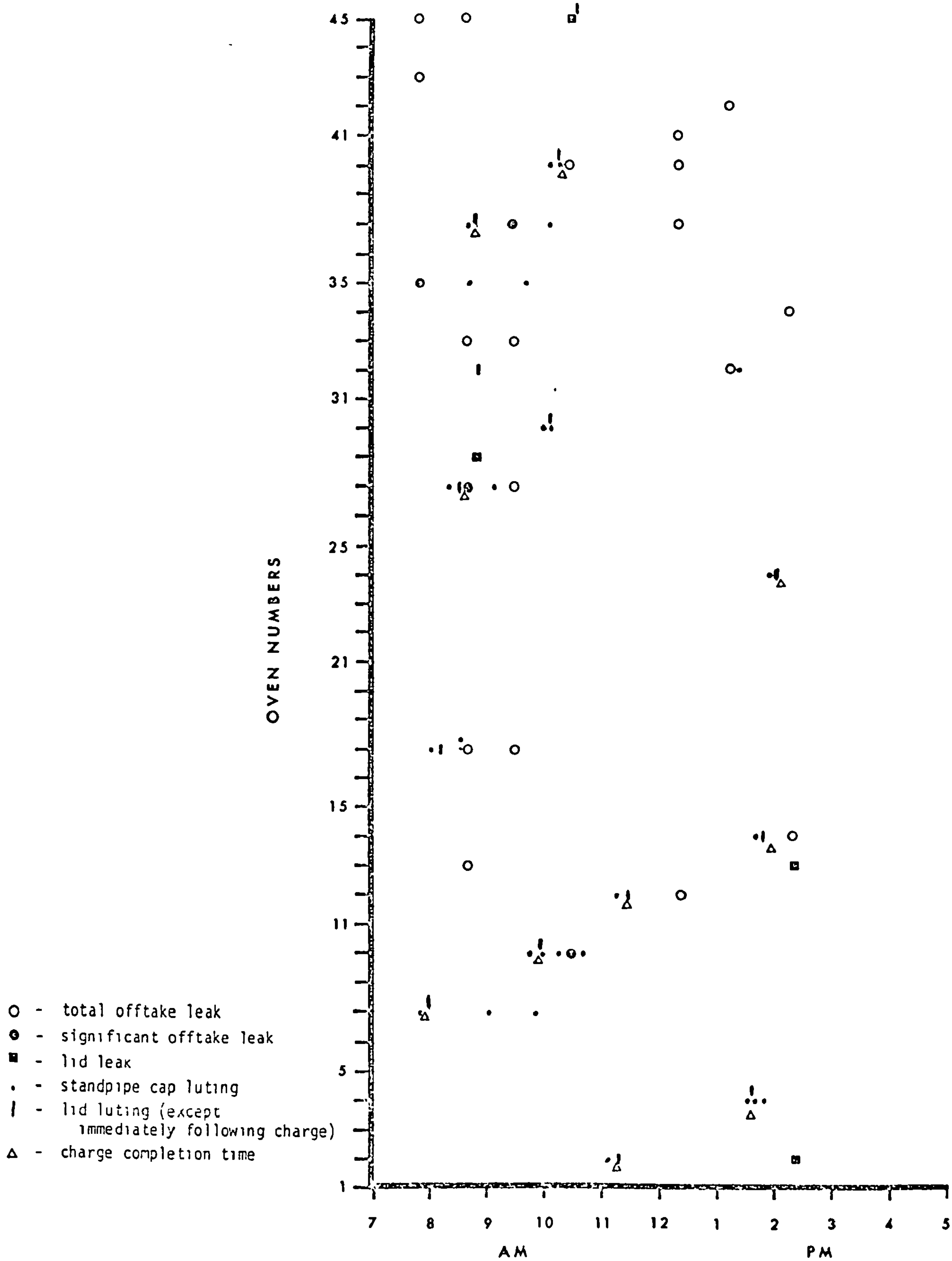


Figure 131. Topside Leak Data

Battery 6

USSC Fairfield Works December 8, 1976

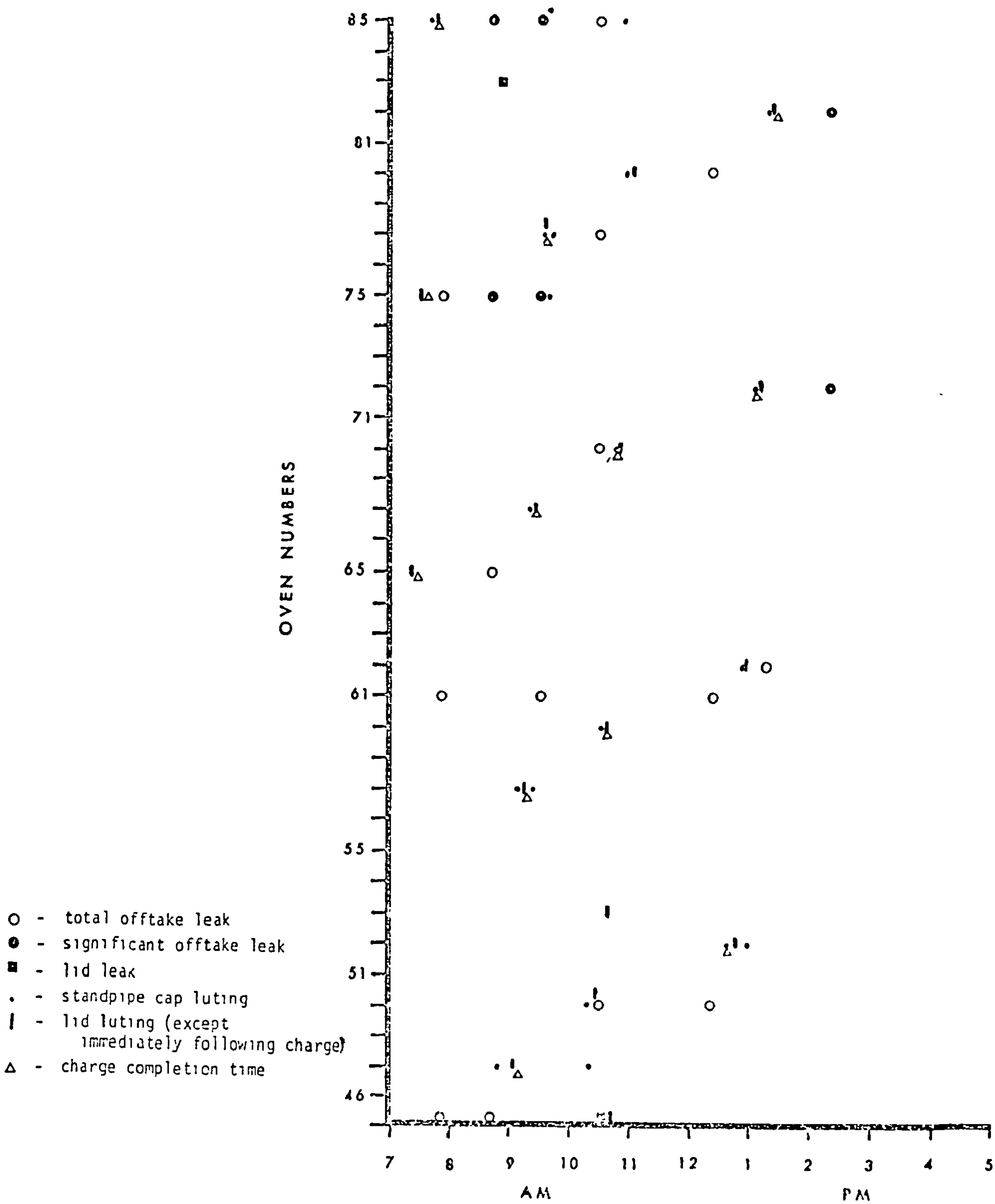


Figure 132. Topside Leak Data

Battery 6

USSC Fairfield Works December 8, 1976

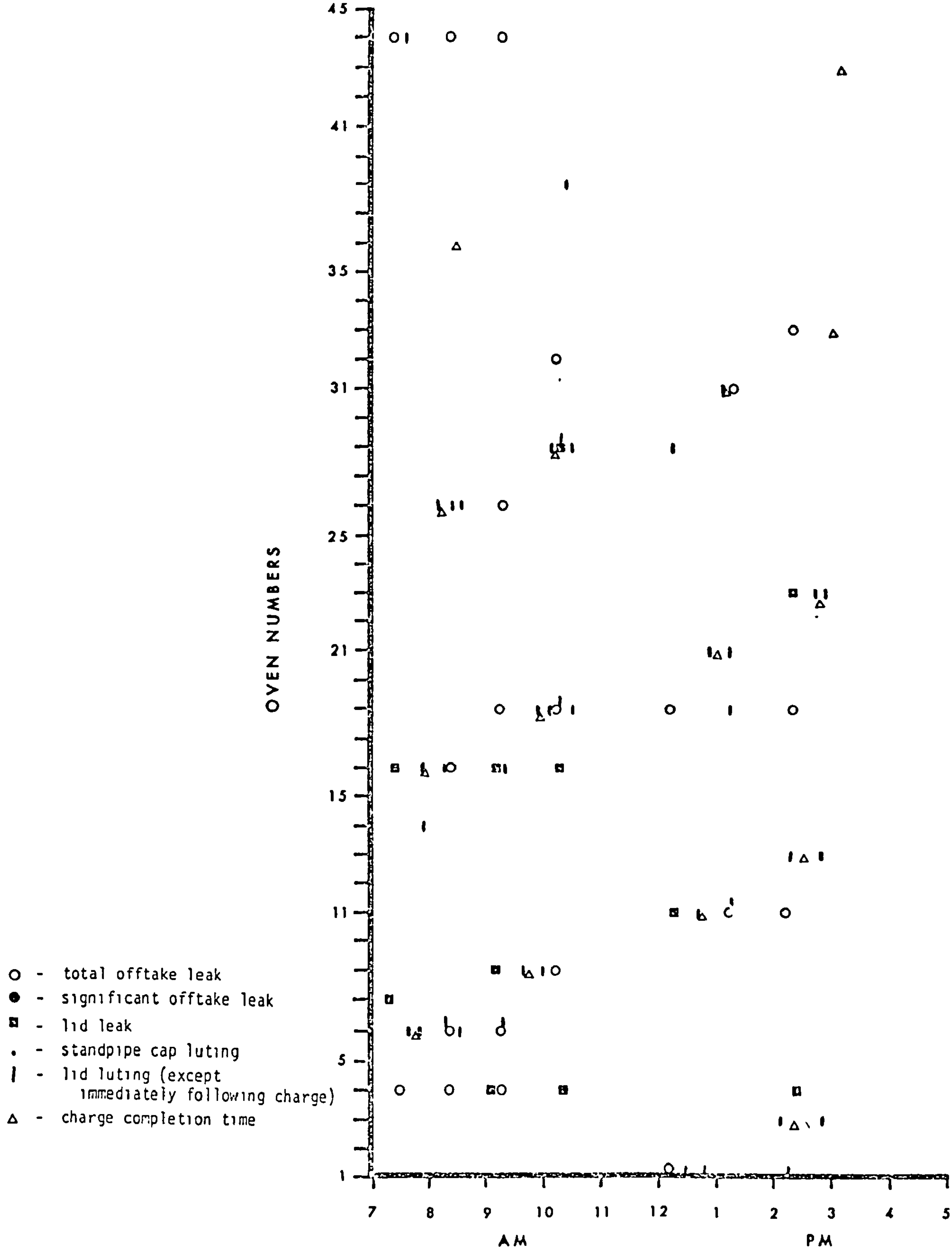


Figure 133. Topside Leak Data

Battery 5

USSC Fairfield Works December 9, 1976

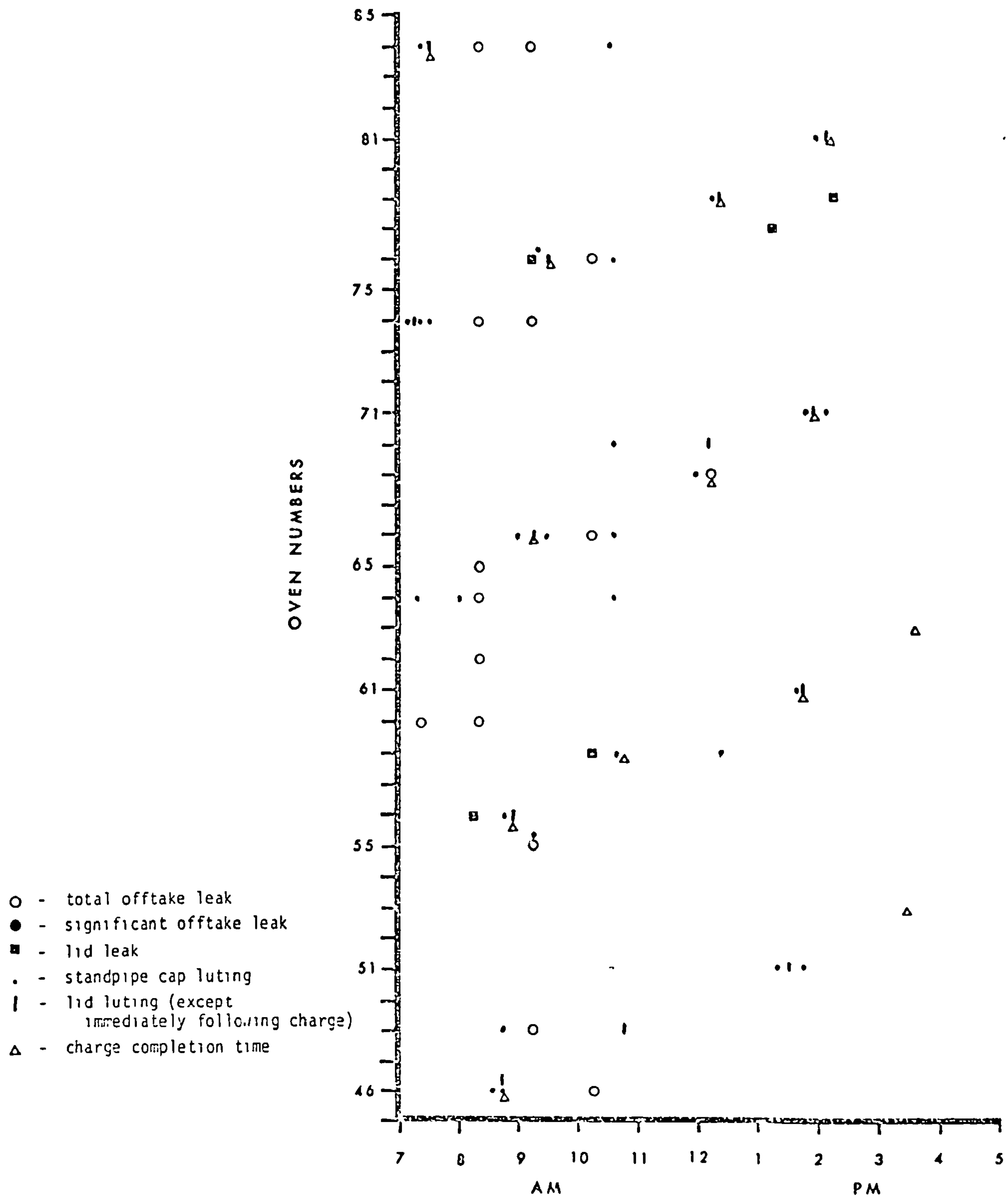


Figure 134. Topside Leak Data

Battery 5

USSC Fairfield Works December 9, 1976

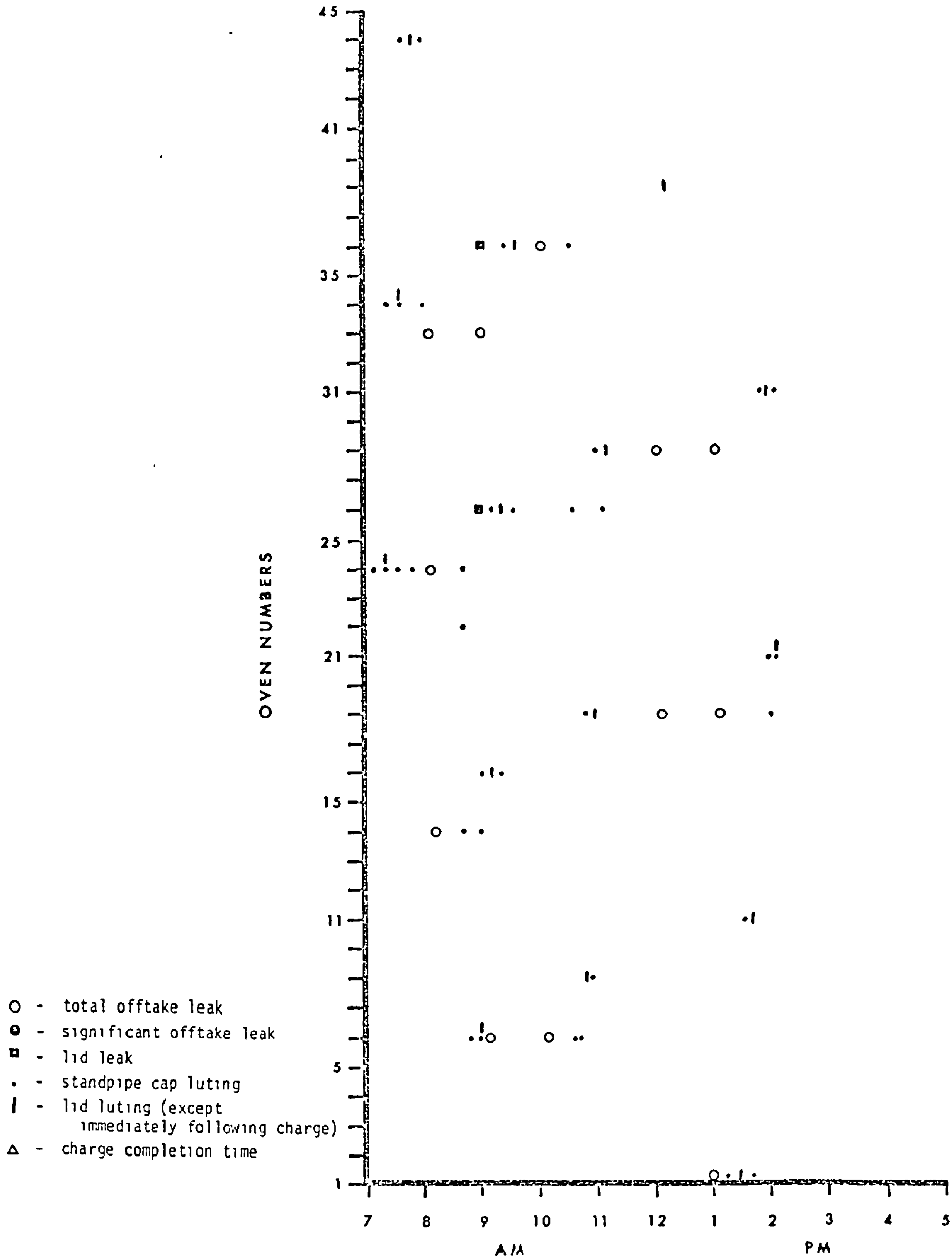


Figure 135. Topside Leak Data

Battery 6

USSC Fairfield Works December 9, 1976

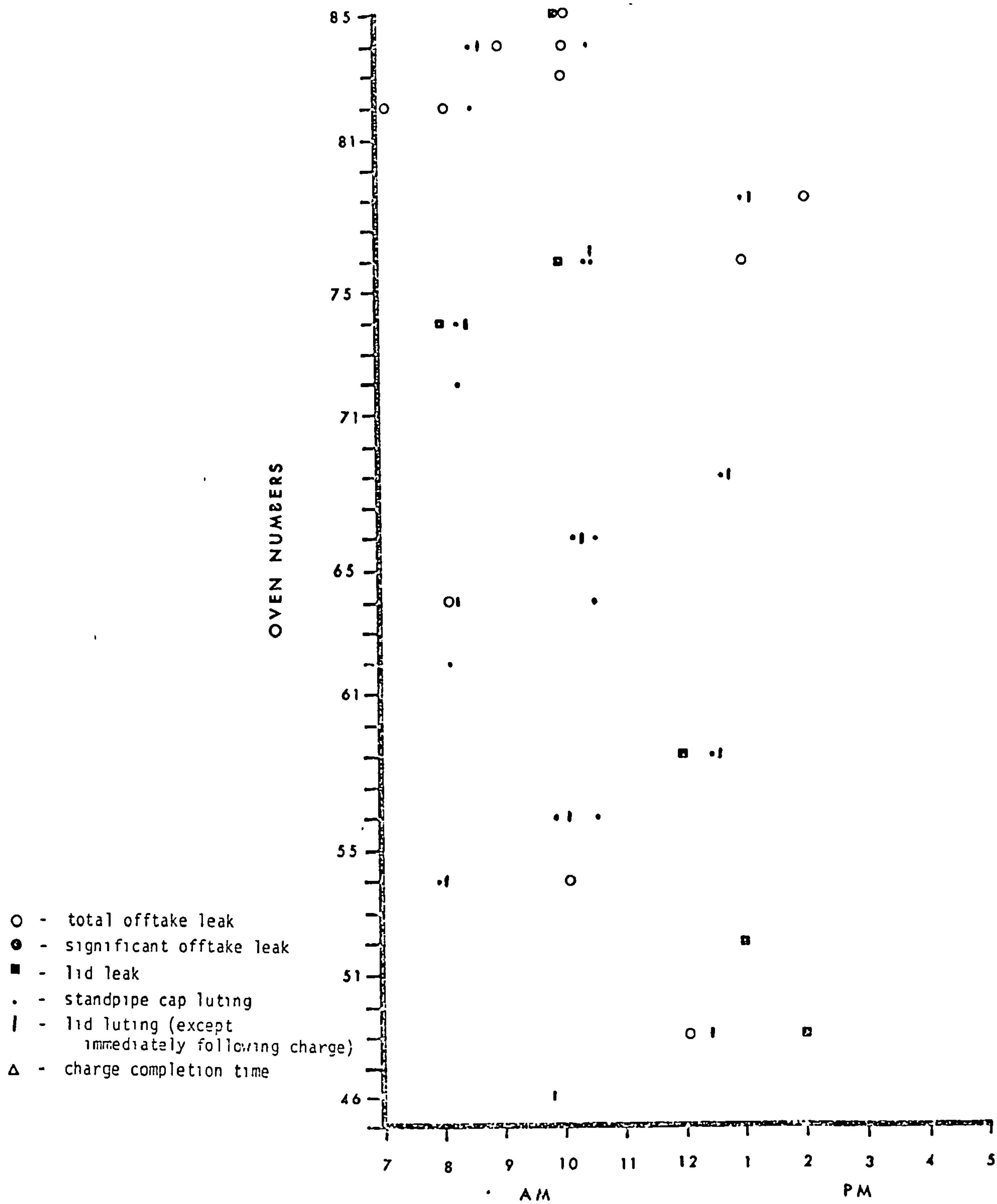
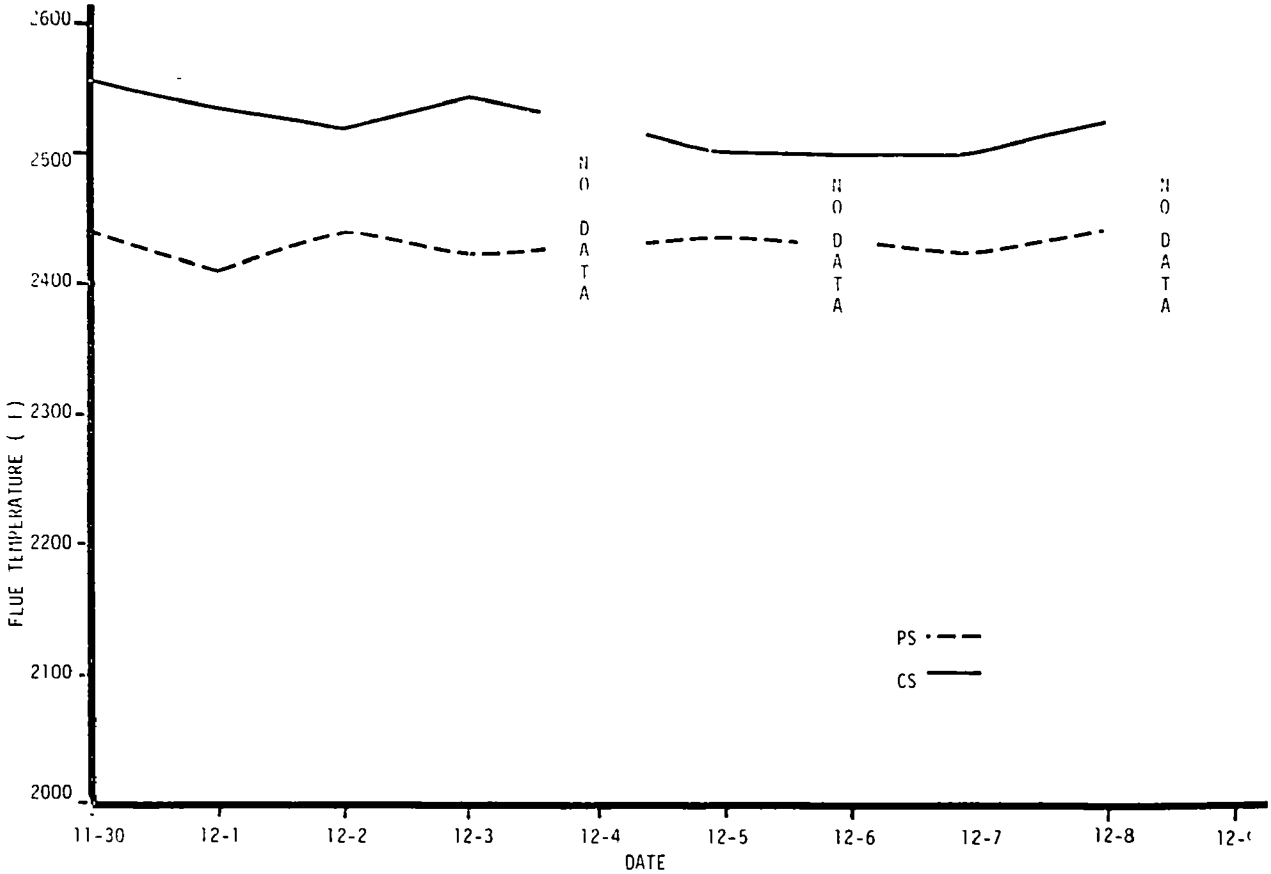


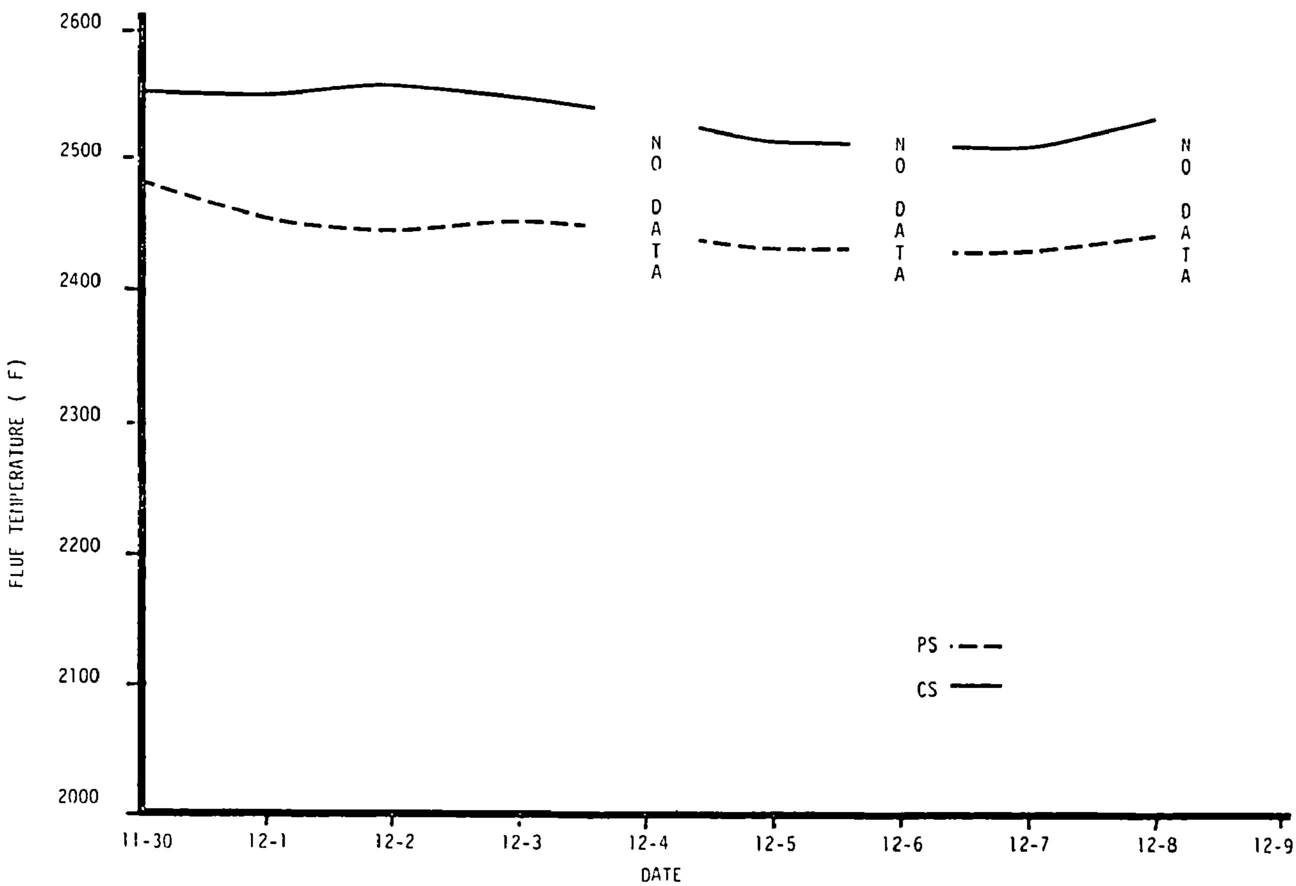
Figure 136. Topside Leak Data

Battery 6

USSC Fairfield Works December 9, 1976



USSC Fairfield Works
Battery 5
Average Oven Wall Flue Temperatures



USSC Fairfield Works
Battery 6

Figure 137 Average Oven Wall Flue Temperature USSC Fairfield Works

Appendix D

Tables

Table 1

PEAK AND CHANNEL HEIGHTS
USSC FAIRFIELD WORKS

Date Dec	Battery/ Oven	Type[a]	Measurement[b] Port #1 cm	Port #1 in	Port #2 cm	Port #2 in	Port #3 cm	Port #3 in	Port #4 cm	Port #4 in
1	6/69	P	99	39	107	42	-	-	124	49
		C	-[c]	-	-	-	135	53	-	-
2	5/24	P	99	39	117	46	-	-	114	45
		C	-	-	-	-	145	57	-	-
	5/58	P	97	38	107	42	-	-	124	49
		C	155	61	155	61	150	59	147	58
3	5/83	P	112	44	135	53[d]	-	-	124	49
		C	165	65	170	67	150	59	145	57
4	5/35	P	97	38	109	43	-	-	119	47
		C	147	58	145	57	147	58	150	59
	5/69	P	97	38	107	42	-	-	122	48
		C	155	61	155	61	152	60	150	59
6	6/74	P	99	39	117	46	-	-	122	48
		C	160	63	157	62	155	61	150	59
	6/46	P	99	39	112	44	-	-	119	47
		C	157	62	152	60	150	59	150	59
	6/71	P	102	40	109	43	-	-	119	47
		C	160	63	160	63	150	59	150	59
7	6/17	P	119	47	127	50	-	-	127	50
		C	147	58	155	61	157	62	152	60
8	6/17	P	104	41	107	42	-	-	112	44
		C	165	65	178	70	145	57	150	59
9	6/44	P	99	39	119	47	-	-	122	48
		C	170	67	170	67	165	65	152	60
	5/51	P	94	37	122	48	-	-	109	43
		C	163	64	173	68	152	60	152	60

a P = peak height measurement, C = channel height measurement.

b Measured distance from top of oven casting to coal peak or levelled coal line. Distance from top of oven casting to oven roof line (inside) is 117 cm (46 in). Measurements <117 cm (46 in) indicate peaking above the roof line into charge port opening. A desired free space distance of 30 cm (12 in) would require a measurement of 147 cm (58 in) or greater.

c - indicates no data

d May have been recorded incorrectly, may be 109 cm (43 in).

Table 2

CHARGING TIME DATA
USSC FAIRFIELD WORKS

BATTERY 5 - November 30, 1976

PROCESS OPERATIONS		OVENS 31	51	61	71	81	3	33	43	53	63	15	25	35	45	55	65	85	7	17	27	37	47
		MIN.SEC																					
Fill larry car at coal bunker		a	4·53	a	1:39	1:07	1.04	1:53	1:18	1.21	1·58	1·18	1:42	a	1:29	1:24	1:15	a	1 22	1·38	1·16	1:56	1.32
Clean boots[b]																							
Move car to oven		1.40	1·55	1:53	3.45	8.57	0:22	2:47	3:18	5.21[c]	2.08	5.58	2:55	2:10	2:15	2.39	2:07	5:20	1 50	1:16	1:53	1 16	2 00
Clean gooseneck, standpipe cap, and seats		a	1.00	a	a	a	a	a	a	a	a	1:35	0:40	0:59	0:52	1:00	0:34	0.35	0·28	0.27	0:31	0:13	1:08
EPA Inspection		a	0:22	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Close and lute standpipe cap, damper oven, turn on steam		a	0:30	a	a	a	a	a	a	a	a	a	a	a	0:49	1:07	0:32	1:18	0:39	0:26	1:05	0:42	0.30
Spot car on oven[a]																							
Drop sleeves		a	a	a	a	a	a	a	a	a	a	a	a	0:46	0 44	0·34	a	0 21	a	0 41	0 42	a	0·48
Charge coal[d,e] to oven	#1	1·50	2:20	1 38	0:59	1:00	0.54	0·54	1:04	0 55	0.54	1:02	0.53	0:56	0:49	0:44	0 54	1·16	1·05	0 56	0.56	0 57	0:53
	#4	2·05	2 20	2 17	1:19	1:06	1:19	1.21	1.19	1·19	1:19	1·56	1 21	1.22	1:09	0:44	1·17	1 23	1·28	1·32	1 22	2 18	1·33
	#2	2 35	2·20	0 57	0·40	0:32	0:36	3·15	0·34	0·35	0·39	0·49	0 37	0·41	0·36	1.24	0:41	0·47	0.55	0:37	0.37	0:38	0.41
	#3	1 35	1·55	0 57	1:10	1:08	1:25	2:28	0:44	1.03	0 49	1·07	1:28	0 55	1·02	0:41	1·14	1·09	1.05	1.02	1 02	1.26	0.56
Raise sleeves		a	a	a	0.52	1:50	1:40	1:42	1:50	1.38	1:53	1:48	1:40	1·43	2:18	2:10	1:29	1·35	1.35	1·34	1:38	1:48	2:05
Return larry car to bunker		0:30	a	3.26	a	a	1·39	1:50	1:21	1.04	1:12	6:28	0:59	0:48	1:21	1:04	1:25	1 34	0:32	1 07	1:11	1:28	0.46
Overall time laps		a	37·22[f]	11·19	13.45	27:50	13.09	15.45	12:26	16·22	15·50	15·17	12:55	a	a	12·36	17·30	14·28	12.29	11:40	11 40	13·06	12:12

Table 2 (Continued)

CHARGING TIME DATA
USSC FAIRFIELD WORKS

BATTERY 5 - December 3, 1976

PROCESS OPERATIONS		OVENS 46	56	66	76	8	18	28	38	68	78	1	11	21	31
							MIN SEC								
Fill larry car at coal bunker		0:52	1:13	1·07	1:29	1.02	7:28	1:08	1:14	2:28	1.45	1:0[illegible]	1 07	0·57	0.57
Clean boots[b]															
Move car to oven		2·14	2:36	4·16	a	a	a	2:18	1:12	3:02	1.16	1·08	1:15	1·19	a
Clean gooseneck, standpipe cap, and seats		0·31	0:38	0:34	0 50	a	a	0:16	0:18	a	0:16	0:35	0 20	0 20	a
EPA Inspection[a]															
Close and lute standpipe cap, damper oven, turn on steam		0:23	0:30	0:41	0:46	0.16	a	0:55	0:23	a	0:28	0:13	0:26	0:45	0:57
Spot car on oven[a]															
Drop sleeves		a	1:13	a	0 14	1 00	a	1:30	a	a	0·57	0.58	1 13	1·04	1·23
Charge coal to oven[d,g]	#1	1 23	1.13	1·09	1·06	1 39	1 06	1 40	1·03	1 07	1 07	1.05	1 03	1.07	1 01
	#4	2.42	2 33	1:54	2:15	3 00	2·28	3:07	2·37	2·15	2:22	2:39	2 44	2.15	2·30
	#2	0:45	1·01	0·50	0.41	0.46	0:43	1:17	0 48	0·48	0:41	0 43	1 16	0 48	0 49
	#3	1:03	1.03	1 39	1.06	1 10	1·02	1.28	1 23	2·28	2:14	1 32	1·10	1·18	1·14
Raise sleeves		1:37	1·42	1.42	a	1:33	1:40	1:37	a	1:41	1:43	1.54	1 41	1 39	1.23
Return larry car to bunker		0.35	0·55	5 02	1·24	0 32	4·41	0:44	a	1:51	3:45	0:27	1·22	1·49	2.08
Overall time laps		13.48	25 08	22 20	13:41	11 02	19·39	13.41	14 00	30 66	15:38	11·34	12:51	13 57	13.14

Table 2 (Continued)

CHARGING TIME DATA
USSC FAIRFIELD WORKS

BATTERY 6 - December 6, 1976

PROCESS OPERATIONS		OVENS												
		26	36	46	56	66	76	68	78	01	11	21	31	41
		MIN SEC												
Fill larry car at coal bunker		1:10	0:55	0:55	0·55	1:15	1.15	3:10	1:15	1:10	0:50	1:15	0 55	1 00
Clean boots		3 20	1:30	0:15	2·05	1·35	1·30	2:05	0:00	0:00	1:00	1:45	2.35	0.40
Move car to oven		h 1:30	0.39	0.45	0.47	0.53	0:55	1·10	1:25	0.30	1:00	1·40	0 50	0 37
Clean gooseneck, standpipe cap, and seats		h 4:55	0:46	1:20	0:48	0.32	0:30	0.20	0:35	h 2:40	0:45	0:45	0.55	0·33
EPA Inspection		0·05	0.18	0:15	0:05	0.15	0:15	0:10	0.10	0:10	0:10	0:13	0.10	0:15
Close and lute standpipe cap, damper oven, turn on steam		0·33	0:40	0:40	0:35	0:30	0:30	0:25	0:20	0:20	0:30	0:32	h 2:05	0.55
Spot car on oven		0.12	0 12	0:13	0·10	0.10	0:15	0·20	0:10	0:10	0:15	0:10	0 45	h 1·05
Drop sleeves		0.40	0.45	0.52	0 35	0.45	0 25	a	0·25	0.25	0:20	0·30	1 45	h 2 30
Charge-coal to oven	#1 †	1:05	2:15	2.33	2 20	2.25	2 45	2.40	1:35	1:25	2:10	2 10	1·25	1·15
	#4													
	#2	1.15	0 45	0.37	0.40	0:35	a	0·40	0:55	0:35	0 50	0·30	0·35	0 40
	#3	0:50	1:35	h 5·22	2:08	1 50	a	1 30	1 50	2:05	1.30	1·40	1 50	1·00
Raise sleeves		3:50	2:04	1:43	1·42	2:28	a	1:40	1·40	1·23	1:25	1:50	1:40	1·40
Return larry car to bunker		1:15	1:16	1:55	0.55	a	a	2:25	1:10	0·27	1:00	1 05	0.40	1.55
Overall time laps		20·40	13:40	17·25	13·45	13:15	a	16·35	11 30	11:20	11·45	14·05	16·10	14.15

Table 2 (Continued)

CHARGING TIME DATA
USSC FAIRFIELD WORKS

BATTERY 6 - December 8, 1976

PROCESS OPERATIONS		OVENS MIN.SEC 07	17	27	37	47	57	67	77	09	29
Fill larry car at coal bunker		1:30	1:25	a	a	a	a	a	a	a	a
Clean boots		a	a	a	a	a	a	a	a	a	a
Move car to oven		1:30	h 2 03	0.35	0·40	0:40	0:45	0·55	1·10	0 20	k 1·15
Clean gooseneck, standpipe cap, and seats		0:40	0:32	0:30	0:35	0:30	0·15	0:15	0·40	1·00	0:15
EPA Inspection		0.10	0.10	a	0·10	0.10	0:10	0·10	0·10	0.10	0 10
Close and lute standpipe cap, damper oven, turn on steam		0:37	0·50	0.43	0.43	h 2·00	0:15	0:10	0·23	0:48	0 28
Spot car on oven		a	0.15	0 12	0:17	a	0·10	0.13	0:12	0.12	0 10
Drop sleeves		j 1·33	0 35	0 45	0·35	0 40	0·10	0 27	0 25	0·30	0·37
Charge-coal to oven	#1	h 2 30	1·38	2 05	2:18	2 38	1:30	1 35	1:53	1·45	1·32
	#4										
	#2	0·30	0 37	0·35	0·42	0·32	0·25	0·30	0 35	0 35	0.26
	#3	1.00	5 35	2 15	1·30	1 20	1:15	1 00	1 02	1 10	1.12
Raise sleeves		1·40	1 03	1 28	1 20	1 30	1·35	1·40	1 40	1:30	1.40
Return larry car to bunker		0·25	0 47	1.07	0.40	0·55	0·50	1·22	2:13	0 23	0 25
Overall time laps		12 05	15 30	10.15	9 30	10 55	7 20	8 17	12 23	9 53	8 10

Table 2

CHARGING TIME DATA
USSC FAIRFIELD WORKS

FOOTNOTES

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a Data not obtained
b Included in time to fill larry car when it was done
c Resupplied with lute
d Actual time of coal flow from each hopper is shown. Time to switch from one hopper to the next one (usually a few seconds) is not shown.
e For the charges of ovens 31-65, hoppers 1 and 4 were discharged simultaneously. For the charges of ovens 85-47, hoppers 2 and 4 were discharged separately without overlap.
f Long wait for push
g Hoppers 2 and 4 were discharged separately without overlap
h Includes a waiting period preceding the event
i Total time over which hoppers 1 and 4 were discharged
j Includes time to "spot car on oven."
k Includes time to lute a standpipe cap

Table 3

COAL ANALYSES
USSC FAIRFIELD WORKS

Date 1976	Analyses	Battery	Turn	Sample Location	Moisture	VM	S	Ash	<1/8 Mesh	Bulk Density lb/ft^3	Concord %	Black Creek %
Nov 30	1[a]	5,6	A,B,C	Belt	8.33	25.55	0.83	7.05	75[e]	-[f]	52	48
	2[b]	5	B	Larry	9.33	26.27	0.92	6.95	76[e]	46	52	48
	3[c]	5	B	Larry	4.42	24.59	1.00	13.24	62.35	44.88	-	-
	4[d]	5	B	Larry	5.84	26.81	0.78	13.87	51.85	43.36	-	-
Dec. 1	1	5,6	A,B,C	Belt	7.00	23.72	0.79	6.65	76	-	52	48
	2	6	B	Larry	9.00	27.00	0.74	6.77	74	47	52	48
	3	6	B	Larry	3.21	26.03	0.88	11.56	74.33	43.36	-	-
	4	6	B	Larry	4.84	26.54	0.72	10.64	70.28	43.78	-	-
Dec 2	1	5,6	A,B,C	Belt	7.33	26.10	0.76	7.72	75	-	52	48
	2	5	B	Larry	8.00	26.40	0.73	7.10	70	39.7	52	48
	3	5	B	Larry	4.67	26.58	0.86	10.01	80.75	42.99	-	-
	4	5	B	Larry	5.12	26.27	0.76	10.51	74.35	43.05	-	-
Dec 3	1	5,6	A,B,C	Belt	9.33	25.27	0.84	6.28	76	-	52	48
	2	5	B	Larry	8.67	25.62	0.87	7.50	74	-[g]	52	48
	3	5	B	Larry	4.96	25.44	0.83	11.85	78.35	43.78	-	-
	4	5	B	Larry	5.47	26.28	0.72	11.14	80.70	43.42	-	-
Dec 4	1	5,6	A,B,C	Belt	5.95	0.[illegible]2[h]	0.81	8.83	-	-	52	48
	2	5	B	Larry	10.33	25.93	0.93	7.11	-	-[g]	52	48
	3	5	B	Larry	5.36	25.54	0.84	11.20	72.77	43.54	-	-
	4	5	B	Larry	5.52	25.63	0.76	12.32	68.05	44.94	-	-
Dec 6	1	5,6	A,B,C	Belt	8.33	25.46	0.82	6.91	75	-	52	48
	2	6	B	Larry	9.00	26.25	0.87	6.39	74	-[g]	52	48
	3	6	B	Larry	4.75	24.83	0.85	10.17	74.80	45.92	-	-
	4	6	B	Larry	5.47	25.46	0.68	9.36	80.82	41.10	-	-
Dec 7	1	5,6	A,B,C	Belt	10.00	24.83	0.89	7.04	70	-	52	48
	2	6	B	Larry	10.00	25.12	1.01	7.65	71	-[g]	52	48
	3	6	B	Larry	6.05	25.42	0.76	10.19	73.06	39.64	-	-
	4	6	B	Larry	6.28	25.78	0.82	9.88	74.03	40.18	-	-
Dec 8	1	5,6	A,B,C	Belt	10.33	25.11	0.90	7.14	71	-	52	48
	2	6	B	Larry	9.33	26.01	0.82	6.77	72	40.1	52	48
	3	6	B	Larry	6.27	24.30	0.86	10.32	74.82	45.98	-	-
	4	6	B	Larry	7.15	25.70	0.88	10.16	86.57	41.83	-	-
Dec 9	1	5,6	A,B,C	Belt	9.00	27.15	0.86	6.35	65	-	52	48
	2	6	B	Larry	13.33	25.88	0.76	7.17	72	39.7	52	48
	3	6	B	Larry	-	-	-	-	-	-	-	-
	4	6	B	Larry	4.80	25.76	0.98	10.53	77.01	43.42	-	-

a #1 = Company routine analysis of own sample (composite) taken from belt to coal bunker for batteries 5 and 6
b #2 = Company special analysis of EPA sample (composite) taken from larry car hoppers
c #3 = EPA analysis of second EPA sample (composite) taken from larry car hoppers
d #4 = EPA analysis of single EPA sample (spot) taken from larry car hoppers.
e For both analyses (1 and 2) Company actually reported (100-value in table), assumed reporting >1/8 mesh, therefore converted
f - indicates no data
g Insufficient coal sample collected for analysis.
h As reported, probable recording error by analyst.

Table 4

STEAM PRESSURE[a]
USSC FAIRFIELD WORKS

Hour of Day	Date (1976) Nov 30	Dec.1	Dec.2	Dec.3	Dec 4	Dec.5	Dec.6	Dec.7	Dec.8	Dec.9
					Battery 5					
a.m.										
7-8	b	125	125	125	125	120	125	125	125	125
8-9	125	125	125	125	125	120	125	120	125	125
9-10	125	125	125	120	125	120	125	120	125	125
10-11	125	125	125	125	120	120	120	120	125	125
11-12	125	125	125	120	120	125	120	120	125	125
p m.										
12-1	125	125	120	120	120	120	120	120	125	120
1-2	125	125	120	120	120	120	120	120	125	125
2-3	125	125	120	120	120	120	120	120	125	120
3-4	125	125	125	120	125	120	120	120	125	120
4-5	125	125	125	125	120	120	120	120	125	120
					Battery 6					
a m.										
7-8	b	120	140	140	140	140	140	130	125	130
8-9		120	125	140	140	140	140	130	125	130
9-10		120	120	140	140	140	140	130	125	130
10-11		120	120	140	140	140	140	130	130	130
11-12		120	120	140	140	140	140	130	125	125
p.m.										
12-1		120	120	140	140	140	145	130	125	125
1-2		120	120	140	140	140	145	130	125	125
2-3		120	120	140	140	140	140	130	125	125
3-4		120	120	140	140	140	140	130	125	125
4-5	120	120	120	140	140	145	140	130	125	125

a *As measured by a steam gauge with recorder downstream from the regulator in lb/sq. inch (psi) to nearest 5 psi.*
b *Equipment malfunction; no data recorded.*

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TO See Below

DATE December 19, 1977

FROM Assistant Director, Technical Programs

SUBJECT Report on Coke Battery Survey, USSC Fairfield Works, Fairfield, Alabama

A copy of the subject report is enclosed. This report summarizes the visible emissions data for charging, door leaks, topside leaks, and pushing on selected coke batteries at the USSC Fairfield Works.

Should you have any questions, please contact us.

Robert D. Harp

Encl.

cc: Andrew Trenholm, OAQPS, RTP, NC
James O. McDonald, Enf. Div., Region V
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Lois Green, Region IX
Kenneth Eng, Region II
Walter Mugden, Region II
Bernard Bloom, EPA, DSSE
Joe Hopkins, EPA, DSSE

Table 5

COLLECTOR MAIN PRESSURES[a]
USSC FAIRFIELD WORKS

Date (1976)	11-30		12-1		12-2		12-3		12-4		12-5		12-6		12-7		12-8		12-9	
North/South	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
Hour of Day									Battery 5											
a m																				
7-8	9	9	9	-[b]	9	9	9	-	9	9	9	9	9	9	9	9	9	9	9	8
8-9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
9-10	9	9	9	9	9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9
10-11	9	9	9	9	9	9	9	9	9	9	9	9	4[c]	4[c]	9	9	9	9	9	9
11-12	9	9	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9
p m																				
12-1	9	9	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9
1-2	9	9	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9
2-3	9	9	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9
3-4	9	9	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9
4-5	9	9	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	9	9
									Battery 6											
a m.																				
7-8	9	7	9	8	9	8	-	-	9	8	9	8	9	8	9	8	9	8	9	8
8-9	9	8	9	8	9	8	9	-	9	8	9	8	9	8	9	8	9	8	9	8
9-10	9	9	9	8	9	8	9	-	9	9	9	8	9	8	9	8	9	8	9	8
10-11	9	9	9	8	9	8	9	-	9	9	9	8	9	8	9	8	9	8	9	8
11-12	9	9	9	8	9	8	9	-	9	9	9	9	9	8	9	8	9	8	9	9
p m																				
12-1	9	9	9	8	9	8	9	-	9	8	9	9	9	8	9	8	9	8	9	8
1-2	9	8	9	8	9	8	9	-	9	8	9	9	9	9	9	8	9	8	-	9
2-3	9	8	9	8	9	8	9	-	9	8	9	8	9	9	9	8	9	8	-	8
3-4	9	9	9	8	9	8	9	9	9	8	9	8	9	9	9	8	9	8	9	9
4-5	9	9	9	8	9	8	9	9	9	8	9	8	9	9	9	8	9	8	9	8
									Battery 9											
a m																				
7-8									8	9			8	8	8	8	8	8		
8-9									8	9			8	8	8	8	8	-		
9-10									8	9			8	8	8	8	-	8		
10-11									8	9			8	8	8	8	8	8		
11-12									8	8			8	8	8	8	8	8		
p.m.																				
12-1									8	8			8	8	8	8	8	8		
1-2									8	8			8	8	8	8	8	8		
2-3									8	8			8	8	8	8	8	8		
3-4									8	8			8	8	8	8	8	8		
4-5									8	8			8	8	8	8	8	8		

a As recorded at Askania valve at crossover main in either the north (N) or south (S) doghouse in units of millimeters of water back pressure to nearest 1 mm.

b - indicates no data

c Average value for entire hour

Table 6

COKE ANALYSES
USSC FAIRFIELD WORKS

Date 1976	Analyses[a]	Battery	Turn	Sample Location	Stability[b]	Sulfur %	Volatile Matter %	Net Coking Time
Nov 30	1	5	B	Wharf	46 0	0.68	-[c]	-
	2	6	B	Wharf	46 7	0.80	-	-
	3	5,6	A,B,C	Wharfs	43 3	0.84	-	-
Dec. 1	1	5	B	Wharf	43 0	0.68	-	18 13
	2	6	B	Wharf	44.8	0.80	-	18·39
	3	5,6	A,B,C	Wharfs	44.1	0.76	-	18 26
Dec 2	1	5	B	Wharf	42 9	0.79	0.45	17 49
	2	6	B	Wharf	43 6	0 86	0 50	18 05
	3	5,6	A,B,C	Wharfs	34.3	0.85	0.48	17 57
Dec. 3	1	5	B	Wharf	41 6	0.80	0.29	17 59
	2	6	B	Wharf	43.4	0.82	0 22	18 12
	3	5,6	A,B,C	Wharfs	45 6	0.79	0 21	18 06
Dec. 4	1	5	B	Wharf	46.3	0.84	1 50	18 55
	2	6	B	Wharf	45 1	0.82	0 68	18 16
	3	5,6	A,B,C	Wharfs	42.9	0.81	0.92	18 36
Dec 6	1	5	B	Wharf	42.3	0.88	0 83	17.27
	2	6	B	Wharf	45.6	0.89	0.86	17 32
	3	5,6	A,B,C	Wharfs	45 6	0.84	0.59	17:30
Dec. 7	1	5	B	Wharf	45 5	0 85	0.44	17 29
	2	6	B	Wharf	45 2	0 80	0 49	17 45
	3	5,6	A,B,C	Wharfs	43.5	0.84	-	17 37
Dec 8	1	5	B	Wharf	43.3	0 86	0 40	17 10
	2	6	B	Wharf	43 9	0 84	0 30	17 21
	3	5,6	A,B,C	Wharfs	44 4	0.81	0 30	17 16
Dec. 9	1	5	B	Wharf	46 1	0.82	0 20	17 54
	2	6	B	Wharf	43.2	0 87	0 20	17 51
	3	5,6	A,B,C	Wharfs	45.1	0.84	0.20	17 52

a *All 3 analyses performed by Company, No. 3 is routine composite analysis for both batteries 5 and 6, No. 1 and 2 were performed as requested by EPA.*
b *The stability index is the % of coke remaining on a 1-in. screen, when the coke is screened after tumbling (ASTM procedure)*
c *- indicates no data*

Table 7

PUSHING PROCESS PARAMETERS
USSC FAIRFIELD WORKS

Oven No	Offtake Opacity[a]					Coke Face Appearance[b]				Cold Spots[c]		Refractory[d]				Coking Time	
						PS		CS				Jamb		Door			
	0	15	30	45	60	S	F	S	F	PS	CS	PS	CS	PS	CS	Hr	Min
									BATTERY 5								
									DECEMBER 2, 1976								
4	-[e]	-	-	-	-	P	P	-	-	OK	OK	OK	OK	OK	OK	16	55
14	20	0[f]	0	0	0	OK	OK	-	-	OK	OK	OK	OK	Y	OK	16	55
24	30	0[f]	0	0	0	OK	OK	-	-	OK	OK	OK	OK	Y	OK	16	51
54	50	40	40	40	40	P	OK	-	-	OK	OK	Y	OK	OK	Y +	17	27
64	-	-	-	-	-	OK	OK	-	-	OK	OK	Y	OK	OK	OK	17	49
74	-	-	-	-	-	P	-	-	-	OK	OK	Y	OK	Y	Y	17	47
84	-	-	-	-	-	-	-	-	-	OK	OK	Y	OK	OK	OK	17	52
16	-	-	-	-	-	-	-	-	-	OK	OK	OK	OK	OK	Y	18	47
26	-	-	-	-	-	-	-	-	-	OK	OK	OK	Y	OK	OK	18	45
36	20	0	0	0	0	OK	OK	-	-	OK	OK	OK	OK	OK	Y	18	44
46	20	0[f]	0	0	0	OK	OK	-	-	OK	OK	OK	OK	OK	Y	18	06
56	20	0[f]	0	0	0	W	W	-	-	OK	OK	OK	OK	Y	OK	18	11
66	40	15	0	0	0	OK	OK	-	-	OK	OK	Y	OK	OK	OK	18	20
76	10	0	0	0	0	-	-	-	-	OK	OK	OK	OK	OK	OK	18	26
8	30	30[f]	30[f]	10[f]	10[f]	-	-	-	-	OK	OK	OK	OK	OK	Y	18	32
18	35	0[f]	0	0	0	P	P	-	-	OK	OK	OK	OK	OK	Y	18	35
38	-	-	-	-	-	-	-	-	-	OK	Y	OK	OK	Y	OK	18	28
58	100	100	0	0	0	-	-	-	-	OK	OK	OK	OK	Y	OK	18	30
68	0	0[f]	0	0	0	P	OK	-	-	OK	OK	OK	OK	Y	Y	g	
78	-	-	-	-	-	P	P	-	-	OK	OK	OK	OK	OK	Y	g	
28	100	60	60	60	40	-	-	-	-	OK	OK	Y	Y	OK	OK	g	
1	20	0	0	0	0	-	-	-	-	OK	OK	Y	Y	Y	OK	g	
11	60	0[f]	30	20	5	W	OK	-	-	OK	OK	OK	Y	OK	Y	g	
21	-	-	-	-	-	-	-	-	-	-	OK	-	OK	-	OK	g	
									DECEMBER 3, 1976								
46	-	-	-	-	-	-	-	-	-	OK	OK	OK	OK	-	Y	18	05
56	-	-	-	-	-	P	OK	-	-	OK	OK	OK	OK	Y	OK	17	59
66	100	10	0	0	0	P	OK	-	-	OK	OK	OK	OK	OK	OK	18	03
76	-	-	-	-	-	P	OK	-	-	-	OK	-	Y	OK	OK	18	09
8	20	20	0	0	0	W	P	-	-	OK	OK	OK	OK	Y	Y	17	57
18	20	0	0	0	0	W	P	NO	NO	OK	OK	OK	OK	OK	OK	18	10
28	22	20	0	0	0	P	OK	-	-	OK	OK	OK	OK	OK	OK	17	02
38	20	5	0	0	0	W	OK	-	-	OK	OK	OK	OK	Y	OK	17	55
48	-	-	-	-	-	P	P	-	-	OK	OK	OK	OK	Y	Y	15	25
58	100	60	10	10	0	W	OK	-	-	Y	OK	Y	OK	Y	OK	18	22
68	40	10	10	0	0	W	OK	-	-	OK	OK	OK	OK	Y	Y	18	16
78	20	20	0	0	0	P	OK	-	-	OK	OK	OK	OK	Y	Y	18	16
1	-	-	-	-	-	W	OK	-	-	OK	OK	OK	OK	Y	OK	17	56
11	40	20	20	20	20	W	P	-	-	OK	OK	OK	OK	OK	Y	17	55
21	40	0	0	0	0	W	OK	-	-	OK	OK	Y	Y	Y	OK	17	49
31	40	20	10	10	10	P	OK	-	-	OK	OK	OK	OK	OK	Y	17	54
51	20	10	0	0	0	P	OK	-	-	OK	OK	OK	OK	OK	Y	17	50
61	20	10	20	0	0	P	OK	-	-	OK	OK	Y	Y	OK	OK	17	55
13	-	-	-	-	-	P	OK	-	-	OK	OK	OK	OK	Y	OK	18	03
33	-	-	-	-	-	P	P	-	-	OK	OK	OK	OK	OK	OK	15	07
43	20	10	10	0	0	W	P	-	-	-	OK	OK	OK	OK	OK	18	01
53	40	10	10	10	0	P	OK	-	-	Y	Y	OK	OK	OK	OK	18	15
63	20	10	10	0	0	W	OK	-	-	OK	OK	OK	OK	OK	OK	18	10
73	-	-	-	-	-	P	P	-	-	-	OK	Y	Y	OK	OK	18	01
83	100[f]	20	0	0	0	W	OK	-	-	OK	OK	OK	OK	Y	Y	17	51
5	20	10	0	0	0	W	OK	-	-	OK	OK	OK	OK	OK	OK	17	45
15	20	20	0	0	0	P	OK	-	-	OK	OK	OK	OK	OK	OK	18	04
25	-	-	-	-	-	P	OK	-	-	OK	OK	OK	OK	OK	Y	18	02

a Percent Opacity Read at 15-second intervals
b S = smoking face, F = flaming face, W = whole or entire face, P = partial face, OK = none of the above.
c Y = cold spots observed, OK = no cold spots observed, + - door replaced.
d Y = broken refractory observed, OK = no broken refractory observed, + = door replaced.
e - means No Data
f Offtake gas ignited
g Turn C, therefore no data from Company

Table 7 (Continued)

PUSHING PROCESS PARAMETERS
USSC FAIRFIELD WORKS

Oven No	Offtake Opacity[a]					Coke Face[b] Appearance PS		Coke Face[b] Appearance CS		Cold[c] Spots		Refractory[d] Jamb		Refractory[d] Door		Coking Time	
	0	15	30	45	60	S	F	S	F	PS	CS	PS	CS	PS	CS	Hr	Min
BATTERY 6, (Continued)																	
DECEMBER 7, 1976																	
1	-[e]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	26
11	-	-	-	-	-	-	-	OK	OK	-	OK	-	OK	-	OK	17	32
21	-	-	-	-	-	OK	OK	Y	Y	OK	OK	Y	Y	OK	OK	17	24
31	I	-	-	-	-	OK	OK	Y	OK	OK	OK	OK	Y	OK	OK	17	24
41	-	-	-	-	-	P	OK	Y	OK	OK	OK	OK	OK	Y	OK	17	31
51	30	20	I	-	-	OK	OK	OK	OK	OK	Y	Y	OK	OK	Y	17	30
61	-	-	-	-	-	OK	OK	OK	OK	Y	OK	OK	OK	Y	OK	17	26
71	30	20	20	I	-	OK	OK	P	OK	OK	OK	OK	OK	Y	OK	17	28
81	30	20	I	-	-	OK	OK	OK	OK	OK	OK	OK	Y	OK	Y	17	32
3	30	I	-	-	-	OK	OK	P	OK	OK	OK	OK	Y	OK	Y	17	39
13	30	15	I	-	-	OK	OK	P	OK	Y	OK	OK	Y	OK	OK	17	47
23	25	25	25	I	-	OK	OK	Y	OK	OK	Y	OK	Y	OK	OK	17	39
33	25	25	I	-	-	OK	OK	OK	OK	OK	OK	Y	Y	OK	OK	17	35
43	40	25	I	-	-	OK	OK	Y	Y	OK	OK	OK	OK	OK	OK	17	35
53	20	20	20	I	-	OK	OK	Y	OK	OK	OK	OK	Y	OK	Y	17	33
63	20	20	I	-	-	OK	OK	OK	OK	OK	OK	Y	Y	OK	OK	17	32
73	25	-	-	-	-	OK	OK	P	OK	OK	Y	OK	Y	OK	Y	17	29
83	24	I	-	-	-	OK	OK	P	OK	OK	OK	OK	Y	OK	OK	17	27
5	25	25	I	-	-	OK	OK	Y	Y	Y	OK	OK	Y	OK	OK	17	27
45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	22
55	-	-	-	-	-	OK	OK	OK	OK	OK	OK	Y	OK	Y	OK	17	19
65	25	I	-	-	-	OK	OK	P	OK	OK	OK	Y	Y	OK	OK	17	29
75	40	30	30	30	I	OK	OK	OK	OK	OK	OK	OK	Y	Y	OK	17	39
85	20	20	I	-	-	OK	OK	P	OK	OK	OK	OK	Y	OK	OK	23	36
37	-	-	-	-	-	P	OK	Y	OK	OK	OK	OK	OK	Y	OK	17	38
17	30	30	21	I	-	OK	OK	OK	OK	OK	OK	OK	Y	OK	Y	17	41
27	30	I	-	-	-	OK	OK	Y	OK	OK	OK	OK	Y	OK	OK	17	41
7	20	I	-	-	-	OK	OK	OK	OK	Y	OK	OK	Y	Y	OK	17	41
47	20	20	I	-	-	OK	OK	OK	OK	OK	OK	OK	Y	OK	OK	17	50
57	25	I	-	-	-	OK	OK	Y	Y	OK	OK	OK	Y	Y	OK	17	43
DECEMBER 8, 1976																	
75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	42
85	-	-	-	-	-	OK	OK	P	P	-	OK	-	Y	-	OK	17	40
17	-	-	-	-	-	OK	OK	OK	W	OK	OK	OK	OK	OK	OK	17	45
27	-	-	-	-	-	OK	OK	P	P	OK	OK	OK	OK	OK	Y	17	41
37	10	15	I	I	I	OK	OK	P	P	OK	OK	OK	Y	Y	OK	17	36
47	5	10	5	0	0	OK	OK	P	P	OK	OK	Y	OK	OK	OK	17	52
57	0	0	0	0	0	OK	OK	W	OK	OK	OK	OK	OK	Y	OK	18	00
67	5	10	I	0	0	OK	OK	P	P	OK	OK	OK	Y	OK	OK	17	48
77	60	I	I	I	I	OK	OK	P	P	OK	OK	OK	OK	OK	OK	17	47
9	0	40	I	I	I	OK	OK	OK	W	OK	-	OK	Y	OK	Y	17	45
29	0	I	I	I	I	OK	-	P	P	OK	OK	OK	OK	Y	OK	17	46
39	0	10	I	I	I	-	-	P	P	OK	OK	OK	OK	OK	OK	17	36
49	0	10	I	I	I	OK	OK	OK	W	OK	OK	OK	Y	Y	Y	17	26
59	0	I	I	-	-	OK	OK	P	P	OK	OK	OK	Y	Y	OK	17	22
69	5	I	-	-	-	OK	OK	W	OK	OK	OK	OK	OK	OK	OK	17	12
79	10	20	I	-	-	OK	OK	P	P	OK	OK	OK	Y	Y	OK	17	09
2	0	0	0	0	0	OK	OK	OK	W	OK	OK	OK	OK	OK	Y	17	11
12	10	5	I	-	-	Y	OK	P	P	OK	OK	OK	OK	OK	OK	17	08
22	20	I	-	-	-	OK	OK	P	O	OK	OK	OK	OK	OK	Y	17	04
62	-	-	-	-	-	OK	OK	OK	W	Y	OK	OK	OK	Y	Y	17	04
72	-	-	-	-	-	-	-	P	P	OK	OK	OK	OK	OK	Y	17	08

Table 7 (Continued)

PUSHING PROCESS PARAMETERS
USSC FAIRFIELD WORKS

Oven No	Offtake Opacity[a]					Coke Face Appearance[b] PS		Coke Face Appearance[b] CS		Cold Spots[c]		Refractory[d] Jamb		Refractory[d] Door		Coking Time	
	0	15	30	45	60	S	F	S	F	PS	CS	PS	CS	PS	CS	Hr	Min
BATTERY 5 (Continued)																	
DECEMBER 4, 1976																	
13	-[e]	-	-	-	-	P	-	-	-	OK	OK	OK	OK	Y	OK	21	11
33	-	-	-	-	-	P	OK	-	-	OK	OK	OK	OK	OK	OK	18	11
43	-	-	-	-	-	W	OK	W	W	OK	OK	OK	OK	OK	Y	18	20
53	30	0	10	5	0	W	OK	-	-	OK	OK	Y	OK	OK	OK	18	14
63	-	-	-	-	-	P	OK	OK	OK	OK	OK	OK	OK	OK	OK	18	19
73	20	0	0	0	0	P	OK	-	OK	Y	OK	OK	OK	OK	Y	18	17
83	30	30	10	0	0	P	OK	OK	OK	OK	OK	Y	OK	Y	Y	18	22
48	15	15	5	0	0	P	OK	-	-	Y	OK	OK	OK	OK	Y	15	30
5	15	10	0	0	0	W	OK	-	-	OK	OK	OK	OK	Y	OK	18	35
15	20	0	10	5	0	W	OK	-	-	Y	OK	OK	OK	Y	-	18	37
25	20	0	0	0	0	W	OK	-	-	OK	OK	OK	OK	OK	Y	18	43
35	5	0	0	0	0	OK	OK	-	-	OK	OK	OK	OK	Y	Y	18	41
45	100	65	0	0	0	W	OK	-	-	Y	OK	OK	OK	Y	-	18	40
55	0[f]	0	0	0	0	OK	OK	OK	OK	Y	OK	OK	OK	OK	OK	18	43
65	-	-[f]	-	-	-	W	OK	-	-	Y	OK	OK	OK	OK	Y	18	47
75	20	0[f]	0	0	0	P	P	P	P	OK	OK	OK	OK	Y	OK	18	46
85	40	5	0	0	0	OK	OK	-	-	-	OK	OK	-	Y	Y	18	49
37	30	10	0	0	0	P	OK	-	-	-	OK	OK	-	OK	-	19	22
47	100	100	20[f]	10	0	W	P	-	-	OK	OK	Y	OK	Y	Y	19	25
57	15	10	0	0	0	W	P	P	P	OK	OK	OK	OK	Y	Y	19	24
67	-	-[f]	-	-	-	OK	OK	-	-	-	OK	OK	OK	Y	OK	19	27
77	10	0[f]	0	0	0	W	OK	-	-	-	OK	-	OK	OK	OK	19	18
9	40	15	5	0	0	P	OK	-	-	OK	OK	OK	OK	OK	Y	19	22
19	40	5	0	0	0	OK	OK	-	-	Y	OK	OK	OK	Y	OK	18	58
29	50	20	20	0	0	P	OK	W	W	OK	OK	Y	OK	Y	OK	18	55
39	100	100	20	10	0	P	OK	-	-	OK	OK	OK	OK	Y	OK	18	57
49	80	0[f]	5[f]	0[f]	0[f]	W	OK	-	-	OK	OK	OK	OK	Y	OK	18	51
59	-	-	-	-	-	W	W	-	-	OK	OK	OK	OK	OK	OK	18	16
69	40	-	0	0	0	P	OK	P	P	OK	OK	OK	OK	OK	Y	18	36
79	10	0	0	0	0	W	P	-	-	-	-	-	-	Y	Y		
BATTERY 6																	
DECEMBER 6, 1976																	
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	02
24	-	-	-	-	-	OK	OK	W	W	-	OK	-	OK	OK	OK	17	03
34	20	5	5	-	-	OK	OK	P	W	OK	OK	OK	OK	OK	OK	17	06
44	80	90	0	5	5	P	OK	W	W	OK	OK	OK	OK	OK	OK	17	04
54	-	-	-	-	-	P	OK	W	W	OK	OK	OK	OK	OK	OK	16	57
64	-	-	-	-	-	P	OK	W	P	OK	OK	OK	OK	Y	Y	17	00
74	0	0	0	0	0	P	OK	P	P	OK	OK	OK	OK	OK	Y	17	02
84	0	0	0	0	0	OK	OK	P	W	OK	OK	OK	OK	OK	OK	17	06
6	0	0	0	0	0	OK	OK	W	W	OK	OK	OK	OK	OK	Y	17	07
16	10	10	0	0	0	P	OK	W	W	OK	OK	OK	OK	Y	Y	17	12
26	10	0	0	0	0	P	OK	P	W	OK	OK	OK	OK	Y	OK	17	17
36	10	0	0	0	0	OK	OK	-	-	OK	OK	Y	Y	OK	Y	17	22
46	0	0	0	0	0	OK	OK	P	W	OK	OK	OK	OK	OK	Y	17	18
56	0	0	0	0	0	P	OK	W	W	-	OK	-	OK	OK	Y	17	30
66	0	0	0	0	0	OK	OK	W	W	OK	OK	OK	Y	OK	OK	17	36
76	0	0	0	0	0	P	OK	P	W	-	OK	-	OK	Y	OK	17	36
8	-	-	-	-	-	OK	OK	-	-	OK	OK	Y	Y	Y	OK	17	43
58	-	-	-	-	-	-	-	P	W	-	OK	-	OK	-	Y	17	46
68	0	0	0	0	0	OK	OK	W	W	Y	OK	OK	OK	OK	Y	17	47
78	-	-	-	-	-	OK	OK	W	W	OK	OK	Y	OK	OK	OK	17	48
1	-	-	-	-	-	OK	OK	W	W	Y	OK	Y	OK	OK	OK	17	49
11	-	-	-	-	-	OK	OK	W	W	OK	OK	OK	Y	OK	OK	17	48
21	-	-	-	-	-	OK	OK	W	W	OK	-	OK	-	OK	OK	17	43
31	-	-	-	-	-	OK	OK	-	-	OK	-	OK	-	OK	OK	17	52
41	0	5	5	0	0	OK	OK	-	-	OK	OK	OK	Y	OK	OK	17	58

Table 8

METHOD A - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Oven No	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
Battery 5, November 30, 1976									
	11[b]	12	13	11	12	13	11	12	13
31	2.0	2.0	3.0	4.0	2.0	6.5	6.0	4.0	9.5
51	2.0	6.0	1.0	9.0	6.0	6.5	11.0	12.0	7.5
61	5.0	2.0	3.0	7.0	3.0	5.0	12.0	5.0	8.0
71	12.0	3.0	2.0	3.0	3.0	2.0	15.0	6.0	4.0
81	7.0	2.0	4.0	6.0	2.0	4.0	13.0	4.0	8.0
3	102.0	4.0	5.5	5.0	7.0	9.0	107.0	11.0	14.5
13	12.0	3.0	3.0	6.0	3.0	5.5	18.0	6.0	8.5
33	12.0	3.0	2.0	6.0	2.0	3.5	18.0	5.0	5.5
43	28.0	14.0	15.0	10.0	3.0	5.0	38.0	17.0	20.0
53	4.0	1.0	2.5	8.0	4.0	2.5	12.0	5.0	5.0
63	7.0	7.0	13.0	3.0	1.0	4.0	10.0	8.0	17.0
	Mean = 8.9[c]			Standard Deviation = 16.5[d]					
Battery 6, November 30, 1976									
	21[b]	22	23	21	22	23	21	22	23
58	1.5	3.0	1.0	2.5	10.0	3.0	4.0	13.0	4.0
68	6.0	4.5	3.5	12.0	5.0	6.0	18.0	9.5	9.5
78	6.0	3.0	2.0	19.0	10.0	6.0	25.0	13.0	8.0
1	12.0	2.0	1.0	11.0	3.0	4.0	23.0	5.0	5.0
11	28.0	24.0	12.0	19.0	2.0	3.0	47.0	26.0	15.0
21	44.0	5.0	4.0	17.0	5.0	13.0	61.0	10.0	17.0
31	7.0	0.0	1.0	13.0	6.0	4.0	20.0	6.0	5.0
41	21.0	6.0	7.0	12.0	1.0	4.0	33.0	7.0	11.0
51	3.0	1.0	4.0	15.0	4.0	5.0	18.0	5.0	9.0
61	12.0	1.0	3.0	11.0	3.0	2.0	23.0	4.0	5.0
	Mean = 7.6			Standard Deviation = 7.0					
Battery 5, December 1, 1976									
	21[b]	22	23	21	22	23	21	22	23
55	11.0	9.0	9.0	7.0	6.0	3.0	18.0	15.0	12.0
65	15.0	11.0	8.0	13.0	13.0	5.0	28.0	24.0	13.0
75	11.0	4.0	10.0	3.0	2.0	2.0	14.0	6.0	12.0
85	54.0	42.0	41.0	5.0	4.0	3.0	59.0	46.0	44.0
7	21.0	23.0	16.0	25.0	6.0	20.0	45.0	29.0	36.0
17	20.0	3.0	4.0	12.0	1.0	3.0	32.0	4.0	7.0
27	22.0	1.0	9.0	22.0	2.0	6.0	44.0	3.0	15.0
37	22.0	2.0	9.0	4.0	1.0	2.0	26.0	3.0	11.0
47	23.0	8.0	7.0	25.0	5.0	2.0	48.0	13.0	9.0
57	16.0	3.0	3.0	11.0	2.0	4.0	27.0	5.0	7.0
67	22.0	6.0	18.0	7.0	5.0	2.0	29.0	11.0	20.0
77	27.0	3.0	21.0	11.0	10.0	15.0	38.0	13.0	36.0
69	19.0	8.0	11.0	3.0	1.0	2.0	22.0	9.0	13.0
79	4.0	3.0	4.0	8.0	1.0	3.0	12.0	4.0	7.0
2	55.0	26.0	37.0	6.0	3.0	6.0	61.0	29.0	43.0
	Mean = 15.6			Standard Deviation = 5.2					

Table 8 (Continued)

METHOD A - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Oven No	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	Battery 6, December 1, 1976								
	11[b]	12	13	11	12	13	11	12	13
63	8.0	11.0	6.0	12.0	10.0	6.0	20.0	21.0	12.0
73	10.0	17.0	7.0	4.0	12.0	4.5	14.0	29.0	11.5
83	30.0	30.0	29.0	57.0	29.0	35.5	87.0	59.0	64.5
5	35.0	40.0	42.0	66.0	56.0	78.0	101.0	106.0	120.0
15	23.0	18.0	40.0	62.0	23.0	26.0	85.0	41.0	66.0
25	3.0	7.0	14.0	14.0	18.0	18.0	17.0	25.0	32.0
35	5.0	12.0	12.0	37.0	21.0	32.0	42.0	33.0	44.0
45	17.0	22.0	26.0	10.0	9.0	6.0	27.0	31.0	32.0
55	4.0	4.0	3.5	12.0	9.0	8.0	16.0	13.0	11.5
65	4.0	5.0	7.5	7.0	6.0	6.5	11.0	11.0	14.0
75	3.0	3.0	4.0	12.0	7.0	10.0	15.0	10.0	14.0
85	8.0	5.0	11.0	8.0	6.0	7.0	16.0	11.0	18.0
37	4.0	5.0	2.5	7.0	9.0	2.5	11.0	14.0	5.0
57	4.0	4.0	3.0	9.0	7.0	11.0	13.0	11.0	14.0
67	4.0	5.0	4.0	17.0	6.0	5.0	21.0	11.0	9.0
	Mean = 12.5[c]			Standard Deviation = 4.0[d]					
	Battery 5, December 2, 1976								
	11[b]	12	13	11	12	13	11	12	13
22	5.2	8.0	9.0	6.2	14.0	16.0	11.4	22.0	25.0
32	10.0	10.0	6.0	3.0	5.0	3.0	13.0	15.0	9.0
42	2.6	4.0	3.5	1.6	2.0	2.0	4.2	6.0	5.5
52	11.0	9.0	17.5	15.0	9.0	18.0	26.0	18.0	35.5
	Mean = 8 0			Standard Deviation = 2.9					
	Battery 6, December 2, 1976								
	21[b]	22	23	21	22	23	21	22	23
57	6.0	7.0	6.0	5.0	4.0	3.0	11.0	11.0	9.0
67	8.0	4.0	4.0	5.0	4.0	3.0	13.0	8.0	7.0
77	6.0	3.0	2.0	5.0	3.0	3.0	11.0	6.0	5.0
9	11.0	7.0	6.0	5.0	6.0	4.0	16.0	13.0	10.0
19	37.0	18.0	24.0	15.0	16.0	20.0	52.0	34.0	44.0
	Mean = 9.9			Standard Deviation = 3 9					

Table 8 (Continued)

METHOD A - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 6, December 7, 1976

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	13[b]	32	33	13	32	33	13	32	33
73	8.5	6.0	3.5	0.5	0.5	0.0	9.0	6.5	3.5
83	15.5	15.5	8.0	4.0	8.0	3.0	19.5	23.5	11.0
15	8.5	15.0	8.0	2.0	5.0	3.0	10.5	20.0	11.0
25	9.5	16.0	10.0	1.5	2.0	2.0	11.0	18.0	12.0
35	3.0	5.0	3.5	8.0	7.0	9.5	11.0	12.0	13.0
45	1.5	3.0	2.0	1.5	0.5	2.0	3.0	3.5	4.0
55	1.5	5.0	2.5	2.0	5.0	2.0	3.5	10.0	4.5
65	0.5	0.0	0.0	3.0	5.0	2.5	3.5	5.0	2.5
75	2.5	1.0	2.0	1.5	1.5	3.0	4.0	2.5	5.0
85	35.0	47.0	30.0	2.5	3.5	2.0	37.5	50.5	32.0
27	5.5	10.5	7.0	5.0	5.0	4.5	10.5	15.5	11.5
37	1.5	5.0	3.5	4.5	6.5	3.5	6.0	11.5	7.0
47	9.0	14.5	5.5	2.0	3.0	2.5	11.0	17.5	8.0
57	3.0	1.5	2.0	3.5	6.5	4.0	6.5	8.0	6.0
67	1.5	2.5	2.0	2.5	3.0	3.5	4.0	5.5	5.5

Mean = 7.6[c] Standard Deviation = 2.8[d]

Battery 5, December 9, 1976

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
-	13[b]	32	33	13	32	33	13	32	33
78	0.5	1.0	1.6	3.0	9.0	4.5	3.5	10.0	6.1
01	3.5	3.0	1.8	4.5	4.0	4.6	8.0	7.0	6.4
11	1.0	0.5	0.6	3.5	4.0	1.8	4.5	4.5	2.4
21	1.0	1.0	1.3	4.0	5.0	5.4	5.0	6.0	6.7
31	2.5	4.0	1.4	2.0	6.0	2.2	4.5	10.0	3.6
61	4.5	5.0	5.0	5.0	7.5	6.4	9.5	12.5	11.4
71	1.0	2.0	2.5	2.0	3.0	5.8	3.0	5.0	8.3
81	0.8	1.5	1.2	3.5	5.0	5.5	4.3	6.5	6.7
03	3.5	5.0	5.0	7.0	9.5	10.4	10.5	14.5	15.4
13	3.0	2.0	3.3	2.5	4.0	4.5	5.5	6.6	7.8
23	3.5	9.0	5.9	5.0	9.0	6.0	8.5	18.0	11.9
33	5.0	7.0	6.0	3.0	5.0	4.0	8.0	12.0	10.0
43	15.0	30.0	17.4	7.0	10.5	7.8	22.0	40.5	25.2
53	4.5	5.0	4.7	3.0	4.0	4.4	7.5	9.0	9.1
63	3.0	4.5	5.5	7.0	7.0	4.9	10.0	11.5	10.4

Mean = 4.4 Standard Deviation = 2.2

a - *Number of seconds ≥20% opacity.*
b - *Observer number.*
c - *Overall mean for charge time.*
d - *Overall standard deviation for charge time.*
• - *Non-BACT charge.*

Table 9

METHOD B - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
Battery 5, November 30, 1976									
	11[b]	12	13	11	12	13	11	12	13
5	55.0	11.0	13.5	10.0	3.0	19.0	65.0	14.0	32.5
15	37.0	10.0	20.0	12.0	8.0	10.0	49.0	18.0	30.0
25	33.4	13.0	21.0	3.0	9.0	20.0	36.4	22.0	41.0
35	21.0	14.0	39.0	18.0	4.0	12.0	39.0	18.0	51.0
45	39.0	12.0	37.0	8.0	5.0	9.0	47.0	17.0	46.0
55	55.0	16.0	38.0	8.0	4.0	7.0	63.0	20.0	45.0
65	31.0	12.0	26.0	10.0	6.0	11.0	41.0	18.0	37.0
75	37.0	26.0	30.0	9.0	10.0	14.0	46.0	36.0	44.0
85	99.0	72.0	121.0	11.0	10.0	11.0	110.0	82.0	132.0
7	11.0	24.0	27.0	5.0	11.0	10.0	16.0	35.0	37.0
17	33.0	19.0	34.0	13.0	20.0	27.0	46.0	39.0	61.0
27	17.0	40.0	27.0	49.0	35.0	35.0	66.0	75.0	62.0
37	8.0	25.0	20.0	8.0	13.0	16.0	16.0	38.0	36.0
47	63.0	62.0	53.0	16.0	29.0	30.0	79.0	91.0	83.0
57	18.0	26.0	17.0	31.0	16.0	20.0	49.0	42.0	37.0
	Mean = 32.5[c]				Standard Deviation = 12.6[d]				
Battery 6, November 30, 1976									
	21[b]	22	23	21	22	23	21	22	23
71	37.0	5.0	7.0	27.0	19.0	12.0	64.0	24.0	19.0
81	22.0	12.0	12.0	14.0	11.0	17.0	36.0	23.0	29.0
23	13.0	5.0	5.0	49.0	55.0	4.0	62.0	60.0	9.0
33	32.0	20.0	12.0	23.0	16.0	2.0	55.0	36.0	14.0
43	33.0	9.0	.8.0	33.0	11.0	4.0	66.0	20.0	12.0
53	36.0	51.0	33.0	23.0	34.0	18.0	59.0	85.0	51.0
63	19.0	11.0	18.0	20.0	21.0	8.0	39.0	32.0	26.0
73	15.0	14.0	7.0	8.0	6.0	9.0	23.0	20.0	16.0
83	28.0	17.0	22.0	9.0	9.0	8.0	37.0	26.0	30.0
5	45.0	39.0	34.0	12.0	7.0	12.0	57.0	46.0	46.0
15	47.0	~~[illegible]~~	48.0	32.0	29.0	14.0	79.0	29.0	62.0
25	43.0	34.0	5.0	42.0	9.0	12.0	85.0	43.0	17.0
35	100.0	68.0	71.0	45.0	73.0	36.0	145.0	141.0	107.0
45	48.0	28.0	39.0	40.0	45.0	28.0	88.0	73.0	67.0
55	18.0	23.0	12.0	35.0	11.0	20.0	53.0	34.0	32.0
	Mean = 26.8				Standard Deviation 10 5				
Battery 5, December 1, 1976									
	21[b]	22	23	21	22	23	21	22	23
12	68.0	44.0	45.0	35.0	25.0	24.0	103.0	69.0	69.0
22	41.0	28.0	22.0	36.0	31.0	30.0	77.0	59.0	57.0
32	37.0	33.0	19.0	77.0	15.0	13.0	114.0	48.0	37.0
42	9.0	23.0	17.0	34.0	21.0	16.0	43.0	44.0	3[illegible].0
52	21.0	26.0	30.0	14.0	24.0	16.0	35.0	50.0	46.0
62	22.0	32.0	23.0	13.0	20.0	19.0	35.0	52.0	41.0
72	20.0	31.0	25.0	7.0	19.0	3.0	27.0	50.0	28.0
82	56.0	31.0	32.0	17.0	32.0	9.0	73.0	63.0	41.0
4	22.0	25.0	23.0	17.0	18.0	32.0	39.0	43.0	55.0
14	125.0	121.0	177.0	23.0	51.0	46.0	148.0	172.0	223.0
	Mean = 40 9				Standard Deviation = 13.6				

Table 9 (Continued)

METHOD B - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	Battery 6, December 1, 1976								
	11[b]	12	13	11	12	13	11	12	13
77	2.0	2.0	2.8	4.0	3.0	6.2	6.0	5.0	9.0
9	19.0	16.0	23.0	16.0	10.0	9.0	35.0	26.0	32.0
19	9.0	10.0	17.5	9.0	9.0	18.0	18.0	19.0	35.5
47	73.0	42.0	112.0	8.0	8.0	10.0	81.0	50.0	123.0
29	~~6.0~~	7.0	11.0	0.0	8.0	11.5	0.0	15.0	22.5
39	10.0	10.0	16.0	7.0	8.0	12.0	17.0	18.0	23.0
49	32.0	33.0	37.0	10.0	12.0	20.0	42.0	45.0	57.0
59	33.0	26.0	42.0	11.0	14.0	17.0	44.0	40.0	59.0
79	14.0	16.0	21.0	14.0	13.0	12.0	28.0	29.0	33.0
2	8.0	8.0	10.0	11.0	7.0	12.0	19.0	15.0	22.0

Mean = 22.1[c] Standard Deviation = 10.5[d]

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	Battery 5, December 2, 1976								
	11[b]	12	13	11	12	13	11	12	13
62	5.4	5.0	4.5	14.6	8.0	10.0	20.0	13.0	14.5
72	9.0	9.0	12.5	12.0	5.0	11.0	21.0	14.0	23.5
82	10.0	9.0	11.0	5.0	6.0	7.5	15.0	15.0	18.5
4	10.0	14.0	14.5	10.0	10.0	9.0	20.0	24.0	23.5
14	42.0	24.0	35.0	6.0	4.0	2.5	48.0	28.0	37.5
54	6.0	8.0	11.0	3.0	5.0	4.5	9.0	13.0	15.5
64	9.0	10.0	10.0	6.0	7.0	12.5	15.0	17.0	22.5
6	39.0	17.0	17.0	32.0	8.0	45.0	71.0	25.0	62.0
16	14.0	9.0	12.0	10.0	10.0	12.0	24.0	19.0	24.0
26	12.0	14.0	13.5	15.0	13.0	14.0	27.0	27.0	27.5
36	9.0	7.0	7.0	5.0	10.0	10.0	14.0	17.0	17.0
46	136.0	48.0	83.0	10.0	9.0	9.0	146.0	57.0	92.0
56	6.0	7.0	8.0	6.6	7.0	7.0	12.6	14.0	15.0
66	16.0	10.0	13.0	6.0	6.0	7.0	22.0	16.0	20.0
76	24.0	12.0	17.5	4.0	4.0	5.0	28.0	16.0	22.5
8	5.0	7.0	12.0	10.0	9.0	9.0	15.0	16.0	21.0
18	11.0	13.0	16.0	4.0	5.0	7.0	15.0	18.0	23.0
38	24.0	17.0	21.0	8.0	7.0	9.0	32.0	24.0	30.0
68	7.0	7.0	11.0	7.0	7.0	11.0	14.0	14.0	22.0
78	10.0	9.0	15.0	11.0	10.0	19.0	21.0	19.0	34.0
28	7.5	9.0	12.5	4.0	6.0	10.0	11.5	15.0	22.5
1	7.5	5.0	7.5	3.0	4.0	7.0	10.5	9.0	14.5

Mean = 16.0 Standard Deviation = 9.9

Table 8 (Continued)

METHOD B - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	Battery 5, December 3, 1976								
	41[b]	22	12	41	22	12	41	22	12
36	12.0	12.0	8.0	9.0	9.0	6.0	21.0	21.0	14.0
46	29.0	18.0	18.0	13.0	12.0	10.0	42.0	30.0	28.0
56	5.0	8.0	8.0	7.0	6.0	8.0	12.0	14.0	16.0
66	6.0	4.0	8.0	3.0	5.0	9.0	9.0	9.0	17.0
76	7.0	5.0	7.0	5.0	8.0	7.0	12.0	13.0	14.0
8	10.0	5.0	8.0	5.0	4.0	6.0	15.0	9.0	14.0
18	10.0	7.0	10.0	9.0	10.0	11.0	19.0	17.0	21.0
28	20.0	15.0	21.0	3.0	6.0	8.0	23.0	21.0	29.0
38	16.0	27.0	16.0	8.0	9.0	11.0	24.0	36.0	27.0
68	7.0	5.0	6.0	8.0	4.0	6.0	15.0	9.0	12.0
78	4.0	3.0	4.0	8.0	9.0	8.0	12.0	12.0	12.0
1	7.0	7.0	7.0	5.0	5.0	3.0	12.0	12.0	10.0
11	7.0	7.0	6.0	7.0	9.0	8.0	14.0	16.0	14.0
21	7.0	7.0	8.0	5.0	3.0	6.0	12.0	10.0	14.0
31	5.0	4.0	3.0	7.0	9.0	6.0	12.0	13.0	9.0
51	25.0	40.0	29.0	13.0	18.0	14.0	38.0	58.0	43.0
81	7.0	6.0	9.0	5.0	6.0	7.0	12.0	12.0	16.0
3	12.0	31.0	13.0	4.0	10.0	5.0	16.0	41.0	18.0
13	13.0	22.0	16.0	9.0	2.0	5.0	27.0	24.0	21.0
33	9.0	12.0	6.0	6.0	9.0	4.0	15.0	21.0	10.0
43	21.0	29.0	18.0	6.0	7.0	8.0	27.0	36.0	26.0
53	10.0	8.0	6.0	7.0	6.0	5.0	17.0	14.0	11.0
63	7.0	9.0	5.0	8.0	9.0	7.0	15.0	18.0	12.0
73	17.0	18.0	13.0	4.0	5.0	3.0	21.0	23.0	16.0
5	11.0	8.0	7.0	6.0	7.0	7.0	17.0	15.0	14.0
	Mean = 11 5[c]				Standard Deviation = 3.7[d]				
	Battery 5, December 4, 1976								
	21[b]	13	23	21	13	23	21	13	23
13	24.0	13.0	15.0	4.0	4.5	2.0	28.0	17.5	17.0
23	12.0	10.0	9.0	3.0	2.5	1.5	15.0	12.5	10.5
33	8.0	9.5	21.0	5.0	6.0	3.5	13.0	15.5	24.5
43	32.0	18.0	22.0	10.0	12.0	6.0	42.0	30.0	28.0
53	6.0	5.0	7.0	8.0	6.0	5.0	14.0	11.0	12.0
63	9.0	3.0	5.0	6.0	6.5	7.5	15.0	9.5	12.5
73	4.5	4.0	4.0	7.0	9.0	7.0	11.5	13.0	11.0
83	13.0	10.0	12.0	4.0	4.0	4.0	17.0	14.0	16.0
5	60.0	66.0	67.0	13.0	12.0	8.0	73.0	78.0	75.0
15	7.0	7.5	16.0	6.0	6.0	4.5	13.0	13.5	20.5
45	61.0	75.0	67.0	18.0	13.0	6.0	79.0	88.0	73.0
55	5.0	6.0	5.0	4.0	6.0	4.0	9.0	12.0	9.0
65	5.0	4.0	3.0	1.0	1.0	5.0	6.0	5.0	8.0
75	3.5	3.0	3.0	3.0	5.0	2.0	6.5	8.0	5.0
27	5.0	4.5	4.5	4.0	7.5	4.0	9.0	12.0	8.5
37	6.0	5.5	5.5	4.0	2.5	1.5	10.0	8.0	7.0
47	5.0	4.0	6.0	5.0	4.5	5.0	10.0	8.5	11.0
57	5.0	5.5	7.0	3.0	1.5	6.0	8.0	7.0	13.0
67	3.0	3.5	3.0	4.0	4.0	2.0	7.0	7.5	5.0
77	12.0	11.0	12.0	3.0	2.0	2.0	15.0	13.0	14.0
9	21.0	29.0	60.0	6.0	7.5	4.0	27.0	36.5	64.0
19	7.0	12.0	8.0	2.0	3.0	2.5	9.0	15.0	10.5
29	8.0	19.0	9.0	5.0	7.5	3.0	13.0	26.5	12.0
39	11.0	15.0	12.5	3.0	8.0	4.0	14.0	23.0	16.5
49	12.0	20.5	17.5	4.0	6.5	4.0	16.0	27.0	21.5
	Mean = 14.8				Standard Deviation = 5 4				

Table 9 (Continued)

METHOD B - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
Battery 6, December 6, 1976									
	41[b]	22	23	41	22	23	41	22	23
4	12.0	8.0	10.0	5.0	7.0	4.0	17.0	15.0	14.0
14	7.0	5.0	6.0	5.0	3.0	3.0	12.0	8.0	9.0
24	4.0	5.0	4.0	4.0	4.0	3.0	9.0	9.0	7.0
34	6.0	5.0	7.0	8.0	5.0	6.0	14.0	10.0	13.0
44	15.0	11.0	15.0	4.0	2.0	4.0	19.0	13.0	19.0
54	2.0	2.0	2.0	4.0	4.0	3.5	6.0	6.0	5.5
64	4.0	5.0	4.0	4.0	3.0	4.0	8.0	8.0	8.0
84	42.0	42.0	47.0	7.0	8.0	5.5	49.0	50.0	52.5
6	10.0	5.0	7.5	14.0	5.0	12.0	24.0	10.0	19.5
16	14.0	16.0	15.5	15.0	12.0	8.5	29.0	28.0	24.0
26	6.0	4.0	5.5	8.0	4.0	6.0	14.0	8.0	11.5
36	7.0	4.0	7.5	6.0	3.0	4.0	13.0	7.0	11.5
56	3.0	2.0	2.0	5.0	5.0	4.5	8.0	7.0	6.5
66	6.0	5.0	5.5	3.0	3.0	3.5	9.0	8.0	9.0
48	3.0	2.0	4.0	6.0	4.0	4.0	9.0	6.0	8.0
58	4.0	2.0	4.0	3.0	1.0	2.0	7.0	3.0	6.0
68	3.0	3.0	2.0	4.0	3.0	4.0	7.0	6.0	6.0
78	12.0	12.0	13.5	5.0	4.0	4.0	17.0	16.0	17.5
1	6.0	4.0	6.0	6.0	5.0	5.5	12.0	9.0	11.5
11	2.0	2.0	2.5	5.0	4.0	3.0	7.0	6.0	5.5
21	4.0	3.0	3.0	5.0	4.0	4.0	9.0	7.0	7.0
31	2.0	2.0	2.0	2.0	2.0	3.0	4.0	4.0	5.0
41	5.0	5.0	7.0	5.0	5.0	3.0	10.0	10.0	10.0
51	3.0	2.0	3.5	6.0	3.0	5.0	9.0	5.0	8.5
61	7.0	11.0	10.0	9.0	4.0	5.0	16.0	15.0	15.0

Mean = 7.4[c] Standard Deviation = 1.2[d]

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
Battery 6, December 7, 1976									
	13[b]	32	33	13	32	33	13	32	33
11	12.0	13.0	8.5	7.5	15.0	7.0	19.5	28.0	15.5
21	5.0	7.0	6.0	3.5	11.5	6.5	8.5	18.5	12.5
31	1.0	2.0	1.0	2.5	2.0	2.0	3.5	4.0	3.0
41	16.0	16.0	12.5	8.5	9.5	12.0	24.5	25.5	24.5
51	4.0	3.0	4.5	2.5	1.0	2.5	6.5	4.0	7.0
61	4.0	3.5	3.5	3.0	2.0	3.5	7.0	5.5	7.0
71	4.5	7.0	4.0	2.5	2.0	3.0	7.0	9.0	7.0
81	8.5	6.0	6.5	3.5	5.0	4.5	12.0	11.0	11.0
03	6.0	5.0	5.0	4.5	7.0	4.0	10.5	12.0	9.0
13	7.0	4.5	21.0	8.5	11.0	8.5	15.5	15.5	29.5
23	6.0	3.0	3.5	6.0	7.0	6.0	12.0	10.0	9.5
33	9.0	8.0	6.0	6.0	7.0	5.5	15.0	15.0	11.5
43	2.5	2.0	2.0	4.5	6.0	5.0	7.0	8.0	7.0
53	3.5	3.0	2.0	6.0	8.0	6.0	9.5	11.0	8.0
63	7.0	7.0	7.0	9.0	6.5	8.0	16.0	13.5	15.0

Mean = 6.2 Standard Deviation = 2 7

Table 9 (Continued)

METHOD B - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 5, December 8, 1976

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	21[b]	22	23	21	22	23	21	22	23
54	3.0	8.0	10.0	4.0	8.0	5.0	7.0	16.0	15.0
64	10.0	9.0	7.5	5.0	6.0	4.0	15.0	15.0	11.5
74	11.0	10.0	13.5	4.0	5.0	3.5	15.0	15.0	17.0
84	25.0	32.0	42.0	4.0	5.0	4.5	29.0	37.0	46.5
6	7.0	3.0	4.0	6.0	3.0	2.0	13.0	6.0	6.0

Mean = 13.0[c] Standard Deviation = 4.2[d]

Battery 6, December 8, 1976

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	21[b]	12	41	21	12	41	21	12	41
65	6.0	3.0	4.0	3.0	3.0	2.0	9.0	6.0	6.0
75	5.0	4.0	4.0	3.0	4.0	3.0	8.0	8.0	7.0
85	9.0	8.0	7.0	3.0	2.0	2.0	12.0	10.0	9.0
7	6.0	3.0	4.0	3.0	3.0	3.0	9.0	6.0	7.0
27	28.0	25.0	20.0	5.0	7.0	6.0	33.0	32.0	26.0
37	6.0	9.0	7.0	3.0	6.0	5.0	9.0	15.0	12.0
47	8.0	8.0	7.0	3.0	6.0	3.0	11.0	14.0	10.0
57	5.0	3.0	3.0	3.0	4.0	3.0	8.0	7.0	6.0
67	8.0	4.0	4.0	2.0	2.0	2.0	10.0	6.0	6.0
77	6.0	7.0	5.0	2.0	3.0	2.0	8.0	10.0	7.0
9	31.0	28.0	19.0	6.0	13.0	10.0	37.0	41.0	29.0
29	5.0	6.0	3.0	3.0	6.0	5.0	8.0	12.0	8.0
39	15.0	14.0	6.0	4.0	8.0	7.0	19.0	22.0	13.0
49	11.0	9.0	5.0	6.0	9.0	8.0	17.0	18.0	13.0
59	8.0	8.0	6.0	4.0	8.0	6.0	12.0	16.0	12.0
69	4.0	6.0	4.0	4.0	4.0	3.0	8.0	10.0	7.0
79	5.0	5.0	4.0	5.0	5.0	4.0	10.0	10.0	8.0
2	119.0	22.0	17.0	4.0	5.0	5.0	123.0	27.0	22.0
12	14.0	15.0	12.0	6.0	7.0	7.0	20.0	22.0	19.0
52	25.0	22.0	14.0	8.0	9.0	7.0	33.0	31.0	21.0

Mean = 11.5 Standard Deviation = 12.7

Battery 6, December 8, 1976

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	11[b]	12	13	11	12	13	11	12	13
72	10.0	10.0	9.5	5.0	5.0	4.0	15.0	15.0	13.5
82	27.0	16.0	8.5	6.0	7.0	6.5	33.0	23.0	15.0
4	44.0	40.0	33.5	5.0	8.0	5.5	49.0	48.0	39.0
14	20.0	18.0	11.5	9.0	9.0	7.5	29.0	27.0	19.0
24	7.0	10.0	7.5	7.0	8.0	8.0	14.0	18.0	15.5

Mean = 18.2 Standard Deviation = 4.0

Table 9 (Continued)

METHOD B - CHARGING EMISSIONS DATA
USSC FAIRFIELD WORKS

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	Battery 5, December 9, 1976								
	13[b]	32	33	13	32	33	13	32	33
84	31.0	35.0	21.0	11.0	11.0	8.0	42.0	46.0	29.0
06	11.0	19.0	9.5	16.0	13.0	14.5	27.0	32.0	24.0
16	26.0	25.0	19.0	313.0	303.0	305.0	339.0	328.0	324.0
26	6.0	9.0	5.5	9.0	10.0	7.5	15.0	19.0	13.0
36	4.5	6.5	4.5	8.5	9.0	9.0	13.0	15.5	13.5
46	28.0	32.0	27.5	20.5	26.0	17.0	48.5	58.0	44.5
56	8.0	8.0	8.5	10.0	11.0	8.5	18.0	19.0	17.0
66	5.0	5.0	5.6	9.5	10.0	10.5	14.5	15.0	16.1
76	4.5	4.0	5.0	6.5	5.5	7.0	11.0	9.5	12.0
08	11.0	12.0	11.5	13.0	11.0	8.5	24.0	23.0	20.0
18	3.5	4.5	3.5	10.0	15.5	10.5	13.5	20.0	14.0
28	3.5	3.0	2.5	7.0	5.5	6.0	10.5	8.5	8.5
38	49.5	49.0	34.5	6.5	6.0	7.5	56.0	55.0	42.0
58	6.5	8.5	7.0	11.5	12.0	12.0	18.0	20.5	19.0
68	6.5	9.5	7.0	11.0	14.0	10.0	17.5	23.5	17.0

Mean = 13.5[c]　　Standard Deviation = 3.0[d]

Oven No.	Charge Time (Sec)[a]			Cleanup/Seal Time (Sec)[a]			Total Time (Sec)[a]		
	Battery 6, December 9, 1976								
	11[b]	21	22	11	21	22	11	21	22
24	31.0	26.0	35.0	11.0	7.0	4.0	42.0	33.0	39.0
34	4.7	7.0	4.0	3.0	4.0	3.0	7.7	11.0	7.0
54	6.0	4.0	7.0	3.0	5.0	4.0	9.0	9.0	11.0
64	3.4	4.0	3.0	3.0	4.0	4.0	6.4	8.0	7.0
74	9.0	20.0	8.0	3.8	4.0	3.0	12.8	24.0	11.0
84	185.0	167.0	158.0	6.0	6.0	10.0	191.0	173.0	168.0
06	15.0	10.0	11.0	3.0	7.0	5.0	13.0	17.0	16.0
16	4.0	4.0	4.0	7.0	7.0	8.0	11.0	11.0	12.0
26	6.0	5.0	5.0	5.8	3.0	10.0	11.8	8.0	15.0
36	2.4	3.0	3.0	4.4	4.0	6.0	6.8	7.0	9.0
46	13.0	14.0	8.0	2.8	3.0	2.0	15.8	17.0	10.0
56	4.3	3.0	3.0	2.9	3.0	3.0	7.2	6.0	6.0
66	13.0	20.0	8.0	7.0	5.0	5.0	20.0	25.0	13.0
76	3.4	5.0	7.0	1.6	2.0	1.0	5.0	7.0	8.0
08	1.8	3.0	4.0	3.2	2.0	3.0	5.0	5.0	7.0
18	3.4	3.0	2.0	4.3	3.0	3.0	7.7	6.0	5.0
28	4.6	4.0	3.0	2.9	4.0	3.0	7.5	8.0	6.0
38	25.0	26.0	24.0	6.0	5.0	7.0	31.0	31.0	31.0
48	3.6	4.0	3.0	3.3	3.0	1.0	6.9	7.0	4.0
58	3.6	7.0	3.0	15.4	5.0	4.0	19.0	12.0	7.0
68	4.2	5.0	3.0	3.6	3.0	2.0	7.8	8.0	5.0
78	4.2	6.0	3.0	9.8	6.0	4.0	14.0	12.0	7.0
01	4.8	5.0	3.0	5.0	4.0	4.0	9.8	9.0	7.0
11	5.0	4.0	3.0	4.2	5.0	4.0	9.2	9.0	7.0
31	3.0	7.0	3.0	4.4	3.0	3.0	7.4	10.0	6.0
21	4.0	8.0	4.0	9.0	5.0	4.0	13.0	13.0	8.0

Mean = 13 6　　Standard Deviation = 3.5

a - *Number of seconds of any visible emissions.*
b - *Observer number.*
c - *Overall Mean for charge time.*
d - *Overall standard deviation for charge time.*
* - *Non-BACT charge.*

Table 10

METHOD C - DOOR EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 5 — November 30, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0825	2.6	6.5	3.4	6.5	4.5	3.5	9.1
0930	6.5	9.1	4.5	7.8	7.8	5.2	14.3
1038	3.9	10.4	5.8	9.1	7.1	5.2	13.0
1253	5.2	11.7	6.5	11.7	8.4	6.1	15.6
0151	3.9	13.0	7.1	13.0	8.4	6.1	15.6
0248	2.6	11.7	6.5	10.4	7.1	5.2	13.0
0350	2.6	10.4	5.2	10.4	6.5	4.3	10.4
Avg.	3.9	10.4	5.6	9.8	7.1	5.1	13.0

Battery 6 — November 30, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0758	.0	2.6	1.3	2.6	1.3	.9	2.6
0913	2.6	6.5	3.9	6.5	4.5	3.5	7.8
1020	3.9	6.5	3.2	5.2	5.2	3.5	9.1
1120	2.6	6.5	3.2	6.5	4.5	3.0	7.8
0129	2.6	10.4	5.2	10.4	6.5	4.3	11.7
0230	2.6	6.5	3.2	5.2	4.5	3.0	7.8
0333	2.6	6.5	3.2	6.5	4.5	3.0	9.1
Avg.	2.4	6.5	3.3	6.1	4.4	3.0	8.0

Battery 5 — December 1, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0726	3.9	.0	.0	.0	1.9	1.3	3.9
0821	5.2	7.8	3.9	6.5	6.5	4.3	10.4
0930	5.2	5.2	2.6	3.9	5.2	3.5	10.4
1044	7.8	3.9	1.9	2.6	5.8	3.9	10.4
0115	9.1	14.3	7.8	13.0	11.7	8.2	22.1
0217	7.8	13.0	6.5	11.7	10.4	6.9	19.5
0314	5.2	11.7	6.5	11.7	8.4	6.1	15.6
0414	7.5	10.4	5.8	9.1	9.1	6.5	18.2
Avg.	6.5	8.3	4.4	7.3	7.4	5.1	13.8

Battery 6 — December 1, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0744	2.6	3.9	1.9	2.6	3.2	2.2	6.5
0835	5.2	1.3	.6	1.3	3.2	2.2	6.5
0947	6.5	3.9	1.9	3.9	5.2	3.5	7.8
1055	1.3	1.3	.6	1.3	1.3	.9	2.6
1253	2.6	6.5	3.2	3.9	4.5	3.0	7.8
0151	.0	5.2	2.6	1.3	2.6	1.7	5.2
0300	1.3	6.5	3.2	3.9	3.9	2.6	6.5
0400	2.6	1.3	.6	.0	1.9	1.3	2.6
Avg.	2.8	3.7	1.8	2.3	3.2	2.2	5.7

Table 10 (Continued)

METHOD C - DOOR EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 5 — December 2, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0754	6.5	5.2	2.6	5.2	5.8	3.9	10.4
0855	6.5	2.6	1.3	2.6	4.5	3.0	9.1
1001	7.8	5.2	2.6	3.9	6.5	4.3	10.4
1050	5.2	3.9	1.9	3.9	4.5	3.0	7.8
1248	6.5	11.7	5.8	11.7	9.1	6.1	14.3
0159	3.9	11.7	5.8	7.8	7.8	5.2	13.0
0247	5.2	9.1	4.5	7.8	7.1	4.8	10.4
0337	5.2	6.5	3.2	6.5	5.8	3.9	10.4
Avg.	5.8	7.0	3.5	6.2	6.4	4.3	10.7

Battery 6 — December 2, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0739	3.9	2.6	1.3	2.6	3.2	2.2	5.2
0836	1.3	1.3	.6	1.3	1.3	.9	2.6
0946	6.5	3.9	1.9	2.6	5.2	3.5	10.4
1035	5.2	2.6	1.3	2.6	3.9	2.6	6.5
0113	1.3	3.9	1.9	1.3	2.6	1.7	5.2
0215	1.3	6.5	3.2	5.2	3.9	2.6	6.5
0301	1.3	6.5	3.2	3.9	3.9	2.6	7.8
0403	5.2	3.9	1.9	1.3	4.5	3.0	9.1
Avg.	3.2	3.9	1.9	2.6	3.6	2.4	6.7

Battery 5 — December 3, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0807	6.5	9.1	4.5	7.8	7.8	5.2	13.0
0908	1.3	5.2	3.2	2.6	3.2	2.6	6.5
1011	1.3	5.2	2.6	5.2	3.2	2.2	6.5
1118	3.9	9.1	5.2	7.8	6.5	4.8	13.0
0106	2.6	11.7	7.1	11.7	7.1	5.6	11.7
0211	1.3	11.7	6.5	11.7	6.5	4.8	11.7
0307	1.3	10.4	5.2	9.1	5.8	3.9	11.7
Avg.	2.6	8.9	4.9	8.0	5.7	4.2	10.6

Battery 6 — December 3, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0739	3.9	2.6	1.3	2.6	3.2	2.2	6.5
0852	6.5	6.5	3.2	5.2	6.5	4.3	10.4
0954	2.6	3.9	2.6	3.9	3.2	2.6	5.2
1054	1.3	5.2	3.2	5.2	3.2	2.6	6.5
1247	1.3	7.8	3.9	3.9	4.5	3.0	9.1
1051	5.2	7.8	3.9	7.8	6.5	4.3	10.4
0256	2.6	5.2	3.2	3.9	3.9	3.0	7.8
Avg.	3.3	5.6	3.0	4.6	4.4	3.1	8.0

Table 10 (Continued)

METHOD C - DOOR EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 5 — December 4, 1976

0808	3.9	5.2	2.6	1.3	4.5	3.0	9.1
0903	1.3	3.9	1.9	2.6	2.6	1.7	3.9
1003	1.3	2.6	1.3	1.3	1.9	1.3	2.6
1100	1.3	1.3	.6	1.3	1.3	.9	1.3
1239	.0	15.6	7.8	7.8	7.8	5.2	15.6
1340	1.3	10.4	5.2	10.4	5.8	3.9	11.7
1437	1.3	7.8	3.9	6.5	4.5	3.0	9.1
Avg.	1.5	6.7	3.3	4.5	4.0	2.7	7.6

Battery 9 — December 4, 1976

0726	1.6	7.9	4.0	1.6	4.8	3.2	9.5
0826	3.2	9.5	4.8	4.8	6.3	4.2	9.5
0929	1.6	7.9	4.8	6.3	4.8	3.7	6.3
1030	3.2	9.5	5.6	7.9	6.3	4.8	11.1
1208	4.3	.0	.0	.0	2.4	1.6	4.8
1309	6.3	1.6	.8	1.6	4.0	2.6	6.3
1407	4.3	1.6	.8	1.6	3.2	2.1	6.3
Avg.	3.6	5.4	3.0	3.4	4.5	3.2	7.7

Battery 6 — December 6, 1976

0735	3.9	2.6	1.3	2.6	3.2	2.2	5.2
0809	2.6	1.3	1.3	1.3	1.9	1.7	3.9
0857	.0	6.5	3.9	3.9	3.2	2.6	6.5
0950	1.3	1.3	.6	.0	1.3	.9	2.6
1231	3.9	2.6	1.3	2.6	3.2	2.2	5.2
1333	.0	1.3	1.3	1.3	.6	.9	1.3
1415	2.6	.0	.0	.0	1.3	.9	2.6
Avg.	2.0	2.2	1.4	1.7	2.1	1.6	3.9

Battery 9 — December 6, 1976

0715	3.2	.0	.0	.0	1.6	1.1	3.2
0818	6.7	.0	.0	.0	3.2	2.1	6.3
0908	1.6	.0	.0	.0	.8	.5	1.6
0959	1.6	.0	.0	.0	.8	.5	.0
1305	1.6	3.2	2.4	3.2	2.4	2.1	3.2
1402	4.8	.0	.0	.0	2.4	1.6	4.3
Avg.	3.2	0.5	0.4	0.5	1.9	1.1	3.2

Table 10 (Continued)

METHOD C - DOOR EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 6 — December 7, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0733	1.3	.0	.0	.0	.6	.4	1.3
0802	1.3	1.3	.6	1.3	1.5	.9	2.6
0848	5.2	1.3	.6	1.3	3.2	2.2	5.2
0945	3.9	.0	.0	.0	1.9	1.3	3.9
1048	3.9	1.3	.6	1.3	2.6	1.7	5.2
1208	1.3	.0	.0	.0	.6	.4	.0
1303	1.3	.0	.0	.0	.6	.4	.0
1406	1.3	1.3	.6	1.3	1.3	.9	1.3
Avg.	2.4	0.6	0.3	0.6	1.5	1.0	2.4

Battery 9 — December 7, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0852	1.6	.0	.0	.0	.8	.5	1.6
0952	1.6	.0	.0	.0	.8	.5	1.6
1329	1.6	.0	.0	.0	.8	.5	1.6
1429	4.8	3.2	1.6	3.2	4.0	2.6	6.3
Avg.	2.4	0.8	0.4	0.8	1.6	1.0	2.8

Battery 6 — December 8, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0740	.0	1.3	.6	1.3	.6	.4	1.3
083	1.3	3.9	1.9	3.9	2.6	1.7	5.2
0924	3.9	3.9	1.9	3.9	3.9	2.6	5.2
1022	2.6	2.6	1.9	2.6	2.6	2.2	5.2
1213	3.9	7.8	3.9	5.2	5.8	3.9	10.4
1310	1.3	13.0	7.1	9.1	7.1	5.2	13.0
1415	2.6	10.4	5.8	9.1	6.5	4.8	10.4
Avg.	2.2	6.1	3.3	5.0	4.2	3.0	7.2

Battery 9 — December 8, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0724	1.6	.0	.0	.0	.8	.5	1.6
0820	3.2	1.6	.8	1.6	2.4	1.6	4.8
908	1.6	4.8	2.4	3.2	3.2	2.1	6.3
1003	.0	3.2	1.6	3.2	1.6	1.1	3.2
1204	3.2	1.6	.8	.0	2.4	1.6	4.8
1255	3.2	.0	.0	.0	1.6	1.1	3.2
1356	4.8	1.6	.8	1.6	3.2	2.1	4.8
Avg.	2.5	1.8	0.9	1.4	2.2	1.4	4.1

Table 10 (Continued)

METHOD C - DOOR EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 5 — December 9, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0742	.0	6.5	3.2	3.9	3.2	2.2	6.5
0841	11.7	7.8	3.9	5.2	9.7	6.5	16.9
0934	7.8	6.5	3.2	6.5	7.1	4.8	11.7
1042	5.2	2.6	1.3	2.6	3.9	2.6	7.8
1245	5.2	11.7	5.8	10.4	8.4	5.6	14.3
1345	6.5	9.1	5.8	7.8	7.8	6.1	11.7
1452	3.9	10.4	5.8	10.4	7.1	5.2	14.3
Avg.	5.8	7.8	4.1	6.7	6.7	4.7	11.9

Battery 6 — December 9, 1976

STOP TIME	% CS DOORS	% PS DOORS (1/SIDE)	% PS DOORS (2/SIDE)	% CHUCK DOORS	% TOTAL DOORS (2/OVEN)	% TOTAL DOORS (3/OVEN)	% OVENS WITH LEAKING DOORS
0753	1.3	2.6	1.3	.0	1.9	1.3	3.9
0947	10.4	2.6	1.3	1.3	6.5	4.3	10.4
1031	1.3	2.6	1.3	1.3	1.9	1.3	3.9
1232	1.3	9.1	5.2	5.2	5.2	3.9	9.1
1334	.0	5.2	3.9	5.2	2.6	2.6	5.2
1440	1.3	10.4	5.8	9.1	5.8	4.3	10.4
Avg.	2.6	5.4	3.1	3.7	4.0	3.0	7.2

Table 11

METHOD H - TOPSIDE EMISSIONS DATA
USSC FAIRFIELD WORKS

Battery 5[a], November 30, 1976

STOP TIME	■ OFFTAKE ■ % TOT[b] LEAKS	% SIG[c] LEAKS	% LIDS	■ NUMBER OF LEAKS ■ BAS[d]	CAP	SAD[e]	FLG[f]	OTH[g]	■ DECARBON INFO ■ LID[h]	OFT[i]	IGN[j]	EMS[k]	I/E[l]	CLUP INSP[m]
0852	10.4	.0	.0	0	5	1	0	1	12	2	0	0	0	2
0952	7.8	.0	.0	0	4	0	0	1	16	3	0	1	0	0
1059	11.7	1.3	.0	0	9	0	0	0	16	3	0	0	0	1
1311	5.2	1.3	.3	0	4	0	0	0	16	4	0	0	0	1
1409	11.7	1.3	.6	1	7	0	0	0	0	3	0	0	0	2
1511	5.2	.0	2.9	0	4	0	0	0	0	3	0	1	0	0
1611	11.7	.0	3.2	2	7	0	0	0	0	2	0	0	0	0
Avg	9.1	0.6	1.0											

Battery 6[a], December 1, 1976

0858	10.4	.0	.3	0	8	0	0	0	16	3	0	0	0	0
1109	7.8	2.6	.3	0	o	0	0	0	24	2	0	0	0	0
1334	5.2	.0	.3	0	4	0	0	0	8	4	0	0	0	0
1433	.0	.0	.3	0	0	0	0	0	28	0	0	0	0	0
1528	2.6	1.3	.3	0	0	0	0	0	12	3	0	1	0	0
1620	3.9	.0	.3	0	2	0	0	0	4	5	1	0	0	0
1625	6.5	1.3	.0	0	2	0	0	0	0	3	0	0	0	0
Avg	5.2	0.7	0.3											

Battery 5, December 2, 1976

0804	10.4	2.6	.0	0	7	1	0	0	0	5	0	0	0	1
0910	13.0	1.3	.3	0	9	1	0	0	0	3	0	0	0	1
1039	14.3	2.6	.0	0	11	0	0	0	0	4	0	1	0	0
1104	11.7	2.6	.0	0	9	0	0	0	0	5	0	0	0	0
1331	5.2	1.3	.3	0	4	0	0	0	0	0	0	0	0	0
1431	5.2	2.6	1.0	0	4	0	0	0	0	0	0	0	0	0
1517	10.4	.0	2.6	0	0	0	0	0	0	0	0	0	0	0
1622	2.6	.0	1.3	0	2	0	0	0	0	0	0	0	0	0
Avg	9.1	1 6	0.7											

Battery 5, December 3, 1976

0833	16.9	1.3	.3	0	12	0	0	1	0	0	0	0	0	4
0934	26.0	5.2	.0	1	16	0	0	3	0	0	0	0	0	11
1037	29.9	2.6	.0	0	18	1	1	3	4	0	1	0	0	8
1143	19.5	5.2	.0	0	13	0	1	1	0	0	0	0	0	3
1331	11.7	1.3	.3	0	8	0	0	1	0	1	0	1	0	2
1436	11.7	2.6	.0	0	6	0	1	2	0	0	0	0	0	2
1528	2.6	1.3	.3	0	0	0	0	2	0	0	0	0	0	0
Avg	16.9	2.8	0 1											

Battery 5, December 4, 1976

0747	2.6	2.6	.0	0	1	0	1	0	0	1	0	1	0	0
0844	6.5	1.3	.0	0	5	0	0	0	0	0	0	0	0	0
0948	1.3	.0	.0	0	1	0	0	0	0	2	0	0	0	0
1047	2.6	.0	.0	0	2	0	0	0	0	1	0	0	0	0
1224	.0	.0	.6	0	0	0	0	0	0	0	0	0	0	0
1327	5.2	1.3	.3	0	4	0	0	0	0	0	0	0	0	0
1420	2.6	.0	.0	0	2	0	0	0	0	1	0	0	0	0
Avg	3.0	0.7	0.1											

Battery 6, December 6, 1976

0756	3.9	.0	.0	0	0	0	0	0	0	4	0	0	0	0
0849	1.3	.0	.0	0	0	0	0	0	0	2	0	0	0	0
0937	3.9	1.3	.0	0	2	0	1	0	0	5	2	0	0	0
1251	7.5	1.3	.0	0	3	1	2	0	0	5	0	0	0	0
1324	3.9	.0	.0	0	3	0	0	0	0	2	1	0	0	0
1432	7.1	.0	.0	0	5	0	1	0	0	2	0	0	0	0
Avg	4 8	0 4	0 0											

Table 11 (Continued)

METHOD H - TOPSIDE EMISSIONS DATA
USSC FAIRFIELD WORKS

STOP TIME	% TOT[b] LEAKS	% SIG[c] LEAKS	% LIDS	BAS[d]	CAP	SAD[e]	FLG[f]	OTH[g]	LID[h]	OFT[i]	IGN[j]	EMS[k]	I/E[l]	CLUP INSP[m]
	◄ OFFTAKE[a] ►			◄ NUMBER OF LEAKS ►					◄ DECARBON INFO ►					
Battery 6, December 7, 1976														
0738	2.6	.0	.0	0	2	0	0	0	0	0	0	0	0	1
0827	3.9	1.3	.0	0	3	0	0	0	0	0	0	0	0	0
0908	5.2	1.3	.0	0	4	0	0	0	0	0	0	0	0	1
1105	5.2	.0	.0	0	4	0	0	0	0	0	0	0	0	0
1219	6.5	3.9	.0	0	5	0	0	0	0	0	0	0	0	0
1318	6.5	.0	.0	0	4	0	1	0	0	0	0	0	0	1
1416	7.8	.0	.0	0	6	0	0	0	0	0	0	0	0	0
Avg	5.4	0.9	0.0											
Battery 6, December 8, 1976														
0757	6.5	1.3	.0	0	5	0	0	0	12	0	0	0	0	1
0853	9.1	3.9	.6	0	3	0	0	0	12	3	2	0	0	0
0935	9.1	3.9	.0	0	7	0	0	0	0	4	1	0	0	1
1037	6.5	2.6	.3	1	3	0	0	0	0	2	0	1	0	1
1228	9.1	.0	.0	0	7	0	0	0	0	2	0	0	0	1
1321	3.9	.0	.0	0	3	0	0	0	0	3	0	0	0	2
1426	5.2	2.6	.6	0	4	0	0	0	0	2	0	0	0	1
Avg	7.0	2.0	0.2											
Battery 5, December 9, 1976														
0728	3.9	.0	.0	0	2	0	0	1	8	0	2	0	0	0
0827	13.0	1.3	.0	0	9	0	0	1	4	0	1	0	0	0
0921	11.7	.0	1.0	0	8	0	0	1	8	1	1	1	1	0
1019	7.8	.0	1.0	0	6	0	0	0	4	0	0	0	2	0
1214	2.6	.0	.0	0	2	0	0	0	4	1	1	1	2	0
1321	2.6	.0	.0	0	2	0	0	0	4	0	1	0	2	0
1423	2.6	.0	.6	0	2	0	0	0	4	1	2	0	2	0
Avg	6.3	0.2	0.4											
Battery 6, December 9, 1976														
0713	1.3	.0	.3	0	1	0	0	0	0	0	0	0	0	0
0813	6.5	.0	.0	0	4	1	0	0	4	0	1	0	0	0
0903	3.9	.0	.0	0	2	1	0	0	8	0	1	0	1	0
1009	7.8	.0	.6	0	6	0	0	0	8	0	1	0	2	0
1208	2.6	.0	.0	0	2	0	0	0	4	1	1	1	2	0
1309	3.9	.0	.6	0	3	0	0	0	4	0	1	0	2	0
1411	1.3	.0	.6	0	1	0	0	0	0	0	0	0	2	0
Avg	3.9	0 0	0.3											

a - *Both batteries have 77 ovens, 308 lids and 77 offtake systems each*
b - *Any standpipe leak.*
c - *Standpipe leaks at least one meter in length.*
d - *Standpipe base leak*
e - *Gooseneck saddle leak.*
f - *Standpipe or gooseneck flange leak.*
g - *Any other leak.*
h - *Number of lids open for decarbonization.*
i - *Number of standpipe caps open for decarbonization.*
j - *Number of standpipe caps open with flame only.*
k - *Number of standpipe caps open with smoke only.*
l - *Number of standpipe caps open with flame and smoke.*
m - *Number of clean up inspections, [illegible] middle of battery to investigate existence of leaks.*

Table 12

PUSHING EMISSIONS DATA
USSC FAIRFIELD WORKS

OVEN	PUSHING TIME PERIODS[a]/METHODS[b] A-B D sec.	A-B F_1 sec.	A-B E sec.	A-B F_2 sec.	A-B F_3 %	A-B F_3 min:sec	B-C D sec.	B-C F_1 sec.	B-C E sec.	B-C F_2 sec.	B-C F_3 %	B-C F_3 min sec	C-D D sec.	C-D F_1 sec.	C-D E sec.	C-D F_2 sec.	C-D F_3 %	C-D F_3 min sec	COKING TIME hr	COKING TIME min.
									BATTERY 5											
									DECEMBER 4, 1976											
13	4	-	-	-	-	-	18	-	-	-	-	-	0	-	-	-	-	-	21	11
33	0	-	-	-	-	-	13	-	-	-	-	-	0	-	-	-	-	-	18	11
43	15	-	-	-	-	-	43	-	-	-	-	-	8	-	-	-	-	-	18	20
53	2	-	-	-	-	-	18	-	-	-	-	-	0	-	-	-	-	-	18	14
63	0	-	-	-	-	-	5	-	-	-	-	-	0	-	-	-	-	-	18	19
73	0	-	-	-	-	-	6	-	-	-	-	-	0	-	-	-	-	-	18	17
83	3	-	-	-	-	-	33	-	-	-	-	-	2	-	-	-	-	-	18	22
48	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	15	30
5	4	-	-	-	-	-	6	-	-	-	-	-	0	-	-	-	-	-	18	35
15	0	-	-	-	-	-	5	-	-	-	-	-	0	-	-	-	-	-	18	37
25	0	-	-	-	-	-	12	-	-	-	-	-	13	-	-	-	-	-	18	43
35	4	-	-	-	-	-	22	-	-	-	-	-	2	-	-	-	-	-	18	41
45	2	-	-	-	-	-	12	-	-	-	-	-	0	-	-	-	-	-	18	40
55	8	-	-	-	-	-	12	-	-	-	-	-	0	-	-	-	-	-	18	43
65	2	-	-	-	-	-	11	-	-	-	-	-	2	-	-	-	-	-	18	47
75	0	-	-	-	-	-	9	-	-	-	-	-	0	-	-	-	-	-	18	46
85	2	-	-	-	-	-	10	-	-	-	-	-	2	-	-	-	-	-	18	49
37	3	-	-	-	-	-	15	-	-	-	-	-	0	-	-	-	-	-	19	22
47	20	-	-	-	-	-	6	-	-	-	-	-	0	-	-	-	-	-	19	25
57	23	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	19	24
67	12	-	-	-	-	-	7	-	-	-	-	-	0	-	-	-	-	-	19	27
77	7	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	19	18
9	4	-	-	-	-	-	6	-	-	-	-	-	0	-	-	-	-	-	19	22
19	2	-	-	-	-	-	12	-	-	-	-	-	0	-	-	-	-	-	18	58
29	5	-	-	-	-	-	7	-	-	-	-	-	3	-	-	-	-	-	18	55
39	123	-	-	-	-	-	12	-	-	-	-	-	0	-	-	-	-	-	18	57
49	36	-	-	-	-	-	5	-	-	-	-	-	0	-	-	-	-	-	18	51
59	10	-	-	-	-	-	4	-	-	-	-	-	17	-	-	-	-	-	18	16
69	35	-	-	-	-	-	10	-	-	-	-	-	0	-	-	-	-	-	18	36
79	14	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	-	-
									BATTERY 6											
									DECEMBER 6, 1976											
14	0	-	0	-	-	-	28	-	0	-	-	-	0	-	0	-	-	-	17	02
24	0	0	0	0	0	10:15	28	45	0	30	57	0.45	0	0	0	0	0	1.00	17	03
34	0	45	0	0	2	10:00	22	15	0	0	13	0:45	0	0	0	0	0	1:00	17	06
44	0	0	0	0	1	10:15	27	30	0	0	23	0:45	0	0	0	0	0	1 15	17	04
54	0	0	0	0	0	8:30	19	30	0	0	25	0:45	0	0	0	0	0	1.30	16	57
64	1	0	0	0	0	8:45	19	-	0	-	-	-	0	-	0	-	-	-	17	00
74	0	0	0	0	0	11:30	33	45	1	15	42	0:45	4	-	0	-	-	-	17	02
84	66	60	0	0	4	11:30	29	30	1	15	53	0:30	2	0	0	0	3	0:45	17	06
6	25	0	0	0	2	7.30	30	30	0	0	32	0:30	1	0	0	0	0	1:15	17	07
16	45	105	0	0	6	8.30	31	30	0	0	15	0:45	1	0	0	0	0	1 30	17	12
26	35	15	0	0	2	12:00	29	30	1	15	30	0·45	2	0	0	0	0	1:45	17	17
36	5	0	0	0	0	9:30	29	30	0	30	50	0.45	3	-	0	-	-	1:45	17	22
46	0	0	0	0	0	13:45	32	30	0	0	23	0:45	10	15	0	0	9	1:45	17	18
56	11	15	0	0	3	14:30	29	45	0	30	65	0:45	0	0	0	0	0	2:00	17	30
66	3	0	0	0	1	9:15	31	30	0	15	33	0 45	2	-	0	-	-	2 00	17	36
76	19	0	0	0	0	10 45	23	30	0	0	22	0·45	0	0	0	0	1	1·45	17	36
8	18	75	0	15	11	5:30	29	45	0	0	28	0:45	2	0	0	0	0	1:45	17	43
58	13	0	0	0	0	2:45	32	30	0	0	20	0:45	1	0	0	0	0	1:00	17	46
68	5	0	0	0	0	1:45	32	30	0	0	17	0·45	2	0	0	0	0	1:15	17	47
78	10	-	0	-	-	-	25	-	0	-	-	-	0	-	0	-	-	-	17	48
1	11	15	0	0	1	8:15	32	15	0	0	17	0:45	1	0	0	0	0	1·45	17	49
11	15	15	0	0	3	9·45	32	30	0	0	20	0:45	0	0	0	0	0	1:00	17	48
21	11	0	0	0	2	9:00	29	30	0	0	13	0·45	0	0	0	0	0	1 00	17	43
31	19	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	17	52
41	-	0	0	0	0	1:00	27	30	0	0	18	0:45	0	0	0	0	4	1:00	17	58

Table 12 (Continued)

PUSHING EMISSIONS DATA
USSC FAIRFIELD WORKS

OVEN	PUSHING TIME PERIODS[a]/METHODS[b] A-B D	A-B F_1	A-B E	A-B F_2	A-B F_3		B-C D	B-C F_1	B-C E	B-C F_2	B-C F_3		C-D D	C-D F_1	C-D E	C-D F_2	C-D F_3		COKING TIME	
	sec.	sec.	sec.	sec.	%	min sec	sec.	sec.	sec.	sec.	%	min sec	sec.	sec.	sec.	sec.	%	min sec	hr.	min.
									BATTERY 5 DECEMBER 2, 1976											
4	0	0	40	0	5	6:15	5	45	5	0	23	0·45	0	15	0	0	4	1.30	16	55
14	0	30	0	0	6	6:15	2	45	0	0	37	0:45	0	0	0	0	3	0 45	16	55
24	0	30	23	0	6	7:30	2	30	17	0	32	0·45	0	15	0	0	5	1 30	16	51
54	0	180	0	0	8	22 00	40	45	16	45	70	0 45	0	30	0	0	10	1·45	17	27
64	0	75	0	0	10	6 45	6	45	8	15	43	0 45	0	15	0	0	9	1·45	17	49
74	6	45	0	0	6	6.30	28	45	27	45	73	0 45	0	15	0	0	12	1 45	17	47
84	0	195	7	0	12	8.45	6	45	13	0	43	0 45	0	0	0	0	0	1 45	17	52
16	0	0	0	15	2	4 15	37	45	5	15	55	0:45	0	0	0	0	0	1 30	18	47
26	55	75	0	0	10	4 45	40	45	0	0	36	0:45	0	0	0	0	0	1.15	18	45
36	119	90	49	0	10	7·45	39	30	0	30	43	0 45	0	15	0	0	8	1:00	18	44
46	134	30	0	0	5	8:00	36	45	14	0	47	0·45	1	0	0	0	0	1:45	18	06
56	215	165	0	0	10	8.45	34	45	18	0	37	0 45	3	0	0	0	0	0 45	18	11
66	15	75	0	0	5	7 45	38	45	11	0	40	0 45	0	15	0	0	13	1 00	18	20
76	20	15	0	0	5	9:15	41	45	10	0	37	0.45	1	0	0	0	3	0 45	18	26
8	82	30	16	0	6	7 45	40	45	45	45	83	0 45	60	60	47	45	65	1 15	18	32
18	70	15	0	0	5	5:15	34	30	13	0	30	0 45	1	0	0	0	1	1 15	18	35
38	35	90	0	0	9	6:30	40	45	0	0	40	0 45	1	0	0	0	2	1 00	18	28
58	76	45	0	0	7	6:45	40	45	6	0	33	0 45	12	30	0	0	10	1 30	18	30
68	29	75	0	0	7	9:00	36	45	0	0	23	0:45	1	0	0	0	0	1 30	-	-
78	90	75	0	0	4	16.00	33	45	0	0	28	0.45	0	0	0	0	0	1 30	-	-
28	11	0	0	0	5	3.30	41	45	43	45	77	0.45	89	90	95	45	60	1:30	-	-
1	118	210	64	0	9	15 30	40	45	12	0	33	0:45	2	0	0	0	2	1.15	-	-
11	197	150	42	30	14	9 15	35	30	5	0	27	0:45	2	0	0	0	2	1.15	-	-
21	187	150	37	0	17	6.00	37	30	25	0	30	0.45	29	0	0	0	5	1 45	-	-
									DECEMBER 3, 1976											
46[c]	-	0	0	0	4	3:15	-	60	1	0	40	1 00	-	0	0	0	0	1 00	18	05
56	-	0	0	0	0	7:45	-	30	1	0	23	0:45	-	0	0	0	0	0 45	17	59
66	-	0	0	0	0	18 15	-	-	7	-	-	2.00	-	0	0	0	0	0 30	18	03
76	-	15	0	0	3	10:15	-	45	15	0	43	0 45	-	0	0	0	0	2.00	18	09
8	-	15	0	0	8	6.00	-	60	17	15	48	1 00	-	-	0	-	-	-	17	57
18	-	0	0	0	2	11:15	-	45	16	0	42	0:45	-	-	2	-	-	-	18	10
28	-	0	0	0	1	8·45	-	45	6	0	43	0.45	-	-	0	-	-	-	17	02
38	-	0	0	0	1	7 45	-	45	4	0	33	0.45	-	-	0	-	-	-	17	55
48	-	0	0	0	0	11 00	-	45	2	0	53	0:45	-	-	0	-	-	-	15	25
58	-	45	0	0	3	9 30	-	45	30	30	58	0:45	-	45	49	45	100	0 45	18	22
68	-	0	0	0	1	6:30	-	45	9	30	67	0·45	-	0	0	0	0	0 45	18	16
78	-	60	46	0	5	7:00	-	45	11	30	62	0 45	-	0	0	0	0	1:15	18	16
1	-	165	25	0	18	5.45	-	45	2	30	58	0.45	-	-	-	-	-	-	17	56
11	-	180	0	0	15	5.30	-	45	6	0	48	0 45	-	-	-	-	-	-	17	55
21	-	15	0	0	2	7:15	-	45	10	30	65	0.45	-	-	-	-	-	-	17	49
31	-	45	0	0	6	8 30	-	45	5	0	38	0 45	-	0	0	0	0	1:15	17	54
51	-	0	0	0	0	7 45	-	45	12	0	40	0·45	-	0	0	0	0	1 00	17	50
61	-	15	0	0	1	10 00	-	45	17	45	62	0 45	-	0	-	-	-	-	17	55
13	-	0	0	0	3	6 45	-	45	35	15	53	0 45	-	15	0	0	6	1·15	18	03
33	-	90	11	0	11	5·30	-	45	-	30	63	0·45	-	0	0	0	0	1 00	15	07
43	-	15	0	0	5	5:45	-	45	28	30	77	0 45	-	45	6	15	55	0 45	18	01
53	-	90	0	0	11	5 30	-	45	17	30	85	0 45	-	15	0	0	10	0 45	18	15
63	-	15	0	0	4	5 30	-	45	8	30	58	0 45	-	15	10	15	32	0 30	18	10
73	-	0	0	0	4	5 00	-	45	6	0	45	0.45	-	0	0	0	0	0 45	18	01
83	-	0	0	0	1	7:00	-	45	6	0	40	0 45	-	0	0	0	0	0 45	17	51
5	-	120	0	0	10	6:15	-	45	12	15	47	0 45	-	75	61	0	32	1:15	17	45
15	-	30	0	0	3	10.30	-	30	14	0	43	0·30	-	0	0	0	0	1 45	18	04
25	-	15	0	0	4	6 30	-	45	18	0	38	0 45	-	0	0	0	0	1:30	18	02

Table 12 (Continued)

PUSHING EMISSIONS DATA
USSC FAIRFIELD WORKS

OVEN	A-B D sec.	A-B F_1 sec.	A-B E sec.	A-B F_2 sec.	A-B F_3 %	A-B F_3 min.sec	B-C D sec.	B-C F_1 sec.	B-C E sec.	B-C F_2 sec.	B-C F_3 %	B-C F_3 min:sec	C-D D sec.	C-D F_1 sec.	C-D E sec.	C-D F_2 sec.	C-D F_3 %	C-D F_3 min sec	COKING TIME hr	COKING TIME min.
BATTERY 6 (Continued)																				
DECEMBER 7, 1976																				
1	0	0	0	0	0	2 30	60	0	3	0	10	0·45	0	0	0	0	0	0 45	17	26
11	0	0	0	0	1	14.30	25	15	0	0	17	0 45	0	0	0	0	0	1 00	17	32
21	315	30	0	0	8	8:45	37	45	18	30	67	0·45	42	45	0	0	30	0:45	17	24
31	145	45	0	0	5	10:30	32	30	1	0	18	0·45	0	0	0	0	0	0 45	17	24
41	0	0	0	0	0	15.45	32	15	0	0	12	0 45	0	0	0	0	0	0 45	17	31
51	0	0	0	0	0	9 15	35	15	0	0	15	0 45	0	0	0	0	0	1 15	17	30
61	0	0	0	0	0	9 30	31	30	5	0	28	0·45	10	0	0	0	3	0 45	17	26
71	195	30	0	0	6	9 15	35	30	1	0	17	0 45	0	0	0	0	0	0 45	17	28
81	17	0	0	0	0	9 30	27	30	3	0	23	0.45	7	0	0	0	0	0·30	17	32
3	127	45	0	0	7	7·30	30	15	1	0	18	0.45	0	0	0	0	0	1·00	17	39
13	115	0	0	0	2	20·00	25	15	0	0	10	0 45	0	0	0	0	0	0:45	17	47
23	67	0	0	0	4	7:00	32	30	0	0	20	0 45	0	0	0	0	0	1·00	17	39
33	54	30	0	0	5	9:45	25	15	1	0	12	0 45	0	0	0	0	0	0 45	17	35
43	17	0	0	0	5	7:00	34	30	7	0	28	0 45	-	0	0	0	2	0 45	17	35
53	-	0	0	0	7	6·15	35	15	3	0	22	0·45	0	0	0	0	0	0 45	17	33
63	0	0	0	0	4	6 00	31	15	1	0	13	0 45	0	0	0	0	0	0:30	17	32
73	-	-	0	-	-	6·45	32	30	0	0	20	0 45	0	0	0	0	2	0·30	17	29
83	-	0	0	0	8	5:45	27	15	0	0	13	0 45	0	0	0	0	0	0 30	17	27
5	33	75	0	0	11	5 45	30	15	4	0	17	0 45	0	0	0	0	0	0·45	17	27
45	-	0	0	0	0	9 30	31	15	1	0	15	0 45	-	0	0	0	0	0:45	17	22
55	0	0	0	0	0	4 00	32	30	1	0	17	0 45	0	0	0	0	0	0 45	17	19
65	13	0	0	0	5	4 00	35	30	5	0	22	0 45	8	0	0	0	0	0·45	17	29
75	15	0	0	0	4	4·15	29	15	0	0	17	0·45	0	0	0	0	0	0:45	17	39
85	0	0	0	0	6	3 00	31	30	0	0	22	0 30	0	0	0	0	2	0.45	23	36
7	50	45	0	0	11	5·30	27	15	0	0	12	0 45	0	0	0	0	0	1 00	17	38
17	28	30	0	0	4	10.00	35	30	3	0	25	0 45	0	0	0	0	0	1 00	17	41
27	30	15	0	0	9	6 45	30	15	2	0	13	0 45	0	0	0	0	0	0 45	17	41
37	0	0	0	0	1	9.15	31	0	1	0	10	0 45	0	0	0	0	0	0 45	17	41
47	19	0	0	0	4	6 00	28	15	2	0	17	0:45	0	0	0	0	0	0·45	17	50
57	195	180	0	0	15	7.30	37	30	10	15	47	0·45	10	0	0	0	2	0 45	17	43
DECEMBER 8, 1976																				
75	-	0	-	0	-	0 15	10	30	-	0	25	0:30	-	0	-	0	0	0·30	17	42
85	-	0	-	0	0	0 15	28	30	-	0	20	0·30	-	0	-	0	0	0 30	17	40
17	-	0	-	0	0	0:15	15	15	-	0	13	0·45	-	0	-	0	0	0·45	17	45
27	-	0	-	0	0	0·15	26	15	-	0	15	0 45	-	0	-	0	0	1.15	17	41
37	-	0	-	0	0	0·15	32	15	-	0	22	0 45	-	0	-	0	0	1 15	17	36
47	-	0	-	0	0	0.15	34	15	-	0	20	0·30	2	0	-	0	2	0:45	17	52
57	-	0	-	0	0	0:15	21	15	-	0	20	0.30	0	0	-	0	0	0:45	18	00
67	-	0	-	0	0	0:15	8	-	-	-	-	-	0	0	-	0	0	0:30	17	48
77	-	0	-	0	0	0 15	18	15	-	0	13	0 45	0	0	-	0	0	0:30	17	47
9	-	0	-	0	0	0·15	23	15	-	0	12	0.45	0	0	-	0	0	0·45	17	45
29	-	0	-	0	0	0·15	24	15	-	0	10	0:60	-	0	-	0	0	0 45	17	46
39	-	0	-	0	0	0 15	9	15	-	0	18	0.30	-	0	-	0	0	0.45	17	36
49	-	0	-	0	0	0·15	17	15	-	0	27	0.45	-	0	-	0	0	0.30	17	26
59	-	0	-	0	0	0 15	26	15	-	0	23	0 45	3	0	-	0	0	0 30	17	22
69	-	0	-	0	0	0.15	23	30	-	0	18	0 45	-	0	-	0	0	0 30	17	12
79	-	0	-	0	0	0·15	20	45	-	0	27	0 45	-	0	-	0	0	0·30	17	09
2	-	0	-	0	0	0·15	17	15	-	0	20	0·30	-	0	-	0	0	0 45	17	11
12	-	0	-	0	0	0.15	18	15	-	0	13	0 45	-	0	-	0	0	0·45	17	08
22	-	0	-	0	0	0 15	26	15	-	0	20	0 30	-	0	-	0	4	0 60	17	04
62	-	0	-	0	0	0·15	34	45	-	15	58	0 45	8	0	-	0	3	0 45	17	04
72	-	0	-	0	0	0.15	36	30	-	15	34	0:60	-	0	-	0	0	0 45	17	08

a A-B Time period from door removal to coke face movement by ram, B-C· Time period from coke face movement by ram until all coke is in the quench car, C-D Time period from when all coke is in the quench car until the quench begins.

b D, E, and F_3 are the methods described in Appendix C (F_3 = Method F), Columns D, F_1, E, and F_2 are in terms of seconds, Column F_3 is an average opacity and duration of time period, all F_1 values are the number of Method F readings ≥20% multiplied by 15, similarly all F_2 values are the number of Method F readings ≥60% multiplies by 15.

c - indicates no data.

Table 13

METHOD B - CHARGING EMISSIONS DATA[a]
CONSECUTIVE CHARGES
USSC FAIRFIELD WORKS

Oven No.	Average[b]	Sum 4[c]	Mean 4[d]	Sum 5[e]	Mean 5[f]	Sum 7[g]	Mean 7[h]	Sum 10[i]	Mean 10[j]
OBSERVERS: 11 12 13		BATTERY: 5		11-30-76					
5	26.50								
15	22.33								
25	22.47								
35	24.67	95.97	23.99						
45	29.33	98.80	24.70	125.30	25.06				
55	36.33	112.80	28.20	135.13	27.03				
65	23.00	113.33	28.33	135.80	27.16	184.63	26.38		
75	31.00	119.67	29.92	144.33	28.87	189.13	27.02		
7	20.67	111.00	27.75	140.33	28.07	187.47	26.78		
17	28.67	103.33	25.83	139.67	27.93	193.67	27.67	264.97	26.50
27	28.00	108.33	27.08	131.33	26.27	197.00	28.14	266.47	26.65
37	17.67	95.00	23.75	126.00	25.20	185.33	26.48	261.80	26.18
47	59.33	133.67	33.42	154.33	30.87	203.33	29.76	298.67	29.87
57	20.33	125.33	31.33	154.00	30.80	205.67	29.38	294.33	29.43
OBSERVERS: 21 22 23		BATTERY: 6		11-30-76					
71	16.33								
81	15.33								
23	7.67								
33	21.33	60.67	15.17						
43	16.67	61.00	15.25	77.33	15.47				
53	40.00	85.67	21.42	101.00	20.20				
63	16.00	94.00	23.50	101.67	20.33	133.33	19.05		
73	12.00	84.67	21.17	106.00	21.20	129.00	18.43		
83	22.33	90.33	22.58	107.00	21.40	136.00	19.43		
5	39.33	89.67	22.42	129.67	25.93	167.67	23.95	207.00	20.70
15	31.67	105.33	26.33	121.33	24.27	178.00	25.43	222.33	22.23
25	27.33	120.67	30.17	132.67	26.53	188.67	26.95	234.33	23.43
35	79.67	178.00	44.50	200.33	40.07	228.33	32.62	305.33	30.53
45	38.33	177.00	44.25	216.33	43.27	250.67	35.81	323.33	32.33
55	17.67	163.00	40.75	194.67	38.93	256.33	36.62	324.33	32.43

Table 13

METHOD B - CHARGING EMISSIONS DATA[a]
CONSECUTIVE CHARGES
USSC FAIRFIELD WORKS

Oven No.	Average[b]	Sum 4[c]	Mean 4[d]	Sum 5[e]	Mean 5[f]	Sum 7[g]	Mean 7[h]	Sum 10[i]	Mean 10[j]
OBSERVERS: 21 22 23		BATTERY: 5		12-01-76					
12	52.33								
22	30.33								
32	29.67								
42	16.33	128.67	32.17						
52	25.67	102.00	25.50	154.33	30.87				
62	25.67	97.33	24.33	127.67	25.53				
72	25.33	93.00	23.25	122.67	24.53	205.33	29.33		
82	39.67	116.33	29.08	132.67	26.53	192.67	27.52		
4	23.33	114.00	28.50	139.67	27.93	185.67	26.52		
14	141.00	229.33	57.33	255.00	51.00	297.00	42.43	409.33	40.93
OBSERVERS: 11 12 13		BATTERY: 6		12-01-76					
77	2.27								
9	19.33								
19	12.17								
39	12.00	45.77	11.44						
49	34.00	77.50	19.37	79.77	15.95				
59	33.67	91.83	22.96	111.17	22.23				
79	17.00	96.67	24.17	108.83	21.77	130.43	18.63		
2	8.67	93.33	23.33	105.33	21.07	136.83	19.55		
OBSERVERS: 11 12 13		BATTERY: 5		12-02-76					
62	4.97								
72	10.17								
82	10.00								
14	33.67	58.80	14.70						
54	8.33	62.17	15.54	13.43	67.13				
64	9.67	61.67	15.42	14.37	71.83				
16	11.67	63.33	15.83	14.67	73.33	88.47	12.64		
26	13.17	42.83	10.71	15.30	76.50	96.67	13.81		
36	7.67	42.17	10.54	10.10	50.50	94.17	13.45		
56	7.00	39.50	9.87	9.83	49.17	91.17	13.02	116.30	11.63
76	17.83	45.67	11.42	11.47	57.33	75.33	10.76	129.17	12.92
8	8.00	40.50	10.12	10.73	53.67	75.00	10.71	127.00	12.70
18	13.33	46.17	11.54	10.77	53.83	78.67	11.24	130.33	13.03
28	8.33	47.50	11.87	10.90	54.50	75.33	10.76	105.00	10.50
78	11.33	41.00	10.25	11.77	58.83	73.50	10.50	108.00	10.80
28	9.67	42.67	10.67	10.13	50.67	75.50	10.79	108.00	10.80
1	6.67	36.00	9.00	9.87	49.33	75.17	10.74	103.00	10.30

Table 13

METHOD B - CHARGING EMISSIONS DATA[a]
CONSECUTIVE CHARGES
USSC FAIRFIELD WORKS

Oven No.	Average[b]	Sum 4[c]	Mean 4[d]	Sum 5[e]	Mean 5[f]	Sum 7[g]	Mean 7[h]	Sum 10[i]	Mean 10[j]
OBSERVERS:	41 22 12		BATTERY: 05	12-03-76					
36	10.67								
46	21.67								
56	7.00								
66	6.00	45.33	11.33						
76	6.33	41.00	10.25	51.67	10.33				
8	7.67	27.00	6.75	48.67	9.73				
18	9.00	29.00	7.25	36.00	7.20	68.33	9.76		
28	18.67	41.67	10.42	47.67	9.53	76.33	10.90		
68	6.00	41.33	10.33	47.67	9.53	60.67	8.67		
73	3.67	37.33	9.33	45.00	9.00	57.33	8.19	96.67	9.67
1	7.00	35.33	8.83	44.33	8.67	58.33	8.33	93.00	9.30
11	6.67	23.33	5.83	42.00	8.40	58.67	8.38	78.00	7.80
21	7.33	24.67	6.17	30.67	6.13	58.33	8.33	78.33	7.83
31	4.00	25.00	6.25	28.67	5.73	53.33	7.62	76.33	7.63
51	31.33	49.33	12.33	55.33	11.27	65.00	9.43	101.33	10.13
81	7.33	50.00	12.50	56.67	11.33	67.33	9.62	101.00	10.10
3	18.67	61.33	15.33	68.67	13.73	82.33	11.76	110.67	11.07
13	18.67	76.00	19.00	80.00	16.00	94.00	12.43	110.67	11.07
33	9.00	53.67	13.42	85.00	17.00	96.33	13.76	113.67	11.37
43	22.67	69.00	17.25	76.33	15.27	111.67	15.95	132.67	13.27
53	8.00	58.33	14.58	77.00	15.40	115.67	16.52	133.67	13.37
63	7.00	46.67	11.67	65.33	13.07	91.33	13.05	134.00	13.40
73	16.00	53.67	13.42	62.67	12.53	100.00	14.29	142.67	14.27
5	8.07	39.67	9.92	62.33	12.47	90.00	12.86	147.33	14.73

Table 13

METHOD B - CHARGING EMISSIONS DATA[a]
CONSECUTIVE CHARGES
USSC FAIRFIELD WORKS

Oven No.	Average[b]	Sum 4[c]	Mean 4[d]	Sum 5[e]	Mean 5[f]	Sum 7[g]	Mean 7[h]	Sum 10[i]	Mean 10[j]
OBSERVERS:	21 13	23	BATTERY: 05	12-04-76					
13	17.33								
23	10.33								
33	12.83								
43	24.00	64.50	16.12						
53	6.00	53.17	13.29	70.50	14.10				
63	5.67	48.50	12.12	58.83	11.77				
73	4.17	39.83	9.96	52.67	10.53	60.33	11.48		
83	11.67	27.50	6.87	51.50	10.30	74.67	10.67		
15	10.17	31.67	7.92	37.67	7.53	74.50	10.64		
45	67.67	93.67	23.42	99.33	19.87	129.33	18.48	169.83	16.98
55	5.33	94.83	23.71	99.00	19.80	110.67	15.81	157.83	15.78
65	4.00	87.17	21.79	98.83	19.77	106.67	15.52	151.50	15.15
75	3.17	80.17	20.04	90.33	18.07	106.17	15.17	141.83	14.18
27	4.67	17.17	4.29	84.83	16.97	106.67	15.24	122.50	12.25
37	5.67	17.50	4.37	22.83	4.57	100.67	14.38	122.17	12.22
47	5.00	18.50	4.62	22.50	4.50	95.50	13.64	121.50	12.15
57	5.83	21.17	5.29	24.33	4.87	33.67	4.81	123.17	12.32
67	3.17	19.67	4.92	24.33	4.87	31.50	4.50	114.67	11.47
77	11.67	25.67	6.42	31.33	6.27	39.17	5.60	116.17	11.62
9	36.67	57.33	14.33	62.33	12.47	72.67	10.38	85.17	8.52
19	9.00	60.50	15.12	66.33	13.27	77.00	11.00	88.83	8.88
29	12.00	69.33	17.33	72.50	14.50	83.33	11.90	96.83	9.68
39	12.83	70.50	17.62	82.17	16.43	91.17	13.02	106.50	10.65
49	16.67	50.50	12.62	87.17	17.43	102.00	14.57	118.50	11.85

Table 13

METHOD B - CHARGING EMISSIONS DATA[a]
CONSECUTIVE CHARGES
USSC FAIRFIELD WORKS

Oven No.	Average[b]	Sum 4[c]	Mean 4[d]	Sum 5[e]	Mean 5[f]	Sum 7[g]	Mean 7[h]	Sum 10[i]	Mean 10[j]
OBSERVERS: 41 22 23	BATTERY: 06	12-06-76							
4	10.00								
14	6.00								
24	4.33								
34	6.00	26.33	6.58						
44	13.67	30.00	7.50	40.00	8.00				
54	2.00	26.00	6.50	32.00	6.40				
64	4.33	26.00	6.50	30.33	6.07	46.33	6.62		
6	7.50	27.50	6.87	33.50	6.70	43.83	6.26		
16	15.17	29.00	7.25	42.67	8.53	53.00	7.57		
26	5.17	32.17	8.04	34.17	6.83	53.83	7.69	74.17	7.42
36	6.17	34.00	8.50	38.33	7.67	54.00	7.71	70.33	7.03
56	2.33	28.83	7.21	36.33	7.27	42.67	6.10	66.67	6.67
66	5.50	19.17	4.79	34.33	6.87	46.17	6.60	67.83	6.78
48	3.00	17.00	4.25	22.17	4.43	44.83	6.40	64.83	6.48
58	3.33	14.17	3.54	20.33	4.07	40.67	5.81	54.50	5.45
68	2.67	14.50	3.62	16.83	3.37	28.17	4.02	55.17	5.52
78	12.50	21.50	5.37	27.00	5.40	35.50	5.07	63.33	6.33
1	5.33	23.83	5.96	26.83	5.37	34.67	4.95	61.17	6.12
11	2.17	22.67	5.67	26.00	5.20	34.50	4.93	48.17	4.82
21	3.33	23.33	5.83	26.00	5.20	32.33	4.62	46.33	4.63
31	2.00	12.83	3.21	25.33	5.07	31.33	4.48	42.17	4.22
41	5.67	13.17	3.29	18.50	3.70	33.67	4.81	45.50	4.55
51	2.83	13.83	3.46	16.00	3.20	33.83	4.83	42.83	4.28
61	9.33	19.83	4.96	23.17	4.63	30.67	4.38	49.17	4.92
OBSERVERS: 21 22 23	BATTERY: 05	12-08-76							
54	7.00								
64	8.83								
74	11.50								
6	4.67	32.00	8.00						
OBSERVERS: 13 32 33	BATTERY: 06	12-07-76							
11	11.17								
21	6.00								
31	1.33								
41	14.83	33.33	8.33						
51	3.83	26.00	6.50	37.17	7.43				
61	3.67	23.67	5.92	29.67	5.93				
71	5.17	27.50	6.87	28.83	5.77	46.00	6.57		
81	7.00	19.67	4.92	34.50	6.90	41.83	5.98		
03	5.33	21.17	5.29	25.00	5.00	41.17	5.88		
13	10.83	28.33	7.08	32.00	6.40	50.67	7.24	69.17	6.92
23	4.17	27.33	6.83	32.50	6.50	40.00	5.71	62.17	6.22
33	7.67	28.00	7.00	35.00	7.00	43.83	6.26	63.83	6.38
43	2.17	24.83	6.21	30.17	6.03	42.33	6.05	64.67	6.47
53	2.83	16.83	4.21	27.67	5.53	40.00	5.71	52.67	5.27
63	7.00	19.67	4.92	23.83	4.77	40.00	5.71	55.33	5.58

Table 13

METHOD B - CHARGING EMISSIONS DATA[a]
CONSECUTIVE CHARGES
USSC FAIRFIELD WORKS

Oven No.	Average[b]	Sum 4[c]	Mean 4[d]	Sum 5[e]	Mean 5[f]	Sum 7[g]	Mean 7[h]	Sum 10[i]	Mean 10[j]
OBSERVERS: 11 12 13		BATTERY: 06		12-08-76					
72	9.83								
82	17.17								
4	39.17								
14	16.50	82.67	20.67						
24	8.17	81.00	20.25	90.83	18.17				
OBSERVERS: 21 12 41		BATTERY: 06		12-08-76					
65	4.33								
75	4.33								
7	4.33								
27	24.33	37.33	9.33						
37	7.33	40.33	10.08	44.67	8.93				
47	7.67	43.67	10.92	48.00	9.60				
57	3.67	43.00	10.75	47.33	9.47	56.00	8.00		
67	5.33	24.00	6.00	48.33	9.67	57.00	8.14		
77	6.00	22.67	5.67	30.00	6.00	58.67	8.38		
9	26.00	41.00	10.25	48.67	9.73	80.33	11.48	93.33	9.33
29	4.67	42.00	10.50	45.67	9.13	60.67	8.67	93.67	9.37
39	11.67	48.33	12.08	53.67	10.73	65.00	9.29	101.00	10.10
49	8.33	50.67	12.67	56.67	11.33	65.67	9.38	105.00	10.50
59	7.33	32.00	8.00	58.00	11.60	69.73	9.90	88.00	8.80
69	4.67	32.00	8.00	36.67	7.33	68.67	9.81	85.33	8.53
79	4.67	25.00	6.25	36.67	7.37	67.33	9.62	82.33	8.23
12	13.67	30.33	7.58	38.67	7.73	55.00	7.36	92.33	9.23
52	20.33	43.33	10.83	50.67	10.13	70.67	10.10	107.33	10.73
OBSERVERS: 13 32 33		BATTERY: 05		12-09-76					
06	13.17								
16	23.33								
26	6.83								
36	5.17	48.50	12.12						
46	29.17	64.50	16.12	77.67	15.53				
56	8.17	49.33	12.33	72.67	14.53				
66	5.20	47.70	11.92	54.53	10.91	91.03	13.00		
76	4.50	47.03	11.76	52.20	10.44	82.37	11.77		
08	11.50	29.37	7.34	58.53	11.71	70.53	10.08		
18	3.83	25.03	6.26	33.20	6.64	67.53	9.65	110.87	11.09
28	3.00	22.83	5.71	28.03	5.61	65.37	9.34	100.70	10.07
38	44.33	62.67	15.67	67.17	13.43	80.53	11.50	121.70	12.17
58	7.33	58.50	14.62	70.00	14.00	79.70	11.39	122.20	12.22
68	7.67	62.33	15.58	66.17	13.23	82.17	11.74	124.70	12.47

Table 13

METHOD B - CHARGING EMISSIONS DATA[a]
CONSECUTIVE CHARGES
USSC FAIRFIELD WORKS

OBSERVERS: 11 21 22 BATTERY: 06 12-09-76

Oven No	Average[b]	Sum 4[c]	Mean 4[d]	Sum 5[e]	Mean 5[f]	Sum 7[g]	Mean 7[h]	Sum 10[i]	Mean 10[j]
24	30.67								
34	5.23								
54	5.67								
64	3.47	45.03	11.26						
74	12.33	26.70	6.67	57.37	11.47				
06	12.00	33.47	8.37	38.70	7.74				
16	4.00	31.80	7.95	37.47	7.49	73.37	10.48		
26	5.33	33.67	8.42	37.13	7.43	48.05	6.86		
36	2.60	24.13	6.03	36.47	7.29	45.60	6.51		
46	11.67	23.80	5.95	35.80	7.16	51.60	7.37	93.17	9.32
56	3.43	23.23	5.81	27.23	5.45	51.57	7.37	65.93	6.59
66	13.67	31.57	7.89	36.90	7.38	52.90	7.56	74.37	7.44
76	5.13	33.90	8.47	36.70	7.34	43.05	6.58	73.83	7.38
08	2.93	25.17	6.29	36.93	7.37	44.97	6.42	73.30	7.33
18	2.80	24.53	6.13	27.97	5.59	42.43	6.06	63.77	6.38
28	3.87	14.73	3.68	26.40	5.68	43.50	6.21	55.63	5.56
38	25.00	34.60	8.65	39.73	7.95	56.83	8.12	75.63	7.06
48	3.57	35.20	8.60	38.13	7.63	56.93	8.13	74.83	7.48
58	4.53	30.93	9.23	39.73	7.95	47.80	6.83	76.57	7.66
68	4.07	37.13	9.28	41.00	8.20	46.73	6.68	68.97	6.90
78	4.40	16.53	4.13	41.53	8.31	48.20	6.89	69.93	6.99
11	4.00	17.00	4.25	20.93	4.11	49.40	7.06	60.27	6.03
31	4.33	16.80	4.20	21.33	4.27	49.87	7.12	59.47	5.95
21	5.33	18.07	4.52	22.13	4.43	30.20	4.31	61.37	6.19

a BACT charges only
b Average number of seconds of any visible emissions for all three observers.
c Sum of averages for four consecutive observations.
d The mean of the sum of averages for four consecutive observations
e Sum of averages for five consecutive observations
f The mean of the sum of averages for five consecutive observations
g Sum of averages for seven consecutive observations
h The mean of the sum of averages for seven consecutive observations
i Sum of averages for ten consecutive observations
j The mean of the sum of averages for ten consecutive observations