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VISUAL GROUND AIDS SURVEY OF JOHN F. KENNEDY INTERNATIONAL AIRPORT

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Paul H. Jones



NOVEMBER 1975

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16. Abstract The purpose of this report was to document the types of visual ground aids that are presently being used at John F. Kennedy International Airport. The report was done in support of an overall program at the Department of Transportation, Transportation System Center, to develop an airport surface traffic control system. This survey was accomplished through the help of the Aviation Technical Services Division, Aviation Department, of the Port Authority of New York and New Jersey. Information for this survey was gathered through visitation to the airport, airport drawings, and discussions with Port Authority personnel. Information from this report will be used to determine the feasibility of installing and operating an airport surface traffic control system.					
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PREFACE

This survey was accomplished through the help of the Aviation Technical Services Division, Aviation Department, of the Port Authority of New York and New Jersey. Information for this survey was gathered through visits to the airport, study of airport drawings, and discussions with Port Authority personnel. Most of the discussions were with Mr. Renato L. Berzolla, Senior Airport Engineer. Discussions on maintenance were with Mr. Joseph L. Johnson, Electrical Maintenance Supervisor.

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INTRODUCTION

PURPOSE.

The purpose of this report was to document the types of visual ground aids that are being used at John F. Kennedy (JFK) International Airport. Information on types of lighting and lighting power controls, maintenance systems, signs, markings, markers, and docking aids are compiled.

BACKGROUND.

This report was done in support of an overall program at the Department of Transportation, Transportation System Center, to develop an airport surface traffic control system. This program is sponsored by the Federal Aviation Administration (FAA) through the Systems Research and Development Services, Washington, and was accomplished by a team from the National Aviation Facilities Experimental Center (NAFEC) by request of the Airport Surface Traffic Control Project Manager.

JFK Airport is maintained and operated by the Port Authority of New York and New Jersey. There are four major instrumented runways and one short takeoff and landing (STOL)/general aviation runway (figure 1 shows layout of the airport).

DISCUSSION

RUNWAY LIGHTING FIXTURES.

Several types of lighting fixtures are used at JFK. They are depicted in table 1.

TABLE 1. LIST OF ALL RUNWAY LIGHTS AT JFK AIRPORT

<u>Type</u>	<u>Use</u>	<u>Amount</u>	<u>Location</u>
L-852	R/W C/L	452	R/W 4L - 22R
L-850A	R/W C/L	166	R/W 4R - 22L
L-819	R/W Edge	552	R/W's: 4L-22R, 4R-22L, 13L-31R, 13R-31L
L-802	R/W Edge	42	R/W 14-32
L-850B	TDZ	360	R/W 4R-22L

L-819. All major runways at JFK are equipped with L-819-type high-intensity runway edge lighting fixtures (figure 2). These have 200-watt lamps with fixed-focus bidirectional lenses and are spaced at 200-foot intervals at the runway edge, except for runway 4R-22L which has its edge lights spaced at 100-foot intervals.

L-819 IMPROVED. There are a few new L-819 runway edge lighting fixtures in use as runway threshold lights on runway 31L (figure 3). These fixtures are smaller in size, due mostly to a smaller glass globe and are also 200-watts with fixed-focus bidirectional lenses. Because of its smaller and more stream-line shape, it should be more able to withstand jet blasts.

L-802. Runway 14-32 is equipped with medium-intensity L-802-type runway edge lighting fixtures. An L-802-type light is shown in figure 4. These lights are installed with 30-watt lamps. Forty-five-watt lamps were used until pilots of large jets were mistaking runway 14-32 for runway 13L-31R. It seems that when the major runway's edge lights were on step 2 or 3 brightness level, they looked similar to the 45-watt lights that are always on full intensity. The threshold lights on runway 14-32 are L-819 fixtures with 45-watt lamps installed in them.

L-852. Runway 4L-22R has medium-intensity centerline lights installed. These are L-852 fixtures with 45-watt lamps and are installed at 25-foot spacings. An L-852-type fixture is shown in figure 5. They are alternately powered by two regulators (i.e., every other light is powered by a different regulator) for backup reliability.

L-850A. Runway 4R-22L has high-intensity type L-850A centerline fixtures installed (figure 6). These contain lamps of 200 watts and are spaced every 50 feet.

L-850B. Runway 4R-22L also has touchdown zone lighting fixtures (L-850B) on the first 3,000 feet on each end of the runway (figure 7). These fixtures are in two groups of three, one group on each side of the runway centerline, and are spaced at 100-foot intervals down the runway. Figure 8 shows a typical installation of touchdown zone lighting. Runway 4R is the only category (CAT) II runway at JFK. Runway 22L has the lighting for CAT II, but the electronics and obstructions are the limitations for not commissioning it. Figures 9 and 10 show the locations of the types of runway lighting used at JFK.

COLOR CODING. The four major runways have color coding of their edge lights and centerline lights. Centerline lights are color coded on the final 3,000 feet of the runway as viewed from the approach or takeoff direction. The lights alternate red and white from 3,000 to 1,000 feet and are all red for the last 1,000 feet. Edge lights are color coded yellow for the last 2,000 feet. Split filters are used so that the color coding appears only in one direction. The color coding helps the pilot determine how much distance

is remaining on the runway. All threshold lights have split filters, red on the runway end and green facing the runway approach. All edge lights in displaced threshold areas have split filters with red showing towards the closed section and the proper color coding in the other direction.

DISPLACED THRESHOLDS LIGHTS. There are five displaced thresholds at JFK; i.e., the runway threshold is displaced backward from the actual beginning of the runway pavement. The runways are displaced due to obstructions and noise abatement requirements. The location and size of the displaced thresholds are as follows:

<u>Runway</u>	<u>Distance (ft)</u>
13L	1,000
13R	2,600
22R	3,022
31L	3,320
31R	1,024

The centerline lights of the various runways are blocked out in front of a displaced threshold; however, the runway edge lights prior to the displaced threshold are lit and are color coded red.

TAXIWAY LIGHTING FIXTURES.

GENERAL. Taxiway lighting at JFK is handled basically in two different ways. The first is with taxiway edge lights (figure 11). These lights are L-822-type fixtures with 30-watt lamps and blue omnidirectional globes. The second way of lighting taxiways is with taxiway centerline lighting. This type is used on most of the "inner" and "outer" taxiways. (Figure 12 shows the locations of the different types of lighting.) The centerline lights are L-852 fixtures and 45-watt lamps (65-watts on curbs) with green filters installed (figure 5). The centerline lights are augmented with edge reflectors to help the pilot navigate on curves and straight sections of the taxiways. More information on the reflectors can be found in the section on markers. Table 2 lists the types of taxiway lights.

TABLE 2. LIST OF ALL TAXIWAY LIGHTS AT JFK AIRPORT

<u>Type</u>	<u>Use</u>	<u>Amount</u>	<u>Location</u>
L-852	T/W Holding Bars	495 (165 Sets)	Inner and Outer T/W's
L-852	High-Speed T/O C/L	149	R/W 4R - 22L Exits
L-852	T/W C/L	1045	Inner and Outer T/W's
L-822	T/W Edge	1350	All Others T/W's

At JFK, the "straight-through" method of centerline lighting (i.e, centerlines meet at the center of intersections rather than curving with the turn radius) is used. In areas where the centerline lighting is used, there are hold bars at all the intersections. The hold bar consists of three 65-watt wide-angle lamps in L-852 fixtures located perpendicular to the centerline lighting (figure 13). They are yellow in color and remain lighted constantly when the centerline lights are ON. They inform the pilot where it is safe to stop to give clearance to other aircraft crossing at the intersection. The centerline lights also have wide-angle 65-watt lamps at all intersections, starting with the light before the hold bar and continuing through the intersection. (Figure 14 gives details.)

In areas where lighting changes from edge to centerline lights (and vice versa), there is a overlap of 200 feet.

HIGH-SPEED TURNOFFS. There are four high-speed turnoffs for runway 4R-22L, two for operations in each direction. They are lighted with both L-822 edge lighting fixtures and L-852 centerline lighting fixtures.

RUNWAY 14-32. Runway 14-32 is sometimes used as a taxiway when runway 4R-22L is in use. Though used as one, runway 14-32 is not lighted as a taxiway.

INTERSECTION J AND Z. At the intersection of taxiways J and Z there is a sharp curve where the edge lights have been replaced by inset lights. This was done because, when large jets used this curve, they turned too sharp and knocked off the edge lights. To correct this, Canadian-type inset omnidirectional lights were installed on the curve (figure 15).

The Canadian light is unique in that it is completely flat. There is one lense in the center which directs the light in all directions. There is a blue filter inside. No FAA number has been assigned to these lights as yet.

BRIDGES. There are a total of four bridges at JFK, two over each access road. All bridges have both L-822 runway edge lighting fixtures and L-852 centerline lighting fixtures installed. Edge lights on the bridges over the west access road are mounted on the curb as shown in figure 16. Edge lights on the north access road bridges are inset in the curb to provide more clearance, as shown in figure 17. The pathways on bridges on the inner taxiway have been narrowed by large timbers (figure 18). The timbers have been painted orange and white and have reflective tabs and edge lights attached to them, as shown in figure 19. Bridge pathways were narrowed due to the interference of the large wingspans of wide-bodied jets with trucks on the service road bridge, which parallels the inner taxiway bridge.

RAMP AREAS.

At JFK, all ramp areas are illuminated by floodlights. All ramp areas come under control of the airline using them except at the International Arrival Building, which is controlled by the Port Authority. Therefore, each one is

different, and floodlighting varies so much in types used that no attempt will be made to list all types or locations. The types of floodlighting used are: incandescent, fluorescent, quartz, high-pressure sodium, mercury vapor, and xenon. (Figure 20 shows a typical ramp area.)

In the British Overseas Airways Corporation (BOAC) ramp area, there are L-852 lead-in light fixtures inset in the pavement. These are controlled and operated by the airline. Spacings vary from 25 to 50 feet. They have 45-watt lamps with green filters (figure 21).

In the Trans World Airline (TWA) ramp area, there are omnidirectional inset lights to show the location of the throat of the two entrances and to show the safe distance to the blast fence for aircraft taxiing in the ramp area. These lights are FMT medium intensity (figure 22). The lenses are clear.

All ramp areas have lead-in lines painted for guidance of aircraft in and out of the ramps.

LIGHTING VAULTS.

Runway and taxiway lighting at JFK are powered from two lighting vaults, which are called Switch Houses One and Two.

The larger of the two is Switch House One (figure 23). It is located between the inner taxiway and the ramp area, near taxiway F. This switch house is constructed of concrete blocks. Power is supplied by two independent 4,160-volt alternating current (V a.c.) feeders. Switch House One also has a 400-kilowatt (kW) emergency diesel generator, which can take over operation in the event of a power failure. The emergency power generator can supply all the power needed to operate all the runway and taxiway regulators in Switch House One.

Switch House Two is located between the bridges of the inner and outer taxiways where they cross the west access road. This switch house is located below ground level and is constructed of concrete. Switch House Two receives its power from three 4,160 V a.c. feeders, one primary and two backups.

Tables 3 and 4 contain a list of all runway and taxiway regulators and their uses.

All regulators have a 2,400 V a.c. primary, and a 6.6-amperes (A) maximum output, except for the 70-kW regulators, which are 20 A. All taxiway edge lights are powered by constant brightness regulators, which operate at 6.6 A when turned ON. Taxiway centerline lighting and all runway lighting are all brightness controlled. There are five settings, with the fifth step being the brightest.

Figure 24 shows a typical taxiway centerline regulator. Power coming into the switch house goes through a series cutout before it goes to the regulator. Figure 25 shows a typical series cutout.

TABLE 3. RUNWAY CIRCUITS JFK INTERNATIONAL AIRPORT

<u>Area Served</u>	<u>Function</u>	<u>FAA Type</u>	<u>Rated Power (kW)</u>	<u>Switch House No.</u>
4R-22L	R/W Edge	L-828	20	One
4R-22L	R/W Edge	L-828	20	One
4R-22L	R/W Edge	L-828	20	One
4L-22R	R/W Edge	L-828	25	One
4L-22R	R/W Edge	L-828	25	One
13L-31R	R/W Edge	L-828	20	One
13L-31R	R/W Edge	L-828	20	One
14-32	R/W Edge	L-828	20	One
4L-22R	C/L	L-828	20	One
4L-22R	C/L	L-828	20	One
4R-22L	C/L	L-828	70	One
4R-22L	TDZ	L-828	70	One
13R-31L	R/W Edge	L-828	25	Two
13R-31L	R/W Edge	L-828	25	Two

LEGEND:

R/W = Runway
 C/L = Centerline
 TDZ = Touchdown zone

TABLE 4. TAXIWAY LIGHTING CIRCUITS AT JFK INTERNATIONAL AIRPORT

<u>Circuit No.</u>	<u>Tower Switch</u>	<u>Area Served</u>	<u>Function</u>	<u>FAA Type</u>	<u>Constant Brightness or Variable Brightness</u>	<u>Rated Power kW</u>	<u>Switch House No.</u>
I-1	T/W I	T/W I from HH to PA	T/W C/L	L-828	V	20	Two
I-2	T/W I	T/W I from D to HH	T/W C/L	L-828	V	20	One
I-3	T/W I	T/W I from Q to Bridge, T/W S	T/W C/L	L-828	V	30	Two
I-4	T/W I	T/W I from A to D, T/W B, BB, W, WW	T/W C/L	L-828	V	30	One
O-1	T/W O	T/W O from KK to PA	T/W C/L	L-828	V	20	Two
O-2	T/W O	T/W O from H to KK	T/W C/L	L-828	V	20	One
O-3	T/W O	T/W O from F to H	T/W C/L	L-828	V	20	One
O-4	T/W O	T/W O from D to F, T/W ZA	T/W C/L	L-828	V	20	One
7 O-5	T/W O	T/W O from Q to Bridge, T/W R	T/W C/L	L-828	V	30	Two
O-6	T/W O	T/W O from A to D, Communal T/W	T/W C/L	L-828	V	30	One
T/W-3			T/W Edge	CC-RPF	C	20	One
T/W-4			T/W Edge	CC-RPF	C	20	One
T/W-9			T/W Edge	CC-RPF	C	20	One
T/W-10			T/W Edge	CC-RPF	C	20	One
T/W-11			T/W Edge	CC-RPF	C	20	One
T/W-5			T/W Edge	CC-RPF	C	20	Two
T/W-6			T/W Edge	CC-RPF	C	20	Two
T/W-7			T/W Edge	CC-RPF	C	20	Two
T/W-12			T/W Edge	CC-RPF	C	20	Two
T/W-13			T/W Edge	CC-RPF	C	20	Two
	Exits	High-Speed Turnoff R/W 4R - 22L	High-Speed Turnoff	L-828	V	20	One

An oil switch, figure 26, is used to control the incoming 2,400 V a.c. and therefore controls the regulator. Regulator controls are discussed in the section on controls.

LIGHTING CONTROLS.

The lighting at JFK is controlled from one lighting panel in the control tower; (figures 27 and 28). Its dimensions are approximately 18 by 24 inches. The three touchdown zone switches shown in figures 27 and 28 will be modified to one switch in the near future.

The control voltage is 48-volts direct current (V d.c.) from the tower to the relay panel in the vault. In the vault, it is 120 V a.c. from the relay panel to the oil switch, which controls the 2,400 V a.c. and the regulator (figure 29).

To operate the panel, the controller must first select which runway or runways will be used and switch the runway master switch to the correct position. Next, the controller must select which types of lights he wants for each runway (edge, centerline, taxiway, etc.) and what intensities.

Taxiway lighting circuits are broken down into groups that correspond to the runway that they serve (table 5). Some of the lettering used on the taxiway and auxiliary switches in figure 27 use old taxiway designations.

TABLE 5. AREAS SERVED BY TAXIWAYS EDGE LIGHTING SWITCHES AT JFK AIRPORT

<u>Taxiway Switch</u>	<u>Area Served</u>
13L-31R	T/W I from VB to R, W
13R-31L	T/W O from VB to S, P
4R-22L	T/W E, J, Y, YA, FA, JA
4L-22R	T/W ZA, K, KB
Central	T/W F, G, H, Z
S W Hanger	T/W O from R to NB
	T/W I from R to NB
	T/W Q
7-25	T/W north of runway 13L-31R

LIGHTING MAINTENANCE.

The inspection procedure at JFK is accomplished by Airports Operations. Runway lights are inspected twice a day, once in the morning and again at noon. Taxiway edge lights are inspected once a day. Taxiway centerline lights are inspected once a week. Relamping is done as soon as outages are detected.

The total manpower for lighting maintenance is nine men; five on the day shift and two on each night shift. During the day shift, the men work in two two-man teams, and the remaining man rebuilds the lamp fixtures. This saves time out on the field, where a whole lamp may be replaced by a new (or rebuilt) fixture and the damaged one repaired later.

Common lighting repair problems at JFK are as follows:

1. Burnt contacts on the L-852 taxiway centerline lights.
2. In a few taxiway areas where asphalt pavement shoving has occurred, wiring which was placed in saw-cuts has moved and caused open circuits.
3. Runway vibration and jet blasts have caused problems by cracking glass and damaging L-819 fixtures on runways, especially at runway thresholds. (Possibly the new L-819 fixture could help here.)

Table 6 shows a list of the typical yearly amount of replacement of lighting equipment.

TABLE 6. ESTIMATED YEARLY REPLACEMENT RATES AT JFK INTERNATIONAL AIRPORT*

Part

<u>Lamps</u>	<u>Fixture</u>	<u>Approximate Amount</u>
210W 6.6 Amp Prefocused	L-819	7,000
200W 6.6 Amp Prefocused	L-850A	750
200W 6.6 Amp	L-850B	30
65W 6.6 Amp	L-852W	2,500
45W 6.6 Amp	L-852N	1,000
45W 6.6 Amp	L-822	1,500
30W 6.6 Amp	L-822	7,000

Fixtures

L-819 Light Assembly	600
L-822 Light Assembly	1,500
L-850A Light Assembly	40
L-850B Light Assembly	25
L-852 Light Assembly	70

GLOBES

L-822 (blue)	500
L-819 (clear)	150

*Taken from past purchase orders

SIGNS.

All taxi guidance signs used at JFK are Port Authority, L-858 signs (figure 30). These signs were developed by the Port Authority of New York and New Jersey and have FAA approval.

There are 430 taxi guidance signs at JFK, all of which are color coded. This alerts the pilot to the type of information the sign contains. Fifteen percent of the signs are "mandatory" or hazard signs. These signs have white lettering with a red background. If a mandatory sign was ignored by a pilot while taxiing, this could cause a hazard to an aircraft landing or taking off. An example of a location for a mandatory sign would be at a taxiway/runway intersection.

The largest group of signs (82 percent) are "informational" or location signs. These signs have black lettering with a yellow background. An informational sign enables the pilot to determine his location on the airport and, if ignored, could cause a hazard to other taxiing aircraft. Taxiway identification and intersection signs are examples of informational signs.

The remaining 3 percent of the signs are "convenience" signs. These signs have white lettering with a green background. Convenience signs are used to direct pilots to specific areas on the airport. Examples of convenience signs are: "RAMP," "FUEL," and "HGR."

All colors are retroreflective except black, which has a flat finish. Some signs are externally lighted by 60-watt, F 48T12/CW/HO-type fluorescent lights. The power to light the signs is obtained from the taxiway lighting system through General Electric (GE) "series to multiple" ballasts. At the present time, only a few signs are lighted, but plans are made to contract to have the remaining signs lighted. The initial sign installation was completed in 1973. The sizes of the two basic sign panels are 3 feet by 4 feet and 3 feet by 6 feet. For longer messages, combinations of panels are located next to each other. Signs are supported on frangible couplings which will withstand 190 mile-per-hour (mi/h) winds with 260 mi/h gusts. The couplings will also breakaway if the sign is struck, to minimize damage to the aircraft. The locations of and information on each sign are contained in the appendix.

Nonstandard signs on the service road at taxiway intersections instruct vehicles to yield to aircraft (figure 31).

MARKINGS.

All runway and taxiway markings at JFK are in accordance with Advisory Circular 150/5340-1. The four main runways at JFK have precision instrument runway markings (figure 32). The smaller runway has the basic runway markings with side stripes added (figure 32). On three of the major runways, there are five displaced thresholds. These areas are marked with arrows on the centerline which point towards the displaced threshold (figure 33). On the smaller runway, there are four small chevrons placed across the runway just prior to the threshold (figure 33).

All taxiways have centerline markings and most have side stripes. Due to large stabilized areas along most taxiways, there are, in addition to side stripes, deceptive area markings. These are 3-foot-wide stripes perpendicular to the edge of the taxiway. These stripes extend to 5 feet from the edge of the stabilized area or 25 feet long, whichever is less. These stripes are spaced at 100 feet maximum on straight portions and 50 feet maximum on curves.

Most taxiways have their letter designation painted on the surface of the taxiway just after an intersection.

The type of paint used at JFK is Prismo Night Liner No. 2. Cost for the paint is:

<u>Color of paint</u>	<u>Cost per gallon</u>
white	\$4.00
yellow	\$4.25

The average coverage for the paint is 250 square feet per gallon. The approximate amount of painted area on the runways and taxiways at JFK is;

Runways - white	619,370 sq. ft.
Runways - yellow	23,700 sq. ft.
Taxiways - yellow	335,930 sq. ft.

Runways are painted on the average of one and one-half times a year, and taxiways once a year. Runways 4R-22L and 13L-31R are repainted more often because these runways are used for landings which causes large amounts of rubber deposits to obfuscate the painted areas. Airports Operations inspects and decides when painting is needed and schedules repainting. Painting on the landing runways is almost a continuous job due to the large quantity of rubber deposits and the high density of traffic which limits the amount of time the runways may be closed for painting.

MARKERS.

Reflectors are used to supplement areas of the taxiways which have centerline lighting. Reflectors function as edge lights and are located 10 feet from the edge of the taxiway. They are also used on sections of taxiways Y and Z.

In these areas, they are used to narrow sections of what used to be runways which now are used for taxiways. This was done by placing cones over the edge lights on one side (figure 34) and placing the reflectors down the centerline of the old runway limiting use to half the width of the runway (figure 35).

The reflectors are approximately 2.5 feet high by 4 inches in diameter. At present, there are two types of reflectors in use. The older type, which is faded yellow and easily broken, has two round blue reflectors attached to the top of each (figure 36). These are being replaced by the new EVA (ethyl-vinyl-acetate) type (figure 37). These reflectors are blue cylindrically shaped tubes with four yellow retroreflective bands around each.

The advantages of these units are:

1. Very high reflectivity, even when at large angles of incidence;
2. Effectiveness both day and night;
3. Total flexibility, obviating the need for frangibility;
4. Greater height for better pilot guidance while operating in snow and better driver guidance while removing snow;
5. Less likelihood of causing damage to aircraft if struck or broken loose; and
6. Less likelihood of being damaged if struck, or even rolled over, by aircraft and/or maintenance vehicles.

Plans are being made to put this edge reflector into the L-853 specifications for reflectors.

AIRCRAFT DOCKING AIDS.

There are various methods of aircraft docking used at JFK. They vary from airline personnel giving hand signals to more sophisticated alignment devices and lights.

Air Canada uses two types of devices. The first is an amber light in a specially constructed box with a slotted opening for aircraft alignment (figure 38). The second is a windshield touch bar for stop guidance (figure 39). There are two bars for the DC8 and DC9 which are manually inserted into the aircraft's path. When the aircraft touches the bar, it is a signal to stop.

American airlines uses three types of docking aids (figure 40). The first, which is used for the B747, is a green neon and amber light which is used for alignment. Secondly, they use the windshield touch bar for stop indication. Thirdly, they have a green and red light for an all clear and emergency stop signals.

BOAC uses two systems, the "AGNIS" (Azimuth Guidance Nose in Stand) and the "PAPA" (Parallex Aircraft Parking Aid). The AGNIS consists of a specially constructed box with a light inside for alignment of aircraft. The PAPA is an alignment indicator for different types of aircraft. It is used by aligning the light bar in the slot with the mark on the surface of the box corresponding to the type of aircraft being used (figure 41). A stop indicator is also mounted off to the side.

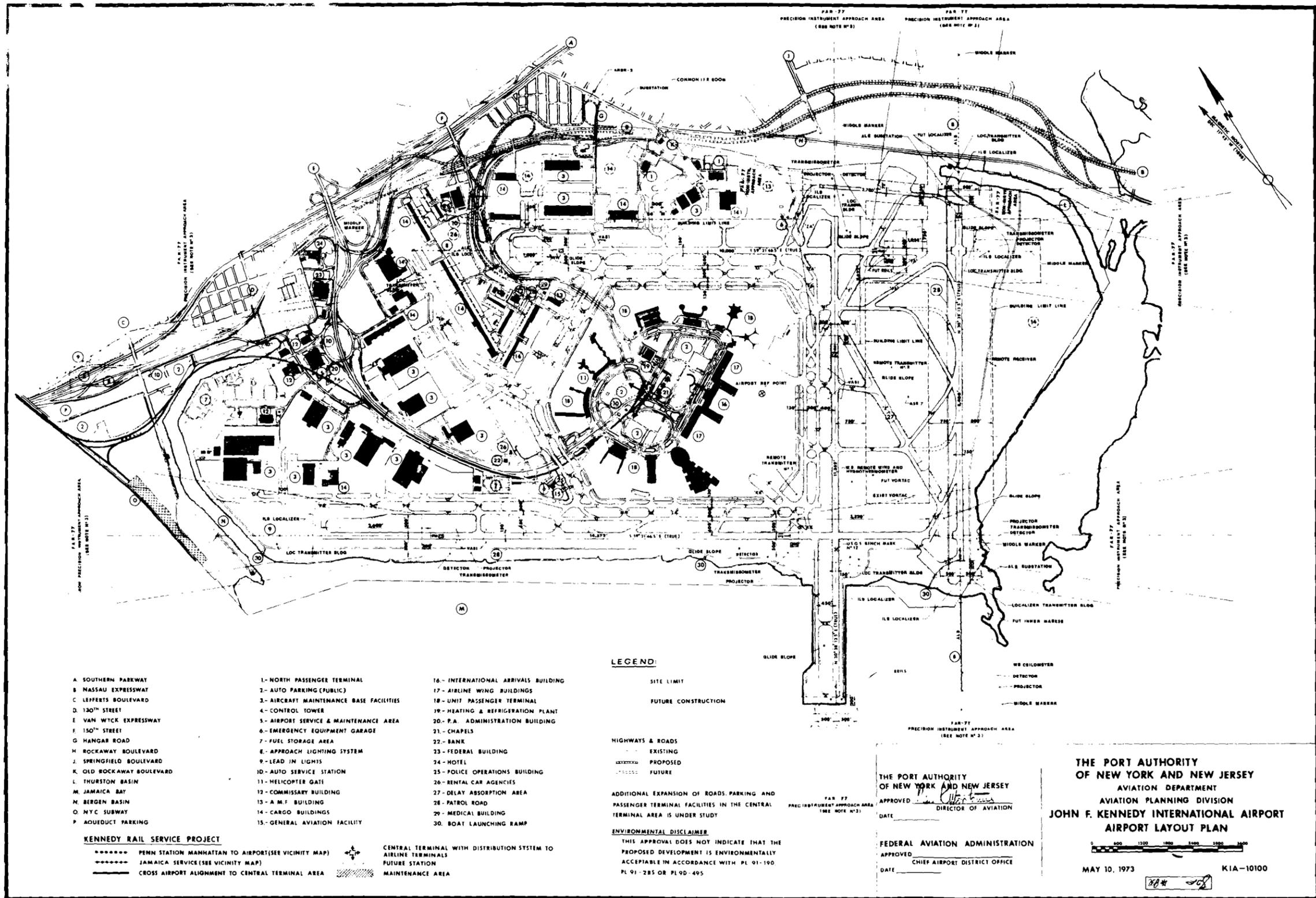
Eastern Airlines uses the "BOLDS" (Burrough Optical Lens Docking System) system. The system is a combined alignment and stop indicator for several aircraft types. It is used by lining up the light beam with a tab for the appropriate aircraft size (figure 42).

At the Northwest - Delta terminal, they use a split board for alignment of aircraft. Alignment is accomplished by aligning the lines on the two boards which are displaced from each other (figure 43). At other gates, mirrors are used to follow the progress of the nose wheel for stop guidance.

Pan American used the "AccuPark" system. This is an alignment indicator with red and green vertical neon tubes. Alignment is accomplished by superimposing the two neon tubes. Also a plastic keg windshield touch is used for stop indication for the B747 (figure 44 gives more details).

At the International Arrivals Building, the airline marshalling crew gives directions to aid aircraft docking.

TWA uses three types of aircraft docking aids. The first type is the BOLDS system (figure 45). This is used for the B747 aircraft and has a supplementary red and green light for emergency stop and all clear signals at congested gates. Another type is the use of highly directional lights in shuttered slots for turn and stop indications (figure 46). Thirdly, is the use of amber and red lights for ramp location and direction alignment (figure 47).



- | | | |
|---|---|--|
| <p>A. SOUTHERN PARKWAY
 B. NASSAU EXPRESSWAY
 C. LEFFERTS BOULEVARD
 D. 130TH STREET
 E. VAN WYCK EXPRESSWAY
 F. 150TH STREET
 G. HANGAR ROAD
 H. ROCKAWAY BOULEVARD
 J. SPRINGFIELD BOULEVARD
 K. OLD ROCKAWAY BOULEVARD
 L. THURSTON BASIN
 M. JAMAICA BAY
 N. BERGEN BASIN
 O. NYC SUBWAY
 P. AQUEDUCT PARKING</p> <p>KENNEDY RAIL SERVICE PROJECT
 - - - - - PENN STATION MANHATTAN TO AIRPORT (SEE VICINITY MAP)
 - - - - - JAMAICA SERVICE (SEE VICINITY MAP)
 - - - - - CROSS AIRPORT ALIGNMENT TO CENTRAL TERMINAL AREA</p> | <p>1. NORTH PASSENGER TERMINAL
 2. AUTO PARKING (PUBLIC)
 3. AIRCRAFT MAINTENANCE BASE FACILITIES
 4. CONTROL TOWER
 5. AIRPORT SERVICE & MAINTENANCE AREA
 6. EMERGENCY EQUIPMENT GARAGE
 7. FUEL STORAGE AREA
 8. APPROACH LIGHTING SYSTEM
 9. LEAD IN LIGHTS
 10. AUTO SERVICE STATION
 11. HELICOPTER GATE
 12. COMMISSARY BUILDING
 13. A.M.F. BUILDING
 14. CARGO BUILDINGS
 15. GENERAL AVIATION FACILITY</p> | <p>16. INTERNATIONAL ARRIVALS BUILDING
 17. AIRLINE WING BUILDINGS
 18. UNIT PASSENGER TERMINAL
 19. HEATING & REFRIGERATION PLANT
 20. P.A. ADMINISTRATION BUILDING
 21. CHAPELS
 22. BANK
 23. FEDERAL BUILDING
 24. HOTEL
 25. POLICE OPERATIONS BUILDING
 26. RENTAL CAR AGENCIES
 27. DELAY ABSORPTION AREA
 28. PATROL ROAD
 29. MEDICAL BUILDING
 30. BOAT LAUNCHING RAMP</p> <p>CENTRAL TERMINAL WITH DISTRIBUTION SYSTEM TO AIRLINE TERMINALS
 FUTURE STATION
 MAINTENANCE AREA</p> |
|---|---|--|

LEGEND:

SITE LIMIT
 FUTURE CONSTRUCTION

HIGHWAYS & ROADS
 - - - - - EXISTING
 - - - - - PROPOSED
 - - - - - FUTURE

ADDITIONAL EXPANSION OF ROADS, PARKING AND PASSENGER TERMINAL FACILITIES IN THE CENTRAL TERMINAL AREA IS UNDER STUDY

ENVIRONMENTAL DISCLAIMER
 THIS APPROVAL DOES NOT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH PL 91-190, PL 91-285 OR PL 90-495

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY
 AVIATION PLANNING DIVISION
 APPROVED: [Signature]
 DIRECTOR OF AVIATION
 DATE: _____

FEDERAL AVIATION ADMINISTRATION
 APPROVED: [Signature]
 CHIEF AIRPORT DISTRICT OFFICE
 DATE: _____

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY
 AVIATION PLANNING DIVISION
JOHN F. KENNEDY INTERNATIONAL AIRPORT AIRPORT LAYOUT PLAN

0 400 800 1200 1600 2000 2400 2800 3200 3600

MAY 10, 1973
 KIA-10100

FIGURE 1. JFK AIRPORT LAYOUT



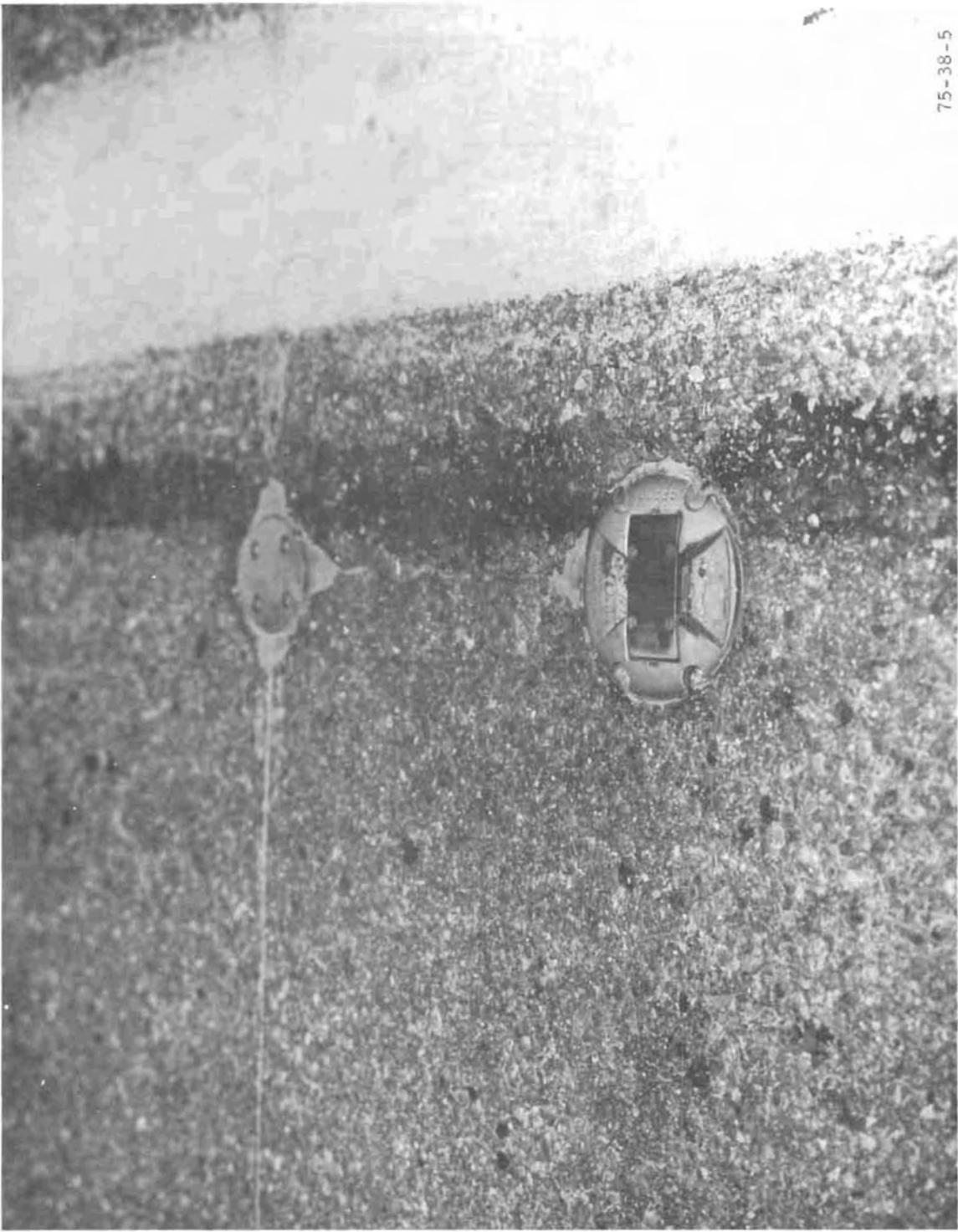
FIGURE 2. TYPICAL L-819 FIXTURE



FIGURE 3. NEW L-819 FIXTURE



FIGURE 4. TYPICAL L-802 FIXTURE



75-38-5

FIGURE 5. TYPICAL L-852 FIXTURE



FIGURE 6. TYPICAL L-850A FIXTURE

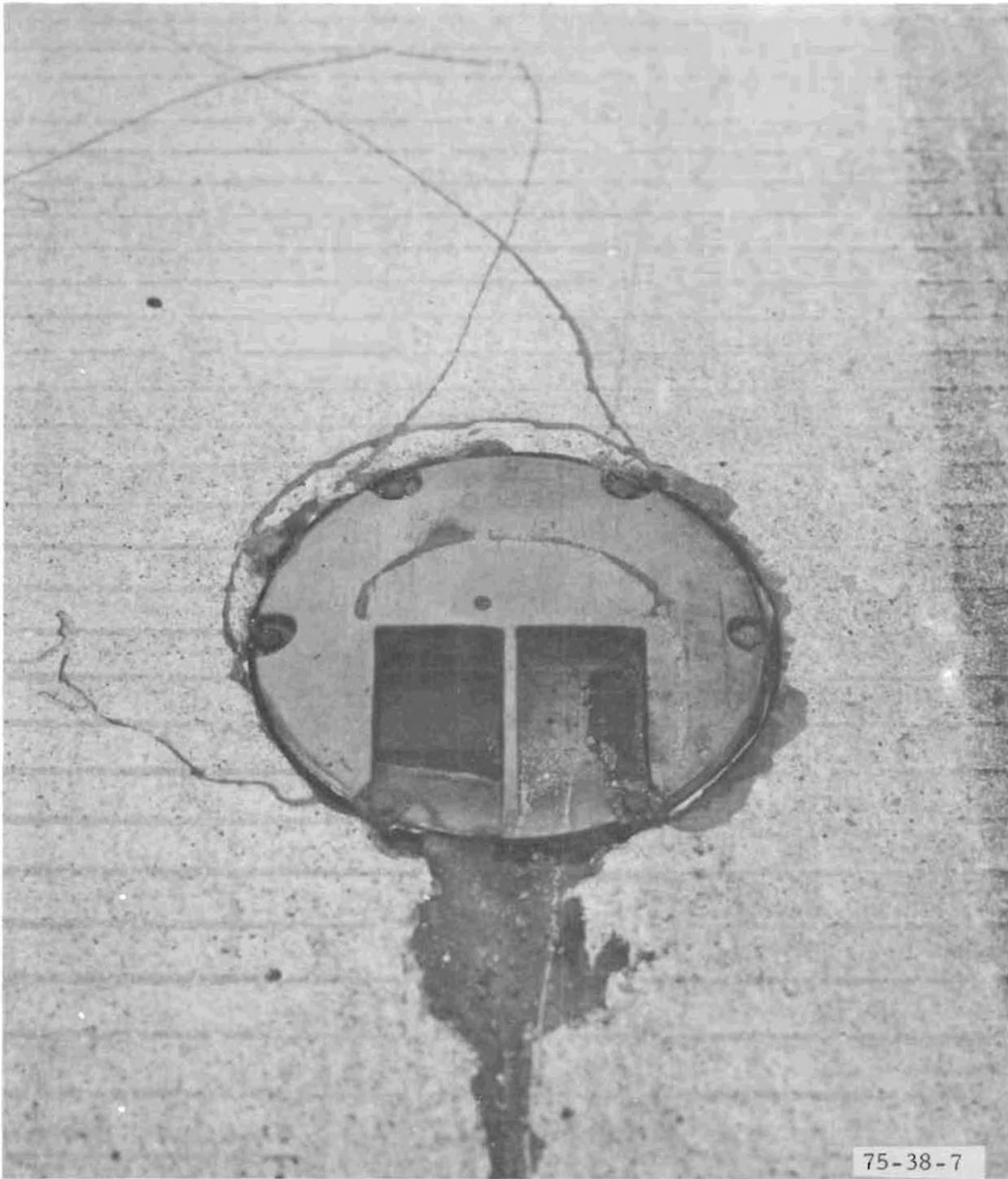
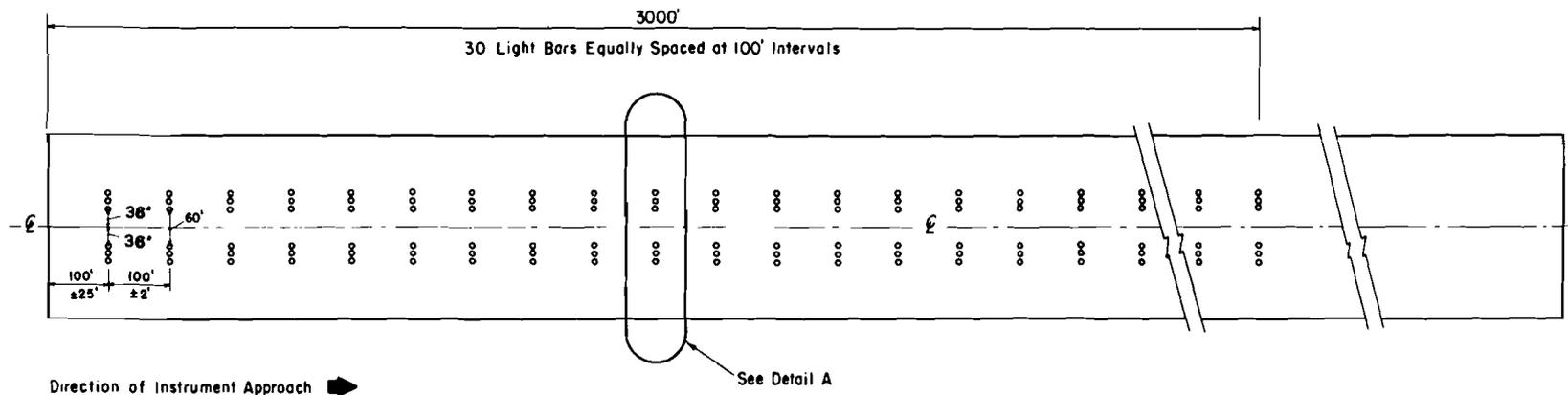
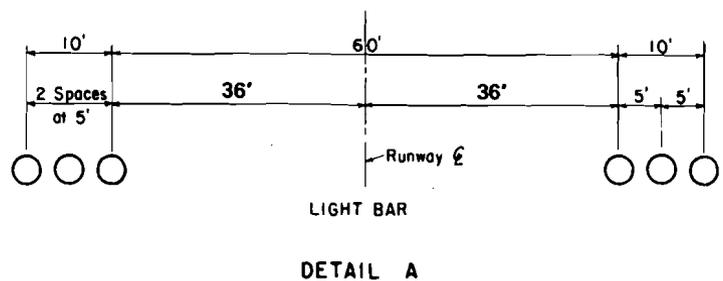


FIGURE 7. TYPICAL L-850B FIXTURE



23



NOTES:

1. THE LONGITUDINAL INSTALLATION TOLERANCE IN LOCATING THE PAIRS OF TRANSVERSE LIGHT BARS SHOULD NOT EXCEED 2 FEET.
2. THE SPACING BETWEEN THE INNERMOST TOUCHDOWN ZONE LIGHT FIXTURES SHOULD BE UNIFORM THROUGHOUT THE LENGTH OF THE SYSTEM. THIS SPACING IS 60 FEET EXCEPT WHERE CONSTRUCTION PROBLEMS PREVENT THIS SEPARATION. IN THIS CASE, THE UNIFORM SPACING IS REDUCED TO NOT LESS THAN 55 FEET.

FIGURE 8. TOUCHDOWN ZONE LIGHTING LAYOUT

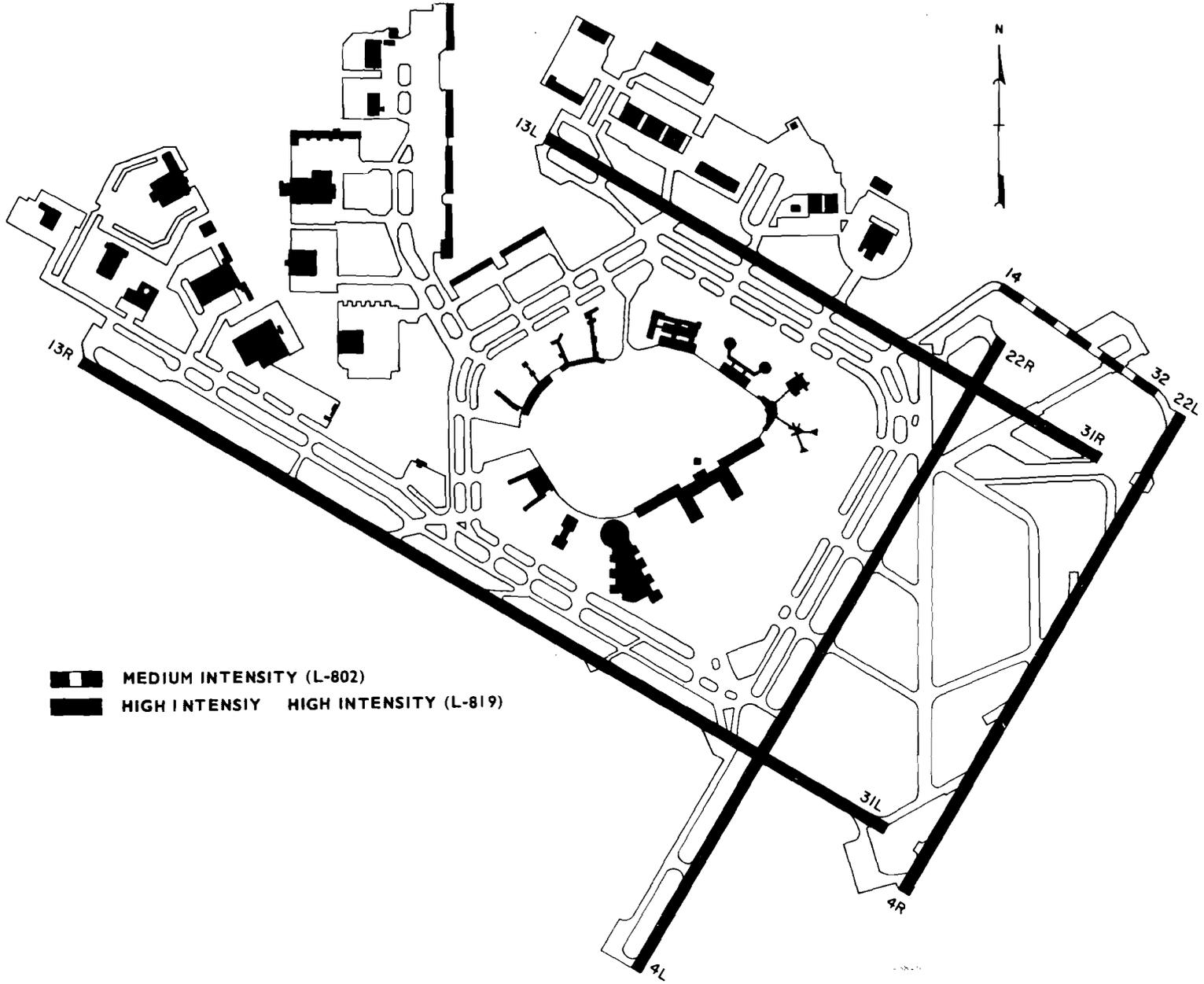


FIGURE 9. RUNWAY EDGE LIGHTING LOCATION

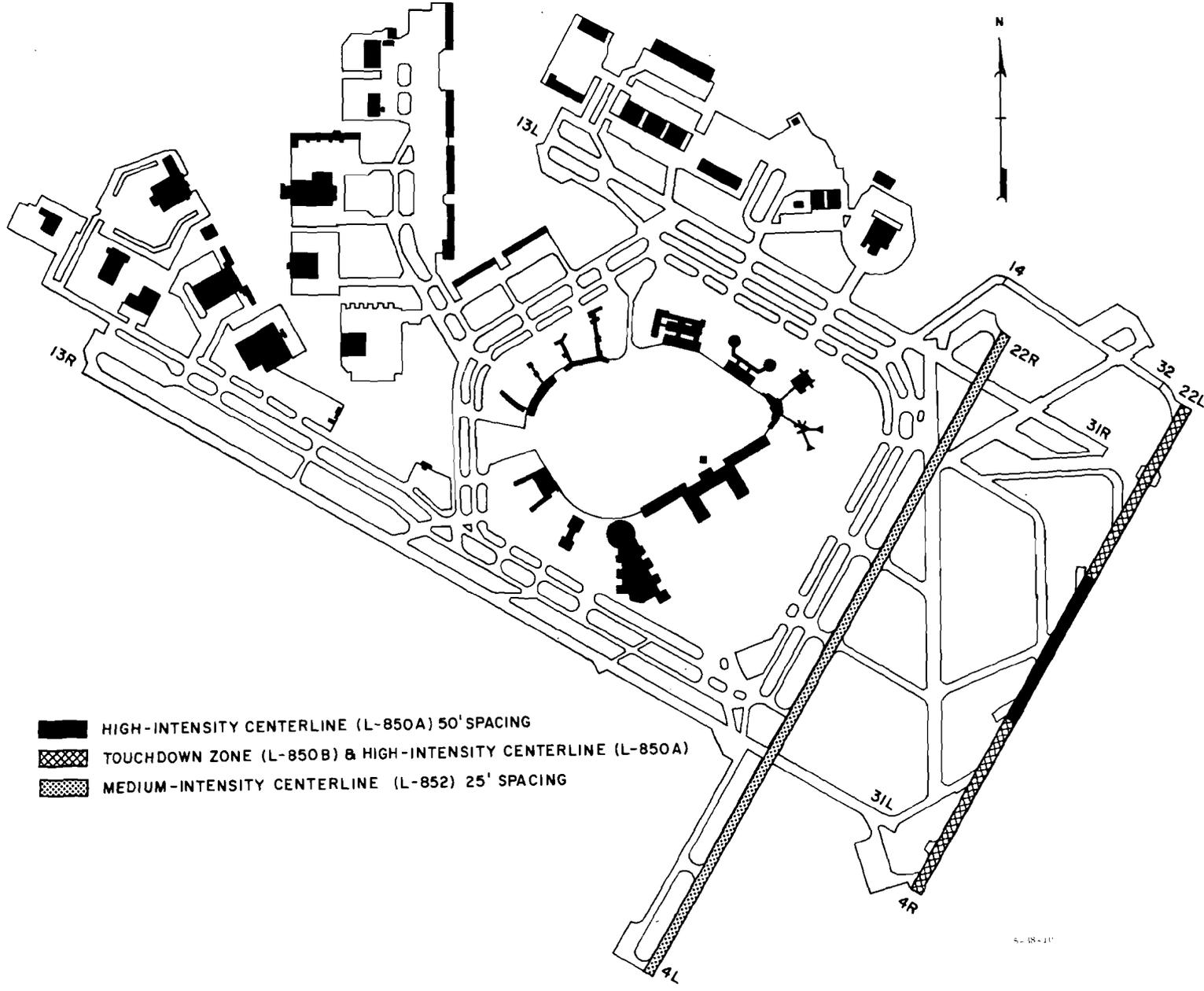


FIGURE 10. RUNWAY CENTERLINE AND TOUCHDOWN ZONE LIGHTING LOCATIONS

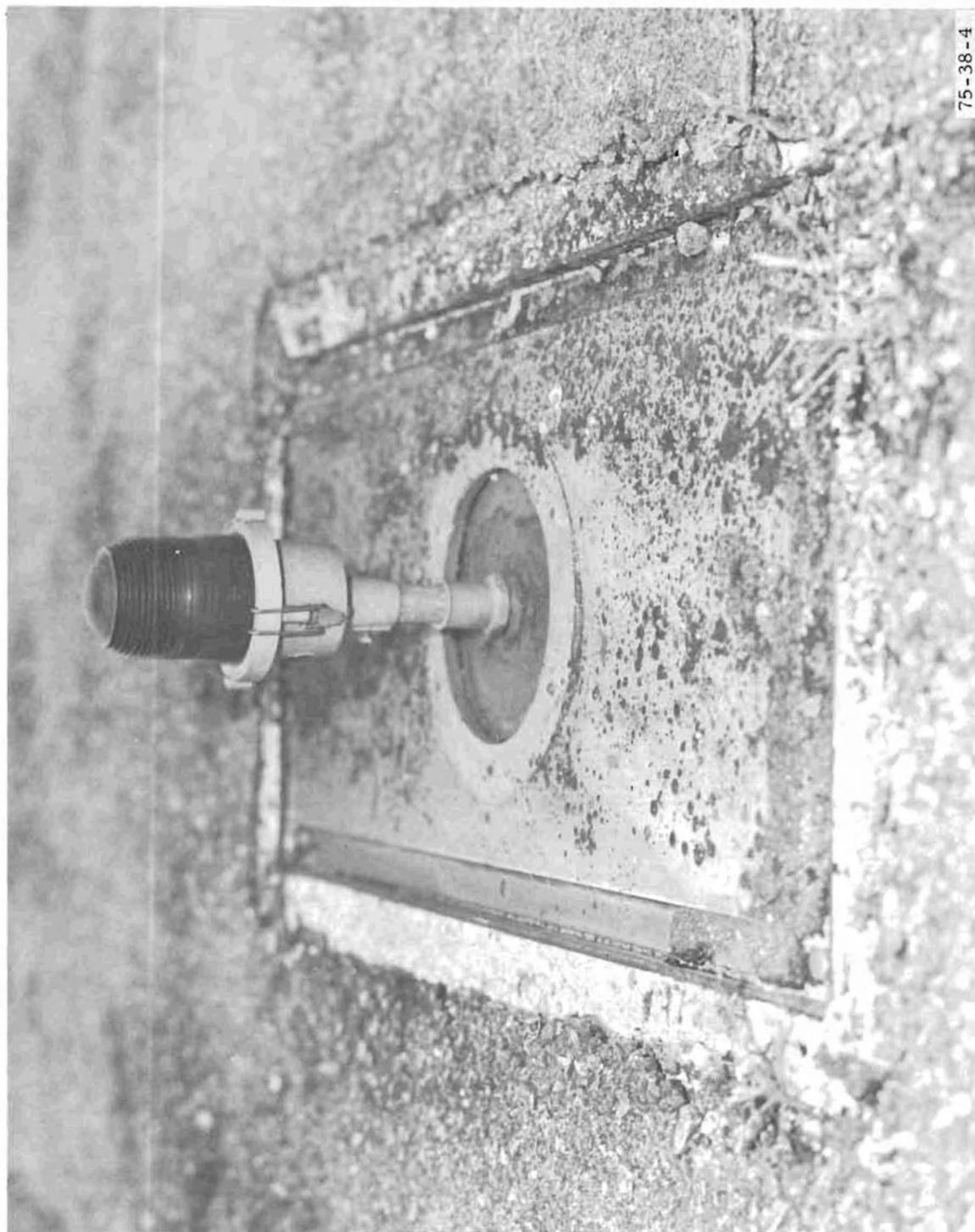


FIGURE 11. TYPICAL L-822 FIXTURE

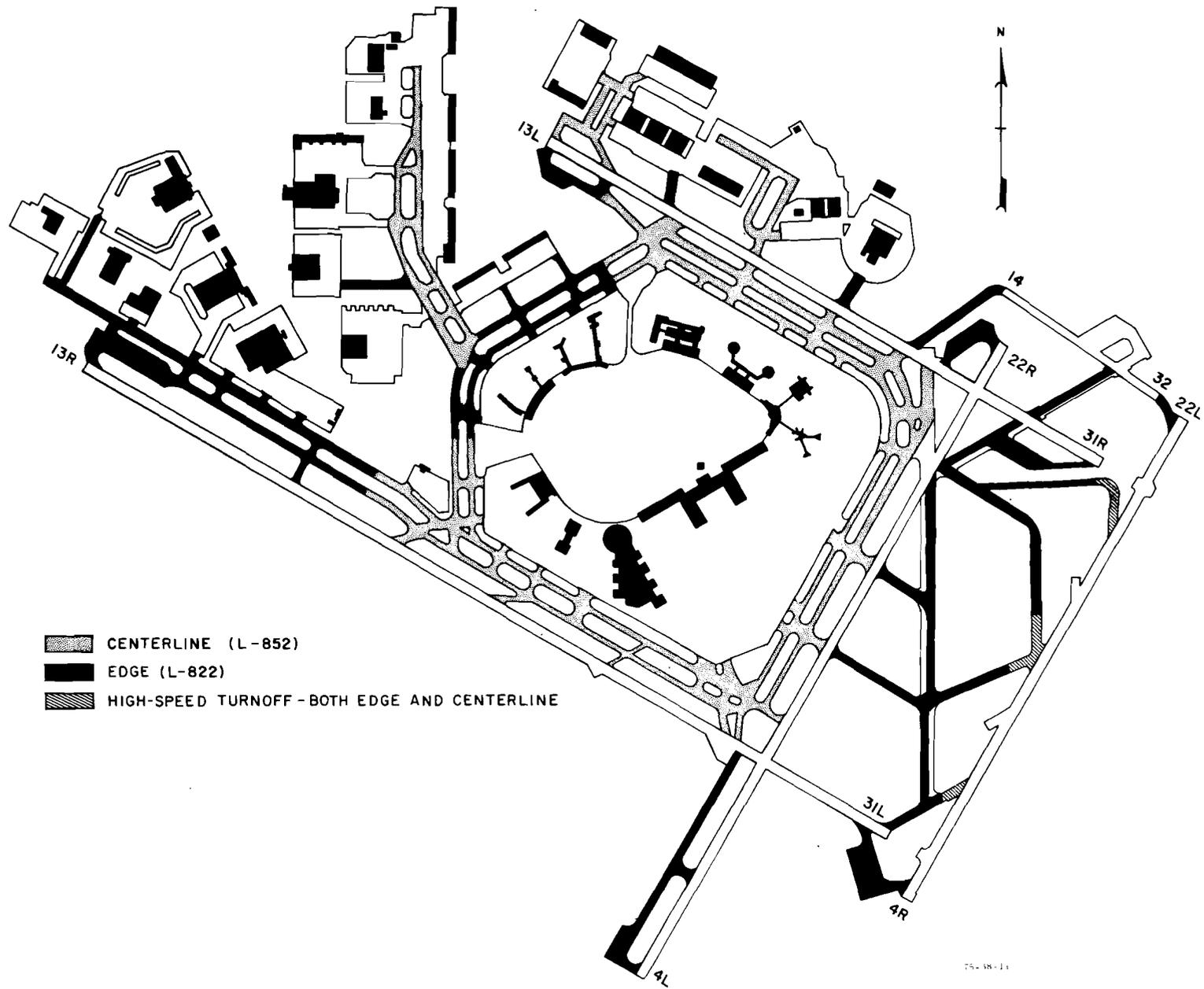


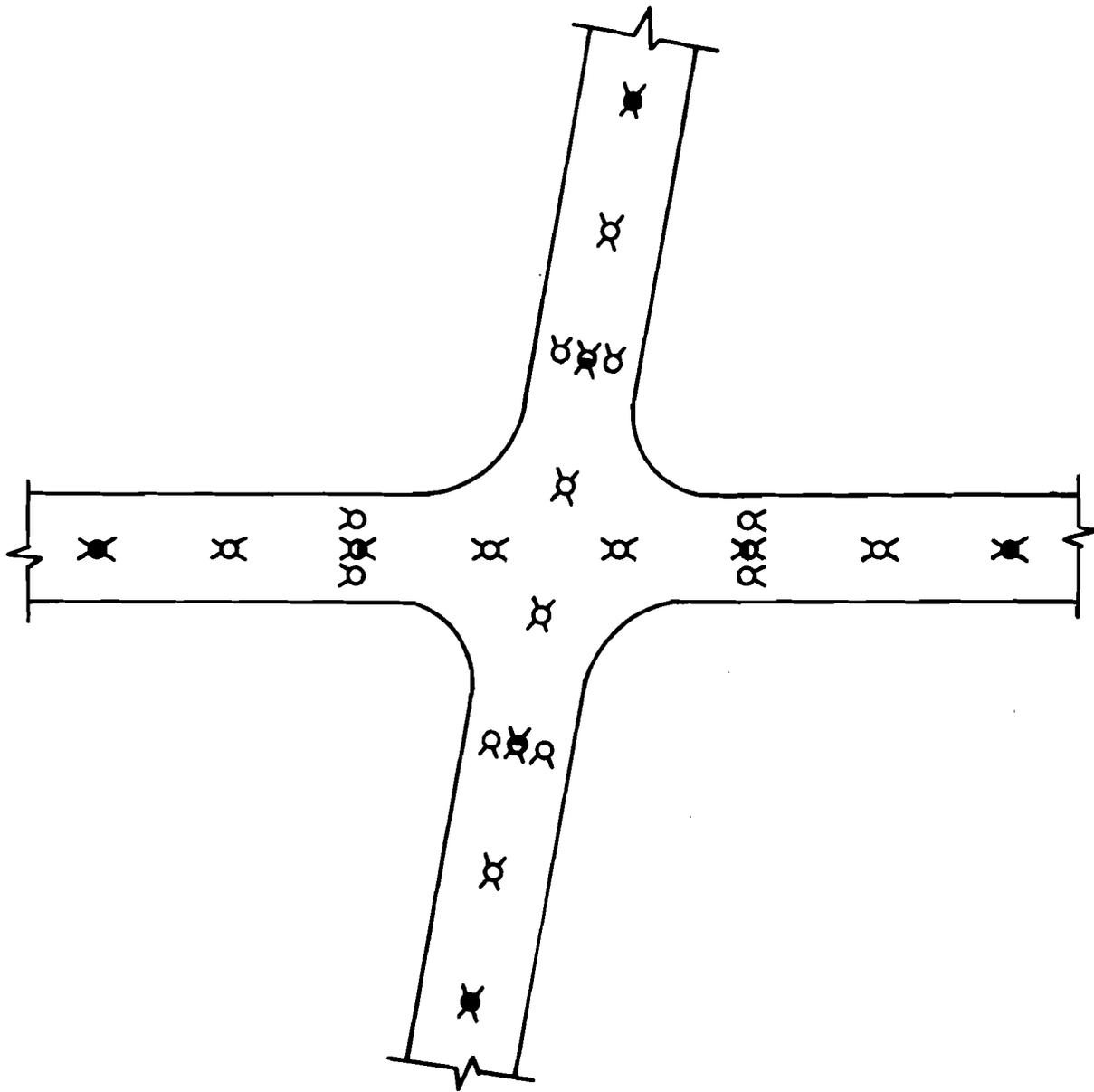
FIGURE 12. TAXIWAY LIGHTING LOCATIONS



FIGURE 13. TYPICAL HOLD BAR



FIGURE 13. TYPICAL HOLD BAR



GREEN {  L-852 45 WATT } BIDIRECTIONAL
 {  L-852 65 WATT }
 YELLOW  L-852 65 WATT UNIDIRECTIONAL
 GREEN }  L-852 65 WATT BIDIRECTIONAL
 YELLOW }

75-38-13

FIGURE 14. TYPICAL STRAIGHT-THROUGH TAXIWAY INTERSECTION



75-38-14

FIGURE 15. CANADIAN-TYPE INSET OMNIDIRECTIONAL LIGHT



75-38-15

FIGURE 16. EDGE LIGHT ON WEST ACCESS ROAD BRIDGES



FIGURE 17. EDGE LIGHTS INSET ON THE NORTH ACCESS ROAD BRIDGES



FIGURE 18. TIMBERS USED TO NARROW THE INNER TAXIWAY

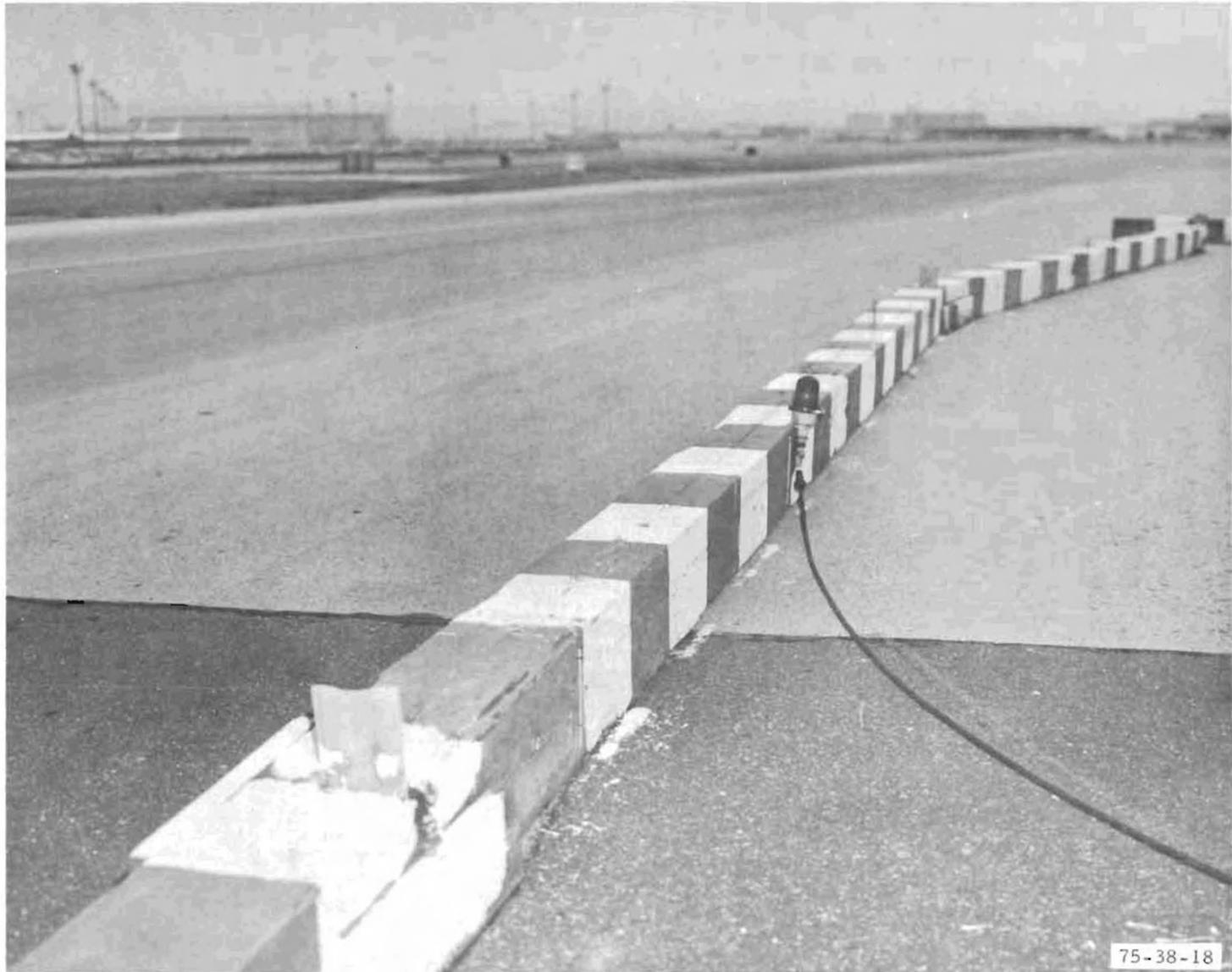
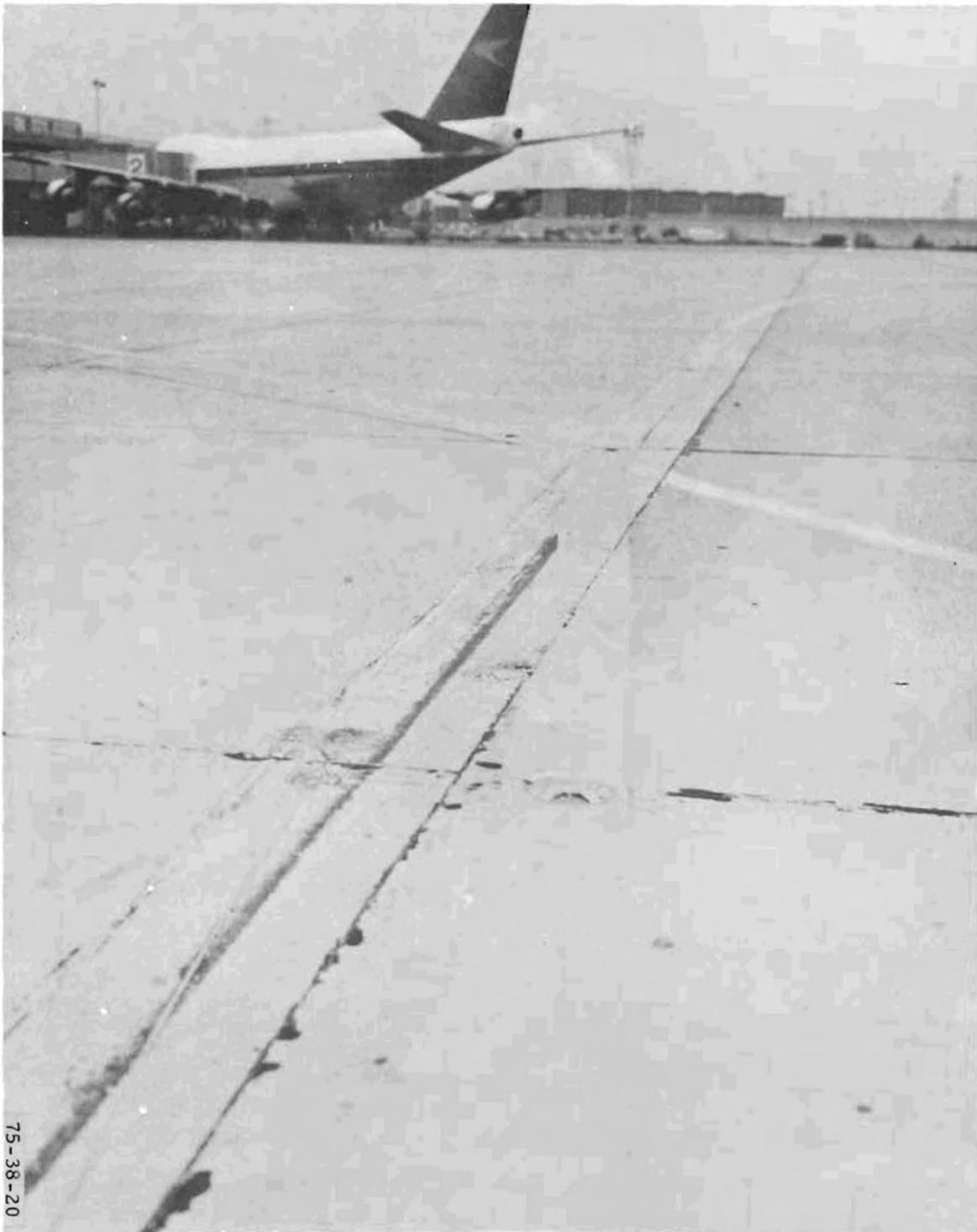


FIGURE 19. LIGHTS AND REFLECTORS ARE ATTACHED TO THE TIMBERS



FIGURE 20. TYPICAL RAMP AREA



75-38-20

FIGURE 21. BOAC RAMP--LEAD-IN LIGHTS

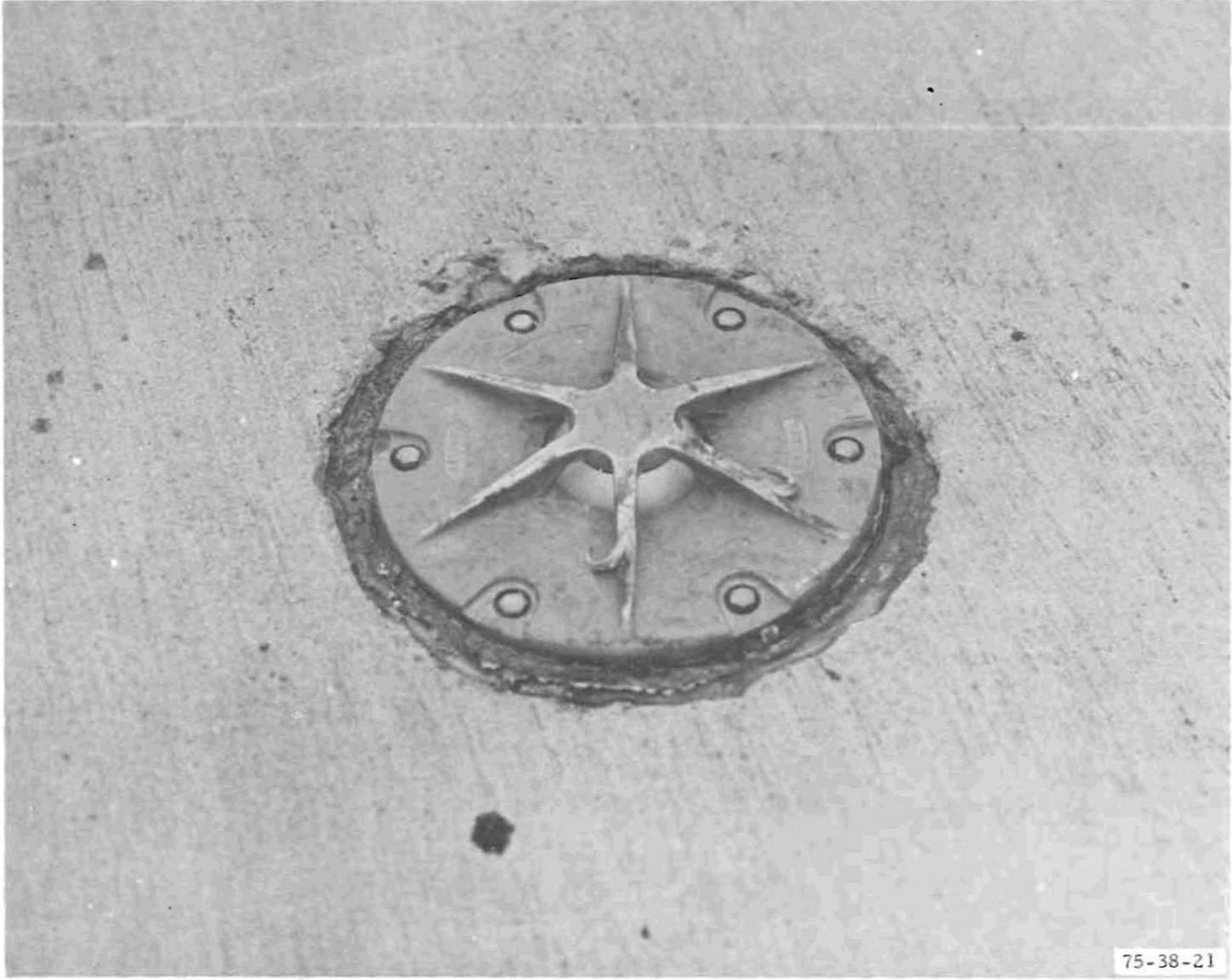


FIGURE 22. TWA RAMP--FMT FIXTURE



FIGURE 23. SWITCH HOUSE ONE

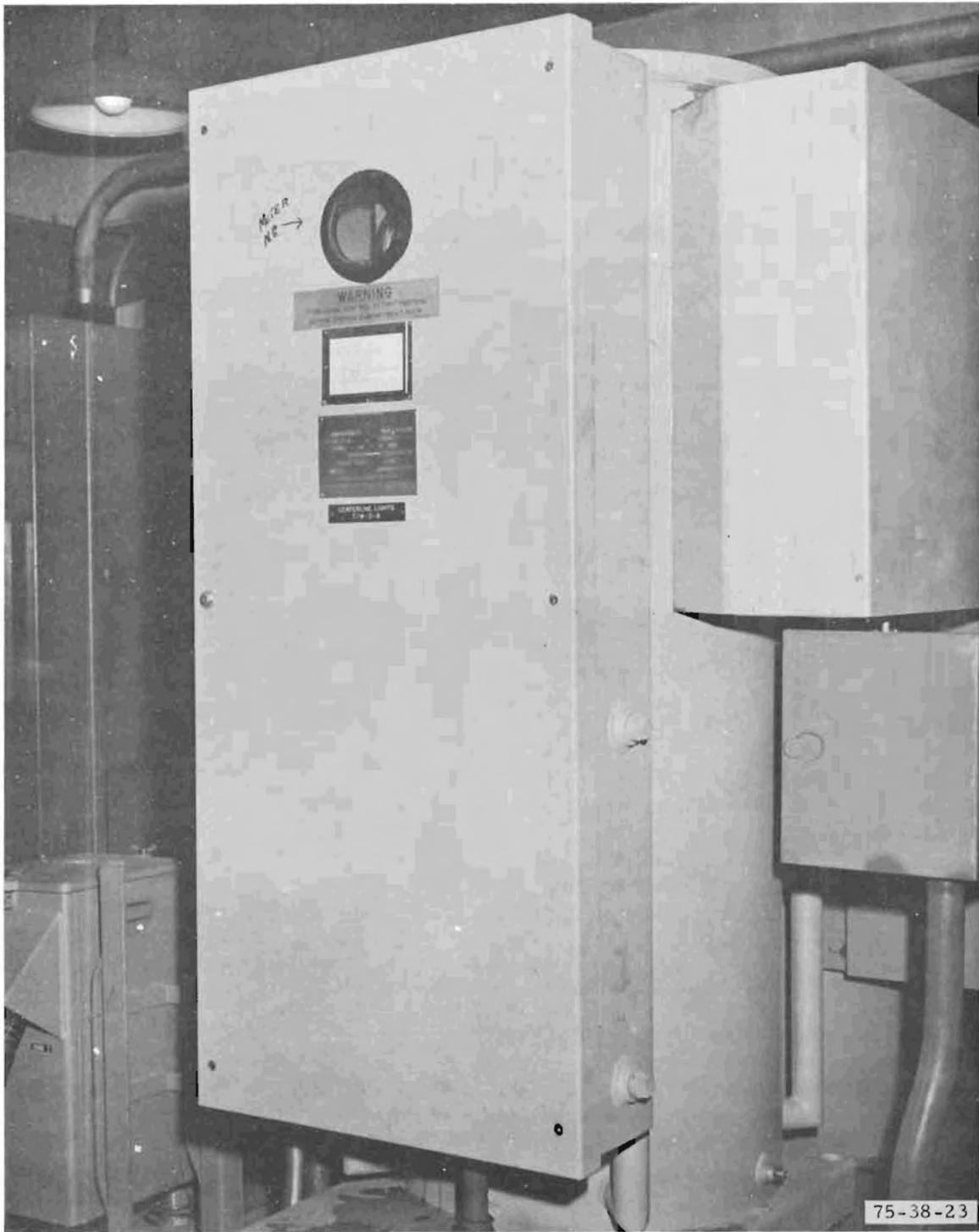


FIGURE 24. TYPICAL L-828 REGULATOR

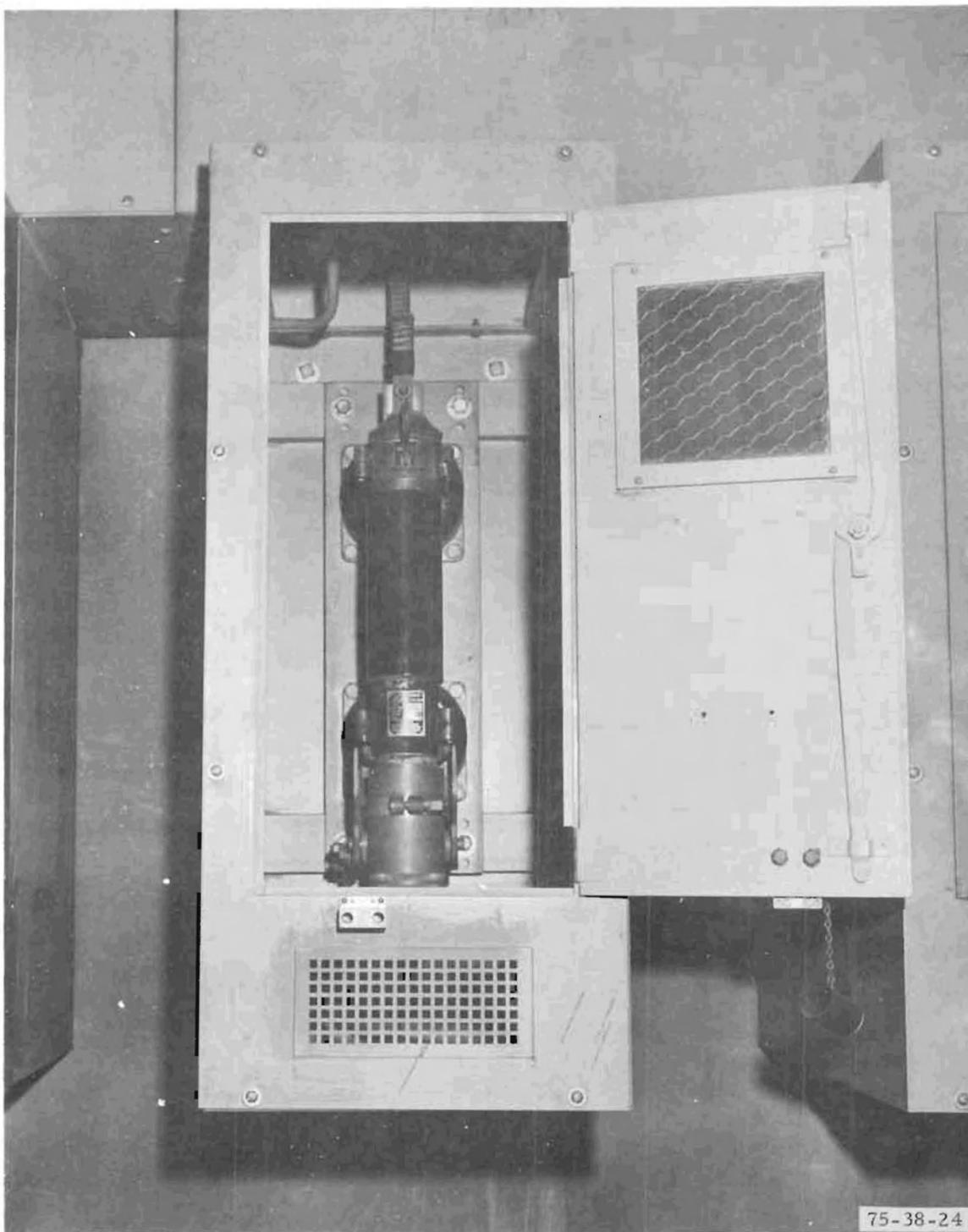


FIGURE 25. TYPICAL SERIES CUTOUT

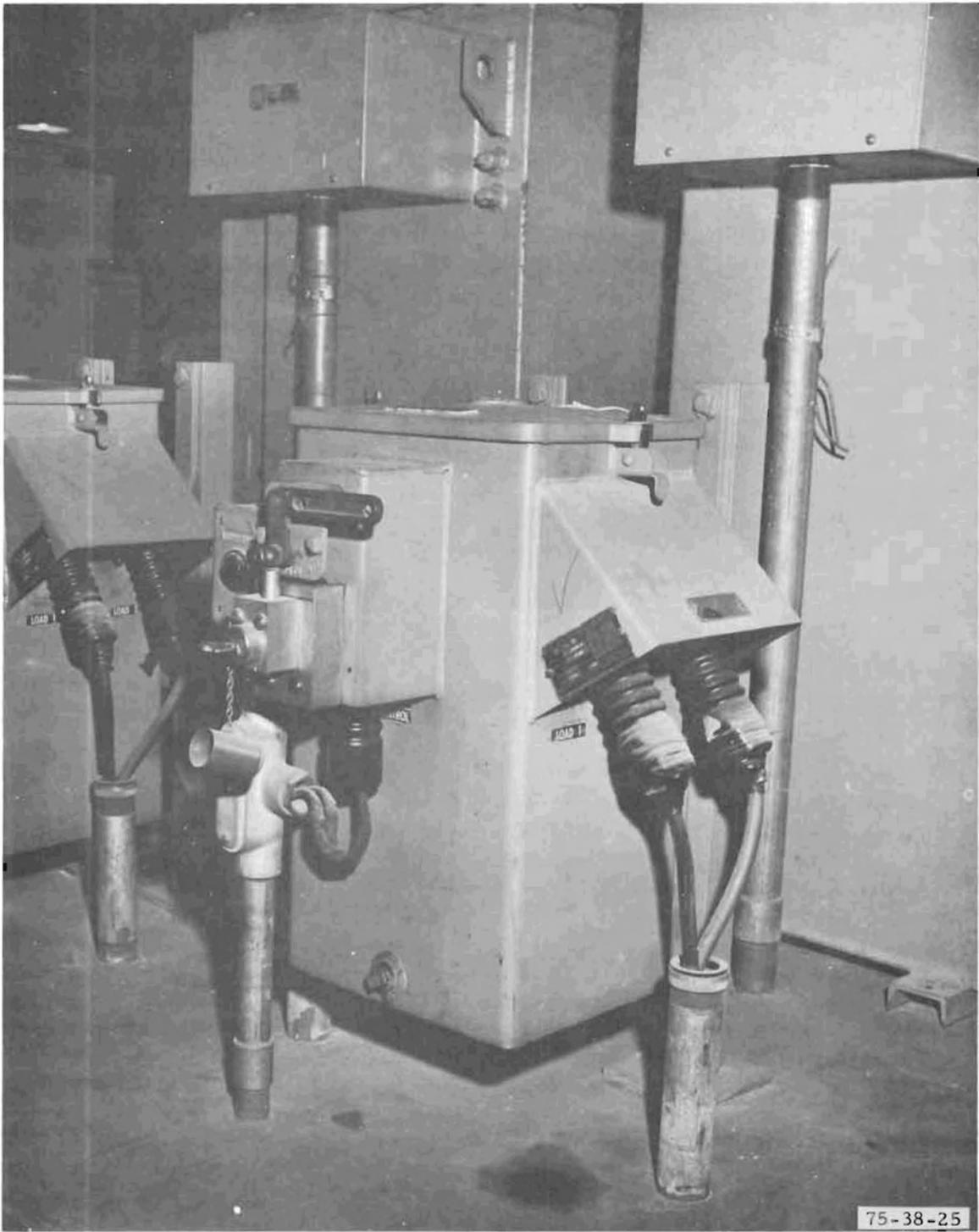


FIGURE 26. TYPICAL OIL SWITCH

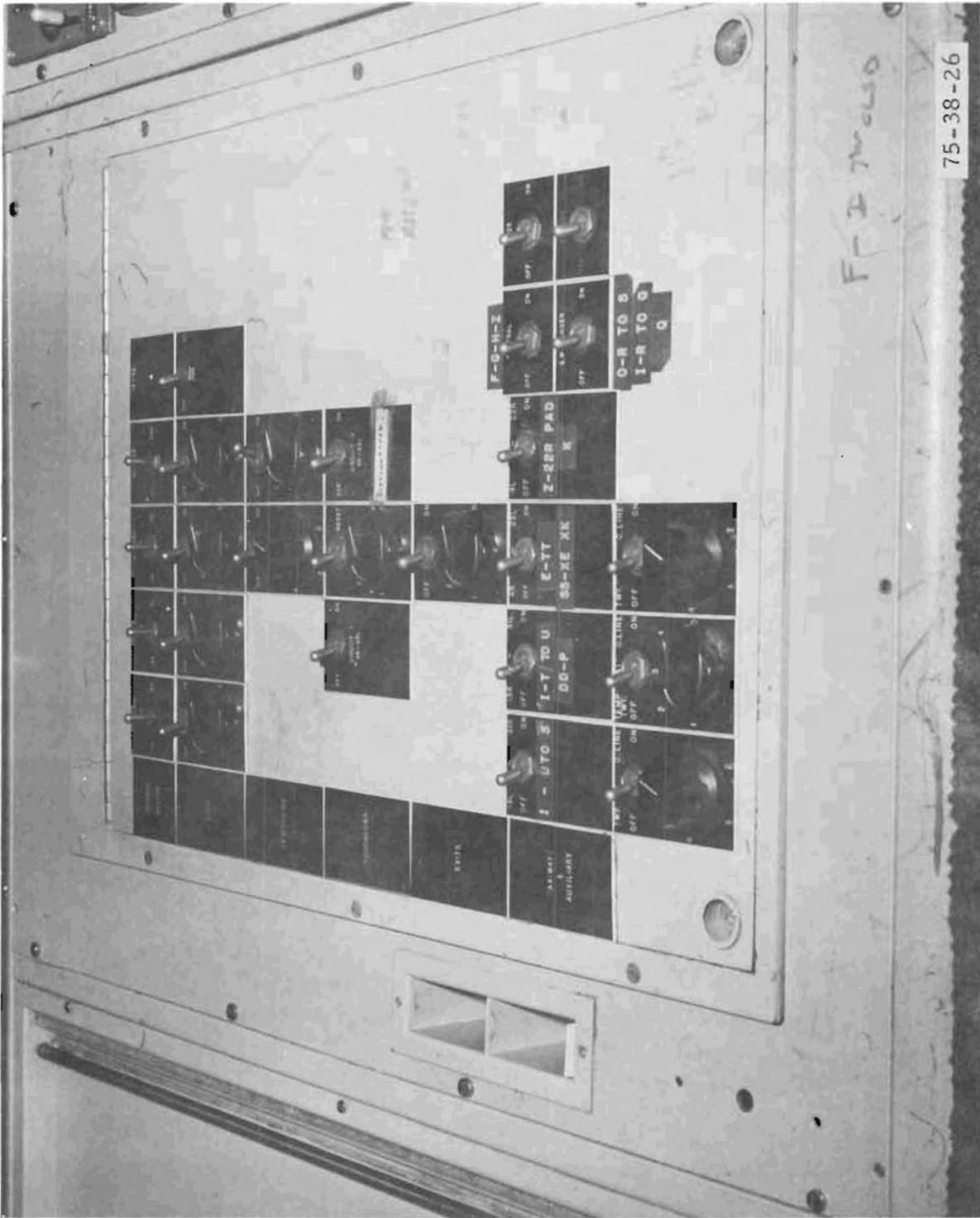
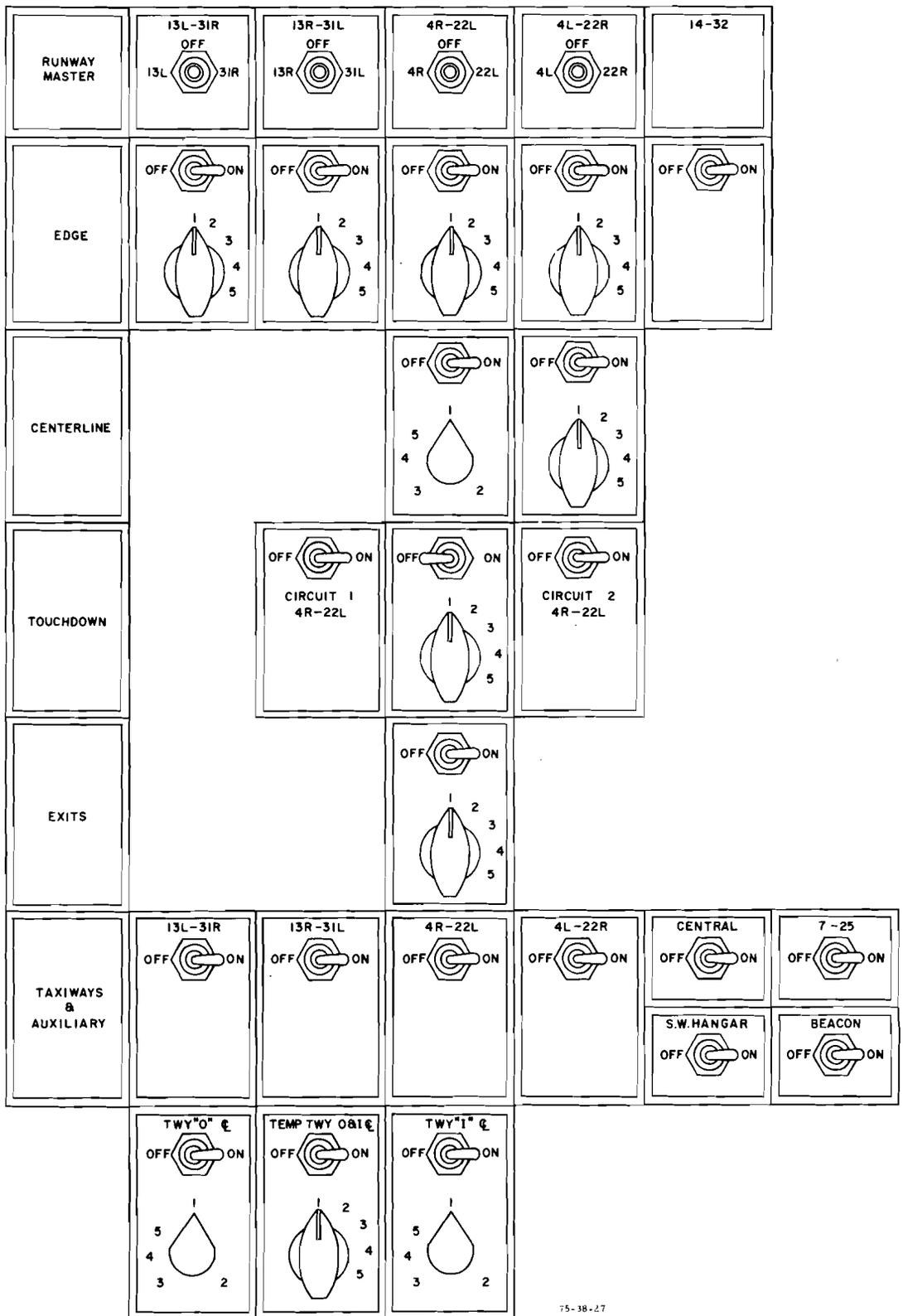


FIGURE 27. LIGHTING CONTROL PANEL



75-38-27

FIGURE 28. LIGHTING CONTROL PANEL LAYOUT

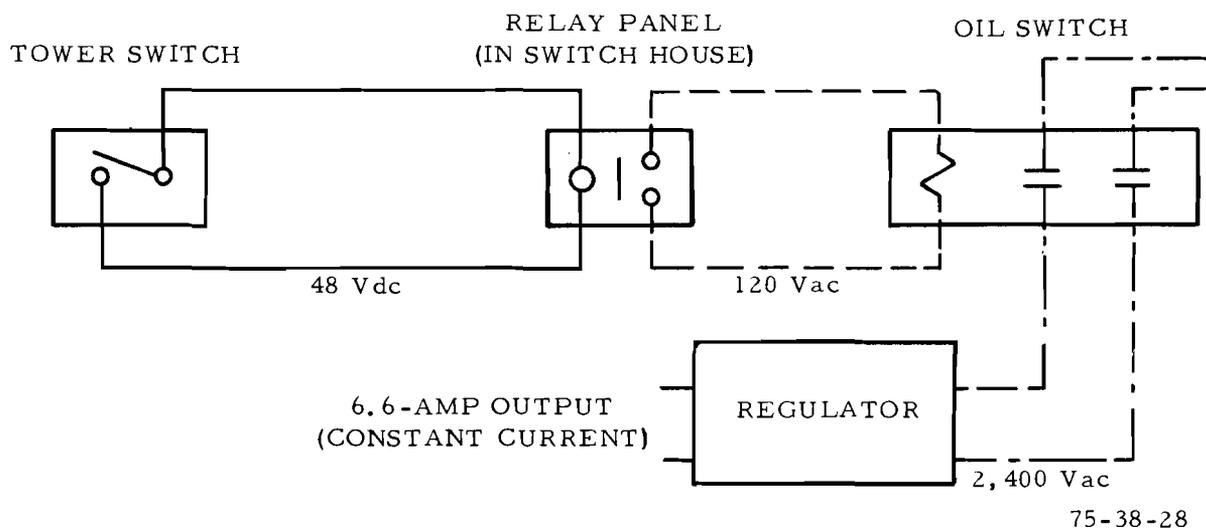


FIGURE 29. LIGHTING POWER CONTROL CIRCUIT

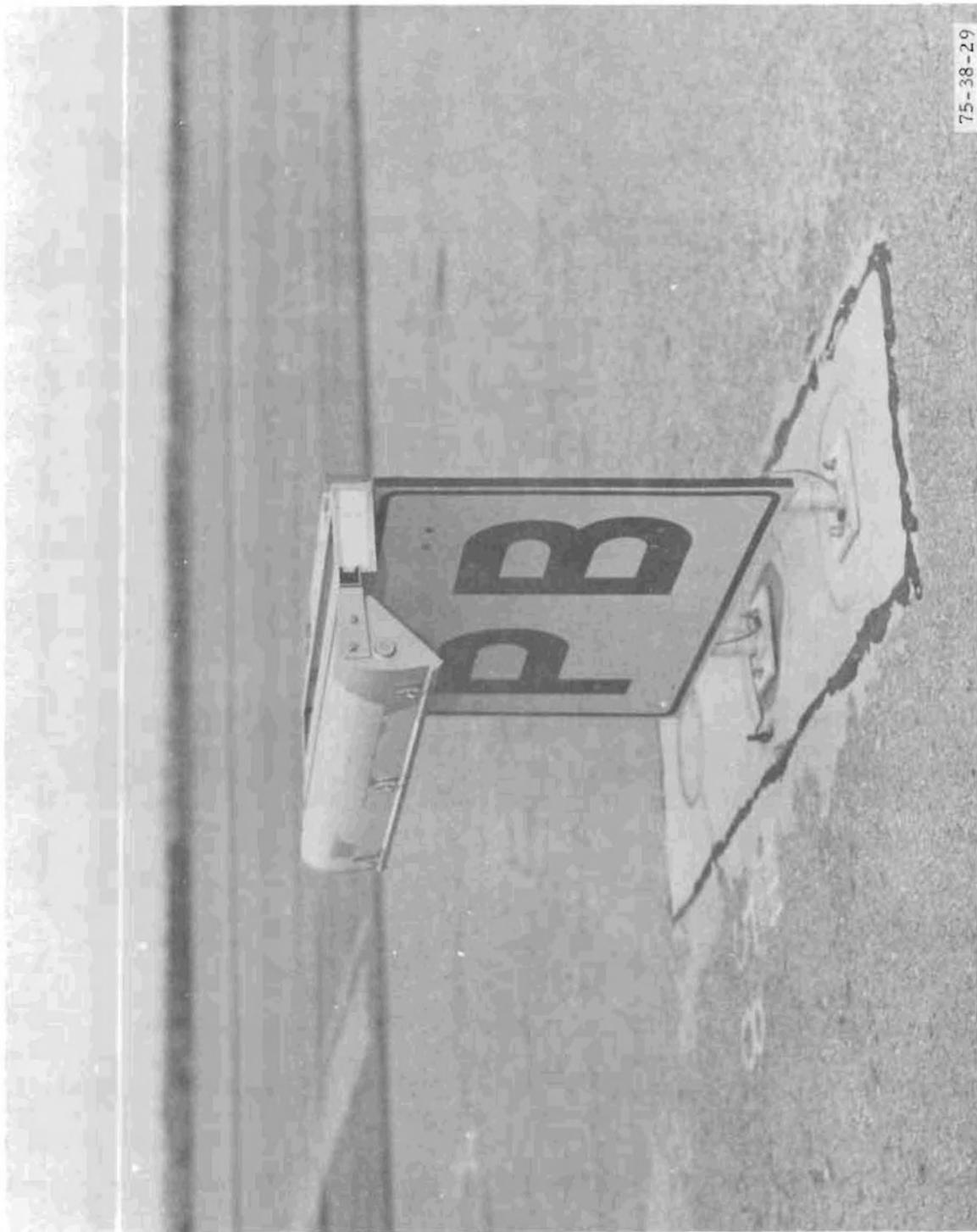
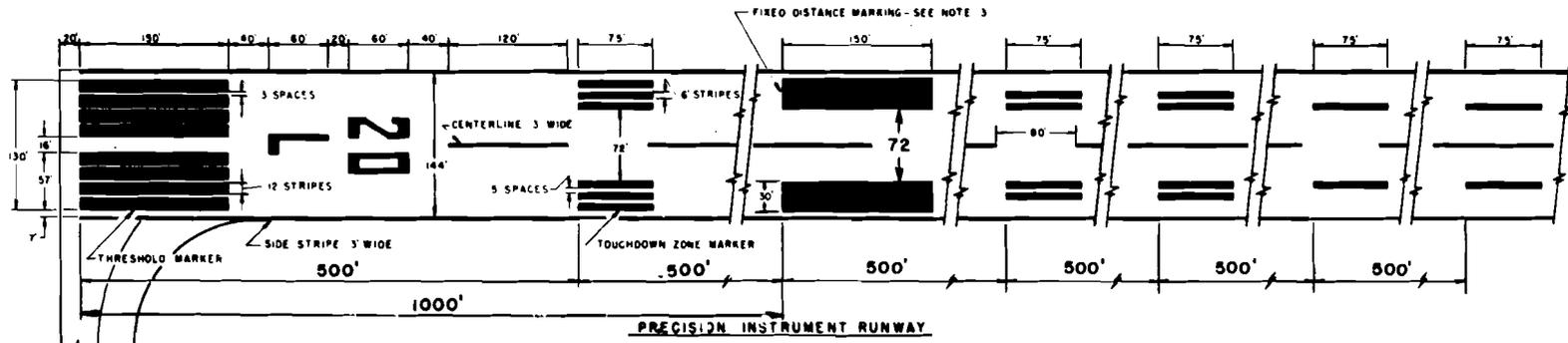


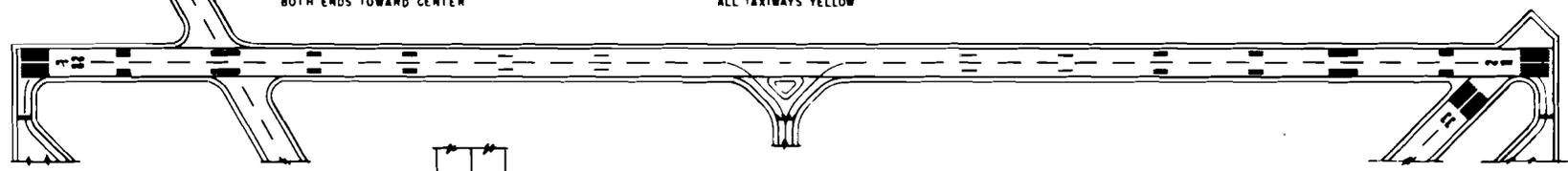
FIGURE 30. TYPICAL L-858 SIGN



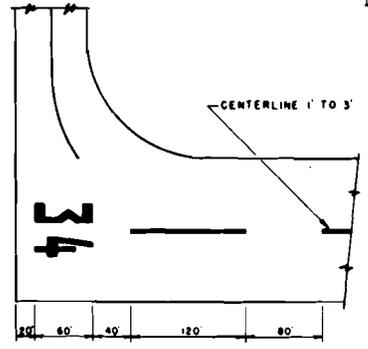
FIGURE 31. NONSTANDARD SIGN USED ON SERVICE ROAD



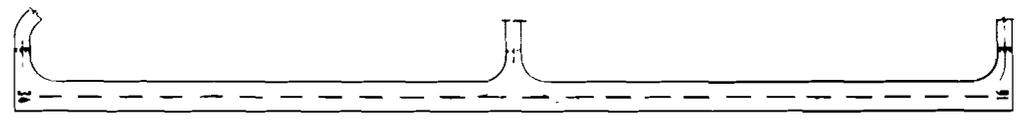
- NOTE
- 1 RUNWAY NUMBERS ARE ONE TENTH OF MAGNETIC AZIMUTH MEASURED ALONG RUNWAY CENTERLINE FROM APPROACH END
 - 2 LAY OUT RUNWAY CENTERLINE SPACING FROM BOTH ENDS TOWARD CENTER
 - 3 WHERE FIXED DISTANCE MARKER IS NOT USED INSTALL 3-6'X75' STRIPES AT THAT POINT
 - 4 ALL RUNWAY MARKINGS SHALL BE WHITE, ALL TAXIWAYS YELLOW



47



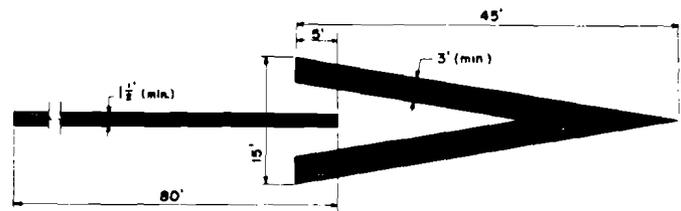
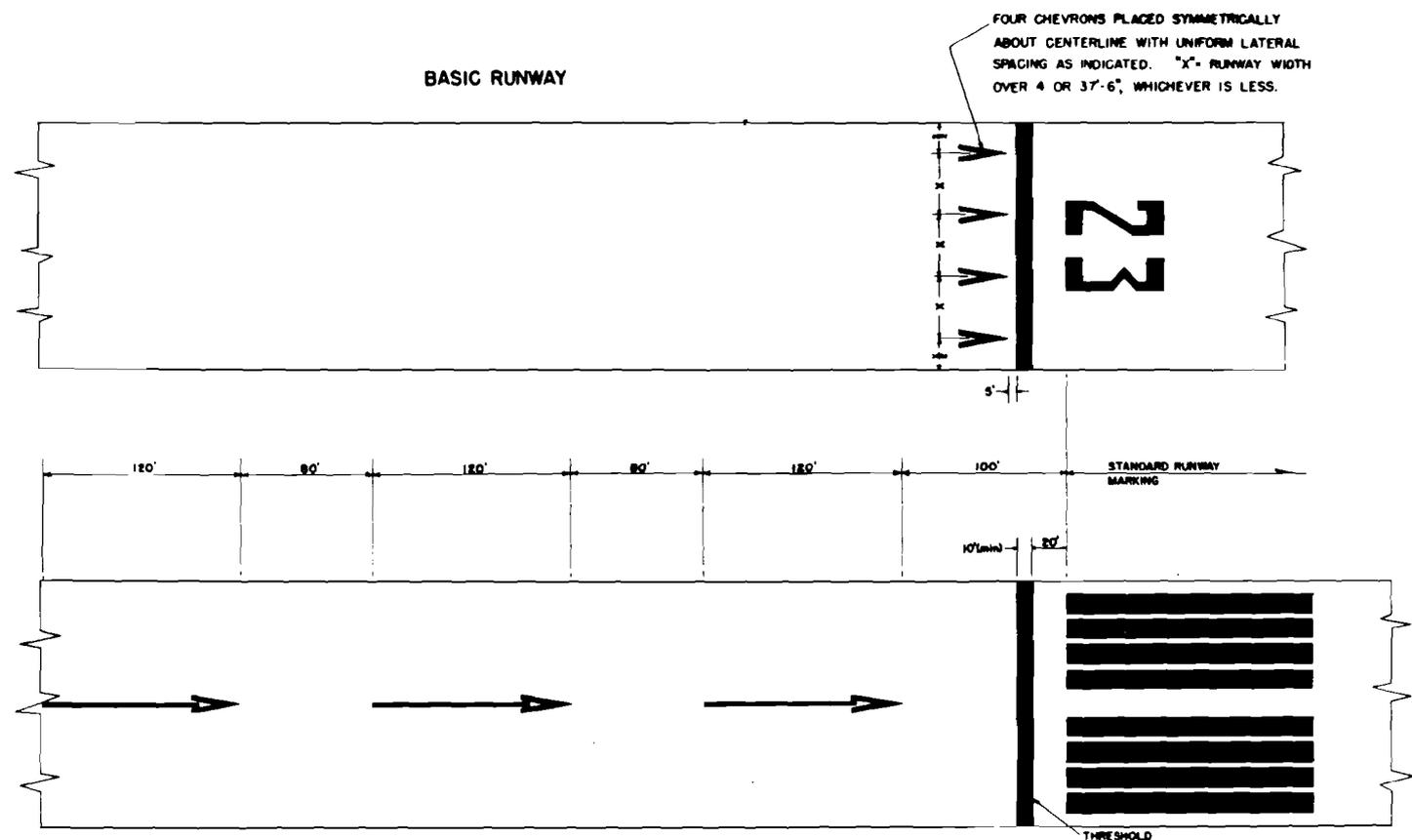
BASIC RUNWAY



BASIC RUNWAY

75-38-31

FIGURE 32. TYPICAL RUNWAY MARKINGS



CHEVRON AND ARROW DETAIL

NOTE:

1. FOR RUNWAYS LESS THAN 75' WIDE REDUCE DIMENSIONS PROPORTIONATELY.
2. COLOR CHEVRONS WHITE AND ARROWS YELLOW.

FIGURE 33. DISPLACED THRESHOLD MARKINGS



FIGURE 34. CONE USED TO COVER UNUSED EDGE LIGHTS



FIGURE 35. NARROWED SECTION OF AN OLD RUNWAY USED AS A TAXIWAY



FIGURE 36. OLD PLASTIC REFLECTOR



FIGURE 37. NEW EVA REFLECTOR

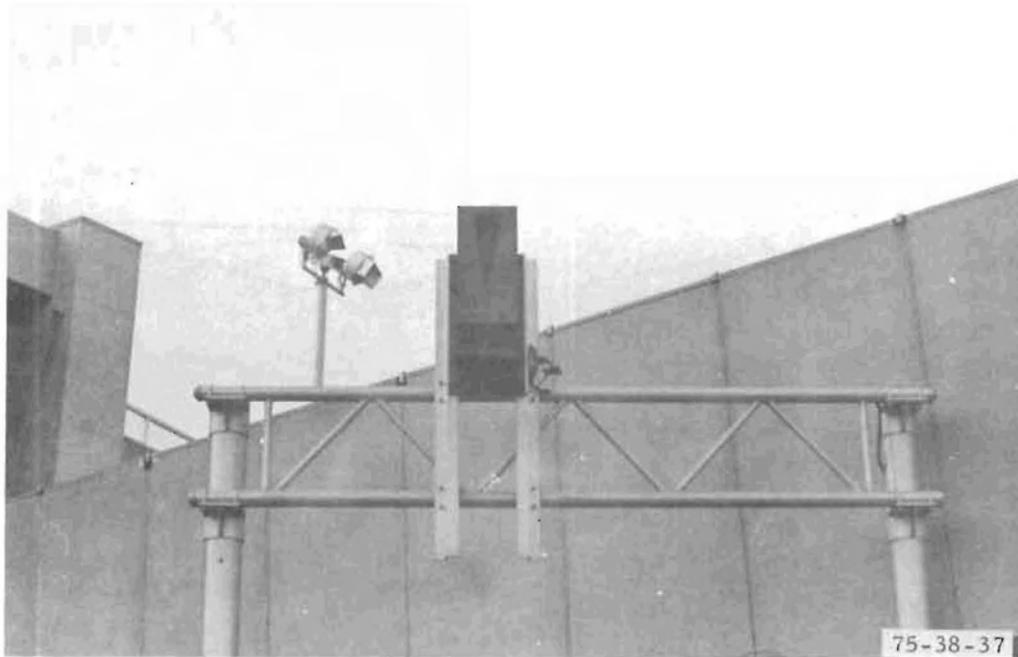


FIGURE 38. AMBER LIGHT IN A SLOTTED BOX FOR AIRCRAFT ALIGNMENT



FIGURE 39. WINDSHIELD TOUCH BAR FOR STOP GUIDANCE

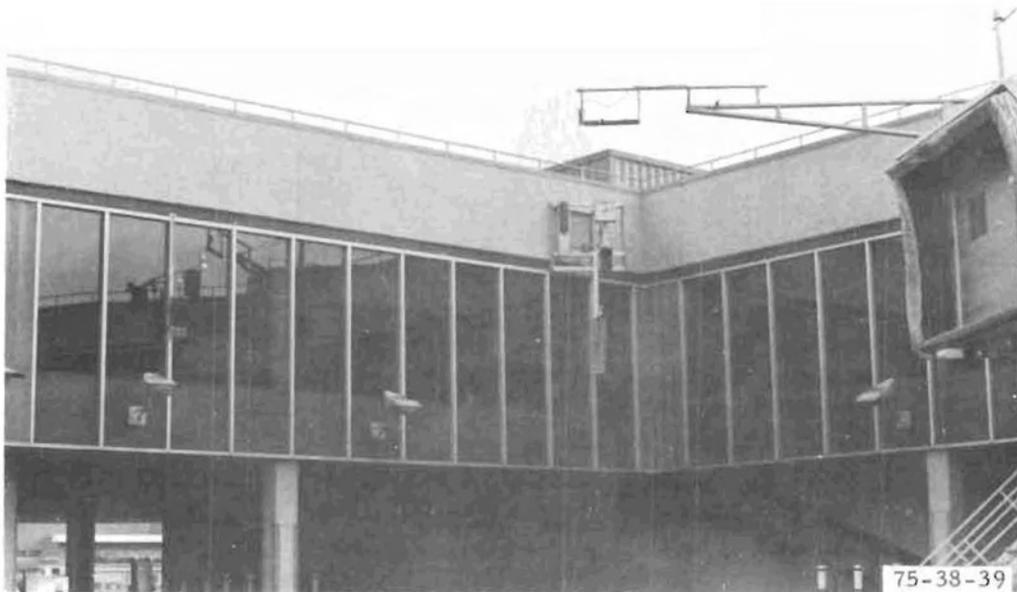


FIGURE 40. GREEN AND AMBER LIGHTS FOR ALIGHMENT, WINDSHIELD TOUCH BAR FOR STOP GUIDANCE, AND RED AND GREEN LIGHTS FOR SIGNALS

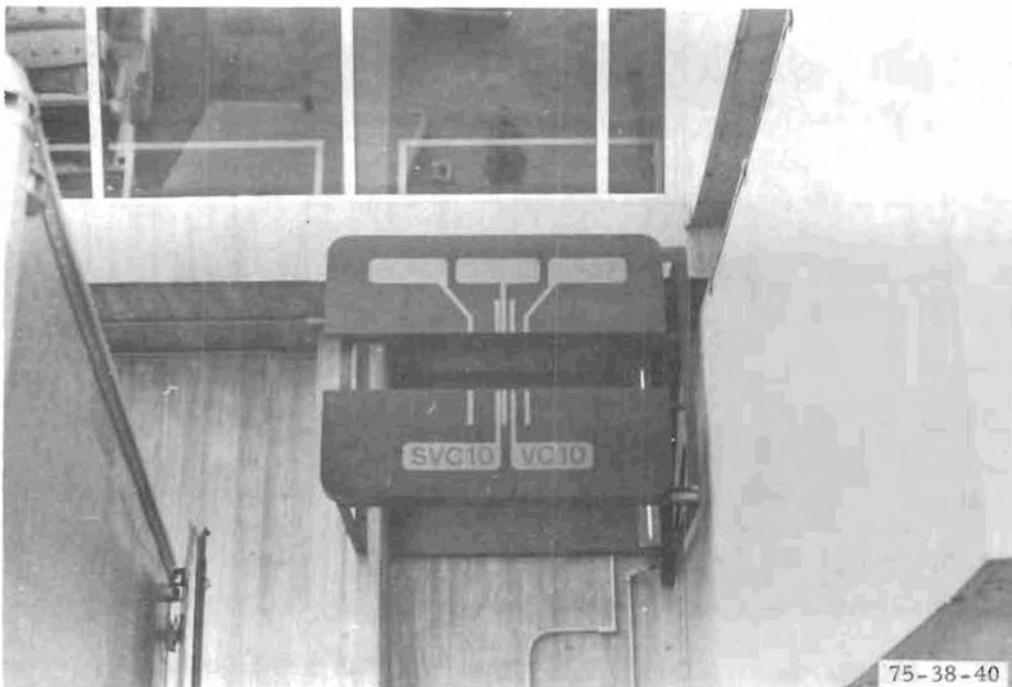


FIGURE 41. "PAPA" ALIGNMENT INDICATOR



FIGURE 42. "BOLDS" DOCKING SYSTEM



FIGURE 43. SPLIT BOARD USED FOR ALIGNMENT



FIGURE 44. ACCUPARK SYSTEM WITH PLASTIC KEG WINDSHIELD TOUCH



FIGURE 45. BOLDS SYSTEM WITH SUPPLEMENTARY RED AND GREEN LIGHTS

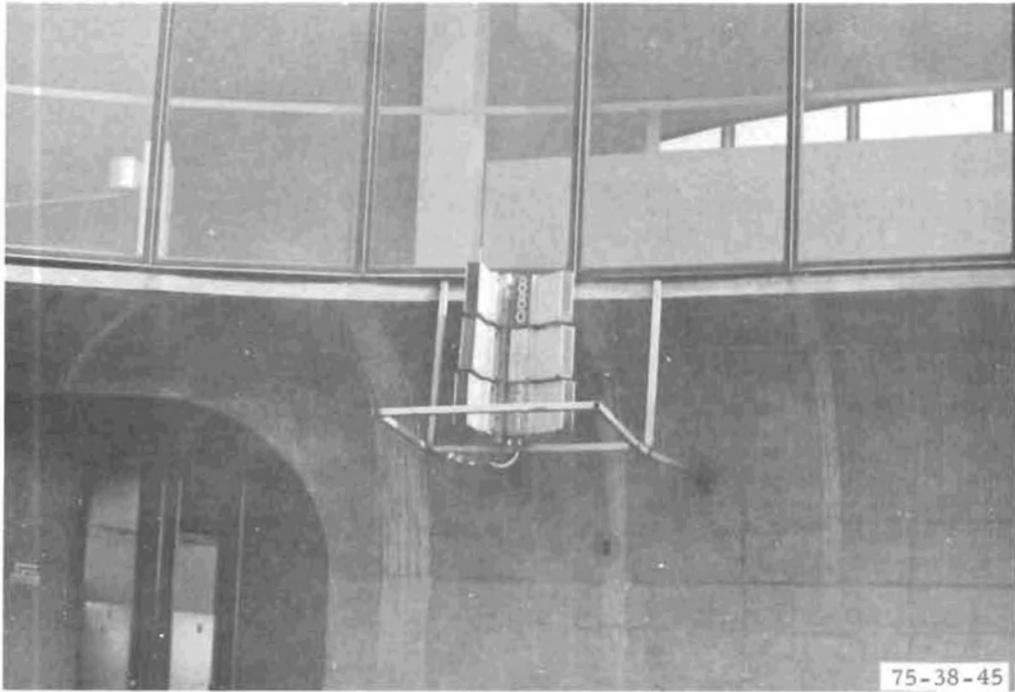


FIGURE 46. HIGHLY DIRECTIONAL SHUTTERED LIGHTS FOR TURN AND STOP

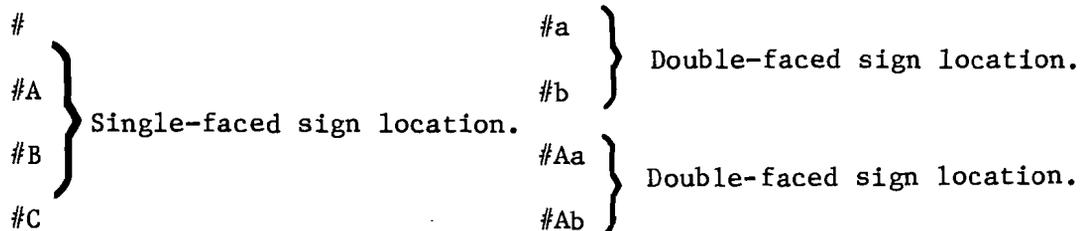


FIGURE 47. RED AND AMBER LIGHTS USED FOR ALIGNMENT

APPENDIX

J. F. KENNEDY INTERNATIONAL AIRPORT
TAXIWAY SIGNING SYSTEM
SIGN LIST
August 16, 1974

NOTE. For list and key plan:



All arrows shown ↖ or ↗ will have 45° angle unless otherwise noted.

Sign No.	Legend (Sign)	Color		Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
1	13L	Red	White	6	6	1
2	←W→	Yellow	Black	10	4+6	1
3	13L	Red	White	6	6	1
4	←W	Yellow	Black	6	6	1
5	↖WW, W→	Yellow	Black	14	4+4+6	1
5A	W	Yellow	Black	4	4	1
6	WW ↗ 60°	Yellow	Black	8	4+4	1
7	31R-13L	Red	White	10	4+6	1
8	←W ↗	Yellow	Black	8	4+4	1
9a	W	Yellow	Black	4	4	1
9b	13L-31R	Red	White	10	4+6	1
10	WW	Yellow	Black	4	4	1
11	ILS, Hold Clearance Req'd.	Red	White	12	6+6	1
12	←0, ↑W	Yellow	Black	12	6+6	1
13a	0	Yellow	Black	4	4	1
13b	13L-31R	Red	White	10	4+6	1
14a	31R-13L	Red	White	10	4+6	1
14b	↑HGR3, 4, 5	Green	White	16	4+6+6	1
15	↖A	Yellow	Black	6	6	1
16	A	Yellow	Black	4	4	1
17	I↗	Yellow	Black	6	6	1
18	A	Yellow	Black	4	4	1
19	AA	Yellow	Black	4	4	1
20	I	Yellow	Black	4	4	1
21	AA	Yellow	Black	4	4	1
22	I	Yellow	Black	4	4	1
23	B	Yellow	Black	4	4	1
24	B	Yellow	Black	4	4	1
25a	0	Yellow	Black	4	4	1
25b	13L-31R	Red	White	10	4+6	1
26	B→	Yellow	Black	6	6	1
27	←B	Yellow	Black	6	6	1
27A	BB	Yellow	Black	4	4	1
27B	↑B	Yellow	Black	6	6	1

Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
27C	↑BB	Yellow	Black	8	4+4	1
28a	31R-13L	Red	White	10	4+6	1
28b	↑NPT	Green	White	10	4+6	1
29	B→	Yellow	Black	6	6	1
30	↖B	Yellow	Black	6	6	1
31	B	Yellow	Black	4	4	1
32a	I	Yellow	Black	4	4	1
32b	O	Yellow	Black	4	4	1
33	B	Yellow	Black	4	4	1
34	I	Yellow	Black	4	4	1
35	BA	Yellow	Black	4	4	1
36	BA	Yellow	Black	4	4	1
37	I	Yellow	Black	4	4	2
38	D	Yellow	Black	4	4	2
39	D	Yellow	Black	4	4	2
40a	O	Yellow	Black	4	4	2
40b	13L-31R	Red	White	10	4+6	2
41	D ↗	Yellow	Black	6	6	2
42a	31R-13L	Red	White	10	4+6	2
42b	↑HTR 7	Green	White	10	4+6	2
43	↖D	Yellow	Black	6	6	2
44	D	Yellow	Black	4	4	2
45a	I	Yellow	Black	4	4	2
45b	O	Yellow	Black	4	4	2
46	D	Yellow	Black	4	4	2
47A	I	Yellow	Black	4	4	2
47B	DA	Yellow	Black	4	4	2
47C	DA	Yellow	Black	4	4	2
48	E	Yellow	Black	4	4	2
49	E	Yellow	Black	4	4	2
50a	O	Yellow	Black	4	4	2
50b	13L-31R	Red	White	10	4+6	2
51	E ↗	Yellow	Black	6	6	2
52a	31R-13L	Red	White	10	4+6	2
52b	↑14	Yellow	Black	10	4+6	2
53A	22R→	Yellow	Black	8	4+4	2
53B	14	Red	White	4	4	2
53C	↖E	Yellow	Black	6	6	2
54	ZA ↗ 60°	Yellow	Black	6	6	2
55	E	Yellow	Black	4	4	2
56a	I	Yellow	Black	4	4	2
56b	O	Yellow	Black	4	4	2
57	E	Yellow	Black	4	4	2
58A	Y ↘ 60°	Yellow	Black	6	6	2
58B	31R-13L	Red	White	10	4+6	2
59	13L-31R	Red	White	10	4+6	2
60	Y	Yellow	Black	4	4	2

Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
61	31R	Red	White	6	6	2
62	YA ↘ 60°	Yellow	Black	6	6	2
63	←ZA	Yellow	Black	8	4+4	2
64	22R	Red	White	6	6	2
64A	22R-4L	Red	White	12	6+6	2
64B	4L-22R	Red	White	12	6+6	2
64C	22R-4L	Red	White	12	6+6	2
64D	4L-22R	Red	White	12	6+6	2
65a	31R-13L	Red	White	10	4+6	2
65b	↑22R	Yellow	Black	10	4+6	2
66	↖30° 22R	Yellow	Black	8	4+4	2
67	13L-31R	Red	White	10	4+6	2
68	EA	Yellow	Black	4	4	2
69a	O	Yellow	Black	4	4	2
69b	ZA	Yellow	Black	4	4	2
70	EA	Yellow	Black	4	4	2
71	EA	Yellow	Black	4	4	2
72	↑O	Yellow	Black	6	6	2
72A	EA	Yellow	Black	6	6	2
73	EA	Yellow	Black	4	4	2
74a	I	Yellow	Black	4	4	2
74b	O	Yellow	Black	4	4	2
75	EA	Yellow	Black	4	4	2
76	I	Yellow	Black	4	4	2
77	F	Yellow	Black	4	4	2
78	F	Yellow	Black	4	4	2
79	↖O, ↑ZA	Yellow	Black	14	6+4+4	2
79A	F→	Yellow	Black	6	6	2
80a	O	Yellow	Black	6	6	2
80b	22R-4L	Red	White	12	6+6	2
81	31R ↗	Yellow	Black	8	4+4	2
82	4L-22R	Red	White	12	6+6	2
84	FA	Yellow	Black	4	4	2
85	F	Yellow	Black	4	4	2
86a	60°↖Y, ↑F, ↗60°	Yellow	Black	18	6+6+6	2
86b	4L-22R	Red	White	12	6+6	2
87	↙F	Yellow	Black	6	6	2
88	F	Yellow	Black	4	4	2
89a	I	Yellow	Black	4	4	2
89b	O	Yellow	Black	4	4	2
90	F	Yellow	Black	4	4	2
91	Not Used					
92a	Not Used					
92b	Not Used					
93	4L-22R	Red	White	12	6+6	2

Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
94	I	Yellow	Black	4	4	2
95	G	Yellow	Black	4	4	2
96	G	Yellow	Black	4	4	2
97a	22R-4L	Red	White	12	6+6	2
97b	O	Yellow	Black	6	6	2
98A	4L-22R	Red	White	12	6+6	2
98B	G	Yellow	Black	4	4	2
98C	Z	Yellow	Black	4	4	2
99A	G	Yellow	Black	4	4	3
99B	4L-22R	Red	White	12	6+6	2
100	←G	Yellow	Black	6	6	2
101	G	Yellow	Black	4	4	2
102a	O	Yellow	Black	4	4	2
102b	I	Yellow	Black	4	4	2
103	G	Yellow	Black	4	4	0
104	I	Yellow	Black	4	4	3
105	H	Yellow	Black	4	4	3
106	H	Yellow	Black	4	4	3
107a	22R-4L	Red	White	12	6+6	3
107b	O	Yellow	Black	6	6	3
108	H→	Yellow	Black	6	6	3
109	4L-22R	Red	White	12	6+6	3
110	4L-22R	Red	White	12	6+6	3
111	←H	Yellow	Black	6	6	3
112	H	Yellow	Black	4	4	3
113a	O	Yellow	Black	4	4	3
113b	I	Yellow	Black	4	4	3
114	I	Yellow	Black	4	4	3
115	H	Yellow	Black	4	4	3
116	H	Yellow	Black	4	4	3
117	Not Used					
118	I ↗	Yellow	Black	6	6	3
119	↑4L	Yellow	Black	8	4+4	3
120	Not Used					
121	O	Yellow	Black	4	4	3
122	Not Used					
123a	Not Used					
123b	Not Used					
124	Not Used					
125	Not Used					
126	Not Used					
127	I→	Yellow	Black	6	6	3
128	←I	Yellow	Black	6	6	3
129	31L-13R	Red	White	10	4+6	3
130	↖60° K, ↑KA	Yellow	Black	14	6+4+4	3
130A	↙K	Yellow	Black	6	6	3

Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
131	4L-22R	Red	White	12	6+6	3
131A	22R-4L	Red	White	12	6+6	3
131B	22R-4L	Red	White	12	6+6	3
131C	31L-13R	Red	White	10	4+6	3
131D	31L-13R	Red	White	10	4+6	3
132	4L-22R	Red	White	12	6+6	3
133a	↑4L	Yellow	Black	10	4+6	3
133b	13R-31L	Red	White	10	4+6	3
134	ILS Hold	Red	White	12	6+6	3
	Clearance Req'd.					
135	KB	Yellow	Black	4	4	3
136a	22R-4L	Red	White	12	6+6	3
136b	K	Yellow	Black	6	6	3
137	KB→	Yellow	Black	8	4+4	3
138	K→	Yellow	Black	6	6	3
139	4L	Red	White	6	6	3
140	Y↘ 60°	Yellow	Black	6	6	2
141	14-32	Red	White	8	4+4	2
142	↖60 Y	Yellow	Black	6	6	2
143	22L	Red	White	6	6	2
144	↖E	Yellow	Black	6	6	2
145	↖	Yellow	Black	4	4	2
146	22L-4R	Red	White	12	6+6	2
147	↖60° FA	Yellow	Black	6	6	2
148	H ↑	Yellow	Black	6	6+6	2
149	22L-4R	Red	White	12	6+6	2
150	22L-4R	Red	White	12	6+6	2
151	↖F	Yellow	Black	6	6	3
152	Z	Yellow	Black	4	4	3
153	H	Yellow	Black	4	4	3
154	Z	Yellow	Black	4	4	3
155	H	Yellow	Black	4	4	3
156	J ↑	Yellow	Black	6	6	3
157	22L-4R	Red	White	12	6+6	3
158a	Z	Yellow	Black	4	4	3
158b	CAT II	Red	White	8	4+4	3
159	J	Yellow	Black	4	4	3
160	Not Used					
161	Not Used					
162a	31L	Red	White	6	6	3
162b	↖Z	Yellow	Black	6	6	3
163	↖Z	Yellow	Black	6	6	3
164	Z ↑	Yellow	Black	6	6	3
165	←4R	Yellow	Black	8	4+4	3
166a	↑4R	Yellow	Black	8	4+4	3
166b	31L	Red	White	8	4+4	3
167	CAT II	Red	White	8	4+4	3

Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
168	4R	Red	White	6	6	3
169	J A ↗	Yellow	Black	8	4+4	3
170a	↗4L	Yellow	Black	8	4+4	3
170b	O	Yellow	Black	4	4	3
171a	O	Yellow	Black	4	4	3
171b	↗I	Yellow	Black	4	4	3
172a	Not Used					
172b	↗I→	Yellow	Black	8	4+4	3
173	↗4L→	Yellow	Black	8	4+4	3
173b	Not Used					
174a	31L-13R	Red	White	10	4+6	3
174b	O	Yellow	Black	4	4	3
175	KK	Yellow	Black	4	4	3
176A	↗4L ↗	Yellow	Black	8	4+4	3
176B	K	Yellow	Black	4	4	3
177a	O	Yellow	Black	4	4	3
177b	I	Yellow	Black	4	4	3
178	K	Yellow	Black	4	4	3
178	KK	Yellow	Black	4	4	3
180	I	Yellow	Black	4	4	3
181	I	Yellow	Black	4	4	3
182a	↖I	Yellow	Black	6	6	3
182b	K	Yellow	Black	6	6	3
183	I	Yellow	Black	4	4	3
184	KK	Yellow	Black	4	4	3
185a	O	Yellow	Black	4	4	3
185b	I	Yellow	Black	4	4	3
186	KK	Yellow	Black	4	4	3
187	I	Yellow	Black	4	4	3
188	Not Used					
189	L	Yellow	Black	4	4	3
190	L	Yellow	Black	4	4	4
191a	31L-13R	Red	White	10	4+6	4
191b	O	Yellow	Black	4	4	4
192	↖L	Yellow	Black	6	6	4
193	L	Yellow	Black	4	4	4
194a	O	Yellow	Black	4	4	4
194b	I	Yellow	Black	4	4	4
195	L	Yellow	Black	4	4	4
196	I	Yellow	Black	4	4	4
197	LA	Yellow	Black	4	4	4
198	LA	Yellow	Black	4	4	4
199	LA	Yellow	Black	4	4	4
200a	O	Yellow	Black	4	4	4
200b	I	Yellow	Black	4	4	4
201	LA	Yellow	Black	4	4	4

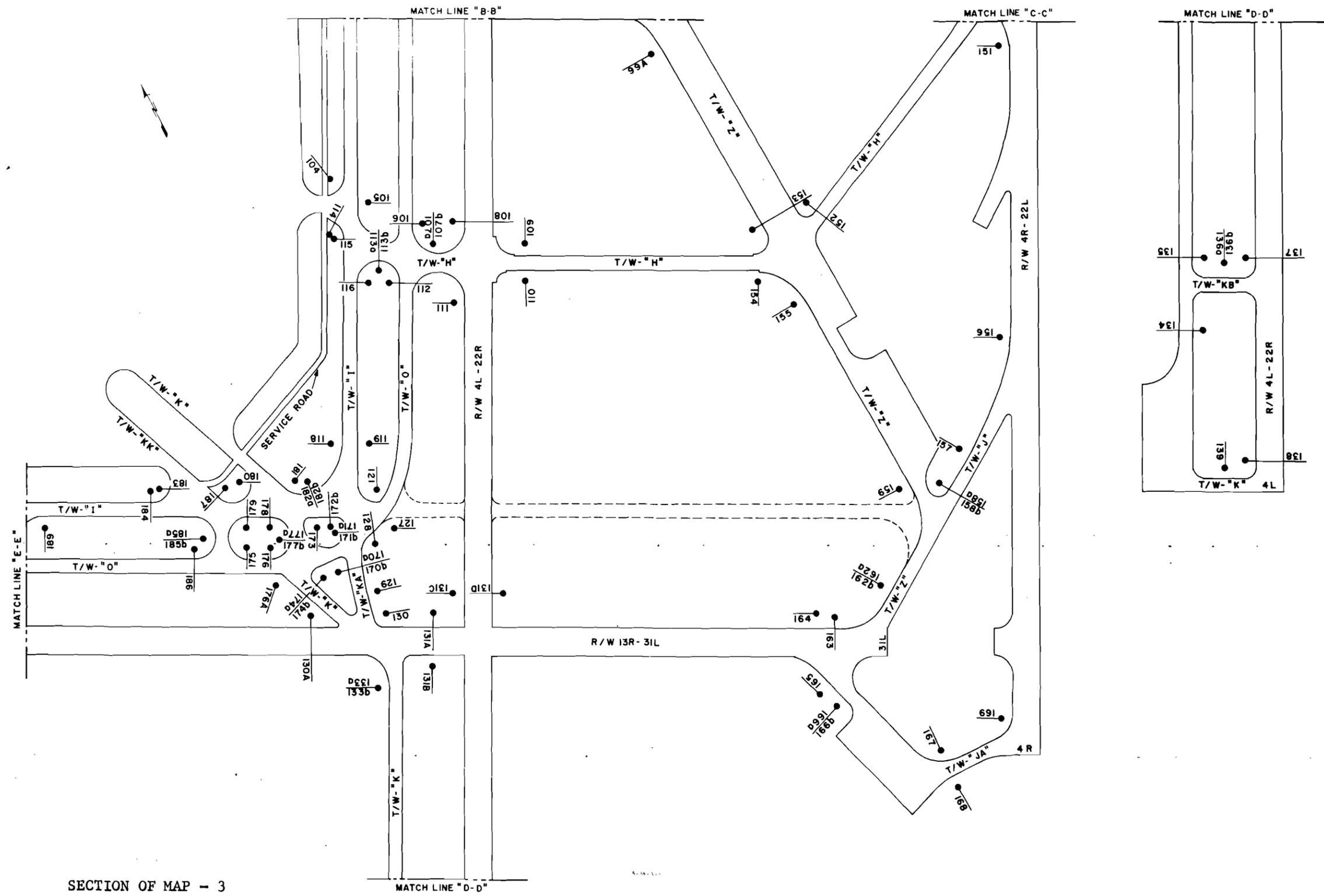
Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
202	I	Yellow	Black	4	4	4
203	M	Yellow	Black	4	4	4
204	M	Yellow	Black	4	4	4
205	M ↘	Yellow	Black	6	6	4
206	↖ M	Yellow	Black	6	6	4
207a	31L-13R	Red	White	10	4+6	4
207b	O	Yellow	Black	4	4	4
208	M	Yellow	Black	4	4	4
209a	O	Yellow	Black	4	4	4
209b	I	Yellow	Black	4	4	4
210	M	Yellow	Black	4	4	4
211	I	Yellow	Black	4	4	4
212	MA	Yellow	Black	4	4	4
213a	O	Yellow	Black	4	4	4
213b	I	Yellow	Black	4	4	4
214	MA	Yellow	Black	4	4	4
215	MA	Yellow	Black	4	4	4
216	MA	Yellow	Black	4	4	4
217	I ↗	Yellow	Black	6	6	4
218	↑Q	Yellow	Black	6	6	4
219	O ↗	Yellow	Black	6	6	4
220	↑P	Yellow	Black	6	6	4
221	O	Yellow	Black	4	4	4
222	I	Yellow	Black	4	4	4
223	I	Yellow	Black	4	4	4
224	N	Yellow	Black	4	4	4
225a	O	Yellow	Black	4	4	4
225b	I	Yellow	Black	4	4	4
226a	↖ I, ↑O	Yellow	Black	12	6+6	4
226b	N	Yellow	Black	6	6	4
227	O	Yellow	Black	4	4	4
228	↑13R	Yellow	Black	8	4+4	4
229	Q	Yellow	Black	4	4	4
230a	O	Yellow	Black	4	4	4
230b	↑13R	Yellow	Black	8	4+4	4
231	N	Yellow	Black	4	4	4
232	Q	Yellow	Black	4	4	4
233	N	Yellow	Black	4	4	4
234a	31L-13R	Red	White	10	4+6	4
234b	P	Yellow	Black	4	4	4
235	N→	Yellow	Black	6	6	4
236	←N	Yellow	Black	6	6	4
237a	31L-13R	Red	White	10	4+6	4
237b	P	Yellow	Black	4	4	4
238	13R ↗	Yellow	Black	8	4+4	4
239	N	Yellow	Black	4	4	4

Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
240	P	Yellow	Black	4	4	4
241a	N	Yellow	Black	6	6	4
241b	↑Q	Yellow	Black	6	6	4
242	←I	Yellow	Black	6	6	4
243a	Q	Yellow	Black	4	4	4
243b	O	Yellow	Black	4	4	4
244	←GAT	Green	White	8	4+4	4
245	Q	Yellow	Black	4	4	4
246	GAT→	Green	White	8	4+4	4
247	PA	Yellow	Black	4	4	4
248a	P	Yellow	Black	4	4	4
248b	Q	Yellow	Black	4	4	4
249	PA	Yellow	Black	4	4	4
250	P	Yellow	Black	4	4	4
251	31L-13R	Red	White	10	4+6	4
252	PA→	Yellow	Black	8	4+4	4
253	PA	Yellow	Black	4	4	4
254	PA	Yellow	Black	4	4	4
255	Q	Yellow	Black	4	4	4
256	PB	Yellow	Black	4	4	4
257a	P	Yellow	Black	4	4	4
257b	Q	Yellow	Black	4	4	4
258	PB	Yellow	Black	4	4	4
259	PB	Yellow	Black	4	4	4
260	PB	Yellow	Black	4	4	4
261	Q	Yellow	Black	4	4	4
262	PC	Yellow	Black	4	4	4
263	PC	Yellow	Black	4	4	4
264	PC	Yellow	Black	4	4	4
265a	P	Yellow	Black	4	4	4
265b	Q	Yellow	Black	4	4	4
266	PC	Yellow	Black	4	4	4
267	Not Used					
268a	PD	Yellow	Black	6	6	4
268b	↑Q	Yellow	Black	6	6	4
269a	P	Yellow	Black	4	4	4
269b	Q	Yellow	Black	4	4	4
270	PD	Yellow	Black	4	4	4
271a	13R	Red	White	6	6	4
271b	P	Yellow	Black	4	4	4
272	PD→	Yellow	Black	8	4+4	4
273	←13R	Yellow	Black	8	4+4	4
274	PD	Yellow	Black	4	4	4
275	Not Used					
276	QD	Yellow	Black	4	4	4
277	Not Used					
278	Not Used					

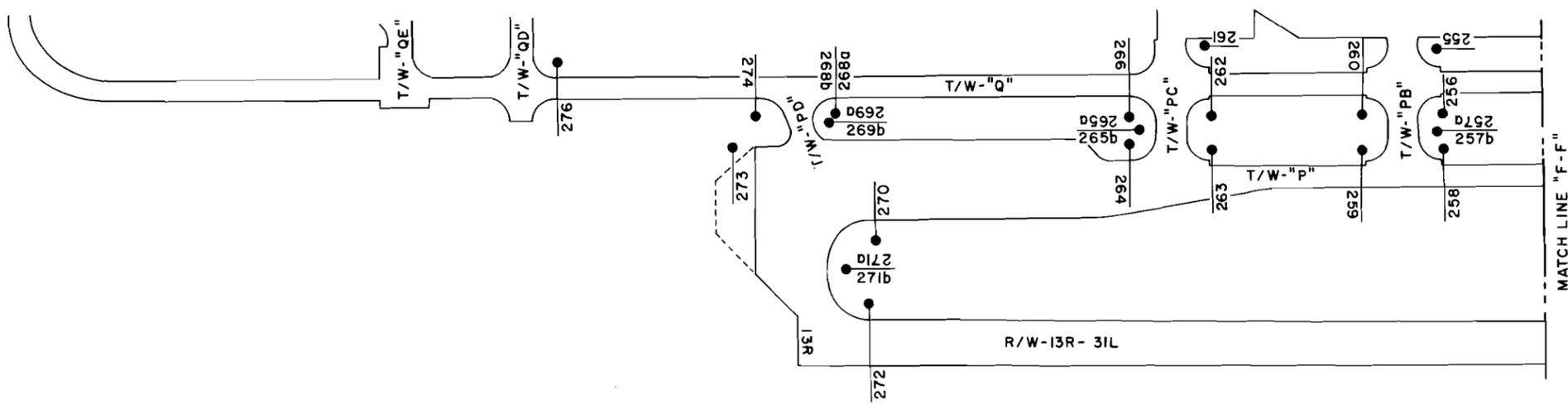
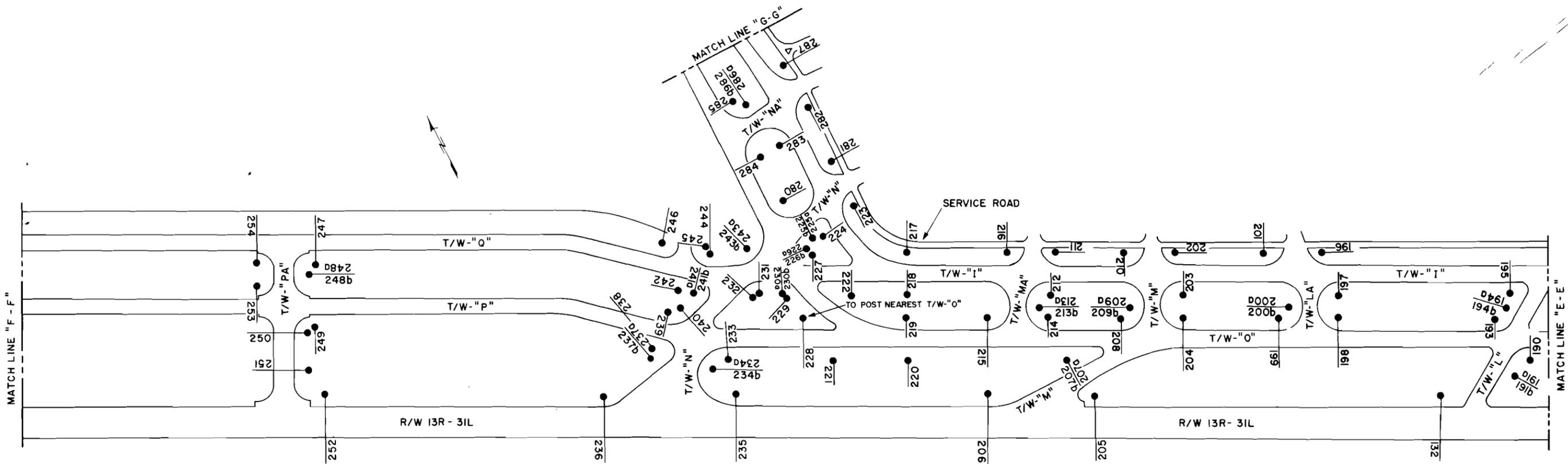
<u>Sign No.</u>	<u>Legend (Sign)</u>	<u>Color</u>		<u>Face Width (ft)</u>	<u>Width of Panels (ft)</u>	<u>Sect. of Map</u>
		<u>Background</u>	<u>Letter</u>			
279	Not Used					
280	N	Yellow	Black	4	4	4
281	N	Yellow	Black	4	4	4
282	I	Yellow	Black	4	4	4
283	NA	Yellow	Black	4	4	4
284	NA	Yellow	Black	4	4	4
285	NA	Yellow	Black	4	4	4
286a	O	Yellow	Black	4	4	4
286b	I	Yellow	Black	4	4	4
287	NA	Yellow	Black	4	4	4
288	I	Yellow	Black	4	4	5
289	NB	Yellow	Black	4	4	5
290a	O	Yellow	Black	4	4	5
290b	I	Yellow	Black	4	4	5
291	NB	Yellow	Black	4	4	5
292	NB	Yellow	Black	4	4	5
293	NB	Yellow	Black	4	4	5
294	Not Used					
295	R	Yellow	Black	4	4	5
296	R	Yellow	Black	4	4	5
297	O	Yellow	Black	4	4	5
298a	R	Yellow	Black	4	4	5
298b	S	Yellow	Black	4	4	5
299	CRGO	Green	White	10	4+6	5
300a	O	Yellow	Black	4	4	5
300b	I	Yellow	Black	4	4	5
301	R	Yellow	Black	4	4	5
302	S	Yellow	Black	4	4	5
303	O	Yellow	Black	4	4	5
304	SA	Yellow	Black	4	4	5
305a	R	Yellow	Black	4	4	5
305b	S	Yellow	Black	4	4	5
306	S	Yellow	Black	4	4	5
307	V	Yellow	Black	4	4	5
308	SA	Yellow	Black	4	4	5
309	V	Yellow	Black	4	4	5
310a	I	Yellow	Black	4	4	5
310b	O	Yellow	Black	4	4	5
311	V	Yellow	Black	4	4	5
312	I	Yellow	Black	4	4	5
313	V	Yellow	Black	4	4	5
314	V	Yellow	Black	4	4	5
315	O	Yellow	Black	4	4	5
316	VA	Yellow	Black	4	4	5
317	Not Used					
318a	I	Yellow	Black	4	4	5
318b	O	Yellow	Black	4	4	5

Sign No.	Legend (Sign)	Color		Face Width (ft)	Width of Panels (ft)	Sect. of Map
		Background	Letter			
319	VA	Yellow	Black	4	4	5
320	SA	Yellow	Black	4	4	5
321a	O	Yellow	Black	4	4	5
321b	↑CRGO 81	Green	White	14	4+4+6	5
322	VA	Yellow	Black	4	4	5
323a	VA	Yellow	Black	4	4	5
323b	←CRGO 81	Green	White	14	4+4+6	5
324	I	Yellow	Black	4	4	1
325	VB	Yellow	Black	4	4	1
326b	O	Yellow	Black	4	4	1
327	VB	Yellow	Black	4	4	1
328	VB	Yellow	Black	4	4	1
329	VB	Yellow	Black	4	4	1
330	I	Yellow	Black	4	4	1
331	A	Yellow	Black	4	4	1
332	↖ I, O ↗	Yellow	Black	12	6+6	1
333	←W	Yellow	Black	6	6	1
334a	O	Yellow	Black	4	4	1
334b	↑13L	Yellow	Black	8	4+4	1
335	SA	Yellow	Black	4	4	5
336	SA	Yellow	Black	4	4	5
337	↖ HGR 8	Green	White	10	4+6	5
338a	SA	Yellow	Black	4	4	5
338b	CRGO 82→	Green	White	14	4+4+6	5
339	SB	Yellow	Black	4	4	5
340	SB	Yellow	Black	4	4	5
341	R	Yellow	Black	4	4	5
342	SB	Yellow	Black	4	4	5
343a	R	Yellow	Black	4	4	5
343b	S	Yellow	Black	4	4	5
344	↖ HGR 9	Green	White	10	4+6	5
345	CRGO 83→	Green	White	14	4+4+6	5
346	SC	Yellow	Black	4	4	5
347a	R	Yellow	Black	4	4	5
347b	S	Yellow	Black	4	4	5
348	SC	Yellow	Black	4	4	5
349	R	Yellow	Black	4	4	5
350	SC	Yellow	Black	4	4	5
351	←HGR 10	Green	White	10	4+6	5
352	SC	Yellow	Black	4	4	5
353	CRGO 84→	Green	White	14	4+4+6	5
354	SD	Yellow	Black	4	4	5
355a	R	Yellow	Black	4	4	5
355b	S	Yellow	Black	4	4	5
356	SD	Yellow	Black	4	4	5

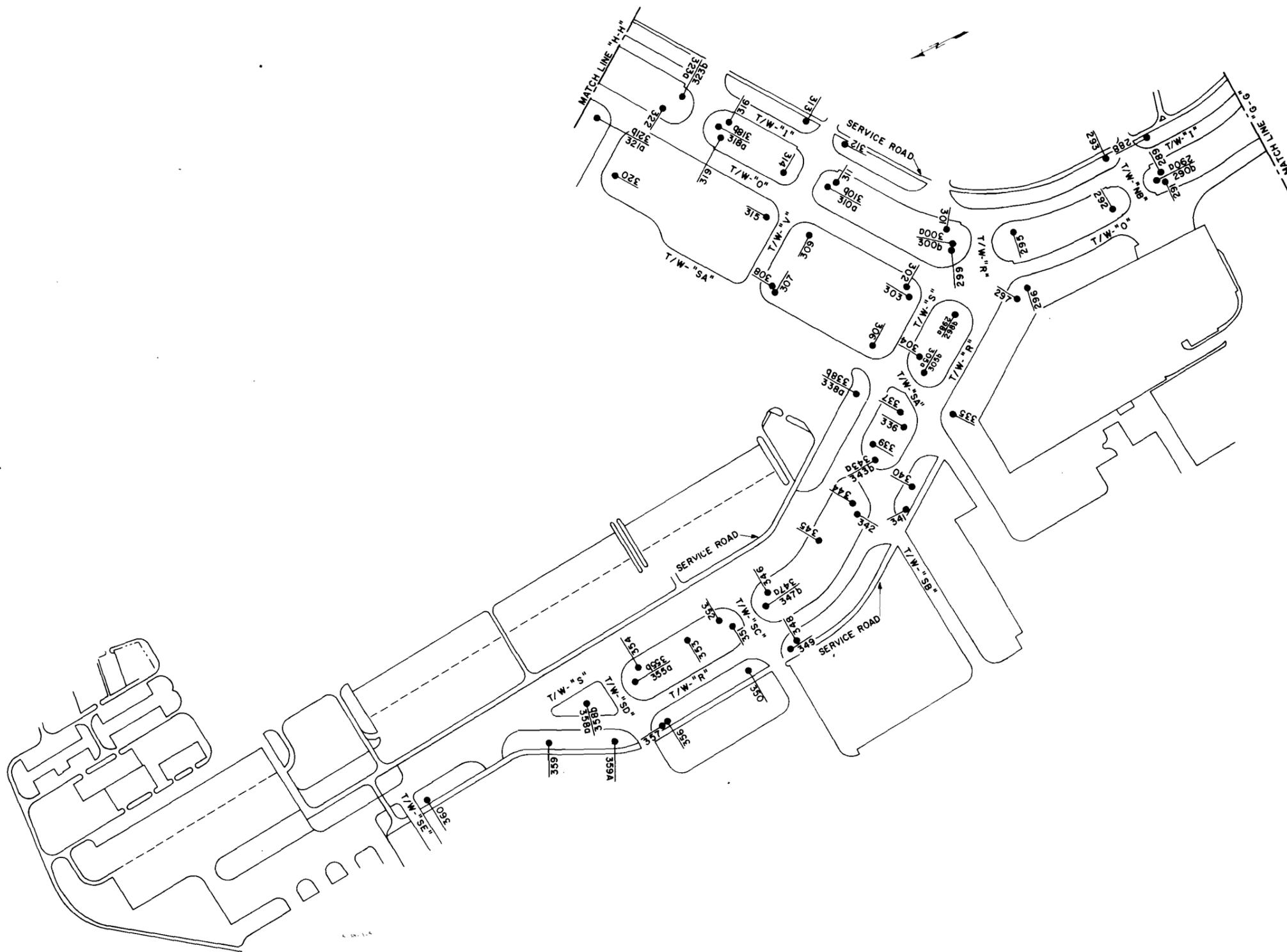
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		<u>Background</u>	<u>Letter</u>			
357	R	Yellow	Black	4	4	5
358a	^S, R ^	Yellow	Black	12	6+6	5
358b	↑CRGO 86, 87	Green	White	22	4+6+6+6	5
359	S	Yellow	Black	4	4	5
359A	SD	Yellow	Black	4	4	5
360	SE	Yellow	Black	4	4	5
361						
362	Not Used					



SECTION OF MAP - 3



SECTION OF MAP - 4



SECTION OF MAP - 5