# Lighting Improvements

## for

## I-235 Corridor

### Polk County, Iowa

Iowa Department of Transportation

STANLEY CONSULTANTS

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STANLEY CONSULTANTS, INC.

January 14, 1987

Mr. George Sisson, P.E.
Road Design Engineer
Iowa Department of Transportation
800 Lincoln Way
Ames, Iowa 50010

Dear Mr. Sisson:

Re: I-235 Lighting Rehabilitation

We are pleased to submit this report relative to the proposed lighting rehabilitation program for I-235 in Des Moines. This report was prepared under the terms of the May 20, 1986, agreement between the Iowa Department of Transportation and Stanley Consultants.

It has been a distinct privilege to be of service on this important project.

Respectfully submitted,

STANLEY CONSULTANTS, INC.

Ronald J. Gear
Contract Officer

Vernon L. McAllister
Technical Manager

RJG:jlw:8944

Enclosure

# Lighting Improvements

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This report is respectfully submitted in accordance with our agreement to perform professional services for the Iowa Department of Transportation.

Prepared by: Vernon L. McAllister

Vernon L. McAllister, P.E.
Technical Manager

Approved by: Robert L. Sandburg

Robert L. Sandburg, P.E.
Assoc. Chief Electrical Engineer

Date: January 16, 1987


I hereby certify that this report was prepared by me or under by direct supervision and that I am a duly registered Professional Engineer in the State of Iowa.

Vernon L. McAllister

Vernon L. McAllister, P.E.
Electrical Engineer

8944
d37

## I. SCOPE OF STUDY

A. Purpose. This study has been performed by Stanley Consultants, Inc. to investigate the nature of the roadway lighting problems on the I-235 corridor through Des Moines and West Des Moines in Polk County. From the investigation, alternative solutions have been reviewed, leading to a recommended scheme and the development of projects.

B. Contract Requirements. The study has been performed in accordance with Attachment "A" of the contract scope of services which has the following requirements:

1. Provide a 100-scale layout of the existing lighting system. Note: Two copies of these drawings are provided as included documents. Smaller scale reproductions of these are included in Appendix B of this report.
2. A technical review of the lighting in the corridor with recommendations on what needs to be replaced, what could be utilized, and other modifications.
3. A review as to the adaptability of tower lighting in the Central Business District (CBD) area.
4. A recommendation of what work should be accomplished between the limits provided, basing the analysis on a 15-year fix.
5. All drawings will be manually drafted.

C. Subconsultant. Krishna Engineering Consultants of West Des Moines provided assistance to Stanley Consultants in the site investigation survey. They conducted the pole inventory and assisted with the electrical circuit testing.

## II. DEFINITION OF I-235 LIGHTING PROBLEMS

A. Original Lighting System. The original lighting system for I-235 was installed with the roadway construction from 1961 through 1968. It consisted of mercury vapor "cobra-head" luminaires on individual poles typically located 8 feet off the edge of the right shoulder. The poles supported the luminaires at a mounting height of 34 feet and were positioned at 140-foot intervals along the mainline. Lighting for the interchange entrances, exits, and side road terminals was provided with similar luminaires and poles. This lighting was continuous from the I-235/I-35/I-80 interchange on the west end of I-235 to the Euclid Avenue interchange east of Des Moines on the east end. In addition, the east I-235/I-35/I-80 interchange was lighted in this method. Except for roadway crossings the lighting branch circuits were direct buried without conduits.

Pole-mounted and pad-mounted controllers were installed at electric utility service points along I-235 to power and switch the lighting in response to control from a photocontrol at each controller.

B. Present Lighting System. The mercury vapor luminaires were replaced by 150-watt high pressure sodium "cobra-head" roadway luminaires in 1983. By this time, high pressure sodium luminaires were a reliable and economic replacement for mercury vapor luminaires. The most important incentive for replacing the mercury vapor luminaires was their increased efficiency. The existing mercury vapor lamps produced 55 lumens per watt of electric power, while 150-watt high pressure sodium lamps produced 100 lumens per watt of electric power.

At the time of the conversion to high pressure sodium luminaires 35 of the 36 controllers in Des Moines were replaced. In West Des Moines 6 of the 8 controllers were left in service. The other 2 controllers were removed. However, the existing underground wiring was left in place and is still being used, except where repairs have been made.

C. Lighting Coverage Problem. In 1983 the mainline lighting in West Des Moines from 42nd Street in Des Moines to the west I-235/I-35/I-80 interchange was removed, in response to the great public interest in energy conservation. Traffic density in this area did not justify the energy usage at that time. The poles were used as replacements for others on I-235. The removed pole foundations were removed down to below grade, and the wiring was abandoned in place. Lighting for interchange entrances, exits, and side road terminals in West Des Moines was replaced with high pressure sodium luminaires.

The traffic density on I-235 through West Des Moines has been increasing because of commercial and residential development in that area. Mainline lighting should be re-installed to provide continuous lighting to the west I-235/I-35/I-80 interchange.

The mainline from 42nd Street in Des Moines east to the Euclid Avenue interchange has continuous lighting. The lighting level averages 0.6 footcandles in the two right lanes, but is lower in the left high-speed lane.

Generally, the luminaires for 4-lane roadway are NEMA Type II and do not project light to the third interior lane as well as NEMA Type III luminaires. However, the lighting on the continuously lighted mainline is generally adequate in lighting coverage.

D. Pole Knockdown Problem. The present design using relatively short poles (mounting height - 34 feet) requires a significant number of poles and requires that they be close to the roadway. This situation combined with the heavy traffic density at high speeds continues to result in frequent motor vehicle collisions with the lighting poles. If the luminaire mounting height was increased, the poles could be moved back from the roadway and could be spaced farther apart. This would result in fewer targets for collision in the motorists' recovery area on the right side of the roadway.

E. Electrical System Reliability Problem. The present electrical system is generally that which was installed from 1961 through 1968. The only major change is that most of the controllers were replaced with new ones when the original luminaires were replaced with high pressure sodium luminaires in 1983. The underground branch circuits to the lighting poles are direct buried without conduit. They have occasionally been cut and spliced when other construction along the roadway was necessary. During the field survey work, it was found that the electrical loads that were measured on some of the branch circuits were inconsistent with the loads that would be expected from the lay-out of the circuits shown on the record drawings. There were instances where the two legs of a single-phase 240 volts branch circuit had significantly different currents. In some cases the circuit load was different than that of the luminaires that appeared to be operating.

The replacement controllers that were installed by the recent project are in excellent condition and can be expected to provide good service for many years. The controllers that remain from the original installation are generally in poor condition and need to be replaced.

## III. INVESTIGATION OF PRESENT LIGHTING SCHEME

A. Site Survey. During July and August 1986 a site survey was made of the present lighting system in Des Moines. At the beginning of the survey it became clear that the major problems to be confronted would be 1) lighting coverage, 2) pole knockdown, and 3) electrical system reliability.

B. Lighting Survey. A lighting survey was conducted on segments of I-235 that had typical lighting coverage. The footcandle level at points on each segment is shown on Figures 3.1, 3.2, 3.3, and 3.4.

The survey showed that where continuous lighting was installed, the lighting is generally in compliance with the AASHTO criteria of 0.6 average maintained footcandles and an average/minimum ratio of 3 or less.

C. Pole Setback Profiles. Because of the need to relocate the existing poles or provide new poles farther from the roadway, a survey was conducted to inventory the existing poles. The purpose of the inventory was to determine pole condition and whether topography and space allowed additional setback distance from the roadway. The items recorded in the inventory are as follows:

1. Pole and circuit designation.
2. Pole shaft and mast arm length.
3. Pole and mast arm condition.
4. Condition of luminaire.
5. Condition of breakaway base and foundation.
6. Graphical representation of pole setback profile.

A typical survey form is shown on Figure 3.5. Since there are 1,573-pole survey forms, they are not provided in this report. The survey showed the following:

1. Many poles are dented due to motor vehicle collisions. Where poles have been knocked down, but are still usable, they have been re-set.

2. Many poles are located within a few feet of the roadway making them quite vulnerable to motor vehicle collisions.
3. In some areas significant additional setback space is available. However, in other areas the present pole location is the most practical one in the vicinity of the pole.

D. Electrical System Survey. The condition of the existing wiring and controllers was inventoried. For each controller and branch lighting circuit the following data was noted:

1. Controller condition and proper operation.
2. Line-to-line and line-to-ground voltage at controller and load end of each lighting circuit. The voltage at the end of the circuit was measured at the pole base connectors with all circuit luminaires operating.
3. Line current for each leg of the 240-volt circuits.

The survey forms are differentiated by control station designation. They are provided in Appendix A. The control stations are identified on the Electrical Concept Plans in Appendix B. The survey showed the following:

1. On all circuits the end-of-circuit voltage was adequate for proper luminaire operation.
2. The newer controllers with stainless steel enclosures were in excellent condition. The older controllers with painted steel enclosures were in poor condition.
3. There were many instances where the expected circuit load current varied considerably from the measured load current.

Job No. 8944 Page No.

Computed by R Corbit Date Aug 21, 1986

Checked by Date

Reviewed by U McAuliffe Date 10/30/86

Approved by Date

Subject IDOT / I-235 Study
Eastbound
Lighting Levels (FC)

Sheet No. of

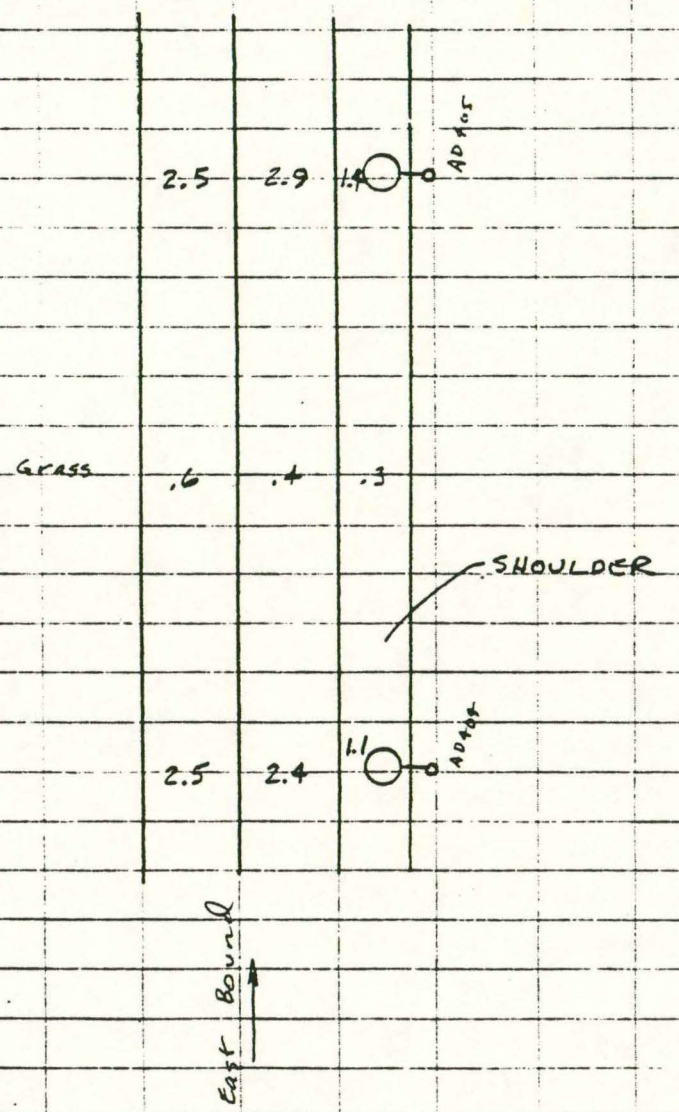



FIGURE 3.1

Job No. 8944 Page No.

Computed by B.C. Britt Date Aug. 21, 1986

Checked by Date

Reviewed by J. McAllister Date 10/30/86

Approved by Date

Subject IDOT / I-235 Study

Lighting Levels (FC.)

Sheet No. of

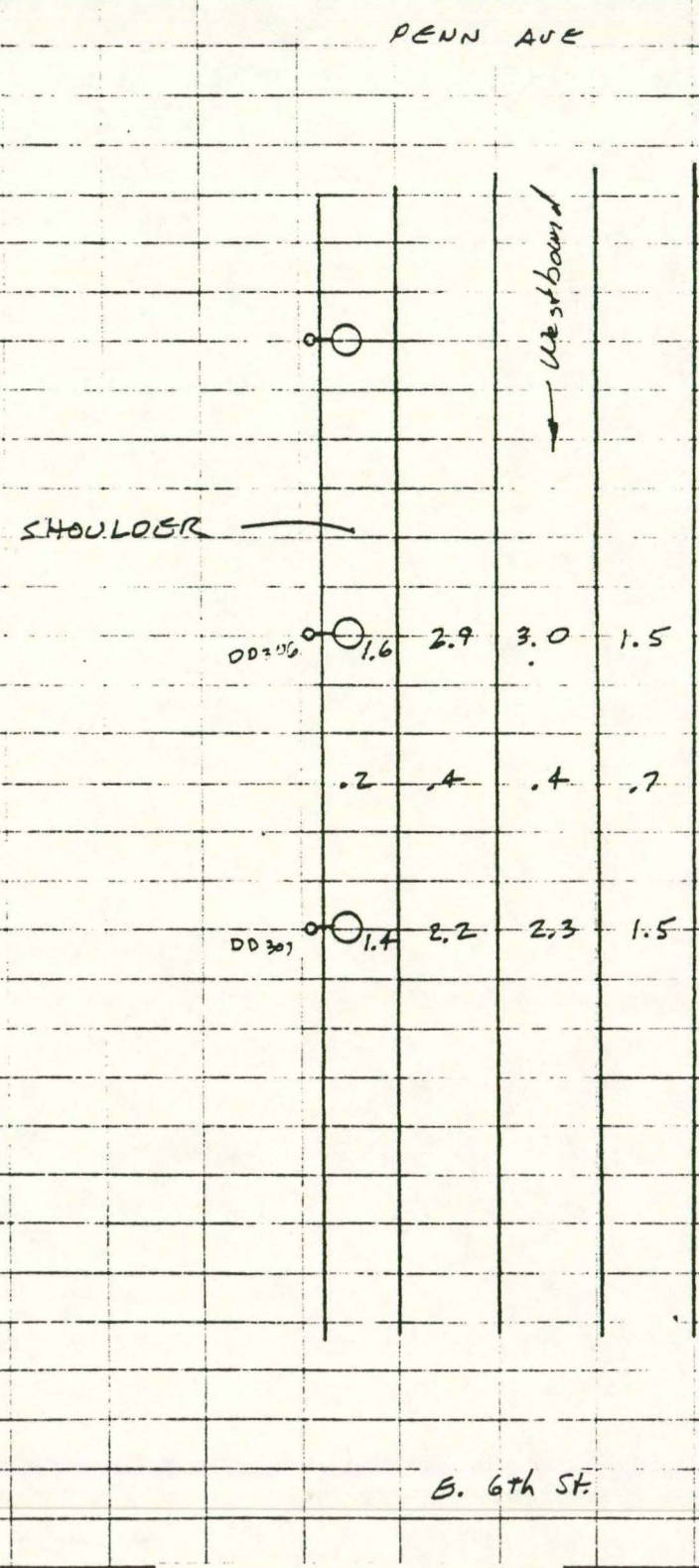



FIGURE 3.2

Job No. 8944 Page No.

Computed by R.L. Britt Date Aug 21, 1986

Checked by Date

Reviewed by O.M. CAMPSEN Date 10/30/86

Approved by Date

Subject IDOT / I-235 Study
Westbound 3 lanes
Lighting Levels (FC)

Sheet No. of

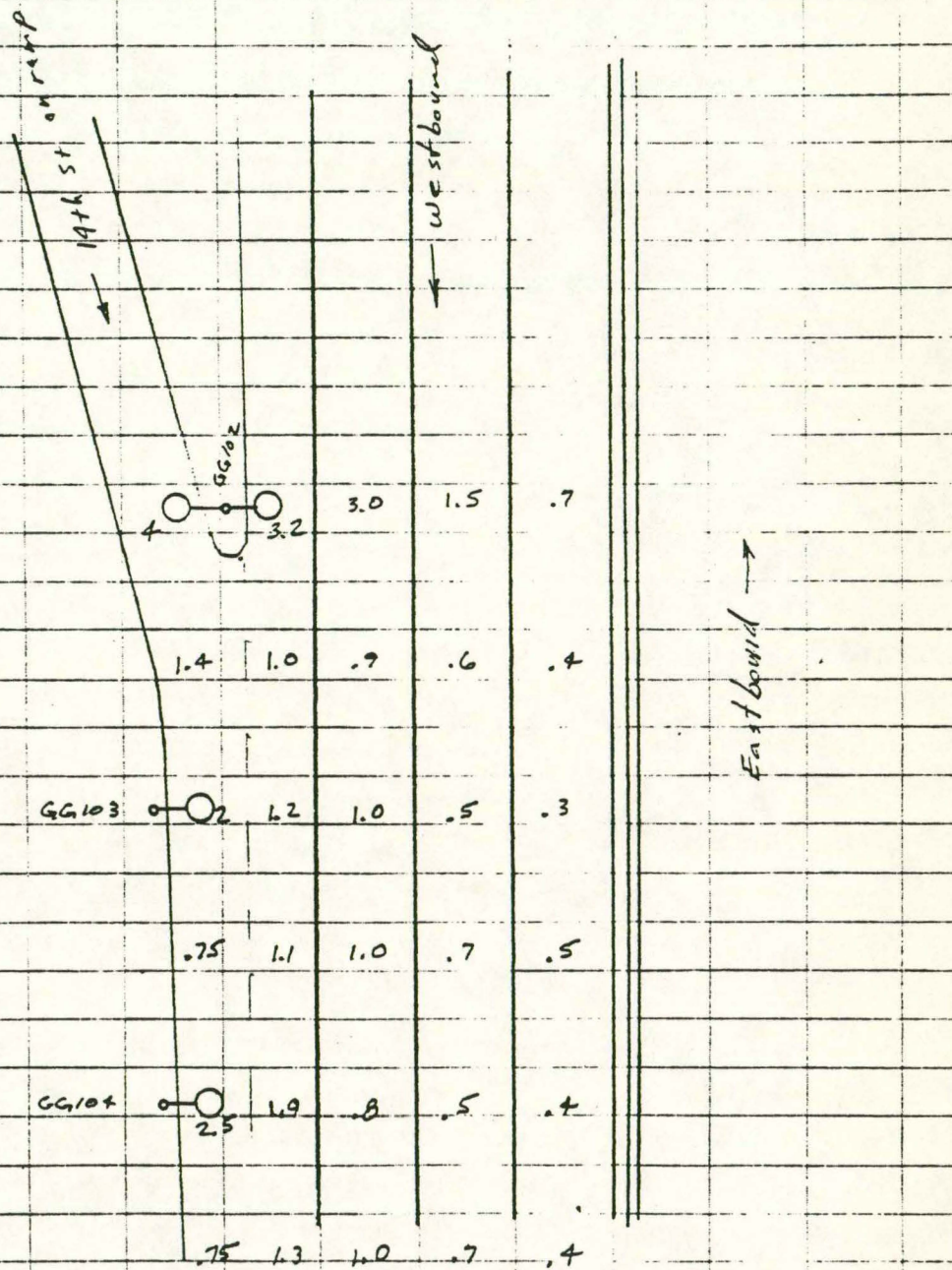



FIGURE 3.3

Job No. 8944 Page No.

Computed by R.L.Britt Date Aug. 21, 1986

Checked by Date

Reviewed by J.McAuley Date 10/30/86

Approved by Date

Subject IDOT/I-235 Study
Eastbound
Lighting Levels (FC)

Sheet No. of

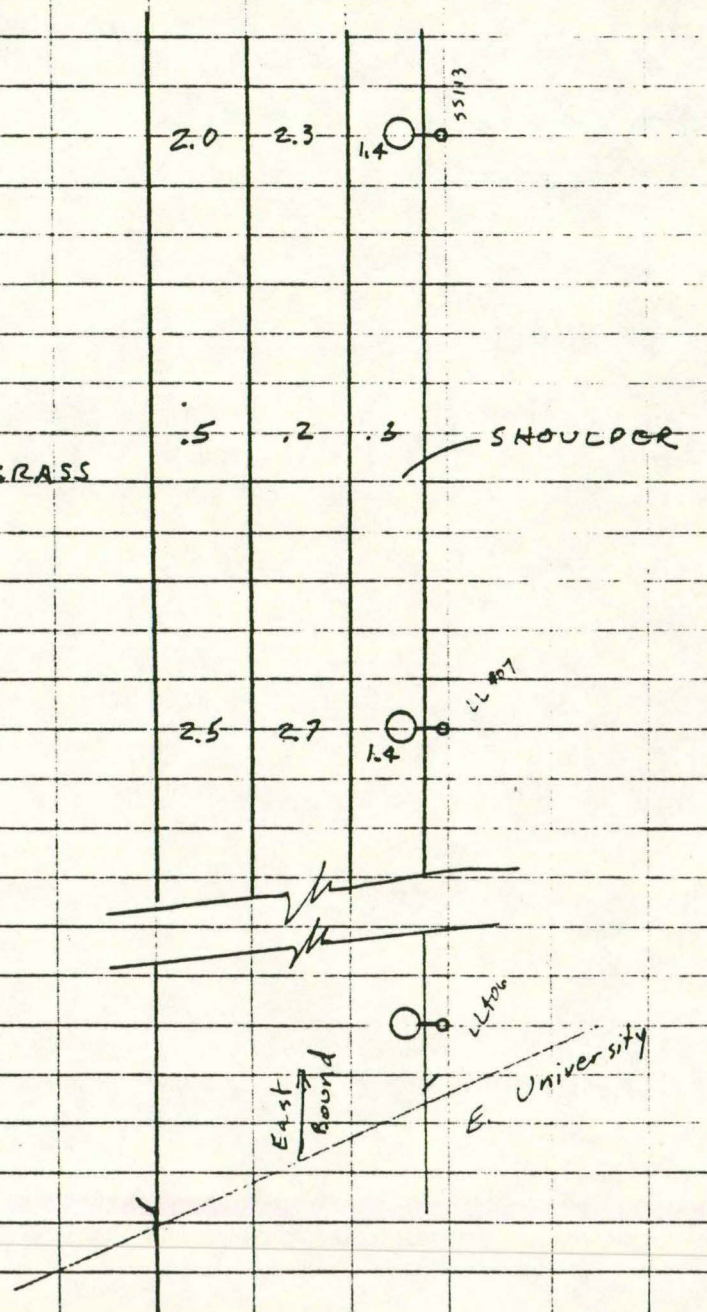



FIGURE 3.4

LIGHTING POLE DATA

A. POLE DESIGNATION: J101 CIRCUIT DESIGNATION: J-1

B. FIXTURE MOUNTING HEIGHT: 34 FEET. ARM LENGTH 15 FEET

C. POLE AND MAST ARM CONDITION:

EXCELLENT: X DENTED: ____ BENT: ____ MISSING: ____ DOWN: ____

REQUIRES REPLACEMENT: ____ OTHER: ____

D. CONDITION OF LIGHT FIXTURE:

WORKING: ____ NOT WORKING: ____ MISSING: ____

E. FRANGIBLE BASE:

COUPLINGS: ____ TRANSFORMER: ____ COUPLINGS/TRANSFORMER: X

CONDITION: GOOD: X MISSING COVER: ____ OTHER: ____

F. CONCRETE FOUNDATION: ADEQUATE: X NEEDS REPLACEMENT: ____

G. COMMENTS: ____

POLE SETBACK PROFILE

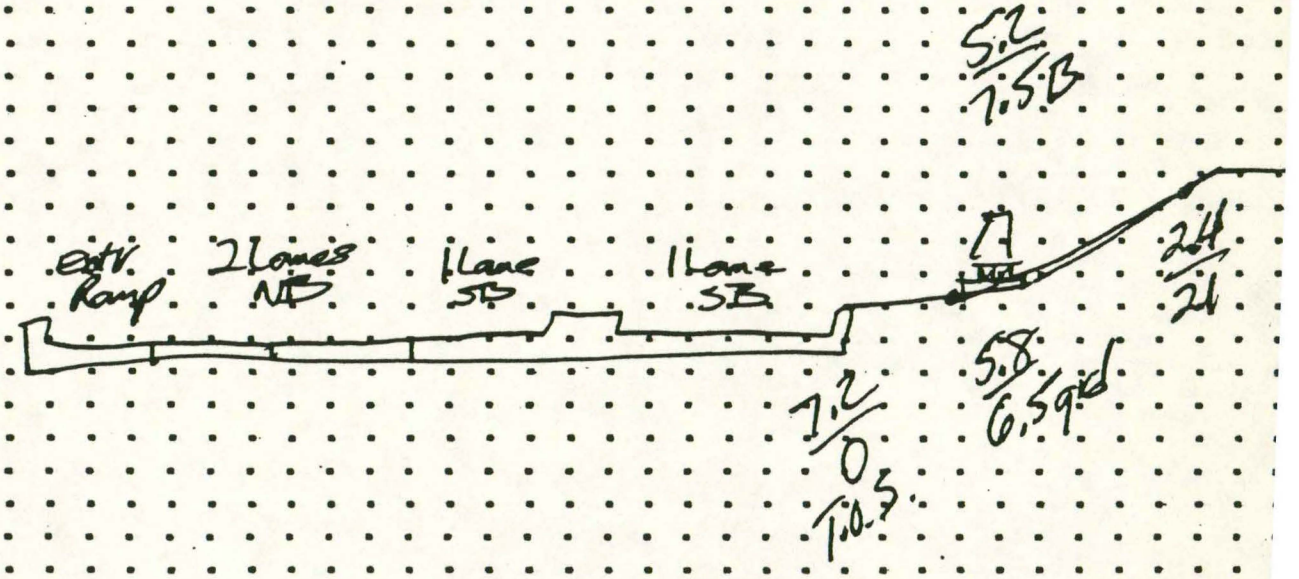



FIGURE 3.5

DATA BY: K E Brett DATE: 8/21/86

## IV. LIGHTING SYSTEM ALTERNATIVES

A. Criteria. Recognizing the need to respond to the problems of lighting coverage, pole knockdowns, and electrical system reliability, Stanley Consultants considered alternate lighting systems that concurrently responded to the three problems. The alternatives are as follows:

1. Median towers in-line with median barrier.
2. Median poles using cobra-head luminaires in-line with median barrier.
3. Pole-mounted expressway luminaires with increased setback distance from right side of roadway.

B. Median Towers. The use of median towers similar to those used at the larger I-80 interchanges would require the placement of towers on 440-foot centers along the mainline median. Each tower would be 100 feet in height and have four 400-watt high-pressure sodium luminaires. The towers have the following advantage:

1. Towers minimize the quantity of structures needed to provide lighting coverage equivalent to pole-mounted luminaires.
2. Towers are protected from vehicles, eliminating the knock-down problem.

However, towers have the following disadvantages:

1. Tower foundations must be built concurrently with the median barrier or must be protected with expensive guard barriers.
2. If the towers are constructed concurrently with the median barrier, the lighting system rehabilitation must be linked with the construction of median barriers. This may require that the upgrade of the lighting be done on a piecemeal basis.
3. Maintenance must be performed in proximity to the high speed left lane.
4. Towers will provide considerable spill lighting beyond the roadway. The footcandle distribution for the segment of tower lighted mainline is shown on Figure 4.1. The cost

estimate for a typical one mile segment of median tower lighting is shown on page 9. The estimated cost is $520,000 per mile. Descriptive literature on the towers is provided following page 9.

The use of towers to light the interchanges in the Central Business District (CBD) area has been reviewed and a typical layout is provided in Appendix C. For this layout towers with six 400 watts luminaires were positioned for best coverage of the interchanges with intermediate towers added to light the mainline. If the poles are going to be removed on the interchanges, the mainline lighting poles and cobra-head luminaires should be removed in order to eliminate the knockdown problem. For the layout in Appendix C 48 towers are shown between the Cottage Grove and University interchanges. The estimated cost of this installation is $45,000 to $50,000 per tower plus the wiring and controllers. In addition pole-mounted lights would be needed at some of the side street intersections where lighting coverage from the towers is inadequate.

If towers are used for the interchange lighting in the CBD, some will be taller than 100 feet since we are generally mounting tower luminaires at 100 feet above the lighted roadway. There should be concern that the presence of towers and the inherent spill lighting will provide a strong visual element in the CBD that may produce a negative public response.

C. Median Poles With Cobra-Head Luminaires. Instead of towers, poles with double cobra-head luminaires could be installed along the median. Each luminaire would illuminate one direction of travelled roadway. The poles would be placed on 250-foot centers along the mainline median. Each would be 55 feet in height and have two 250-watt high-pressure sodium luminaires. This scheme has the following advantages:

1. Poles require a lesser quantity of structures, although not as few as towers.

# CONCEPTUAL COST ESTIMATE

TOWERS
COST PER MILE

| | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | LABOR + MATERIAL $ PER UNIT | LABOR + MATERIAL TOTAL | LABOR $ PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| TOWER FOUNDATION | 12 | EA | 12000 ea | $ 144,000 | | | | |
| TOWER (100' W/FIXTURE RING) | 12 | EA | 20000 ea | 240,000 | | | | |
| FIXTURE 400 W HPS (TOWER FIXTURE) | 48 | EA | 750 ea | 36,000 | | | | |
| PVC CONDUIT SCH 40 2" | 6000 | LF | 4 ea | 24,000 | | | | |
| CABLE 2-#6 W/GROUND | 6000 | LF | 1.50 ea | 9,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 67,000 | | | | |
| PROBABLE COST/MILE - TOWERS | | | | $ 520,000 | | | /MILE | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

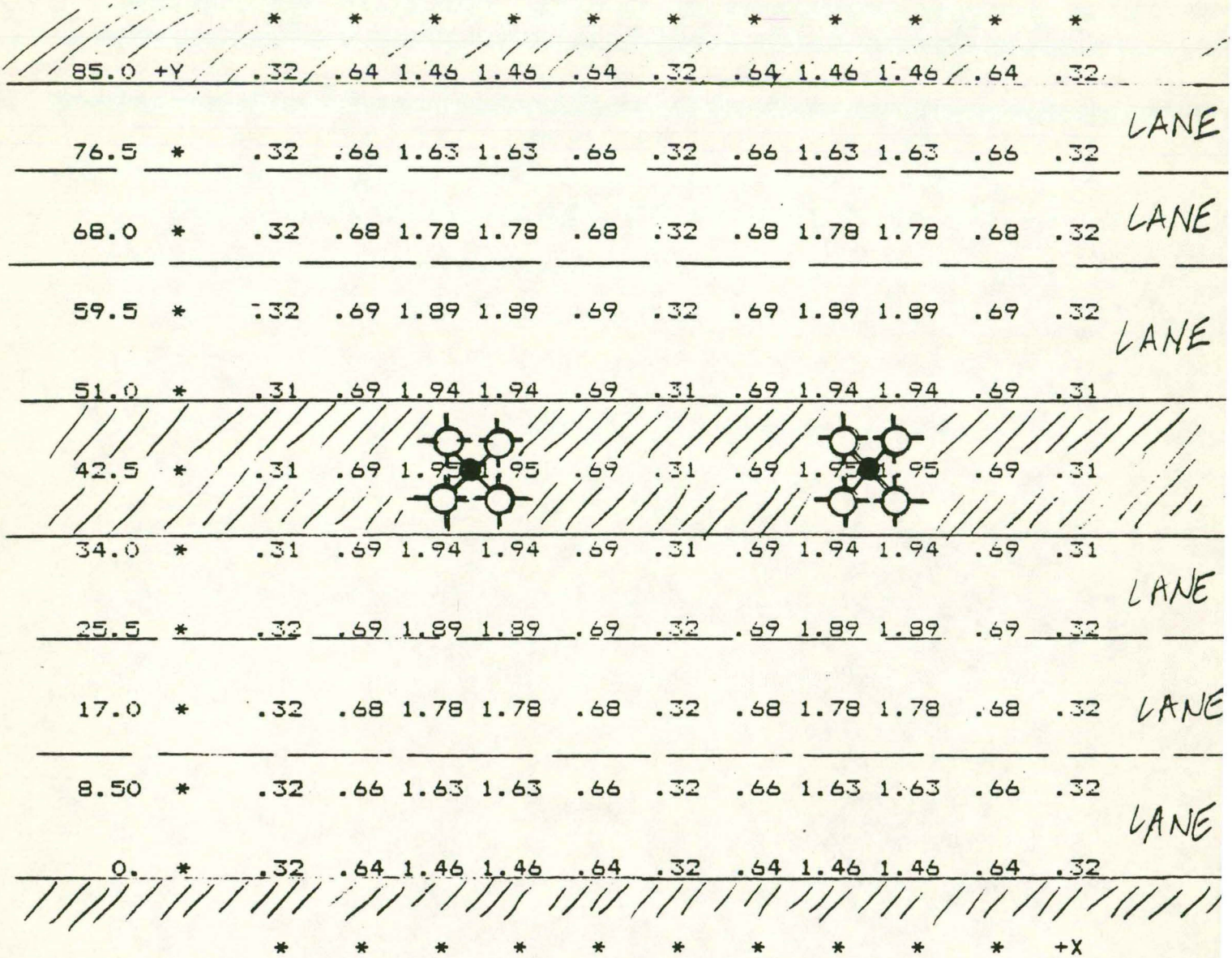
TOTALS THIS SHEET $ _____ _____ $ _____

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY I235 | | | SHEET 3 OF 3 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8964-03-694 |
| ESTIMATOR: JRDRAKE<br>DATE: 10/28/86 | CHECKER: A. Cubbage<br>DATE 10/29/86 | CONSTRUCTION MGR.<br>DATE | DESIGN MGR/PEAP: JM McHUGH<br>DATE 10/29/86 |

STANLEY CONSULTANTS

GENERAL ELECTRIC COMPANY
Lighting Systems Department - Hendersonville, NC 28739

IDOT, HI-MAST LIGHTING, 4-400W HPS, 100'POLE




ILLUMINATION SUMMARY

| | | |
|---|---|---|
| NUMBER OF LUMINAIRES | 16 | NORMAL DEVIATIONS IN LUMINAIRE |
| HORIZONTAL GRID SPACING | 88.00 | INSTALLATION, LIGHTED AREA |
| VERTICAL GRID SPACING | 8.50 | GEOMETRY, ELECTRICAL SUPPLY, LAMP |
| MAXIMUM GRID POINT VALUE | 1.95 | TOLERANCES, LUMINAIRE TOLERANCES, |
| MINIMUM GRID POINT VALUE | .31 | AND OBSTRUCTIONS WITHIN THE |
| AVG OF 121 GRID POINTS | .97 | LIGHTED SPACE MAY PRODUCE |
| UNIFORMITY RATIO AVG/MIN | 3.15 | ILLUMINATION LEVELS DIFFERENT |
| UNIFORMITY RATIO MAX/MIN | 6.34 | FROM THE ABOVE PREDICTED VALUES. |

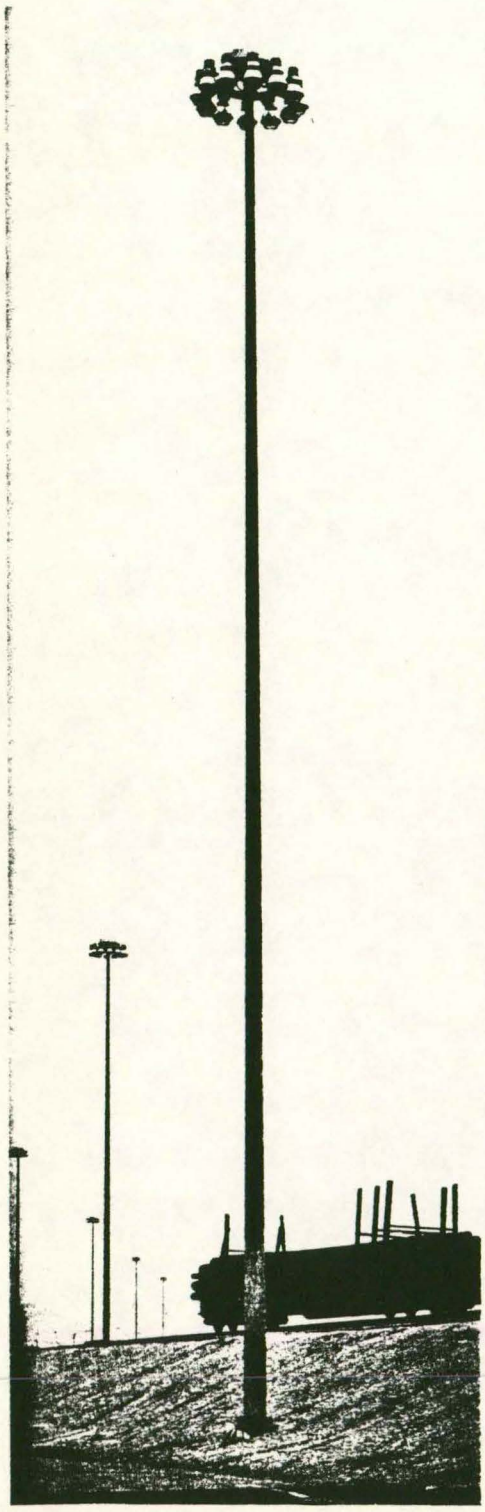
FIGURE 4.1

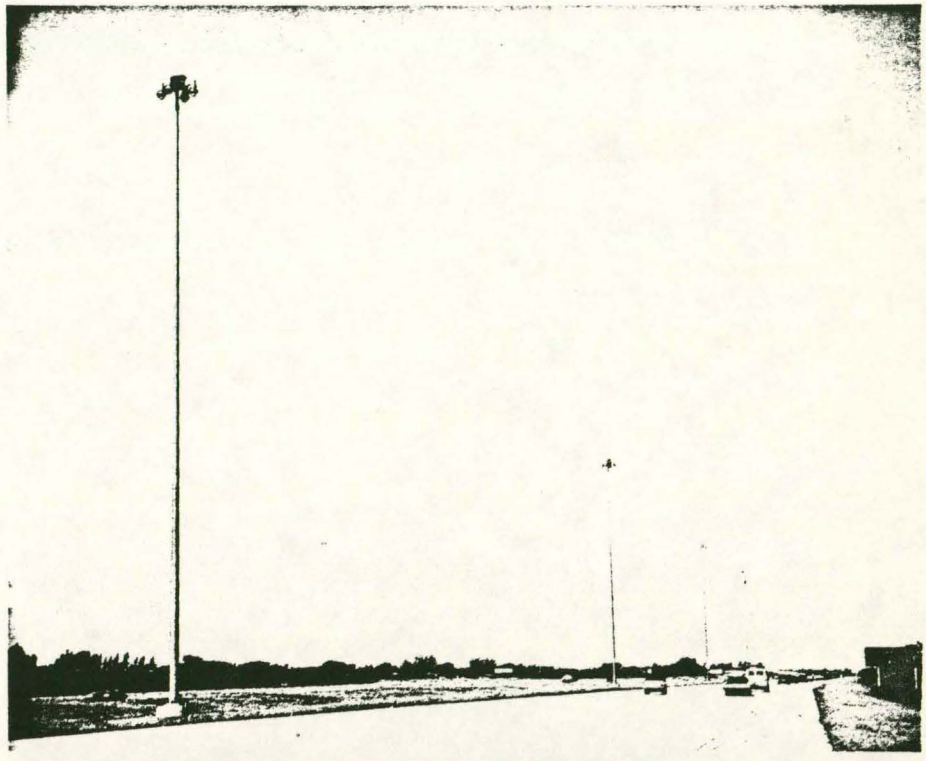
GRID FILE: 01-01-1980 00:08:29

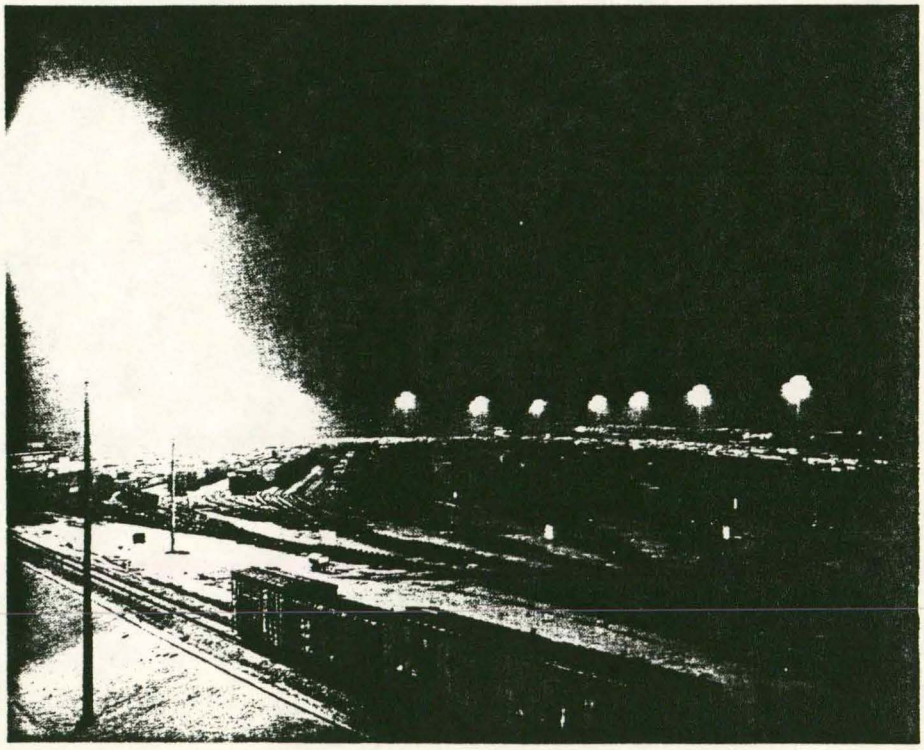
Manville

# Holophane® HMS™ LD5 High Mast Lowering Device System.

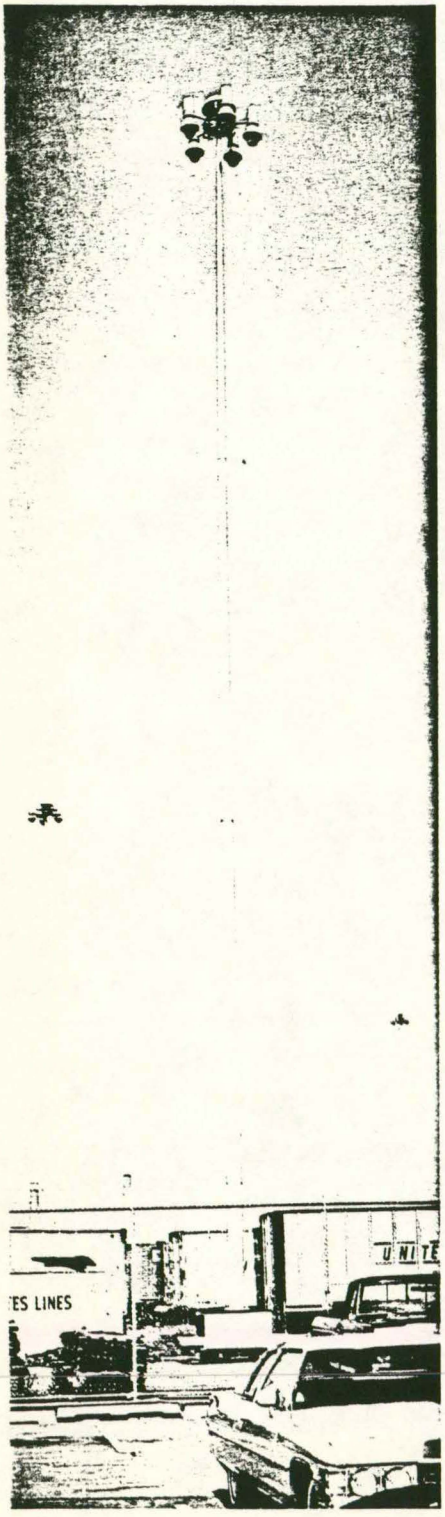
## Outdoor, Highway Commercial, Recreational and Industrial Area Lighting.







Holophane HL-488 11/81 16p LIGHTING outdoor





**A proven concept in lowering systems.**
The Holophane HMS High Mast System fills the need for better lighting created by the spread of complex highways, high speed interchanges and the ever growing requirements of such large outdoor areas as freight terminals, industrial plants, shopping centers and large parking lots.

The LD5 system is a product of more than a decade of engineering research and field study, with hundreds of satisfied customers using thousands of Holophane High Mast Systems.

The Holophane HMS provides a single-source for; computer-assisted lighting designs, technical information, factory installation assistance and assurance of component compatibility.

The LD5 utilizes an integral winch assembly which makes the system ideal for remote, inaccessible areas where cranes or bucket trucks are impracticable and pole steps are undesirable.

With increasing vandalism, there is also a growing demand for after-hours outdoor security lighting for storage areas and public parks.

Holophane HMS is the standard where safe, comfortable, economical lighting is required and where lower installation cost, efficient performance and ease of maintenance are necessities for all large outdoor areas.

**Fewer poles.**
The wide pole spacings eliminate the "forest of poles" appearance. For example: four 100′ poles on 600′ centers can replace sixteen 40′ poles on 200′ centers and save over 5kw of power to light the same area.

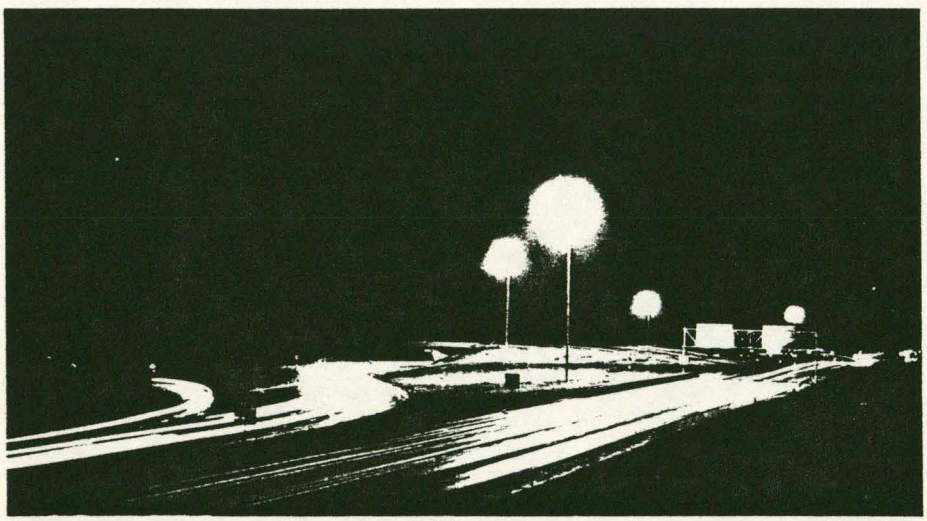
Vehicular safety is improved, since fewer poles mean potentially fewer collisions with poles and less obstruction in the field of view.

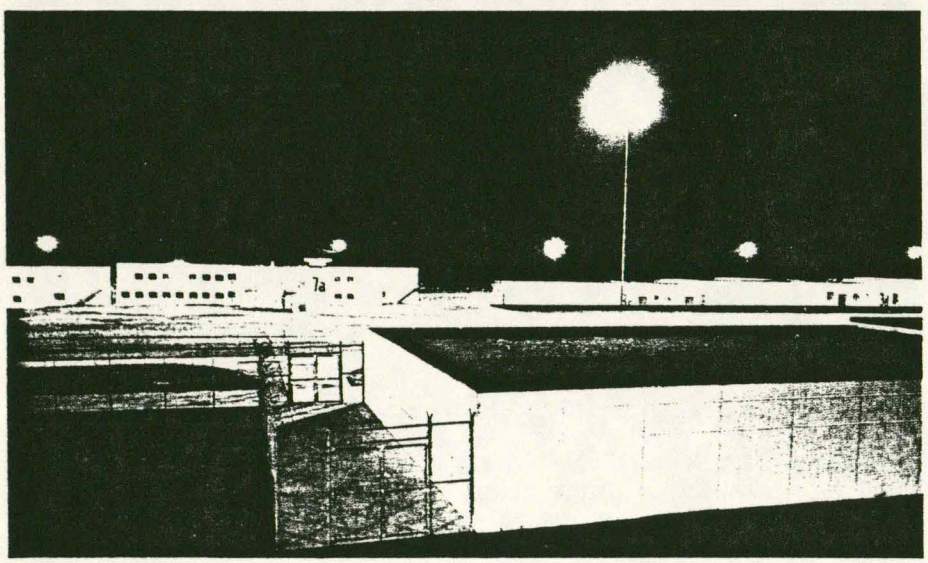
**Lower initial cost.**
More luminaires per pole mean fewer poles. Thus, foundation, wiring, trenching and installation costs are reduced. High lumen utilization reduces the number of fixtures.

**Reduced operating costs.**
Expensive cranes or bucket trucks are not necessary to maintain HMS systems. Luminaires are brought to ground level for quick relamping, testing and cleaning by maintenance personnel operating the lowering device power assembly. Spot relamping becomes an economical option. Fewer lamps mean lower power consumption and lamp replacement costs.

**Areas of use.**
The variety of mounting heights, luminaire types and lighting distributions enables the designer to tailor the lighting system to the specific area. Areas where the LD5 lighting system has been used include:
Highways and Interchanges
Shopping Centers
Work and Storage Yards
Waste Water Treatment Plants
Container Handling Facilities
Piggy Back and General Railroad Yards
Airport Auto Parking
Truck Terminals and Service Areas
Plant Parking and Security Lighting
Piers and Wharves
Generating Stations
Airline and General Aviation Airport Parking Ramps
Downtown Mall Areas and Parking
Prison Yards
Petrochemical Operations
Highway Rest Stops and Service Areas
Large Electrical Switchyards
Mines
Highway Toll Plazas
Feedlots

## Diverse applications





**Power plants and prisons.**
Nighttime security, including TV surveillance and protection of vital equipment are enhanced by the uniformity of vertical and horizontal lighting provided by HMS system. Easy maintenance of system assures that this protection will not be interrupted.

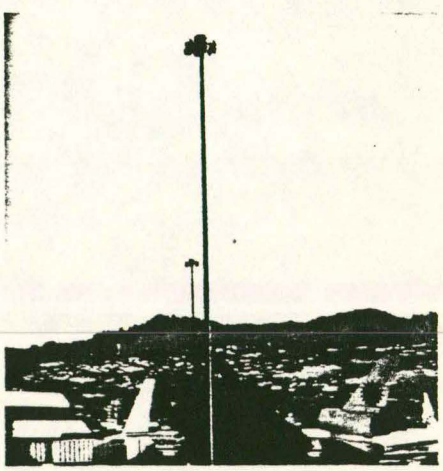
**Freight terminals and railroad yards.**
High vertical surface lighting on railroad cars, trucks and containers reduces possibility of pilferage and speeds identification. Fewer pole locations mean more usable space and improved freight movement.

**Industrial plants, petrochemical facilities and storage areas.**
Uniform illumination helps improve round-the-clock production, with less pole blockage of motorized handling equipment. Placed outside hazardous areas, HMS permits nighttime operations with reduced energy consumption.

**Highways and interchanges.**
Motorists entering a multi-level, high speed, complex interchange need the full panoramic view provided by HMS lighting to accurately assess the location of ramps, lanes, barriers, bridge abutments, dividers and signs. HMS luminaires mounted high above and to the side of normal lines of sight, greatly reduce discomfort glare and visibility veiling brightness.

**Commercial parking lots.**
Wide pole spacings provide clean, uncluttered view of buildings, facades, signs; more parking spaces are available; customer security is improved and vandalism is reduced when dark shadows are eliminated. Optional cylindrical or rectangular decorative covers are available with the HMS 1100 series refractored luminaires for architectural blending with building design.

**Public parks.**
High mounting (50'-100') reduces vandalism to luminaires. HMS poles and lowering devices may be combined with Prismaflood™ luminaires for floodlighting of athletic fields. Provides ease of maintenance because lowering device eliminates hard-to-reach towers and cages.



# Lowering device.

# Increases safety, simplifies maintenance.

**A complete, self-contained system.**
Fig. 1. LD5 lowering device accomodates up to 12 luminaires. All moving latching components are on lowering ring; only pulleys and rollers are permanently installed at top of poles.

Fig. 2. Lowering can be accomplished even in 30mph winds.

Fig. 3. Luminaires lower to within 3′ of pole base for inspection and servicing. Hoisting and electrical cables can be replaced at ground level. All electrical connections are at ground level for easy maintenance.

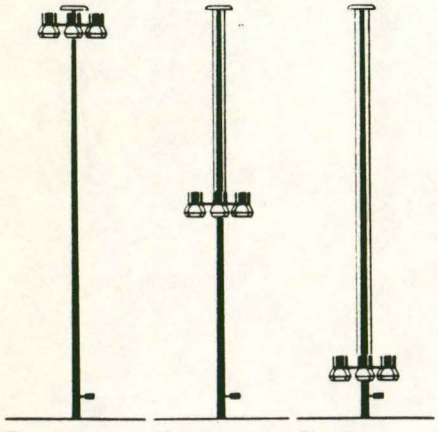


Fig. 1. Fig. 2. Fig. 3.

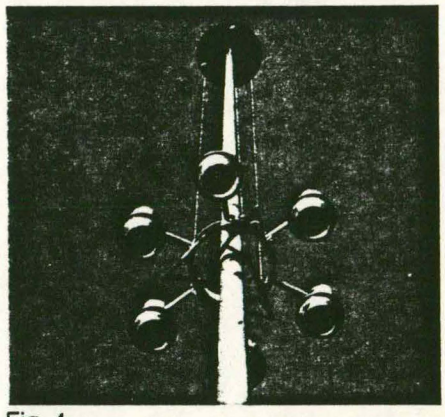


Fig. 4.

**High-stability suspension.**
Fig. 4. Three heavy-duty aircraft cables and continuous-contact iris-action guide arms keep luminaires level and centered during raising, lowering, and latching. Aircraft-grade steel, zinc electroplated cables meet Type A Federal Specification RR-W-410a. In normal atmospheres, life expectancy is 30 years. In special corrosive environments, optional stainless steel cables may be specified.

**Full-support latching.**
Fig. 5. Latching removes all weight from the cables, ensuring long cable life since no stress is placed on them except when the lowering device is in use. Positive-action latches are automatically activated by movement of the luminaire ring. Indicator "flags" turn automatically during locking process, providing a signal visible from ground level that latch is securely locked. Each latch is strong enough to support three times the weight of the entire ring and the maximum number of luminaires, providing a 9 to 1 safety factor.

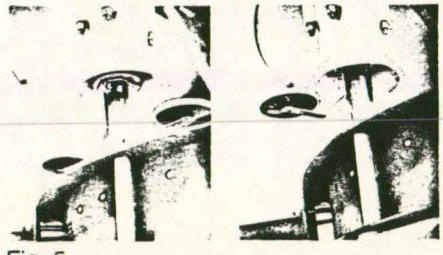


Fig. 5.

**Ground-level testing.**
Fig. 6. The weathertight, ring-mounted power inlet enables the system to be energized and tested at ground level. There is no electromechanical disconnect at the pole top.

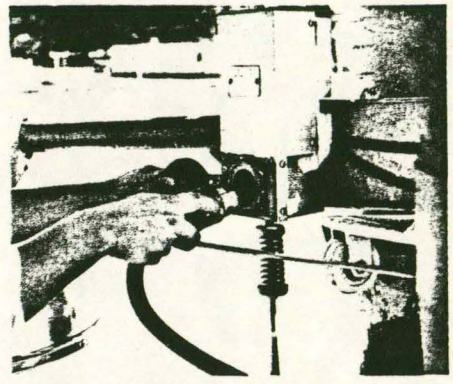


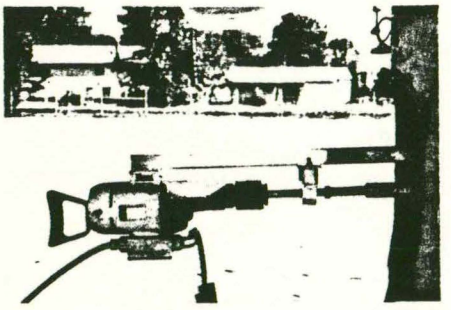
Fig. 6.

**Power cable.**
The main power cable and individual luminaire electrical cables are factory pre-wired into the junction box on the lowering ring, greatly simplifying field installation.

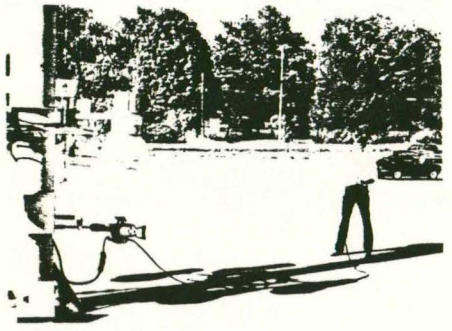
Power cables are available for the following distributions:

| Voltage | Phasing | Conductors |
|---|---|---|
| 120 | Single phase | 2 wire |
| 120/208 | Three phase | 4 wire |
| 208 | Single phase | 2 wire |
| 208 | Three phase | 3 wire |
| 120/240 | Single phase | 3 wire |
| 240/480 | Single phase | 3 wire |
| 277 | Single phase | 2 wire |
| 277/480 | Three phase | 4 wire |
| 480 | Single phase | 2 wire |
| 480 | Three phase | 3 wire |

The above does not include an equipment ground wire. However, it is available if required.

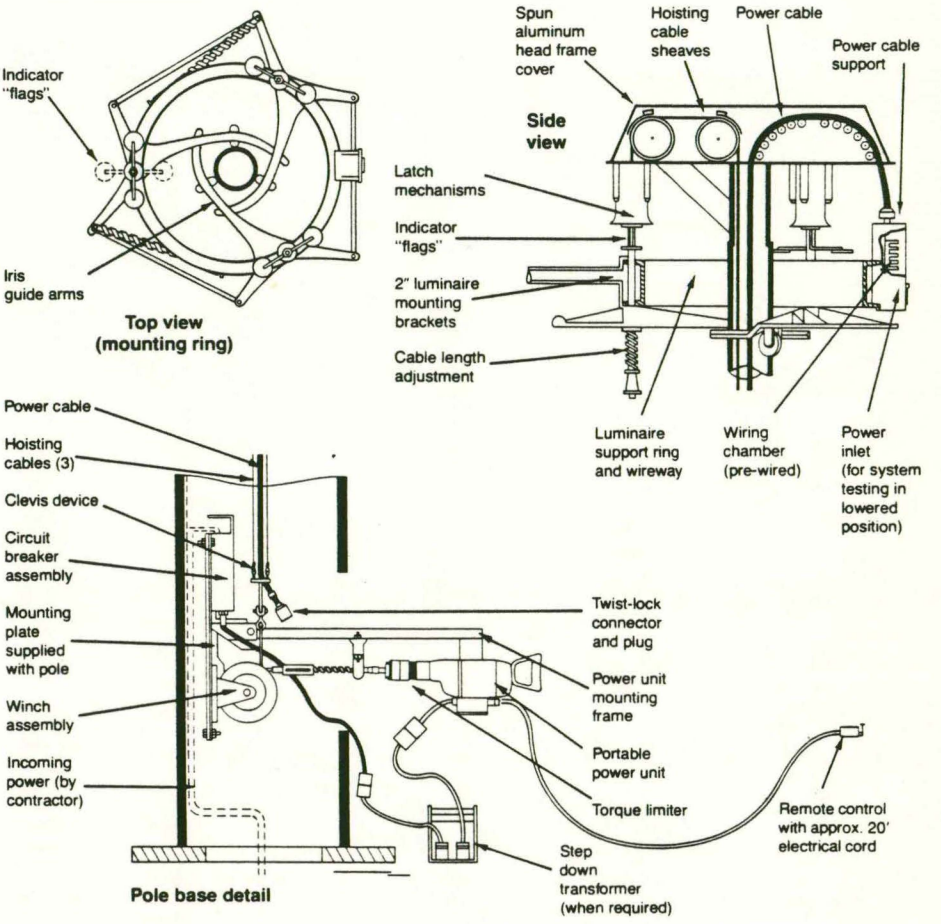


**Easily transported.**
Fig. 7. The portable power unit can be carried, attached to the winch assembly and operated by one person.



**Remote-control portable power unit.**
Fig. 8. Portable, heavy-duty reversing electric power unit. A single unit services an entire installation. Remote control permits operator to stand 20′ from pole base. Average overall speed of raising and lowering is approximately 12 fpm.

**Head frame, luminaire ring, and winch assembly, model LD5.**

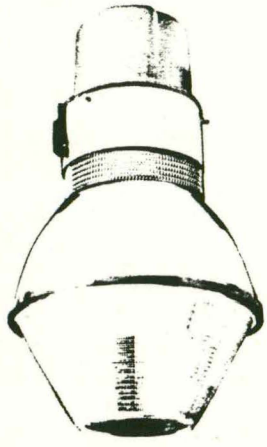



**LD5 lowering device.**

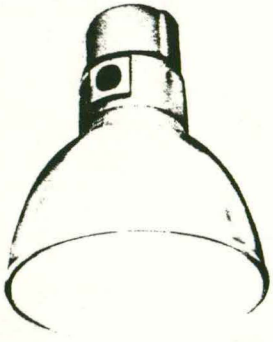
| Number of luminaires | Approx. weight (lbs.)* | Effective projected area (sq. ft.) of lowering device with: Refractored 1100 series | Cut-off 1100 series | Prisma-flood | Refractored 1100 series with decorative cover Rectangular | Cylindrical |
|---|---|---|---|---|---|---|
| 2 | 264 | 7.92 | 8.34 | 9.60 | 18.28 | 13.96 |
| 3 | 271 | 9.88 | 10.51 | 12.40 | 25.42 | 18.94 |
| 4 | 278 | 11.84 | 12.68 | 15.20 | 32.56 | 23.92 |
| 5 | 285 | 13.80 | 14.85 | 18.00 | 39.70 | 28.90 |
| 6 | 292 | 15.76 | 17.02 | 20.80 | 46.84 | 33.88 |
| 8 | 306 | 19.68 | 21.36 | 26.40 | 61.12 | 43.84 |
| 9 | 313 | 21.64 | 23.53 | 29.20 | 66.31 | 48.82 |
| 10 | 320 | 23.60 | 25.70 | 32.00 | 71.80 | 53.80 |
| 12 | 334 | 27.52 | 30.04 | 37.60 | 81.88 | 63.76 |

*The weight given includes head frame, cables, lowering ring and bracket arms, but excludes luminaires. Consult appropriate luminaire data sheet for weights. Add 10½ lbs. for each decorative cover.

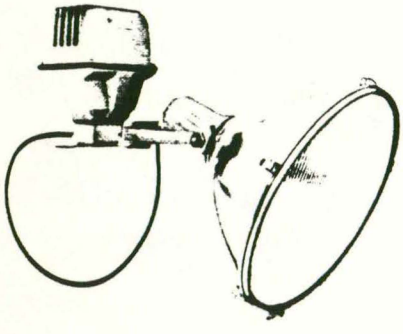
# Choice of luminaires and distribution.



HMS 1100 series refractored luminaire.



HMS 1100 series cut-off luminaire.



Prismaflood.

**Wide choice of luminaires.**
HMS 1100 series refractored luminaires are available with a choice of three reflector/refractor options to produce a symmetric, asymmetric or long and narrow distribution. The new HMS 1100 series cut-off luminaires are available with a symmetric distribution. Integrally ballasted Prismaflood floodlights can provide symmetric or asymmetric distributions in a variety of beam patterns. These luminaires are designed for high pressure sodium, metal halide, super metal halide or mercury lamps permitting custom lighting design for even the most complex or irregular shaped areas.

**Variety of light distributions.**
The High Mast System is designed for cluster mounting of up to 12 symmetric luminaires each with overlapping light patterns. Individual lamp outages will simply result in a slight decrease in light level, rather than the potentially dangerous dark spots encountered with conventional low mounted lighting systems.

In addition, long and narrow and asymmetric distributions are available to provide optical shielding or to fit lighting distributions to odd shaped areas. Prismaflood floodlights may also be used to provide even further beam throws and pole spacings in industrial type applications.

The precise widespread beam patterns, multiple luminaire arrangement, plus aiming capability eliminates the "puddle" of light under each pole.

For photometric data see appropriate luminaire data sheet or photometric booklet.

| Luminaire type | Lamp types | Wattages |
|---|---|---|
| Refractored 1100 series | High pressure sodium | 400,1000 |
| | Metal halide or mercury | 1000 |
| Cut-off 1100 series | High pressure sodium | 400,1000 |
| | Metal halide or mercury | 400,1000 |
| Prismaflood floodlights | High pressure sodium | 250, 400, 1000 |
| | Metal halide | 400, 1000, 1500 |
| | Mercury | 400,1000 |

# Specifications.

**Lowering device.**
The lowering device shall be Holophane Catalog No. LD5. It shall consist of 1) head frame; 2) luminaire ring; 3) winch assembly.

The head frame structure shall be zinc coated steel, attached to the pole by means of a steel slipfitter and secured by four stainless steel setscrews. The head frame shall encompass six 6" nominal diameter steel cable sheaves. They shall be made of hot rolled steel and shall be manufactured by splitting and spin-forming the sheave blank. The cross-section of the spin-formed sheave groove shall have a radius .005" to .009" greater than half the nominal cable diameter. The sheave shall be zinc-electroplated per ASTM A-164 and yellow chromate dipped for corrosion resistance. Oil-impregnated sintered bronze bushings shall be pressed into the steel sheave hub and shall ride on AISI 304 stainless steel shafts.

The three hoisting cables shall be zinc coated steel 7 x 19 aircraft cord of $^{3}/_{16}$" diameter manufactured per MIL W-1511, and meeting Type A Federal Specification RR-W-410a (Where lifting loads allow and special corrosive conditions exist, the following may be substituted: The three hoisting cables shall be stainless steel 7 x 19 aircraft cord of $^{3}/_{16}$" diameter manufactured per MIL W-5424).

The power cord roller assembly shall consist of twelve rollers mounted between two cold-rolled steel plates. The plates shall be zinc-electroplated per ASTM A-164 and yellow chromate dipped. The power cord shall ride on rollers made from acetal resin meeting the requirements of ASTM D-2133-65-T grade 2, mounted on AISI 304 stainless steel shafts. Six rollers shall be located on a radius on either end of the plates to support the power cord in a seven inch bending radius. At either end of the plates, a keeper bar shall be provided over the power cord between the plates to keep the cord in its track during pole erection and during normal operation. The head frame shall be covered with a copper-free aluminum cover attached with six stainless steel machine screws and self-locking nuts.

The head frame shall also include three latch barrels which support the luminaire ring assembly when the lowering device is not in operation. The latch barrels shall be cast high strength, copper-free aluminum. Latching shall be accomplished by the alternate raising and lowering of the luminaire ring assembly by the winch and hoisting assembly, and there shall be no moving latch parts or springs attached to the head frame assembly. All moving parts of the latching mechanism shall be attached to the luminaire ring assembly and serviceable from the ground.

All moving parts that move in contact with other parts except the latch barrels shall be stainless steel to stainless steel (AISI 304). Oil-impregnated sintered bronze bushings shall be provided to carry the vertical loads between moving parts. No coil springs shall be in axial contact with rotating latch parts. The latching and locking of each latching mechanism shall be signalled by retro-reflecting indicator flags visible from the ground. The latching mechanism shall not be impaired by formation of ice and shall not require adjustment after the original installation.

The luminaire ring shall be fabricated of 6" x 2" x #7 gauge steel channel, hot dip galvanized per ASTM A386 Class B with the appropriate number of 2" nominal galvanized steel pipe mounting arms. The luminaire ring shall be wired with ITT Royal Powerflex 90 power cord of a suitable number of conductors and current carrying capacity for the total load, with a maximum voltage drop of 3% and type ST distribution cords with insulation suitable for at least 105 C.

All electrical cords shall be attached to the copper-free aluminum, weather-tight wiring chamber through weather-tight cable connections. A prewired 600 volt terminal block shall be provided in the weather-tight chamber. A weather-tight twistlock power inlet shall be provided on the chamber to allow testing of the luminaires while in the lowered position. "Kellams" type cord grips shall not be used to support the main power cord.

Roller-contact, spring-loaded centering arms shall be provided which will center the luminaire ring while ascending and descending the pole. The arm system shall be capable of keeping the ring concentric with the pole in winds up to 30 MPH. The rollers for the centering arms shall be of a water-resistant, non-marking material with oil-impregnated sintered bronze bushings. All axle shafts for arms and rollers shall be of AISI 304 stainless steel.

Ultimate support of the luminaire ring shall not be sacrificed by individual or total spring failure.

**Winch assembly.**
The winch shall have an ultimate strength of five times the lifted load with the number of layers of cable with which it will be used. The winch shall have a 30 to 1 worm gear reduction ratio and include an integral drag brake on the worm shaft to prevent free spooling of the winch. The winch shall be designed for at least intermittent power operation, but also have hand crank capability.

The winch shall be prewound with zinc coated steel 7 x 19 aircraft cord manufactured per MIL W-1511 of ¼" diameter of sufficient length to maintain at least 4 complete wraps on the drum after the device has been lowered to its lowest position. (If load limits allow and special corrosive conditions exist, the following may be substituted: The winch shall be prewound with stainless steel 7 x 19 aircraft cord manufactured per MIL W-5424 of ¼" diameter . . .) The drum shall be supported at both ends and keepers shall be provided to ensure that uncoiled cable will rewrap onto the drum.

**Portable power unit.**
The motor shall be the heavy-duty reversing type with a stalling torque at least twice that required to operate the device. The motor shall drive the winch through the torque limiter coupling to limit the lifting force. There shall be a back-up shear pin designed to shear at a torque level between 25% and 50% over the torque limiter setting. The motor shall be controlled by a reversing switch connected by a 20 foot remote cord.

**Step-down transformer.**
The portable power unit shall be provided with a portable enclosed and encapsulated transformer to stepdown the voltage from _____ volts to 120 to operate the power unit. The transformer shall be weather proof and easily carried by a carrying handle. All electrical connections from the transformer to the power cord and from the transformer to the power unit shall be twist-lock caps and plugs.

# Ordering data.

**Pole package**[1]

**Pole finish**
Galv-Galvanized
WS-Weathering
PP-Prime-painted

**Number of luminaires**[2]
2,3,4,5,6,
8,9,10,12

**Number of conductors in main power cable**[3]

**HMS-100-H3416-GALV-8-LD5-3-1171-480-SYM-SS**

**Pole height (ft)**
50 90 130
60 100 140
70 110 150
80 120

**Pole number**
See pole data sheet

**Lowering device**

**Luminaire catalog number**[4]

**Options and accessories**
See below

**Example:** HMS package, 100′ pole with galvanized finish, lowering system, 3 conductors in main power cable, eight 1000W HPS refractored luminaires, 480 volts, symmetrical distribution, stainless steel cables:
HMS-100-H3416-GALV-8-LD5-3-1171-480-SYM-SS

**Lowering device options and accessories.***

| Cat. no. suffix | Description | Weight (lbs.) |
|---|---|---|
| -SS | Stainless steel cables | - |
| -FAA-120 | Single aircraft warning light | 8 |
| -FAA-2-120 | Double aircraft warning light | 15 |
| -FAA-2TR-120 | Double aircraft warning light with transfer relamp | 18 |
| -LA | Lightning arrestor | 2 |
| -LR | Lightning rod | 8 |
| -LDP-120 | Portable power unit | 120 |
| -06697 | Hand crank and leveling blocks** | 2 |

*Factory installation supervision available. (Contact your sales representative)
**Supplied with LDP.

The physical properties of Holophane HMS LDS lowering devices represent typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Check with your local Holophane Sales Representative to assure current information. Holophane is a division of Manville Products Corporation.

**Warranty** Refer to the Holophane limited 1 year material warranty on this product, which is published in the "Terms and Conditions" section of the current price schedule, and is available from your local Holophane sales representative.

Contact your local Holophane sales representative for application assistance, computer-aided design and cost studies. For information on other products and systems, call the Product Information Center at 303-978-4900

**Footnotes:**
[1]For poles without lowering systems, obtain ordering information from pole data sheet HL-677 or Holophane representative.
[2]Lowering ring will not accommodate 7 or 11 luminaires symmetrically.
[3]In addition to specifying the number of conductors from the chart below, also indicate on the order the voltage and phasing requirements. If a ground wire is required, increase the conductor number by one.

| Voltage | Phasing | Conductors |
|---|---|---|
| 120 | Single phase | 2 wire |
| 120/208 | Three phase | 4 wire |
| 208 | Single phase | 2 wire |
| 208 | Three phase | 3 wire |
| 120/240 | Single phase | 3 wire |
| 240/480 | Single phase | 3 wire |
| 277 | Single phase | 2 wire |
| 277/480 | Three phase | 4 wire |
| 480 | Single phase | 2 wire |
| 480 | Three phase | 3 wire |

[4]For luminaire catalog numbers and options consult appropriate luminaire brochures: HMS 1100 series, Prismaflood, HL-324.

**Electrical characteristics**
For complete electrical data, see tables of electrical characteristics in Holophane Ballast Handbook, publication HL-301.

**Holophane.**
**Leader in Light Control.**

Manville

**Manville Products Corporation**

Manville Products Corporation, Holophane, Ken-Caryl Ranch, Denver, CO 80217/Holophane Canada, Bramton, Ont. and St. Hyacinthe, Que., Canada/Holophane Europe Limited, Bond Ave., Milton Keynes MK1 1JG, England/Holophane S.A. de C.U., Apartado Postal 75-415, Mexico 14, D.F. Mexico.



Printed in USA

2. Poles are protected from vehicles, eliminating the knockdown problem.
3. Pole-mounted luminaires have good light control.

However, this scheme has the following disadvantages:

1. Pole foundations must be built concurrently with the median barrier or must be protected with expensive guard barriers.
2. If the poles are constructed concurrently with the median barrier, the lighting system rehabilitation must be linked with the construction of the median barriers. This may require that the upgrade of the lighting be done on a piecemeal basis.
3. Maintenance must be performed in proximity to the high speed left lane.

The footcandle distribution for a segment of lighted mainline is shown on Figure 4.2. The cost estimate for a typical one mile segment of median pole-mounted cobra-head luminaires is shown on page 11. The estimated cost is $135,000 per mile. Descriptive literature is provided following page 11.

D. Pole-Mounted Expressway Luminaires. In order to move the luminaire poles or towers completely from the roadway right or left recovery area, expressway luminaires have been developed. Descriptive literature for these is shown following page 11. The optical system in these luminaires allows them to be located as much as 40 feet from the right hand edge of the roadway. For this scheme, 40-foot poles with single 250-watt high-pressure sodium luminaires on 250-foot centers would be required on each side of the roadway. This scheme has the following advantages:

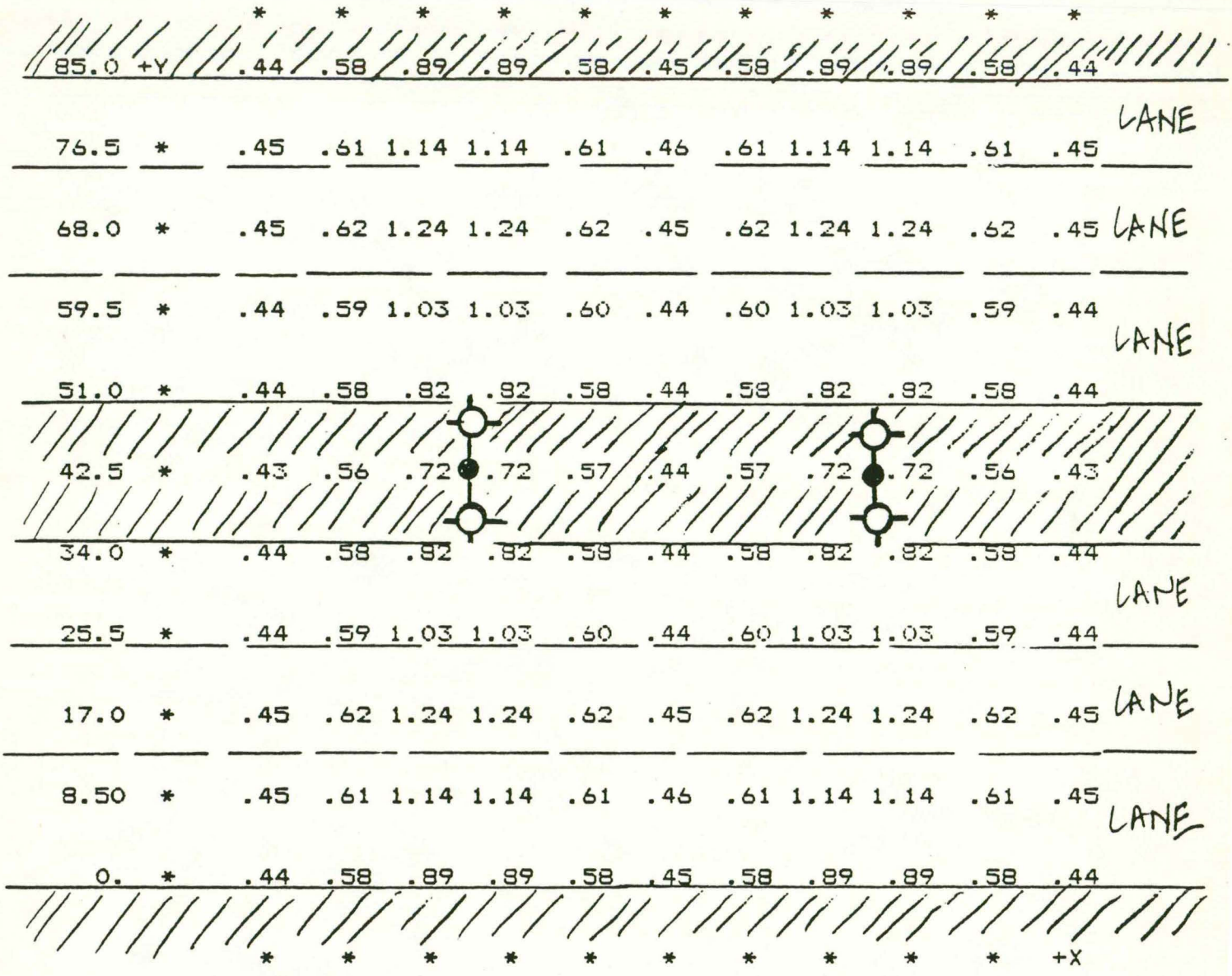
1. Shorter poles would be used, allowing existing high-reach maintenance trucks to be utilized.
2. Poles would generally be located 30 feet to the right of the travelled roadway providing safety for maintenance crews.

This scheme has the following disadvantages:

1. Approximately twice as many poles would be required since each pole line lights only one direction of travelled roadway.

GENERAL ELECTRIC COMPANY
Lighting Systems Department - Hendersonville, NC 28739

IDOT, COBRA-HEAD FIXTURES, 2-250W HPS ON 55' POLES
SPACED 250' APART, GRID=85'X500'
M-N-III DISTRIBUTION, CURVE 5816, MF=.8




ILLUMINATION SUMMARY

| | | |
|---|---|---|
| NUMBER OF LUMINAIRES | 8 | NORMAL DEVIATIONS IN LUMINAIRE |
| HORIZONTAL GRID SPACING | 50.00 | INSTALLATION, LIGHTED AREA |
| VERTICAL GRID SPACING | 8.50 | GEOMETRY, ELECTRICAL SUPPLY, LAMP |
| MAXIMUM GRID POINT VALUE | 1.24 | TOLERANCES, LUMINAIRE TOLERANCES, |
| MINIMUM GRID POINT VALUE | .43 | AND OBSTRUCTIONS WITHIN THE |
| AVG OF 121 GRID POINTS | .70 | LIGHTED SPACE MAY PRODUCE |
| UNIFORMITY RATIO AVG/MIN | 1.61 | ILLUMINATION LEVELS DIFFERENT |
| UNIFORMITY RATIO MAX/MIN | 2.84 | FROM THE ABOVE PREDICTED VALUES. |

FIGURE 4.2

# CONCEPTUAL COST ESTIMATE

| COBRA HEAD FIXTURES COST PER MILE | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | LABOR & MATERIAL $ PER UNIT | LABOR & MATERIAL TOTAL | LABOR $ PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| POLE FOUNDATION | 21 | EA | 470.00 | $ 9,870 | | | | |
| POLE 55' W/ DOUBLE MAST ARM | 21 | EA | 2,700.00 | 56,700 | | | | |
| FIXTURES 250 W HPS (COBRA HEAD) | 42 | EA | 425.00 | 17,850 | | | | |
| PVC CONDUIT SCH 40 2" | 6000 | LF | 4.00 | 24,000 | | | | |
| CABLE 2-#6 W/ GROUND | 6,000 | LF | 1.50 | 9,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 17,580 | | | | |
| PROBABLE COST/MILE – COBRA HEAD FIXTURES | | | | $ 135,000 | | | | /MILE |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

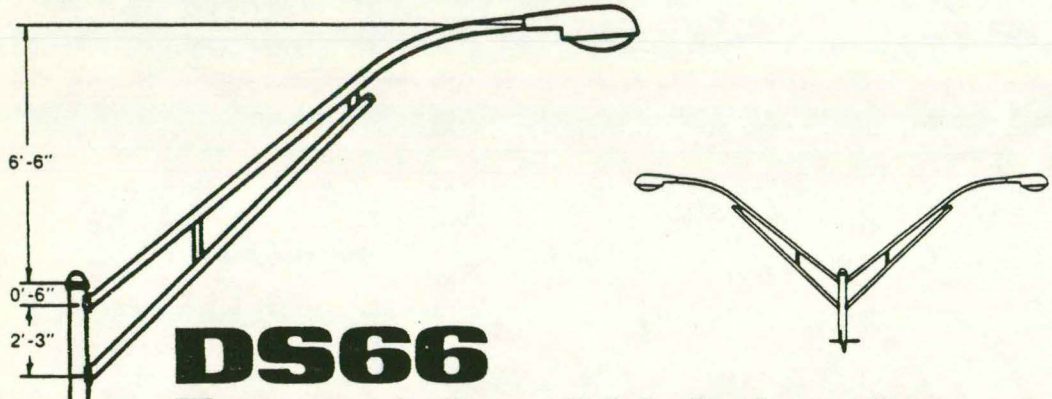
TOTALS THIS SHEET $ _____ $ _____

STANLEY CONSULTANTS

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY I 235 | | | SHEET 1 OF 3 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8944-03-694 |
| ESTIMATOR: JR DRAKE | CHECKER: [illegible] | CONSTRUCTION MGR. | DESIGN MGR/PEAP: McAUSTER |
| DATE 10/28/86 | DATE 10/29/86 | DATE | DATE 10/29/86. |

# DS66

Valmont




# DS66
## Tapered Steel Lighting Standard

## Single or twin tubular luminaire arms

### SPECIFICATIONS

### MATERIAL AND FABRICATION

**ANCHOR BOLTS**
Anchor bolts are fabricated from a commercial quality hot rolled carbon steel bar with a minimum guaranteed yield strength of 50,000 psi. Bolts have an "L' bend on one end and are galvanized a minimum length of 12 inches on the threaded end. Four bolts (sizes as charted), each furnished with one hex nut and flat washer, are provided per pole. Included with each anchor bolt set are two leveling shims.

**ANCHOR BASE**
The anchor base is fabricated from a structural quality hot rolled carbon steel plate with a guaranteed minimum yield strength of 36,000 psi. The base plate telescopes the pole shaft and is circumferentially welded top and bottom. The base is provided with slotted bolt holes to accommodate a ±½" variation in the nominal bolt circle as charted.

**FULL BASE COVER**
The base cover is fabricated from United States standard 14 Ga. (0.0747") commercial drawing quality carbon steel. It is a two-piece cover secured together with two hex head screws. The cover conceals the entire base plate and anchorage.

**POLE SHAFT**
The pole shaft is one or two section design. Each section is fabricated from United States standard 11 Ga. (0.1196"), 10 Ga. (0.1345"), or 7 Ga. (0.1793") coil stock. It is a weldable grade hot rolled commercial quality carbon steel with a guaranteed minimum yield strength of 48,000 psi after fabrication. Each section is one-piece construction with a full length longitudinal high frequency resistance weld and is cylindrical in cross-section having a uniform taper of approximately 0.14 inches of diameter change per foot of length.

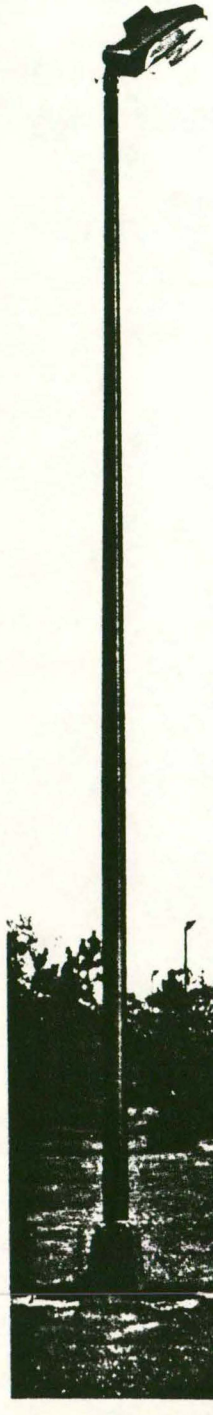
**HANDHOLE**
The oval reinforced handhole has a nominal 4" x 6½" inside opening and is circumferentially welded in the pole shaft. Included are two tabs for mounting a steel cover with hex head attachment screws. A nut holder is welded to the vertical side of the handhole and includes a 1/2"-13UNC hex head bolt and nut for grounding. The handhole is located at 1'-6" above the base and 90° clockwise with respect to the luminaire arm when viewed from the top of pole.

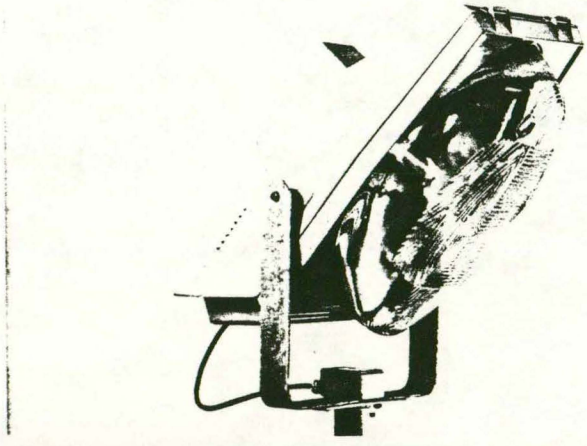
**Expressway off-highway luminaire**

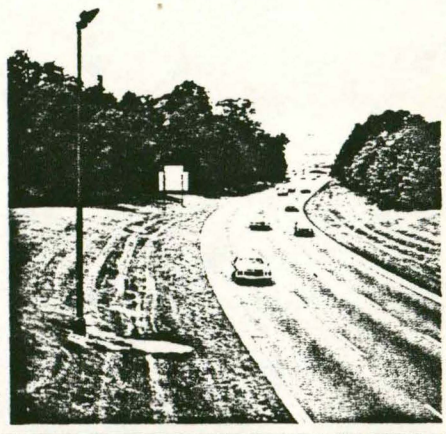
**Optimum visibility for drivers.**

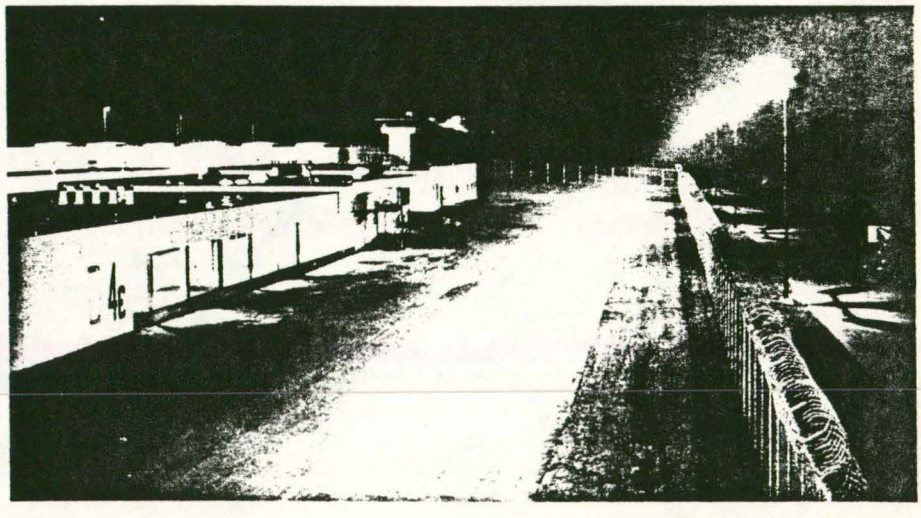
**Improved highway safety.**

**Effective security lighting.**









HL-51

85

outdoor

# Expressway— A versatile luminaire for high pressure sodium and metal halide lamps.

# An off-highway lighting unit for traffic safety.

When light poles are located alongside a highway and no protective barriers are required, the American Association of State Highway & Transportation Officials (AASHTO) recommends that poles be placed outside the continuous clear roadside recovery area, a zone which may extend from 20′ to 40′ back from the travelled way.

Because of the limitations of conventional lighting equipment and where practical considerations make deep setback impossible, AASHTO allows poles as close as 12′ to 15′. In this case the pole must be equipped with a suitable impact attenuation feature. Guardrails may be used, but are not encouraged solely to prevent pole collisions.

Thus the designer of highway lighting systems is faced with the difficult problem of achieving good and safe lighting at an economical cost.

**The Holophane Expressway solution.** This unique lighting system provides safe pole setback up to 40′ with none of the compromises inherent in conventional systems; offers an important and dramatic improvement in highway lighting; and does the job at a lower cost. Expressway features all of the following advantages:

**More economical.** Since luminaires can mount directly on standard tenon top poles, no costly, extra-strength poles or long mounting arms are required. Also, Expressway luminaires provide a spacing ratio of 7:1 as compared with the more usual 5:1 for conventional luminaires of the same wattage, while providing 3:1 average to minimum uniformity. This reduces the number of poles and luminaires normally required with conventional systems by nearly 30%.

**Easier maintenance.** All work can be performed from a standard bucket truck parked off the roadway. There are also fewer luminaires to service, so the system provides continuing savings in energy and operating costs.

**Aesthetically pleasing.** Expressway luminaires have a clean, modern appearance. The closest units are completely out of the driver's normal field of vision. More distant luminaires are at the far corner of the motorist's viewing range.

**Better highway lighting.** Expressway gives the driver an expanded field of view. This experience is more like the open feeling of daylight driving than the closed-in feeling created by conventional lighting.

The entire area, from the base of the pole to the median strip, is lighted. This improvement in overall illuminance increases the motorist's visual performance.

The luminaire minimizes the problem of eye adaptation required to compensate for the difference between roadway illuminance and lighting in surrounding areas.

In addition, the Expressway luminaire gives the motorist fuller peripheral vision, thus allowing the driver to better assess dynamic driving situations at any given moment.

All of these factors, along with greatly reduced glare potential combine to minimize motorist stress and create a safer, more relaxed nighttime driving experience.

**Flexible & adaptable.** Expressway luminaires feature a vertical adjustment of ± 45° from normal 45° position. This allows application in areas with short setback by either depressing the angle of the unit to light the near side lanes or raising the angle to light the opposite lanes in a crossing pattern from units opposite each other or in a staggered configuration.

The adjustment feature also allows elevation to cover wide toll plaza areas, changeover or merge lanes most effectively.

Expressway eliminates the problem of light spill-over into adjacent residential neighborhoods. The luminaires are aimed to light only the driving environment, the roadway and immediate surrounding areas. Less than 7% of the lamp output is directed in back of the luminaire when mounted in its normal 45° tilt.

**Choice of lamps.** Integrally ballasted Expressway is designed for a wide range of lamp types and wattages. By selecting from 250W to 1000W size, the appropriate light level can be provided.

**Performance to meet AASHTO requirements.** AASHTO recommendations call for light levels of 0.6 fc. maintained or more with a 3:1 or 4:1 average to minimum uniformity ratio on the roadway. With conventional luminaires, it is often difficult or uneconomical to balance these parameters. For example, a uniformity of 3:1 to 4:1 average to minimum may not be obtainable with a given luminaire spaced to provide 0.6 fc. In this case, poles would have to be spaced closer together to satisfy the uniformity criteria. As a result, illumination levels as well as equipment, installation and operating costs increase, and maintenance becomes more time consuming and expensive.

The Expressway luminaire, on the other hand, was designed specifically to meet AASHTO recommendations.

The luminaire provides balanced performance with optimum utilization of available light energy with wide pole spacing and setbacks of up to 40′ from the highway.

# A security luminaire for industrial locations and correctional facilities.

Security is of major importance today around industrial facilities, power generating plants, processing and outdoor storage areas, and areas containing valuable commodities. The object is to keep people out.

Prisons and correctional facilities need adequate lighting in order to detect prisoners attempting escape. The object is to keep people in.

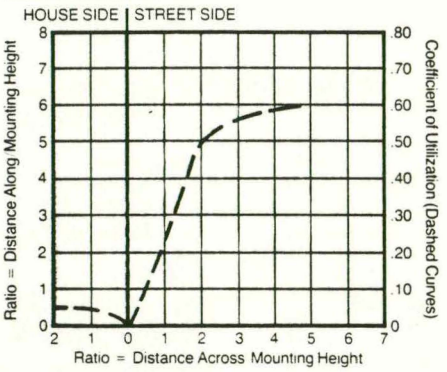
Expressway luminaires offer an ideal solution to these problems by providing a band of light which can be directed toward or away from the area to be protected. In industrial areas the light may be directed outward so that guards may see intruders before they reach the area. In prison application, light is directed toward the facility so that guards may detect escape attempts.

The combination of fixture tilt and optical design enhance the vertical levels of illumination for better intruder identification.

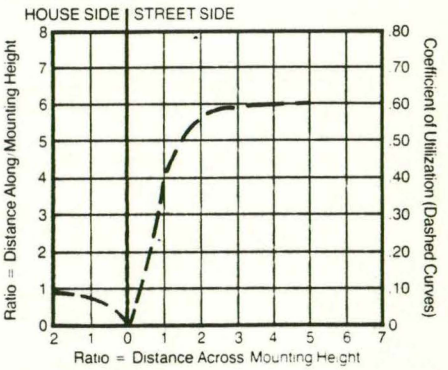
Efficient performance of the luminaire as well as the use of economical, long-life lamps also contribute to low operating costs for protection and production.

# Horizontal isofootcandle curves for fast computations.

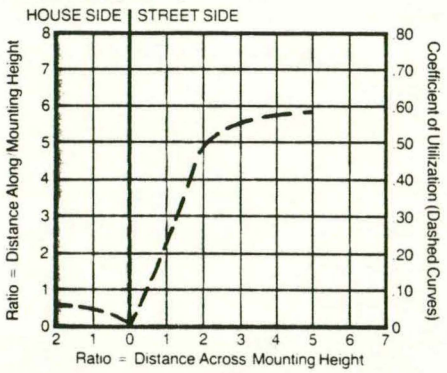
**EXPS250HP12GR**
**Tilted 45°**
**250W Clear HPS**



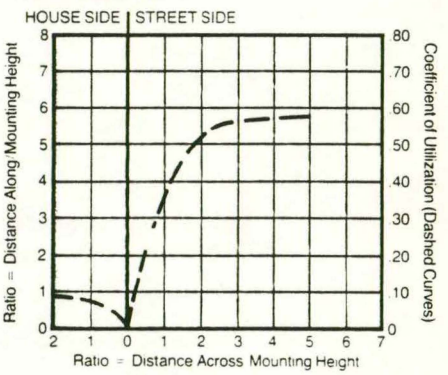

**EXPS250HP12GR**
**Tilted 30°**
**250W Clear HPS**

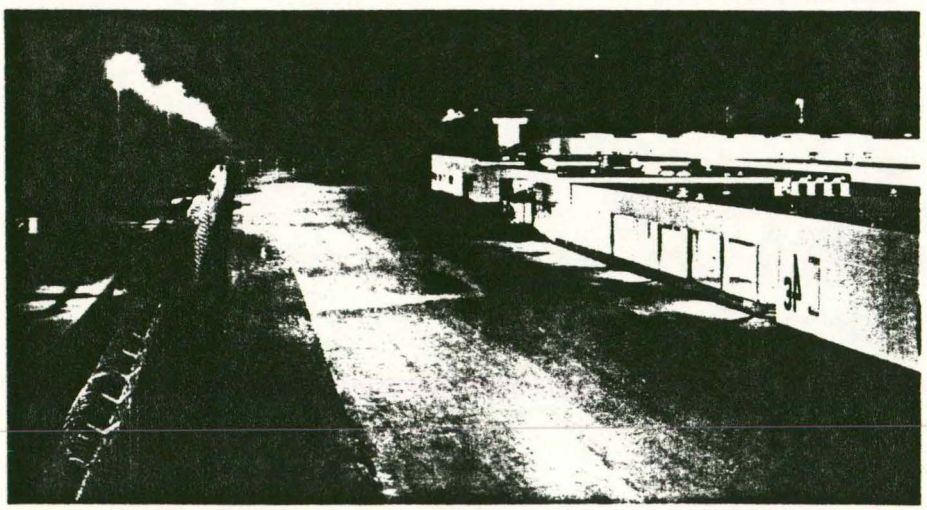



**EXPS400HP12GR**
**Tilted 45°**
**400W Clear HPS**




**EXPS400HP12GR**
**Tilted 30°**
**400W Clear HPS**



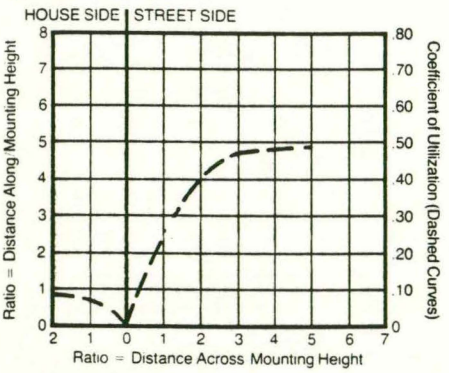



To convert isofootcandle curve values for mounting heights other than 40 feet use the following muliplying factors:

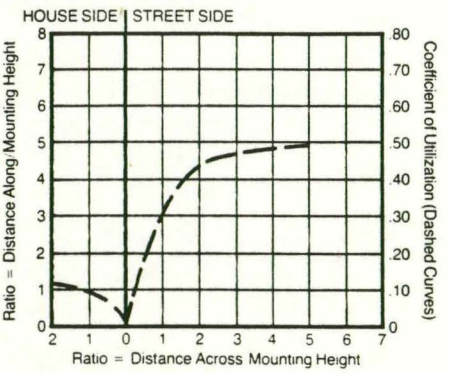
| Mounting height (feet) | Factor |
|---|---|
| 30 | 1.78 |
| 35 | 1.31 |
| 40 | 1.00 |
| 45 | .79 |
| 50 | .64 |
| 55 | .53 |
| 60 | .44 |

# Engineered lighting for wider pole spacings.

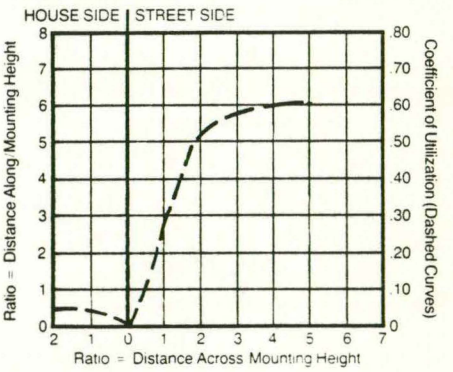
**EXPSC10HP12GR**
**Tilted 45°**
**1000W Clear HPS**



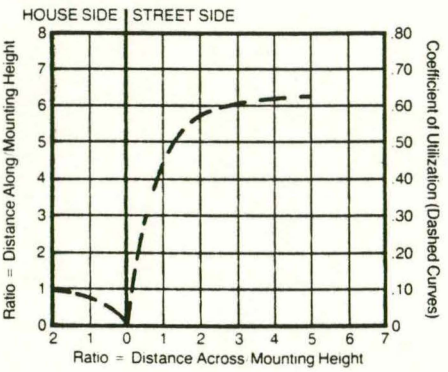

**EXPSC10HP12GR**
**Tilted 30°**
**1000W Clear HPS**



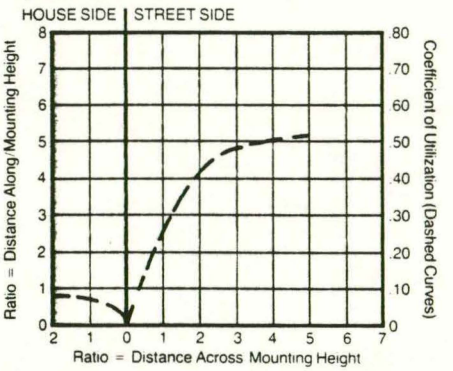

**EXPS400MH12GR**
**Tilted 45°**
**400W Clear MH***



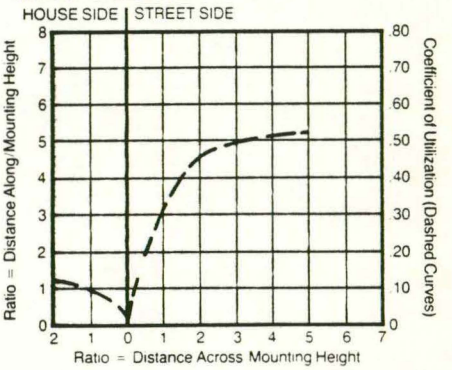

**EXPS400MH12GR**
**Tilted 30°**
**400W Clear MH***




**EXPSC10MH12GR**
**Tilted 45°**
**1000W Clear MH***

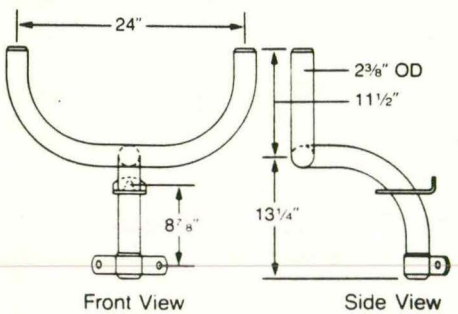



**EXPSC10MH12GR**
**Tilted 30°**
**1000W Clear MH***

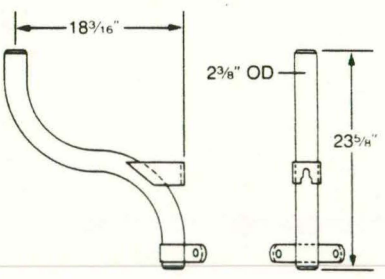



**Optional Mounting Brackets:**

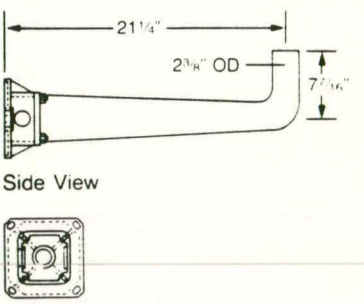
Holophane 06517
Double Mounting Bracket




Holophane 06469
Single Mounting Bracket




Holophane 06387
Wall Bracket




*Corrected for metal halide lamp tilt.

# Ordering data

**How to construct a catalog number for Expressway**

**EXAMPLE:** **EXPS — 400HP — 12 — GR — -R**

1 2 3 4 5

| Step | Catalog no. | Descripton |
|---|---|---|
| 1. Luminaire | EXPS | Expressway |
| 2. Source and wattages | *250 HP | 250W high pressure sodium |
| | *400 HP | 400W high pressure sodium |
| | *C10 HP | 1000W high pressure sodium |
| | *400 MH | 400W metal halide |
| | *C10 MH | 1000W metal halide |
| 3. Voltage | 12 | 120 volt |
| | 20 | 208 volt |
| | 24 | 240 volt |
| | 27 | 277 volt |
| | 48 | 480 volt |
| | *MT | Multi-voltage for 120 through 277 volts, available with wattages indicated * above |
| 4. Color | GR | Grey housing |
| 5. Options | –R | NEMA photocontrol receptacle |

**Options**

| Catalog number | Description |
|---|---|
| -R | Photocontrol receptacle |

**Accessories (order separately)**

| | |
|---|---|
| 06387 | Single wall bracket, prime paint, must use with one EXPSPA2 |
| 06469 | Single bracket for wood pole, prime paint, must use with one EXPSPA2 |
| 06469-GAL | Single bracket for wood pole, galvanized, must use with one EXPSPA2 |
| 06517 | Double bracket for wood pole, prime paint, must use with two EXPSPA2 |
| 06517-GAL | Double bracket for wood pole, galvanized, must use with two EXPSPA2 |
| EXPSPA2 | Mounting adapter for 2" tenon, galvanized |
| EXPSPA3 | Mounting adapter for 3" tenon, galvanized |

**Expressway lighting package.**

**Pole**
S__RT Steel, round tapered
A__RT Aluminum, round tapered

**Pole base type**
anchor base

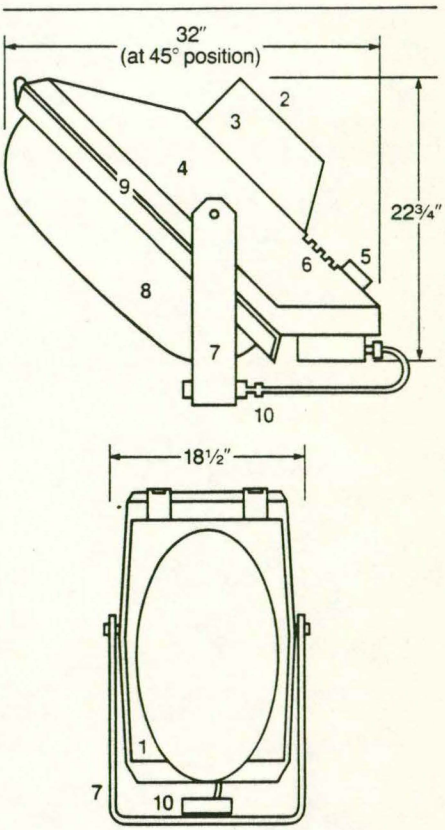
**Number of luminaires**
1, 2

**S P R T 30 J / 1 / EXPS400HP12GR-R**

**Pole finish**
L-Satin finish, aluminum only
P-Prime painted, steel only
G-Galvanized, steel only

**Pole height ft.**
Aluminum 30, 35, 39
Steel 30, 35, 39, 45, 50, 55, 60

**Luminaire catalog no.**
See above




**(1)** Twin, trigger-action door latches for quick, easy access to all internal components. **(2)** Built-in sights for quick, sure optical alignment of main beam. **(3)** Lamp socket permanently attached to reflector to assure proper positioning. **(4)** Rugged cast aluminum housing with baked enamel finish. **(5)** NEMA photocell receptacle available. **(6)** Ballasts—250W, 400W & 1000W high pressure sodium, 400W & 1000W metal halide. **(7)** Support yoke. **(8)** Borosilicate prismatic glass refractor set in cast aluminum door frame. **(9)** Gasketed for weather tight operation. **(10)** Weather tight wiring box with flexible ballast cord and connections.

# Performance specification

The luminaire shall be Holophane catalog number _____ for use with a ____ watt ____ lamp. It shall operate the lamp in all types of outdoor environments when mounted on poles, parapets, walls, and brackets. It shall consist of a cast aluminum housing, built-in ballast, and pressed borosilicate glass refractor enclosed in a cast aluminum door frame.

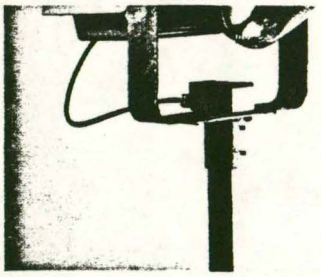
The cast aluminum housing shall provide a weather resistant environment for all components when operating up to 1000 watt high pressure sodium or metal halide lamps. A galvanized steel yoke shall support the housing assembly and shall allow the luminaire to be aimed from 0° to 90° above nadir by loosening two stainless steel bolts and lock washers. Twin, trigger action door latches shall allow quick easy access to all internal components. The luminaire shall be vibration tested under normal operating conditions and shall pass a 2.25 g, 100,000 cycle test without mechanical failure of any parts. All components shall be of non-corrosive material or have positive corrosion protection.

**Ballast:** The copper wound ballast shall operate the ____ watt lamp at ____ volts with the following operating characteristics: starting current less than operating current; primary lamp extinguishing voltage, ____ volts; operating line current, ____ amps; input wattage, ____ volts; and have its power factor over 90%. It shall operate at a minimum ambient starting temperatures of – ___°F and shall provide lamp wattage regulation of ± ___ % for line voltage of ± ___%. All ballast components shall be mounted to a single plate which shall be completely removable as a unitized assembly for maintenance without removing the luminaire from the pole. All ballast components shall be factory tested and pre-wired. A weather resistant flexible cord shall connect the ballast assembly to the yoke mounted wiring box.

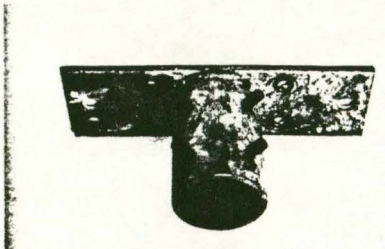
**Optical assembly:** The optical train shall consist of a prismatic pressed borosilicate glass refractor with smooth outer surface and a formed Alzak aluminum reflector. It shall produce an IES Type II, III or IV (depending on lamp type) medium non-cutoff distribution based on a ¾ mounting height off set reference line. The nickel plated, lamp grip, porcelain enclosed, pulse rated socket shall prevent undue lamp vibration and backout. A NEMA photocontrol receptacle shall be available.

---

**Mounting arrangement:**



Support yoke, wiring box and optional mounting adapter.



EXPSPA2 or 3 pole mounting adapter.

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**Electrical characteristics:** For complete electrical data, see tables of electrical characteristics in Holophane Ballast Handbook, publication HL-301.

**Warranty:** Refer to the Holophane limited 1 year material warranty on this product, which is published in the "Terms and Conditions" section of the current price schedule, and is available from your local Holophane sales representative.

The physical properties of the Holophane Expressway luminaires represent typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Check your local Holophane sales representative to assure current information.

Contact your local Holophane sales representative for application assistance, computer-aided design and cost studies, and sample units for trial installation. For information on other products and systems, call the Product Information Center at 303-978-4900.


**Manville**

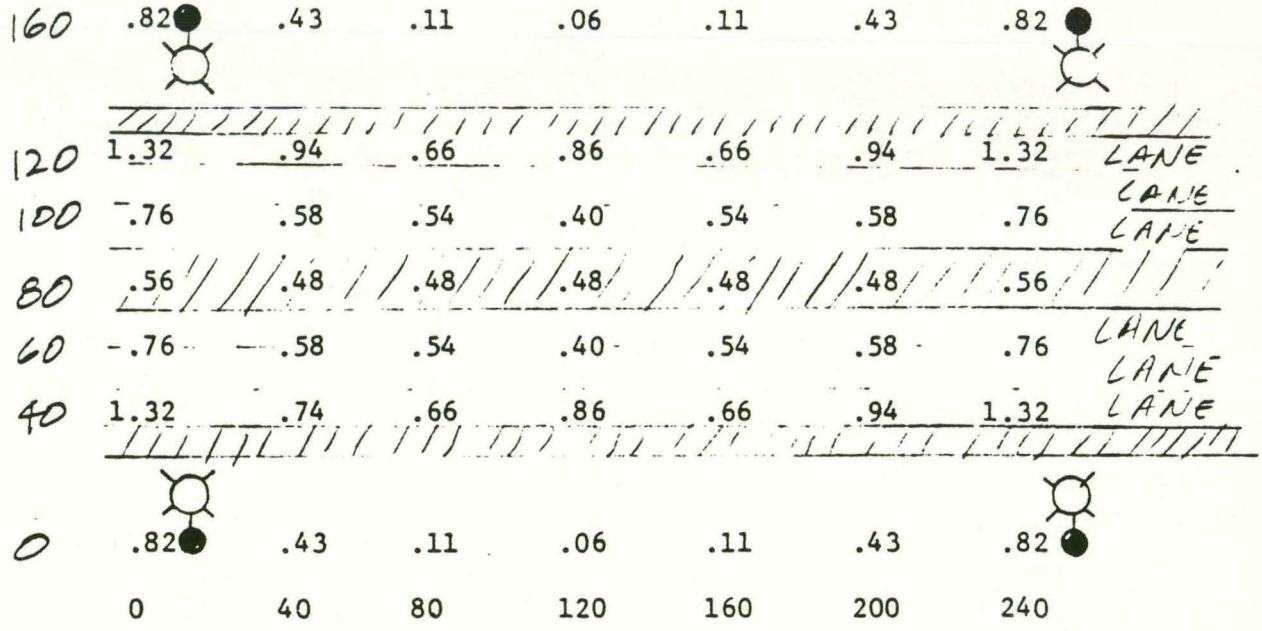
**Holophane Division**

Holophane, Ken Caryl Ranch, P.O. Box 5108, Denver, CO 80217 Holophane Canada, Brampton, Ont. and St. Hyacinthe, Que., Canada Holophane Europe Limited, Bond Ave., Milton Keynes, MK1 1JG, England Holophane S.A. de C.V. Apartado Postal 75-415, Mexico 14, D.F. Mexico

2. Light control is not as good as with the cobra-head luminaires, producing more glare in some directions.
3. With the increased setback distance, winter maintenance may be difficult if large amounts of snow have accumulated in the road ditches.
4. In some areas it will not be practical or possible to locate the poles as far as 30 feet from the roadway.

The footcandle distribution for a segment of lighted mainline is shown on Figure 4.3. The cost estimate for a typical one-mile segment of expressway lighting is shown on page 13. The estimated cost is $200,000 per mile. If this scheme is used, the lighting for interchange entrances, exits, and side-road terminals would be provided with expressway luminaires also.

EXPRESSWAY LIGHTS
(Holophane 250 W, 45° Tilt)




| | |
|---|---|
| Maximum FC: | 1.32 |
| Minimum FC: | 0.40 |
| Average of 35 Grid Points: | 0.72 |
| Uniformity Ratio Avg/Min: | 1.80 |
| Uniformity Ratio Max/Min: | 3.30 |

FIGURE 4.3

# CONCEPTUAL COST ESTIMATE

| EXPRESSWAY LUMINAIRES COST PER MILE | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | LABOR & MATERIAL $ PER UNIT | LABOR & MATERIAL TOTAL | LABOR $ PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| POLE FOUNDATION | 42 | EA | 470.00 | $ 19,740 | | | | |
| POLE 40' GALVANIZED | 42 | EA | 1800.00 | 75,600 | | | | |
| FIXTURE 250W HPS (EXPRESSWAY) | 42 | EA | 700.00 | 29,400 | | | | |
| CABLE 2-#6 W/GROUND IN CONDUIT | 12,000 | LF | 4.00 | 48,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 27,260 | | | | |
| PROBABLE COST/MILE - EXPRESSWAY | LUMINAIRES | | | $ 200,000/MILE | | | | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ $ _____

STANLEY CONSULTANTS

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY I235 | | | SHEET 2 OF 3 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8944-03-694 |
| ESTIMATOR: DR DRAKE DATE 10/28/86 | CHECKER: A. Culberson DATE 10/31/86 | CONSTRUCTION MGR. DATE | DESIGN MGR/PEAP: JM Amsden DATE 10/29/86 |

## V. RECOMMENDED LIGHTING SCHEME - EXPRESSWAY LIGHTS

A. Advantages. Each of the lighting schemes can be designed to correct the initial problems of lighting coverage, pole knock-downs, and electrical system reliability. However, the expressway lights offer two significant advantages over the lighting installed in the median.

1. Maintenance can be performed in a relatively safe area of the roadway corridor.
2. The lighting rehabilitation can be programmed and constructed separate from projects to add left traffic lanes and median barriers.

B. Implementation. In order to implement this scheme the following would be required:

1. Existing lighting poles, mast arms, and fixtures would be removed to be used by Iowa DOT for other projects.
2. Existing concrete pole bases would be removed to below grade.
3. Existing direct buried lighting branch circuit cables would be abandoned in-place.
4. Existing controllers would be re-used, if in good condition.
5. New pole foundations, poles, and expressway luminaires would be installed.
6. New cable-in-conduit branch lighting circuits would be installed.

## VI. PROJECT DEVELOPMENT

In order to implement the renovation of the roadway lighting system in the I-235 corridor a series of projects is proposed. The projects and their recommended order of priority are as follows:

A. Electrical System Rehabilitation. During the field survey it was noted that some of the controllers were in need of immediate repair. Lighting circuits in some areas needed replacement of individual segments between poles. There were also some poles which had been knocked down and removed. To the extent that this work has not already been accomplished by maintenance, a project should be developed to make these initial changes. Generally, the existing system will be repaired to bring it into conformance with the design shown on the record drawings. The detailed cost estimate is shown on page 16. The estimated cost of this project is $235,000. The scope of these changes is shown on sheets 2 through 20 of Appendix B.

B. West I-235 Expressway Lights. For the segment of I-235 west from 42nd Street in Des Moines to the west I-235/I-35/I-80 interchange, the mainline lighting was removed, but the interchange entrance ramp, exit ramp, and side road terminal lighting have been left in-place. All of these will be replaced with new expressway luminaires, poles, foundations, and underground cable-in conduit. Additional controllers will be provided where they are needed. The detailed cost estimate is shown on page 20. The estimated cost of this project is $1,505,000. The scope of these changes is shown on sheets 2 through 6 of Appendix B.

The cost estimate for this work shows an aggregate cost of approximately $5,000 per expressway light including pole, luminaire, foundation, conduit, and cable. This cost can generally be applied to the expressway lighting on I-235. The estimated costs for the segments of this work are as follows:

1. West I-235/I-35/I-80 Interchange to 35th Street in West Des Moines: $270,000.

# CONCEPTUAL COST ESTIMATE

| REHABILITATION – I235 | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | LABOR & MATERIAL $PER UNIT | LABOR & MATERIAL TOTAL | LABOR $PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| REMOVE & REPLACE: CONTROL STATION | 12 | EA | 3,000.00 | $ 36,000 | | | | |
| CABLE | 21,000 | LF | 3.00 | 63,000 | | | | |
| POLE & FIXTURE | 31 | EA | 2,800.00 | 86,800 | | | | |
| TROUBLESHOOT CIRCUIT | 23 | EA | 320.00 | 7,360 | | | | |
| REMOVE JUMPER | 21 | EA | 80.00 | 1,680 | | | | |
| REINSTALL POLE & FIXTURE | 2 | EA | 400.00 | 800 | | | | |
| INSTALL NEW CABLE TO COMPUTE CIRCUIT | 800 | LF | 2.50 | 2,000 | | | | |
| DISCONNECT & RECONNECT FIXTURE | 3 | EA | 300.00 | 900 | | | | |
| REPAIR MAIN SWITCH MECHANISM | 1 | EA | 100.00 | 100 | | | | |
| WATER TIGHT CONNECTION ON BREATHER FITING | 1 | EA | 50.00 | 50 | | | | |
| REPAIR OR REPLACE DOGS | 4 | EA | 1160.00 | 4,640 | | | | |
| UNREVEALED DESIGN DETAILS | — | LS | — | 31,670 | | | | |
| PROBABLE COST REHABILITATION I235 | | | | $ 235,000 | | | | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ $ _____

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY I235 | | | SHEET 2 OF 6 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8944-03-694 |
| ESTIMATOR: DRIBLAKE | CHECKER | CONSTRUCTION MGR. | DESIGN MGR/PEAP: JMcAllister |
| DATE 10/24/86 | DATE | DATE | DATE 10/29/86 |

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2. 35th Street West Des Moines to Rancho Grande: $500,000.
3. Rancho Grande to 63rd Street: $335,000.
4. 63rd Street to 56th Street: $200,000.
5. 56th Street to 42nd Street: $200,000.

If new poles with cobra-head luminaires were installed for mainline lighting in the areas where poles have previously been removed, the cost of this work would be $808,000. For this work poles with 250-watt high pressure sodium luminaires at 50-foot mounting height would be installed with 225- to 250-foot spacing.

C. East I-235 Expressway Lights. For the segment of I-235 east from 42nd Street to the Euclid Avenue interchange, the existing lighting will be replaced. New expressway luminaires, poles, foundations, and underground cable-in-conduit will be installed. The detailed cost estimate is shown on page 21. The estimated cost of this project is $3,525,000. The scope of these changes is shown on sheets 6 through 17 of Appendix B.

The estimated costs for the segments of this work are as follows:

1. 42nd Street to 35th Street: $360,000.
2. 35th Street to Cottage Grove: $275,000.
3. Cottage Grove to Keo Way: $450,000.
4. Keo Way to 2nd Avenue: $600,000.
5. 2nd Avenue to East 14th Street: $470,000.
6. East 14th Street to Easton Boulevard: $550,000.
7. Easton Boulevard to Guthrie Avenue: $350,000.
8. Guthrie Avenue to Euclid Avenue: $470,000.

D. Euclid Avenue to I-235/I-35/I-80 Interchange Expressway Lights. No lighting is presently provided on this segment of roadway. New expressway luminaires, poles, foundations, controllers, electric services, and underground cable-in-conduit will be provided in this project. The detailed cost estimate is shown on page 22. The estimated cost of this project is $225,000. The scope of this work is shown on sheets 17 and 18 of Appendix B.

If new poles with corba-head luminaires were installed for mainline lighting the cost of this work would be $230,000. For this work poles with 250 watts high pressure sodium luminaires at 50 foot mounting height would be installed with 225- to 250-foot spacing.

E. East I-235/I-35/I-80 Interchange Tower Lighting. Presently, this interchange is lighted with pole-mounted cobra-head luminaires. This project would replace this system with lighting towers. The detailed cost estimate is shown on page 23. The estimated cost of this project is $1,570,000. The scope of this work is shown on sheets 18, 19, and 20 of Appendix B.

Although the lighting controllers are being replaced in the I-235 rehabilitation project, underground wiring is not being repaired at this time. However, the DOT maintenance group has identified that it is deteriorating and repair work will be required soon. The north segment of the interchange lighting was installed in 1967 and the south segment in 1973.

Lamp replacement is accomplished on a four-year cycle. Replacement of the poles with towers should be programmed for the end of the next lamp cycle in four years. The new controllers can be used with the towers.

F. Priority of Projects. In order to implement this upgrade, the work has been organized into an appropriate sequence of projects. These projects can be designed and constructed as funding allows. The projects with their estimated costs are listed by order of priority.

1. Electrical System Rehabilitation ($235,000). This project should be attempted first in order to upgrade the present lighting system as much as practical to the as-built condition.
2. West I-235 Expressway Lights ($1,505,000). This project would replace the interchange lighting west of 42nd Street in Des Moines with expressway lights. Expressway lights

would also be installed for mainline lighting from 42nd Street west to the I-80 interchange. The cost estimates in this report show an aggregate cost approximately $5,000 per expressway light, including pole, luminaire, foundation, conduit, and cable. This cost can generally be applied to the expressway lighting on I-235. The estimated cost for the segments of this work are as follows:

a. West I-235/I-35/I-80 Interchange to 35th Street in West Des Moines: $270,000.
b. 35th Street West Des Moines to Rancho Grande: $500,000.
c. Rancho Grande to 63rd Street: $335,000.
d. 63rd Street to 56th Street: $200,000.
e. 56th Street to 42nd Street: $200,000.

3. East I-235 Expressway Lights ($3,525,000). This project would replace the mainline and interchange lighting from 42nd Street to the Euclid Avenue interchange, including the lighting in the Central Business District.

   The cost estimates for individual segments of this work are as follows:

   a. 42nd Street to 35th Street: $360,000.
   b. 35th Street to Cottage Grove: $275,000.
   c. Cottage Grove to Keo Way: $450,000.
   d. Keo Way to 2nd Avenue: $600,000.
   e. 2nd Avenue to East 14th Street: $470,000.
   f. East 14th Street to Easton Boulevard: $550,000.
   g. Easton Boulevard to Guthrie Avenue: $350,000.
   h. Guthrie Avenue to Euclid Avenue: $470,000.

4. Euclid Avenue to I-235/I-35/I-80 Interchange Expressway Lights ($225,000). This project would provide new lighting in an area which is not lighted now.
5. East I-235/I-35/I-80 Interchange Tower Lighting ($1,570,000). This project would replace the mercury vapor pole-mounted lights with towers and high pressure sodium lights.

# CONCEPTUAL COST ESTIMATE

| NEW CONSTRUCTION - I 235 WEST | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL $PER UNIT | MATERIAL TOTAL | LABOR $PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| POLE FOUNDATION | 299 | EA | 470.00 | $ 140,530 | | | | |
| POLE 40' GALVANIZED | 308 | EA | 1,800.00 | 554,400 | | | | |
| FIXTURE 250W HPS | 308 | EA | 700.00 | 215,600 | | | | |
| CABLE 2-#6 W/GROUND IN CONDUIT | 68000 | LF | 4.00 | 272,000 | | | | |
| REMOVE EXISTING POLE & FIXTURE | 262 | EA | 300.00 | 78,600 | | | | |
| POLE FOUNDATION (70 6" UNDERGROUND) | 262 | EA | 150.00 | 39,300 | | | | |
| MAIN CONTROL STATION | 2 | EA | 4000.00 | 8,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 196,570 | | | | |
| PROBABLE COST I 235 WEST | | | | $ 1,505,000 | | | | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ $ _____

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY I 235 | | | SHEET 3 OF 6 |
| LOCATION: DESMOINES, IOWA | | | JOB NO. 5741-03-674- |
| ESTIMATOR: DR DRAKE | CHECKER: [illegible] | CONSTRUCTION MGR. | DESIGN MGR/PEAP: JMcAllister |
| DATE 10/24/86 | DATE [illegible] | DATE | DATE 10/29/86 |

STANLEY CONSULTANTS

# CONCEPTUAL COST ESTIMATE

| COBRAHEAD FIXTURES VISST I-80 INTERCHANGE TO 42ND ST DESMOINES | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL $PER UNIT | MATERIAL TOTAL | LABOR $PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| POLE FOUNDATION | 145 | LF | 470.00 | $ 68,150 | | | | |
| POLE 50' GALVANIZED W/15' MAST ARM | 145 | LF | 2500.00 | 362,500 | | | | |
| FIXTURE 250 W HPS | 145 | LF | 425.00 | 61,625 | | | | |
| CABLE 2-#6 W/GROUND IN CONDUIT | 36750 | LF | 5.50 | 202,125 | | | | |
| NEW CONTROL STATION | 2 | EA | 4000.00 | 8,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 105,600 | | | | |
| PROBABLE COST | | | | $ 808,000 | | | | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ _____ $ _____

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY I-235 | | | SHEET 1 OF 1 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8919-05-039 |
| ESTIMATOR: [illegible] DATE 1/14/87 | CHECKER: [illegible] DATE [illegible] | CONSTRUCTION MGR. DATE | DESIGN MGR/PEAP DATE |

STANLEY CONSULTANTS

2620 (d) R1

# CONCEPTUAL COST ESTIMATE

| NEW CONSTRUCTION – I235 EAST | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | LABOR & MATERIAL $ PER UNIT | LABOR & MATERIAL TOTAL | LABOR $ PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| POLE FOUNDATION | 687 | EA | 470.00 | $ 322,890 | | | | |
| POLE 40' GALVANIZED | 698 | EA | 1,800.00 | 1,256,400 | | | | |
| FIXTURE 250W HPS | 698 | EA | 700.00 | 488,600 | | | | |
| CABLE 2-#6 W/GROUND IN CONDUIT | 126,000 | LF | 4.00 | 504,000 | | | | |
| REMOVE: EXISTING POLE & FIXTURE | 1,092 | EA | 300.00 | 327,600 | | | | |
| POLE FOUNDATION (TO 6" UNDERGROUND) | 1,092 | EA | 150.00 | 163,800 | | | | |
| UNDERGLOPED DESIGN DETAILS | — | LS | — | 461,710 | | | | |
| | | | | | | | | |
| | | | | | | | | |
| POSSIBLE COST I 235 EAST | | | | $ 3,525,000 | | | | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ $ _____

| PROJECT | | | SHEET 4 OF 6 |
|---|---|---|---|
| LIGHTING STUDY I235 | | | |
| LOCATION DES MOINES, IOWA | | | JOB NO. 8944-03-674 |
| ESTIMATOR DEDRICK | CHECKER | CONSTRUCTION MGR. | DESIGN MGR/DEAP J McALLISTON |
| DATE 10/24/86 | DATE | DATE | DATE 10/29/86 |

STANLEY CONSULTANTS

# CONCEPTUAL COST ESTIMATE

| NEW CONSTRUCTION - EUCLID TO I 80 | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | Labor & MATERIAL $ PER UNIT | Labor & MATERIAL TOTAL | LABOR $ PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| POLE FOUNDATION | 47 | EA | 470.00 | $ 22,090 | | | | |
| POLE 40' GALVANIZED | 47 | EA | 1,800.00 | 84,600 | | | | |
| FIXTURE | 47 | EA | 700.00 | 32,900 | | | | |
| CABLE 2-#6 W/GROUND IN CONDUIT | 11,300 | LF | 4.00 | 45,200 | | | | |
| REMOVE: EXISTING POLE & FIXTURE | 4 | EA | 300.00 | 1,200 | | | | |
| POLE FOUNDATION (TO 6" UNDERGROUND) | 4 | EA | 150.00 | 600 | | | | |
| NEW CONTROL STATION | 2 | EA | 4000.00 | 8,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 30,410 | | | | |
| PROBABLE COST EUCLID TO I 80 | | | | $ 225,000 | | | | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ _____ $ _____

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY | | | SHEET 5 OF 6 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8944-03-694 |
| ESTIMATOR: DR DRAKE | CHECKER: D. Crabbs | CONSTRUCTION MGR. | DESIGN MGR/REAP: McAllister |
| DATE: 10/24/86 | DATE: 10/24/86 | DATE | DATE: 10/24/86 |

STANLEY CONSULTANTS

2620 (d) R1

# CONCEPTUAL COST ESTIMATE

| COBRA HEAD FIXTURES EUCLID TO EAST I-80 INTERCHANGE | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | MATERIAL $PER UNIT | MATERIAL TOTAL | LABOR $PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| POLE FOUNDATION | 41 | EA | 470.00 | $ 19,270 | | | | |
| POLE 50' GALVANIZED W/15' MAST ARM | 41 | EA | 2,500.00 | 102,500 | | | | |
| FIXTURE 250W HPS | 41 | EA | 425.00 | 17,425 | | | | |
| CABLE 2-#6 W/GROUND IN CONDUIT | 10,250 | LF | 5.50 | 56,375 | | | | |
| NEW CONTROL STATION | 1 | EA | 4,000.00 | 4,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 30,430 | | | | |
| PROBABLE COST | | | | $ 230,000 | | | | |

☐ PRICES INCLUDE ESCALATION TO _____

☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ _____ $ _____

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY I-235 | | | SHEET 1 OF 2 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8711-07-62 |
| ESTIMATOR: DEDRAKE DATE 1/14/87 | CHECKER: DATE | CONSTRUCTION MGR. DATE | DESIGN MGR/PEAP DATE |

STANLEY CONSULTANTS

2620 (d) B1

# CONCEPTUAL COST ESTIMATE

| NEW CONSTRUCTION - I80 EAST INTERCHANGE | QUANTITY NO. UNITS | QUANTITY UNIT MEAS. | LABOR & MATERIAL $PER UNIT | LABOR & MATERIAL TOTAL | LABOR $PER UNIT | LABOR MH PER UNIT | LABOR TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| CABLE 2-#6 W/GROUND IN CONDUIT | 18,500 | LF | 4.00 | $ 74,000 | | | | |
| REMOVE: EXISTING POLE & FIXTURE | 215 | EA | 300.00 | 64,500 | | | | |
| POLE FOUNDATION (TO 6" UNDERGROUND) | 215 | EA | 150.00 | 32,250 | | | | |
| TOWER (150' INCLUDING FIXTURES & FOUNDATION) | 23 | EA | 52,000.00 | 1,196,000 | | | | |
| UNDEVELOPED DESIGN DETAILS | — | LS | — | 203,250 | | | | |
| PROBABLE COST I80 EAST INTERCHANGE | | | | $ 1,570,000 | | | | |

☐ PRICES INCLUDE ESCALATION TO _____
☐ PRICES ARE AS OF DATE OF THIS ESTIMATE

TOTALS THIS SHEET $ _____ $ _____

| | | | |
|---|---|---|---|
| PROJECT: LIGHTING STUDY | | | SHEET 6 OF 6 |
| LOCATION: DES MOINES, IOWA | | | JOB NO. 8744-03-697 |
| ESTIMATOR: DR DRAKE<br>DATE 10/24/86 | CHECKER:<br>DATE 10/27/86 | CONSTRUCTION MGR.<br>DATE | DESIGN MGR/PEAP: J McAllister<br>DATE 10/29/86. |

STANLEY CONSULTANTS

## VII. SUMMARY

A. Present Lighting System Problems. The present lighting system for the I-235 corridor utilizes high pressure sodium cobra-head luminaires in a 1983 upgrade from the original mercury vapor system. Low luminaire mounting heights, close pole spacing and short setback distances result in a system which is vulnerable to frequent pole knockdown from vehicle collision.

The areas of the corridor which are continuously lighted are generally adequately lighted, but will be deficient if an additional third left lane is constructed. On the west I-235 segment for which continuous lighting was removed, the increased travel due to development in this area requires the upgrade to continuous lighting.

The present electrical system uses direct buried branch circuit conductors that were installed in the original construction. It appears that these have been spliced and rerouted for various reasons, causing inconsistencies in the circuit loading. However, voltage drop does not appear to be a problem.

B. Lighting System Alternatives. In this study the following lighting schemes were considered as a replacement to the present design of cobra-head luminaires located close to the right travelled lane:

1. Median towers in-line with median barrier.
2. Median poles using cobra-head luminaires in-line with median barrier.
3. Pole-mounted expressway luminaires with increased setback distance from right side of roadway.

C. Recommended Lighting Scheme - Expressway Lights. Expressway lights located at nominal 30-foot setback from the right travelled lane have the advantage of decreasing pole knockdowns, while allowing maintenance to be performed in relative safety. For this scheme the rehabilitation can be accomplished independently of the construction of additional lanes in the median.

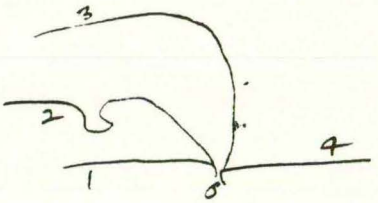
D. Priority of Projects. In order to implement this upgrade, five projects are proposed. The projects with their estimated costs are as follows:

1. Electrical System Rehabilitation. This project would upgrade the system to adequate operation without changing the lighting system. The estimated cost of this project is $235,000.
2. West I-235 Lighting. This work would replace the continuous lighting which was removed earlier with expressway lights. The estimated cost of this project is $1,505,000.
3. East I-235 Lighting. This project replaces the lighting in Des Moines with expressway lights. The estimated cost of this project is $3,525,000.
4. Euclid Avenue to East I-235/I-35/I-80 Interchange Lighting. This work provides continuous lighting from Euclid Avenue north to the East I-80 Interchange. The estimated cost of this project is $225,000.
5. East I-235/I-35/I-80 Interchange Tower Lighting. This project replaces the pole-mounted lights at this interchange with towers using high-pressure sodium luminaires. The estimated cost of this project is $1,570,000.

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: I DATE: 8-21-86

B. CONDITION OF CONTROL STATION:

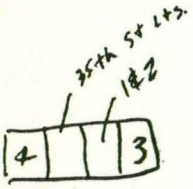



(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: G

C. BREAKERS: 1#2, 3, 4 (P) 35th St Lts N

PHOTOCONTROL: E




ENCLOSURE: Painted steel old key system - Had weatherhead but removed. Hole not plugged. 1" deep birds nest inside

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 117.3 (120) L2-G: 117.5 (120) L1-L2: 236 (230 Big Simpson)

D. AMPERES AT FULL LOAD: L1: 30+ L2: 30-

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | T222 | 15.5 | | | | 111.2 | 110.9 | 221 |
| 1&2 | T114 | 15.5 + 4 | 117.2 | 117.2 | 235 | 110.1 | 109.9 | 220 |
| 35th | T209 | 4 + 9 | 118.0 | 118.0 | 236 | 118.1 | 117.9 | 238 |
| 3 | T314 | 8 + 1.4 | 118.1 | 118.0 | 236 | 116.3 | 115.7 | 232 |
| 4 (3 fix. 100+) | T402 | 8 | 117.6 | 117.7 | 236 | 119.7 | 119.8 | 243 |

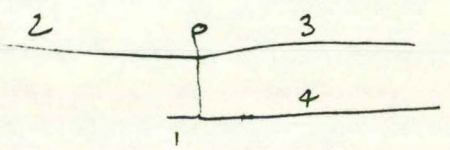
F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: S DATE: 8-21-86

B. CONDITION OF CONTROL STATION:




(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

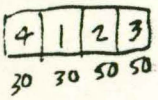
CONTACTORS: E

C. BREAKERS: 3 E 4th(?)

PHOTOCONTROL: E

200A M ENCLOSURE: (G.) Painted steel old key system

COMMENTS: Disconnecting load side of 3rd breaker doesn't shut off any fixtures just has 4.5A load.(?)




C. VOLTAGE AT FULL LOAD: L1-G: 121.1/130 L2-G: 120.9/130 L1-L2: 243/243 Big Simpson

D. AMPERES AT FULL LOAD: L1: 24/20 L2: 24/20

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | | | | | | | |
| 1 (first k out) | | 0/4.2 | | | | | | | |
| 2 | S211 | 4.5/14 | 121.4 | 121.3 | 243 | 121.6 | 121.2 | 247 | E end |
| 3 | S305 | 14/5.5 | 120.7 | 120.6 | 242 | 117.1 | 116.9 | 236 | W end |
| 4 | S407 | 5.5 | 121.3 | 121.1 | 243 | 122.4 | 121.6 | 245 | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: R DATE: 8-21-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

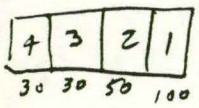
C. BREAKERS: 1#3 E or G 2(?) 4-see comm.
Ckt bkr #1 loose from back panel

PHOTOCONTROL: E

ENCLOSURE: Painted steel - old key system
Needs paint

200 A M

COMMENTS: At first → Ckt 4 wired direct w/ no fuse in one leg since it was within 100' of controller we did not check voltages at pole.
Ckt bkr 4 operates hard.
Ckt bkr #3 has jumpers across bkr but holds in w/ jumpers removed




Ckt #2 load conn. on line side of bkr. - Have to shut off controller to check.

C. VOLTAGE AT FULL LOAD: L1-G: 121.6 (125.2) L2-G: 121.6 (125.3) L1-L2: 243 (253)

D. AMPERES AT FULL LOAD: L1: 15.5 L2: 15.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | R112 | 8 | 121.6 | 121.7 | 243-244 | 120.9 | 120.4 | 242 |
| 2 | R213 | 5 | | | | 122.2 | 122.4 | 247 |
| 3 (2 first - 1 out →) | R301 | 1 | 122.5 | 122.6 | 245 | 124.7 | 125.5 | 252 |
| 4 (1 first →) | R401 | 1.5 | 121.8 | 121.7 | 243-244 | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

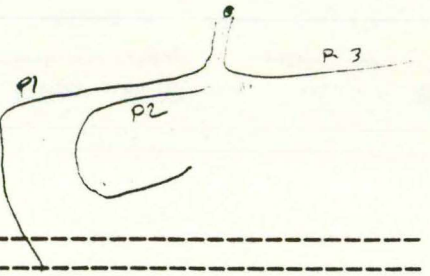
| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: P DATE: 8-20-86

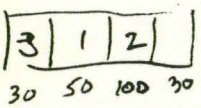
B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION




200 A M

120 V possibly for traffic signals, it's own 40 meter.




CONTACTORS: G

C. BREAKERS: G

PHOTOCONTROL: G

ENCLOSURE: Painted steel - needs paint, old key system

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 121.6 123.6 L2-G: 121.9 123.7 L1-L2: 244 242-248

D. AMPERES AT FULL LOAD: L1: 16.5 L2: 16.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | P109 | 9.5 9.5 7 | 121.8 | 121.9 | 244 | 119.7 | 119.9 | 238 |
| 2 | P210 | 7 .4 | 121.8 | 121.9 | 244 | 122.2 | 122.0 | 246 |
| 3 | P301 | .4 | 121.7 | 121.9 | 244 | 122.6 | 124.1 | 248 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: N DATE: 8-20-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION


CONTACTORS: A202K47 E

C. BREAKERS: 1 & 3 (G) 2 (?) Load conn w/line wires

PHOTOCONTROL: E

ENCLOSURE: Painted Steel Weigmen needs paint

COMMENTS: Keyed switch had operating old style key

JA225
JA2200 W
200 A M

FA2030 EHB2100 FA2050 W

| 2 | 1 | 3 |
|---|---|---|
| 30 | 100 | 50 |

C. VOLTAGE AT FULL LOAD: L1-G: 120.9 L2-G: 120.0 L1-L2: 241

D. AMPERES AT FULL LOAD: L1: 17.5 L2: 19

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 9.75 | | | | | | |
| 1 | N112 | 9.75 / 5 | 120.8 | 120.0 | 241-242 | 115.0 | 116.5 | 230 |
| 2 | N209 | 6.5 / 3.0 | | | | 130.1 | 110.1 | 241 |
| 3 | N307 | 3.0 | | | | 121.6 | 122.3 | 244 |
| | | | | | | | | |

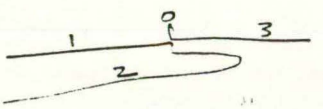
F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: M DATE: 8-19-86
8-20-86

B. CONDITION OF CONTROL STATION:




(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: P Furnace 200A 40JB12AA-D6

C. BREAKERS: G W F2050

PHOTOCONTROL: E

2 3

ENCLOSURE: Painted Steel - "P" gas is

COMMENTS: Not keyed - Screwed cover screws gone
Test button doesn't work in hand position
Could use paint or replace w/ 53. to match others
Enclosure is not grounded, have to use grd bus.

1
50

C. VOLTAGE AT FULL LOAD: L1-G: 123.2 (121.0) L2-G: 123.2 (120.9) L1-L2: 247 (241 W on weld.)
127 127 242 w/ Big Simpson wel 8-20

D. AMPERES AT FULL LOAD: L1: 30 L2: 30

E. VOLTAGE DROP AND LOAD AMPERES:

2 set of cables

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 15 .75 13.75 | | | | | | |
| 1 | P311 | 12 .75 13.75 | | | | 110.9 | 108.2 | 219 |
| 2 | M202 | 4 14.5 | | | | 119.9 | 121.1 | 242 |
| 3 | M311 | 13.5 | | | | 115.8 | 115.9 | 232 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: L DATE: 8-20-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION


CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S

150 A M

COMMENTS:

| 4 | 3 | 2 | 1 |
|---|---|---|---|
| 40 | 40 | 40 | 40 |

C. VOLTAGE AT FULL LOAD: L1-G: 124.4 L2-G: 124.4 L1-L2: 247 ~~244~~

D. AMPERES AT FULL LOAD: L1: 21 L2: 21

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | L108 | 2.75 2.75 14 | 124A | 124.8 | 247-248 | 122.9 | 121.8 | 245 |
| 2 | N312 | 14 1.2 | | | | 112.1 | 111.6 | 226 |
| 3 (1 Double fixt) | L301 | 1.2 2.75 | | | | 120.8 | 121.1 | 245 |
| 4 (1 fixt) | L404 | 2.75 | 124.3 | 124.3 | 247-248 | 120.9 | 121.0 | 244 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: K DATE: 8-19-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

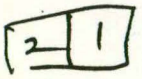
CONTACTORS: G

C. BREAKERS: E

PHOTOCONTROL: E

80 A M ENCLOSURE: E S.S.

COMMENTS:




C. VOLTAGE AT FULL LOAD: L1-G: 122.3 122 L2-G: 122.7 122 L1-L2: 245 234 BJ Simpson

D. AMPERES AT FULL LOAD: L1: 28 L2: 28

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 17.5 | | | | | | |
| 1 | K115 | 17.5 | 117 | 117 | 234 | 117.4 | 116.8 | 235 |
| 2 | K216 | 11 | 117 | 117 | 234 | 116.8 | 117.7 | 236 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: J DATE: 8-29-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

80A M COMMENTS:

2 P

40 40 C. VOLTAGE AT FULL LOAD: L1-G: 126 L2-G: 126 L1-L2: 240 Big Simpson

D. AMPERES AT FULL LOAD: L1: 14.5 L2: 14.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | J105 | 3.5 3.5 11 | | | | 123.6 | 124.5 | 249 |
| 2 | J214 | 11 | | | | 119.9 | 112.8 | 238 |
| | | | | | | | | |
| | | | | | | | | |

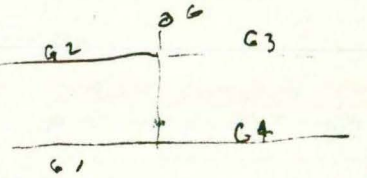
F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: G DATE: 8-19-86

B. CONDITION OF CONTROL STATION:

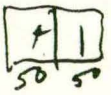



(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: G Furnace

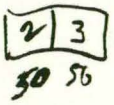
C. BREAKERS: G Unknown Mfg

PHOTOCONTROL: E




ENCLOSURE: N Door fell off steel-painted.

200 A M COMMENTS: Doesn't have key control
No Meyer hub on top service entrance




C. VOLTAGE AT FULL LOAD: L1-G: 128 L2-G: 128 L1-L2: 246 Big 3 imp 240

D. AMPERES AT FULL LOAD: L1: 28 L2: 28

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | G105 | 3.5 | 122 | 122 | 243 | 122.5 | 122.9 | 247 |
| 2 | G206 | 5 | | | | 121.5 | 122.1 | 245 |
| 3 | G314 | 11.5 | | | | 119.9 | 119.6 | 240 |
| 4 | G408 | 8 | | | | 118.4 | 120.0 | 239 |

door hit + knocked off clipboard

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: F DATE: 8-19-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 130 L2-G: 130 L1-L2: 248 Big Simpson

D. AMPERES AT FULL LOAD: L1: 30.5 L2: 30.5

JM

E. VOLTAGE DROP AND LOAD AMPERES:

| 2 | 1 | 3 | 4 |
|---|---|---|---|
| 40 #6 | 40 #6 | 40 #6 | 40 #6 |

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 5 | | | | | | |
| 1 | F106 | 5 | 125 | 125 | 246 | 122.2 | 123.0 | 247 |
| | | 10 | | | | | | |
| 2 | F211 | 10 | | | | 123.4 | 123.1 | 248 |
| | | 7.25 | | | | | | |
| 10 3 | F310 | 7.25 | | | | 120.9 | 120.2 | 243 |
| 12 4 | F410 | 9 | | | | 119.7 | 120.1 | 242 |
| | | 9 | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: E DATE: 8-19-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E SS.

COMMENTS:

150 A M

| 3 | 2 | 1 | 4 |
|---|---|---|---|
| 40 | 90 | 40 | 90 |

C. VOLTAGE AT FULL LOAD: L1-G: 124 (120.7) L2-G: 124 (120.6) L1-L2: 243 (239) W Big Simpson

D. AMPERES AT FULL LOAD: L1: 24 L2: 24

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE----- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | E108 | 7 (1) | 120 | 120 | 240 | 119.9 | 118.6 | 238 |
| 2 | E209 | 5.75 | | | | 118.4 | 118.6 | 236 |
| 3 | E307 | 5.75 | | | | 119.7 | 119.5 | 239 |
| 4 | E404 | 6 (6.5) | | | | 119.4 | 118.4 | 241 |

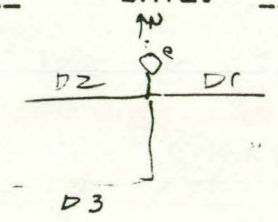
F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: D DATE: 8-18-86

B. CONDITION OF CONTROL STATION:




(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

100 A M

COMMENTS:

| 2 | 1 | 3 |
|---|---|---|
| 90 | 90 | 90 |

C. VOLTAGE AT FULL LOAD: L1-G: 122 L2-G: 122 L1-L2: 244

D. AMPERES AT FULL LOAD: L1: 35 L2: 28

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | D103 | 3 2 | 121.8 | 121.3 | 244 | 123.2 | 122.6 | 247 |
| 2 | D210 | 11 11 | 121.9 | 121.4 | 243 | 120.0 | 119.0 | 241 |
| 3 | D316 | 24 13.5 | 122 | 121.9 | 244 | 101.5 | 128.1 | 233 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: C DATE: 8-15-86
8-10-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

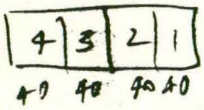
C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E 55

150A M

COMMENTS:




C. VOLTAGE AT FULL LOAD: L1-G: 124.7 (123) L2-G: 121.9 (123) L1-L2: 243 (246)

D. AMPERES AT FULL LOAD: L1: 50 L2: 50

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | BR113 | 25 (25) | 121.9 | 122.1 | 244 | 107.5 | 108.1 | 216 |
| 2 | C207 | 12 (12) | 122.2 | 122.6 | 246 | 119.5 | 120.2 | 239 |
| 3 | C306 | 3.5 (3.5) | ---- | ---- | ----- | 120.3 | 121.3 | 242 |
| 4 | C409 | 9.5 (9.5) | ---- | ---- | ----- | 118.5 | 118.0 | 239 |

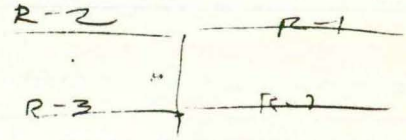
F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| ---- | ------- | ------- | ---------- |
| ---- | ------- | ------- | ---------- |
| ---- | ------- | ------- | ---------- |
| ---- | ------- | ------- | ---------- |
| ---- | ------- | ------- | ---------- |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: R(RR) DATE: 8-15-86

B. CONDITION OF CONTROL STATION:




(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

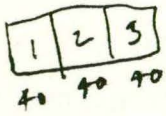
C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

100A M

COMMENTS: Main switch operating mechanism dismantled.




C. VOLTAGE AT FULL LOAD: L1-G: 119.8 L2-G: 119.7 L1-L2: 239

D. AMPERES AT FULL LOAD: L1: 17 L2: 12

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 4 | | | | | | |
| 1 | RR107 | 4 | 119.8 | 119.7 | 239 | 118.7 | 118.6 | 239 |
| 2 | | 0 | | | | | | |
| | | 0 | | | | | | |
| | | 13 | | | | | | |
| 3 | RR314 | 13 | | | | 116.2 | 115.5 | 233 |
| | | | | | | | | |

CKT 1 NORTH SIDE OUT

CKT 2 NORTH SIDE OUT

F. CIRCUIT INSULATION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: CG DATE: 8-15-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

100A M

COMMENTS:

| 4 | 3 | 1 |
|---|---|---|
| 40 | 40 | 40 |

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 121 L1-L2: 241

D. AMPERES AT FULL LOAD: L1: 22 L2: 22

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 3.5 | | | | | | |
| 1 | CG105 | 3.5 | 120 | 120 | 239 | 119.0 | 118.9 | 242 |
| | | 8 | | | | | | |
| 3 | CG311 | 8 | 120 | 120 | 240 | 115.9 | 116.0 | 233 |
| | | 11 | | | | | | |
| 4 | CG417 | 11 | 121 | 121 | 241 | 117.1 | 117.5 | 238 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: DX DATE: 8-15-96

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

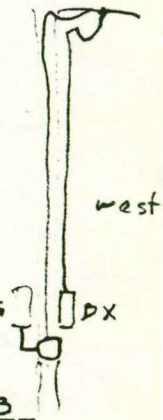
C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

100A M

COMMENTS: Main supply connected ahead of metering. Breather in top so close to serv. riser that a lock nut ~~isn't~~ installed so its just sitting there leaking water in.




| 3 | 1 | 2 |
|---|---|---|
| 40 | 40 | 40 |

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 122 L1-L2: 243

D. AMPERES AT FULL LOAD: L1: 18 L2: 18

E. VOLTAGE DROP AND LOAD AMPERES:

243 V no load w/ weston

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | DX102 | 1 (12) | 121 | 122 | 243 | 122.1 | 121.8 | 247 |
| 2 | DX216 | 11.5 (5.5) | 119 | 119 | 239 | 116.7 | 116.8 | 235 |
| 3 | DX368 | 5.5 | 119.9 | 119.7 | 241 | 117.9 | 118.6 | 236 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: B DATE: 8-15-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E Westinghouse Size 3 A200M3CB

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E SS.

150A m

COMMENTS:

| 1 | 3 | 2 | 4 |
|---|---|---|---|
| 40 | 40 | 40 | 40 |

C. VOLTAGE AT FULL LOAD: L1-G: 124.2 L2-G: 124.2 L1-L2: 250

D. AMPERES AT FULL LOAD: L1: 29.5 L2: 29.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 19.5 | | | | | | |
| 1 | B112 | 19.5 | 124.2 | 124.2 | 250 | 116.6 | 116.0 | 233 |
| 2 | B202 | 11 | | | | 124.0 | 123.5 | 248 |
| 3 | | 00 | | | | | | |
| 4 | B410 | 88 | | | | 117.3 | 121.2 | 238 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: A (West of Rec) DATE: 8-14-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

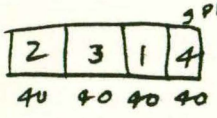
CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

150 A M ENCLOSURE: E SS

COMMENTS:




C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 122 L1-L2: 243

D. AMPERES AT FULL LOAD: L1: 30 L2: 30

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 10.5 | | | | | | |
| 1 | A111 | 10.5 / 7.5 | 121 | 121 | 242 | 118.3 | 117.8 | 238 |
| 2 | A205 | 8 / 14 | 121 | 121 | 242 | 117.8 | 118.5 | 240 |
| 3 | A314 | 14 | 121 | 121 | 242 | 113.3 | 112.4 | 227 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: DY DATE: 8-17-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

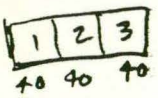
C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

100A M

COMMENTS:




C. VOLTAGE AT FULL LOAD: L1-G: 122.6 121 L2-G: 121.8 121 L1-L2: 245 241

D. AMPERES AT FULL LOAD: L1: 43 L2: 56

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 9.5 | | | | | | |
| 1 | DY113 | 9.0 17 | 121 | 121 | 241 | 121.4 | 118.9 | 242 |
| 2 | B304 | 30 | 121 | 121 | 242 | 110.0 | 115.8 | 226 |
| 3 | BB108 | 16 to 17 | 121 | 121 | 242 | 117.5 | 117.0 | 233 E |
| | A402 | | | | | 121.9 | 118.4 | 241 W |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: C(cc) DATE: 8-14-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS:

100A M

| 3 | 2 | 1 |
|---|---|---|

100 to 40

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 122 L1-L2: 242

D. AMPERES AT FULL LOAD: L1: 49 L2: 18.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | CC103 | 8.5 9.5 | 121 | 121 | 242 | 108.5 | 118.2 | 24 |
| 2 | CC201 | 9.5 | 121 | 122 | 242 | 118.8 | 122.9 | 245 |
| 3 | CC305 | 36A 5.5A | 121 | 122 | 243 | 131.5 | 100.7 | 236 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: B (BB) DATE: 8-14-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

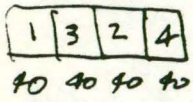
C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S Pad mount

150 A M

COMMENTS: CKT 2 has only one light on it. It's on a bridge and unable to get to connections.




C. VOLTAGE AT FULL LOAD: L1-G: 118 L2-G: 116 L1-L2: 234

D. AMPERES AT FULL LOAD: L1: 36 L2: 36

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 6 | | | | | | |
| 1 | BB104 | 6 | 118 | 116 | 234 | 114.3 | 115.6 | 232 |
| | | .5 | | | | | | |
| 2 | | .5 | 118 | 116 | 234 | | | |
| | on ckt B | 16 | | | | | | |
| 3 | AA303 | 16 | 118 | 116 | 234 | 109.6 | 111.0 | 224 |
| | | 13 | | | | | | |
| 4 | BB206 | 13 | 118 | 115 | 233 | 109.4 | 111.8 | 221 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
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| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: A(AA) DATE: 8-13-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E Controls DZ controller also

ENCLOSURE: E SS. Pad mount

COMMENTS:

100A M

| 1 | 5 | 3 |
|---|---|---|
| 40 | 50 | 40 |

C. VOLTAGE AT FULL LOAD: L1-G: 119 L2-G: 120 L1-L2: 239

D. AMPERES AT FULL LOAD: L1: 62 L2: 32

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | AA10B | 9 8 | 118 | 120 | 238 | 107.1 | 124.6 | 235 |
| | | 10 | | | | | | |
| 3 | AA312 | 9 | 118 | 120 | 238 | 125.3 | 111.1 | 236 |
| 5 | AA514 | 44 13 | 119 | 121 | 240 | 97.3 | 126.5 | 223 |

No ckts 2 or 4

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
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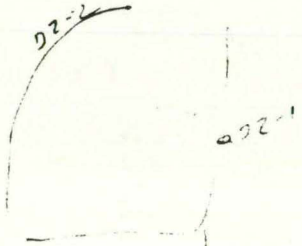
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: DZ DATE: 8-12-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION




CONTACTORS: E

C. BREAKERS: E

70A M

PHOTOCONTROL: In Control Sta "A"

| 1 | 2 |
|---|---|
| to | to |

ENCLOSURE: E 3.S. Pad mount

COMMENTS: 2 wires off L1 of ckt DZ-1
To extra city lights on this ckt?

C. VOLTAGE AT FULL LOAD: L1-G: 119 L2-G: 120 L1-L2: 239

D. AMPERES AT FULL LOAD: L1: 24 L2: 20

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 15.5 | | | | | | |
| 1 | DZ111 | 11.5 9 | 119 | 120 | 239 | 112.1 | 122.4 | 235 |
| 2 | DZ210 | 9 | 119 | 119 | 238 | 118.6 | 111.3 | 230 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
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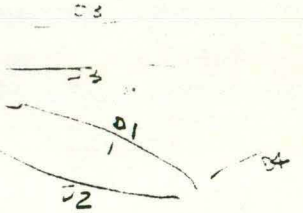
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: D(00) DATE: 8-12-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION




CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S

COMMENTS:

50A M

| 4 | 3 | 2 | 1 |
|---|---|---|---|
| 40 | 40 | 40 | 90 |

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 121 L1-L2: 242

D. AMPERES AT FULL LOAD: L1: 59 L2: 44

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 13.25 | | | | | | |
| 1 | DD111 | 13.25 | 120 | 121 | 241 | 117.7 | 112.8 | 230 |
| | | 4.5 | | | | | | |
| 2 | DD206 | 19 | 120 | 121 | 241 | 145.3 | 86.3 | 231 |
| | | 17 | | | | | | |
| 3 | DD310 | 17 | 120 | 121 | 241 | 115.8 | 120.0 | 237 |
| | | 7.5 | | | | | | |
| 4 | DD411 | 9.5 | 120 | 121 | 241 | 117.4 | 117.1 | 236 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
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| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: E(EE) DATE: 8-12-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

150A MB

| 4 | 1 | 2 | 3 |
|---|---|---|---|
| 40 | 40 | 40 | 40 |

COMMENTS: 2P 40A SPARE IN BOX (LOOSE)

C. VOLTAGE AT FULL LOAD: L1-G: 120 L2-G: 110 L1-L2: 230

D. AMPERES AT FULL LOAD: L1: 41 L2: 87

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | EE110 | 18 24 | 119 | 109 | 228 | 114.2 | 79.1 | 216 |
| 2 | EE207 | 8 18 .5 | 119 | 108 | 229 | 102.2 | 120.3 | 224 |
| 3 | EE303 | 3.5 | 118 | 109 | 227 | 104.3 | 125.3 | 232 |
| 4 | EE407 | 13 43 39.5 88.5 | 119 | 110 | 228 | 112.3 | 91.9 | 210 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: E(FF) DATE: 8-11-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S

COMMENTS:

70 A M

| 2 | 1 |
|---|---|
| 40 | 40 |

C. VOLTAGE AT FULL LOAD: L1-G: 123 L2-G: 122 L1-L2: 245

D. AMPERES AT FULL LOAD: L1: 22.5 L2: 22.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | -----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | FF111 | 13.5 | 123 | 122 | 245 | 120.7 | 119.9 | 244 |
| 2 | FF212 | 9 | 123 | 122 | 245 | 119.6 | 119.3 | 239 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: G(GG) DATE: 8-11-86

B. CONDITION OF CONTROL STATION:

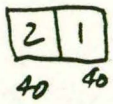
(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

70 A M ENCLOSURE: E 55.




COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 120 L2-G: 120 L1-L2: 240

D. AMPERES AT FULL LOAD: L1: 24.5 L2: 24.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | GG108 | 15.5 15.5 | 120 | 120 | 240 | 115.9 | 116.0 | 233 |
| 2 | GG211 | 9 9 | 119 | 119 | 238 | 116.8 | 117.3 | 233 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: H(HH) DATE: 8-11-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS: Bird nest in enclosure

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 121 L1-L2: 241

D. AMPERES AT FULL LOAD: L1: 20 L2: 20

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | HH111 | 10- | 120 | 120 | 240 | 118.2 | 118.1 | 239 |
| 2 | HH209 | 10+ | 120 | 120 | 240 | 115.7 | 115.6 | 230 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: J (JJ) DATE: 8-11-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

70 A M ENCLOSURE: E S.S.

1 | 2
40 40 COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 123.8 L2-G: 123.9 L1-L2: 246

D. AMPERES AT FULL LOAD: L1: 21 L2: 21

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | JJ112 | 11 11 | 123.8 | 124 | 252 | 107.2 | 118.6 | 244 |
| 2 | JJ210 | 10 10 | 123.9 | 123.9 | 252 | 119.2 | 121.4 | 238 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: L(LL) DATE: 8-6-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS: Wires into L but no fixtures hooked to it. Appear to be connected on ckt 4

150 A M

| | | | |
|---|---|---|---|
| 1 | 3 | | |

40 40 40 40

C. VOLTAGE AT FULL LOAD: L1-G: 119 L2-G: 119 L1-L2: 238

D. AMPERES AT FULL LOAD: L1: 36 L2: 24

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 10.0 | | | | | | |
| 1 | LL108 | 9.0 | 119 | 119 | 238 | 118.8 | 116.6 | 236 |
| 2 | | | | | | | | |
| 3 | LL314 | 3 4 24 | 119 | 120 | 239 | 121.4 | 118.2 | 240 |
| 4 | LL407 | 11 | 119 | 119 | 238 | 118.4 | 114.9 | 233 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
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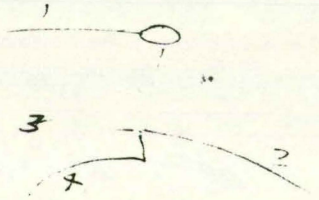
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: M(MM) DATE: 8-6-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION




CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 120 L2-G: 119 L1-L2: 239

D. AMPERES AT FULL LOAD: L1: 44 L2: 38

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | -----END VOLTAGE----- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | MM107 | 15.5 8.5 | 119 | 119 | 238 | 117.9 | 118.6 | 238 |
| 2 | Sign Truss MM255 | 14 14 | 119 | 119 | 238 | 116.0 | 116.9 | 234 |
| 3 | MM307 | 6 6.1 | 120 | 119 | 239 | 118.7 | 119.4 | 238 |
| 4 | MM409 | 10 10 | 119 | 119 | 238 | 117.3 | 115.7 | 234 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: P(PP) DATE: 8-6-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS: Seal broken on meter

70A M

1 2

40 30

to CO M

C. VOLTAGE AT FULL LOAD: L1-G: 118 L2-G: 120 L1-L2: 238

D. AMPERES AT FULL LOAD: L1: 32 L2: 15

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | PP112 | 30A 14A | 119 | 120 | 239 | 123.8 | 101.9 | 226 |
| 2 | PP202 | 1 | 118 | 120 | 238 | 119.3 | 121.9 | 244 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: R(I) DATE: 8-6-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS:

70 A.M

| 1 | 2 |
|---|---|

40 40

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 121 L1-L2: 243

D. AMPERES AT FULL LOAD: L1: 19 L2: 19

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 10,75 | | | | | | |
| 1 | I112 | 10.75 | 121 | 121 | 243 | 120.5 | 120.1 | 243 |
| | | 8.0 | | | | | | |
| 2 | I208 | 8.0 | 121 | 121 | 242 | 119.7 | 119.5 | 241 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
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| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: S(SS) DATE: 8-6-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS:

Tom

C. VOLTAGE AT FULL LOAD: L1-G: 120 L2-G: 119 L1-L2: 239

D. AMPERES AT FULL LOAD: L1: 20.5 L2: 20

E. VOLTAGE DROP AND LOAD AMPERES:

2 1
40 40

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 13 | | | | | | |
| 1 | SS113 | 13 | 120 | 119 | 239 | 117.8 | 116.3 | 236 |
| | | 7.5 | | | | | | |
| 2 | SS210 | 7.0 | 120 | 118 | 238 | 117.3 | 119.1 | 238 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: A(OA) DATE: 8-5-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

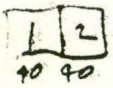
COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 120 L1-L2: 241

D. AMPERES AT FULL LOAD: L1: 21 L2: 21

E. VOLTAGE DROP AND LOAD AMPERES:

72A M




| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | OA109 | -13A -13A | 121 | 121 | 243 | 118.0 | 117.6 | 242 |
| 2 | AB102 | +8A -8A | 121 | 120 | 243 | 118.4 | 119.2 | 235 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: B (AB) DATE: 8-1-86

B. CONDITION OF CONTROL STATION:

(E) XCELLENT CONDITION
(G) OOD CONDITION
(P) OOR CONDITION, BUT OPERABLE
(N) ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 121 L1-L2: 242

D. AMPERES AT FULL LOAD: L1: 185 L2: 19

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | AB110 | 8 8 | 121 | 121 | 242 | 1195 | 1202 | 241 |
| 2 | AB212 | 10.5 10.5 | 120 | 120 | 241 | 1175 | 1175 | 237 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: C(AC) DATE: 8-1-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E 100A Main

PHOTOCONTROL: E

| 2 | 1 | 3 |
|---|---|---|

ENCLOSURE: E SS

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 121 L2-G: 121 L1-L2: 242

D. AMPERES AT FULL LOAD: L1: 29 L2: 29

E. VOLTAGE DROP AND LOAD AMPERES:

| | CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|---|
| 40A | 1 | AC3H | 17 | 120 | 120 | 240 | 106.8 | 106.8 | 214 |
| 40A | 2 | AC2H | 7 | 121 | 121 | 242 | 116.9 | 118.5 | 236 |
| 40A | 3 | AC303 | 4 | 121 | 121 | 242 | 121 | 122.2 | 245 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: D(AD) DATE: 8-1-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E Hamming

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E SS

COMMENTS:

4 | 1 | 3 | 2

C. VOLTAGE AT FULL LOAD: L1-G: 119 L2-G: 116-117 L1-L2: 236

D. AMPERES AT FULL LOAD: L1: 32 L2: 32

E. VOLTAGE DROP AND LOAD AMPERES:

| | CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5 | | | | | | |
| > | 1 | AD 107 | 5 | 119 | 117 | 236 | 115.9 | 117.9 | 235 |
| | | | 5.5 | | | | | | |
| 8 | 2 | AD208 | 5.25 | 119 | 116 | 236 | 118.4 | 115.6 | 235 |
| | | | 9 | | | | | | |
| 1 out > | 3 | AD305 | 9 | 119 | 117 | 237 | 117.7 | 118.4 | 235 |
| | | Sign | 11.5 | | | | | | |
| | 4 | Structure | 11 | 118 | 117 | 235 | 112.5 | 110.8 | 224 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: E(AE) DATE: 2-31-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: OK

ENCLOSURE: E SS.

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 118 L2-G: 118 L1-L2: 236

D. AMPERES AT FULL LOAD: L1: 25 L2: 25

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | AE17 | 15.5A 16A | 120 | 120 | 240 | | | 237 |
| 2 | AE43 | 11 A 10A | 120 | 120 | 241 | 115.9 | 117.5 | 237 236 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: E(AF) DATE: 7-31-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: E SS.

COMMENTS:

2413

C. VOLTAGE AT FULL LOAD: L1-G: 122 L2-G: 121 L1-L2: 243

D. AMPERES AT FULL LOAD: L1: 45 L2: 45

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | AF110 | 8.5 8.5 | 122 | 122 | 244 | 119.5 | 121.0 | 244 |
| 2 | AF213 | 15 15 | 121.5 | 121.5 | 243 | 116.8 | 116.8 | 237 |
| 3 | AF310 | 13 13 | 122 | 122 | 244 | 120.9 | 116.5 | 243 |
| 4 | AF410 | 9.5 9.0 | 121 | 122 | 243 | 120.5 | 121.3 | 246 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: G2(AG) DATE: 8-1-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

| 3 | 4 | 1 | 2 |
|---|---|---|---|

PHOTOCONTROL: E

ENCLOSURE: E S.S.

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 119 L2-G: 119 L1-L2: 238

D. AMPERES AT FULL LOAD: L1: 44 L2: 44

E. VOLTAGE DROP AND LOAD AMPERES

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 (L2 Connected Line side of Bkr. 13 '3) | AG114 | 12A 12A | 119 | 119 | 238 | 114.3 | 112.9 | 231 |
| 2 | AG218 | 13A 13A | 119 | 119 | 238 | 114.9 | 115.2 | 231 |
| 3 | AG314 | 12A 12A | 118-119 | 118-119 | 237 | 115.1 | 115.5 | 231 |
| 4 | AG408 | 7A 7A | 118-119 | 118-119 | 237 | 117.6 | 117.6 | 235 |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

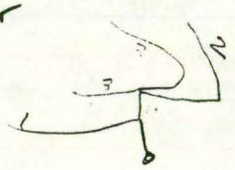
MM

A. CONTROL STATION DESIGNATION: AJ DATE: 8-22-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

Mix master



CONTACTORS: E

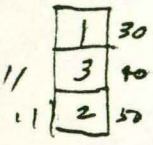
C. BREAKERS: G

100 A M

PHOTOCONTROL: E

ENCLOSURE: Painted steel - old key system - Main switch not operable from outside. Manual position cut off

COMMENTS:




C. VOLTAGE AT FULL LOAD: L1-G: 119.9 / 126 L2-G: 119.7 / 126 L1-L2: 240 / 240 Big Simpson

D. AMPERES AT FULL LOAD: L1: 40 L2: 40

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | BD38 | 18 | | | | 114.2 | 114.0 | 228 W |
| 1 | AJ1B | 18 | 119.5 | 119.6 | 239 | 117.9 | 117.5 | 237 S |
| 2 | AJ2B | 11 | 119.7 | 119.6 | 239 | 116.3 | 117.4 | 235 |
| 3 | AJ3B | 11 | 119.3 | 119.3 | 239 | 117.9 | 118.8 | 238 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

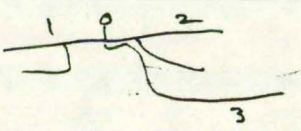
| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

MM

A. CONTROL STATION DESIGNATION: AL DATE: 8-22-86

B. CONDITION OF CONTROL STATION:




(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

100 A M PHOTOCONTROL: On top of pole - could not check

ENCLOSURE: Pad mount on legs - Painted steel - old key system

| | |
|---|---|
| 1 | 30 |
| 2 | 30 |
| 3 | 60 |

COMMENTS: Rusted thru at bottom. Outside main switch not connected to main breaker

Look like area floods. Could be why bottom is rusted out. Pad mounted transformer right behind controller

Cables coming in are uniduct

C. VOLTAGE AT FULL LOAD: L1-G: 120.5 L2-G: 120.6 L1-L2: 241

D. AMPERES AT FULL LOAD: L1: 42 L2: 42

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 15 | | | | | | |
| 1 | AL113 | 15 | 120.1 | 120.1 | 241 | 119.5 | 120.3 | 241 |
| | | 16 | | | | | | |
| 2 | AL23 | 16 | 117.8 | 120.0 | 238 | 117.2 | 120.6 | 238 |
| | | 17.5 | | | | | | |
| 3 | AL311 | 17.5 | 119.3 | 118.1 | 239 | 114.1 | 113.1 | 229 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: BE DATE: 8-26-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

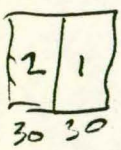
CONTACTORS: E

C. BREAKERS: #2(N) #1(E)

60 A M PHOTOCONTROL: G

ENCLOSURE: Painted steel - old key system lot of rust in bottom

COMMENTS:




C. VOLTAGE AT FULL LOAD: L1-G: 125.0 L2-G: 124.3 L1-L2: 250

D. AMPERES AT FULL LOAD: L1: 22.5 L2: 22.5

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 5 | | | | | | |
| sign ckt 1 | | 5 | | | | | | |
| | | 17.5 | | | | | | |
| #2 | BE214 | 17.5 | | | 250 | 118.6 | 117.4 | 239 |
| | | | | | | | | |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: AK DATE: 8-26-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E Main switch non operable PE cell in he on bracket

PHOTOCONTROL: E Photocontrol mounted on door of controlla

ENCLOSURE: (P) Pad mount painted steel old key system
Big hole covered w/duct tape

COMMENTS: Keyed switch looks like it is in "Hand" position but operates by covering PE cell. Couldn't get key to move switch.
PE cell on door wired direct. Some wiring thru switch must go to old PE cell which doesn't work.

100A M

3 100
2 100
1 100

C. VOLTAGE AT FULL LOAD: L1-G: 119.6 L2-G: 119.0 L1-L2: 239

D. AMPERES AT FULL LOAD: L1: 44 L2: 46

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | AK117 | 13 13 | 119.6 | 119.0 | 239 | 116.6 | 117.4 | 234 |
| 2 | AK210 | 13 16.5 | 119.5 | 119.1 | 239 | 117.1 | 115.6 | 237 |
| 3 | AK3B | 18.5 | 119.5 | 119.1 | 239 | 116.0 | 113.9 | 233 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: BD DATE: 8-25-06

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: G Noisy

C. BREAKERS: E

PHOTOCONTROL: E

ENCLOSURE: (P) Painted steel - old key system - slightly rusted inside

COMMENTS:

C. VOLTAGE AT FULL LOAD: L1-G: 121.2 L2-G: 119.3 L1-L2: 241

150AM

D. AMPERES AT FULL LOAD: L1: 58 L2: 58

E. VOLTAGE DROP AND LOAD AMPERES:

| 1 | 2 | 3 |
|---|---|---|
| 50 | 50 | 40 |

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | BD12 | 17 17 | 120.6 | 119.1 | 240 | 115.1 | 116.9 | 233 |
| 2 | BD216 | 30 30 | 129.1 | 118.2 | 239 | 109.5 | 111.1 | 220 |
| 3 | BD316 | 11.5 11.5 | 121.1 | 119.0 | 241 | 116.7 | 115.4 | 232 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: CB DATE: 8-25-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION


CONTACTORS: P Lot of noise

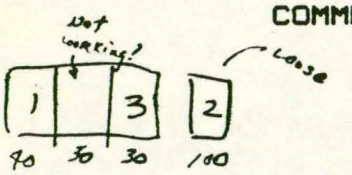
C. BREAKERS: G

PHOTOCONTROL: E

90 A M

ENCLOSURE: (P) Painted steel old key system RUSTed inside on top, sides and bottom

COMMENTS:




C. VOLTAGE AT FULL LOAD: L1-G: 119.9 L2-G: 119.8 L1-L2: 240

D. AMPERES AT FULL LOAD: L1: 49 L2: 49

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | CB12 | 4.5 4.5 | 119.9 | 119.7 | 240 | 119.4 | 119.3 | 238 |
| 2 | CB241 | 25 25 | 120.2 | 120.0 | 241 | 106.3 | 105.6 | 213 |
| 3 | CB310 | 19 19 | 120.3 | 120.1 | 240-241 | 114.7 | 114.5 | 230 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

A. CONTROL STATION DESIGNATION: BA DATE: 8-25-86

B. CONDITION OF CONTROL STATION:

(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E Third breaker hanging loose in front of old 3rd breaker

PHOTOCONTROL: Pole top mtd unable to check

ENCLOSURE: Painted steel - old key system. "Hand" not hooked up
Rusting inside in bottom

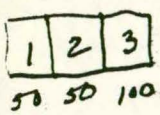
COMMENTS: Main disc not hooked up to external handle

150AM

C. VOLTAGE AT FULL LOAD: L1-G: 120.5 / 121.9 L2-G: 120.3 / 121.6 L1-L2: 241-242 / 242

D. AMPERES AT FULL LOAD: L1: 63 L2: 63

E. VOLTAGE DROP AND LOAD AMPERES:




| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| | | 21.5 | | | | | | |
| 1 | BA115 | 22.5 | 121.3 | 120.9 | 242 | 113.8 | 112.1 | 226 |
| | | 19 | | | | | | |
| 2 | BA217 | 17 | 120.5 | 120.2 | 241 | 115.0 | 115.2 | 231 |
| | | 23 | | | | | | |
| 3 | BA315 | 23 | 120.9 | 120.5 | 241-242 | 111.5 | 112.1 | 226 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

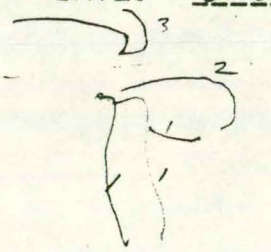
| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# ELECTRICAL FIELD DATA

MM

A. CONTROL STATION DESIGNATION: BC DATE: 8-22-86

B. CONDITION OF CONTROL STATION:




(E)XCELLENT CONDITION
(G)OOD CONDITION
(P)OOR CONDITION, BUT OPERABLE
(N)ON-OPERABLE CONDITION

CONTACTORS: E

C. BREAKERS: E

150 A M PHOTOCONTROL: N Chunk broken out of back.

ENCLOSURE: (P) Pad mount Painted Steel old key system busting inside at bottom

COMMENTS: Door bent but closes with a little persuasion. "Hand" not hooked up

Pad

| 1 | 3 | 2 |
|---|---|---|
| 50 | 50 | 30 |

C. VOLTAGE AT FULL LOAD: L1-G: 119.9 L2-G: 120.3 L1-L2: 241

D. AMPERES AT FULL LOAD: L1: 80 L2: 80

E. VOLTAGE DROP AND LOAD AMPERES:

| CKT. NO. | END POLE | CIRCUIT AMPERES | --SUPPLY VOLTAGE--- L1-G | L2-G | L1-L2 | ----END VOLTAGE---- L1-G | L2-G | L1-L2 |
|---|---|---|---|---|---|---|---|---|
| 1 | BC18 | 21 | 120.4 | 120.5 | 241 | 115.8 | 116.3 | 232 |
| 2 | BC113 | 20 | 119.9 | 120.1 | 240 | 112.2 | 112.5 | 224 |
| Done 8-25-86 → 3 | BC315 | 36 | 120.8 | 120.8 | 242 | 111.1 | 110.9 | 223 |
| | | | | | | | | |

F. CIRCUIT INSULATIION TEST WITH 500 VOLTS MEGGER:

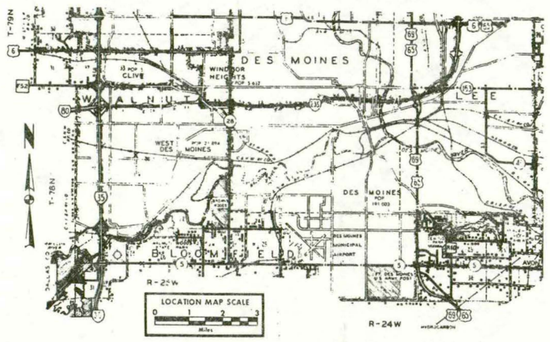
| CKT. NO. | MEGOHMS L1-G: | MEGOHMS L2-G: | COMMENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Iowa Department
of Transportation
Highway Division

# ELECTRICAL CONCEPT PLANS

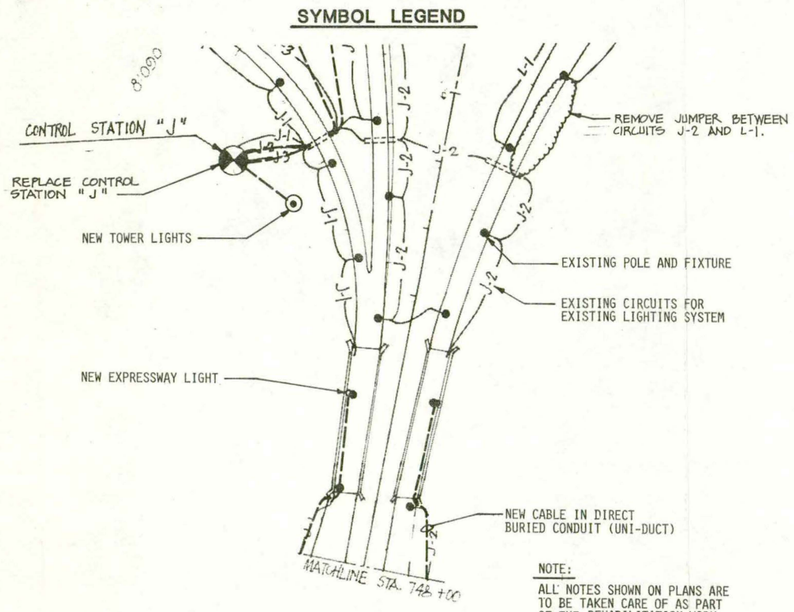
# PROPOSED LIGHTING IMPROVEMENTS FOR I-235

**POLK COUNTY**




**LOCATION MAP**

**SYMBOL LEGEND**




**TYPICAL PARTIAL PLAN**

NOTE:

ALL NOTES SHOWN ON PLANS ARE TO BE TAKEN CARE OF AS PART OF THE REHABILITATION WORK EXCEPT AS NOTED BY: (NEW CONSTRUCTION)

I.D.O.T. P000-316920

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | FED ROAD DIST NO | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 1 | 20 |

SCI FILE NO. 8944-E11

Sta. 1355+70(Lt)
40-15-II-M, U-4

Sta. 1357+70(Lt)
40-15-II-M, U-4

Sta. 1359+70 (Lt.)
40-15-II-M, U-4

Sta 1361+70 (Lt)
40-15-II-M, U-4

Sta 1363+70(Lt)
40-15-II-M, U-4

Sta 1365+70 (Lt.)
40-15-II-M, U-4

Sta 1367+70 (Lt.)
40-15-II-M, U-4

Sta 1369+70 (Lt.)
40-15-II-M, U-4

Sta 1371+70 (Lt.)
40-15-II-M, U-4

Match Line Sta 1354+00

1355

U-4

I-235

42ND STREET

FOR CONTINUATION SEE LOWER LEFT

U-3

Sta. 1355+70(Rt)
40-15-II-M, U-3

Sta. 1357+70(Rt)
40-15-II-M, U-3

Sta. 1359+70(Rt)
40-15-II-M, U-3

Sta 1361+70 (Rt.)
40-15-II-M, U-3

Sta 1363+70(Rt.)
40-15-II-M, U-3

Sta 1365+70 (Rt)
40-15-II-M, U-3

Sta 1367+70 (Rt.)
40-15-II-M, U-3

Sta. 1369+70 (Rt.)
40-15-II-M, U-3

Sta. 1371+70(Rt.)
40-15-II-M, U-3

Sign Truss
CKT U-3

N

Sign Truss
CKT U-4

Sta. 1373+80(Lt)
40-15-II-M, U-2

Sta. 1375+50(Lt)
40-15-II-M, U-2

Sta. 1377+40 (Lt)
40-15-II-M, U-2

Sta. 1379+25
40-15-II-M, U-2

Sta. 1381+15
40-15-III-S, T-3

Sta. 1382+95
40-15-III-S, T-3

Sta 1384+65
40-15-III-S, T-3

Sta 1386+25
40-15-III-S, T-3

Sta 3587+70
40-15-III-S, T-3

Sta 3589+00 t
40-15-II-M, T-2

Sta 3590-90
40-15-II-M

Sta 3592+80
40-15-II-M

Sta 3594+10
40-15-II-M,

Sta 6401+70
40-15-III-S, T-2

Sta 6402-20
40-15-III-S, T-3

Sta 3596+60
40-15-II-M,

Sta 3596-50
40-15-II-M, T-3

Sta 6403+70
40-15-III-S, T-3

Sta 4004+60
40-15-II-M, T-3

35TH STREET

Sign Support
Circuit T-3

Sta 6399+20
40-6-III-S, T-3

Sta 1400+20
40-15-II-M, T-3

Sta 1401+00

Sta 6396+65
40-15-II-M, T-4

North Line Sta 1401+00

Sta 1400+20
40-15-II-M, T-4

Sta 6396+65
40-15-II-M, T-4

Control Station "T"

REPLACE CONTROL STATION "T"

FOR CONTINUATION SEE UPPER RIGHT

42ND Street

NEW CONTROL STATION "U" (NEW CONSTRUCTION)

Sta. 1370+80(Rt)
40-15-III-S, U-1

Sta. 1377+40(Rt)
40-15-II-M, U-1

Sta. 1375+50(Rt)
40-15-II-M, U-1

Sta. 1373+80(Rt)
40-15-II-M, U-1

Sta 1380+80
40-15-III-S, T-1

Sta 2582+30
40-15-III-S, T-1

Sta 1383+80
40-15-III-S, T-1

Sta 2584+35
40-15-II-M, T-1

Sta 2586+50
40-15-II-M,

Sta 2588+55
40-15-II-M

Sta 2590+60
40-15-II-M,

Sta 2592+70
40-15-II-M,

Sta 2594+70
40-15-III-S,

Sta 6585+20
40-15-III-S, T-1

Sta 6393+65
40-15-III-S, T-1

Control Station "U"

Sta. 1389+00t

Sta. 1393+80t

LOCATE JUMPER BETWEEN CIRCUITS T-1 AND T-2. REMOVE. TROUBLESHOOT CIRCUIT T-2. REPLACE BAD CABLE AS REQUIRED.

0' 100' 200'
SCALE: 1" = 100'

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | | | | |
|---|---|---|---|---|---|---|
| | | | STATE | FED. ROAD DIST. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
| | | | IOWA | 1 | 1987 | 2 | 20 |

SCI FILE NO. 8944-E12

Sta 1501+45
40-15-II-M, T-3
Sta 1503+30
40-15-II-M, T-3
Sta 1505+15
40-15-II-M, T-3
Sta. 1507+00
40-15-II-M, T-3
Sta 1508+85
40-15-II-M, S-2
Sta 1409+20
40-15-III-S, S-2
Sta 1510+70
40-15-III-S, S-2
Sta 1412+10
40-15-III-S, S-2
Sta 1413+60
40-15-III-S, S-2
Sta 1415+15
40-15-III-S, S-2
Sta 1416+70
40-15-III-S, S-2
Sta 1418+25
40-15-III-S, S-2
Sta 1419+80
40-15-III-S, S-2
Sta 1421+40
40-15-III-S, S-2
Sta 1423+00
40-15-III-S, S-2
Sta 1424+60(LT)
40-15-III-S, S-2
Control Station "S"
REPLACE CONTROL STATION "S"
Sta 1426+70(Lt)
40-15-III-S, S-3
Sta 1429+60
40-15-III-S, S-3
Sta 1428+15
40-15-III-S, S-3
Sign Support Circuit S-2
6 Luminaires
Match Line Sta 1430+00
FOR CONTINUATION SEE BELOW LEFT
Sta 1428+10
40-15-III-S, S-4
Sta 1426+70(Rt)
40-15-II-M, S-4
Sta 1429+40
40-15-III-S, S-4
REPLACE POLE AND FIXTURE
Match Line Sta 1401+00
Ramp "A"
Sta 1402+00(Lt)
40-15-II-M, T-3
Sta 1403+80
40-15-II-M, T-3
Sta 1405+60
40-15-II-M, T-3
Sta 1407+40
40-15-II-M, T-3
Sta 1402+00(Rt)
40-15-II-M, T-4
Sta 1404+05
40-15-II-M, T-4
Sta 1406+10
40-15-II-M, T-4
Sta 1408+15
40-15-II-M, T-4
Sta 1410+20
40-15-II-M, T-4
Sta 1412+25
40-15-II-M, T-4
Sta 1414+30
40-15-II-M, S-1
Sta 1416+35
40-15-II-M, S-1
Sta 1418+40
40-15-II-M, S-1
Sta 1420+45
40-15-II-M, S-1
Sta 1422+50
40-15-II-M, S-1
Sta 1424+60(Rt)
40-15-II-M, S-1
Sign Truss Circuit S-1
6 Luminaires
16th Street
I-235
1405
1410
1415
1420
1425
1430
Sta 8446+40
40-15-III-S, R-2
Sta 8444+90
40-15-III-S, R-2
Sta 1543+30
40-15-II-M, R-2
Sta 1545+20
40-15-II-M, R-2
Sta 3542+00
40-15-II-S, R-2
Sta 3540+10
40-15-II-M, S-3
Sta 3536+30
40-15-II-M, S-3
Sta 3538+20
40-15-II-M, S-3
Sta 1547+10
40-15-II-M, R-2
Sta 1549+00
40-15-II-M, R-2
Sta 1449+55
40-15-II-M, R-2
Sta 1550+90
40-15-II-M, R-2
Sta 1451+35
40-15-II-S, R-2
Sta 1552+80
40-15-II-S, R-2
Sta 1454+30
40-15-III-S, R-2
Sta 1456+00
40-15-III-S, R-2
Sta 1457+80
40-15-II-M, R-3
Sta 1459+60
40-15-II-M, R-3
Sta 1432+55±
40-15-II-M, S-3
Sta 1434+55
40-15-II-M, S-3
Sta 3534+40
40-15-II-M, S-3
Sta 1436+55
40-15-II-M, S-3
Sta 1438+55
40-15-II-M, S-3
Sta 1440+55
40-15-II-M, S-3
Sta 8443+35
40-15-III-S, R-2
Sta 1442+50
40-10-II-S, R-2
Sta 1444+25
40-15-II-S, R-2
Sta 1446+00
40-15-II-S, R-2
Sta 1437+75
40-15-II-M, R-2
Ramp C
Ramp A
Ramp D
Ramp B
3535
3540
1545
1550
1435
1440
1445
1450
1455
I-235
Match Line Sta 1460+00
FOR CONTINUATION SEE UPPER RIGHT
Match Line Sta 1430+00
Sta 2531+70
-15-III-S, S-4
Sta 1433+20
40-15-II-S, S-4
Sta 2533+60
40-15-II-M, S-4
Sta 1434+90
40-15-II-S, S-4
Sta 2535+50
40-15-II-M, S-4
Sta 1436+60
40-15-II-S, S-4
Sta 2537+40
40-15-II-M, S-4
Sta 1439+90
40-15-II-S, S-4
Sta 2539+30
40-15-II-M, S-4
Sta 1438+25
40-15-II-S, S-4
Sta 2541+20
40-15-II-M, S-4
Sta 1441+55
40-10-II-S, S-4
Sta 1442+85
40-10-II-S, R-1
Sta 8439+30
40-15-III-S, R-1
Sta 8440+80
40-15-III-S, R-1
8440
Sta 4542+65
40-15-II-M, R-1
Sta 8437+80
40-15-III-S, R-1
Sta 1444+70
40-15-II-M, R-1
Sta 1446+55
40-15-II-M, R-1
Sta 1448+40
40-15-II-M, R-1
Sta 1450+25
40-15-II-M, R-1
Sta 4546+45
40-15-II-M, R-1
Sta 4548+35
40-15-II-M, R-1
Sta 4550+25
40-15-II-M, R-1
Sta 1452+10±
40-15-II-M, R-1
Sta 1453+60
40-15-III-S, R-1
Sta 1455+15
40-15-III-S, R-1
Sta 1456+75
40-15-III-S, R-1
REPLACE CONTROL STATION "R"
Control Station "R"
Sta 1458+40
40-15-III-S, R-4
Match Line Sta 1460+00
FOR CONTINUATION SEE BELOW CENTER
22ND STREET
2535
2540
4545
4550
Sta 1432+55±
Sta 1452+10±
Sign Truss Circuit R-3
17th Street
Sta 1463+20
40-15-II-M, R-3
Sta 1465+05
40-15-II-M, R-3
Sta 1466+90(Lt)
40-10-II-M, R-3
Sta 1469+00(Lt)
40-15-II-M, R-3
Sta 1471+10(Lt)
40-15-II-M, R-3
Sta 1473+2
40-15-II-M, R-
FOR CONTINUATION SEE ABOVE RIGHT
Match Line Sta 1460+00
Sta 1461+80
40-15-II-S, R-4
Sta 1463+50
40-15-II-S, R-4
Sta 1465+20
40-15-II-S, R-4
Sta 1460+10
40-15-II-S, R-4
Sta 1469+00(Rt)
40-15-II-M, R-4
Sta 1471+10(Rt)
40-15-II-M, R-4
Sta 1473+
40-15-II-M,
Match Line Sta 1474+32.53
Sign Truss Circuit R-4
Sta 1466+90(Rt)
40-10-II-S, R-4
I-235
1465
1470
SCALE: 1" = 100'
POLK COUNTY
PROJECT NUMBER
I-235 LIGHTING
STATE
IOWA
1
1987
3
20
SCI FILE NO. 8444-E13.

REPLACE CONTROL STATION "P"

RANCHO GRANDE BLVD

I-235

FOR CONTINUATION SEE LOWER LEFT

REPLACE CONTROL STATION "N"

REINSTALL POLE AND FIXTURE

N

INSTALL NEW CABLE AS REQUIRED TO COMPLETE CIRCUIT P-3

FOR CONTINUATION SEE UPPER RIGHT

I-235

REINSTALL POLE AND FIXTURE

65TH - 64TH STREET CONN.

INSTALL NEW CABLE AS REQUIRED TO COMPLETE CIRCUIT N-3

DISCONNECT JUMPER AT BOTH ENDS - ABANDON IN PLACE

WALNUT CREEK

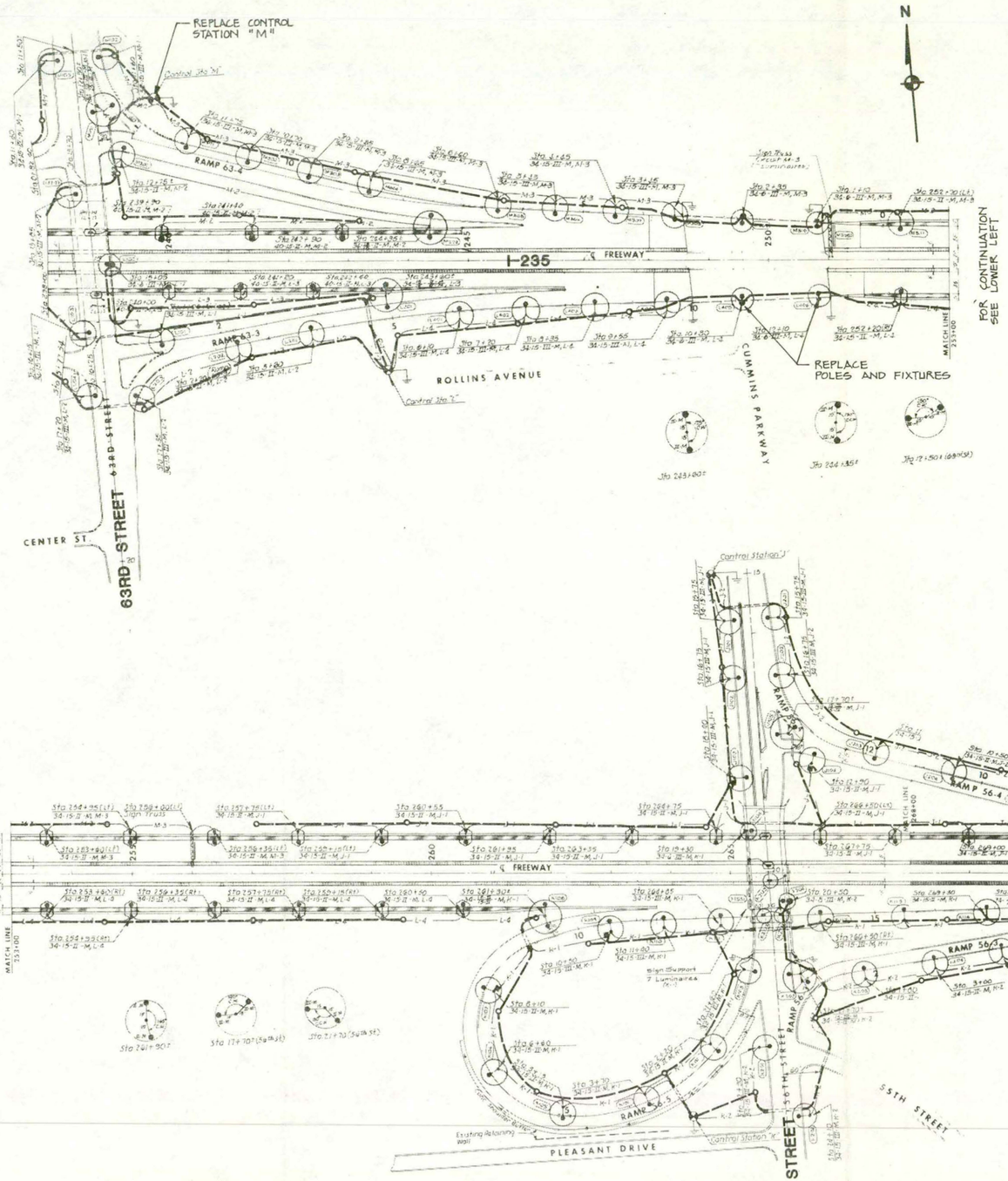
CRACKER STREET RELOC.

0' 100' 200'

SCALE: 1" = 100'

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | FED. ROAD DIST. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 4 | 20 |

SCI FILE No. 8944-E14




POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING

| STATE | FED ROAD DIST NO | FISCAL YEAR | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|
| IOWA | 1 | 1987 | 5 | 20 |

SCI FILE NO. 8944-E15

MATCH LINE 233+00

I-235

FREEWAY

NEW CONTROL STATION "H" (NEW CONSTRUCTION)

POLK BLVD

PLEASANT ST.

51ST ST.

50TH ST.

WEST I-235 WORK

EAST I-235 WORK

FOR CONTINUATION SEE LOWER LEFT

42ND STREET

45TH PLACE

N

Control Sta. "G"

REPLACE CONTROL STATION "G"

CENTER STREET

CENTER ST

RAMP 42-1

RAMP 42-2

RAMP 42-3

RAMP 42-4

FOR CONTINUATION SEE UPPER RIGHT

PLEASANT STREET

44TH STREET

41ST ST. CONN.

41ST STREET

CENTER ST. REL.

CONTROL STATION "F"

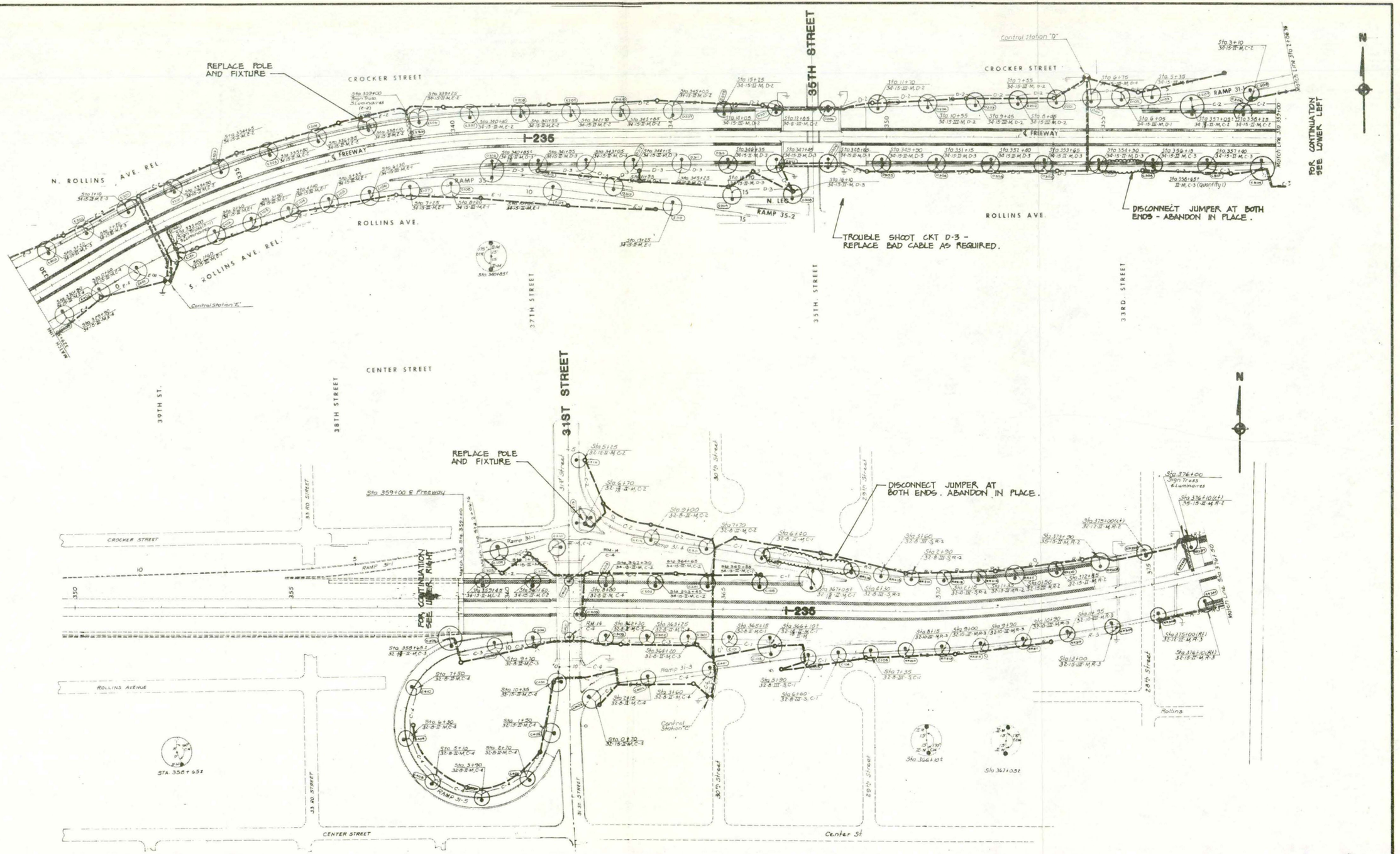
CENTER S

0' 100' 200'

SCALE: 1" = 100'

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 6 | 20 |

SCI FILE NO. 8944-E16




POLK COUNTY | PROJECT NUMBER I-235 LIGHTING | STATE IOWA | SHEET NO. 1 | SHEETS 1987 | DATE 7 | 20

SCI FILE NO. 8944-817

TROUBLESHOOT CIRCUITS R-1 AND R-2 - REPLACE BAD CABLE AS REQUIRED.

DISCONNECT JUMPER AT BOTH ENDS. ABANDON IN PLACE.

TROUBLESHOOT CIRCUIT DX-1 - REPLACE BAD CABLE AS REQUIRED.

INSTALL WATERTIGHT CONNECTION ON BREATHER FITTING. CONNECT MAIN SUPPLY CABLES TO LOAD SIDE OF METER.

REPAIR MAIN (SWITCH OPERATING MECHANISM

REPLACE POLE AND FIXTURE

REPLACE POLE AND FIXTURE

COTTAGE GROVE

COTTAGE GROVE

I-235

24TH STREET

ALLEY

ROLLINS

AVE

OLIVE AVE

22 ND STREET

OLIVE AVE

21ST STREET

JEWETT STREET

SCHOOL STREET

0' 100' 200'

SCALE: 1" = 100'

POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING

| STATE | | | | |
|---|---|---|---|---|
| IOWA | 1 | 1987 | 8 | 20 |

SCI FILE NO. 3444-E18

REPLACE POLE AND FIXTURE.

REINSTALL POLE AND FIXTURE

REPLACE POLE AND FIXTURE

REPLACE POLE AND FIXTURE

REPAIR OR REPLACE BASE. REPLACE POLE AND FIXTURE.

REPAIR OR REPLACE BASE. REPLACE POLE AND FIXTURE.

LOCATE AND DISCONNECT JUMPER FROM CIRCUIT DY-2 TO B-3. TROUBLESHOOT CIRCUIT B-3 - REPLACE BAD CABLE AS REQUIRED.

LOCATE AND DISCONNECT JUMPER FROM CIRCUIT DY-3 TO B-1. TROUBLESHOOT CIRCUIT B-1. REPLACE BAD CABLE AS REQUIRED.

TROUBLESHOOT CIRCUIT C-3. REPLACE BAD CABLE AS REQUIRED.

REPLACE POLE AND FIXTURES

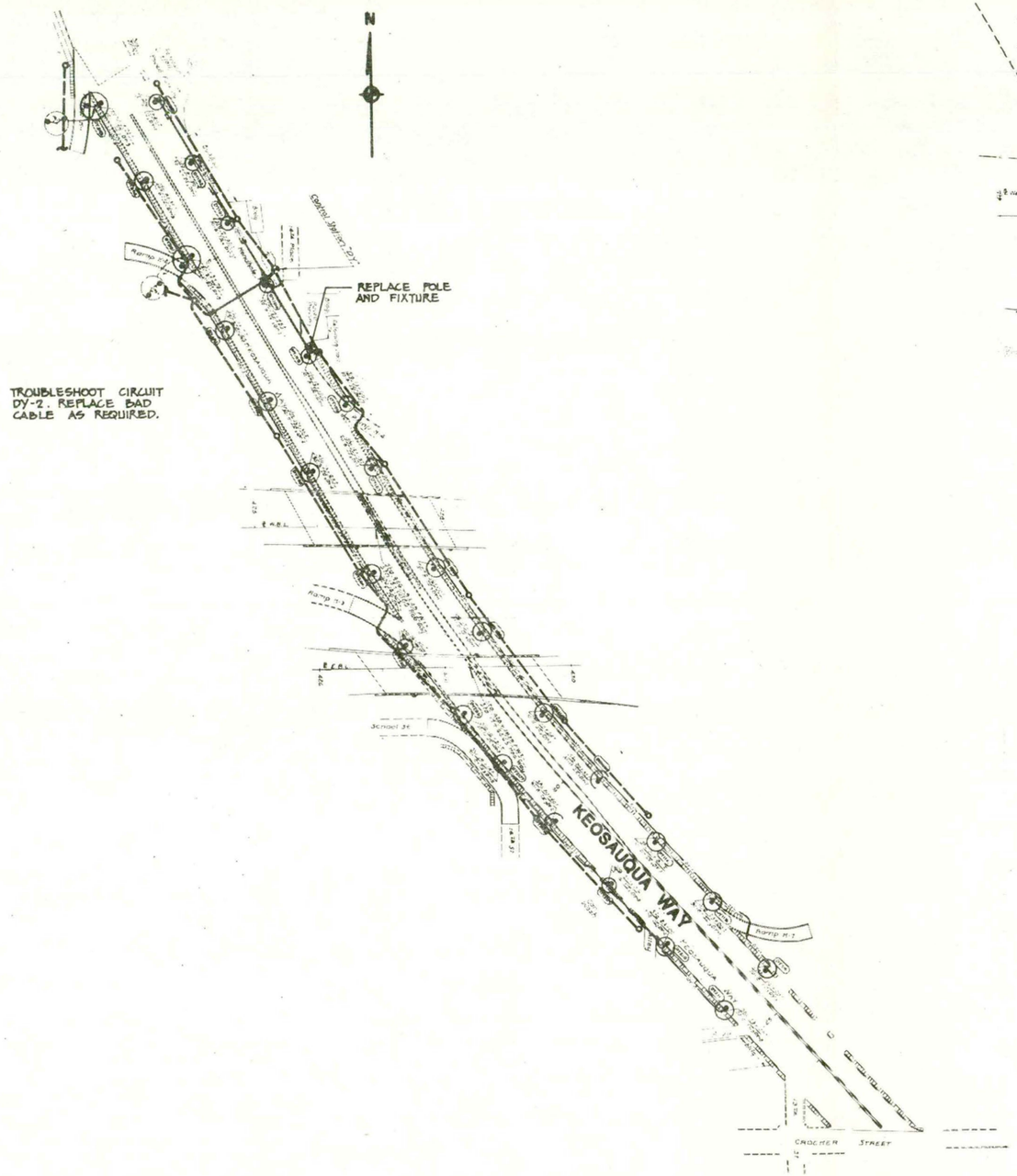
TROUBLESHOOT CIRCUIT B-1 - REPLACE BAD CABLE AS REQ'D.

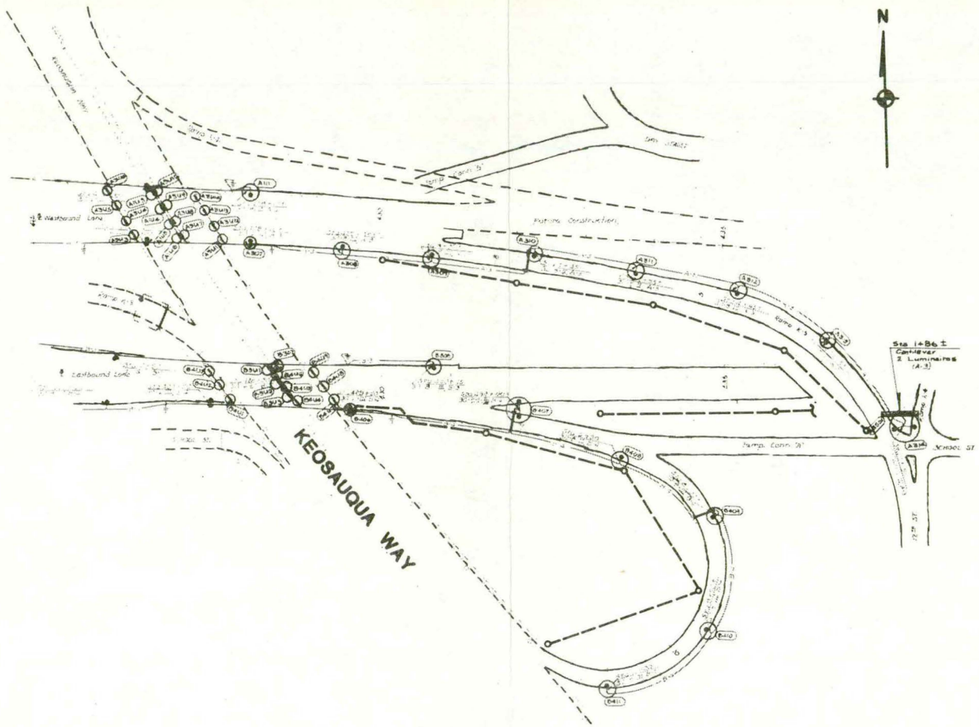
REMOVE JUMPER FROM CIRCUIT B-3 TO B-1

SCALE: 1" = 100'

POLK COUNTY | I-235 LIGHTING | STATE TOWN | 1 | 1987 | 4 | 20

SCI FILE NO. 3944-EM



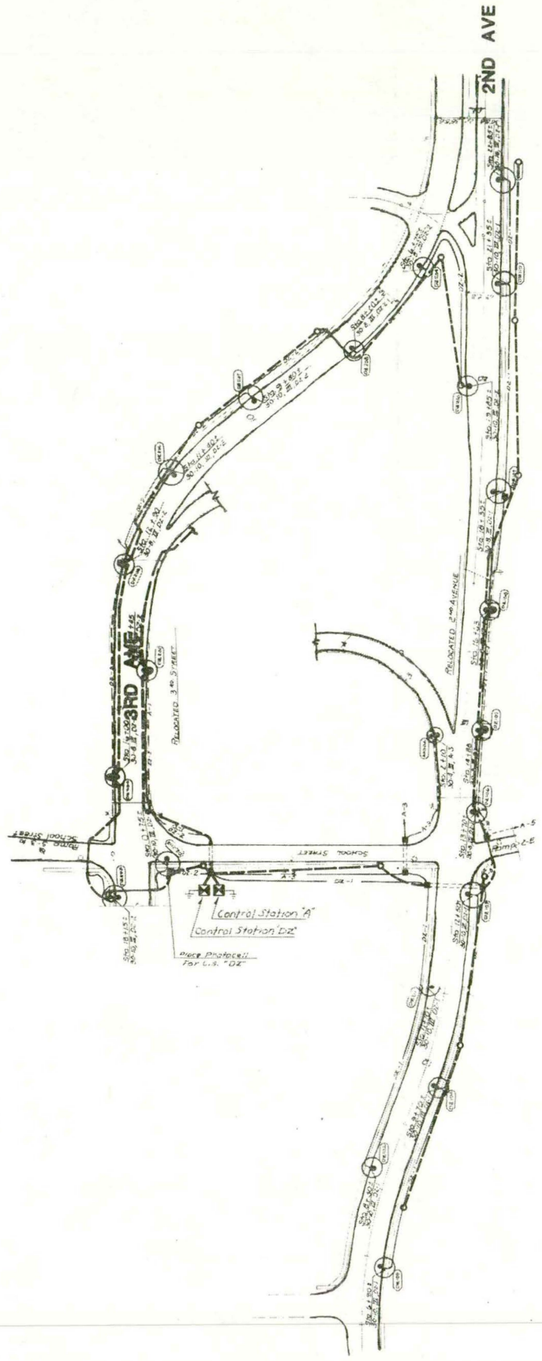



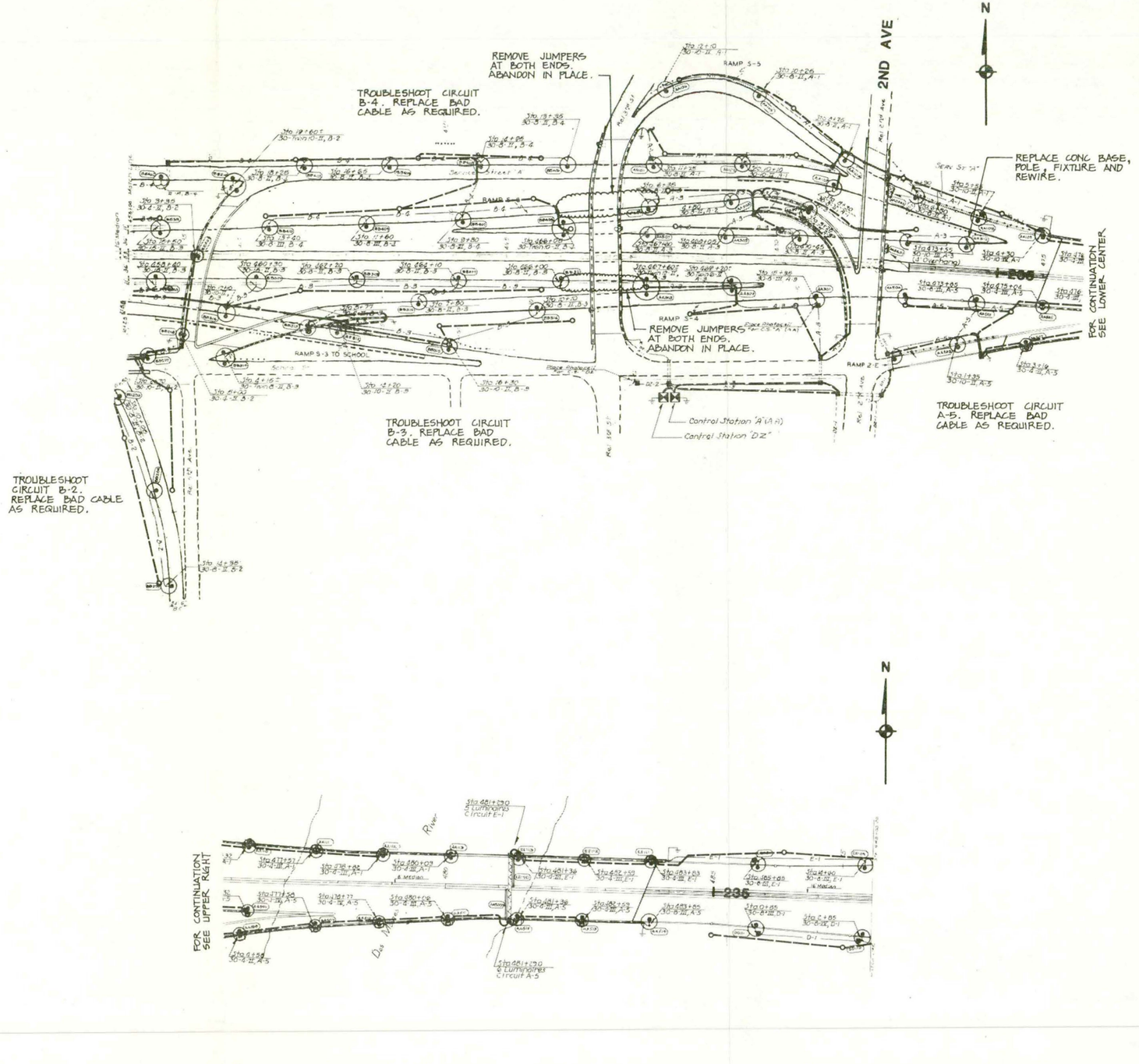

0' 100' 200'

SCALE: 1" = 100'

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | FED ROAD DIST NO | FISCAL YEAR | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 10 | 20 |

SCI FILE NO. 8944-E20







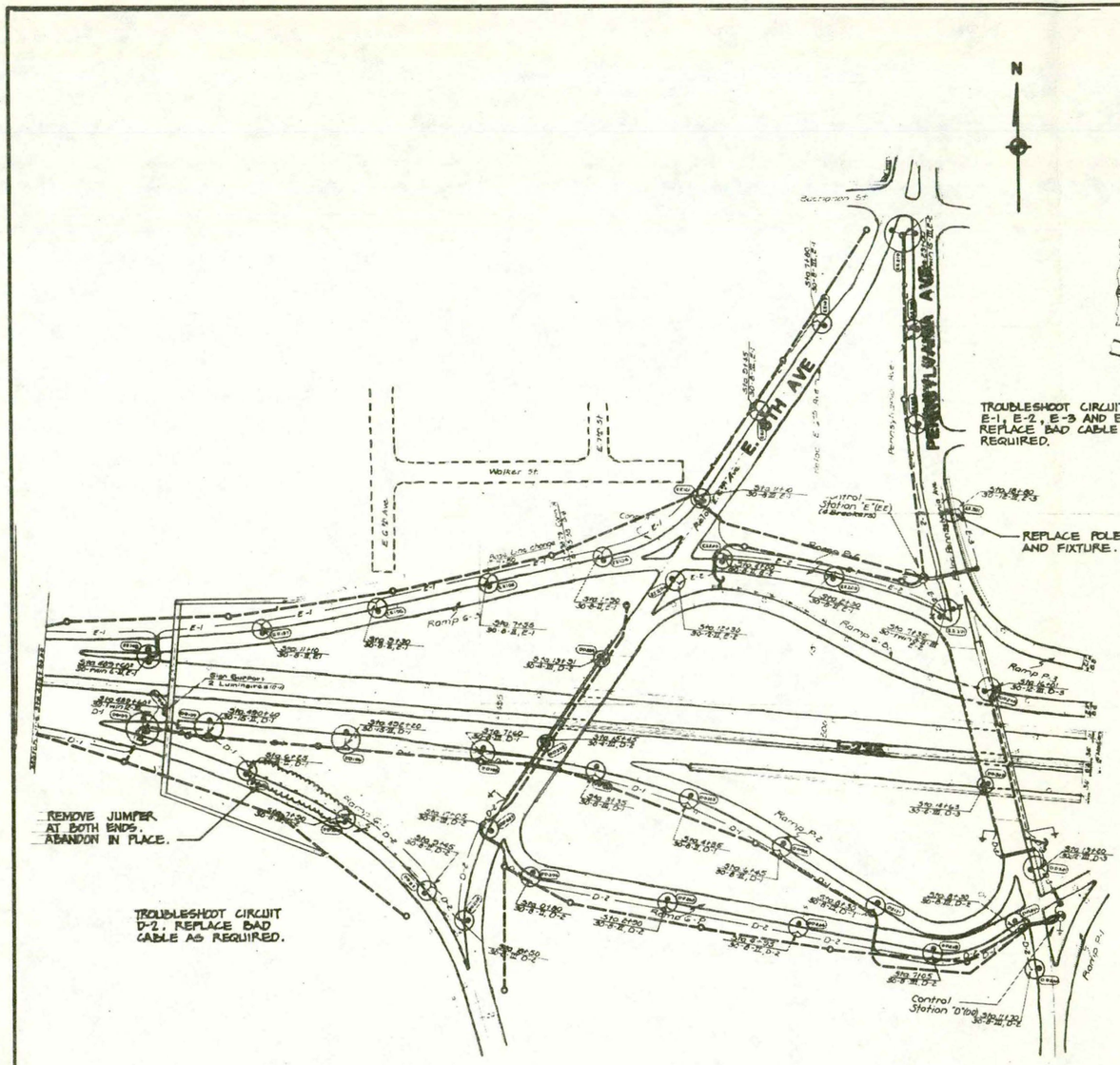
0' 100' 200'

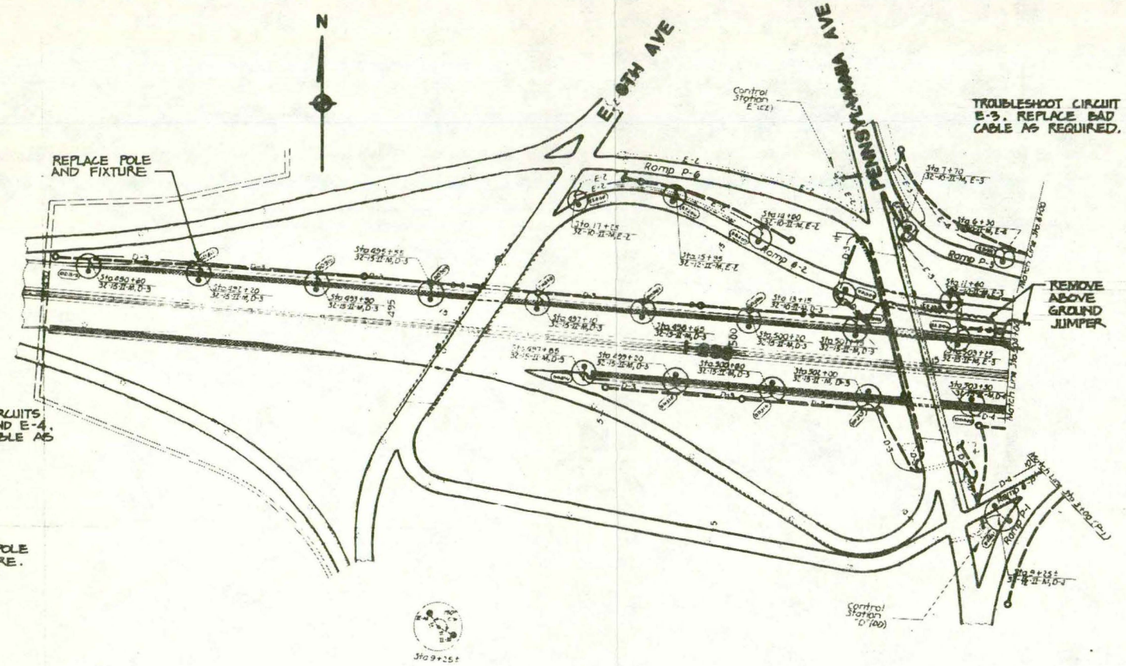
SCALE: 1" = 100'

POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING

| STATE | FED ROAD DIST NO | FISCAL YEAR | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|
| IOWA | 1 | 1987 | 11 | 20 |

SCI FILE NO. 8944-E21



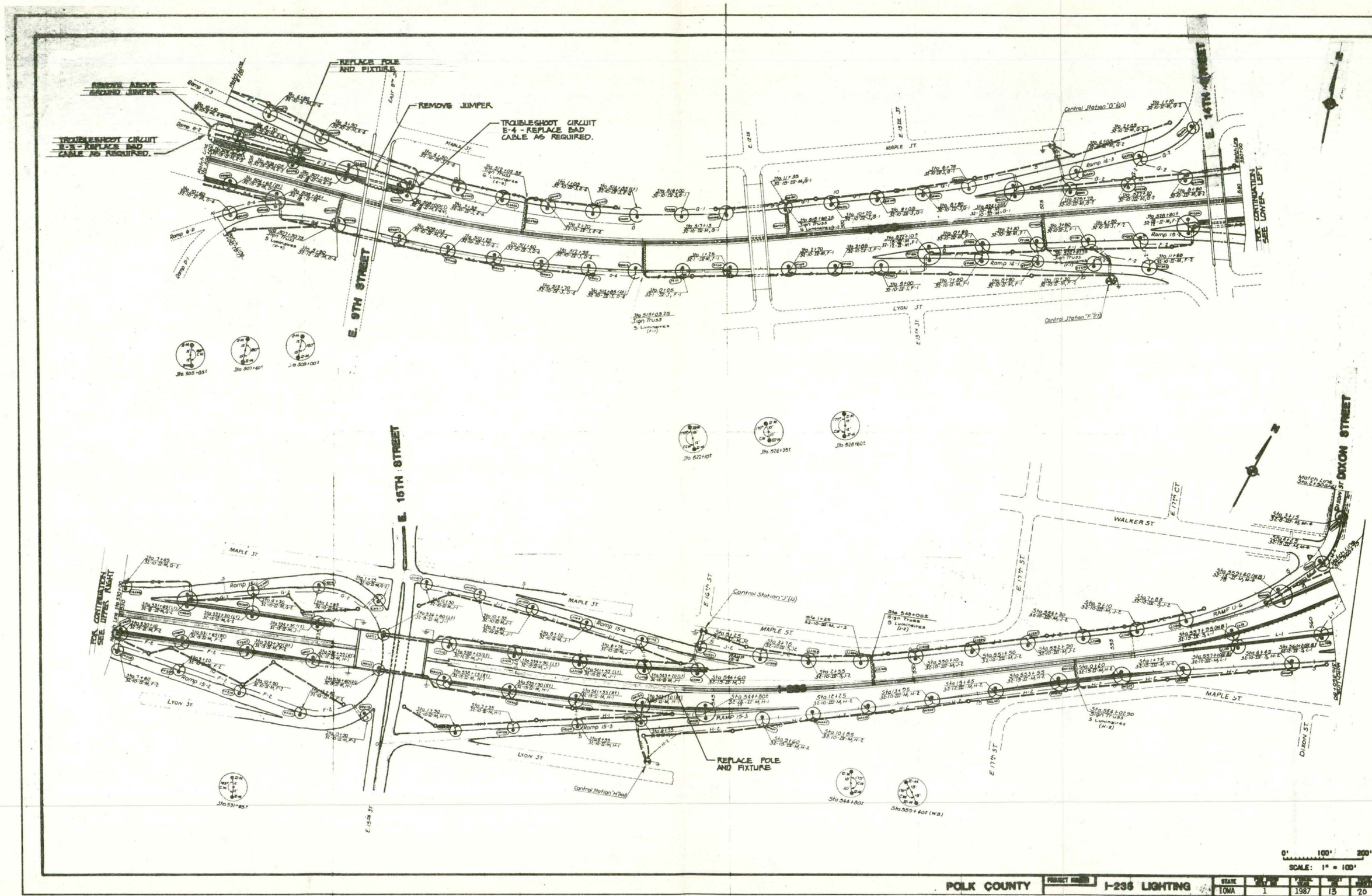




0' 100' 200'
SCALE: 1" = 100'

POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING

| STATE | SHEET NO. | TOTAL SHEETS | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| IOWA | 1 | 1987 | 12 | 20 |

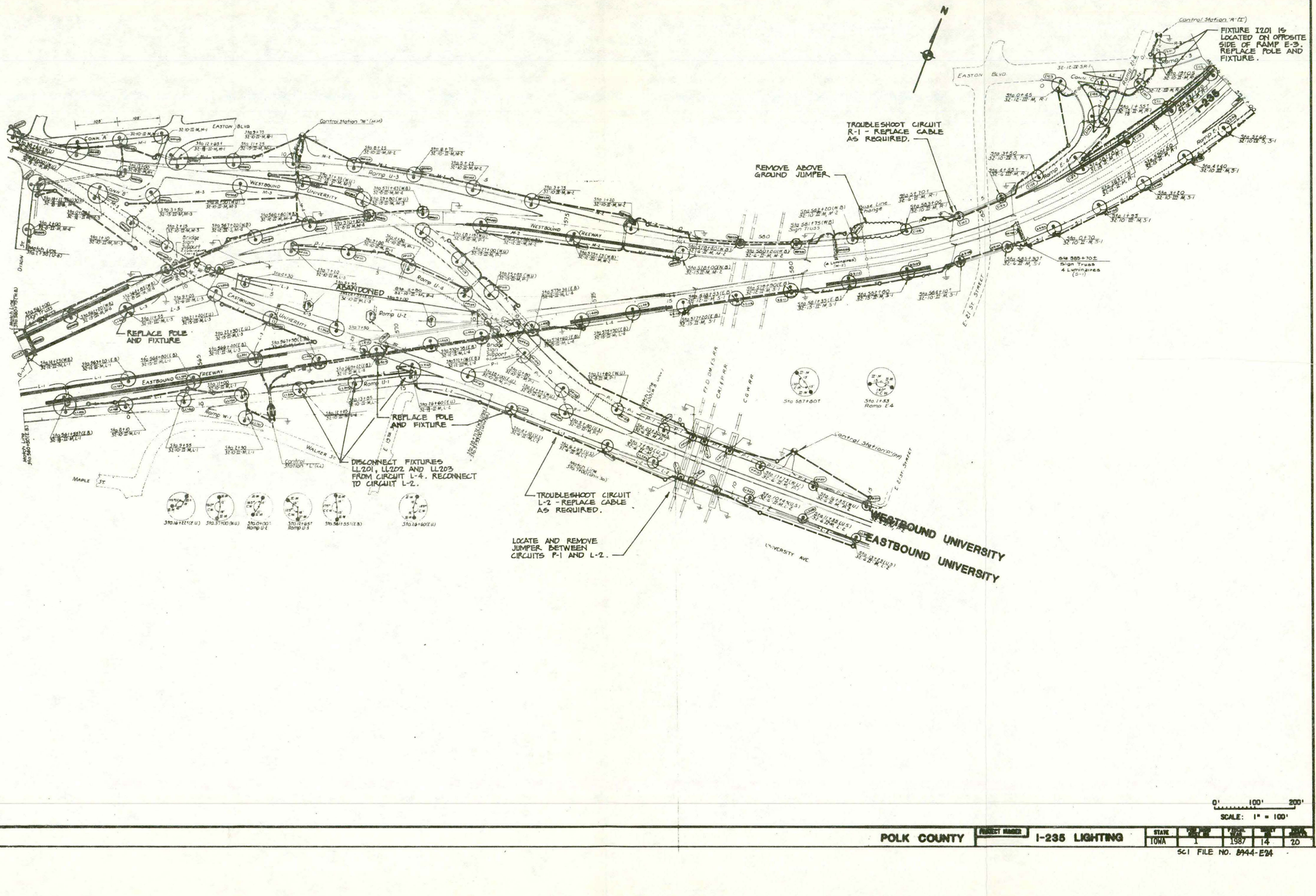
SCI FILE NO. 8944-E22




POLK COUNTY | PROJECT NUMBER | I-236 LIGHTING

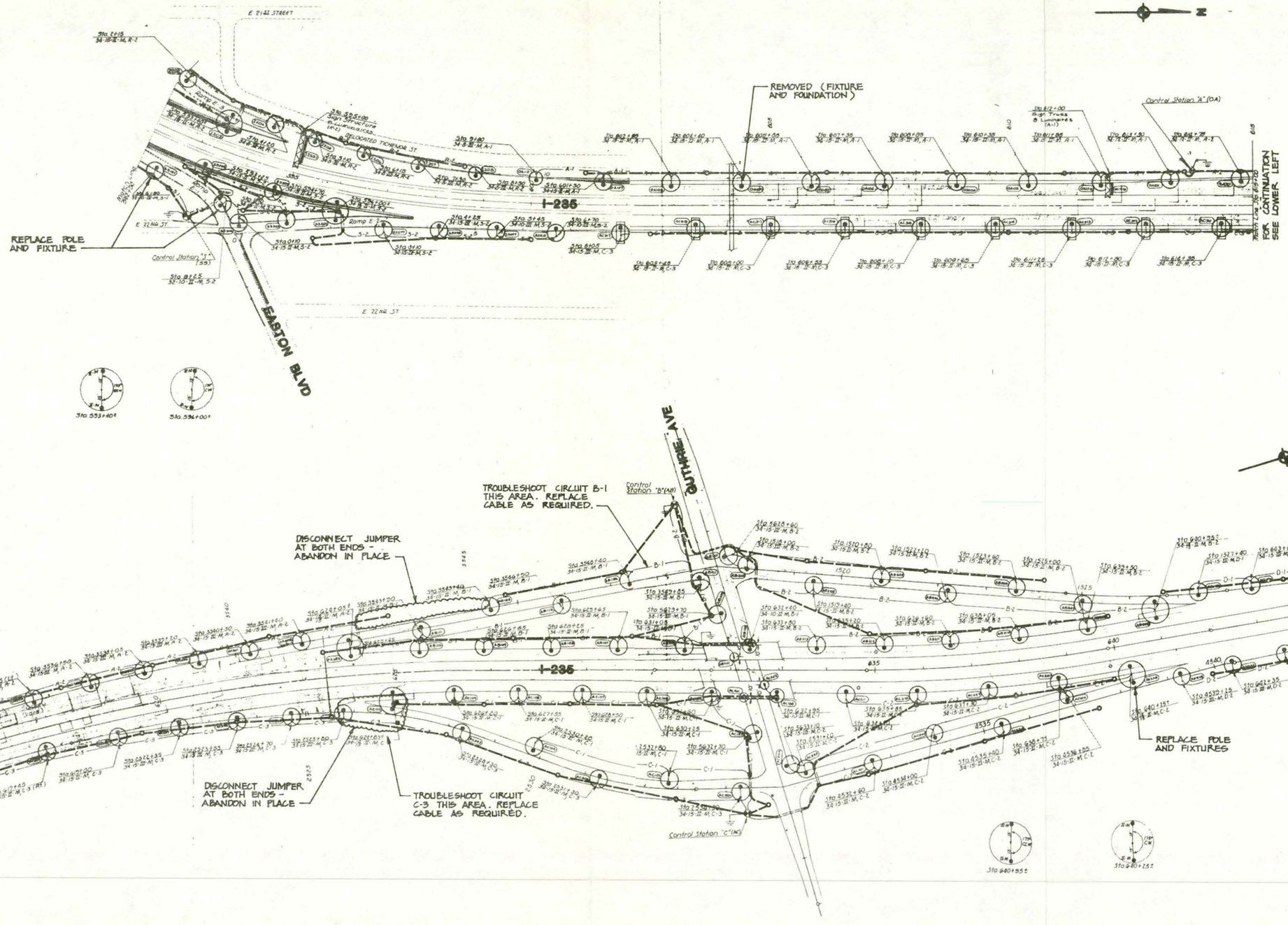
| STATE | SHEET NO. | TOTAL SHEETS | SHEET NO. | SHEET NO. |
|---|---|---|---|---|
| IOWA | 1 | 1987 | 15 | 20 |

I.E. NO. 8944-E23



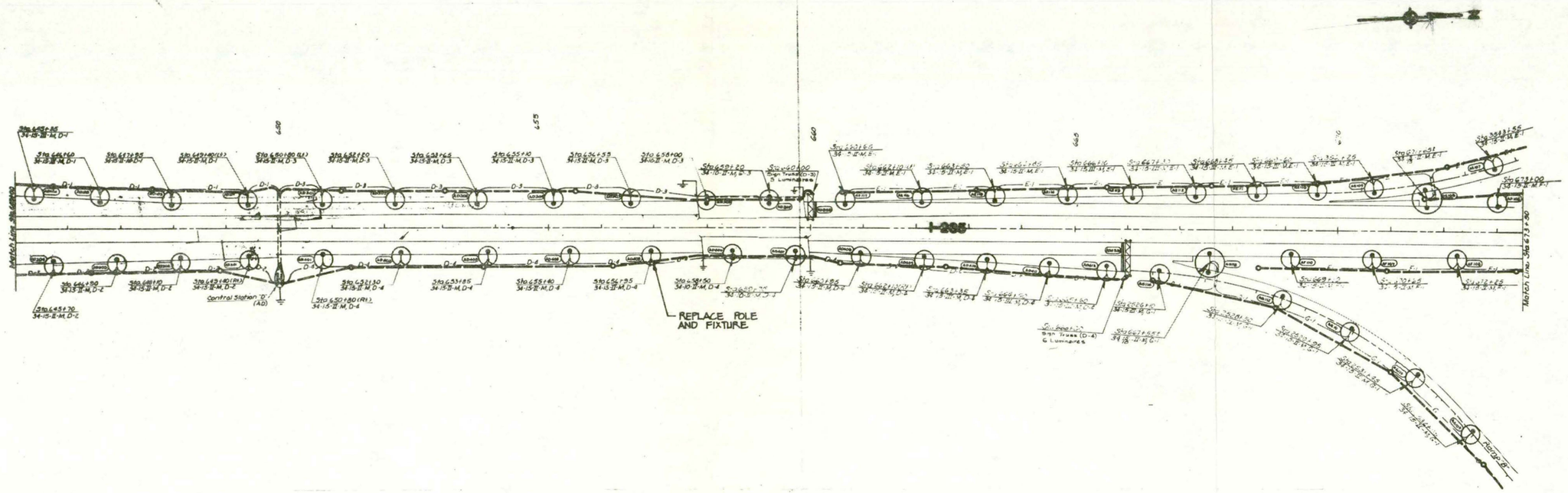

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | SHEET NO. | SHEETS | TOTAL SHEETS |
|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 14 | 20 |

SCI FILE NO. 8944-E24




| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | FED. ROAD DIST. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 15 | 20 |

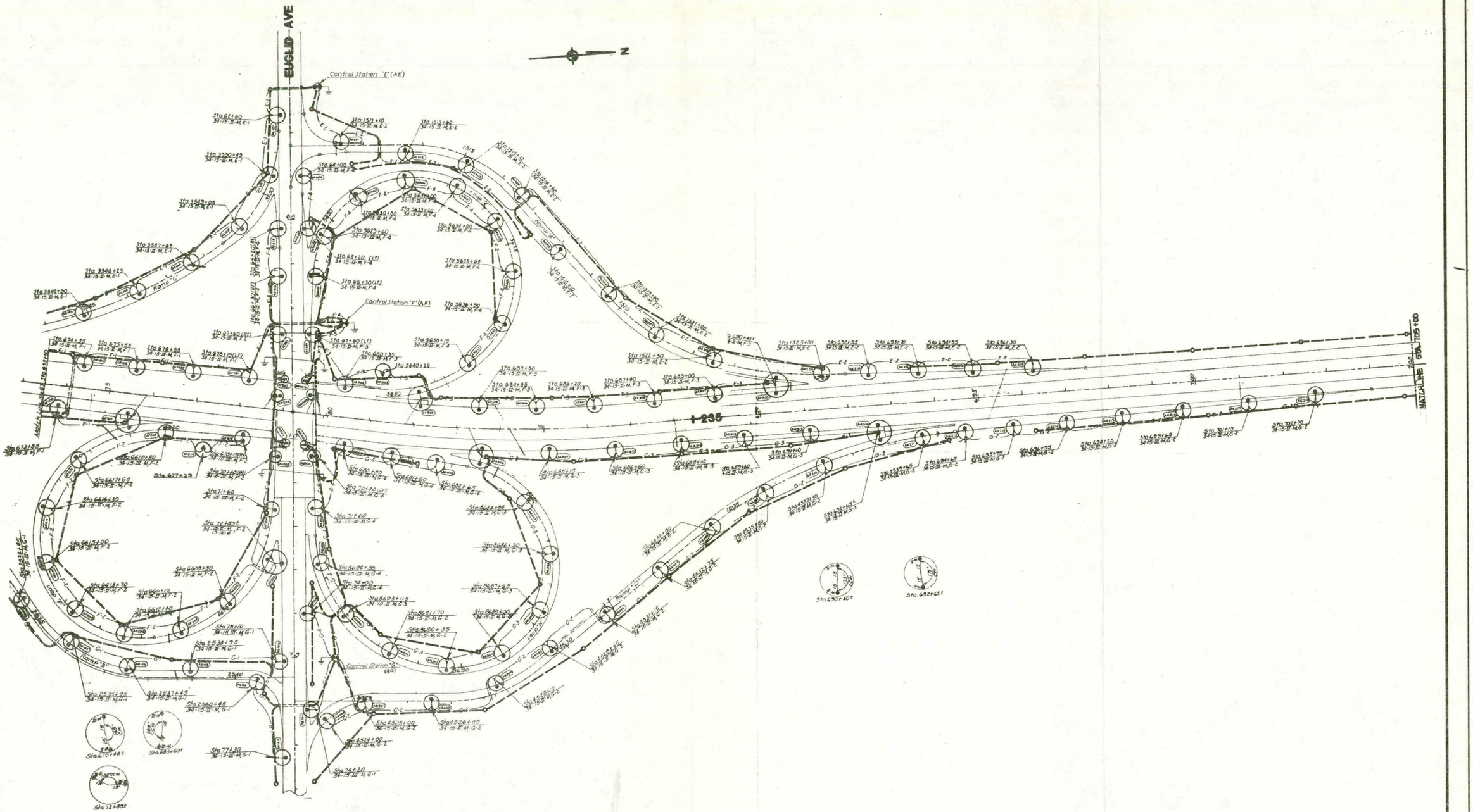
SCI FILE NO. 8944-E25




0' 100' 200'
SCALE: 1" = 100'

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | SHEET NO. | FISCAL YEAR | SHEETS | REVISED |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 16 | 20 |

SCI FILE No. 8944-E26




0' 100' 200'

SCALE: 1" = 100'

| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | SHEET NO. | SHEETS | DRAWING NO. |
|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 17 | 20 |

SCI FILE NO. 8944-E27

NEW CONTROL STATION (NEW CONSTRUCTION)

Sta. 720+00

Sta. 720+40

I-235

MATCHLINE

MATCHLINE

DELAWARE TWP.
T79N R23W

Sec. 19

Sec. 18

725

730

735

740

745

Sta 720+00

Control Station "H"

REPLACE CONTROL STATION "H" (NEW CONSTRUCTION)

Sta. 738+00
Sign Truss (H-2)
5 Luminaires

Sta. 745+85(Lt)
34-15-II-M, J-1

Sta. 747+45 (Lt)
34-15-II-M, J-1

I-235

I-1

J-2

Sta. 748+00
Match Line

P.O.T. Sta. 729+88.59, I-235

NEW CONTROL STATION (NEW CONSTRUCTION)

Match Line

Sta. 745+85(Rt)
34-15-II-M, J-2

Sta. 740+00
Sign Truss (H-1)
4 Luminaires

Sta. 747+45 (Rt)
34-15-II-M, J-2

+93.25 BROADWAY AVE.

N

REPLACE CONTROL STATION "D"

Control Station "D"

Sta. 61076+35
32-8-III-M, D-2

Sta. 61079+25
32-8-III-M, D-2

Sta 1071+65
32-15-II-M, D-1

Sta 1073+35
32-15-II-M, D-1

D-1

D-2

Sta W-1077+90
32-10-III-M, D-2

Match Line W.W.

Match Line

61075

1075

Sta N-1074+90
32-10-II-M, D-2

Sta 1071+00

D-1

1060

1070

Match Line W.W.

Sta 1060+00

N

Ramp E

Sta 5,1107+20
32-8-II-M, A-1

Sta 5,1108+85
32-8-II-M, A-1

Sta 1109+80
Sign Truss
(1 Luminaires)

A-1

A-2

5110

1109

1110

E-2

Sta 5+35
32-15-II-M, E-2

Sta 3+75
32-10-III-M, E-2

Station "E"

REPLACE CONTROL STATION "E"

1135

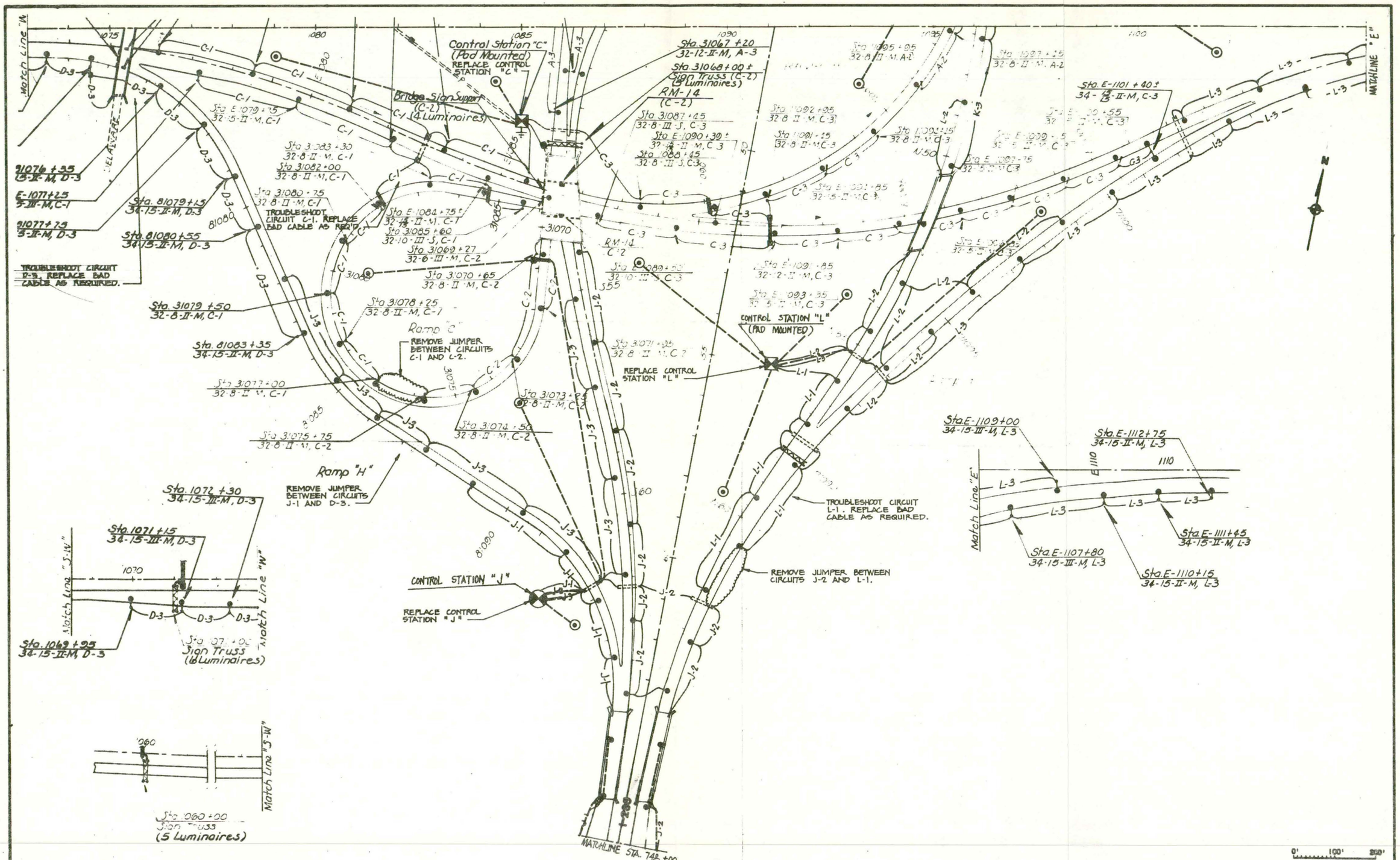
Sta 63+00
Sign Truss (E-1
(1 Luminaires)

0' 100' 200'

SCALE: 1" = 100'

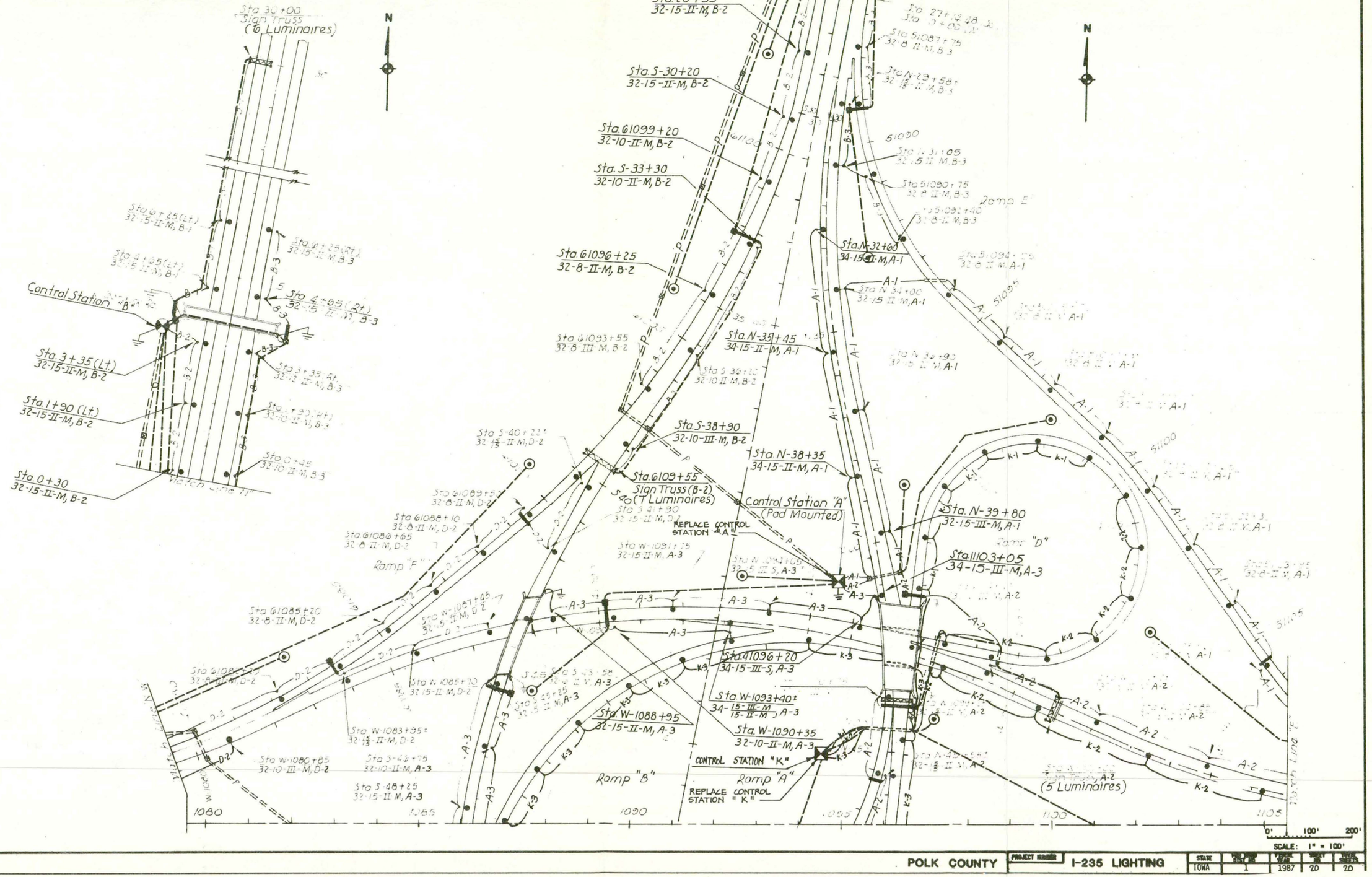
| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | SHEET NO. | TOTAL SHEETS | SHEET NO. | REVISION NO. |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 18 | 20 |

SCI FILE NO. 8944-E2B




| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | SHEET NO. | SHEETS | SHEET NO. | SHEETS |
|---|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 19 | 20 |

SCI FILE NO. 8944-E29




| POLK COUNTY | PROJECT NUMBER | I-235 LIGHTING | STATE | SHEET NO. | SHEETS | DRAWING NO. |
|---|---|---|---|---|---|---|
| | | | IOWA | 1 | 1987 | 20 | 20 |

MATCHLINE 1

MATCHLINE 2

I-235

I-235

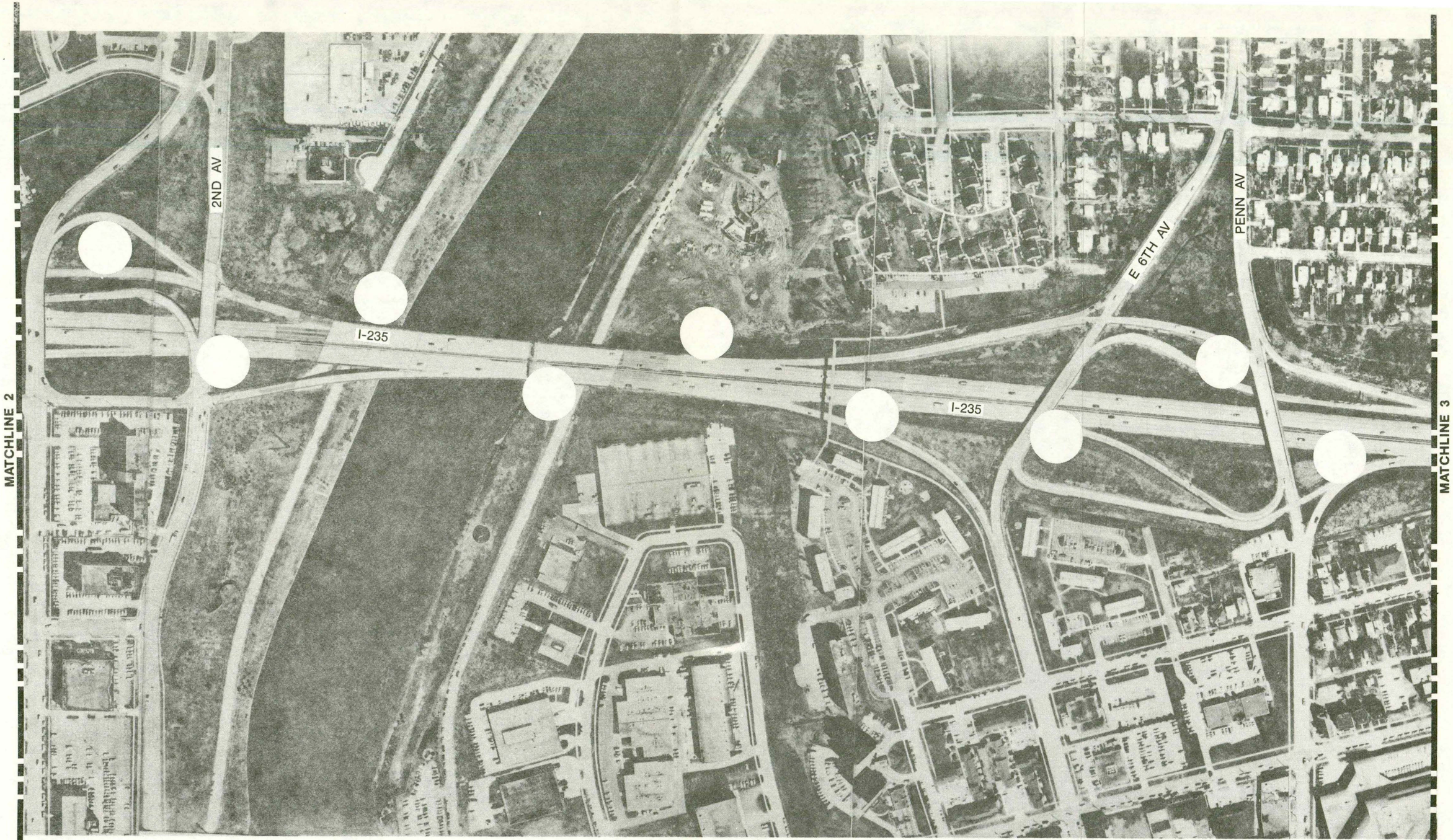
KEOSAUQUA WAY

12TH ST

7TH ST

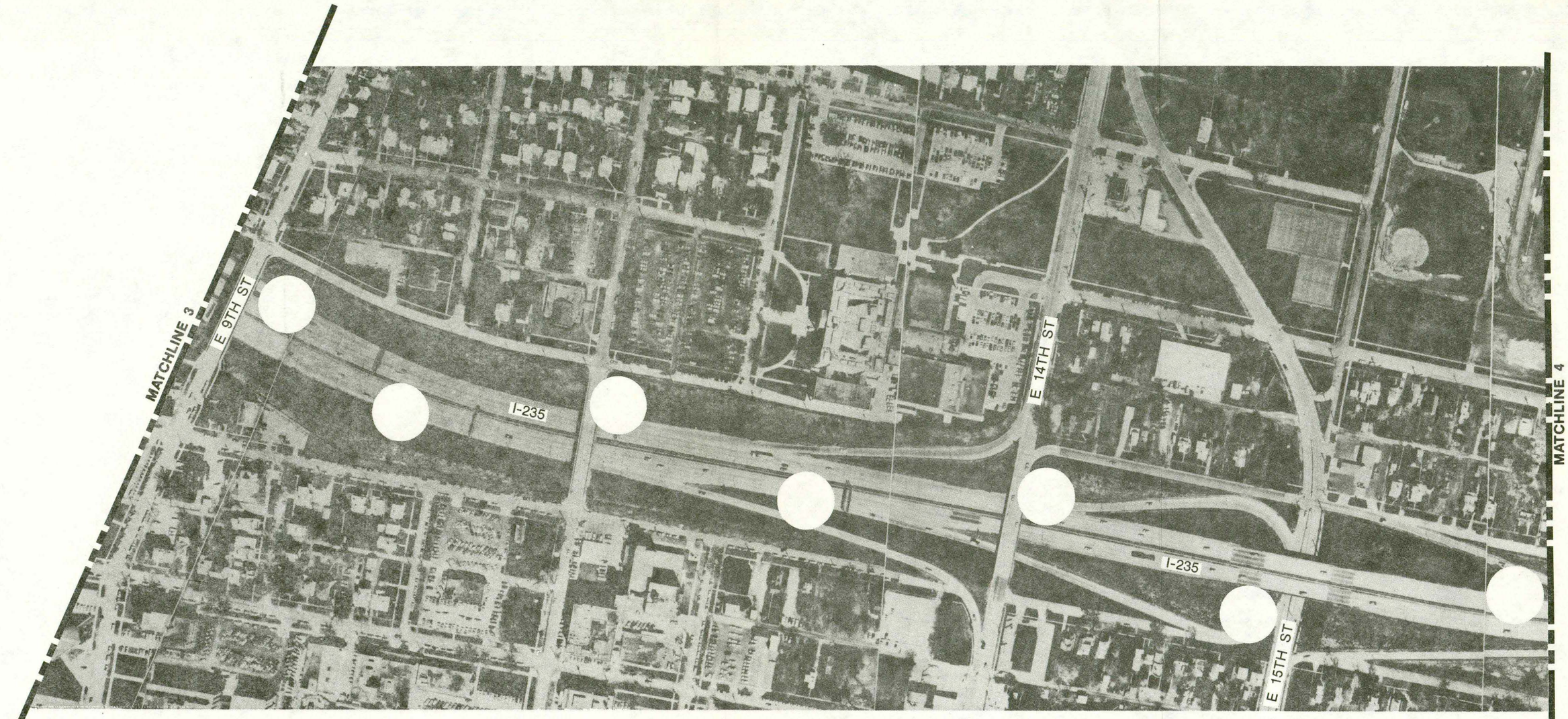
N

**DES MOINES**
**CENTRAL BUSINESS DISTRICT**
**I-235 TOWER LIGHTING**
**Sheet 2 of 5**




N

**DES MOINES**
**CENTRAL BUSINESS DISTRICT**
**I-235 TOWER LIGHTING**
**Sheet 3 of 5**

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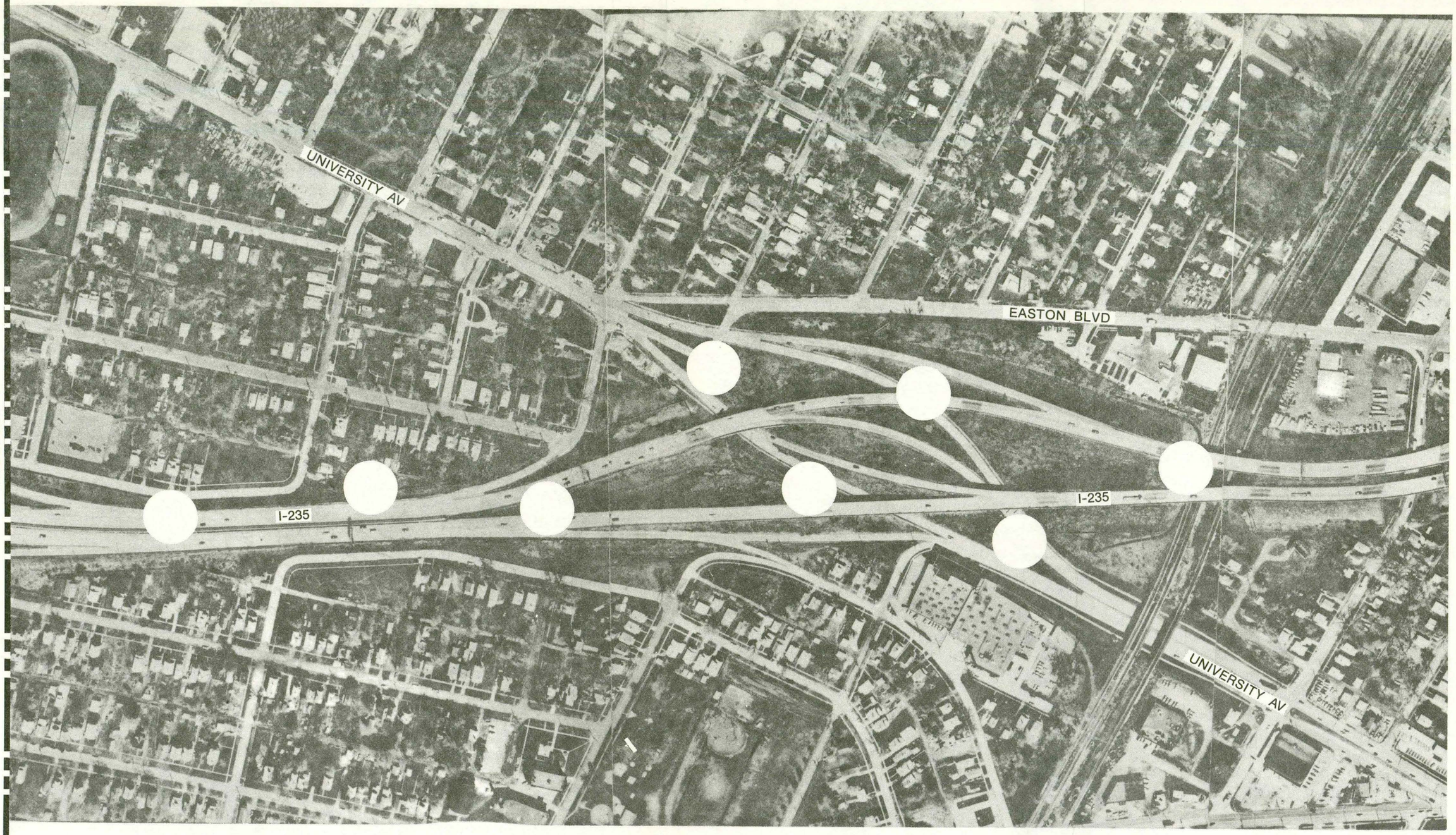
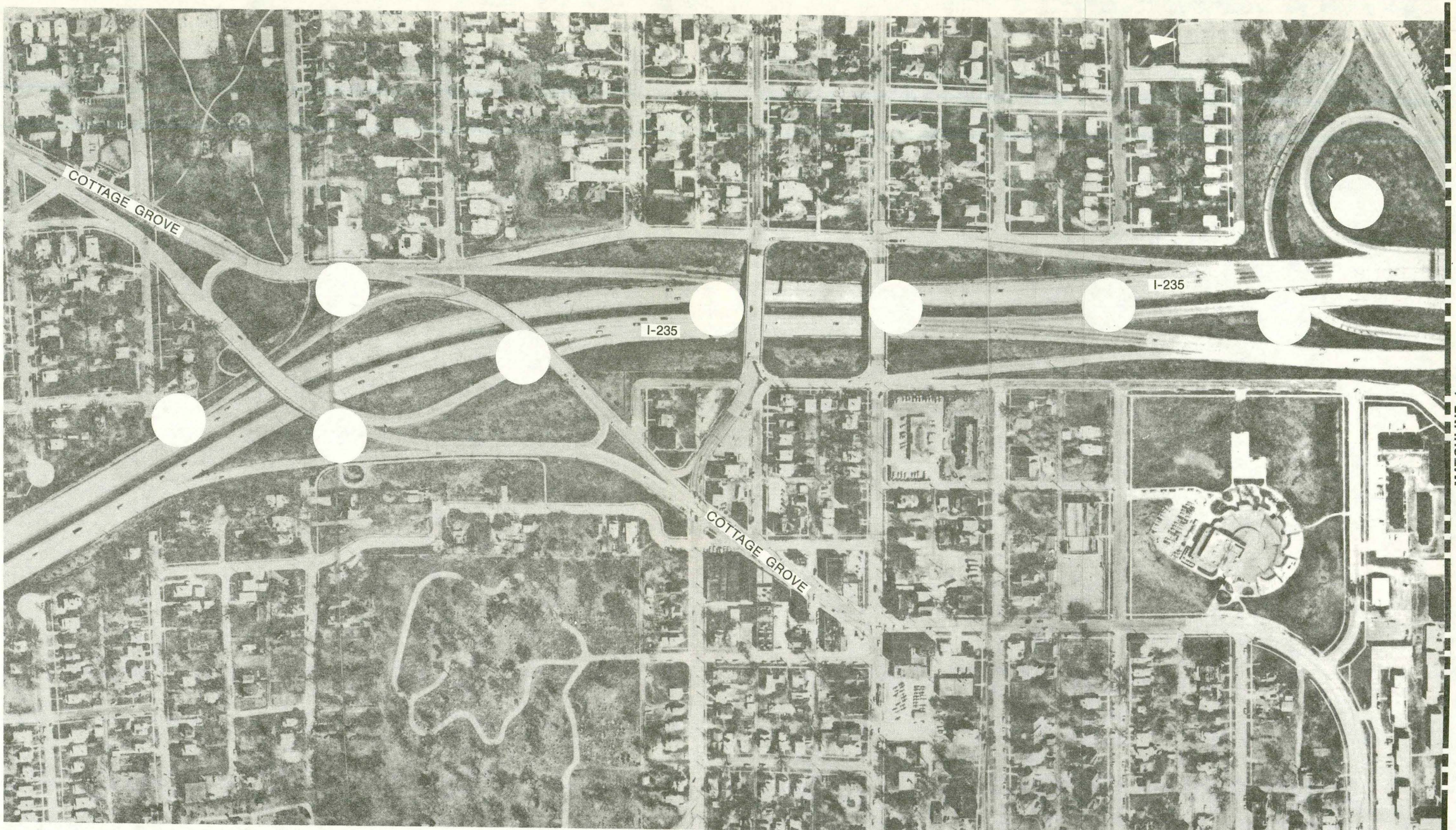
**DES MOINES**
**CENTRAL BUSINESS DISTRICT**
**I-235 TOWER LIGHTING**
**Sheet 4 of 5**

MATCHLINE 4




N

**DES MOINES**
**CENTRAL BUSINESS DISTRICT**
**I-235 TOWER LIGHTING**
**Sheet 5 of 5**

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**DES MOINES**
**CENTRAL BUSINESS DISTRICT**
**I-235 TOWER LIGHTING**
**Sheet 1 of 5**