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**CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.  
4 IRVING PLACE  
NEW YORK, N .Y. 10003**

**DISTRIBUTION ENGINEERING DEPARTMENT  
NETWORK SYSTEMS SECTION**

**SPECIFICATION EO-2034  
REVISION 3  
OCTOBER. 1995**

**ELECTRIC AND GAS SERVICES TO D.C. RAILROAD PROPERTIES**

**FILE: APPLICATION AND DESIGN  
MANUAL NO. 4  
FIELD MANUAL 16, SECT. 4  
FIELD MANUAL 20, SECT. 3**

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ELECTRIC AND GAS SERVICES TO D.C RAILROAD PROPERTIES

**1.0**     PURPOSE

To provide the requirements for installation of electric and gas services to D.C. Railroad Properties and prevent the flow of stray direct currents onto Con Edison facilities

**2.0**     APPLICATION

This specification applies to all Customer Service Operation areas.

**3.0**     DEFINITIONS

3.1 D.C. Railroad Properties consist of facilities operated by The Long Island Railroad, Metro North, Staten Island Rapid Transit, PATH, N.Y.C. Transit Authority and others.

3.2 Facilities include yards, shops, substations, passenger stations, elevated structures, and any structure connected that may provide a path for stray D.C. current into the Con Edison system.

3.3 Property Line Splice - a point of termination which joins Con Edison primary supply cables to Customer-owned cables.

**4.0**     GENERAL

4.1 Stray Direct Current - Bare neutral cables, lead sheaths of insulated cables and metal pipes in contact with elevated or other railway structures may form an alternate path (i.e., a path with comparable d.c. resistance to the negative return circuit of the Transit system) for d.c. current returning to the originating Transit system substation. These "stray" currents can result in corrosion of Company cables, conduits and pipes via electrolysis. Furthermore, an electrical fault on the railway system could cause arcing damage to uninsulated cables, pipes, and metal conduits due to the flow of heavy fault currents.

4.2 Remedy - Paragraphs 5.0 through 9.0 describe the action that is required to minimize the interchange of direct current between the two systems.

## 5.0 SECONDARY SERVICES

5.1 Steel or Non-Metallic Conduits may be used for secondary service cables. If steel conduits are used they shall be insulated from contact with metallic railroad structures, including the metal service end box, by means of phenolic insulation.

5.2 A.C. Conductors, including the neutral, shall be fully insulated. Leaded secondary cables or bare neutral conductors are not permitted.

5.3 A.C. Neutrals shall be insulated and there shall be no metallic contact between it and any metal conduit or the metal service end box.

## 6.0 . HIGH VOLTAGE FEEDERS

6.1 Non-Metallic Conduits shall be used for high voltage cables from the Company manhole to the termination inside the station.

6.2 Lead Sheath Cables shall be installed with a with a synthetic hose or polyethylene jacket over the sheath between the Company manhole and the equipment termination inside the station.

6.3 A Sheath Break shall be provided on the high voltage cable on the Customer's side of the splice which joins the Company and Railroad cables. The Customer's side is the preferred location for the sheath break to assure that an operating fault at the property line splice will be readily detected by the Con Edison's relay protection. The following specification drawings are referenced to show the method of performing a sheath break for various types of cable:

6.3.1 EO-15367-B, "Method of Isolating Grounding on S/C, XLP Lead Cable and S/C XLP/EPR Non-Leaded Cable 15kV,27kV and 35kV."

6.3.2 EO-13466-B, "Method of Isolating Lead Sheath on Single Conductor, Paper Insulated, Lead Sheathed "Solid" Type Cable - 13kV, 27kV and 35kV."

6.4 Sheath Insulating Joints, as an alternative to the sheath break, shall be

provided on the high voltage cables at the splice which joins the Con Edison and Railroad cables.

## 7.0 GROUNDING

7.1 Water Pipe - The Customer's A.C. ground connection from the insulated A.C. neutral to the water service pipe shall be made on the street side of an insulating joint in the water service pipe.

7.2 Insulated A.C. Neutrals shall not be used as grounds for Railroad D.C. equipment or D.C. apparatus windings or support brackets.

7.3 Old Railroad Rectifier Substations (Type A) which were installed prior to 1950 have a protective relay connected between the station ground bus and the water pipe. The grounding connection shall be made as shown on Drawing No. EO-5095-C, latest revision.

7.4 Substations Installed Between 1950 and 1955 (Type B) with a separate A.C. ground bus shall have the A.C. service neutral and A.C. equipment casings connected to the A.C. ground bus and the water pipe as shown on Drawing No. EO5212-C, latest revision.

7.5 Substations Installed Subsequent to 1955 shall have the A.C. service neutral and the A.C. equipment casings connected to the A.C. ground bus and water pipe as shown on Drawing No. EO-13728-C, latest revision.

7.6 Metallic Water Piping System not Available - Where no metallic water piping system is available, an alternate method which provides a resistance to ground of not more than 25 ohms shall be used for the grounding connection.

## 8.0 GAS SERVICE PIPE

Insulating joints shall be installed at the property line in all gas service pipes to Railroad properties.

## 9.0 WATER SERVICE PIPE

It is recommended that the Customer install an insulating joint in the water service pipe.

**10.0**    **ATTACHMENTS**

The following drawings are attached:

EO-5095-C  
EO-5212-C  
EO-13728-C

**11.0**    **REFERENCE DRAWINGS**

EO-13466-B  
EO-15357-B

**SEE NEXT PAGE FOR SIGNATURE**



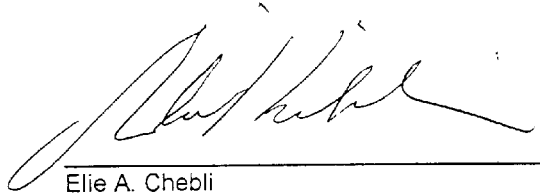
10.0 ATTACHMENTS

The following drawings are attached:

EO-5095-C  
EO-5212-C  
EO-13728-C

11.0 REFERENCE DRAWINGS

EO-13466-B  
EO-15357-B



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REVISION 3:

Changed title, format and updated  
to include current work methods  
and materials used.

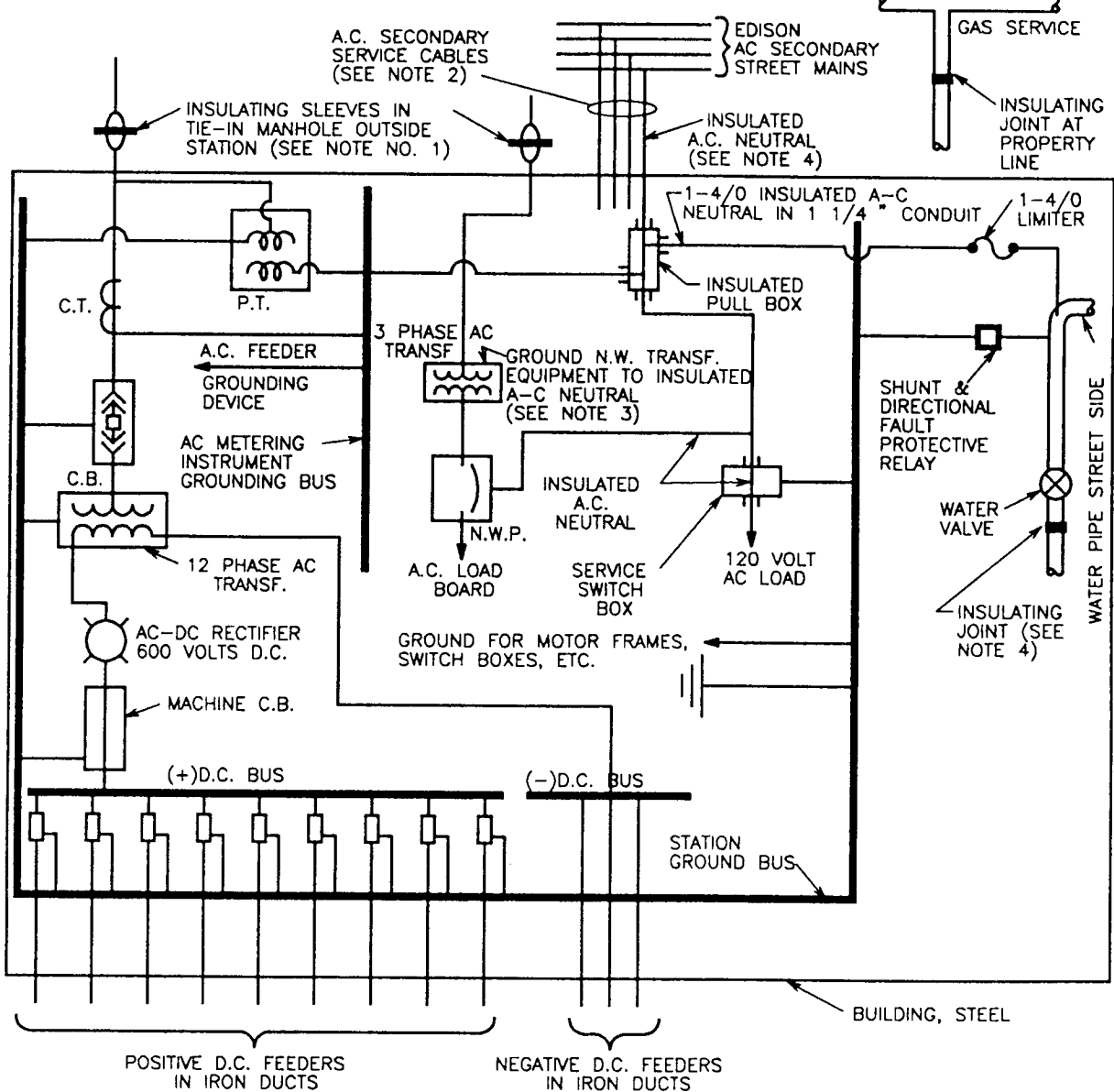
FILE:

Application and Design  
Manual No. 4  
Field Manual 16, Service  
Inspection and Control -  
Sect. 4, Electric Services  
Field Manual 20, Service  
Determination Reference Book -  
Sect. 3, Underground

REVISIONS

J.M. 9/5/95 5

EMULATED TO  
AUTO CAD CHGD  
NOTE 2  
J.L. 8/29/95



NOTES:

1. H.T. FEEDERS; USE NON-METALLIC DUCTS ONLY. USE SHJ CABLE ONLY. INSTALL INSULATING SLEEVES IN MANHOLE WHERE EDISON CABLES TIE-IN TO R.R. CABLES.
2. A.C. SECONDARIES; USE EPR INSULATION ON ALL CONDUCTORS INCLUDING NEUTRAL. USE METALLIC OR NON-METALLIC DUCTS. IF STEEL CONDUIT IS USED, KEEP STEEL CONDUIT FREE OF CONTACT WITH STATION GROUNDS (OTHER PIPES, BUILDING STEEL, METAL BOXES, ETC.) WITH PHENOLIC INSULATION.
3. A.C. GROUNDS; TRANSFORMER EQUIPMENT AND A.C. METERING WINDINGS SHALL BE GROUNDED TO THE INSULATED A.C. NEUTRAL ONLY. KEEP FREE OF CONTACT WITH STATION GROUNDS.
4. A.C. INSULATED NEUTRAL; NEUTRAL SHALL BE GROUNDED TO WATER PIPE ON STREET SIDE OF I.J. AS SHOWN. KEEP INSULATED NEUTRAL FREE FROM CONTACT WITH OTHER STATION GROUNDS (PIPES, BUILDING STEEL, METAL BOXES, ETC.).

TYPE A STATION INSTALLED PRIOR TO 1950  
PART OF SPEC. EO-2034

**ELECTRIC AND GAS  
SERVICE TO TYPE-A RAILROAD  
RECTIFIER SUBSTATIONS**

CONSOLIDATED EDISON COMPANY OF N.Y., INC.  
DISTRIBUTION ENGINEERING DEPT

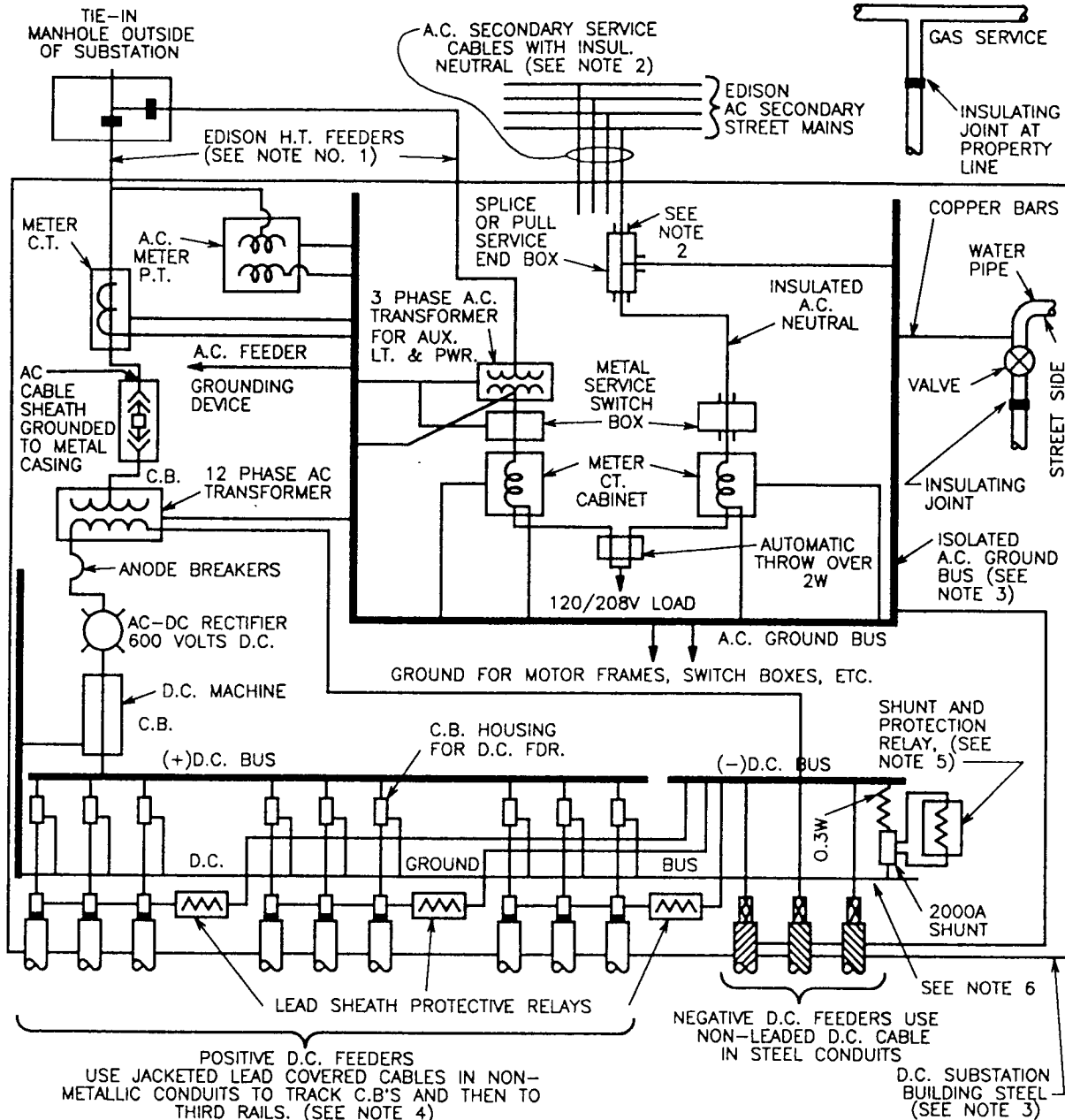
DATE 7/2/48  
LAST REV. 8/29/95

DWG. NO. **EO-5095-C** REV. **5**

REVISIONS

J.M. 9/5/95 13

EMULATED TO  
AUTO CAD CHGD  
NOTE 2  
J.L. 8/29/95



**NOTES:**

- H.T. FEEDERS:** USE NON-METALLIC DUCTS ONLY. USE SHJ CABLE ONLY. INSTALL INSULATING SLEEVES IN MANHOLE WHERE EDISON CABLES TIE-IN TO R.R. CABLES.
- A.C. SECONDARIES:** USE METAL OR NON-METAL DUCTS. USE EPR INSULATION ON ALL CONDUCTORS INCLUDING NEUTRAL. IF STEEL CONDUIT IS USED, KEEP STEEL CONDUIT FREE OF CONTACT WITH STATION GROUNDS (OTHER PIPES, BUILDING STEEL, METAL BOXES, ETC.) WITH PHENOLIC INSULATION.
- A.C. GROUNDS:** GROUND A.C. EQUIPMENT, A.C. METERING, INSTRUMENTS, INSULATED A.C. NEUTRAL, MOTOR FRAMES AND SWITCH BOXES TO A.C. GROUND BUS. KEEP A.C. GROUND BUS FREE OF CONTACT TO BUILDING STEEL.
- POSITIVE D.C. FEEDERS:** USE JACKETED-LEAD COVERED CABLES IN NON-METALLIC CONDUITS. SHEATHS SHALL BE BONDED IN GROUPS, EACH GROUP CONNECTED TO THE NEGATIVE (-) D.C. BUS THROUGH LEAD SHEATH PROTECTIVE RELAY DESIGNED TO TRIP OUT ITS D.C. BUS THROUGH LEAD SHEATH PROTECTIVE RELAY DESIGNED TO TRIP OUT ITS D.C. FEEDER AND TRACK C.B.'S ON A D.C. FEEDER CABLE FAULT.
- PROTECTION RELAY:** RELAY SHOULD BE DESIGNED TO ISOLATE CONVERSION EQUIPMENT BY TRIPPING ALL ASSOCIATED A.C. AND D.C. BREAKERS WHEN FAULT CURRENT EXCEEDS 2000 AMPS, D.C.
- THE D.C. GROUND BUS:** BUS SHALL BE ISOLATED FROM THE A.C. GROUND BUS AND FROM ANY METAL CONDUIT OR EQUIPMENT CONNECTED TO THE A.C. GROUND BUS.

**REFERENCE DWG:**

FOR GROUNDING IN SUBSTATIONS WITH COMMON GROUND BUS. SEE DWG. EO-5095-C

TYPE B STATION INSTALLED 1950-1955  
PART OF SPEC. EO-2034

**ELECTRIC AND GAS  
SERVICE TO TYPE-B RAILROAD  
RECTIFIER SUBSTATIONS**

CONSOLIDATED EDISON COMPANY OF N.Y., INC.  
DISTRIBUTION ENGINEERING DEPT

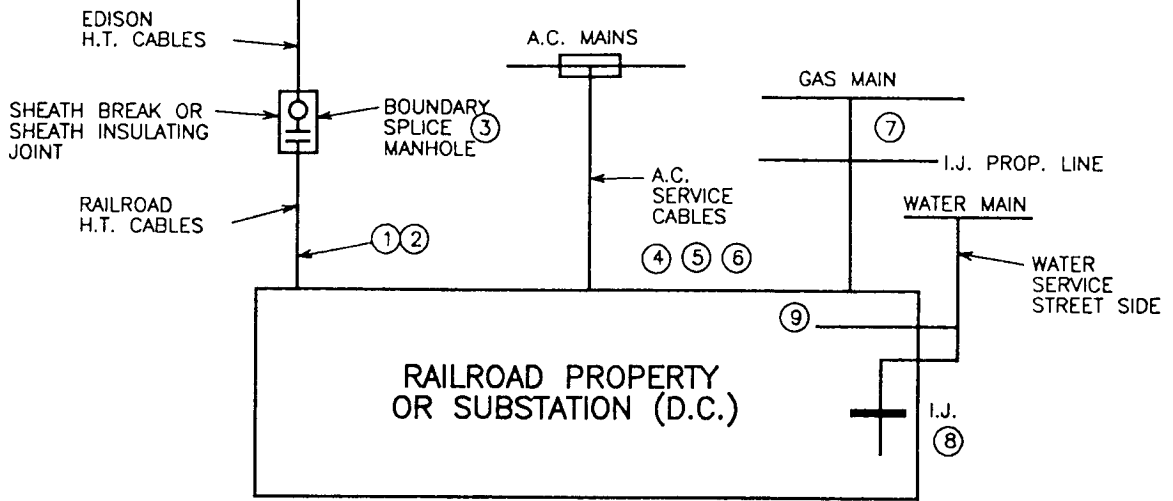
DATE 7/28/49  
LAST REV. 8/29/95

DWG. NO. **EO-5212-C REV. 13**

**REVISIONS**

J.M. 9/5/95 1

AEMULATED TO  
AUTO CAD CHGD  
STEP 5  
J.L. 8/29/95



**CONSTRUCTION REQUIREMENTS:**

**H.T. FEEDERS**

- ① USE NON-METALLIC DUCTS FOR H.T. FEEDERS. (E)(R)
- ② USE SYNTHETIC HOSE JACKETED (SHJ) CABLE FOR H.T. FEEDERS (E)(R).
- ③ INSTALL A SHEATH BREAK ON THE CUSTOMER'S SIDE OF SPLICE IN MANHOLE WHERE EDISON CABLES TIE-IN TO R.R. CABLES (E).

**LOW VOLTAGE SERVICE CONDUCTORS(120/208V).**

- ④ USE NON-METALLIC DUCT FOR L.V. CABLE (PREFERRED)(E)(R).
- ⑤ USE NON-LEADED SECONDARY MAINS. USE EPR INSULATED CABLE (600V) ON ALL LEGS, INCLUDING NEUTRAL. (E)(R).
- ⑥ IF STEEL DUCTS ARE USED, SEPARATE STEEL DUCTS FROM STATION STEEL (BUILDING STEEL, REINFORCING RODS, METAL SPLICE BOXES) WITH PHENOLIC INSULATION. (R).

**GAS SERVICE PIPE**

- ⑦ INSTALL INSULATING JOINT AT PROPERTY LINE IN ALL GAS PIPES TO RAILWAY PROPERTIES. (E).

**WATER SERVICE PIPE**

- ⑧ INSTALL INSULATING JOINT NEAR CUSTOMER'S WATER METER. (R).

**GROUND CONNECTION**

- ⑨ GROUND AC INSULATED NEUTRAL AND/OR GROUND BUS TO STREET SIDE OF AN INSULATING JOINT IN WATER SERVICE. (R).

(E)=EDISON CO.  
(R)=R.R. CO.

PART OF SPEC. EO-2034

**CONSTRUCTION REQUIREMENTS  
FOR ELECTRIC AND GAS  
SERVICE TO RAILROAD  
PROPERTY OR  
D.C. SUBSTATION**

CONSOLIDATED EDISON COMPANY OF N.Y., INC.  
DISTRIBUTION ENGINEERING DEPT

DATE 11/10/89 DWG. NO. EO-13728-C REV. 1  
LAST REV. 8/29/95