



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

**DISTRIBUTION ENGINEERING  
DISTRIBUTION EQUIPMENT**

**SPECIFICATION EO-5051  
REVISION 8  
MARCH 2010**

**EFFECTIVE DATE  
APRIL 1, 2010**

**DESIGN AND CONSTRUCTION OF 265/460 VOLT  
TRANSFORMER VAULT AND NETWORK COMPARTMENTS BY CONTRACTORS**

**FILE: CONSTRUCTION STANDARDS MANUAL NO. 3**

<b>TARGET AUDIENCE</b>	<b>REGIONAL CONSTRUCTION</b>
<b>NESC REFERENCE</b>	<b>SECTION 32</b>

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## 1.0 **PURPOSE**

This specification is to be used by customers as a guideline for the procedures to be followed and requirements to be met in the design and construction of 265/460 volt transformer vaults and network compartments at sidewalk level.

## 2.0 **APPLICATION**

This specification applies to all districts.

## 3.0 **GENERAL**

This guideline covers the following items:

- 1) Overall procedure to be followed.
- 2) Method of payment.
- 3) Customer's and Company's responsibilities.
- 4) Dimensional, design, and construction requirements.
- 5) Reference specifications.

## 4.0 **DEFINITIONS**

The term contractor shall mean the customer or customer's contractor.

## 5.0 **PROCEDURE FOR CONTRACTING VAULT CONSTRUCTION**

- 1) The customer submits load requirements to Energy Services, which then will inform them of the existence and intent of this specification and also of the current estimated prices for the work.
- 2) The Company shall determine how it will supply the power to meet the required loads of the installation.
- 3) If the contractor expresses interest in the Company's proposal, the Company's authorized representative will give design and construction requirement specifications and typical installation drawings to the contractor.

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- 4) If the contractor agrees to the proposal, the Purchasing Department will issue a Purchase Order to the Contractor based on the Company's latest amended standard prices.
- 5) The Contractor shall design vaults and network compartments (including subsurface investigation) and prepare detailed drawings for approval by Company.
- 6) After approval by the Company, the Contractor will obtain customer's and/or owner's approval.
- 7) The Contractor shall obtain the N.Y.C. Building Department permit. The Company shall obtain all other permits.
- 8) The Contractor will notify the Company's authorized representative before start of construction and again upon completion.
- 9) At the start of construction and at intervals until completion, the Company's authorized representative will conduct inspections and, upon final approval, will arrange for delivery of equipment (approximately two weeks after final approval). Failure of the Company to inspect the construction shall not relieve the Contractor of his responsibility to construct the vaults and network compartments according to the approved drawings. The Contractor will be responsible to have the transformer vaults and network compartments clear of debris on day of the transformer installation.
- 10) The Company will furnish and install the transformers and gratings and will also install the Contractor supplied, removable, precast roof slabs.
- 11) The Contractor shall maintain the vaults until the sidewalk finish is installed to the satisfaction of the authorities having jurisdiction and shall be responsible for preventing any debris from entering the vaults during construction of the building. The grating areas must be maintained free of obstructions once the transformers are energized.

## **6.0 METHOD OF PAYMENT**

For the design and construction of transformer vaults and network compartments, payment will be made as follows:

- 1) Lump sum per vault.

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- 2) Lump sum per network compartment.
- 3) Unit price per cubic yard of rock removed within the space that will be occupied by the vault by:
  - a) Blasting
  - b) Plug and Feather Methods

Rock is defined as sound rock or boulders which cannot be removed with ordinary soil excavating equipment and must be removed by blasting or plug and feather, chippers, bull points or similar drilling and breaking methods.

- 4) Unit price per cubic yard of masonry or concrete removed within the space that will be occupied by the vault. For masonry and concrete removal criteria, the above rock definition shall be applicable.
- 5) Unit price per lineal foot (tip to cut off) of piling (including pile caps).

## 7.0 **DIVISION OF RESPONSIBILITY**

It shall be the Company's responsibility to:

- 1) Provide the Contractor with basic sizes of vaults, weights of equipment and location of cable openings.
- 2) Before the construction of the vaults and network compartments, approve and accept drawings prepared by the Contractor.
- 3) Approve and accept the finished construction.
- 4) Furnish, deliver, install and connect all transformers, protectors, bus and associated equipment within the vaults and network bus compartment.
- 5) Furnish, deliver and install all gratings. Install contractor supplied, removable precast roof slabs which shall be positioned near the vaults so that placement can be

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accomplished without relocating equipment used to install the transformers.

- 6) Furnish and install the sump pump or furnish the high-dome strainer required.

It shall be the Contractor's responsibility to:

- 1) Provide all engineering design for structures and prepare detailed drawings for approval by the Company, (See Para. #7.2.9)
- 2) Obtain the N.Y.C. Building Department permit and file all required forms upon completion. In Westchester any necessary permits will be obtained with the assistance of the Company.
- 3) Provide lines and grades and elevations at the extreme ends of the vaults.
- 4) Provide soil data and ground water level at the vault location.
- 5) Provide all materials and labor required to construct the vaults and network compartments except those, which will be provided by the Company as mentioned above. Some of the items to be furnished by the Contractor are: removable precast slab, permanent bearing angles, all network compartment doors, lintels over openings, all pipe within vaults (including the sump pump piping) and network compartments, and, if required, sump frames and gratings.
- 6) Construct the vaults and network compartments in a sound manner and in conformance with our specifications and the requirements of the authorities having jurisdiction.
- 7) Provide permanent drainage to public sewer. Only when field conditions do not permit connection to public sewers should connections for drains then be made to customer's sewer. Both connections shall be in accordance with EO-12160-C and/or EO-130207-B.
- 8) Install conduits from the transformer vaults to either: (a) one foot outside the curb line and plug the ends, or (b) to existing street ducts already terminated at the curb line and connect to them.

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- 9) Drawings: The Contractor shall submit detailed construction drawings, drawn on Company forms that shall be provided by the Company. The Contractor shall furnish the Company with either the original drawings or with copies on "mylar". The drawings (arranged as shown on the accompanying sketch A) shall consist of a plan at sidewalk grade indicating detailed roof construction, a transformer vault plan indicating detail of wall and floor construction and location of all doors, conduits and openings in the vault walls and floor, and an elevation indicating the relative elevation of all doors, conduits and openings to the rough floor, and sections as necessary to completely outline for the Contractor's field forces the exact extent of the work to be done as part of the vault construction.

The drawing shall contain whatever notes are required in the way of material and construction specifications necessary to complete the information for obtaining permits and completing construction of the vaults. Further notes may be required as directed by the Company's representative outlining responsibilities of the Company or the customer for specific items of work.

In addition, the Contractor shall be required to furnish all supplementary drawings or reports required to complete his obligation in designing (such as loading diagram, pressure diagram, design values and method used in obtaining them), obtaining approvals and constructing the vaults, (such as plot plan, boring data, concrete inspection data, special door or grating drawings).

Upon receipt of approval of the vault design drawing by the Company's Engineering Departments, the Contractor shall obtain the necessary approval for use of the intended space from the owner of the premises and from the customer applying for the service prior to proceeding with construction. After one signed copy with the signatures of the above individuals is delivered to the Company, the construction of the vaults may commence.

## 8.0 DIMENSIONAL, DESIGN AND CONSTRUCTION REQUIREMENTS

### 8.1 Dimensional Requirements

- 8.1.1 The basic dimensional requirements for transformer vaults and network compartments are shown on specifications EO-1114 and EO-5023. The vault headroom dimensions shown are minimum

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and should be laid out to take care of any sidewalk slope and possible future cuts to legal grade. The vault wall dimensions have been designed for bearing considerations and should be adhered to. All dimensions not shown shall be determined by appropriate design to meet the encountered loads for the structure under that particular situation.

**8.1.2** Vaults shall be located to minimize interference with public areas for safety reasons. Vault access grating doors shall be immediately available to company representatives 24 hours of every day.

**8.1.3** Vaults shall not be located in driveways or loading docks.

**8.2 Design and Construction Requirements**

**8.2.1** General: Design loads and stresses shall conform to the requirements of the current administrative code of the City of New York Department of Buildings and to Con Edison specifications. Vault floors and walls shall be constructed of reinforced concrete and the roof slabs shall be composed of gratings and removable precast concrete slabs. Construction requirements for both vault and network protector compartments shall be followed as outlined in specification EO-5023.

**8.2.2** Loads: Vertical - the gratings, beams and removable precast slabs installed in the sidewalk or driveway shall be designed to withstand a 600 psf live load or a 16,000 pound wheel load whichever causes maximum stresses. In addition to normal live and dead loads, floors shall be designed to support the weight of equipment. Weights of various transformers are as follows:

1000 or 1120 kVA - 16,000 Pounds\*  
 2000 or 2240 kVA - 24,000 Pounds  
 2500 or 2800 kVA - 30,000 Pounds  
 Above 40,000 Pounds

\*The transformers are supplied with support beams (steel runners) with dimensions and spacing as shown on EO-5630-B (part of specification EO-5031). Network Protectors weigh approximately 3000 pounds each distributed on a two foot square area.

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**8.2.3** Loads: Horizontal Vault walls within sidewalk areas shall be designed to resist the lateral forces exerted by the load of the soil including ground water, if present, plus the combination of live loads due to (a) a 26,000 pound wheel at ground surface adjacent to the outside face of the wall and (b) a 600 PSF surcharge uniform load.

**8.2.4** Vaults: The vaults shall be designed as an integral part of the building foundation with the foundation wall forming the fourth wall of the vault. The vaults shall be supported so as to eliminate any differential movement between the vaults and the building. In areas with high ground water table, floors and walls shall be poured monolithically to at least twelve inches above the water line. Where monolithic structures are specified due to the presence of water, the excavation for the vault shall be completely sheeted and provisions shall be made to keep the water level below the lowest elevation prior to the initial placement of the concrete until a minimum of 24 hours after the complete monolithic structure has been poured in place. Concrete that will form any part of the permanent structure shall not be placed against water pressure. Once concrete placement is started, it shall be carried on in a continuous operation until the complete monolithic structure has been placed. For partially monolithic structures the above procedure shall be followed for the monolithic portion of such structures. Waterstop shall be installed at all joints on the outside walls and at about 8 inches from the top of the floor elevation. The tapered form ties used in the construction is only allowed for vaults located on or above ground level.

**8.2.4.1** Voids under the proposed vault area shall be properly backfilled to insure no settlement of the vault. Vault floors shall be designed according to the type of support, namely, soil, rock or piles as the case may be. No walls shall be less than 8" or normally more than 12" thick. Partition walls shall be 10" thick with horizontal reinforcement of #5 rods at 6" O.C. and vertical reinforcement of #4 rods at 10" O.C., both on each face of the wall. The wall openings shall be as specified on the drawings and the building foundation wall shall be provided with a haunch to support the gratings.

**8.2.4.2** The roofs must be entirely removable and not

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encumbered by building or curb. If necessary, the curb side wall of the vault shall be pocketed to allow for future street widening. A detail of this construction must be shown on the drawings. A building paper separator is required between the sidewalk finish and the precast slabs. All structural steel shall be protected with a minimum of two inches of concrete (spray application will not be permitted). A minimum of one inch of mortar is required between the sidewalk grating frame and supporting structure.

**8.2.4.3** The Contractor shall provide temporary vault drainage during construction and permanent drainage by the use of sumps and pumps to the street sewer. When draining into the building system using the gravity flow method, a high dome strainer (EO-13334-B) and four inch cast iron pipe with a trap in the building shall be used. All plumbing shall be clear of the network compartment area. Normally, sumps, three feet long by two feet wide (see EO12086C), shall be installed inside the vaults, on the curb side, and the pump connected with two inch galvanized steel pipe which shall be terminated as per EO-12160-C. Also required in the line will be a two inch running trap and a two inch check valve located inside the vault and easily accessible for maintenance. The galvanized pipe shall be connected to the street sewer by a four inch extra-heavy cast iron pipe beginning at the vault wall and extending to the sewer. Connection to the sewer shall be made according to municipal specifications. Sump gratings and frames as per EO-12086-C shall be bolted in place using anchors as per EO-1051.

**8.2.4.4** The Contractor shall arrange to have each batch of concrete that is used in the vault construction tested by a qualified testing company. The test shall include concrete class, number of cubic yards, number of loads, mix proportions, brand or source, and aggregate gradation. The test shall include inches of slump and compressive strength, PSI, for seven and twenty eight

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days, respectively. Copies of the tests shall be forwarded to the Company's authorized representative for inclusion in the job records.

**8.2.4.5** Conduits shall be concrete encased fiberglass reinforced epoxy. They shall be set in place while the concrete walls are being poured. No reinforcing bars shall be installed between conduits.

**8.2.5** Network Protector Compartments: Walls shall be 100% filled concrete block or reinforced concrete, with openings as shown on the drawing. Reinforcing bars shall clear all conduits into the network compartment by at least four inches. If the inside of the customer's building wall is waterproofed, the compartments shall be constructed with a concrete block wall adjacent to the building wall in order not to disturb the waterproofing. The roof shall be a six inch (minimum) reinforced concrete slab and may be the first floor slab. The roof slab over the entire network compartment area shall be membrane waterproofed in accordance with EO-1007. Prior to construction, all concrete forms, including corrugated metal, within the compartment areas must be removed. Precast concrete lintels shall be provided over all openings. Access to customer's space and between compartments shall be through steel doors as per EO-16447-A and EO-16448-A. Exterior doors (leading to customer's space) shall have twelve inch sills. The entire network compartment floor area and twelve inches of the perimeter walls shall be waterproofed in accordance with EO-1007 before the interior walls are set. Furthermore, a three inch concrete finish on top of the waterproofing is required. The eleven foot minimum headroom required in the compartment area shall be measured from the top of the finished slab to the underside of the roof lowest projection. All building steel on the roof within the compartment area shall be covered with a minimum of two inches of concrete and shall be at least eight inches clear of bus and conduits. The interior of all compartments shall be painted in accordance with EO-1191 and EO-100,184. Ventilation of compartments shall be in accordance with EO-7557-B.

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## 9.0 REFERENCE SPECIFICATIONS

- EO-1007 - "Membrane Method of Waterproofing Outside Plant Structures"
- EO-1051 - "Specification for Bolt Anchor"
- EO-1114 - "Space Requirements for 460V Network Installations"
- EO-1191 - "Painting of 460 Volt Network Protector Compartments"
- EO-2032 - "Design Outline For Forced Exhaust Ventilation Systems In Network Installations"
- EO-2079 - "265/460 Volt Network Installations"
- EO-5023 - "Requirements for Construction of 265/460V Network Installations"
- EO-7557-B - "Forced Ventilation and Alarm System for 265/460V Network Protector Compartments"
- EO-11991-D - "Latch Handle Sign for Vault Doors"
- EO-12086-C - "Transformer Vault Sump Frame and Panel Details"
- EO-12160-C - "Installation - Kenco Sump Pump"
- EO-13027-B - "Drainage Installation for V-11, V-12, V-13-6 and V-15-6 by Sump Pump or Gravity Flow Method"
- EO-13335-B - "High Dome Strainer for Draining Street Vaults"
- EO-16447-A - "Frame Assemblies and Details for Entry to Transformer Vaults and Network Protector Compartments"
- EO-16448-A - "Door Assemblies and Details for Entry to Transformer Vaults and Network Protector Compartments"
- EO-100,184 - "Paint Used in 460V Network Vaults"

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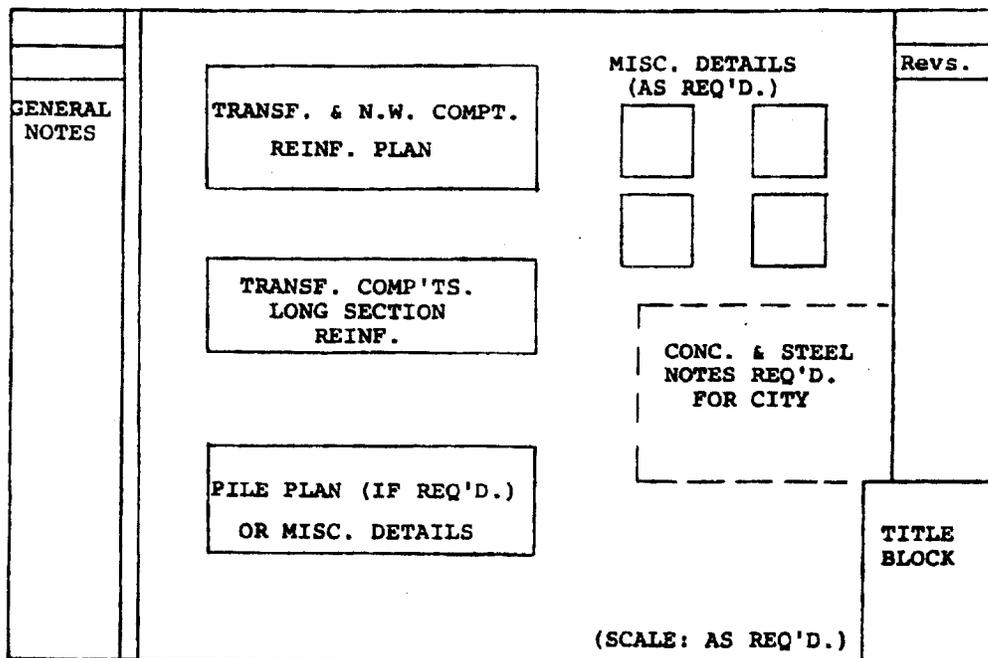
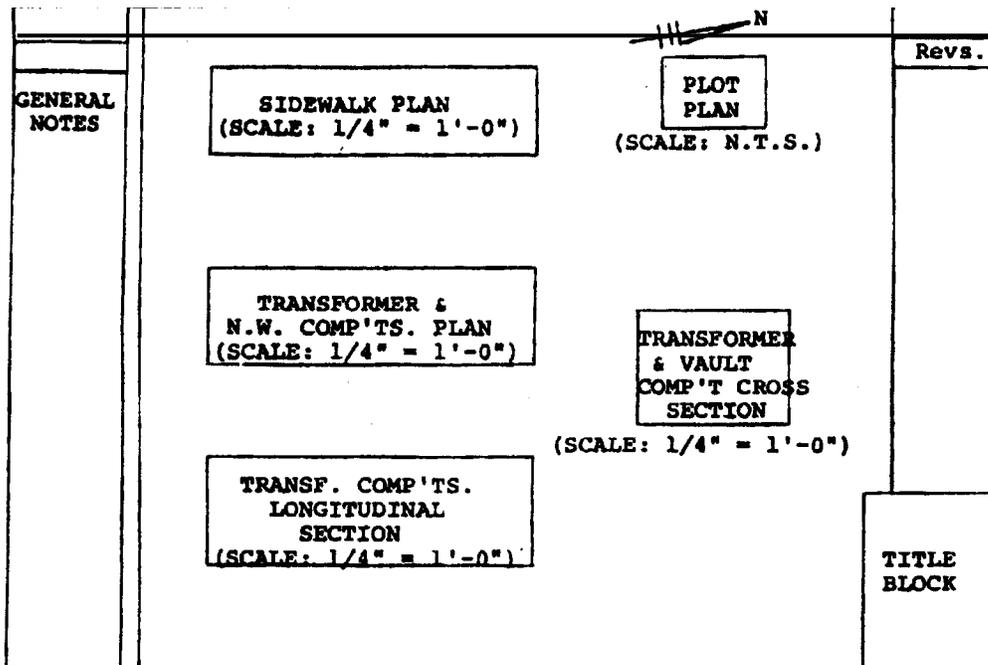
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<b><u>REVISION 8:</u></b>  Revised to remove any references to ladder installation requirements. Due to be reviewed 9/2012.	<b><u>FILE:</u></b>  Construction Standards Manual No. 3 Section 42 - Vaults Field Manual No. 5, Section 2
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