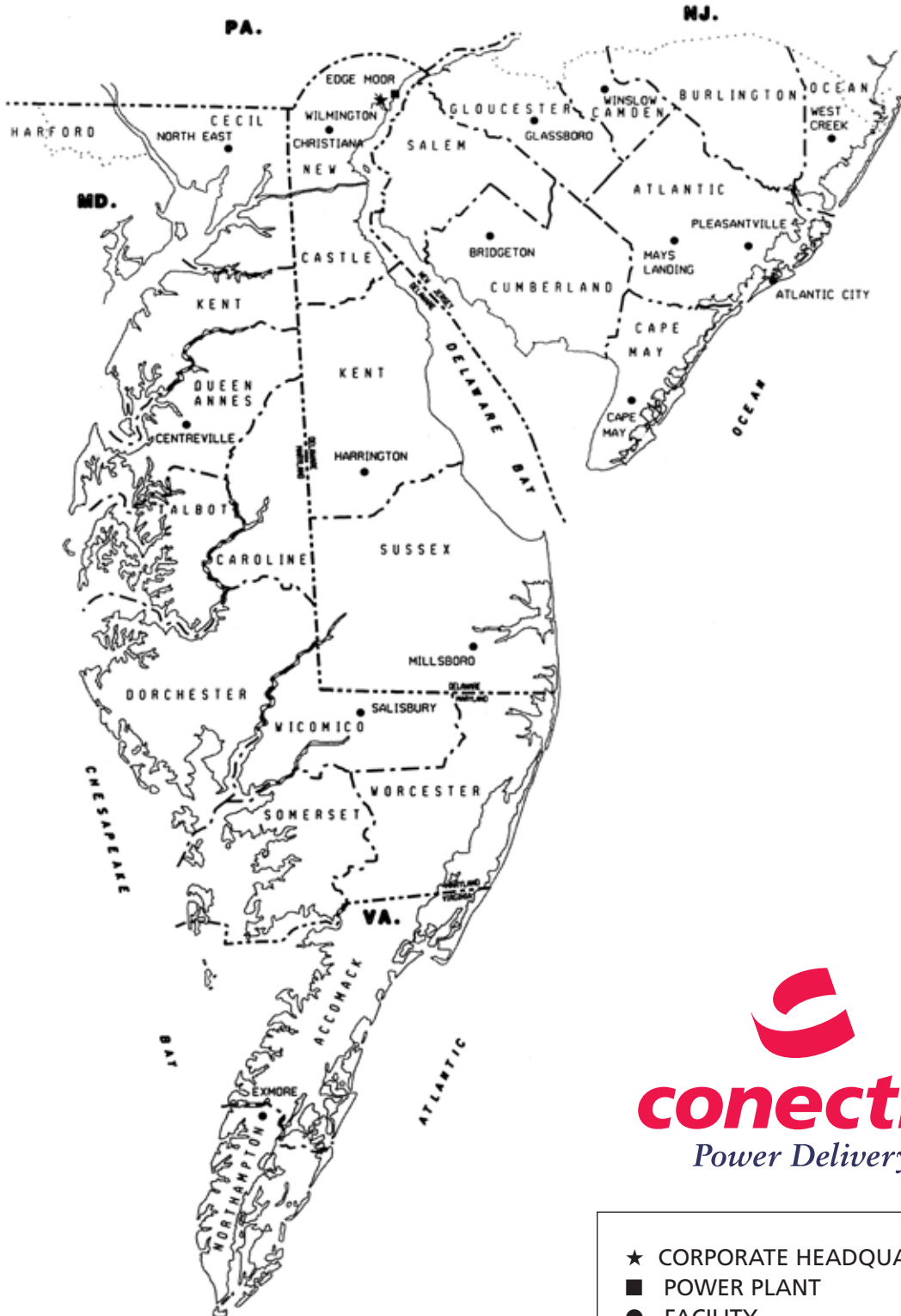


Electric Service Handbook

(Updated October 2002)



- ★ CORPORATE HEADQUARTERS
- POWER PLANT
- FACILITY



New Business Addresses and Phone Numbers

DELAWARE OFFICES

New Castle Region

401 Eagle Run Road, P.O. Box 9236
Newark, De. 19714
(302) 454-4343

Millsboro Operations

700 E. Dupont Highway, P.O. Box 637
Millsboro, De. 19966
(800) 375-7117

MARYLAND OFFICES

Centerville Operations

2600 Centerville Rd., P.O. Box 159
Centerville, Md. 21617
(800) 375-7117

Conowingo Operations

2 Center Dr., P.O. Box 497
Northeast Commerce Center
Northeast, Md. 21901-0497
(800) 375-7117

Salisbury Operations

2530 N. Salisbury Blvd., P.O. Box 1739
Salisbury, Md. 21802-1739
(800) 375-7117

NEW JERSEY OFFICES

Cape May Court House Operations

420 Rt. 9 N.
Cape May Court House, N.J. 08210
(609) 463-3823

Glassboro Operations

428 Ellis St.
Glassboro, N.J. 08028
From Salem Co. (856) 769-0683
From Cumberland Co (856) 451-0070
From Gloucester Co. (856) 863-7906

Pleasantville Operations

2542 Fire Rd.
Egg Harbor Township, N.J. 08234
From Atlantic City (609) 348-3786
From West Creek (609) 296-9114
From Pleasantville (609) 645-4667

Winslow Operations

295 Atlantic Ave.
Williamstown Junction
Berlin, N.J. 08009
From Hammonton (609) 561-2242
From Winslow (856) 753-2808

VIRGINIA OFFICE

Exmore Operations

4174 Lankford Hwy. P.O. Box 608
Exmore, Va. 23350
(800) 375-7117

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CHAPTER 1 — GENERAL

A. GENERAL INFORMATION

101. PURPOSE

Conectiv Power Delivery issues this booklet as a general guide for customers, contractors, architects, engineers, etc., who plan to install electrical wiring or apparatus which will be connected to Conectiv lines. These requirements do not replace the regulations of appropriate State, County or Municipal authorities having jurisdiction or the National Electrical Code (NEC) or the National Electrical Safety Code (NESC). The booklet is not intended to address all possible situations. Contacting your local district office about particular issues is encouraged.

102. GETTING THE JOB DONE

Conectiv will endeavor to cooperate in every way in completing service connections as promptly as possible and will give special attention to unusual problems that may confront the customer, contractor, architect or engineer. Conectiv reserves the right to impose additional requirements where unusual circumstances exist.

103. INTERPRETATIONS

Observance of requirements contained herein will enable Conectiv to render prompt and satisfactory service. Assistance in the interpretation or clarification of these requirements may be obtained by contacting your local Conectiv district office. Key phone numbers appear at the beginning of the booklet.

104. EMPLOYEE IDENTIFICATION

For the mutual protection of you and Conectiv, only authorized employees of Conectiv are permitted to make and energize the connection between the service and your service entrance. All Conectiv employees carry identification cards that will be shown upon request.

105. LIABILITY

Conectiv shall not be liable for damages resulting from the presence its electric service or equipment on the customer's premises, or for the customer's use of that service. Conectiv also shall not be liable for power interruptions resulting from situations beyond the reasonable control of Conectiv.

106. HANDBOOK REVISIONS

Conectiv may from time to time supplement, alter or otherwise change its requirements, as may be required by changing conditions, for the protection of the interest of the customer, Conectiv or the general public. Revisions to the booklet will be automatically sent to holders of the Handbook on record with Conectiv. Any person can obtain the booklet from a local district office of Conectiv. To be registered as a holder of the handbook the that person must fill in the postage free return registration card and mail it to Conectiv.

107. SERVICE SUPPLY

The standard electric service supplied by Conectiv is alternating current with a nominal frequency of 60 hertz (cycles per second). See Articles 121–124 for nominal supply voltages and their load limitations.

108. SERVICE AVAILABILITY

As the voltage, number of phases, load and type of metering which can be supplies depends upon the Conectiv facilities existing at or near the customer's location, the customer will consult Conectiv before proceeding with the purchase or installation of any materials or equipment.

109. SERVICE CONTINUITY

Conectiv does not guarantee continuous and uninterrupted electric service and will not be liable for any loss, cost, damage or expense to any customer caused by an interruption or phase reversal if the incident is caused by an event beyond the reasonable control of Conectiv.

110. OUTAGES

When it becomes necessary to make repairs or changes to Conectiv's electric system, Conectiv may suspend the delivery of service for such periods as may be reasonably necessary without incurring any liability because of such a service interruption. However, Conectiv will make every reasonable effort to schedule outages to minimize the impact of the outage on its customers.

B. DEFINITIONS

111. COMMONLY USED TERMS

Certain terms used in these rules shall be understood to have the following meanings:

A. APPROVED:

Referring to an electrical installation, it is considered as meeting the requirements of an authorized inspector or inspection agency. Referring to electrical materials or equipment, it is considered as meeting the approval of a recognized laboratory after test of by a recognized authority after inspection, trial or general use. Self contained meter socket equipment, which is purchased and installed by the customer, must be approved by Conectiv.

B. COMPANY

The word refers to Conectiv Power Delivery.

C. CONSTRUCTION AGREEMENTS

Written agreements between the Customer and the Company defining what must be done by the Customer before the Company's work to provide service can be completed.

D. CUSTOMER

The word designates either the present or prospective users, or their authorized representatives, of the Company's electric service.

E. DEMAND

The rate at which electric energy in metered per time interval, also referred to as the load.

F. DEMAND LIMITING CONTROL

A system whereby the Customer controls (either manually or automatically) the operating schedule of appliances to minimize demand.

G. ENERGY MANAGEMENT

A system whereby the Company remotely controls the operating schedule of various household or commercial appliances during peak load periods.

H. GROUP METERING

Those meter installations at multiple occupancy buildings where the individual meters for various customers are arranged in a bank or grouping in the same area, and are energized from the same service entrance.

I. INSPECTOR OR INSPECTION AGENCY

The person, agency or organization duly authorized by the appropriate state, county or municipality to conduct the inspection of wires and appliances utilizing electric energy subject to applicable statutes and regulations for such installations.

J. OSHA

The Occupational Safety and Health Act (or Administration).

K. SERVICE

The supply of the Company's product, "electricity", to the Customer. The wire and associated connections between Company lines and the Customer's wiring. These wires may be high or low voltage, aerial or underground.

L. SERVICE DROP

The portion of the overhead service between the Company's last pole or support to and including splices, if any, and the first point of attachment of the Customer's facilities.

M. SERVICE ENTRANCE

The customer owned installation, generally wires and enclosures, connecting the Customer's service equipment to the Company's service drop or underground service.

N. STARTING CURRENT

The maximum current drawn when a motor is starting. Without some sort of starting aid, the starting current is generally about five times the normal running current.

O. TARIFF

The document of agreement between a state's utility regulating body and the utility defining the various rates and the rules and regulations governing specific interactions between the utility and its customers.

P. UNDERGROUND SERVICE

The underground portion of conductors and associated materials, owned by the Company, that run between the Company's overhead or underground system and the Customer's service facilities.

C. SUPPLY VOLTAGES

121. NOMINAL VERSUS ACTUAL

In this booklet, all references to voltages are nominal voltages. Actual voltages supplied may vary above or below nominal by 5%. Customers should call the local Company district office before purchasing equipment if there is any doubt about the service voltage.

122. AVAILABILITY

Not all of the service voltages listed below are available at all locations. Subject to system limitations, the types of secondary electric service are listed below with additional limits for the magnitude of load served in kVA.

			MINIMUM	/	MAXIMUM
Single-phase	3 wire	120/240 Volt	-----		167 kVA
Single-phase	3 wire	120/208 Volt	-----		50 kVA
Three-phase	4 wire	240/120 Volt	-----		300 kVA
Three-phase	4 wire	208/120 Volt	75		1000 kVA(UG Serv.) 500 kVA (Aerial Serv.) 200 kVA (Network)
Three-phase	4 wire	480/277 Volt	75		2500 kVA(UG Serv.) 500 kVA(Aerial Serv.)
Three-phase	4 wire	480/240 Volt**	75		500 kVA

** Atlantic Region only. Aerial service only.

123. PRIMARY SERVICE VOLTAGES

Primary electric service voltages may also be available depending upon the location and the size of load being served. Such electric service may be made available under suitable contractual arrangements. Not all voltages below are available at all locations. Consult your local district office for voltage options at your location.

NOMINAL PHASE TO GROUND/PHASE TO PHASE VOLTAGES

	Maximum kVA
2400/4160	2000
6928/12000#	4000
7200/12470##	4000
13200/23000###	8000
14400/24940*	10000
19200/33000**	18000
19900/34500***	18000

Notes:

New Castle Region only

Atlantic & Bay Regions only

Atlantic Region only

*New Castle & Bay Regions only

**Northeast (Conowingo) area only

*** Atlantic and New Castle regions only

124. CUSTOM VOLTAGES

Customers needing a voltage which is different from their service voltage may obtain whatever voltage is needed by connecting an appropriate transformer to produce a custom voltage from a standard source.

D. APPLICATION FOR SERVICE

131. INFORMATION REQUIRED

To apply for new, reconnected, temporary, additional or upgraded service, dial the appropriate phone numbers appearing in the front of this booklet. Applications were once taken at all the district offices but that function has been assumed by a more centralized group of call takers. To expedite the completion of the application, the prospective customer should be prepared to furnish the following information:

1. Exact location of the premises (number, street, post office and zip code and pole if possible).
2. Name of the person to be billed for service.
3. Social Security Number of applicant.
4. Spouse first name
5. Employer
6. Home & work phone numbers
7. The address to which the bill should be mailed.
8. Date electric service will be required.
9. Characteristics of the electrical load such as the size in kilowatts of major appliances such as electric heat, air conditioning, stove, water heater, etc., horsepower ratings of motors, voltage requirement and three versus single phase service.
10. Details of special load requirements.
11. Suggested meter location.
12. Details of special load requirements.
13. Name & phone number of any other contacts (builder, electrician, etc.)

Sometimes a plot plan or electrical drawings have to be mailed to the appropriate district office.

132. CONSTRUCTION AGREEMENTS

Construction Agreements for electric service will be required for residential developments and commercial and industrial customers. They will also be required for residential customers where deposits for extensions are required.

133. SERVICE DELIVERY LOCATION

In all cases where new installations or alterations or additions to existing installations are to be made, the Company must be consulted as to the location of the service entrance and metering equipment. The Company must also be consulted with regard to the size and character of the anticipated electric load so that the Company may advise the customer about the electrical facilities available at that specific location. These consultations are distinctly advantageous to the customer or his representatives so that errors in equipment ratings and any deficiency in electric service capacity may be avoided. Advance consultation may also help avoid unnecessary additional expense or delays on the part of the customer or his contractor.

134. TARIFF

The service classifications and the rules and regulations applicable to electric service prepared pursuant to the requirements of the respective state regulatory authorities are open for inspection at each business office of the company.

135. RIGHT OF WAY

Furnishing electric service to a prospective customer is necessarily dependent upon the ability to obtain adequate rights of way.

136. CONSTRUCTION POWER

Temporary installations requiring special service, meter or other work, such as for construction purposes, exhibits of short duration, etc., shall be made at the expense of the customer with charges according to the material and work required for installing and removing. A payment in advance, sufficient to cover construction and removal expenses and current use, may be required. See Chapter 6 for more details on Temporary Services.

137. TEMPORARY SERVICE WIRING

Service entrance, metering and wiring on temporary installations shall be installed in the same manner as for permanent installations.

E. INSPECTIONS

141. NATIONAL ELECTRICAL CODE

All new wiring and equipment, or changes in wiring and equipment, must be installed in accordance with the latest edition of the National Electrical Code and the Company's requirements in order to be approved for connection to the Company's lines.

142. INSPECTION AGENCY APPROVAL

The Company will normally render electric service from its distribution system to the new facilities of a customer only after receipt by the Company of a notice of approval, issued by a duly recognized inspection agency. Whenever a service has been disconnected for a year or more or the Company suspects that the wiring may have been modified, an inspection will be required before service will be reconnected.

143. SAFETY

The Company may refuse to render or continue service to a customer when it has knowledge of or reason to believe that a customer's wiring or equipment does not comply with recognized requirements.

144. COMPANY INSPECTIONS

Inspections, when made by the Company, are to insure compliance with its own requirements and to cooperate with customers, contractors, architects and engineers. The Company does not assume any responsibility for the customer's wiring or equipment, or for any loss or damage that may result from any defects that may exist in the customer's wiring and equipment.

F. DESIGN & CONSTRUCTION

150. RECOMMENDED MATERIALS

In certain situations a customer or his electrical contractor may be required to furnish certain connectors or other devices to be applied or installed by the company. Pictured of Figures 30 & 31 are some of the devices which may have to be furnished by the customer. The Company has evaluated numerous makes and designs of equipment and selected certain ones believed to afford superior performance. They should be readily available from distributors since the Company buys them from distributors. Jobs on which questionable materials are provided may have to be delayed to determine if those materials are acceptable on our system. If they are not, a device acceptable to the Company must be provided before the work can be completed.

151. CLEAR ZONES

To allow for safe and efficient operation of high voltage equipment, certain areas around the equipment must be free from obstructions. Figure 32 shows the Company's requirements for clear space around commonly used equipment. If there is any doubt about placement of surface mounted equipment, consult your local district office.

CHAPTER 2 – SAFETY

A. GENERAL INFORMATION

In order to avoid personal injury or extended loss of electric service, certain safety practices should be followed.

201. OVERHEAD WIRES

Persons have suffered serious injuries or death as a result of carelessness around electrical wires. Many of these persons believed that the wires were insulated and fairly harmless. While it is true that various types of wire may have a covering, it is NOT insulation that is designed for personal protection.

202. REGULATIONS

Recognizing these facts many local, State and Federal laws or regulations have been passed. The Occupational Safety & Health Administration (OSHA) is the arm of the Federal Government that regulates the proximity to electrical wires of work crews unqualified to work on electric lines. In New Jersey the High Voltage Proximity Act, amended May 20, 1987, defines clearances between energized electrical wires and personnel or work equipment. Additionally, the National Electrical Safety Code governs the erection of structures near electric lines.

203. PLANNING

Whenever any work activity is to be performed in the vicinity of overhead lines or when an excavation is involved, our Company must be notified in advance of the start of such work. Most situations are different and must be handled individually. Sometimes covering the wires will suffice while other times the wires might have to be removed, relocated or deenergized. Depending on the scope of the work there may be costs associated.

204. UNDERGROUND FACILITIES

Underground facilities belonging to most utility companies will be located for free by calling either 1-800-272-1000 in New Jersey or 1-800-282-8555 in Delaware or 1-800-441-8355 in Maryland or Virginia. It is the law that you must have underground structures marked so there is no chance of damaging them when excavating. Fines may be imposed for failure to comply with the law.

205. PLANTING

Trees should not be planted where they would normally grow into electric lines. The Company should be contacted before tree trimming or removal in the vicinity of electric wires so the work site can be made safe for the workers.

206. FOREIGN ATTACHMENTS

The Company's poles, towers and other structures are provided for the sole purpose of supplying electric service. The attachment of antennas, signs, banners, basketball hoops to Company facilities is strictly prohibited. The Company reserves the right to remove such attachments without notice.

207. ANTENNAS

Antennas on any high support are particularly vulnerable to high winds and lightning. Accidents may be prevented if installations are made by experienced installers who use prime materials, conform to manufacturers' recommendations and conform to all building and electrical codes.

208. POOLS & BUILDINGS

Pools and their associated structures should never be constructed under electrical wires. Contact the Company during the planning stages of such projects so various options for relocating facilities can be evaluated.

209. CIRCUIT BREAKERS & SERVICE EQUIPMENT

The available fault current at a site must be known before circuit breakers and other service equipment which must interrupt and withstand such fault current magnitudes, can be specified. To safeguard your property, you are warned against sizing fuses or circuit breakers larger than National Electrical Code guidelines. You are also warned against using any technique to modify the operation of any protective device.

210. FALLEN WIRES

Fallen wires are particularly dangerous because they are often assumed to be deenergized. Do not hesitate to call '911' to report downed wires. Do not touch the wire, even with a tree branch or long pole. Prevent others from getting near the wire until a Company representative checks the situation. A downed wire is our highest response priority.

211. POLE SAFETY

In Delaware, Maryland, New Jersey and Virginia, electricians will not erect any structure like an underground cable riser or ladder higher than 10 feet high on Company poles. No work on Company poles at an elevation above 10 feet is permitted. The Company will perform all work above that 10-foot elevation. Contact the Company's local district operating center to coordinate any work involving Company poles.

CHAPTER 3 — EXTENSIONS & SERVICES

A. GENERAL Information

301. EXTENSIONS

The Company will extend its system up to the point of connection to the customer's service entrance under conditions outlined below and detailed in the Rules & Regulations section of the appropriate state Tariff. The extension of the Company's system may be on public or private rights-of-way. The last span of wire or run of underground cable will be considered the service. See Article 111-K for the definition of service.

302. CONNECTIONS

Service wires, underground service cables, meters and other Company equipment shall not be connected or disconnected so as to be energized or de-energized by persons other than Company employees.

B. EXTENSIONS

311. CONFORMITY

In general, extensions will conform to the existing facilities (overhead or underground) in accordance with regulatory commission regulations.

312. OWNERSHIP

The Company will own and maintain extension facilities, aerial or underground.

313. FINANCIAL PARTICIPATION

Owners of a building and residential, commercial and industrial developers must contact the Company while in the planning stage of their projects whether or not company facilities already exist at the construction site. Existing facilities may not be adequate to support the proposed project. The economic analysis of whether and to what extent the customer must participate financially in the cost of the extension varies from state to state within the Company's territory.

C. SERVICES - GENERAL

321. TAP LOCATION

The Company shall specify the pole or underground facility from which the service is run. In general, the customer's service entrance will be located near the closest front corner of the structure to the service tap location. The Company reserves the right to refuse service if the service entrance has not been placed at the location specified by the Company. The customer may have to pay the cost of modifications to Company facilities to accommodate the service entrance location or simply relocate his service entrance.

322. OVERHEAD TO UNDERGROUND CONVERSIONS

Where an overhead service drop to a customer exists and an underground service is requested, the company must be contacted to determine the location and routing of the service. Also, the proposed division of labor between the customer and the Company and the cost to be paid by the customer, if any, must be determined. In the event that the Company shall be required by a public authority to place overhead facilities underground, the customer will be responsible for the costs to modify his facilities to receive the new underground service.

323. OVERHEAD SERVICE ATTACHMENT

The customer shall provide and maintain a safe, substantial support for the Company's service drop wires. The anticipated steady state pull of the wires should never exceed 350 pounds. In no case shall the Company be responsible for the condition of any customer's structure or building to which service drops are attached. Figure 26 shows recommended methods and hardware required to provide adequately strong attachment hooks for various types of building materials. Parapet walls and chimneys are not satisfactory supports.

Some buildings may not be sufficiently high to allow attachment of overhead service wires given the fact that the Company must adhere to the ground clearance requirements of the National Electric Safety Code. An extension support above the roof may be required in order to provide the necessary clearances specified in Figures 15 and 16. The Company will, on request, provide approved designs and specifications for such supports. Sometimes a guyed pole may have to be installed near the customer's service entrance to provide necessary attachment height.

324. OVERHEAD SERVICE LENGTH

The maximum length of overhead service wires shall be limited to 100 feet to limit the tension on the structure at the attachment point. For heavy duty commercial or industrial service, this length may have to be shortened considerably. Always consult the Company for advice on how best to serve a structure using aerial wire. Sometimes an underground service may prove to be a better design.

325. PROTECTION FOR UNDERGROUND SERVICES

Customers may be required to provide conduit, size specified by the Company, when the proposed cable route is to be covered by paving, decks, stoops, patios, etc., prior to the installation of the cables. The conduit provides mechanical protection for the cables as well as facilitating their replacement without digging.

D. SERVICES-UNDERGROUND

331. OWNERSHIP – RESIDENTIAL

The Company, in general, will own all services in underground developments and most services not in such developments. However, there are private underground services, often in older homes built before underground services were offered. Sometimes research in Company records is the only way to determine ownership. The Company may, at the customer's request, assume ownership of private services if the facilities meet Company standards for construction. If the facilities do not comply, they may be upgraded at the customer's expense.

332. FINANCIAL PARTICIPATION

In all cases the owner or developer shall contact the Company before construction begins to satisfy the physical and financial requirements set forth in Section C above.

333. RESIDENTIAL INSTALLATIONS

- Underground services to residences will generally terminate in a meter enclosure mounted on the outside of the building. Contractors should mount the meter enclosure at the location specified by the Company as shown on Figure 1. The enclosure should be at a height where the top of the meter glass will be between 3 and 6 feet above the ground with three feet of horizontal clear area in front of the meter. Line and load side cable connectors for the meter box shall be provided by the box installer.
- Residential customers (in NJ ONLY) have the option to request Conectiv Power Delivery to install their underground secondary service cables, for a fee, or they can choose to install their own secondary cables.
- Residential customers (in NJ ONLY) that choose to install privately owned underground secondary cables will be required to install customer owned secondary cables from the meter socket out to a pole location designated by the company and on the side of the pole designated by the company.
- Residential customers will ONLY be required to install the 1st 10 feet of cable and conduit (in compliance with NEC requirements) up the utility pole. The remaining 35 feet of cable is to be coiled up and tied off at this level. The conduit is to be attached directly to the pole.

- Conectiv Power Delivery will provide, at No Cost, the labor and material to install a 2" or 4" PVC U-Guard over the existing conduit and cable provided by the customer and secure it from the 10-foot level up to the electrical system on the pole. The Customer will continue to own and maintain the entire secondary voltage cables and conduits.
- If the Customer chooses to install the cables in conduit along the entire length, the contractor must ensure that water, which may enter the conduit system, be drained out at appropriate locations. One way of accomplishing this is to drill a 1/2" diameter hole in the conduit to drain the water.

334. COMMERCIAL OR INDUSTRIAL SERVICE

- Underground service designs and electrical loads for commercial and industrial customers vary widely as does the responsibility for installing different portions of the service. Each design and construction plan must be examined by the Company to determine the customer's financial responsibility if any.
- All Commercial customers (except in the State of Maryland) requesting secondary cables underground need to have this work performed by a licensed electrical contractor at their expense.
- Commercial customers (except in the State of Maryland) need to have these cables installed from the meter socket or electrical panel (if Instrument Transformer rated metering is used) to a pole location designated by the company and on the side of the pole designated by the company.
- All commercial single-phase and three phase customers will ONLY be required to install the 1st 10 feet of cable and conduit (in compliance with NEC requirements) up the utility pole. The remaining 35 feet of cable is to be coiled up and tied off at this level. The conduit is to be attached directly to the pole.
- Conectiv Power Delivery will provide, at No Cost, the labor and material to install a 2", 4" or 6" PVC U-Guard over the existing conduit and cable provided by the customer and secure it from the 10-foot level up to the electrical system on the pole. The Customer will continue to own and maintain the entire secondary voltage cables and conduits.
- If the Customer chooses to install the cables in conduit along the entire length, the contractor must ensure that water, which may enter the conduit system, be drained out at appropriate locations. One way of accomplishing this is to drill a 1/2" diameter hole in the conduit to drain the water.
- For large commercial services that require 4 sets or more of 600MCM conductors or larger, *and if additional conduits need to be installed to a pole that already has existing conduits*, the electrical contractor must meet with a Company Representative before performing any work. The Company Representative will provide further instruction.

CHAPTER 4 — CUSTOMERS' INSTALLATIONS

A. GENERAL INFORMATION

401. PLANNING

The Company shall be consulted in conjunction with the planning of new installations and all changes to the service entrance equipment so that facilities of the proper capacity may be provided to assure satisfactory operation of the customer's equipment, and to protect both the customer's and Company's equipment against damage.

402. SHORT CIRCUIT RATINGS

The available short circuit current will vary from place to place within an electrical system. Customers' service equipment must be designed to withstand available short circuit currents. The Company can provide values for available short circuit current at locations on its system.

403. CONNECTIONS TO COMPANY FACILITIES

All connections to Company lines must be designed, installed and operated in a manner which will cause no undue disturbance to other customers or handicap the Company in maintaining proper operating conditions. Wiring and equipment, and its application, must be such as to permit proper metering and servicing. For instance, the Company requires individual main disconnect switches for multiple buildings served from the same transformer so that an individual building can be shut off without interrupting service to any other customers in other buildings.

B. SERVICE ENTRANCE

409. NATIONAL ELECTRICAL CODE

All service entrance conductors must be installed in accordance with the NEC. The service entrance conductors must be terminated in a manufactured service head if the facility is to receive an aerial service drop.

410. AERIAL SERVICE DROPS

Service entrance conductors shall extend at least three feet beyond the service head to permit the attachment to the service drop conductors with a drip loop. See Figure 15.

411. ATTACHMENT HOOKS

The customer is responsible for providing a device on a structure near the service head which has enough strength to hold the tension of the aerial service drop. In general, the tension in any individual wire or wire assembly such as triples is limited in steady state to 350 pounds.

412. SERVICE CAPACITY

A new or upgraded single family residence shall be wired with a three wire service entrance having a National Electrical Code allowable current carrying rating of not less than 100 amperes, and shall have service equipment of equal ampacity. The requirement shall also apply to each unit of a multi family dwelling and to mobile homes.

413. SAFETY

When an existing service installation is considered unsafe by the company, the customer shall have a reasonable amount of time to correct the condition or face being disconnected.

414. MULTI-UNIT DWELLINGS

All metering and disconnecting devices are to be arranged so that the service for each unit can be properly and independently controlled from a point readily accessible to both the customer and the Company. Additionally, each meter or disconnect shall be permanently marked with the address served by that equipment.

415. EXTERIOR MOUNTED SERVICE ENTRANCES

The entire length of cable or conduit shall normally be exposed with the exception of masts which sometimes pass through the roof in conduit. Covering with siding is not permitted.

416. COLOR CODING

For three phase 120/240 Volt services, the power wire or high leg (the phase wire having the highest voltage to ground – 208 Volts nominally) shall be located on the right side of the meter box and shall be identified by the color, orange. When parallel service conductors are run, conductors of the same phase must be identified as such.

417. BALANCING LOADS

The total load shall be balanced among the phases as nearly as practicable. This will keep the delivery voltages as closely balanced as possible.

418. HEAT/AIR CONDITIONING SERVICE

A separately metered, non-demand service, just for space heat and air conditioning, is available in Maryland and used to be available in Delaware. Many installations still exist in Delaware. Never connect new loads to the HVAC service entrance unless they are space heating or air conditioning.

C. SERVICE SWITCHES AND FUSES

409. TROUGHS

The company often supplies service to a speculative multi-tenant building using a trough installed by the builder. Specific service to a rental space can be obtained by tapping into the Company's service conductors in the trough. The electrical contractor shall make the connections in the trough. See Figure 28 for trough details. No metered conductors shall be in the trough.

410. SWITCHES / CIRCUIT BREAKERS

A service switch or circuit breaker shall be of a type and capacity approved by the inspection agency having jurisdiction and shall be installed for each meter. The available fault current value shall be obtained from the Company.

411. GROUPING OF SERVICE DISCONNECTS

Where group installations of two or more service switches or circuit breakers are made, each shall be legibly and permanently marked by the customer to indicate the address, apartment number or portion of the building associated with that device.

412. ISOLATING SWITCHES

An isolating switch with a visible break shall be installed by the customer on the line side of the meter for all self-contained 277/480 Volt meter installations and for all the 120/208 Volt self-contained meter installations served from the downtown secondary networks located in downtown Atlantic City and Wilmington. The Company should be consulted about specific requirements in these cases.

D. LIGHTING AND APPLIANCES

431. SINGLE PHASE SERVICE

Single phase service will normally be supplied at 120/240 Volts. However, areas of downtown Atlantic City and Wilmington are served by a 120/208 Volt secondary three phase network. Single phase 120/208 Volt service is supplied in these areas. Consult the Company to determine exactly which areas are served by the network. Special metering (See Figure 3) must be provided as well as appliances which would use the 208 voltage.

432.THREE PHASE SERVICE

Not all areas have three phase service. Some three phase areas are limited to just 120/240 Volt service. Consult the Company to determine what service voltage options are readily available. A cost to extend the facilities into certain areas may be incurred.

433. APPLIANCES

The voltage rating of appliances must correspond to the service voltage specified by the Company. If the customer is moving equipment from one site to another, make sure the voltage requirement for that equipment corresponds to the service voltage before operating it. Where voltages are dissimilar, 'Buck-Boost' transformers may be installed by the customer to customize the voltage to the equipment rating.

E. MOTORS — GENERAL

461. STARTING CURRENT

It is the characteristic of most electrical motors to draw large amounts of power for just an instant. This may result in objectionable dips in voltage supply to other customers who receive their service from the same circuit or transformer. In the interest of all our customers, it is therefore necessary for the Company to limit the value of the starting current which may be drawn through our lines by certain classes of motors. Motor starting accessories are available to reduce the starting current to acceptable values. Permissible values of motors are defined in later sections of this booklet.

462.EXCEPTIONS TO MOTOR START RULES

Some latitude in the permissible starting current of motors may be allowed under certain conditions, such as when motors are started less than three (3) times per day, when motors are supplied by large-capacity circuits and transformers, when motors are necessarily supplied by individual transformers on the customer's premises, etc. Limitations will be site specific. Refer questions to your nearest district's Engineering Department.

463. HORSEPOWER RATING

The Company must always be consulted in advance regarding motor installations above 5 horsepower single phase or above 10 horsepower three phase to insure that the proposed installation is acceptable and that adequate provision for power supply may be made by the time the equipment is ready to be placed in service.

464. MOTOR CIRCUITS

It is recommended that all motors be connected to circuits other than lighting circuits.

F. MOTORS — RESIDENTIAL

466. RATINGS

Motors in residences should be of types which produce low starting currents and high running power factors. Single-phase, 120 and 240 Volt motors will be permitted providing the starting current does not exceed 100 amperes. With environmental emphasis on efficiency of air conditioner motors, the Board of Regulatory Commissioners of New Jersey requires all new air conditioning equipment to have seasonal/energy efficiency ratio (S/EER) of 9.5 or greater for window units and above 12.0 for central units. A S/EER certification form must accompany all requests for service to new homes or commercial buildings. Delaware, Maryland and Virginia have no such formal requirements.

The more efficient the motor's running characteristics, the less efficient the starting characteristics in general. In recent years, even units as small as 2 Tons of refrigeration sometimes exceed the 100 ampere limitation. It is the responsibility of the installer to provide a starting aid to reduce the voltage dips produced by a motor not so equipped.

467.THREE-PHASE MOTORS

Three-phase 240 or 208 Volt service will not normally be supplied for residential service. Converters can be installed to provide a three phase output from a single phase input.

G. MOTORS — COMMERCIAL

470. THREE VS SINGLE PHASE

Historically the company has held the right to refuse service to single-phase motors in excess of 5 horsepower. However, the development of a 'Written Pole' motor has made it possible to start and run a single-phase up to 60 horsepower. This type of motor has a more gradual starting characteristic and is extremely efficient. Use of this type of motor can eliminate costs for the customer for the Company to extend three-phase service into an area where only single-phase was available.

The Company can also refuse three-phase service to customers having small motors which are readily available rated single-phase.

471. COMMERCIAL AREAS

When commercial installations are located in areas which are primarily residential or rural, they normally will be treated as covered by the previous section on "Motors - Residential". When commercial installations are located in an area which is primarily commercial, service may be rendered at any of the available supply voltages, at the option of the Company, depending upon size and character of the installation. The Company shall be consulted as to the voltage and number of phases of supply, and starting and running requirements for proposed equipment.

472. STARTING CURRENTS

In general on 240 or 208 Volt three-phase service, a 200 ampere maximum starting current will be acceptable. Higher values will be permitted only after investigation by the Company prior to installation. Generally, higher values may be permitted if the proposed starting current does not exceed that of existing equipment already served by the same facilities and the proper provision is made to insure that no combination of simultaneous motor starts will exceed the starting current of the largest single motor installed.

H. MOTORS — INDUSTRIAL

473. VARIABILITY OF INDUSTRIAL MOTORS

Because of the wide variety of equipment and methods of service, general rules for starting motors cannot be specifically outlined. Additions to existing installations can be made which will not increase the maximum starting current of the installation. In all other cases, the Company must be consulted as to maximum allowable starting currents.

I. MOTOR PROTECTIVE DEVICES

474. REDUCED VOLTAGE STARTING

Motors equipped with reduced voltage starters that cannot be safely subjected to full voltage at starting should be provided with a device to insure that, on the failure of the supply voltage, the motor will be disconnected from the line or the starter returned to the "off" position, unless the motor is equipped with an automatic starting means. To prevent unnecessary shutdowns, it is recommended that this starter be equipped with a time delay feature to prevent the starter from dropping out and to permit the motor to continue to operate during a momentary voltage change.

475. OTHER PROTECTION

The direction of phase rotation and the continuity of all three phases of the supply are carefully maintained by the Company; however, the Company cannot guarantee against the accidental or temporary change or failure thereof. Therefore, motors or other apparatus requiring unchanged phase rotation or continuity of three-phase supply should be equipped, by the customer, with suitable three-phase protection against reversal or loss of phase.

J. WELDERS

476. PROBLEMS WITH WELDERS

Welders and arc furnaces operate in much the same way by creating a high impedance short circuit to ground. Harmonics are produced which can have adverse effects to electronic appliances. In every case the customer or contractor shall consult with the Company concerning the electrical supply to electric welders before any commitments for their purchase or installation are made.

K. GENERATORS

477. EMERGENCY STANDBY GENERATION

The Company must always be consulted concerning the installation of any electric generating equipment. In all cases of emergency standby generation (Non-Co-generation) a double throw switch shall be installed between the generator and the Company's supply, to prevent the generator from being connected to the Company's system. Since the Company's wires are likely short circuited or grounded, the customer's generator would be subjected to a short circuit. The generator would pose a threat to persons working on the lines. Closed transition switching may be permitted for restoration to the utility system after a customer & equipment specific evaluation is made by the Company. Portable generators may only be used with the service conductors physically disconnected from the utility system to prevent any possibility of backfeed onto the utility system.

478. CO-GENERATION

In the case of co-generation or small power producers, the electrical connection to the utility system must be reviewed by the Company. A brochure detailing the various types of connections to the utility are available upon request.

L. POWER FACTOR CORRECTION

479. ECONOMICS OF POWER FACTOR CORRECTION

Attention is called to the desirability and importance of maintaining the power factor of any load as near to unity (100%) as possible. The maintenance of high power factor using appropriately sized capacitors near the loads will increase the overall operating efficiency of conductors and equipment. In states where the rates are designed with a power factor clause, customers can reap rewards through the rate structure for high power factor and pay a penalty for low power factor. See the Electric Tariff of the appropriate state for details and calculations. Where large motors are to be installed, consideration should be given to the use of synchronous motors or applying capacitors.

M. TRANSFORMER VAULTS AND PADS

479. VAULTS

Where conditions are such that it is necessary to install Company owned transformers within the customer's facility, the customer must provide a suitable vault. Vaults must be of standard fireproof construction and adequately drained and ventilated. Dikes must be provided around liquid filled equipment to prevent leaks or spills from migrating. The National Electrical Code governs certain parameters of vault construction. Because of their cost and access problems, outdoor pad mounted equipment is preferred to indoor vaults.

480. RESTRICTED USE OF VAULTS

Transformer vaults must contain only transformers and their auxiliary equipment. The customer's secondary fuses, circuit breakers and the Company's meters shall not be installed in the transformer vault. The vault is not to be used for storage and access by unqualified personnel is prohibited.

481. PLANNING

Customers are required to consult the Company regarding the location and construction of vaults and transformer pads while the building plans are being drawn.

482. SECURITY

The customer must provide suitable locks for the sole use by the Company for access to all vaults. Company provided lock boxes may be installed for the storage of appropriate access keys.

483. PADS

Poured or pre-cast concrete pads for Company equipment may have to be provided by the customer in certain situations. The Company will supply any necessary drawings for the installation of any necessary company owned pads. Outdoor pad mounted equipment may be made less noticeable by using landscaping or other architectural treatments. It is important to consult with the company to insure that none of the planned camouflage will interfere with the equipment's operation.

N. SUBSTATIONS

479. PLANNING & DESIGN

The Company shall always be consulted regarding the location, layout and key design features of customer owned substations before the plans are completed.

O. MULTI-STORY BUILDINGS

490. FACILITY PLACEMENT

Service requirements for multi-story buildings will vary depending upon loading, voltage and physical characteristics. The Company shall be consulted when such buildings are in the design phase so that a suitable electrical distribution system can be established.

P. METERING ON A PRIVATE STRUCTURE

496. DISCONNECTING MEANS

Where Company service terminates at a privately owned pole or structure and is metered at that point, a disconnecting means should be provided on that same structure by the customer on the load side of the meter. (Examples: farmstead, mobile home, estate and pertinent attached buildings). If service is furnished at 277/480 Volts or from a secondary network system, a disconnecting means ahead of the metering must also be provided.

Q. SENSITIVE ELECTRONIC EQUIPMENT

496. PROTECTION

Electronic equipment such as computers, video/audio equipment, industrial process controllers, should be protected from electrical noise and surges. In certain types of installations they should be protected from each other by isolating them on dedicated circuits. Due to the inability of the Company to completely control many disturbances such as lightning, static electricity and even sources within the customer's facility, power conditioning equipment is recommended to insure product reliability. When momentary power interruptions occur, the installation of a battery powered uninterruptable power system (UPS) can prevent a malfunction of the electronics. Contact the Company if you would like additional information or suggestions.

R. CUSTOMERS' USE OF SERVICE

496. DISTURBANCES

Electric service must not be used by a customer in a manner as to cause unusual fluctuations or disturbances in the Company's supply system. Should such disturbances be caused by the customer, the Company may require the customer to modify his installation and/or install approved controlling devices. Failure by the customer to implement corrective measures will constitute cause for the Company to discontinue service.

497. LOAD BALANCE

Where Commercial or Industrial service is rendered, the customer shall at all times balance the load on the available phases. Should the customer choose to operate an unbalanced system, the Company reserves the right to compute the customer's billing demand on the basis that the load on each phase is equal that on the most heavily loaded phase. The effect of load unbalance on voltage unbalance which can cause overheating in motors should serve as incentive to the customer to balance loads.

CHAPTER 5 — METERS

A. GENERAL INFORMATION

501. NUMBER OF METERS

The Company will normally furnish, install, maintain and own one set of metering equipment for measurement of electric service supplied under each contract. Adding a new metered service to a location which is already metered in order to accommodate a new load is not a substitute for upgrading the existing service entrance equipment.

502. ACCESS

The authorized agents or representatives of the Company having the proper Company identification shall have access at all reasonable times to the premises of the customer for the purpose of inspecting, removing or repairing any property of the Company situated thereon.

503. METER BOX SUPPLY

With the exception of 100 and 600 amp units, self contained meter boxes are not supplied by the Company. Local electrical distributors stock the Company approved meter box and may also stock the less common 100 and 600 amp boxes. Due to the fact that the 100 and 600 amp boxes may be difficult to buy, they may be purchased from the Company along with the specialized connectors for the 600 amp box. The company may refuse to install a meter in an unapproved box. All cables entering a meter box mounted outside shall enter the box through a weatherproof connector.

504. OWNERSHIP

Meters, which may include meter mountings, enclosures and other equipment furnished by the Company, remain the property of the Company. No person except a duly authorized representative of the Company shall make any connection or disconnection, either temporary or permanent, between service load of the customer and the service wires of the company; or set, change, remove or interfere with or make any connections to the Company's meter or other property or any wiring between the Company's meter and the service wires of the Company.

505. INSTALLATIONS PROHIBITED

Meter enclosures, meter mounting devices or instrument transformer cabinets that may be furnished by the Company will be installed by the customer at no expense to the Company. In no case shall any meter enclosure be used as a junction or distribution box. No service equipment ground wires may be run through or attached to meter equipment enclosures.

506. INSTRUMENT RATED METERING

Services with loads too large to flow through a conventional socket meter require the use of low voltage instrument transformers installed in cabinets or switchgear. The cabinets will be supplied, owned and maintained by the Company, and installed by the customer's electrical contractor at a location to be approved by the Company. In no case will the Company supply instrument transformer compartments located in a customer's switchgear.

507. EXCESSIVE METERING COSTS

The cost of instrument rated metering is far more expensive than a socket meter. Customers installing oversized services, where the Company's experience is that the load can be served with a socket meter, may be charged for the excessive cost to the company for the unnecessary metering capacity.

508. CONDUIT

In all cases involving instrument transformers in cabinets or switchgear, the conduit for the secondary wiring to the meters will be furnished and installed by the customer's contractor. The instrument transformers and associated wiring will be by the Company.

509. RESALE OF ELECTRICITY

Resale of bulk metered electricity may be permissible under provisions of the Tariff of a particular state. Contact your local Company office for more information.

510. AESTHETICS

See Figures 33 & 34 for some ideas for how to make meters less obvious. All ideas should be presented to the Company for approval before starting the work to make sure there are no problems. In general the Company is very supportive of efforts to make meter installations more aesthetically pleasing.

B. METER LOCATIONS

512 ACCESS

Meters shall be suitably located in a clean, adequately lighted and safe place free from vibration and shall be accessible from the outside for the convenience in reading, testing and repair. The preferred location for metering is outside. If located inside in a meter room, a Company provided lock box may be installed to house the appropriate keys to obtain access to the room.

513 JUMPERS

Without prior approval of the Company, the use of jumpers is forbidden. When approved, the jumpers must be compatible with the equipment being jumpered.

514 LOCATIONS IN GENERAL

In all cases, approval for meter locations must be obtained from the Company before installation. Meter locations above the first floor are not normally approved. The top of socket meters located outdoors should be no more than 6 feet above grade and no less than three feet. If located in an indoor meter room the height of the center of the meter can be reduced to two feet. When it is necessary to install meters adjacent to a walkway or driveway, clearance of 6-1/2 feet to the bottom of the meter should be provided to insure persons will not hit their head on the meter. At least 3 feet of unobstructed space in front of the meter must be provided. Sufficient space to permit full opening of all meter cabinet doors is required.

Meters are not installed on company poles except when authorized by special agreements covering such attachments.

515. ATTACHMENT TO SUPPORTING STRUCTURE

It is necessary that the metering equipment be rigidly attached to the customer's structure or building. Figures 1 and 24 illustrate typical attachments. When attaching to masonry walls, do not use plastic anchors. Instead use lead anchors with compatible machine bolts. The meter box must also be plumb and level before the meter will be set.

516. MULTI-METER INSTALLATIONS

Multi-meter installations for customers such as apartment buildings, office buildings, commercial buildings or industrial customers, where there is a large number of meters or the equipment is especially bulky, should be installed outdoors if possible. However, if this is not possible, the company may approve a suitable alternate location. Often such installations are facilitated by using a trough (see Figure 28) and meters are tapped into the service bus conductors in the trough. Multiple individual service entrance cables run up the wall from individual meter boxes to the attachment of the aerial service wire are less desirable than running one or two large cables down the wall into a trough. It may become impossible to connect too many individual service entrance cables to one aerial service wire.

517. SAFETY

If the interior of the meter devices is exposed to the weather or if the terminals are energized, it must be temporarily protected. Temporary covers will be given to electricians to facilitate this protection. It is very important to notify the Company if you energize a new meter box and just cover it. A Company employee will either install the meter and seal the box or will seal the protective cover. A covered but unsealed energized meter box is potentially dangerous if tampered with. Replacement of a meter box is required if the locking mechanism is not functional.

Unauthorized removal of meter locking provisions by someone other than a Company employee implies tampering or theft of service. In addition to breaking the law, the act can be hazardous to both the perpetrator or a curious person who always wanted to see the inside of the meter enclosure. The Company recognizes that, under certain circumstances, an electrical contractor may need to break the seal and remove the meter. Notify your local Company district office to insure that the meter is properly sealed as soon as possible.

518. PRIMARY METERING

Customers with large loads often choose to be served and metered at the Company's medium or high distribution (primary) voltage. Such customers (primary metered) are usually required to install a high voltage group operated load break switch behind the high voltage metering. This is a requirement of the National Electrical Code (Rule 230-205 b), not a company rule. Check with your local Company district office.

C. GROUP METERING

519. IDENTIFICATION

When multiple meters are grouped together, it is usually difficult to determine what meter position feeds a particular address. For this reason the contractor must indelibly mark the unit number or the address on both the outside and the inside of the meter box. It is most important that the inside be marked since box covers can sometimes be swapped. Meters shall not be set unless the permanent marking has been done.

520. MANUFACTURED METER ASSEMBLIES

Usually when the exact number of customers for a building is known, a manufactured meter box assembly is specified. It is not as flexible for adding meters as is the trough arrangement previously discussed. Some large group metering installations can create problems for our meter readers. Before buying a specially built group meter enclosure, consult the Company.

521. PROTECTION

If more than 6 meter locations exist for a single service, a main disconnect ahead of all the meters must be provided. If service cable is to be run to a unit through the building, it must be protected by a fuse or circuit breaker.

522. TROUGH FED METERING

Where individual meters are fed from a trough, in no case shall there be metered and un-metered conductors in the same trough. All connections in the trough must be made by the customer's electrician.

D. METER CONNECTIONS

530. SOCKET METERS

Customers shall furnish and completely install suitable wiring within the meter box. Line side wiring goes to the top connections and load side connections to the bottom. When an underground service is supplied to the meter box by the Company, those wires will be run into the meter box and connected by the Company. The meter will be furnished and installed by the Company.

531. INSTRUMENT RATED SERVICE

The Company will provide and install the test block and all secondary wiring from the instrument transformers to the meter. The instrument transformers furnished by the Company for the job and the service cables are installed by the electrical contractor.

532. FIFTH CLIP

Where single-phase 120/208 Volt service is available and approved, a meter mounting device with 5 terminals is required. See Figure 3. The fifth terminal may be obtained from the meter box supplier and shall be installed in the 9 o'clock position.

533. PHONE CONNECTIONS

Whenever a large power customer is added or an existing large power customer is making substantial modifications to his equipment, the customer must provide a " minimum thin-wall conduit with pull line from the metering to a source of telephone access. The specifics of this installation vary between regions of the Company, so contact your local district office for details. The more sophisticated metering used for the large power customers has the capability of phoning in accumulated readings.

CHAPTER 6 — TEMPORARY ELECTRIC SERVICE

A. GENERAL INFORMATION

601. DEFINITION

Temporary service is service, ordinarily not recurrent in nature, required for construction of a project. Single or three-phase service is available. Although temporary services fall into a wide range of sizes, the most common size is 100 Amp or smaller, single phase. Typically the service wire supported on private structures is #4 aluminum triplex. Larger wires require stronger supports. So, the text and drawings pertaining to temporary service refer to the most common type. For the specific requirements for higher capacity and/or three phase service, consult with the Engineering personnel at the Company's local district office.

602. PREREQUISITES

Temporary service will be rendered only when and where the Company has the necessary facilities available to deliver the requested service, without detriment to the service of other customers.

603. COSTS

Extensions from the Company's existing lines and the entire cost of connecting and disconnecting service must be paid by the customer prior to the installation of facilities.

604. LOCATION

All temporary service locations will be designated by a Company representative.

605. SAFETY

No temporary pole or wire installations may be moved while the Company's service is either energized or attached. Since construction sites often have large equipment traveling the site and large material deliveries, the service will be turned off and back on to facilitate safe conditions at the site. Service wires, meters and other Company equipment shall not be connected or disconnected so as to be energized or deenergized by persons other than employees of the Company unless prior approval has been obtained and the person is qualified to do the work required.

B. OVERHEAD

607. CUSTOMER'S SERVICE POLE

A pole or timber to which the Company deadends a temporary overhead service for supplying a construction project shall be supplied and erected by the customer's contractor and shall meet the Company's minimum requirements as outlined in Articles 608 to 614.

608. ROAD CROSSING

If the Company's service wires will cross a public street or highway, the support must be a treated pole of Class 6 or larger. A Class 6 pole has a minimum diameter at the top of 5.4 inches.

If the service will not cross a public highway or street, the support may either be a treated pole or timber. If a timber is to be used, it shall be structural grade fir or pine with a cross section not less than 5-1/2 inches by 4-1/2 inches (nominal 6" x 6"). Three nominal 2" x 6" boards are acceptable if bolted together with a minimum of 2 through bolts with washers.

609. POLE / TIMBER SETTING DEPTH

The pole or timber shall be long enough so that, when set to the proper depth, it will provide a suitable location for the attachment of the Company's service at a sufficient height to insure compliance with the clearances shown on Figures 12, 13 and 15.

610. GUYING / BRACING

The pole or timber shall have inherent strength or be adequately guyed to support the service conductor. Braces are to be 2" x 4" nominal lumber well spiked into the pole or timber at least 10 feet above the ground and to solidly driven 2" x 4" stakes. For 1/0 triples or larger, installation of a guy wire to an anchor in the ground may be required depending on the span length. Consult Engineering at your nearest district office.

611. LOCATION

The customer's pole or timber must be at a location approved by the Company.

612. WIRE / SPAN

Temporary services will normally be three-wire, 120/240 Volt and limited to one span of 100 feet provided proper ground clearance can be maintained. It is important to note that wires must be installed with sag or they will exert too much force on deadend structures. Sags in larger wires or longer spans are greater and compromise vertical ground clearance. Before placing the pole contact the Company.

613. DRAWINGS

Temporary service poles shall be wired as shown in Figures 12 and 13.

614. MATERIAL SUPPLIED

All equipment except the meter shall be furnished and installed by the contractor.

615. INSPECTION

The entire customer installation, including grounding, must be approved by a recognized inspection agency.

C. UNDERGROUND

616. GENERAL

When a customer requires a temporary service from an underground distribution system, the pole or timber with service equipment shall be installed by the contractor and shall meet the requirements in Articles 617 to 623. **IMPORTANT:** Before digging for the post and before driving the ground rod, have the underground electric facilities marked by the local 1-call utility locating service.

617. CUSTOMER'S SERVICE POLE

The support shall be a treated pole or structural timber with a cross sectional area of not less than a nominal 4" x 6" or a 2" x 12" board.

618. LENGTH

The pole or timber must be of sufficient length to be installed in the ground far enough to make the support sturdy against accidental damage, approximately 30". See Figure 14.

619. LOCATION

The pole or timber must be at a location specified and approved by the Company, and will be normally located not less than 5 feet and no more than 10 feet from an existing pad mounted transformer, secondary pedestal or splice box. See Figure 14.

620. CABLE & CONDUIT INSTALLATION

The contractor will provide conduit down the pole or timber from the meter box to a distance approximately 8 inches below grade, and enough underground cable to reach the Company's transformer or splice box. The contractor must dig the trench from the support to within 3 feet of the Company's facility at a minimum depth of 12 inches.

621. CABLE SIZE / TYPE

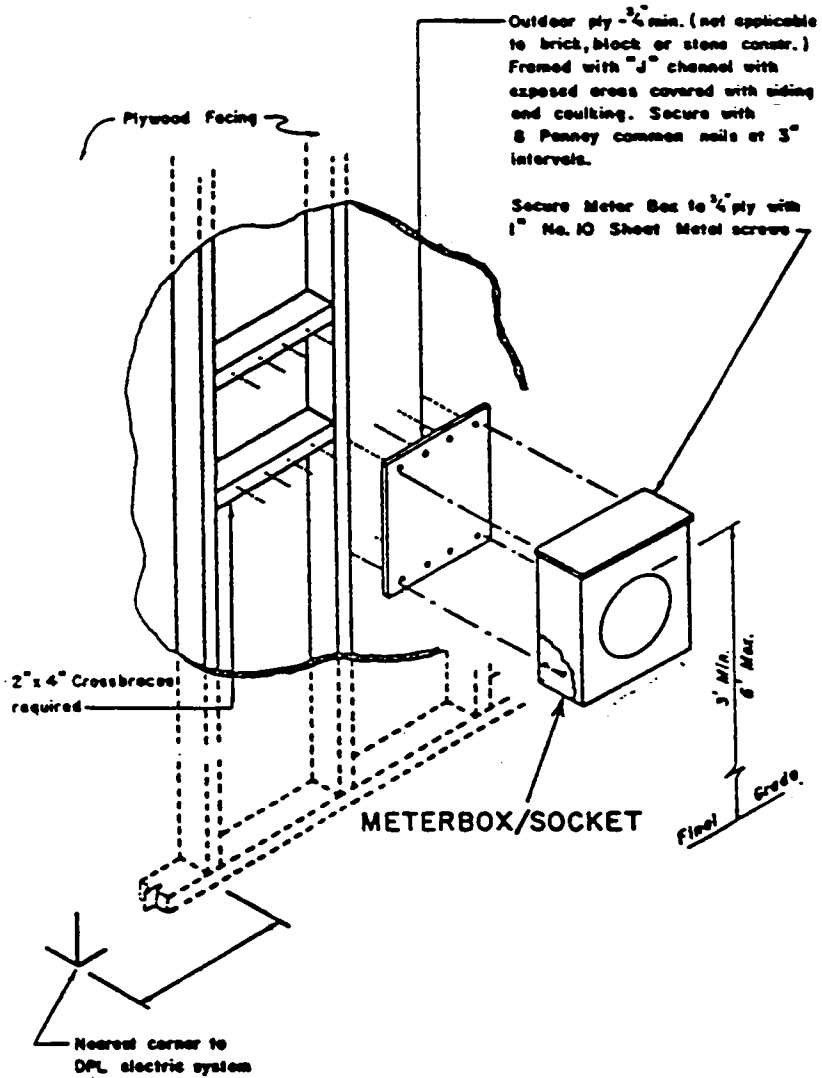
The underground cables must be 600 Volt rated and approved for direct burial. The cable provided by the electrician must be of sufficient length to reach to the splice box or the transformer's low voltage compartment (the far right side as you face the transformer) and sweep up to the terminals. The minimum cable size will be #2 AWG aluminum.

622. MATERIAL / SUPPLIES

All equipment except the meter shall be furnished and installed by the contractor.

623. INSPECTION

The entire installation, including grounding, must be approved by a recognized inspection agency.

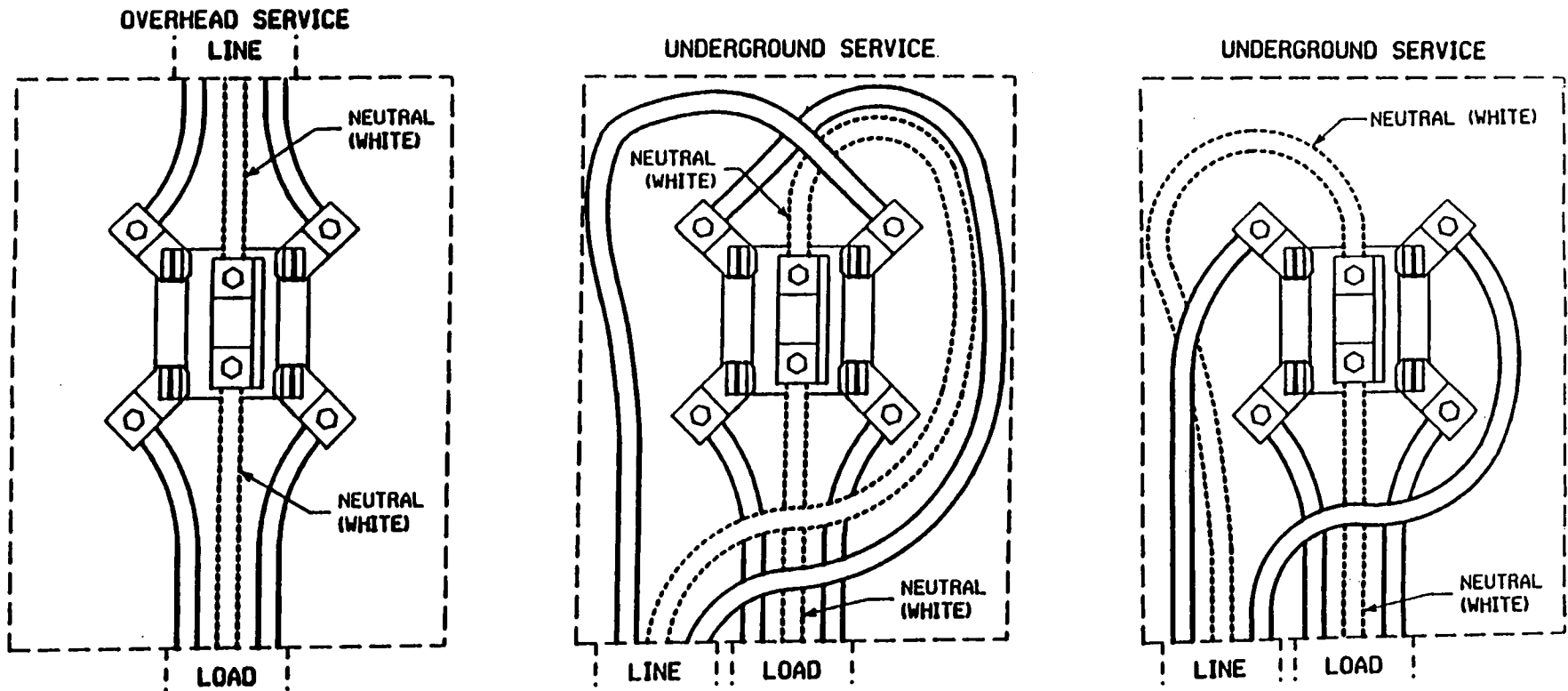


NOTE: Plastic anchors/plugs shall not be used with any construction type

**Meter installation for new construction
 400 Amp. Maximum**

Fig.1

SINGLE PHASE, 3 WIRE, 120/240 VOLT
METER WIRING DIAGRAM
200 AMP.

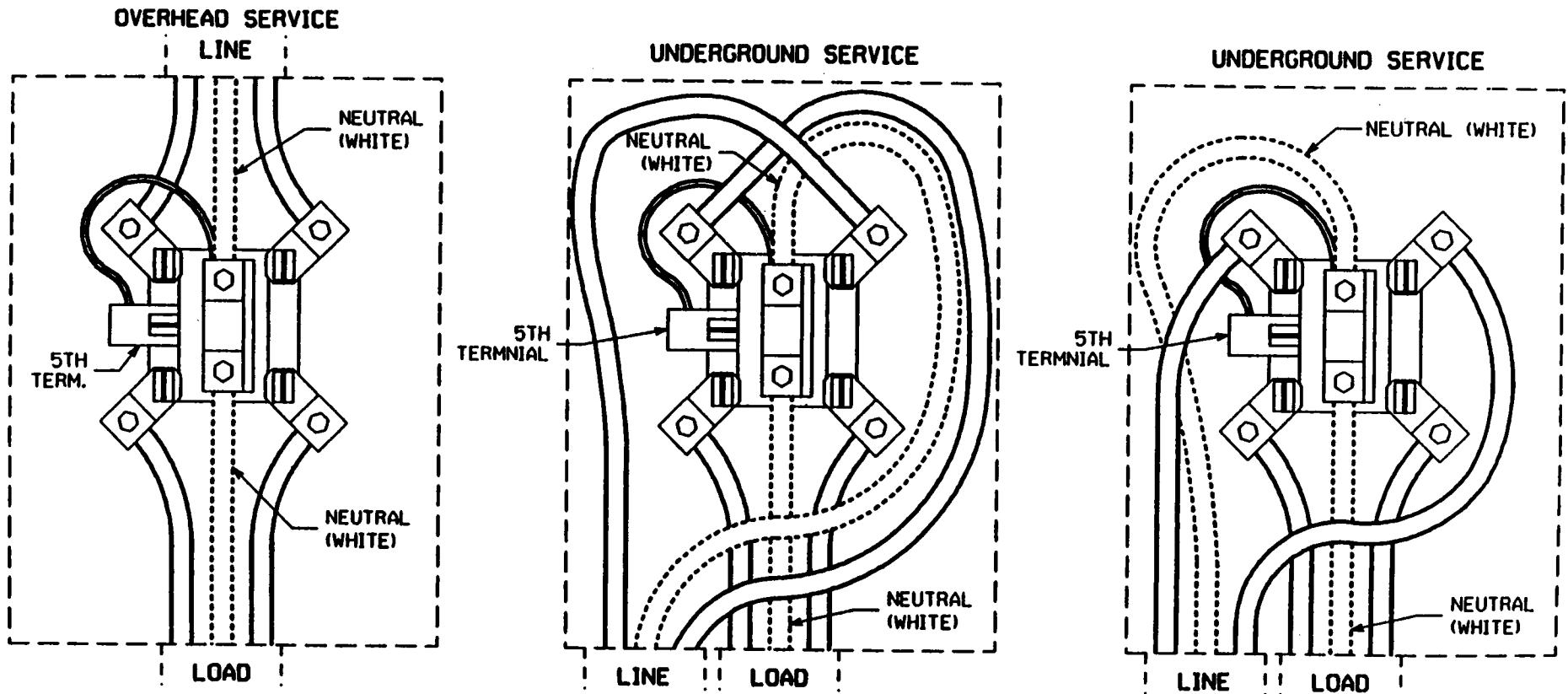


MWD1.DGN

FIG. 2

ALL 200 AMP SINGLE
PHASE BOXES IN NEW JERSEY
WILL HAVE A 5TH CLIP
(SEE FIGURE 3)

SINGLE PHASE, 3 WIRE, 120/208 VOLT
METER WIRING DIAGRAM
200 AMP.



NOTES:

1. A line side isolating switch with visible break for the exclusive use of CONECTIV is required on all 120/208V services fed from the downtown Wilmington secondary network.
2. The fifth terminal as shown shall be provided by the electrical contractor.

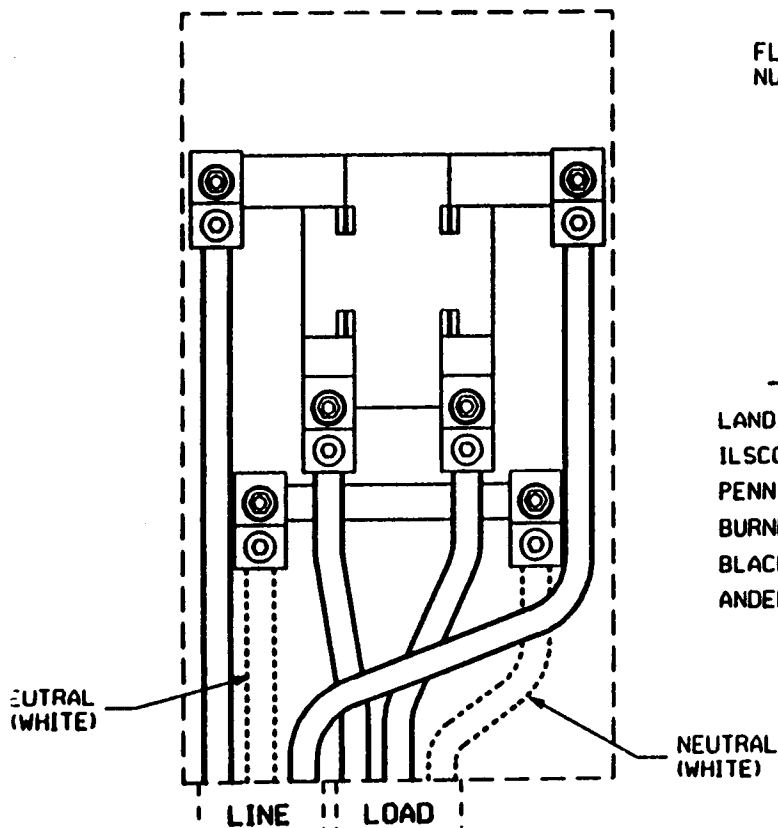
12/98

FIG. 3

**SINGLE PHASE, 3 WIRE, 120/240 VOLT
METER WIRING DIAGRAM
320 AMP. UNDERGROUND SERVICE**

**NOT AVAILABLE
IN NEW JERSEY**

SINGLE CONDUCTOR 500 kcmil MAX.



CAUTION

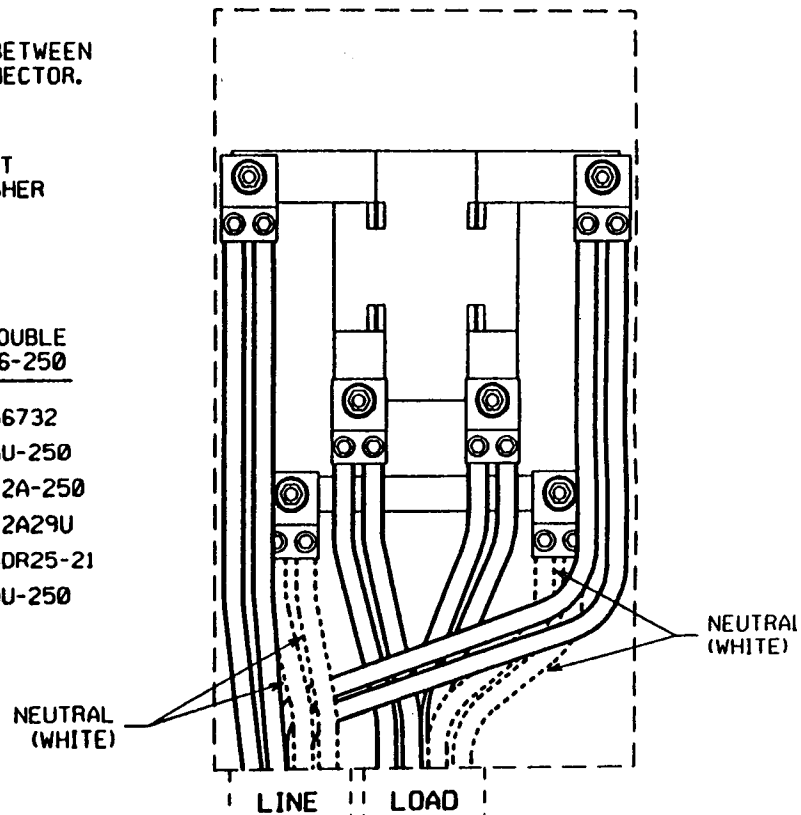
FLAT WASHER MUST BE PLACED BETWEEN
NUT/WASHER ASSEMBLY AND CONNECTOR.



CONNECTOR TABLE

MFG.	SINGLE #4-500	DOUBLE #6-250
LANDIS & GYR	56477	56732
ILSCO	TA-500	AU-250
PENN UNION	LA-500	L2A-250
BURNDY	KA34U	K2A29U
BLACKBURN	ADR50	ADR25-21
ANDERSON	DA-500	DU-250

PARALLEL CONDUCTOR 250 kcmil MAX.



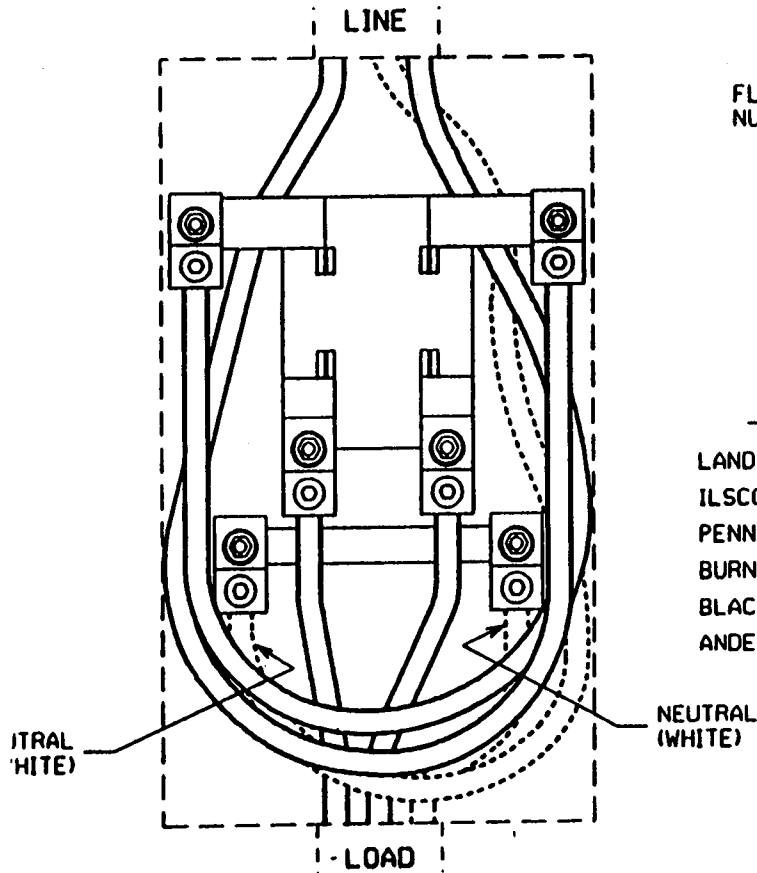
NOTE: CONNECTORS SHALL BE SUPPLIED BY CUSTOMER - SEE TABLE.

SINGLE PHASE, 3 WIRE, 120/240 VOLT
 METER WIRING DIAGRAM
 320 AMP. OVERHEAD SERVICE

NOT AVAILABLE
 IN NEW JERSEY

SINGLE CONDUCTOR 350 kcmil MAX.

PARALLEL CONDUCTORS 250 kcmil MAX.



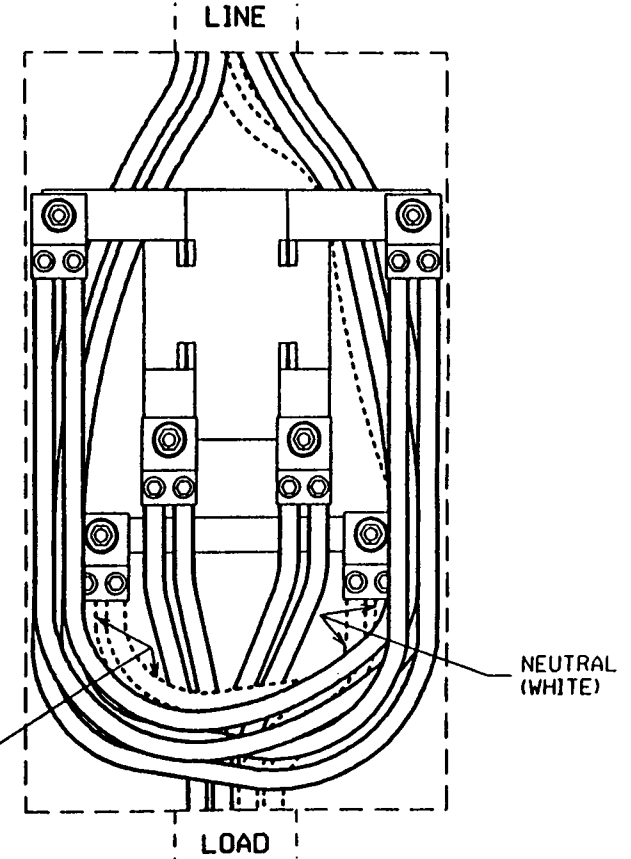
CAUTION

FLAT WASHER MUST BE PLACED BETWEEN NUT/WASHER ASSEMBLY AND CONNECTOR.



CONNECTOR TABLE

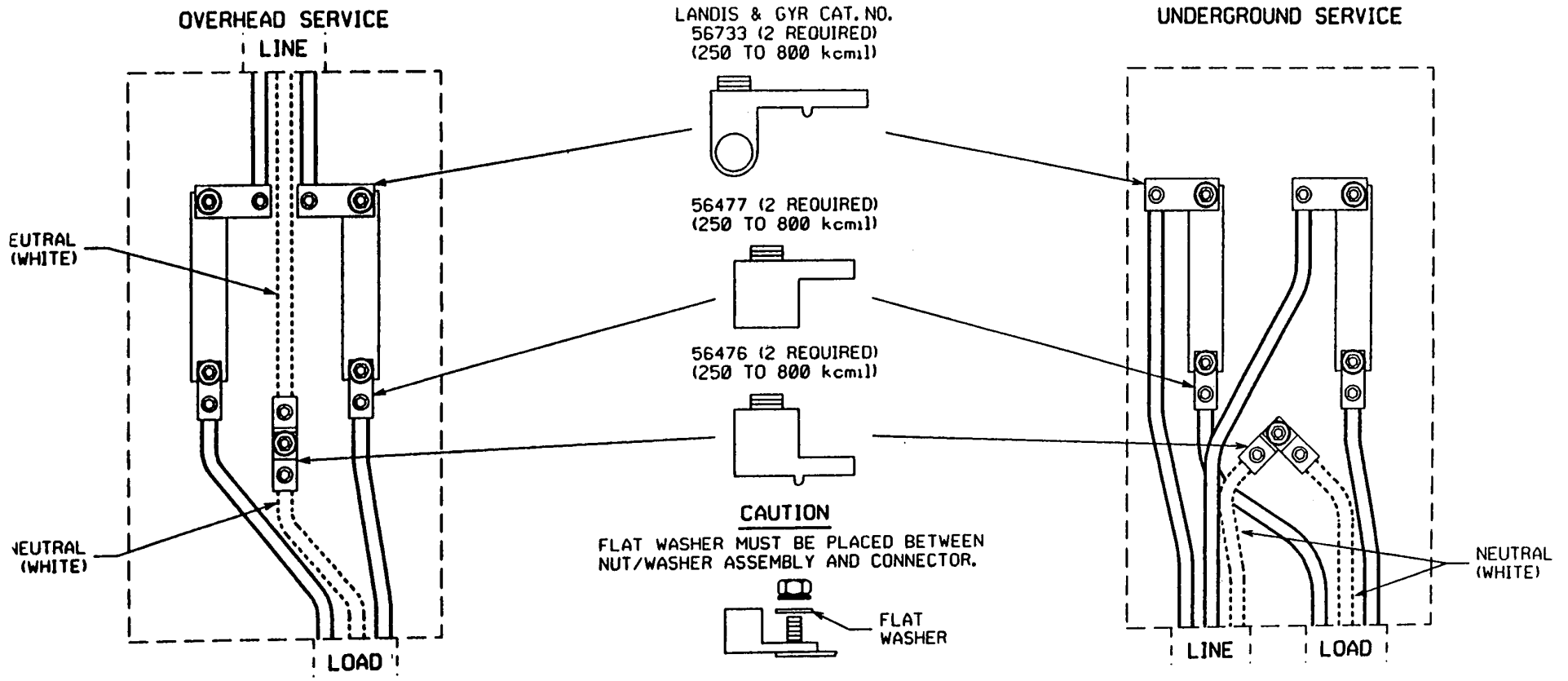
MFG.	SINGLE #4-500	DOUBLE #6-250
LANDIS & GYR	56477	56732
ILSCO	TA-500	AU-250
PENN UNION	LA-500	L2A-250
BURNDY	KA34U	K2A29U
BLACKBURN	ADR50	ADR25-21
ANDERSON	DA-500	DU-250



NOTE: CONNECTORS SHALL BE SUPPLIED BY CUSTOMER - SEE TABLE.

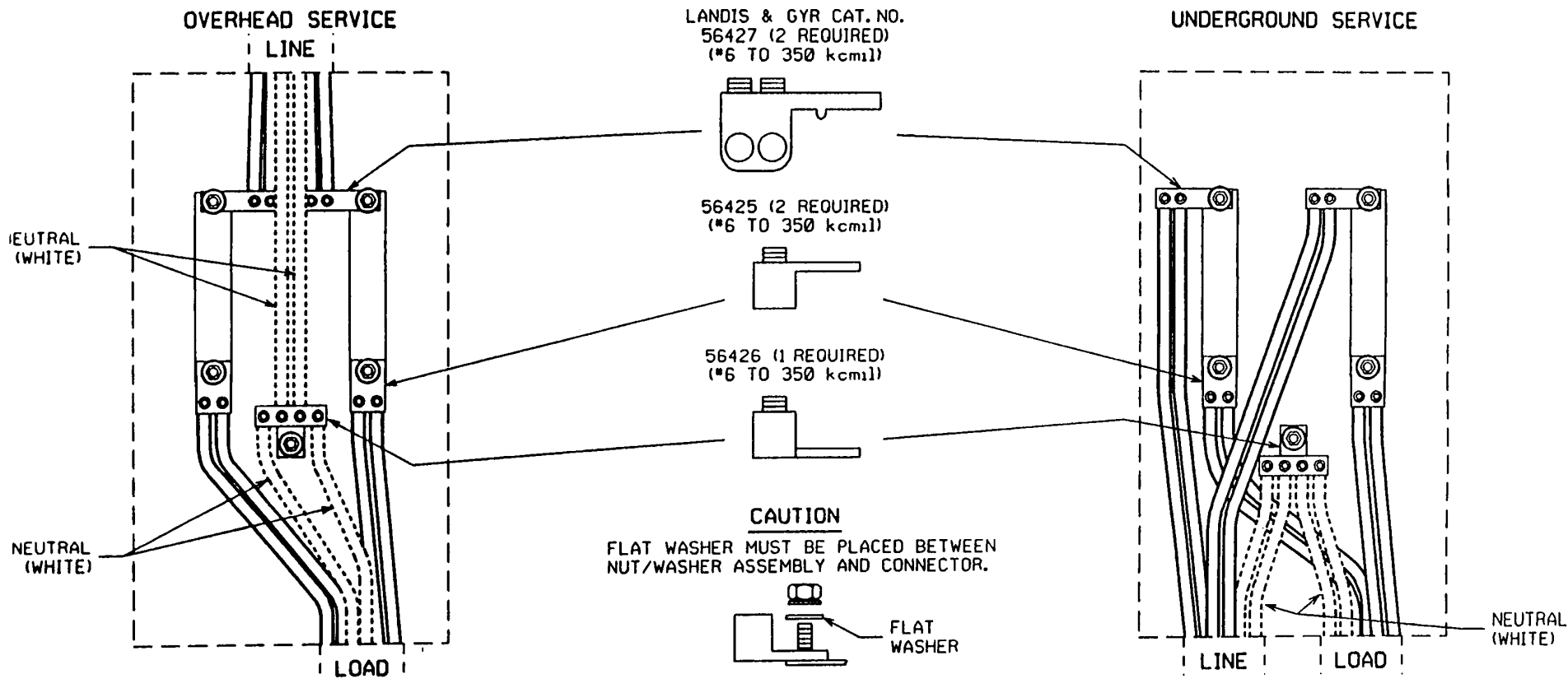
FIG. 4B

**SINGLE PHASE, 3 WIRE, 120/240 VOLT
METER WIRING DIAGRAM
400 AMP. SINGLE CONDUCTOR**



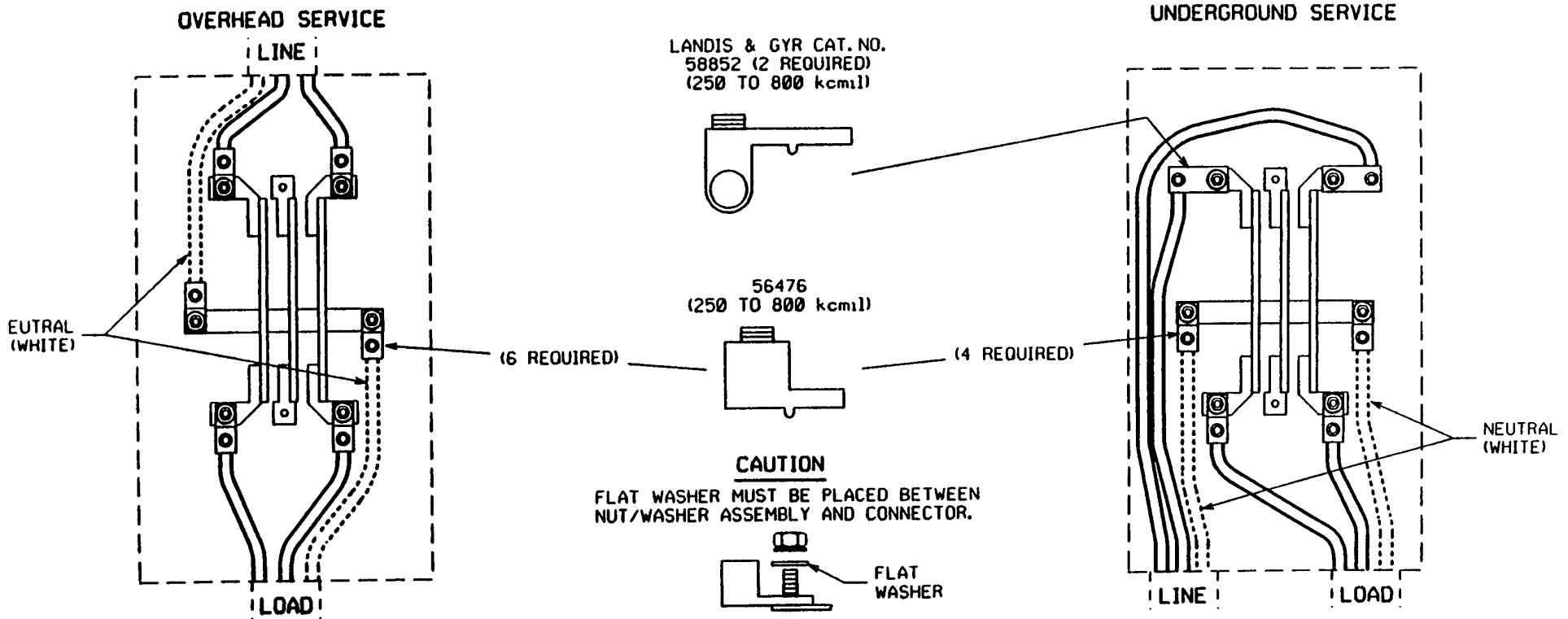
NOTE: THE LANDIS & GYR CONNECTORS SHALL BE PURCHASED BY THE CUSTOMER.

SINGLE PHASE, 3 WIRE, 120/240 VOLT
METER WIRING DIAGRAM
400 AMP. PARALLEL CONDUCTORS



NOTE: THE LANDIS & GYR CONNECTORS SHALL BE PURCHASED BY THE CUSTOMER.

SINGLE PHASE, 3 WIRE, 120/208 VOLT
METER WIRING DIAGRAM
400 AMP. SINGLE CONDUCTOR
WITH A 400 AMP. THREE PHASE SOCKET



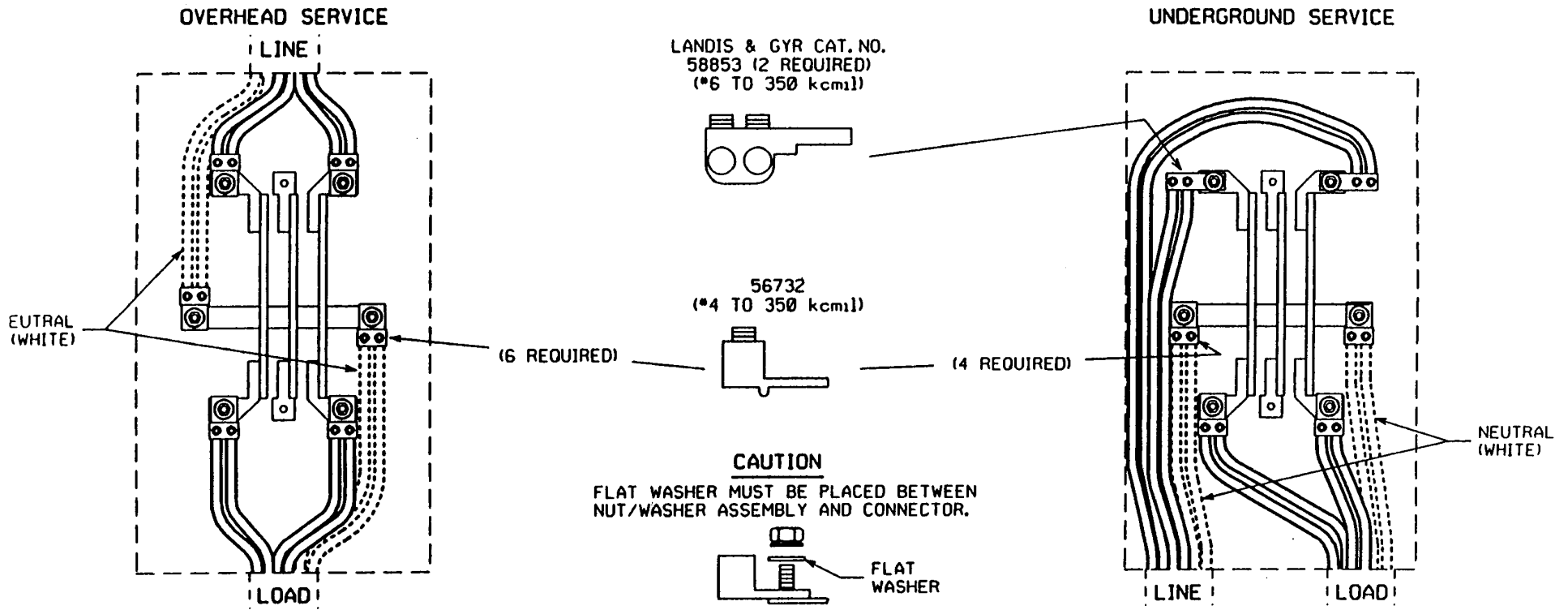
NOTES:

1. The connectors for this box shall be approved by the box manufacturer and shall be furnished by the Electrical contractor.
2. A line side isolating switch, with a visible break, is required for the exclusive use of CONECTIV on all 120/208 volt services fed from the downtown secondary network in Wilmington.

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FIG. 6A

SINGLE PHASE, 3 WIRE, 120/208 VOLT
METER WIRING DIAGRAM
400 AMP. PARALLEL CONDUCTORS
WITH A 400 AMP. THREE PHASE SOCKET

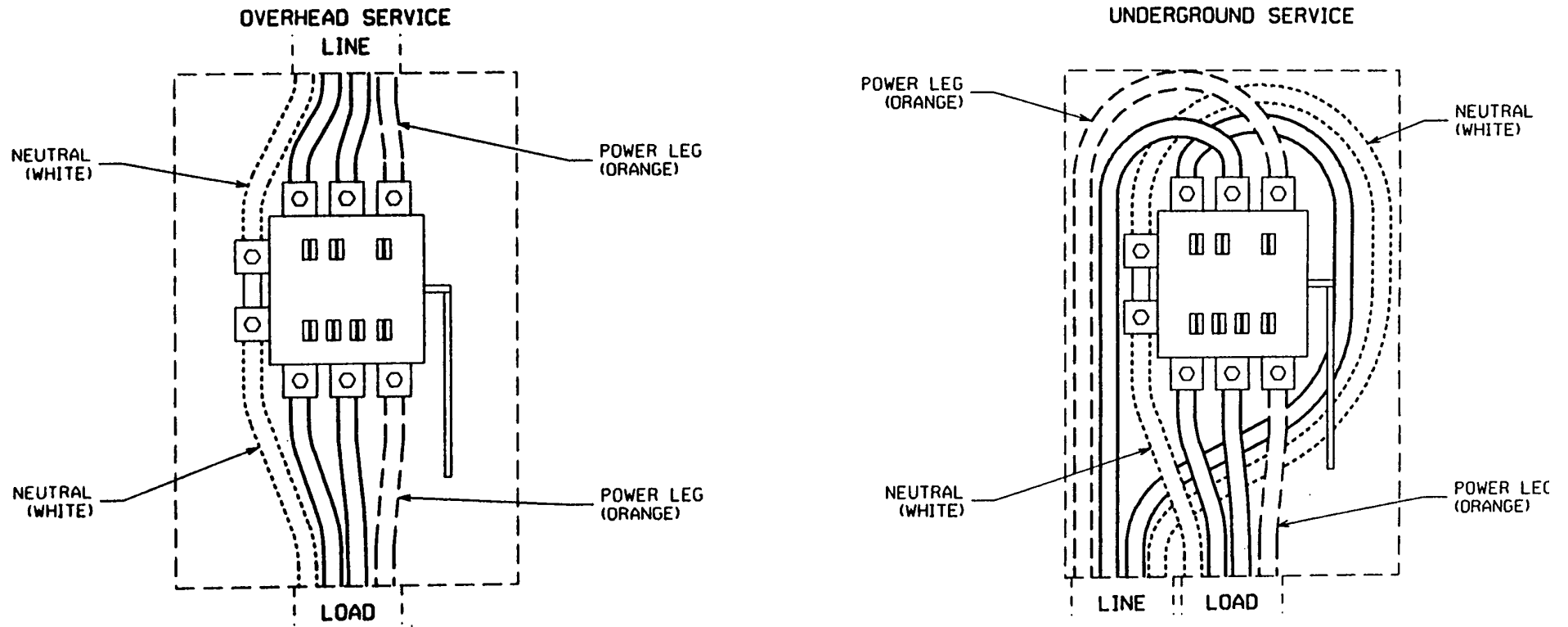


NOTES:

1. The connectors for this box shall be approved by the box manufacturer and shall be furnished by the Electrical contractor.
2. A line side isolating switch, with a visible break, is required for the exclusive use of CONECTIV on all 120/208 volt services fed from the downtown secondary network in Wilmington.

FIG. 6B

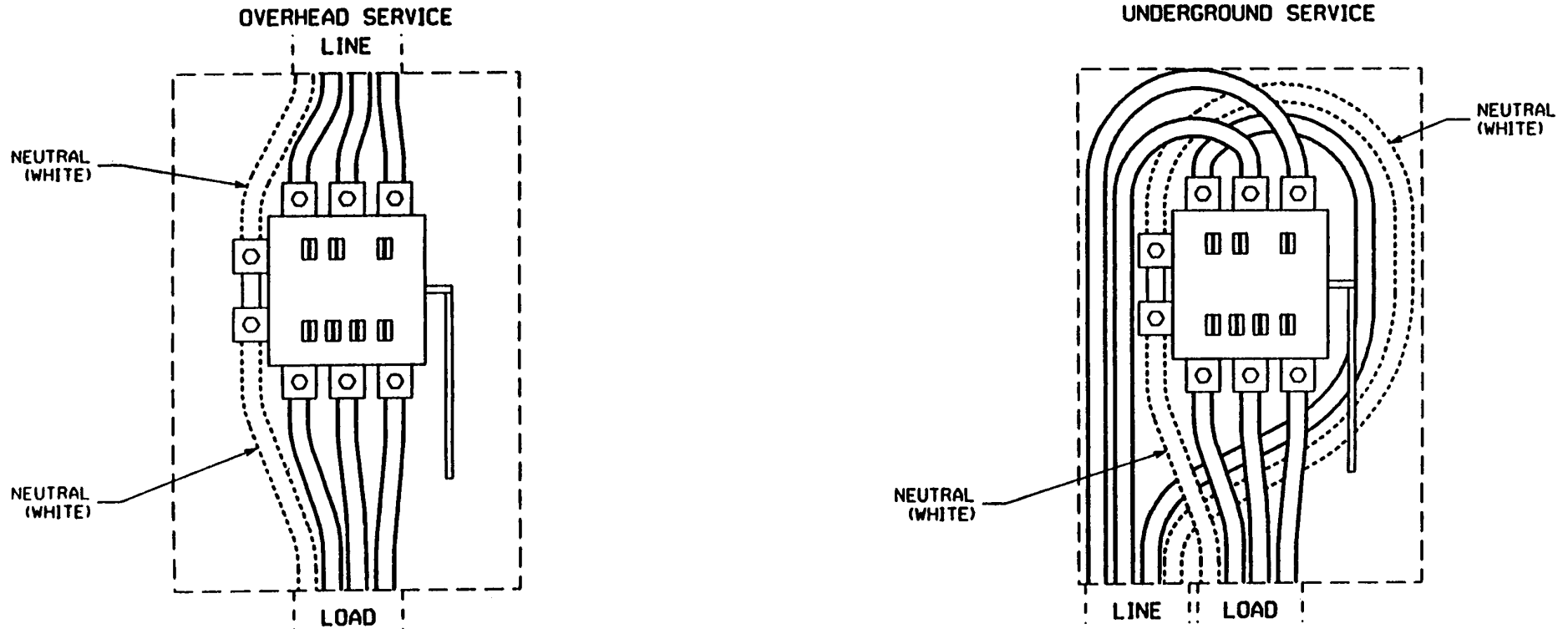
THREE PHASE, 4 WIRE DELTA, 120/240 VOLT
 METER WIRING DIAGRAM
 200 AMP.



NOTE: LINE AND LOAD WIRE SIZE RANGE #6 - 350 kcmil.

THREE PHASE, 4 WIRE WYE, 120/208 AND 277/480 VOLT
METER WIRING DIAGRAM
200 AMP.

NOT FOR USE IN
NEW JERSEY FOR
277 / 480 V



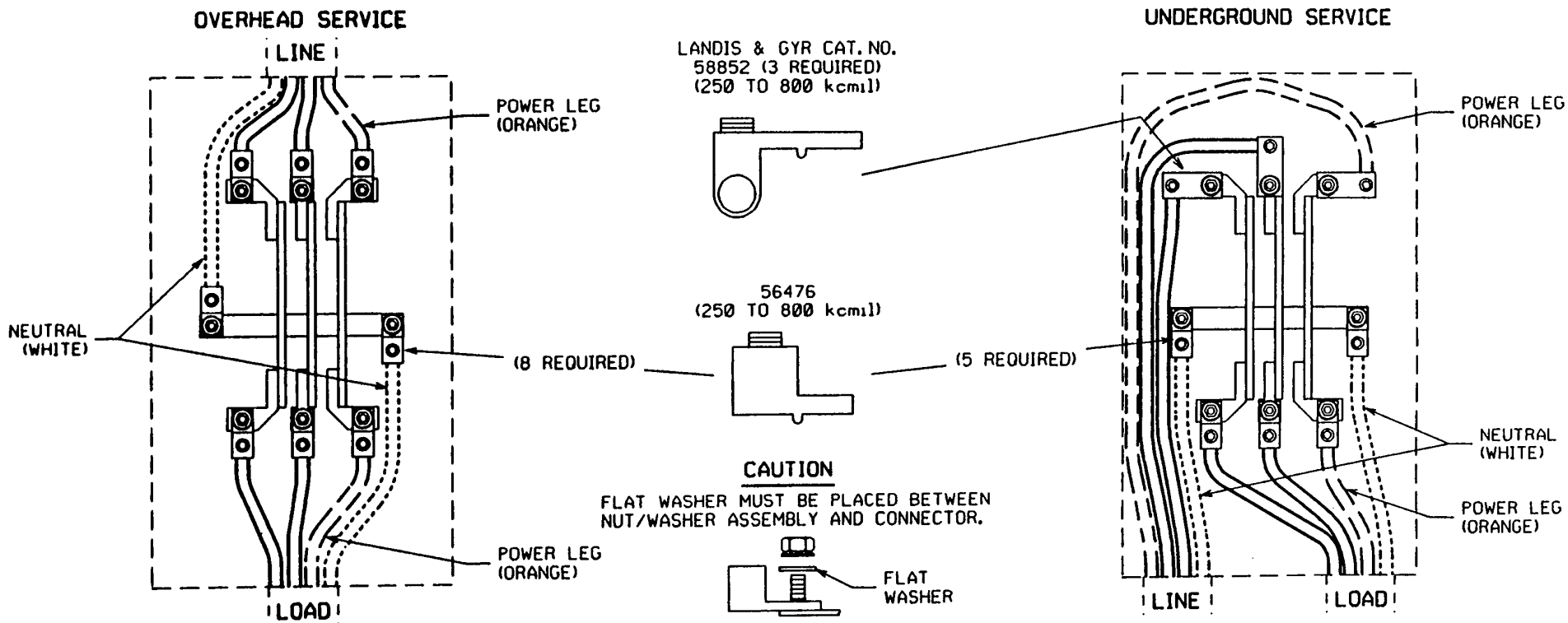
NOTES:

1. A line side isolating switch, with a visible break, is required for the exclusive use of CONECTIV on all 120/208 volt services fed from the downtown Wilmington secondary network and on 277/480 volt services in Delaware, Maryland and Virginia.
2. The line and load side wire range is #6 - 350 kCMIL.

FIG. 8

12/98.

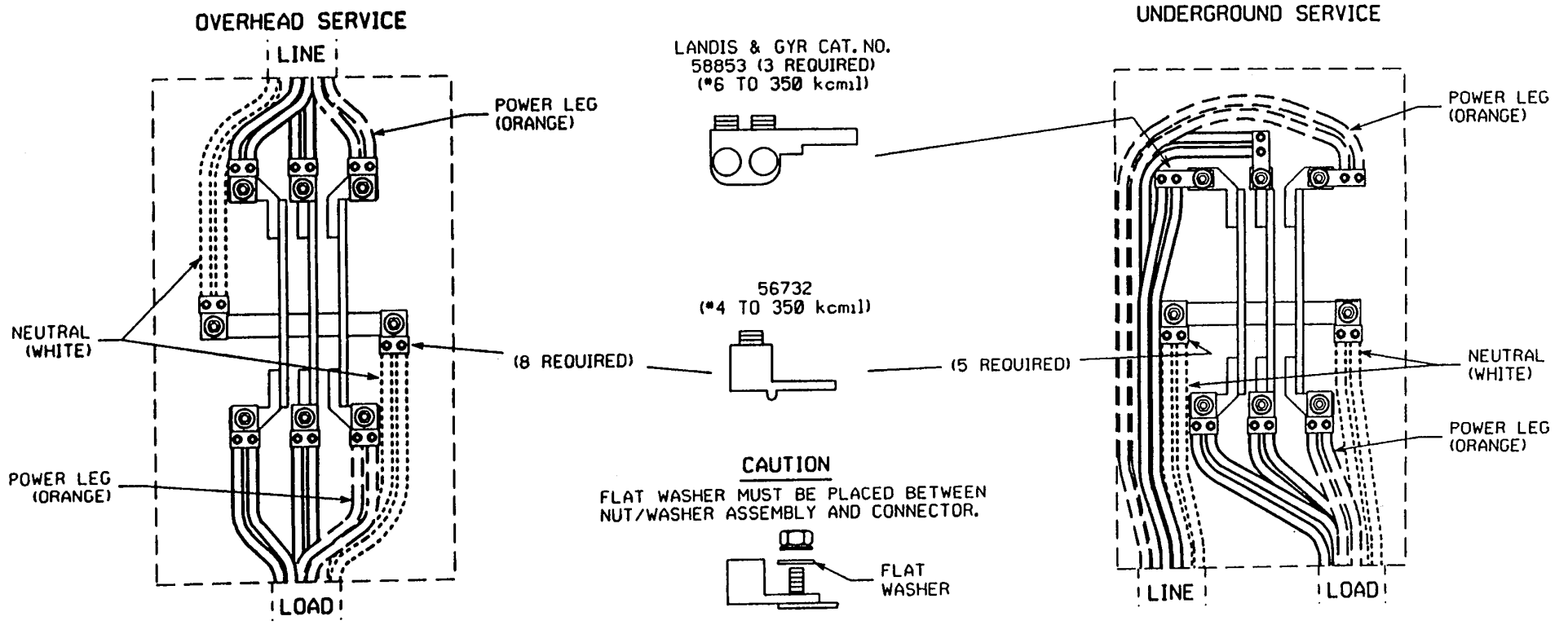
THREE PHASE, 4 WIRE DELTA, 120/240 VOLT
METER WIRING DIAGRAM
400 AMP. SINGLE CONDUCTOR



NOTE: THE LANDIS & GYR CONNECTORS SHALL BE PURCHASED BY THE CUSTOMER.

FIG. 9A

THREE PHASE, 4 WIRE DELTA, 120/240 VOLT
METER WIRING DIAGRAM
400 AMP. PARALLEL CONDUCTORS

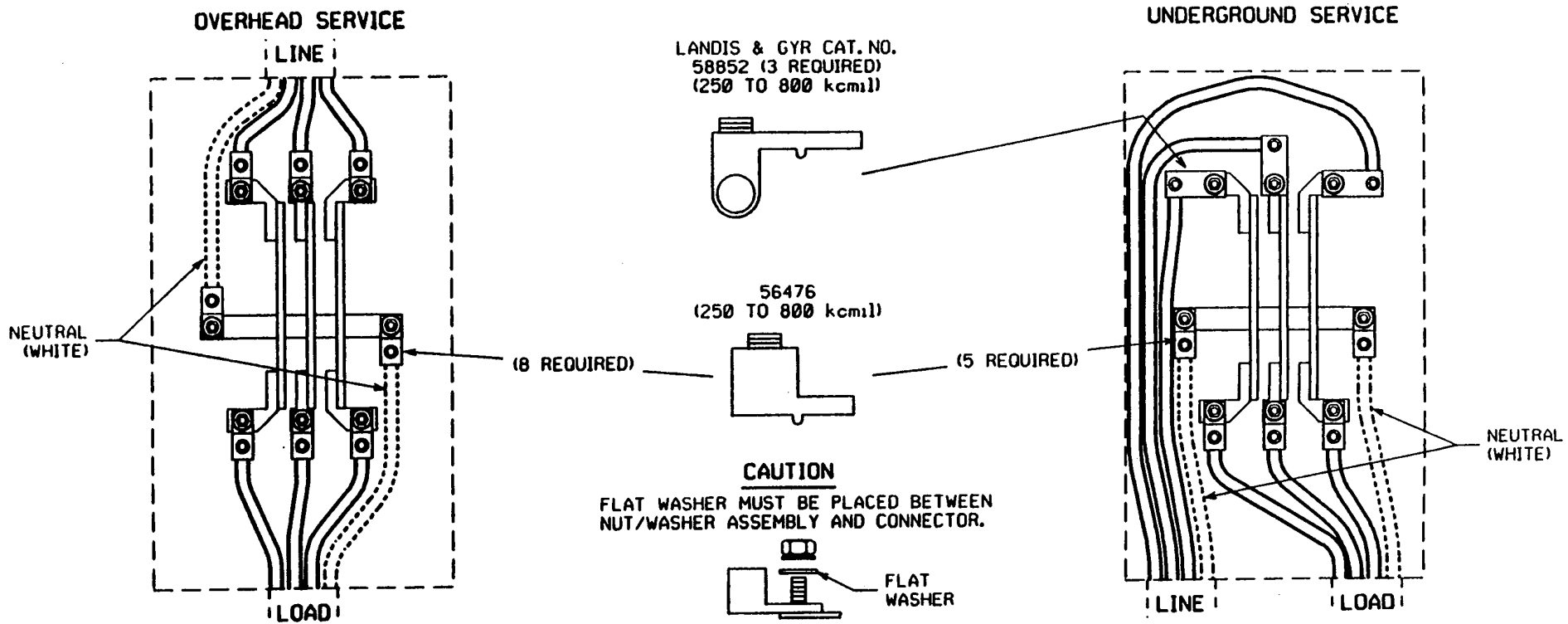


NOTE: THE LANDIS & GYR CONNECTORS SHALL BE PURCHASED BY THE CUSTOMER.

FIG. 9B

THREE PHASE, 4 WIRE WYE, 120/208 AND 277/480 VOLT
METER WIRING DIAGRAM
400 AMP. SINGLE CONDUCTOR

NOT FOR USE IN
NEW JERSEY FOR
277 / 480 V



NOTES:

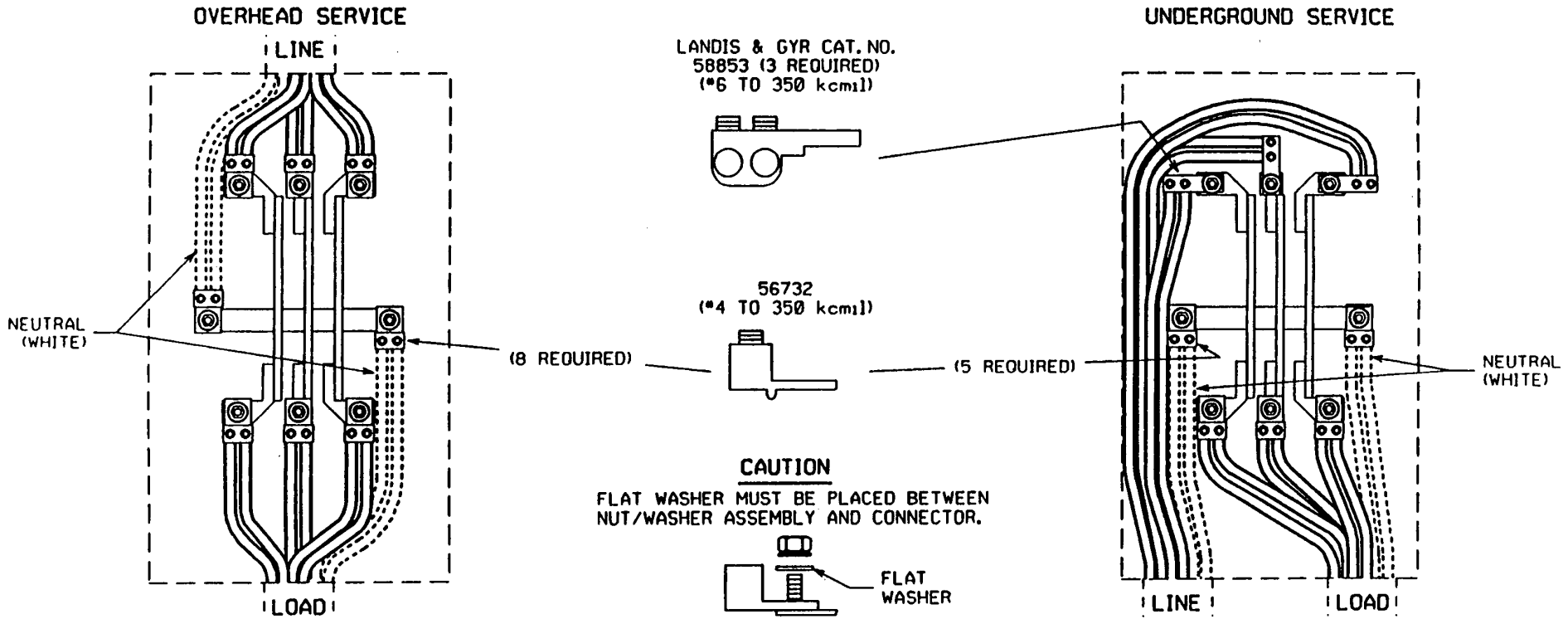
1. The special Landis & Gyr connectors shall be furnished by the customer's electrician.
2. A line side isolating switch, with a visible break, is required for the exclusive use of CONECTIV on all 120/208 volt services fed from the downtown Wilmington secondary network and on 277/480 volt services in Delaware, Maryland and Virginia.

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FIG. 10A

THREE PHASE, 4 WIRE WYE, 120/208 AND 277/480 VOLT
 METER WIRING DIAGRAM
 400 AMP. PARALLEL CONDUCTORS

NOT FOR USE IN
 NEW JERSEY FOR
 277 / 480 V



NOTES:

1. A line side isolating switch, with a visible break, is required for the exclusive use of CONECTIV on all 120/208 volt services fed from the downtown Wilmington secondary network and on 277/480 volt services in Delaware, Maryland and Virginia.
2. The line and load side wire range is #6 - 350 kCMIL.

FIG. 10B

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SIX METER POSITION ENCLOSURE
AERIAL OR UNDERGROUND

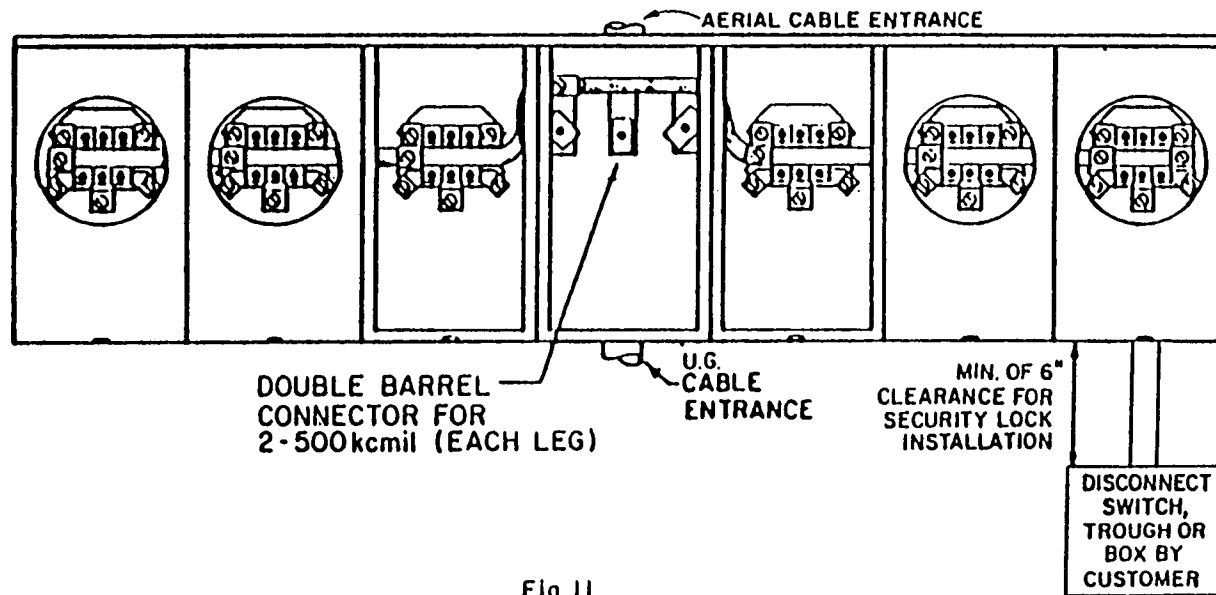


Fig. 11

TEMPORARY SERVICE - OVERHEAD
(ACROSS PUBLIC ROAD)

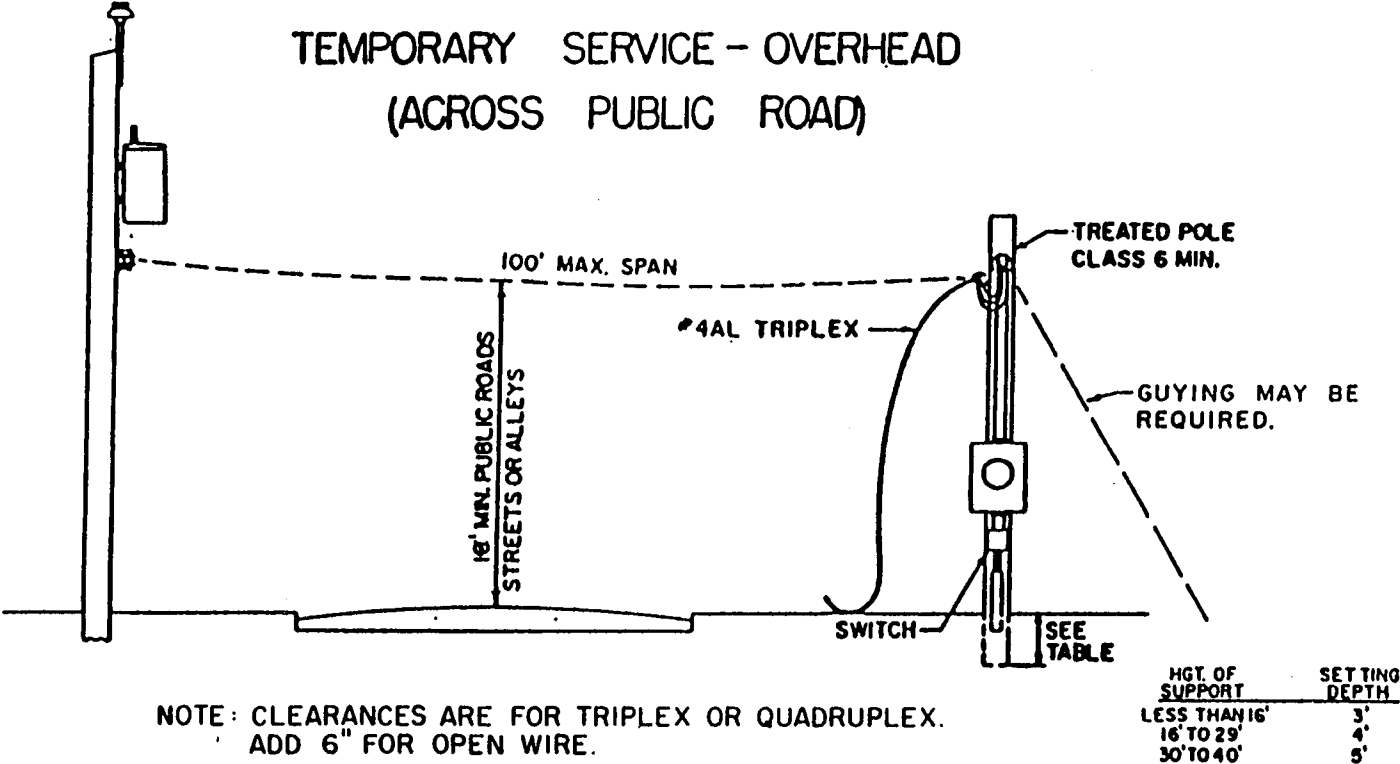


Fig. 12

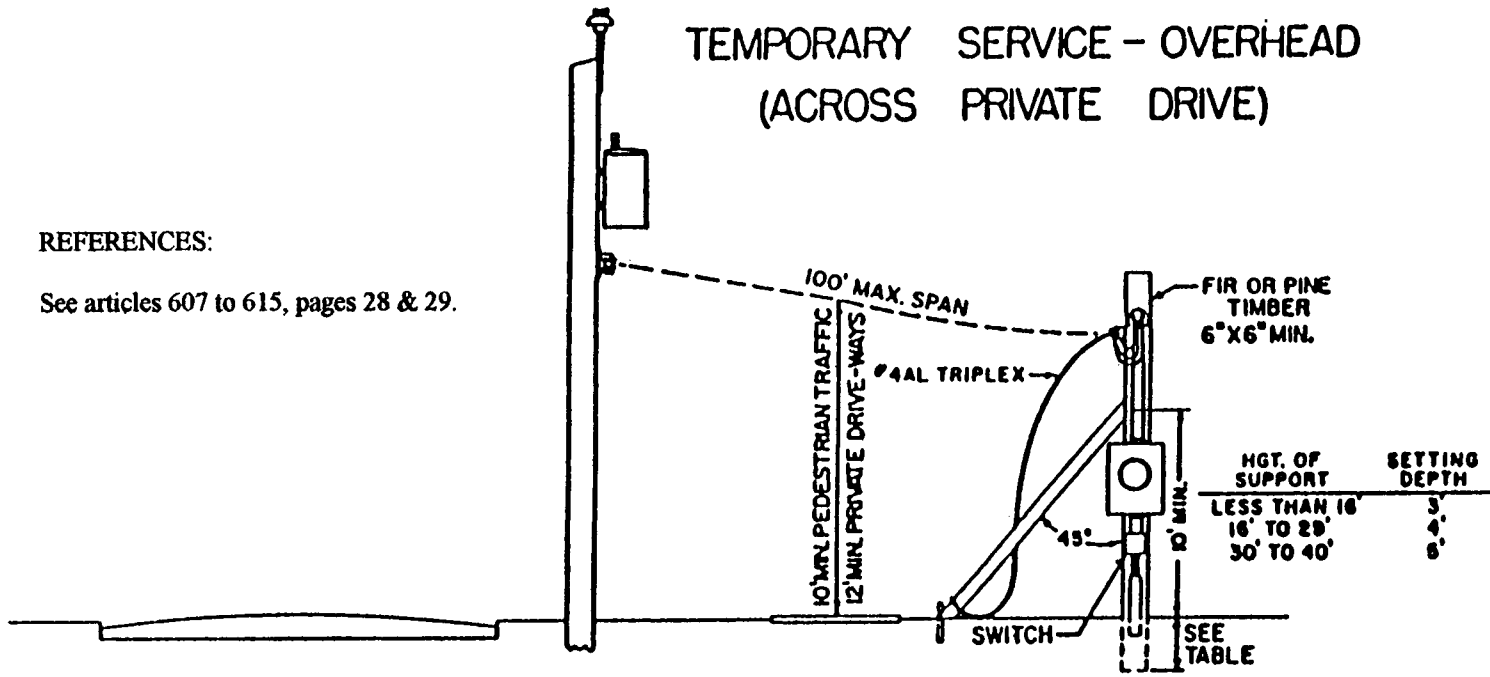
REFERENCES:

See articles 607 to 615, pages 28 & 29.

TEMPORARY SERVICE - OVERHEAD
(ACROSS PRIVATE DRIVE)

REFERENCES:

See articles 607 to 615, pages 28 & 29.



NOTE: CLEARANCES ARE FOR TRIPLEX OR QUADRUPLIX.
ADD 6" FOR OPEN WIRE.

Fig.13

TEMPORARY SERVICE - UNDERGROUND

CAUTION!!!
Before digging to set the post and before driving the ground rod, call the local 1-Call underground locating service.

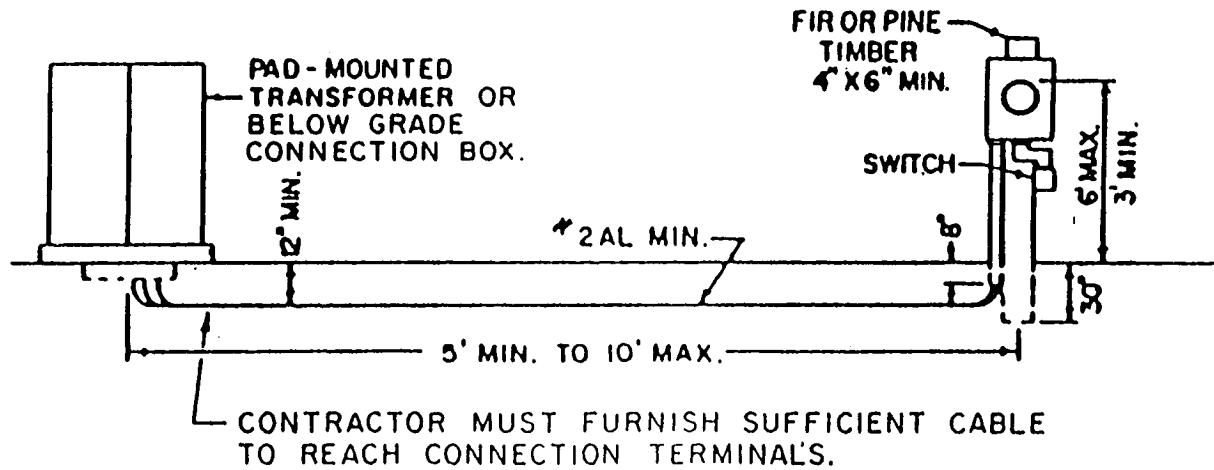
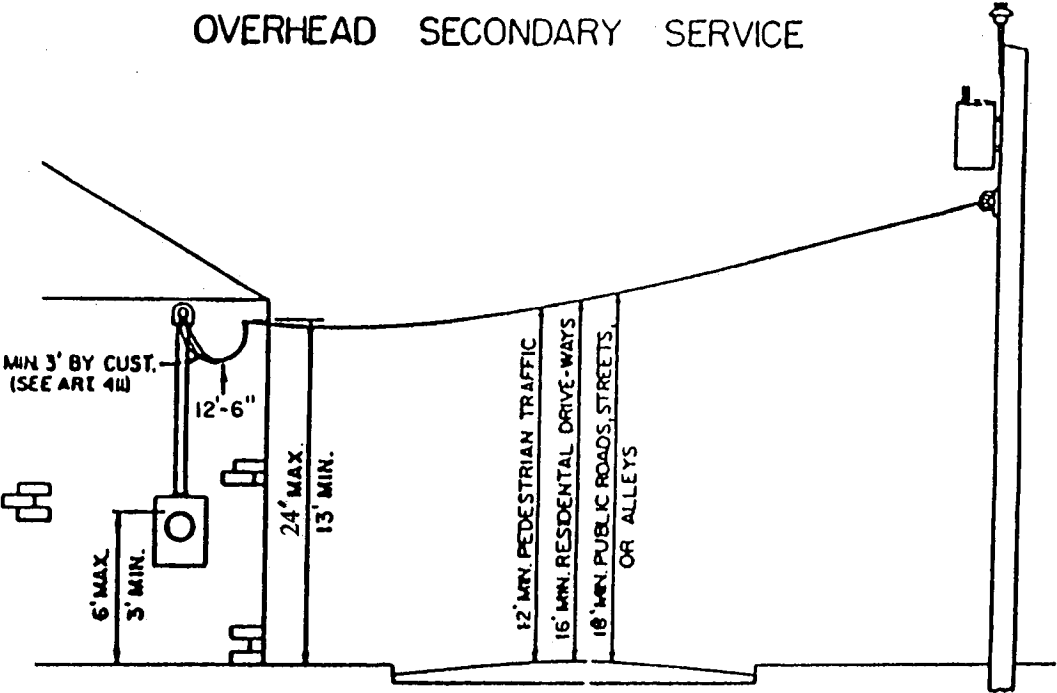


Fig.14

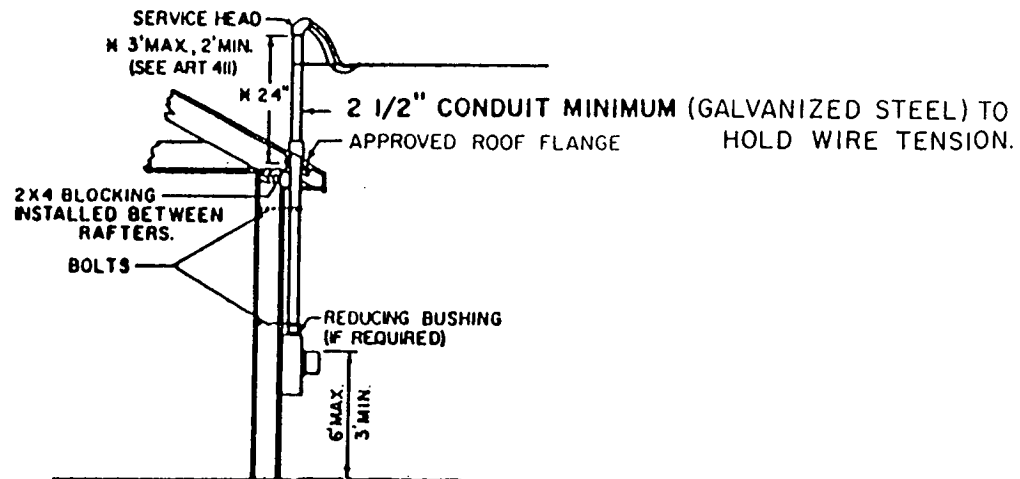
OVERHEAD SECONDARY SERVICE



NOTE: CLEARANCES ARE FOR TRIPLEX OR QUADRUPLIX.
ADD 6" FOR OPEN WIRE.

Fig. 15

SERVICE MAST

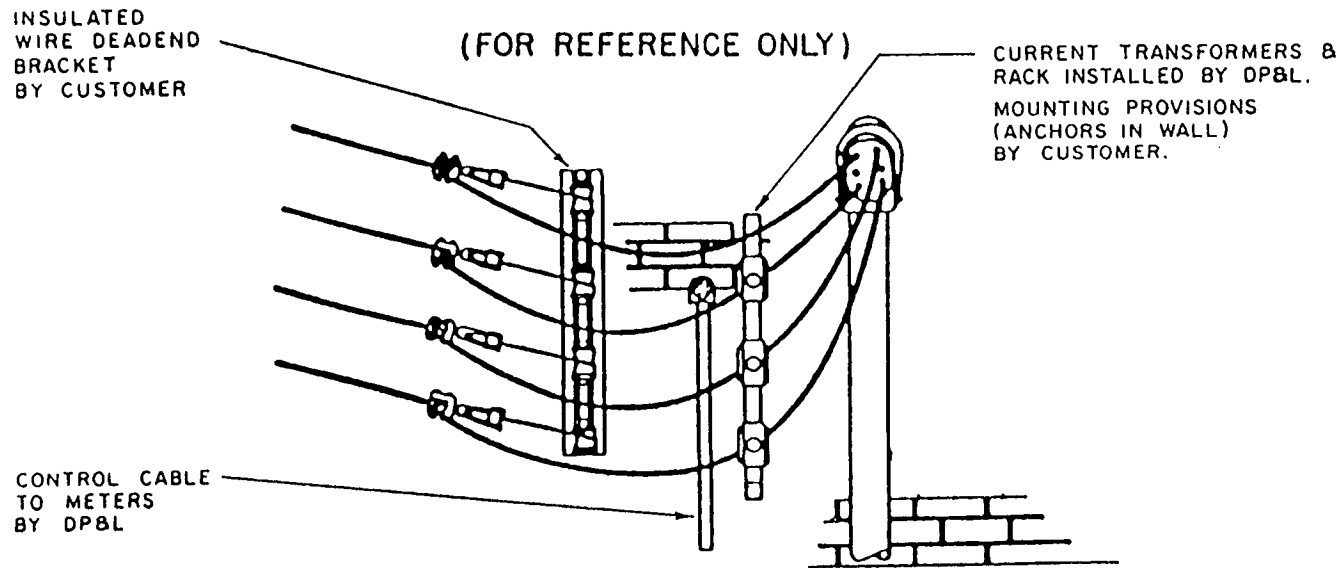


NOTE: See Figure 15 for minimum clearance requirements

Fig.16

* If pipe height exceeds 3 ft., it must be guyed to the roof rafters OR otherwise reinforced. Consult DP&L if in doubt.

AERIAL CURRENT TRANSFORMERS



SIDE WALL - 3 Φ (ABOVE 4.00 AMP.)
(INSTALLATION SUBJECT TO CO. OPTION)

Fig.17

AERIAL CURRENT TRANSFORMERS

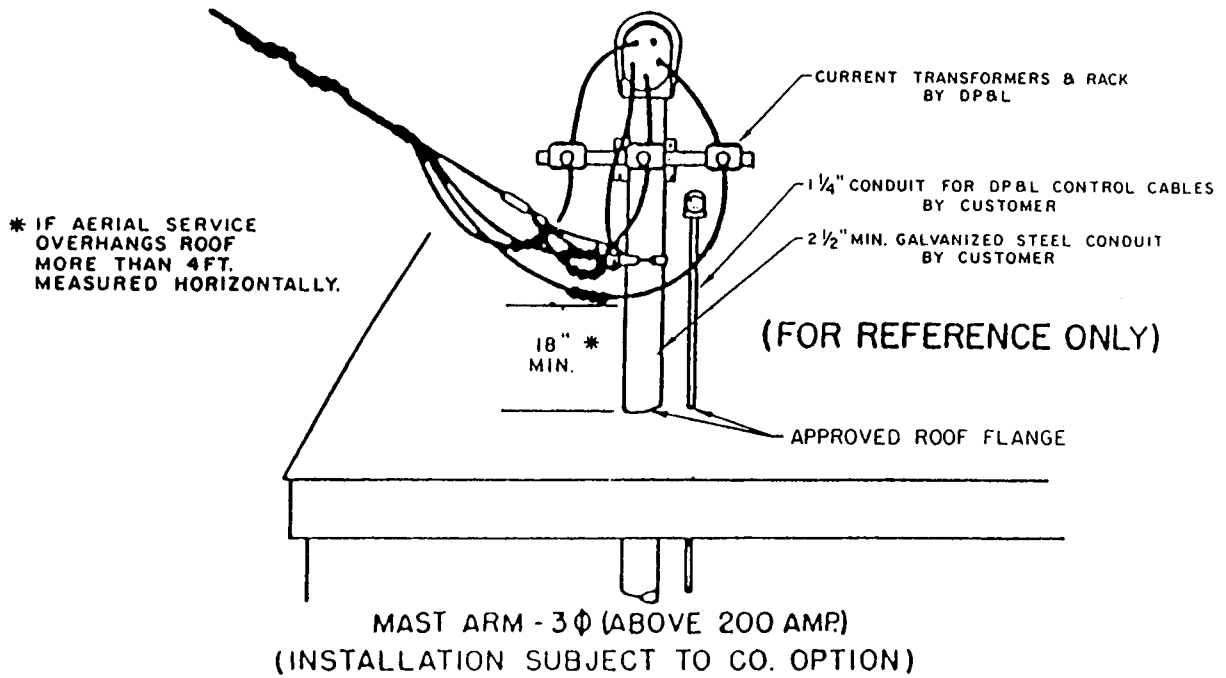
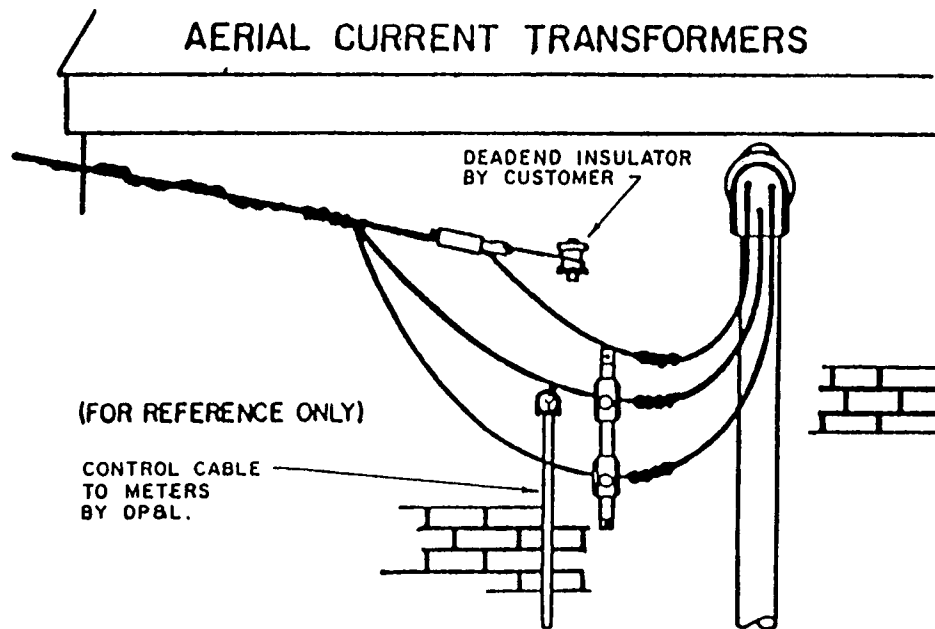


Fig.18



BUILDING MOUNTED - 1 ϕ (ABOVE 400 AMP)
(INSTALLATION SUBJECT TO CO. OPTION)

Fig. 19

UNDERGROUND SECONDARY SERVICE
FROM OVERHEAD SYSTEM
400 AMP. MAX. - 1 ϕ
400 AMP. MAX. - 3 ϕ

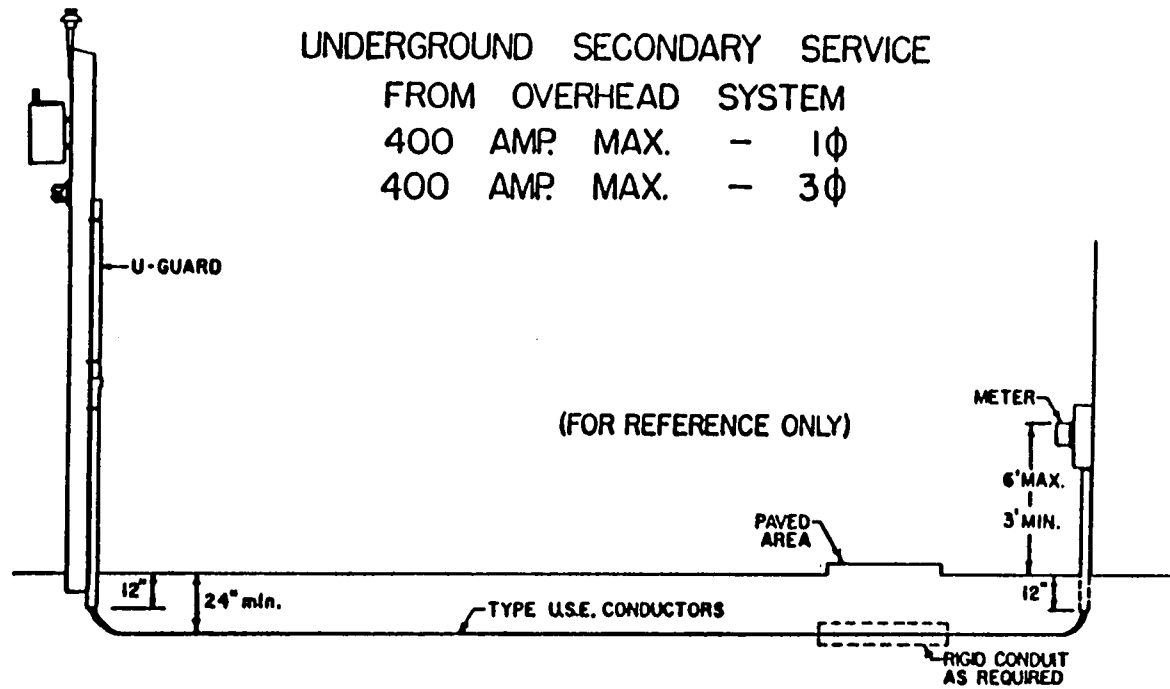


Fig.20

UNDERGROUND SERVICES FROM
PAD-MOUNTED TRANSFORMER

400 AMP. MAX. - 1 ϕ

400 AMP. MAX. - 3 ϕ

(FOR REFERENCE ONLY)

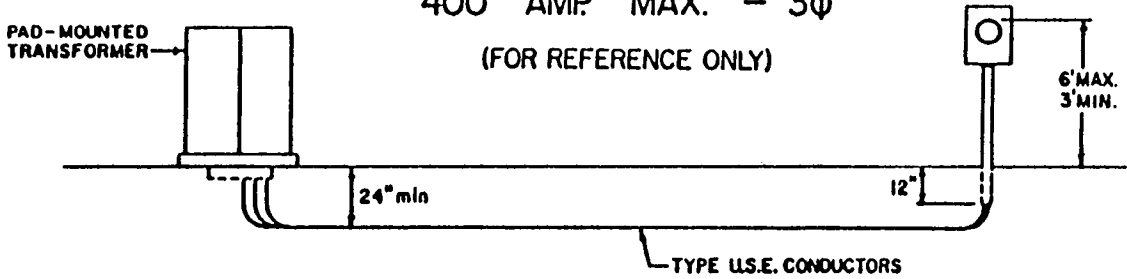


Fig.21

UNDERGROUND SERVICES FROM
PEDESTAL (SPLICE BOX)
400 AMP MAX. - 1 ϕ
400 AMP MAX. - 3 ϕ

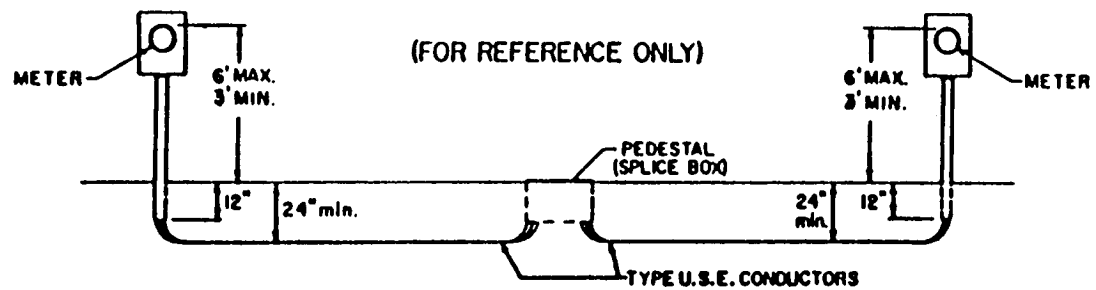


Fig.22

UNDERGROUND SERVICE PEDESTAL

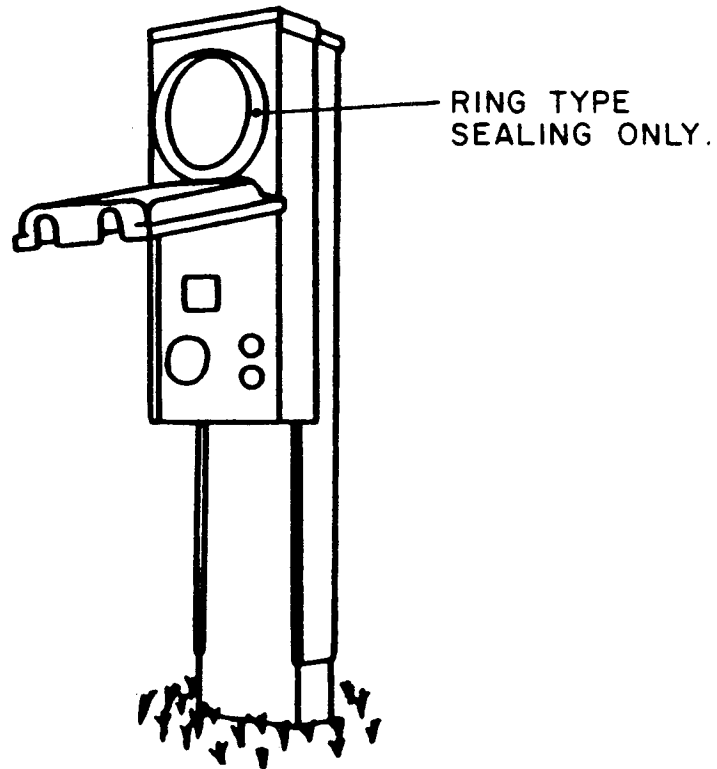


Fig. 23

(FOR REFERENCE ONLY)

NOTES:

1. UNIT MUST BE UL APPROVED.
2. INSTALLATION SHALL BE PER MANUFACTURER'S RECOMMENDATION.

MATERIAL LIST

- 1.) 4" X 6" X 8' Long Treated Posts;
- 2.) 2" X 10" Salt Treated Boards;
- 3.) 1/4" PVC Pipe to be run from meter into Secondary Compartment of Transformer (By Contractor);
- 4.) 1/2" X 7" H. H. Galvanized steelbolts w/washers & nuts;
- 5.) Tamping around each post required.

NOTE: ANY VARIATION TO THESE DIMENSIONS & MATERIALS MUST BE APPROVED BY THE METER DEPARTMENT.

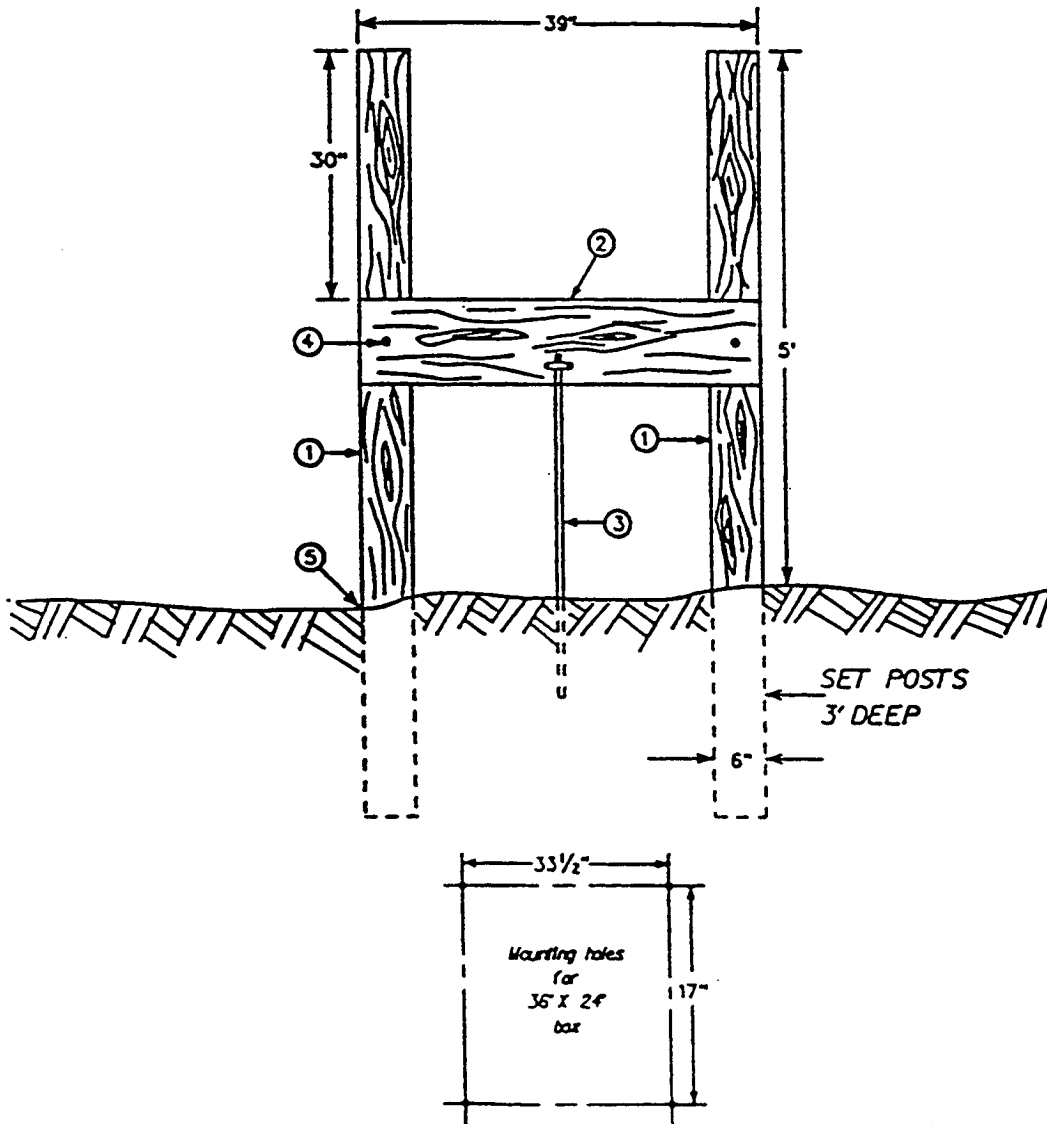
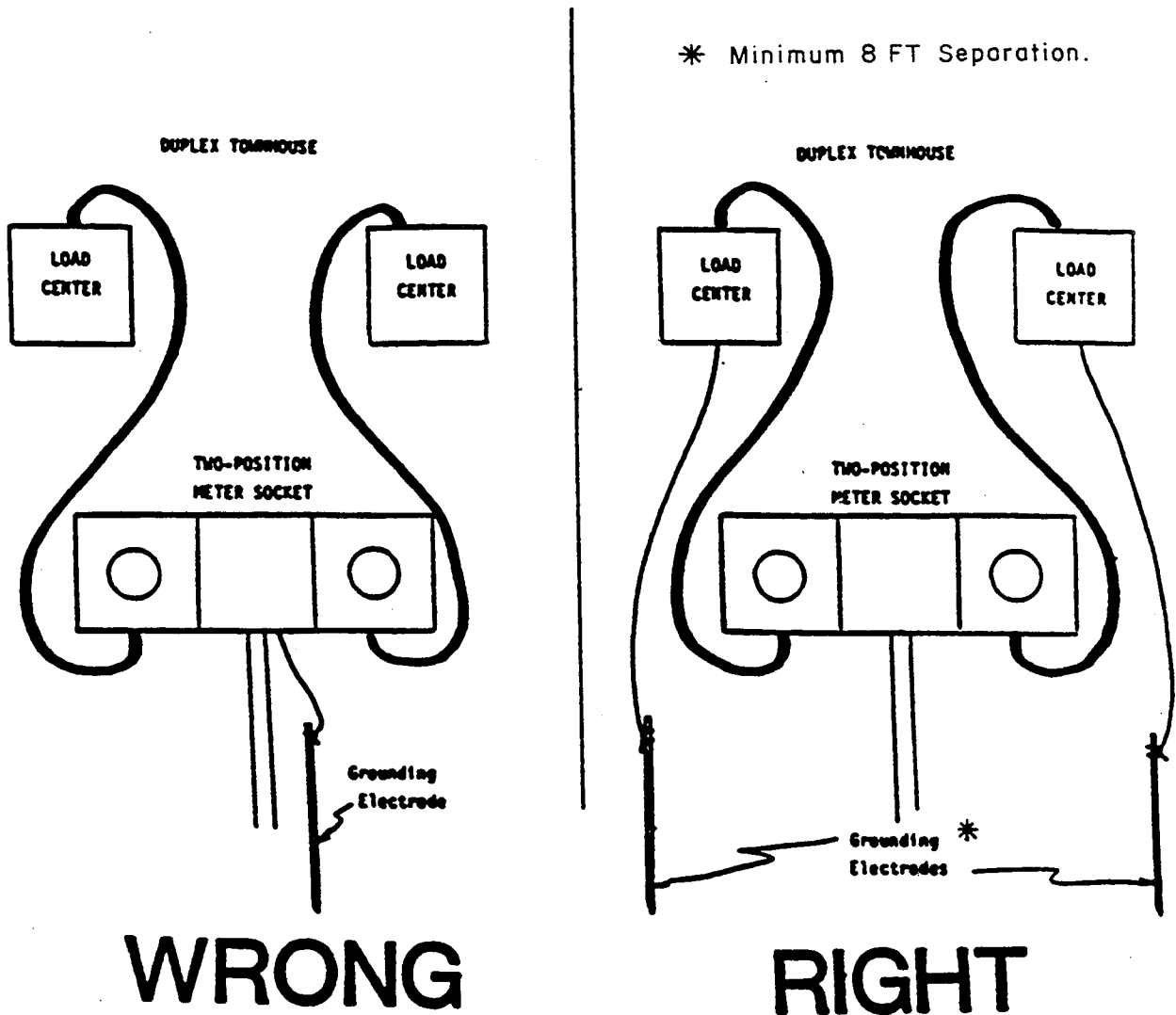


Figure: 24

LOAD CENTER GROUNDING



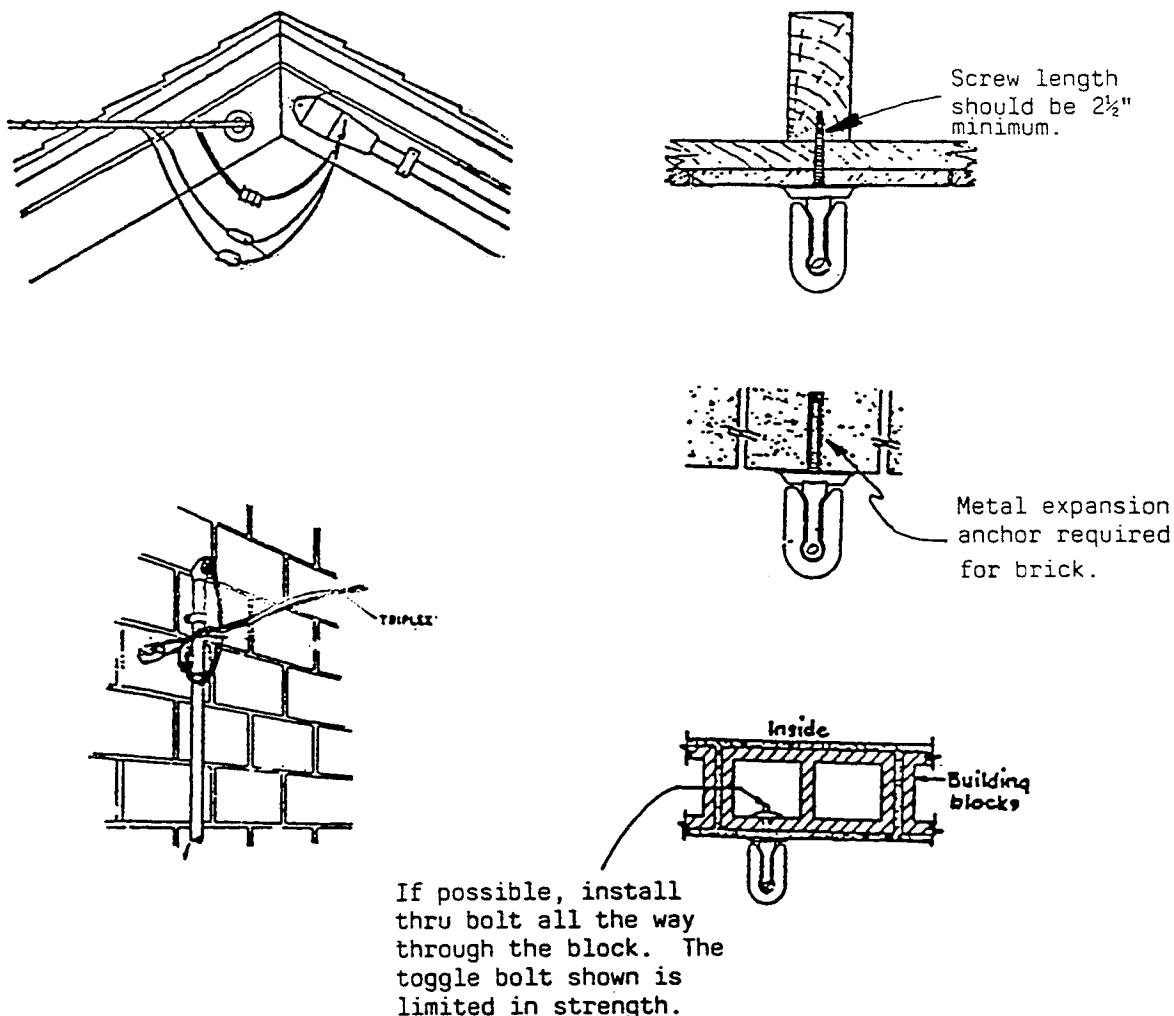
GROUNDING ELECTRODE CONDUCTORS SHALL NOT BE CONNECTED TO OR ROUTED THROUGH THE METER SOCKET. THIS IS A POTENTIALLY DANGEROUS PRACTICE. ANY METER SOCKET FOUND WITH THIS CONDITION WILL NOT BE ENERGIZED.

DELMARVA POWER

FIGURE 25

ANCHORING SERVICE ATTACHMENTS TO BUILDINGS

(FIGURE 26)



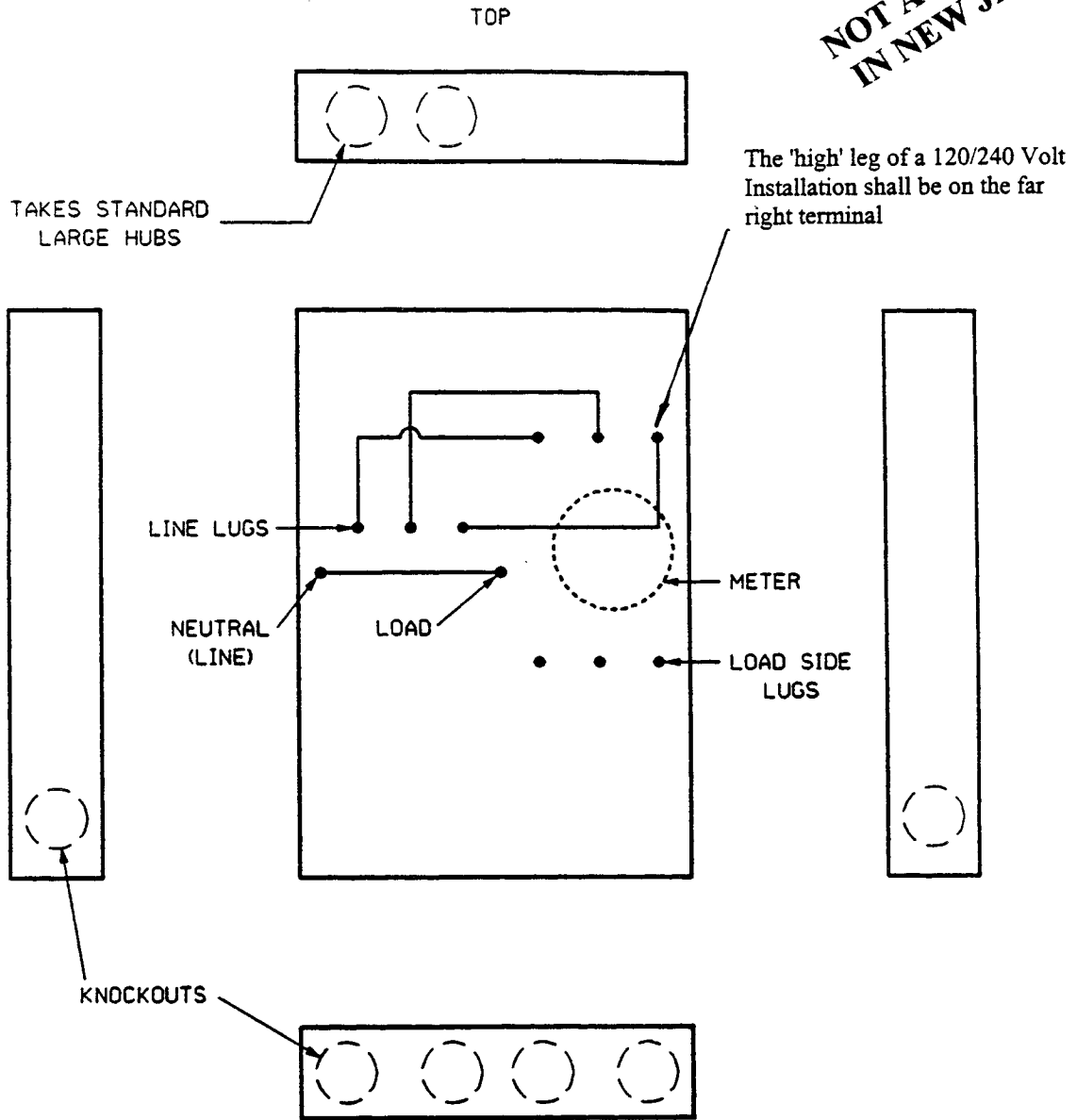
NOTES:

1. The Builder/Electrician assumes responsibility for the integrity of the anchoring device.
2. The pull on a service conductor is maximum when the conductor is covered with a ½" coating of ice and wind is blowing. Depending on the wire size, sag and span length, conductor tensions could exceed 300 pounds.
3. To limit conductor tensions, substantial sag may be required for longer spans. The height of the attachment must be sufficient to provide adequate vertical clearance at the lowest sag of the wire. Sags of service wires may approach 6 feet in a 100 foot span. Consult the company if you suspect a clearance problem might occur.

FIGURE 26

DP&L STOCK #0132-6917 (BOX)

**NOT AVAILABLE
IN NEW JERSEY**



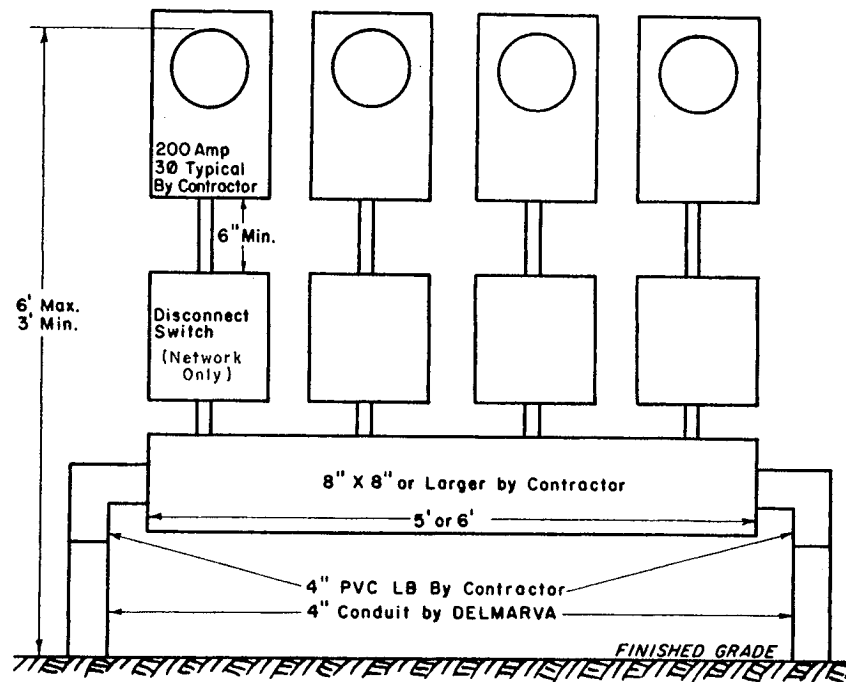
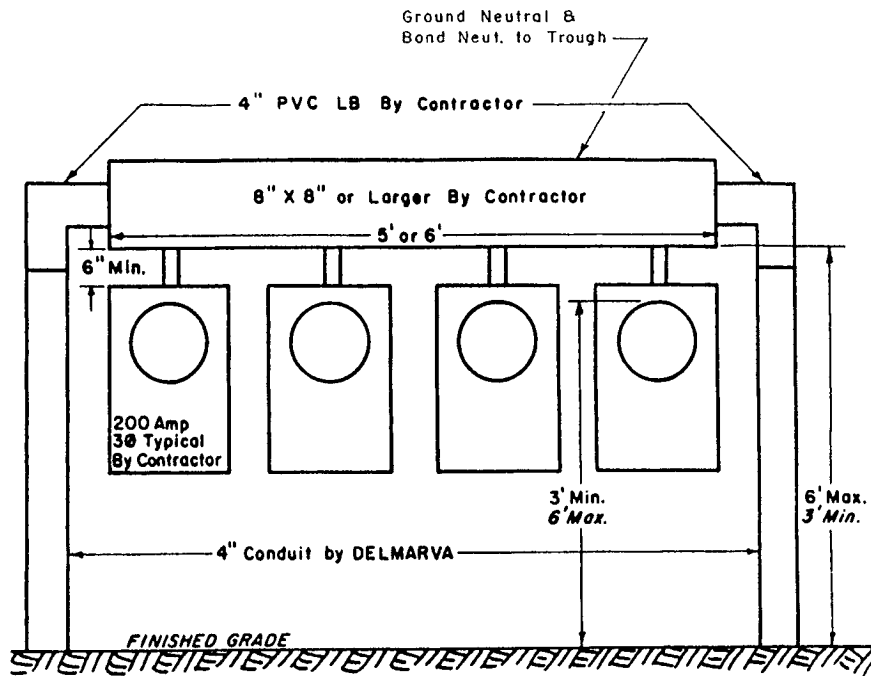
NOTES:

1. This box is only manufactured by Landis & Gyr.
2. The box and matching connectors should be purchased from an electrical distributor. They will be sold by CONECTIV only if there is a problem with the distributors.
3. The connectors shall be either of two approved Landis & Gyr models:

Catalog #54732M accommodates up to 2-500 kcmil stranded conductors and may be used on either the line OR load side. (CONECTIV Stock #0132-6925)

Catalog #68752-1 accommodates up to 3-250 kcmil stranded conductors and may ONLY be used on the LOAD side. (CONECTIV Stock #0132-6933)

4. At the discretion of CONECTIV the installation of a 600 Amp meter box may be used for larger nominal ampacities.
5. This meter box can be used for three phase 120/208 V, 120/240 V and 277/480 V. It will not be used for 277/480 V until the load and potential for load growth are considered. Contact your local engineering office to determine if this self contained meter box will meet CONECTIV requirements.



NOTES:

1. For 3 or 4 meters use 5' trough, for 5 meters use 6' trough. Meters may be mounted above trough, but min-max restrictions apply.
2. Trough, LB's, Meterboxes, Connections in trough purchased and installed by customer.
3. Delmarva Power will supply and install conductors into trough.
4. All line side connections to be made in trough prior to energization of first meter.
5. Trough to have easily removable front panel (may be hinged).
6. Trough must be provided with a means to permit locking by Delmarva Power.
7. Trough may be used for 400 AMP or larger services. (consult Customer Engineering)
8. Trough and all fasteners must be corrosion-resistant material. Trough to be securely fastened to wall.
9. This spec applies to 120/240 volt and 120/208 volt installations except 120/208 volt installations on "Downtown Wilmington Secondary Network".

FIG. 28

Safety Switches

Safety switches for the exclusive use of CONECTIV are required on the line side of all self contained meter installations, single or three phase, served from the downtown Wilmington 120/208 volt secondary network and on the line side of all three phase 277/480 volt self contained meters in Delaware, Maryland and Virginia. The switch will be owned and maintained by the customer. The switch shall be lockable with one of the following style locks: Short shank padlock or a disposable lock.

The following safety switches are approved:

Single and Three Phase 120/208 Volt Services Fed From the City of Wilmington Network (General Duty Switches)

Approved Manufacturer	Catalog Number
Cutler-Hammer	DG32_UR_Series
General Electric	TGN332_RH Series (Use below 400 amps; use heavy duty for 400 amps & above)
Square D	DU32_RB Series
Westinghouse	RGUN-32_Series

Three Phase 277/480 Volt Services (Heavy Duty Switches)

Approved Manufacturer	Catalog Number
Cutler-Hammer	DH36_UR_Series
General Electric	THN336_RH Series
Square D	HU36_RB Series
Westinghouse	RHUN-36_Series

Notes

1. Local code enforcement agencies may require a fused switch. Before installing, consult with your local inspector. These items are Delmarva Power's minimum requirement. Since the switch will be locked by Delmarva, it is not a substitute for a "MAIN".
2. These switches are required ahead of metering shown on Figures 6A, 6B, 8, 10A, and 10B.

FIGURE 29

CONNECTIV - APPROVED SPLICES, TERMINATORS AND LOAD BREAK ELBOW TERMINATORS

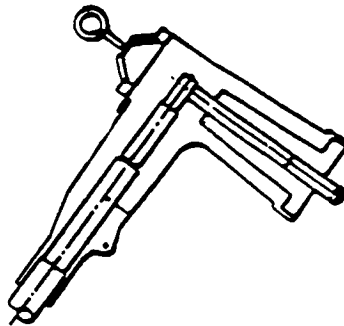
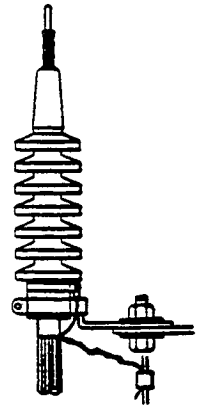


HIGH VOLTAGE SPLICES

INSULATION THICKNESS (MILS)	VOLTAGE RATING (Kv)	CONDUCTOR SIZE	CONNECTIV STOCK NUMBER	MANUFACTURER'S CATALOG NUMBER
175 - 220	15	1/0 Solid	3911-0614	3M #5411-CI-21
260	25	"	3911-1695	3M #5451-CI-1A
345	35	"	3911-1703	3M #5461-CI-1A

OUTDOOR TERMINATIONS

175 - 260	15 or 25	"	3920-1165	3M #7652-S-4-SC0001MB3
345	35	"	3911-2578	3M #5605-SC0001-MB4



200 AMP. LOAD BREAK ELBOWS

175 - 220	15	"	3905-0182	Elastimold #165 RLB 5230
260	25	"	3905-1784	Elastimold #273-LR-H-230 Chardin #9U01BbE644
345	35	"	3905-0125	Cooper #2637077B01M

HIGH VOLTAGE CABLE (See Note)

220	15	1/0 Solid Alum.	9500-1641	Per CONNECTIV Spec.
260	25	"	3430-2505	"
345	35	"	0106-9848	"

NOTE: CONNECTIV's cable specification does not provide for UL APPROVED to be printed on the outside jacket even though it exceeds UL requirements. Buying cable from local distributors to CONNECTIV's specification could get you into trouble if your job is inspected unless you first get approval from the inspector to use that cable.

Fig. 30

CONNECTIV - APPROVED COMPRESSION TERMINAL CONNECTORS



The connectors listed below are made of aluminum and are suitable for use with copper or aluminum conductors. They are drilled either with one 9/16 inch hole or two holes spaced 1-3/4 inch center to center.

WARNING: Never use copper compression connectors with aluminum conductors!

CONDUCTOR	HOLES	MFG. / CAT. NO.	CONNECTIV STOCK #
#12 TO #10 Str.	1	Homac #HL-10-48	3828-2000
#4 Str.	1	Homac #SA4-48 Penn Union #FSLA-W2-S	3818-2018
#2 Str.	1	Homac #SA2-48 Penn Union #FSLA-R2-S Burdy #YRA1CU Kearney #104761-2	3828-2026
#1/0 Str.	1	Homac SA1/0-48TN Penn Union FKLA-010-S-P Burdy #FYRA25U Kearney #104761-3	3828-2034
2/0 Str.	1	Homac #SA2/0-48TN PENN Union #FSLA-013-S-P Burdy #YRA26-U Kearney # 104761-4	3828-2042
4/0 Str.	1	Homac #SA4/0-48TN Penn Union #FSLA-025-S-P Burdy #YRA28U Kearney #104761-6	3828-2067
250 Str.	2	Homac #SA250-NTN Penn Union #FSLA-025-D-TN	3828-2075
350 Str.	2	Homac #SA-350-NTN Anderson #ALM-360BN-TP	3828-2091
500 Str.	2	Homac #SAM500-N Penn Union #KVL-050-D1	3828-2117
750 Str.	2	Blackburn #ALS44-P	3828-2109
750 Compact Str.	2	Homac #AL750NTNV	3828-2208
1000 Str.	2	Penn Union #KWL-100- D-1 Dossert #DPLK-100-2N-EC	3828-2141
1000 Compact Str.	2	Penn Union #KWL-087-D-1-P Homac #SAL800NTN	3828-2166

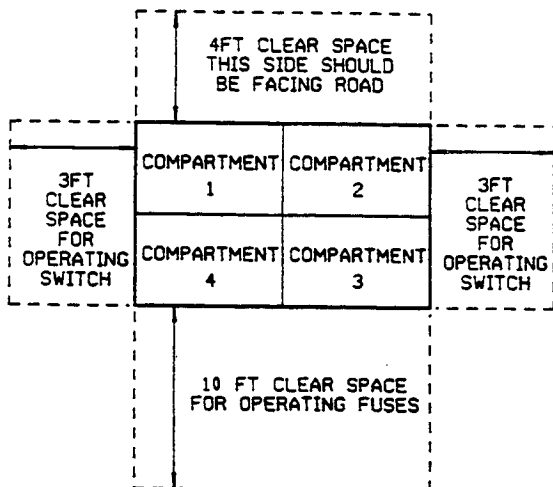
NOTE: The following secondary cable sizes are not approved by CONNECTIV and cannot be used on jobs where CONNECTIV is to install the lugs: #8, #6, #3, #1, #3/0, 300, 400, 600, 700, 800, and 900 kcmil stranded.

Fig. 31

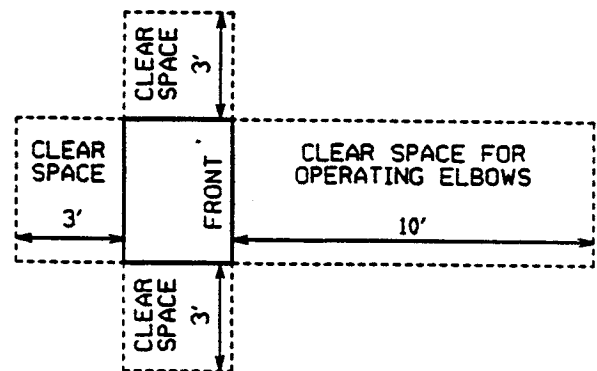
CLEAR SPACE REQUIREMENTS FOR PAD MOUNTED SWITCHING MODULES, FUSING MODULES OR HIGH VOLTAGE METERING

1. Clear space on either side (sides do not have doors) shall be 3'-0".
2. Clear space along the back of a cubicle having no doors shall be 3'-0".
3. Clear space in front of or behind cubicles having doors shall be 10'-0" if manual operation of fuses or switches or load break elbows using insulated switch sticks is likely.
4. Clear space to allow for the opening of cabinet doors where no manual switching using insulated switch sticks is anticipated shall be 4'-0".

Some illustrations of these principles are shown below.



4-Bay Switchgear
with fuses and group
operated load break
switches.



High Voltage Metering
Cabinet

Figure 32

Aesthetic Meter Installations



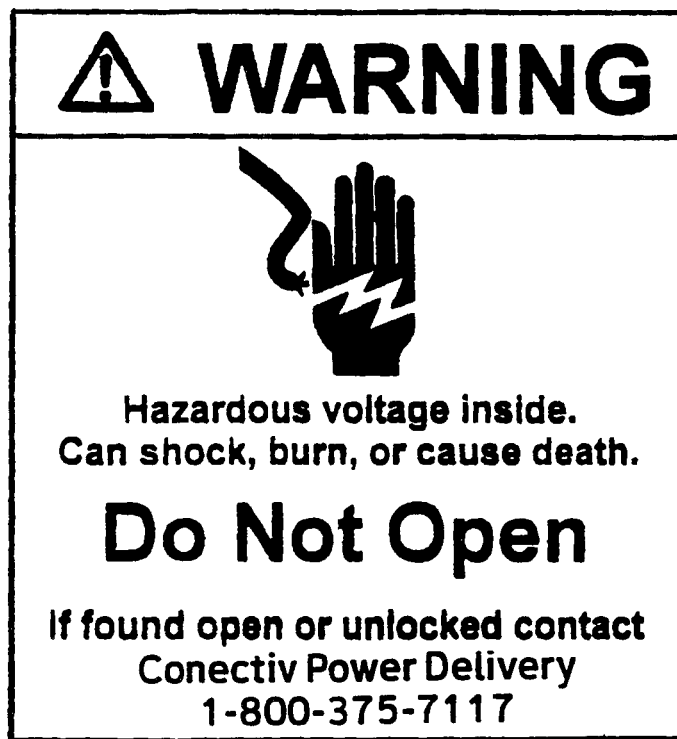
Figure 33

Aesthetic Meter Installations



Figure 34

CONNECTIV APPROVED METER BOXES



Without this sticker visible on the outside of a meter box, the box is not considered APPROVED by CONECTIV!!!!!!!!!!!!!!

TABLE I - MIN. CONDUCTOR SIZES FOR SINGLE PHASE UNDERGROUND SERVICES					
ENTRANCE SIZE	ALUMINUM CONDUCTOR		COPPER CONDUCTOR		CONDUIT SIZE #
	PHASE	NEUTRAL	PHASE	NEUTRAL	
150 AMP.	2- #2/0	1- #1	2- #1/0	1- #2	2"
200 AMP.	2- #4/0	1- #2/0	2- #3/0	1- #1/0	2" (CU.) 2 1/2" (AL.)
400 AMP.	4- #4/0	2- #2/0	2-500KCMIL OR 4- #3/0	1-350KCMIL OR 2- #1/0	3"
* CONDUIT MIN. BENDING RADII : 2" - 9 1/2" RADIUS 2 1/2" - 10 1/2" RADIUS 3" - 13" RADIUS					

For runs over 100 feet, oversized conductors may be required to minimize voltage drop. Consult with DP&L for size recommendations.

**TABLE II - MIN. CONDUCTOR SIZES FOR
THREE PHASE UNDERGROUND SERVICES**

ENTRANCE SIZE	VOLTAGE	ALUMINUM CONDUCTOR		COPPER CONDUCTOR		CONDUIT SIZE †
		PHASE	NEUTRAL	PHASE	NEUTRAL	
100 AMP	208Y/120	3-#1/0	1-#1/0	3-#2	1-#2	2"
100 AMP	240/120	3-#1/0	1-#1	3-#2	1-#2	2"
200 AMP	208Y/120	3-250KCMIL	1-250KCMIL	3-#3/0	1-#3/0	2 1/2" (CU) 3" (AL)
200 AMP	240/120	3-250KCMIL	1-#4/0	3-#3/0	1-#2/0	2 1/2" (CU) 3" (AL)

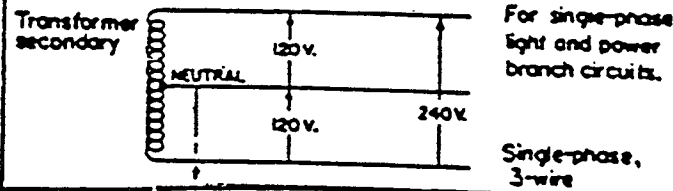
† CONDUIT MIN. BENDING RADII:

- 2" - 9 1/2" RADIUS
- 2 1/2" - 10 1/2" RADIUS
- 3" - 13" RADIUS
- 3 1/2" - 15" RADIUS

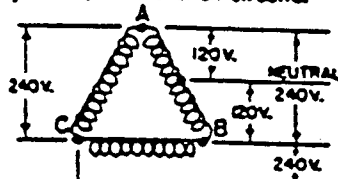
**TABLE III - FORMULAS FOR DETERMINING
AMPERES, HP, KW, AND KVA**

	E = Volts I = Amperes	eff = Efficiency	p-f = Power Factor
TO FIND	SINGLE PHASE (AC)	THREE PHASE (AC)	
Amperes when horsepower is known	$\frac{hp \times 746}{E \times eff \times p-f}$	$\frac{hp \times 746}{1.73 \times E \times eff \times p-f}$	
Amperes when kilowatts is known	$\frac{kw \times 1000}{E \times p-f}$	$\frac{kw \times 1000}{1.73 \times E \times p-f}$	
Amperes when kva is known	$\frac{kva \times 1000}{E}$	$\frac{kva \times 1000}{1.73 \times E}$	
Kilowatts	$\frac{I \times E \times p-f}{1000}$	$\frac{I \times E \times 1.73 \times p-f}{1000}$	
kva	$\frac{I \times E}{1000}$	$\frac{I \times E \times 1.73}{1000}$	
Horsepower (output)	$\frac{I \times E \times eff \times p-f}{746}$	$\frac{I \times E \times 1.73 \times eff \times p-f}{746}$	

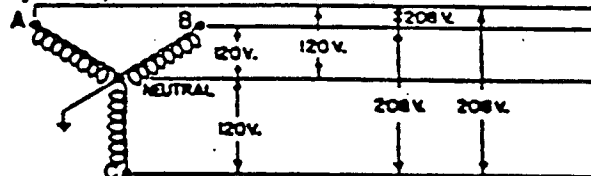
TABLE IV - ELECTRICAL DIAGRAMS OF SECONDARY VOLTAGES AVAILABLE



120/240 volt three-phase 4-wire
power circuit and single-phase
light and power branch circuits.

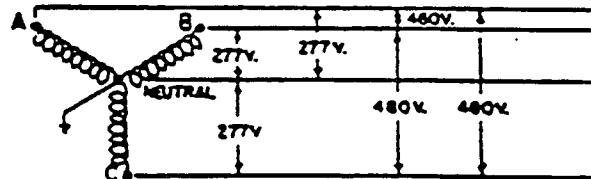


120/208 volt for three-phase power circuits and single-phase
light and power branch circuits.



Three-phase, 4-wire wye with grounded neutral.

277/480 volt for three-phase power circuits and lighting circuits
using 277 volt ballasts. 120 volt lighting and receptacle loads
are fed from this system through single-phase transformers rated
480-120/240 volts or three-phase transformers rated 480-
120/208 volts. The loads must be balanced.



Three-phase, 4-wire wye with grounded neutral.

V. = VOLTS

OPBLCG RESERVES THE RIGHT TO DETERMINE VOLTAGE
CHARACTERISTICS FOR EACH APPLICATION.

TABLE VA - FULL-LOAD CURRENTS IN AMPERES-SINGLE-PHASE CURCUITS

$$\text{FULL-LOAD CURRENT} = \frac{\text{KVA} \times 1000}{\text{CURRENT VOLTAGE}}$$

KVA	120	240	480	2400	4160
3	25.0	12.5	6.3	1.25	.72
5	41.7	20.8	10.4	2.08	1.20
10	83.3	41.7	20.8	4.17	2.40
15	125	62.5	31.3	6.25	3.61
25	208	104	52.1	10.4	6.01
37 1/2	313	156	78.1	15.6	9.01
50	417	208	104	20.8	12.0
75	625	313	156	31.3	18.0
100	833	417	208	41.7	24.0
167	1392	696	348	69.6	40.1
250	2083	1042	521	104	60.1
333	2775	1388	694	139	80.0
500	4167	2083	1042	208	120
KVA	4800	7200	7620	12,000	14,000
3	.63	.42	.39	.25	.21
5	1.04	.69	.66	.42	.35
10	2.08	1.39	1.31	.83	.69
15	3.13	2.08	1.97	1.25	1.04
25	5.21	3.47	3.28	2.08	1.74
37 1/2	7.81	5.21	4.92	3.13	2.60
50	10.4	6.94	6.56	4.17	3.47
75	15.6	10.4	9.84	6.25	5.21
100	20.8	13.9	13.1	8.33	6.94
167	34.8	23.2	21.9	13.9	11.6
250	52.1	34.7	32.8	20.8	17.4
333	69.4	46.3	43.7	27.7	23.1
500	104	69.4	65.6	41.7	34.7

**TABLE VB - FULL-LOAD CURRENTS IN
AMPERES-THREE-PHASE CIRCUITS**

FULL-LOAD CURRENT = $\frac{\text{KVA} \times 1000}{1.732 \times \text{VOLTAGE}}$							
KVA	208	240	480	2400	4160	4800	
9	25.0	21.7	10.8	2.17	1.25	1.08	
15	41.6	36.1	18.0	3.61	2.08	1.80	
30	83.3	72.2	36.1	7.22	4.17	3.61	
45	125	108	54.1	10.8	6.25	5.41	
75	208	180	90.2	18.0	10.4	9.02	
112 1/2	312	271	135	27.1	15.6	13.5	
150	416	361	180	36.1	20.8	18.0	
225	625	541	271	54.1	31.3	27.1	
300	833	722	361	72.2	41.7	36.1	
500	1388	1203	601	120	69.4	60.1	
750	2082	1804	902	180	104	90.2	
1000	2776	2406	1203	241	139	120	
1500	4164	3608	1804	361	208	180	
2000	5552	4811	2406	481	278	240	
KVA	7200	8320	12,000	12,470	13,200	14,400	
9	.72	.63	.43	.42	.39	.36	
15	1.20	1.04	.72	.69	.66	.60	
30	2.41	2.08	1.44	1.39	1.31	1.20	
45	3.61	3.13	2.17	2.08	1.97	1.80	
75	6.01	5.21	3.61	3.48	3.28	3.01	
112 1/2	9.02	7.81	5.41	5.21	4.92	4.51	
150	12.0	10.4	7.22	6.95	6.56	6.01	
225	18.0	15.6	10.8	10.4	9.84	9.02	
300	24.1	20.8	14.4	13.9	13.1	12.0	
500	40.1	34.8	24.1	23.2	21.9	20.1	
750	60.1	52.1	36.1	34.7	32.8	30.1	
1000	80.2	69.4	48.1	46.3	43.7	40.1	
1500	120.3	104	72.2	69.4	65.6	60.1	
2000	160.4	138.8	96.2	92.6	87.4	-	

NATIONAL ELECTRICAL CODE

ALLOWABLE AMPACITIES

Size	Temperature Rating of Conductor (See Table 310-13)						Size
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
AWG or kcmil	Types TW, UF	Types FEPW, RH, RHW, THHW, THW, THWN, XHHW, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	Types TW, UF	Types RH, RHW, THHW, THW, THWN, XHHW	Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	AWG or kcmil
	COPPER			ALUMINUM OR COPPER-CLAD ALUMINUM			
18	—	—	18	—	—	—	—
16	—	—	24	—	—	—	—
14*	25	30	35	—	—	—	—
12*	30	35	40	25	30	35	12*
10*	40	50	55	35	40	40	10*
8	60	70	80	45	55	60	8
6	80	95	105	60	75	80	6
4	105	125	140	80	100	110	4
3	120	145	165	95	115	130	3
2	140	170	190	110	135	150	2
1	165	195	220	130	155	175	1
1/0	195	230	260	150	180	205	1/0
2/0	225	265	300	175	210	235	2/0
3/0	260	310	350	200	240	275	3/0
4/0	300	360	405	235	280	315	4/0
250	340	405	455	265	315	355	250
300	375	455	505	290	350	395	300
350	420	505	570	330	395	445	350
400	455	545	615	355	425	480	400
500	515	620	700	405	485	545	500
600	575	690	780	455	540	615	600
700	630	755	855	500	595	675	700
750	655	785	885	515	620	700	750
800	680	815	920	535	645	725	800
900	730	870	985	580	700	785	900
1000	780	935	1055	625	750	845	1000
1250	890	1065	1200	710	855	960	1250
1500	980	1175	1325	795	950	1075	1500
1750	1070	1280	1445	875	1050	1185	1750
2000	1155	1385	1560	960	1150	1335	2000

CORRECTION FACTORS

Ambient Temp. (°C)	For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below.						Ambient Temp. (°F)
21-25	1.08	1.05	1.04	1.08	1.05	1.04	70-77
26-30	1.00	1.00	1.00	1.00	1.00	1.00	78-86
31-35	0.91	0.94	0.96	0.91	0.94	0.96	87-95
36-40	0.82	0.88	0.91	0.82	0.88	0.91	96-104
41-45	0.71	0.82	0.87	0.71	0.82	0.87	105-113
46-50	0.58	0.75	0.82	0.58	0.75	0.82	114-122
51-55	0.41	0.67	0.76	0.41	0.67	0.76	123-131
56-60	—	0.58	0.71	—	0.58	0.71	132-140
61-70	—	0.33	0.58	—	0.33	0.58	141-158
71-80	—	—	0.41	—	—	0.41	159-176

NATIONAL ELECTRICAL CODE

ALLOWABLE AMPACITIES

Size	Temperature Rating of Conductor (See Table 310-13)						Size
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
AWG or kcmil	Types TW, UF	Types FEPW, RH, RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW- 2, THHN, THHW, THW-2, THWN- 2, USE-2, XHH, XHHW, XHHW- 2, ZW-2	Types TW, UF	Types RH, RHW, THHW, THW, THWN, XHHW, USE	Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	AWG or kcmil
	COPPER			ALUMINUM OR COPPER-CLAD ALUMINUM			
18	—	—	14	—	—	—	—
16	—	—	18	—	—	—	—
14*	20	20	25	—	—	—	—
12*	25	25	30	20	20	25	12*
10*	30	35	40	25	30	35	10*
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000

CORRECTION FACTORS

Ambient Temp. (°C)	For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below.						Ambient Temp. (°F)
21-25	1.08	1.05	1.04	1.08	1.05	1.04	70-77
26-30	1.00	1.00	1.00	1.00	1.00	1.00	78-86
31-35	0.91	0.94	0.96	0.91	0.94	0.96	87-95
36-40	0.82	0.88	0.91	0.82	0.88	0.91	96-104
41-45	0.71	0.82	0.87	0.71	0.82	0.87	105-113
46-50	0.58	0.75	0.82	0.58	0.75	0.82	114-122
51-55	0.41	0.67	0.76	0.41	0.67	0.76	123-131
56-60	—	0.58	0.71	—	0.58	0.71	132-140
61-70	—	0.33	0.58	—	0.33	0.58	141-158
71-80	—	—	0.41	—	—	0.41	159-176

VII - A

NATIONAL ELECTRICAL CODE

ALLOWABLE AMPACITIES

Size	Temperature Rating of Conductor (See Table 310-13)				Size
AWG or kcmil	150°C (302°F)	200°C (392°F)	250°C (482°F)	150°C (302°F)	AWG or kcmil
	Type Z	Types FEP, FEPB, PFA	Types PFAH, TFE	Type Z	
	COPPER		NICKEL OR NICKEL-COATED COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	
14	34	36	39	—	14
12	43	45	54	30	12
10	55	60	73	44	10
8	76	83	93	57	8
6	96	110	117	75	6
4	120	125	148	94	4
3	143	152	166	109	3
2	160	171	191	124	2
1	186	197	215	145	1
1/0	215	229	244	169	1/0
2/0	251	260	273	198	2/0
3/0	288	297	308	227	3/0
4/0	332	346	361	260	4/0

CORRECTION FACTORS

Ambient Temp. (°C)	For ambient temperatures other than 40°C (104°F), multiply the allowable ampacities shown above by the appropriate factor shown below.				Ambient Temp. (°F)
41-50	0.95	0.97	0.98	0.95	105-122
51-60	0.90	0.94	0.95	0.90	123-140
61-70	0.85	0.90	0.93	0.85	141-158
71-80	0.80	0.87	0.90	0.80	159-176
81-90	0.74	0.83	0.87	0.74	177-194
91-100	0.67	0.79	0.85	0.67	195-212
101-120	0.52	0.71	0.79	0.52	213-248
121-140	0.30	0.61	0.72	0.30	249-284
141-160	—	0.50	0.65	—	285-320
161-180	—	0.35	0.58	—	321-356
181-200	—	—	0.49	—	357-392
201-225	—	—	0.35	—	393-437

VII - B

NATIONAL ELECTRICAL CODE

ALLOWABLE AMPACITIES

Size	Temperature Rating of Conductor (See Table 310-13)				Size
AWG or kcmil	150°C (302°F)	200°C (392°F)	250°C (482°F)	150°C (302°F)	AWG or kcmil
	Type Z	Types FEP, FEPB, PFA	Types PFAH, TFE	Type Z	
	COPPER		NICKEL, OR NICKEL-COATED COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	
14	46	54	59	—	14
12	60	68	78	47	12
10	80	90	107	63	10
8	106	124	142	83	8
6	155	165	205	112	6
4	190	220	278	148	4
3	214	252	327	170	3
2	255	293	381	198	2
1	293	344	440	228	1
1/0	339	399	532	263	1/0
2/0	390	467	591	305	2/0
3/0	451	546	708	351	3/0
4/0	529	629	830	411	4/0

CORRECTION FACTORS

Ambient Temp. (°C)	For ambient temperatures other than 40°C (104°F), multiply the allowable ampacities shown above by the appropriate factor shown below.				Ambient Temp. (°F)
41-50	0.95	0.97	0.98	0.95	105-122
51-60	0.90	0.94	0.95	0.90	123-140
61-70	0.85	0.90	0.93	0.85	141-158
71-80	0.80	0.87	0.90	0.80	159-176
81-90	0.74	0.83	0.87	0.74	177-194
91-100	0.67	0.79	0.85	0.67	195-212
101-120	0.52	0.71	0.79	0.52	213-248
121-140	0.30	0.61	0.72	0.30	249-284
141-160	—	0.50	0.65	—	285-320
161-180	—	0.35	0.58	—	321-356
181-200	—	—	0.49	—	357-392
201-225	—	—	0.35	—	393-437

Table 430-148. Full-Load Currents in Amperes
Single-Phase Alternating-Current Motors

The following values of full-load currents are for motors running at usual speeds and motors with normal torque characteristics. Motors built for especially low speeds or high torques may have higher full-load currents, and multispeed motors will have full-load current varying with speed, in which case the nameplate current ratings shall be used.

To obtain full-load currents of 208- and 200-volt motors, increase corresponding 230-volt motor full-load currents by 10 and 15 percent, respectively.

The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110 to 120 and 220 to 240.

HP	115V	208	230V
1/6	4.4	2.4	2.2
1/4	5.8	3.2	2.9
1/3	7.2	4.0	3.6
1/2	9.8	5.4	4.9
3/4	13.8	7.6	6.9
1	16	8.8	8
1 1/2	20	11.0	10
2	24	13.2	12
3	34	18.7	17
5	56	30.8	28
7 1/2	80	44	40
10	100	55	50

NATIONAL ELECTRICAL CODE

FULL LOAD CURRENTS - THREE PHASE AC MOTORS

Horsepower	Induction Type Squirrel Cage and Wound Rotor (Amperes)							Synchronous-Type Unity Power Factor* (Amperes)			
	115 Volts	200 Volts	208 Volts	230 Volts	460 Volts	575 Volts	2300 Volts	230 Volts	460 Volts	575 Volts	2300 Volts
½	4.4	2.5	2.4	2.2	1.1	0.9	—	—	—	—	—
¾	6.4	3.7	3.5	3.2	1.6	1.3	—	—	—	—	—
1	8.4	4.8	4.6	4.2	2.1	1.7	—	—	—	—	—
1½	12.0	6.9	6.6	6.0	3.0	2.4	—	—	—	—	—
2	13.6	7.8	7.5	6.8	3.4	2.7	—	—	—	—	—
3	—	11.0	10.6	9.6	4.8	3.9	—	—	—	—	—
5	—	17.5	16.7	15.2	7.6	6.1	—	—	—	—	—
7½	—	25.3	24.2	22	11	9	—	—	—	—	—
10	—	32.2	30.8	28	14	11	—	—	—	—	—
15	—	48.3	46.2	42	21	17	—	—	—	—	—
20	—	62.1	59.4	54	27	22	—	—	—	—	—
25	—	78.2	74.8	68	34	27	—	53	26	21	—
30	—	92	88	80	40	32	—	63	32	26	—
40	—	120	114	104	52	41	—	83	41	33	—
50	—	150	143	130	65	52	—	104	52	42	—
60	—	177	169	154	77	62	16	123	61	49	12
75	—	221	211	192	96	77	20	155	78	62	15
100	—	285	273	248	124	99	26	202	101	81	20
125	—	359	343	312	156	125	31	253	126	101	25
150	—	414	396	360	180	144	37	302	151	121	30
200	—	552	528	480	240	192	49	400	201	161	40
250	—	—	—	—	302	242	60	—	—	—	—
300	—	—	—	—	361	289	72	—	—	—	—
350	—	—	—	—	414	336	83	—	—	—	—
400	—	—	—	—	477	382	95	—	—	—	—
450	—	—	—	—	515	412	103	—	—	—	—
500	—	—	—	—	590	472	118	—	—	—	—

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Table 430-151(A). Conversion Table of Single-Phase Locked-Rotor Currents for Selection of Disconnecting Means and Controllers as Determined from Horsepower and Voltage Rating

For use only with Sections 430-110, 440-12, 440-41, and 455-8(c).

Rated Horsepower	Maximum Locked-Rotor Current in Amperes, Single Phase		
	115 Volts	208 Volts	230 Volts
½	58.8	32.5	29.4
¾	82.8	45.8	41.4
1	96	53	48
1½	120	66	60
2	144	80	72
3	204	113	102
5	336	186	168
7½	480	265	240
10	600	332	300

Table 430-151(B). Conversion Table of Polyphase Design B, C, D, and E Maximum Locked-Rotor Currents for Selection of Disconnecting Means and Controllers as Determined from Horsepower and Voltage Rating and Design Letter

For use only with Sections 430-110, 440-12,* 440-41,* and 455-8(c).

Rated Horsepower	Maximum Motor Locked-Rotor Current in Amperes Two- and Three-Phase, Design B, C, D and E											
	115 Volts		200 Volts		208 Volts		230 Volts		460 Volts		575 Volts	
	B, C, D	E	B, C, D	E	B, C, D	E	B, C, D	E	B, C, D	E	B, C, D	E
½	40	40	23	23	22.1	22.1	20	20	10	10	8	8
¾	50	50	28.8	28.8	27.6	27.6	25	25	12.5	12.5	10	10
1	60	60	34.5	34.5	33	33	30	30	15	15	12	12
1½	80	80	46	46	44	44	40	40	20	20	16	16
2	100	100	57.5	57.5	55	55	50	50	25	25	20	20
3	—	—	73.6	84	71	81	64	73	32	36.5	25.6	29.2
5	—	—	105.8	140	102	135	92	122	46	61	36.8	48.8
7½	—	—	146	210	140	202	127	183	63.5	91.5	50.8	73.2
10	—	—	186.3	259	179	249	162	225	81	113	64.8	90
15	—	—	267	388	257	373	232	337	116	169	93	135
20	—	—	334	516	321	497	290	449	145	225	116	180
25	—	—	420	646	404	621	365	562	183	281	146	225
30	—	—	500	775	481	745	435	674	218	337	174	270
40	—	—	667	948	641	911	580	824	290	412	232	330
50	—	—	834	1185	802	1139	725	1030	363	515	290	412
60	—	—	1001	1421	962	1367	870	1236	435	618	348	494
75	—	—	1248	1777	1200	1708	1085	1545	543	773	434	618
100	—	—	1668	2154	1603	2071	1450	1873	725	937	580	749
125	—	—	2087	2692	2007	2589	1815	2341	908	1171	726	936
150	—	—	2496	3230	2400	3106	2170	2809	1085	1405	868	1124
200	—	—	3335	4307	3207	4141	2900	3745	1450	1873	1160	1498
250	—	—	—	—	—	—	—	—	1825	2344	1460	1875
300	—	—	—	—	—	—	—	—	2200	2809	1760	2247
350	—	—	—	—	—	—	—	—	2550	3277	2040	2622
400	—	—	—	—	—	—	—	—	2900	3745	2320	2996
450	—	—	—	—	—	—	—	—	3250	4214	2600	3371
500	—	—	—	—	—	—	—	—	3625	4682	2900	3746