ELECTRIC SERVICE MANUAL

REQUIREMENTS
for
ELECTRIC SERVICE
and
METER INSTALLATIONS

"Red Book"

Ohio
and
Kentucky

June 2019

Table of Contents

Duke Energy's Red Book April 2019 Changes

Table of Contents

- Added Public Information, Disclaimer, Ohio/Kentucky Service Territory Map and Definitions

Section I

- "General Information" – Added requirement that all meter/metering equipment installations are to be located outside unless specific approval has been obtained by a Duke Energy Customer Delivery designer

Section II

- "Service Voltages" – Added reference to new Figure 54 for roadway lighting

Section III

- "Service Drop Location" – Service drop attachment points at corners 90 degrees away from the service entrance weatherhead must be installed no more than 12 inches from said corner
- "Service Laterals" – Added requirements for Duke Energy-owned laterals
  - Added requirements for use of expansion coupling

Section IV

- Added "Bus Cabinet" requirements
- Changed "Step-Bus Installation" to "Secondary Cabinet"
- Table 1 – "Permissible Starting Current for Single-Phase Motors" – Revised 230 volts to 240 volts

Section V

- "General" – Added reference to roadway lighting installation and new Figure 54
- "Self-Contained Metering Installations" – Updated meter base requirements
- "Instrument Transformer Metering" – Added requirement that All instrument transformer connections shall be accessible from the bottom or front of the instrument transformer enclosure. Back-to-back connections are not allowed
- "Meter Locations" – Added requirement that all meter enclosures including CT cabinets shall be located outdoors
  - Added standard meter height requirements
  - Added flood zone requirements
- "Metal Cabinets to Enclose Metering Transformers" – Added requirements that no wood components are allowed within the cabinet
  - Stacking lugs are not permitted on bar type CTs
- Added requirements for use of expansion coupling on underground service conduits and the use of 90-degree sweeps in succession

- "Specifications of Metal Cabinets to Enclose Metering Transformers for Installations Not Exceeding 600 Volts or 1200 Amps" – Added door construction requirements
  - Added table listing clearance requirements for uninsulated components inside current transformer cabinets
- "Net Metering" – Added requirements for use of separate metering structure

Section VI

- Fault Current and Arc Flash information added
- Fault Current Tables added

Section VII

- Added Table of Contents and updated "HOW TO APPLY THESE DRAWINGS"
- Added Figures 37, 38, 40, 54, 65, 66, 67, 95A, 95B, 100, 101, 107, 110, 111, 112, 113, 114, 115A, 115B, 120, 121, 122B, 130, 131, 132, 133A, 133B, 135, 141A, 141B, 142A, 142B, 142C, 142D, 142E, 143A, 143B, 144, 145A, 145B, 145C, 145D, 146A and 146B
- All other Figures have been updated
- Burial depth on all Duke Energy-owned conductors have changed – see Figure 100

Duke Energy's Red Book June 2019 Changes

Section III

- "Service Laterals" – Updated number of sets when using pit pads
  - Updated requirements for Duke Energy-owned service laterals
- "Transformer Vaults" – Added maximum conductor size

Section VI

- Removed sections F-I and K-P. Removed sections summed up in "General"

Section VII

- Changed Figure 30 to 30A, 32 to 30B and 33 to 30C
- Updated Figures 31A, 40, 54, 80, 107, 111, 114, 121 and 122B

Publication Information

This publication is for informational purposes only, and in no way shall this publication be construed to impose any liability upon the Company or any subsidiaries, affiliates or parent entities. The Company makes no warranties or representations in this publication expressed or implied, including but not limited to merchantability and fitness for a particular purpose.

The following policies and rules were the Company requirements at the date of publication and are subject to change. This publication is revised periodically and made available at no cost to electrical contractors, electrical inspectors, customers and other interested parties.

Download the latest version of the Electric Service Manual: Requirements for Electric Service and Meter Installations *from the Company website at https://www.duke-energy.com/partner-with-us/builders-developers-and-contractors/construction-toolbox.*

Duke Energy Ohio/Kentucky (DEO/K) Customer Care Center

To Apply for Service:	**877.700.DUKE (3853)**
OR Visit Website at:	**http://www.duke-energy.com**
To Report Power Outages:	**800.343.3525**
Call Before You Dig:	**811**

Disclaimer

This publication is a guide to the Company's electric service requirements and is not intended to cover all rules and National Electric Code or National Electric Safety Code regulations. It is intended to promote uniformity throughout the Company's (as defined below) system and to provide a satisfactory interface guide for the customer's electric service equipment at the service point.

The Company is required to comply with the rules and regulations in National Electrical Safety Code (NESC) and Occupational Safety & Health Administration (OSHA) in the construction and operation of its facilities. All requirements in this document are intended to meet or exceed those requirements.

Except for the installation and maintenance of its own property, the Company does not install or repair wiring on the customer's premises and, therefore, is not responsible for the electricity beyond the service point and does not assume any responsibility for or liability arising because of the condition of wires or apparatuses on the premises of any customer beyond this point.

Duke Energy Ohio/Kentucky, herein referred to as the "Company," provides this publication to assist all customers in planning for and obtaining prompt and satisfactory electric service.

Any reference to Distribution Engineering in this publication includes the Company's Regulated Business Unit.

The format of this manual allows for updating of information and figures. Additions and revisions will be forwarded to individuals listed on the master roster. Please remember it is the customer's responsibility to obtain and maintain a current version of this publication.

All users of the "Electric Service Manual: Requirements for Electric Service and Meter Installations" book for Ohio and Kentucky are encouraged to submit proposals to aid in future revisions. Please submit proposals as follows:

- Give section, paragraph and page number to which the proposal pertains.
- Submit proposal in writing including details, sketches, figures and all supporting information.

Questions or comments can be sent to:

Nathan.Bruins@duke-energy.com	Distribution Standards
Tom.Hostetter@duke-energy.com	Design Engineering
Charlie.Ploeger@duke-energy.com	Meter Engineering

Ohio/Kentucky Service Territory Map

Definitions

The following definitions shall apply for terms used in this book.

ANSI – American National Standards Institute.

Authority Having Jurisdiction (AHJ) – A person or agency authorized by a governmental body to inspect and approve customer electrical installations.

Available Fault Current – The maximum current that would flow due to a direct short from one conductor to ground or between conductors at the point of calculation.

Company – Duke Energy Ohio/Kentucky (DEO/K).

Customer – User of the Company's electric service or the user's authorized representative.

DEI – Duke Energy Indiana.

DEM – Duke Energy Midwest. Includes Indiana, Ohio and Kentucky.

DEO/K – Duke Energy Ohio/Kentucky.

Demand – The average rate at which electric energy in kW or kVA is consumed per time interval.

Demand Ampere – Average current flowing during the peak demand interval.

Distributed Energy Resource (DER) – An electric service where co-generators and independent power producers operate in parallel with the Company's electric system. Energy may flow in either direction through an interconnection.

Emergency and Standby Generators – Generators that normally operate only when the Company's electric service is unavailable and that are normally connected in such a way that no interconnection can exist.

High-Leg (Power Leg) – The conductor in a three-phase, 4-wire delta secondary connection that has a higher voltage to ground potential than the other conductors, typically 208 volts.

IEEE – Institute of Electrical and Electronic Engineers Inc.

Instrument Transformer (IT-rated or T-rated) – Current transformer (CT) or voltage transformer (VT) used to obtain current or voltage levels required for metering circuits.

Interconnection – An electric service where co-generators and small power producers operate in parallel with the Company's electric system. Energy may flow in either direction through an interconnection.

Meter Equipment Group (MEG) – A comprehensive list of meter enclosure devices approved by a committee representing participating electric utilities.

Meter Enclosure – A device that houses a meter socket and line and load connections.

Meter Socket – A device that provides support and a means of electrical connection to a watt-hour electrical meter.

Net Metering – A type of interconnection where customer-owned generation such as solar panels or wind turbines provides energy in parallel with the Company service. Energy generated and not consumed by the customer flows back to the Company.

NRTL – Nationally Recognized Testing Laboratories such as UL, MET Labs, ETL, TUV, CSA, etc.

National Electric Code (NEC) – A code sponsored by the National Fire Protection Association for the purposes of safeguarding persons and property from hazards arising from the use of electricity.

National Electric Safety Code (NESC) – A code sponsored by the Institute of Electrical and Electronics Engineers Inc. under the auspices of the American National Standards Institute for the purposes of the practical safeguarding of persons during the installation, operation or maintenance of electric supply and communication lines and associated equipment.

Network Metering – A service usually delivered by a 120/208 three-phase transformer using a combination of transformer-type metering in conjunction with single-phase 3-wire meters. Commonly found in apartment complexes where three-phase service is required for facilities but not for individual units.

Premise – The street address (physical location) to which the Company provides electrical service: a house, apartment, business, area light or streetlight. Every electric service account is associated with a premise, although a premise may have more than one account associated with it. For example, if a customer has a separately metered shop behind his house, the shop and house must be on separate accounts, but they are associated with the same premise.

Rotating Generation – The total components and subsystems that, in combination, convert methane gas or wind energy into electric energy suitable for connection to a utilization load. This is an example of a DER.

Service – The supply of electricity from the Company to the customer including the readiness and availability of electrical energy at the service point at the standard available voltage and frequency, whether or not utilized by the customer.

Service Drop – The overhead service conductors, rated 600 volts and less, between the Company's facilities and the service point on the customer's property.

Service Entrance – Customer-owned wire and or enclosures connecting the customer's service equipment to the Company's service drop, service lateral, transformer bushings or other source of supply.

Service Lateral – The underground service conductors, rated 600 volts and less, between the Company's secondary conductors or transformers and the service point.

Service Point – The point, as designated by the Company, where the Company's overhead service drop, underground service lateral or transformer secondary bushings connect to the customer's service entrance conductors.

Solar Photovoltaic (PV) System – The total components and subsystems that, in combination, convert solar energy into electric energy suitable for connection to a utilization load. This is an example of a DER.

Tariffs – The applicable rates and electric service rules and regulations under which all energy is delivered and all service is rendered by the Company.

Temporary Service – Service to non-permanent locations such as fairs, displays, exhibits, construction sites and similar temporary purposes.

Meter Socket Guidelines
Customer-Owned Equipment Specifications

Duke Energy is a member of the Meter Equipment Group (MEG), which is an organization comprised of electrical utilities that specifies the requirements for customer-owned, self-contained meter sockets and maintains an approved list of the sockets. For the latest MEG-approved equipment list, please visit http://www.duke-energy.com/pdfs/MEG-Approved-Sockets.pdf or visit http://www.duke-energy.com and in the website search box, enter "Approved Enclosure." Approval is based on the unit's compliance with the MEG specifications, particularly UL listing, sealing requirements, bypass characteristics and certain operational concerns. The MEG makes no claims regarding nameplate ratings or load side attachments beyond the sealed portion of the meter socket. We recommend that all units be used as intended by the manufacturer. All additional data is supplied for informational purposes only.

NOTES:

A. All commercial or three-phase applications require a unit with an approved bypass device. (Configuration 3 or 4)

B. All sockets are listed as their maximum socket amperage. 320/400 amp enclosures are listed as 400 amp.

C. Aluminum enclosures are recommended in salt spray areas.

D. The MEG list includes mostly ringless-type enclosures, and these are preferred by Duke Energy. Sealing rings (ring-type sockets) along with all lugs/connectors (line and load side) are considered to be part of the meter enclosure. The customer/contractor is thereby responsible for furnishing these items. The sealing ring must be a captive-screw-type equivalent to ABB #01L0028G02, Milbank MR-4/A3068, Landis & Gyr #9738-8002, or Ekstrom 10-9090. E. The "configuration" refers to the various meter connecting arrangements used to accommodate the utility meter. These configurations are described below. Use the configuration number from the list to select an appropriate enclosure from the approved list:

SELF-CONTAINED CONFIGURATIONS	DESCRIPTION & TYPICAL APPLICATION
1	Residential – 4-Terminal Socket, Single-Phase, 3-Wire
2	Residential – 5-Terminal Socket, Network, 3-Wire
3	Residential/Commercial – 4-Terminal Socket (w/Bypass), Single-Phase, 3-Wire
3a	Residential/Commercial – 5-Terminal Socket (w/Bypass), Network, 3-Wire
3b	Residential/Commercial – 5-Terminal Socket (w/Bypass), Neutral can be isolated for Three-Phase, 3-Wire applications
4	Commercial – 7-Terminal Socket (w/Bypass), Three-Phase, 4-Wire

Notice:

These meter sockets can be purchased from local electrical supply companies.

Contact the local Duke Energy Ohio/Kentucky office to discuss the location of this meter socket on your building.

Section I

General Information

A. General

1. Customers should give particular attention to sizing the ampacity of the service entrance equipment when determining present and future electrical needs.

2. Customers must provide a certificate of approval from the AHJ before the Company will permanently connect or reconnect customer's service. Also, the Company shall make the determination as to whether the customer's installed electrical equipment complies with all Company requirements.

   The Company's representative has no authority to inspect a customer's electric service equipment, wiring system, other equipment or appliances for compliance with state, local or any other applicable codes. Any inspection and other action by the Company's representatives to determine compliance with service requirements are for the Company's purpose only and will not impose any liability upon the Company or remove the obligation from the customer for the customer's installation and maintenance responsibilities.

   The Company does not warrant or represent in any manner by any provision set forth herein that any element of the customer's electrical system is safe or conforms to any code. Governmental authorities and the customer are responsible for assuring that the customer's electrical service equipment, wiring system, other equipment and appliances are installed and maintained safely and in compliance with applicable codes.

3. The Company's Distribution Engineering business unit is responsible for:

   - Assigning service and meter locations. All meter/metering equipment installations are to be located outside unless specific approval has been obtained by Duke Energy.
   - Assisting in planning the installation for connection to the Company's system.
   - Determining if the customer is in compliance with the Company's requirements for service.

4. Distribution Engineering representatives are available to answer customer questions relating to these guidelines. For information regarding Company procedures and service regulations not covered in this material, call 800.544.6900 to be connected to the appropriate office.

5. The Company reserves the right to withhold connection to and disconnect its system from any installation not conforming to the Company requirements.

6. Residential customers requesting temporary disconnection of service must contact the Company at least two (2) business days in advance of the requested disconnection date. Nonresidential customers requesting disconnection of service must contact the Company at least four (4) business days in advance of the disconnection date.

   Single-family residential customers and up to four-unit apartment building customers should call Service Installation at 877.700.DUKE (3853).

   All nonresidential and multifamily building customers (over four units) should call 877.700.DUKE (3853) to be connected to the appropriate office.

B. Requesting New Electric Service

1. Customers must make requests for new electric service prior to the start of construction. This request can be made by telephone to the appropriate Distribution Engineering office or by visiting the Company's contractor's webpage on Duke Energy's website (http://www.DukeEnergy.com/Residential_Services/contractor_information/).

2. The customer or the customer's representative is responsible for supplying complete and accurate information relative to the use of the service and the equipment that can be connected. Subsequent changes in the customer's service or plans must be reported immediately to the Company's project representative associated with the customer's project.

3. Use the following outline to provide correct information that may be needed by the Company to make the necessary arrangements for service:

   a. Service address (no directional addresses will be allowed on new construction).

   b. Legal name of the customer who will be using the service, a copy of the deed and the correct legal name of the property owner if different than the customer to be served.

   c. Date when customer will be ready for permanent electric service.

   d. Preferred service voltage and service point.

   e. Service ampacity.

f. Total connected load, grouped as to lighting, electric space heating/cooling, process heating or refrigeration, water heating, cooking, motors and special identified equipment such as:

- size of largest motor, type of motor starter to be used, frequency of motor starting and locked rotor amps
- rating and operating characteristics of special equipment such as welders, X-ray machines, etc.

g. Load management equipment.

h. Diagram of the electrical system, including switchgear drawings.

i. Plot plan showing location of right of way, property lines and building structures to be served, satellite buildings, driveways and parking areas, existing and proposed underground utilities and facilities, signs and outdoor lighting standards, areas to be graded, and areas of the property most likely to be developed in the future.

j. Temporary electric service for construction: the date wanted and the voltage ampacity requirements. See Section III(B) of this manual for additional information.

C. Meter Equipment Pickup Locations

Company-provided metering equipment can be picked up Monday through Friday, except holidays, between the hours of 8 and 11:45 a.m. and 12:30 and 3 p.m. This equipment is usually available within three business days at 424 Gest St., Cincinnati, Ohio. Follow instructions posted at the front door upon arrival at the Gest Street location. Allow at least one week for delivery prior to pickup at a satellite location.

D. Installation of Electric Facilities

Installation of electric facilities will begin when all Company requirements, including the following, have been completed:

1. The Company, customer and the property owner to be served have approved the method of service.

2. Arrangements have been made for the billing and collection of charges for the service to be provided.

3. The customer and all parties have completed the required agreements and/or grants of easement to the Company for the installation of facilities on or across

private property.

4. Elevation is to final grade within those areas where the company is to install facilities, assurance that these areas are accessible and clear of stored materials or other construction activities.

5. The Company has received all required permits to install its facilities.

6. Adequate protection for Company-owned equipment has been installed.

E. Service Connections

The Company will connect to a customer's new electric service equipment or reconnect to rewired electric service equipment when all Company requirements, including the following, have been completed:

1. The Company has received an application and/or contract for service specifying service-billing details. Legal name of the customer, service address and billing address are required.

    - To make application for electric service, call Service Installation at 877.700.DUKE (3853).

2. The Company has determined that the customer is in compliance with its requirements for electric service.

3. The Company has received a certificate of approval from the AHJ.

F. Unauthorized Use of Electricity

Removal or relocation of an electric meter without the Company's permission is prohibited. Tampering with the Company's metering equipment, making an unmetered connection or making an unauthorized reconnection to the Company's system is prohibited. The penalties for these activities may include fines and imprisonment.

G. Locating the Company's & Other Utilities' Underground Facilities

State laws require that before you do any excavation you contact the *"Call Before You Dig"* service. Call at least two (2) working days prior to any excavating, digging or breaking ground for information on location of underground utility facilities.

- Ohio locations call:
  Ohio Utilities Protection Service (toll-free) 811
- Kentucky locations call:
  Kentucky Underground Protection Inc. (toll-free) 811

Section II

Systems of Distribution

A. Service Voltages

Listed below are the service voltages that may be available based on customer location and the nature of the load. **For service availability in your area, call 877.700.DUKE (3853) to be connected to the appropriate office.**

1. The following service voltages, 600 volts or less, are supplied by the Company:

    a. Single-phase, 3-wire, 120/240 volts AC at 60 Hz

    b. Three-phase, 4-wire, 208Y/120 volts AC at 60 Hz

    c. Three-phase, 4-wire, 480Y/277 volts AC at 60 Hz

2. The following service voltages, over 600 volts, are supplied by the Company:

    a. Three-phase, 4-wire, 12470Y/7200 volts AC at 60 Hz

    b. Three-phase, 4-wire, 34500Y/19920 volts AC at 60 Hz

    c. Three-phase, 3-wire, 69000 volts AC at 60 Hz

    d. Three-phase, 3-wire, 138000 volts AC at 60 Hz

3. The following voltages, 600 volts or less, are available **for limited use** (for availability, contact the numbers above):

    a. Single-phase, 3-wire, 120/208 volts AC at 60 Hz (please call 877.700.DUKE (3853) for service availability in our area)

    b. Three-phase, 4-wire, 240/120-volt AC at 60 Hz

    c. Single-phase, 3-wire, 240/480 volts AC at 60 Hz for roadway lighting (see Figure 54)

These voltages are nominal and may vary depending on operating conditions:

- Three-phase, 4-wire services are supplied with a grounded neutral.
- Three-phase, 3-wire services are supplied without a neutral.

B. Available Fault Current Information

For fault current information regarding a specific service, call Service Installation at 877.700.DUKE (3853). Refer to Section IV(C) for service equipment interrupting rating requirement.

Section III

Service Installations

A. General

The electrical contractor should be familiar with the work of other construction crews on the premises so the electric service system and electric meter installation will not be obstructed. Examples of possible obstructions are plumbing, HVAC and other building structures.

TEMPORARY ELECTRIC SERVICE

B. Requirements for Electric Service

The Company will supply temporary electric service where available, subject to applicable tariffs on file with the appropriate state public utility commission. For charges and information concerning temporary electric services, call Service Installation at 877.700.DUKE (3853).

1. Before the company will provide temporary service, for single-phase services of 200 amps or less, the customer must furnish and install the following:

    a. Temporary support with address visible from the street

    b. Service entrance conductor or underground service lateral

    c. Weather-head (for overhead services)

    d. Service drop attachment device (for overhead services)

    e. Ringless meter socket

    f. Meter board (when required)

    g. Service grounding

    h. Service disconnecting device

    i. Any other equipment required by the AHJ

These requirements must meet the stipulations contained in Section I(A)(2) of this manual.

Figures 15 and 16 show typical supports for a maximum 200 amps temporary service.

2. The Company will:

   a. Furnish and install the service drop (for overhead areas)

   b. Make connections to the Company's facilities

   c. Furnish and install the electric meter

3. For three-phase services or single-phase service over 200 amps, call Service Installation at 877.700.DUKE (3853).

PERMANENT ELECTRIC SERVICE

C. Number of Services

Only one service drop or underground lateral, except for separate lighting and power services, will be supplied to any one structure. Exceptions may be permitted by the National Electric Code (NEC) but are subject to approval by the Company and the AHJ. Separate service raceways and meter equipment are normally grouped, and service drops or underground laterals will be run to the same general location on the structure.

At the discretion of the Company, the overhead services may be installed from different poles and the service entrance conductors may enter a structure at different locations. When this arrangement occurs, a permanent plaque or directory will be installed by the customer at each service equipment location specifying all other service locations in or on the structure served.

D. Space for Service Equipment

Minimum space requirements can be obtained from figures in Section VII of this manual and from the NEC. For more information regarding installations not covered by these figures, call 877.700.DUKE (3853) to be connected to the appropriate office.

E. Service Address

The structure's permanent address must be clearly visible from the street or road.

F. Service Drop Location

The location of all service drop attachments must be approved by Distribution Engineering before the customer's work begins.

1. The service drop attachment must be *safely accessible* and in a direct line to the Company's service pole. *"Safely accessible"* is defined as accessible with an extension ladder placed on firm level ground directly beneath the point of attachment and with a mounting height of no greater than 20 feet. If these conditions cannot be met, contact Distribution Engineering at 877.700.DUKE (3853) for assistance.

2. The service drop attachment must be located so that the service drop will not cross adjoining property.

3. The service drop attachment must be located at a height to permit the following minimum clearances (under conditions of maximum sag) at any point along the span of the service drop conductors. These clearances apply to company-owned service drops meeting NESC rule 230C3 (triplex, quadraplex, duplex or parallel-lay conductors). For other company-owned service conductors (open-wire, bare wire), refer to NESC for appropriate clearances (see Figure 10).

    a. Twelve (12) feet above the finished grades, sidewalks, platforms or projections from which the conductor might be reached when the voltage is limited to 300 volts to ground

    b. Sixteen (16) feet above the residential driveways when the voltage is limited to 300 volts to ground

    c. Sixteen (16) feet above commercial areas, parking lots, public streets, alleys, roads, commercial driveways and areas subject to truck traffic or agricultural vehicles

4. The service drop conductors to a structure must have a horizontal clearance not less than 3 feet from all windows, doors, porches, fire escapes or similar locations readily accessible to pedestrians. All other clearance requirements of

the NEC, NESC, and state and local requirements must be met. Service drop attachment points at corners 90 degrees away from the service entrance weather-head must be installed no more than 12 inches from said corner.

5. The service drop attachment or service mast guying attachment device must not be installed on a masonry chimney.

6. The minimum size service mast for attachment of a service drop is 2-inch rigid steel or 2-inch intermediate metallic conduit (IMC). Conduit couplings are not permitted above the roofline. Couplings, if required, must be installed below the second conduit support from the roofline (see Figure 22).

G. Attachment of Service Drop

The customer will furnish and install an appropriate service drop attachment device capable of withstanding a 1,200# dead-end tension fastened to the structure wall or other support for terminating the service drop. Attachment details for services over 320 amps are available by calling 877.700.DUKE (3853). These service drop attachment devices must be secured into studs or other parts of the main building and must be capable of supporting the service drop tensions. Attachment to the trim board only is not permitted.

This attachment device must be mounted below and within 2 feet of the weather-head (see Figures 20, 21, 22, 88 and 89).

H. Service Pole Line

If it is necessary to install poles and conductors to reach a service point, the cost of the pole line may be at the customer's expense, which shall be at the discretion of the Company. Distribution Engineering will provide the estimated costs for these facilities to the customer.

I. Service Raceways and Service Entrance Cables

1. The service entrance conductors must be brought to the metering equipment enclosure in conduit, service entrance cable or bus duct installed in compliance with the NEC. The metering equipment must be located on the supply side of the main service disconnecting device whenever possible. **The meter is to be located outdoors on all new or rewired buildings.** For more meter and service

location information, call 877.700.DUKE (3853) to be connected to the appropriate office.

2. Suitable protection must be used in locations where service entrance cables and/or meter would be subject to damage. Locations may include areas adjacent to driveways, sidewalks, parking lots, etc.

3. All service entrance conductor installations must be provided with a raintight weather-head located above and within 2 feet of the service drop attachment device. Weathertight connections must be installed in the top of outdoor meter sockets and cabinets when service entrance cables are used. Cable sealant may be required to make the installation watertight.

4. Where exposed to weather, raceways enclosing service entrance conductors must be arranged to drain as required by the NEC.

J. Service Entrance Conductors

1. All single-phase installations having more than one branch circuit must be wired with a three-wire service.

2. Service entrance conductors must extend at least 3 feet from the weather-head to permit connection to the Company's service drop. Additional conductor lengths may be required on installations having multiple or parallel sets of service entrance conductors or having pole, mast or building mounted current transformers.

3. Outdoor grounded service neutral conductors must be permanently identified by either:

   - White or natural gray insulation or tracer identification
   - Bare conductor stripped to the weather-head
   - On a 4-wire delta connected service where the midpoint of one phase winding is grounded, the service conductor having the higher-phase voltage to ground must be durably and permanently marked by an outer finish that is orange in color, or by other effective means, at each termination or junction point. (See Figure 50 for wiring details.)

   Only indoor grounded service neutral conductors may be identified by painting or taping. The grounded service neutral must be connected to the neutral bus in the

service disconnect and to the neutral connectors in the self-contained meter socket. Phase identification will be required where multiple sets of conductors are used and on all three-phase, three-wire service installations.

4. If multiple-position meter sockets are installed without a main service disconnect ahead of the meters, grounded neutral and phase conductors must be continuous from the weather-head through the line side connectors of each meter position. The grounded service neutral conductor tap connectors should be used at each position supplied (see Figures 68 and 69).

5. Service entrance conductors for residential services must have an ampacity of not less than 100 amps, 120/240 volt, single-phase.

6. An oxidation inhibitor must be properly applied to all connection points where aluminum service entrance conductors terminate in the meter socket or current transformer connectors. It is recommended that the inhibitor also be applied to service equipment connections.

7. Aluminum and copper service entrance conductor termination connections must be torqued to the manufacturer specifications in metering and service equipment.

K. Service Laterals

1. Customer-owned service laterals must meet the following requirements:

    a. The meter location and point of connection to the Company's system must be specified by Distribution Engineering before the installation of the service lateral.

    b. The customer will furnish, install, own and maintain all new service laterals. When a service lateral is installed, an expansion coupling shall be installed at the meter base to allow for settling of the earth. This expansion coupling helps to avoid destructive strain on the meter socket connectors. The trench must be back-filled in a proper manner before the service lateral can be energized. See NEC (Earth Movement). See Figures 45 and 46.

    c. For three-phase installations, or where multiple sets of conductors are used, phase identification is required.

d. A maximum of 10 sets (12 sets if using pit pad, see Figures 111-114), 750MCM max, of conductors is permitted on three-phase transformer installations. For installations exceeding 10 sets, contact Distribution Engineering at 877.700.DUKE (3853).

2. Duke Energy-owned service laterals must meet the following requirements:

   a. One electric service lateral per building (400 amps or less, 120/240 volt, single-phase) to one service point on a private residential building (structure and property must have same owner)

      - May be gang metered (limited to 400 amps total)
        - May include a house/common meter
      - Electric service lateral must not cross a third-party's property

   b. Customer or customer representative to provide service PVC minimum schedule 40 or local AHJ requirements conduit to customer-owned and -installed meter base:

      - Less than or equal to 200 amps service requires 2-inch PVC minimum schedule 40 or local AHJ requirements conduit up to 200 linear feet with maximum of three sweeping 90-degree bends
      - Greater than 200 amps and up to 400 amps service requires 4-inch PVC minimum schedule 40 or local AHJ requirements conduit up to 200 linear feet with maximum of three sweeping 90-degree bends
      - All elbows shall have a minimum 30-inch radius

   c. An expansion coupling installed at the meter base to allow for settling of the earth is required, to help avoid destructive strain on the meter socket connectors.

   d. The Company reserves the right to refuse service to new installations that do not meet Duke Energy requirements and may elect to remove existing service cables if the customer fails to provide adequate maintenance to customer-owned facilities.

   e. For construction details, refer to Figure 106.

L. Underground Service Connections

Company personnel will make all secondary service connections to the system.

1. Unauthorized personnel will not be permitted to enter the Company's pad-mounted transformers, vaults, pits, pull-boxes, pedestals, etc. for pulling cables without specific authorization from Distribution Engineering.

UNDERGROUND IN OVERHEAD AREAS

2. When installing a service lateral to the service pole, the customer must furnish and install the following:

    a. A 4-inch or smaller PVC schedule 40 conduit pipe riser (see Figure 90). The first 10-foot section of conduit must be secured to the pole every 24 inches with 2-hole conduit straps. (**Please note: U-Guard is not accepted.**)

    b. Sufficient lengths of cable for the Company to make connections to secondary conductors or terminals of pole-mounted transformer.

        - Obtain cable length information from Distribution Engineering.
        - The cable is to be coiled and attached to the pole at the top of the cable riser guard (see Figure 90).

3. If the service pole is not adjacent to or on the customer's property, contact Distribution Engineering at 877.700.DUKE (3853).

4. Service laterals with more than two sets of conductors per phase ***OR*** with conductors larger than 500 KCMIL in size will require the installation of an underground pull-box pedestal and associated conduit system to the utility pole. Contact Distribution Engineering at 877.700.DUKE (3853) for assistance.

NETWORK AREAS (DOWNTOWN CINCINNATI)

5. Underground service laterals generally will be furnished, installed, owned and maintained by the Company in the customer-installed duct system. Contact Distribution Engineering at 877.700.DUKE (3853) for details.

6. The service lateral will be installed to the customer's premises and will generally terminate in a service entrance junction box by the Company and installed by the customer. This is the service point.

7. The Company will make the final connections to the customer's wiring in the service entrance junction box.

8. Services consisting of three or more conductors per phase may be terminated individually on each end with cable limiters. For further information, contact Distribution Engineering at 877.700.DUKE (3853).

M. Services Over 600 Volts

Distribution Engineering must be consulted early in the customer's planning for services over 600 volts so the Company may prepare drawings and have sufficient time to order equipment. The customer must provide one-line service diagrams and switchgear drawings to the Company.

GROUNDING

N. Grounding the Customer's Service

Service entrance wiring with a neutral must have the neutral grounded. Grounding of all electric services and equipment must be in compliance with the NEC and meet the requirements of the AHJ.

O. Grounding Electrode Conductor Installation

1. The grounding electrode conductor can be routed through the metering equipment. Connections may be made in self-contained meter sockets only if equipped with proper grounding lug. No connections shall be made in current transformation cabinets serving fewer than three main disconnects.

2. Grounding electrode conductor shall be installed per the NEC.

P. Grounding Connection to AC Wiring

The grounding electrode conductor and the grounded service neutral conductor must be connected to the neutral/grounding bus of the service switch or service

panel board. The grounding electrode conductor must be installed in accordance with Section III(O) and III(P) above and with the NEC.

Q. Grounding of Meter Test Cabinets of Transformer-Rated Meter Sockets to Meter Transformer Cabinets

1. Service installations of 600 volts or less must be grounded as follows:

    a. When metallic conduit system is used, grounding can be obtained by proper bonding at both ends of the conduit run; or

    b. All metering equipment enclosures must be bonded to the main service disconnects.

TRANSFORMER/EQUIPMENT INSTALLATIONS

R. Installations on Customer's Premise

1. The customer is to provide a space at a mutually acceptable location on their premises for Company transformers/equipment. Contact Distribution Engineering at 877.700.DUKE (3853) for further information.

2. Space requirements and specifications for various types of transformer/equipment installations can be obtained from Distribution Engineering. Installations must conform to the requirements of the NEC, NESC, state and local requirements and Company requirements.

3. The customer must maintain the area around the Company's transformer/equipment and keep the area free from obstruction so the Company has satisfactory access for installation, operation, maintenance and removal of its equipment. The Company will not be responsible for damage to any obstruction. (See Figures 105 and 108.)

4. When transformers and/or equipment is in areas where there is vehicular movement, protective barriers will be required (see Figures 122A and 122B).

5. Storage of flammable gases, fluids or other substances in the area adjacent to the Company's transformer/equipment is prohibited.

6. For specific information, see Figures 100-122 in Section VII of this manual.

S. Transformer Vaults

Architects, engineers and contractors must contact Distribution Engineering at 877.700.DUKE (3853) and supply drawings early in the course of planning transformer vaults so the Company may prepare drawings and have sufficient time to order equipment.

1. The vault must be constructed by the customer to conform to all requirements of the NEC, NESC, state and local requirements, and to specifications issued by the Company. The vault will be inspected and approved for compliance with the NEC by the AHJ. The designated Company representative will approve the vault prior to the installation of Company equipment.

2. The Company will install all wiring inside transformer vaults. The customer's service bus must be extended into the vault. The Company will provide the connection (4/0, 250, 500 and 750 **ONLY**) between the transformer and the bus. Maximum customer conductor size is 750. If the customer installs cable services, a sufficient length of cable must be supplied to reach the secondary terminals of the transformer(s).

3. Specific authorization from the Company is required by anyone desiring to work inside the vault after the Company equipment has been installed. Contact Distribution Engineering at 877.700.DUKE (3853) for additional information.

4. The electric meter and equipment must be located outside the transformer vault.

5. Any customer-owned equipment that is to be located inside the vault (i.e., sprinkler heads, etc.) must be approved by Distribution Engineering before it can be installed. The Company reserves the right to limit the type of customer-owned equipment that will be permitted inside the vault.

T. Figures

Figures are contained in Section VII covering various customer installation requirements.

Section IV

Customer Equipment

A. General

The use of Customer's equipment shall not adversely affect the Company's system or service supplied by the Company to other customers.

The Company will make permanent connections between the customer's electric service wiring and the Company's system. Unauthorized connections are not permitted (see figures in Section VII).

Except for installations outlined in Section III(L)(4), no customer-owned equipment will be permitted on any Company-owned pole without prior approval from the Company, which shall be at the Company's sole discretion.

B. Metered and Unmetered Wiring

1. Unless authorized by the Company, which shall be at the Company's sole discretion, metering equipment will not be used as connection points for circuits or services added to the installation after the original service has been approved and energized.

2. Unmetered conductors will not be permitted in any wiring raceway, pull-box or distribution cabinet containing metered conductors.

3. No pull-box, distribution cabinet, wire trough, etc. will be permitted in raceways containing unmetered conductors unless provisions are made by the customer for sealing by the Company. Provisions for padlocking will be required in all unmetered installations.

C. Service Entrance Disconnecting Devices

1. Service ampacities will be limited to 3000 amps per transformer. Customer must contact Company's Distribution Engineering department for installations over this limit.

2. All service equipment must be rated for the available fault current on the Company's system. Information regarding the available fault current can be obtained from Company's Distribution Engineering department. Tables with transformer maximum available fault may be found in Section VI(C).

D. Standby Generators/Uninterruptible Power Supply

No other source of electricity can be connected to the customer's wiring system without transfer equipment to prevent feedback into the Company's system. Distribution Engineering must be contacted a minimum of 90 days in advance to allow time for engineering review and approval.

E. Parallel Operation of Customer Generation/Co-generation

No other source of electricity may be connected to customer's wiring system that results in parallel operation with the Company's system unless prior written authorization has been received from the Company. Please contact the call center for appropriate contact at 800.544.6900. The Company provides technical requirement booklets to assist customers and their representatives in planning and operating customer generation on the Company system. Distribution Engineering must be contacted a minimum of 90 days in advance for engineering review and approval. See Figures 130-146 for examples of approved installations.

F. Bus Cabinet

When a condition exists where more than six (6) total runs of wire for a CT cabinet are needed, the use of a step-bus cabinet will be required. The total runs of wire include both the Company and the customer. It is the responsibility of the customer to provide this equipment and to verify that it meets the requirements of the Company. Contact Distribution Engineering at 877.700.DUKE (3853) prior to the purchase or completion of any work.

Section V

Electric Meter Installations

A. General

Removal of, relocation of or performing any work on an electric meter without the Company's permission is prohibited. Tampering with the Company's metering equipment, making an unmetered connection or making an unauthorized reconnection to the Company's system is prohibited. The penalties for such activities may include but are not limited to fines and imprisonment.

1. Before ordering or installing electrical metering equipment, please obtain from Distribution Engineering available information for establishing system types and service voltage.

2. Certain types of customer installations require special metering. These include but are not limited to:

    a. Bus-bar installations of all ampacities

    b. Service ampacities exceeding 1200 amps

    c. Service voltages over 600 volts

    d. All metering other than standard self-contained type

    e. Multiple services

    f. Multiple occupancy and/or multistory buildings

    g. Underground service laterals terminating in metering compartments

    h. Mobile homes or mobile offices

    i. Pulse sending meters (e.g., power factor, load management)

    j. Preassembled metering units

    k. Roadway lighting (see Figure 54)

3. Customers should discuss any of the above-proposed installations with Distribution Engineering prior to any installation activities in order to permit Distribution Engineering to make recommendations and allow sufficient time to order special equipment.

B. Metered and Unmetered Wiring

1. The service ampacity and service voltage determine the type of meter installation. Service equipment and metering apparatus should conform to the arrangements shown in the figures of Section VII. Customers should familiarize themselves with the metering requirements of these typical installations.

2. Current and voltage transformers are used for metering all 480-volt 3-wire installations and all installations of 600 volts and higher.

3. All metering poles and pole holes must be inspected and approved by a designated Company representative before they are installed. **The pole must be a new, fully treated, minimum 25-foot, class 7 wood pole.** The metering pole location, height, class, and depth of setting and guying must be checked and approved before the pole can be installed. For inspections, call the Company's Service Installation department at 877.700.DUKE (3853).

C. Metering Equipment on the Supply Side of the Disconnect (600 Volts or Less)

The metering equipment shall be connected before the customer's main disconnect as described in the NEC. Arrange metering equipment as shown in figures of Section VII. For service and metering equipment arrangements not shown, call Service Installation at 877.700.DUKE (3853).

D. Self-Contained Metering Installations

1. The customer will furnish, install and maintain the following:

    a. Meter socket (see Meter Socket Guidelines, Page 12)

    b. Overhead service drop attachment device

    c. Service entrance conductors in raceways or cable assemblies

    d. Underground service laterals if all requirements are met to be a Duke Energy-owned service (see Section III(K)(2))

    e. Connections to the meter socket terminals or preassembled unit bus bar connectors

    f. Service disconnecting device

    g. Service equipment board where required (see Section V(I)(1))

    h. Service grounding system

i. Meter blanks for installations requiring more than four

2. The Company will furnish, install and maintain:

   a. Overhead service drop

   b. Service lateral (see Section III(K)(2))

   c. Connectors for the underground service lateral to the Company's facility

   d. Electric meter

   e. Up to four meter banks

3. Meter bases cannot be used as a raceway, junction, termination point, or for grounding any other cables, wires or service conductors.

4. Meter base load side service lugs shall have only one wire installed on each factory installed lug; no double tapping of lugs is permitted.

5. A self-contained meter base shall not be modified in any way beyond what was intended as specified by the manufacturer, including the addition of blocks or connectors to increase capacity.

E. Instrument Transformer Metering

1. Where a single customer is served from a three-phase pad-mounted transformer installation, contact Distribution Engineering at 877.700.DUKE (3853) for metering equipment details (see Figure 80).

2. All instrument transformer connections shall be accessible from the bottom or front of the instrument transformer enclosure. Back-to-back connections are not allowed.

3. The customer will furnish, install and maintain the following:

   a. Service entrance conductors or underground service laterals

   b. Service disconnecting device(s)

   c. Service equipment board where required

   d. Outdoor raintight metal cabinets with two doors for enclosing instrument-type transformers

e. Conduit for metering cables from instrument transformer cabinet to the metering enclosures or transformer-rated meter enclosure

f. All service grounding and bonding

g. All required insulated supplemental cable supports inside instrument transformer cabinets as required

h. All connectors on the line and load side of current transformer when connecting four or more conductors per phase to each current transformer

i. Primary (line side) conductors and connections to the current and voltage transformers on 2400 V and higher installations

4. The Company will furnish and maintain and the customer will install the following:

   a. Instrument transformers

   b. One-, two- or three-barrel connectors when the line and load side conductors are three or fewer per phase to each current transformer

   c. Transformer-rated meter enclosure

5. The Company will furnish, install and maintain the following:

   a. Overhead service drop

   b. Connectors for the underground service lateral to the Company's equipment

   c. Electric meter

   d. Cable and connections from the instrument transformer enclosure to the transformer-rated meter enclosure

6. All conductors must be installed to minimize mechanical stress on the current transformers.

7. Contact Distribution Engineering at 877.700.DUKE (3853) whenever it is proposed to mount the voltage and/or current transformers in switchgear.

F. Meter Locations

1. Meter enclosures including CT cabinets shall be located outdoors unless otherwise authorized in writing by Distribution Engineering.

2. Some municipalities may have ordinances that restrict the placement of meters on the front or street side of residential buildings. Consult your municipality.

3. The location of the meter must be approved by Distribution Engineering in advance of the installation or placement of any meter and before the Company will make the service connection. At some locations the Company may require the customer to install guards or enclosures to protect the Company's metering equipment from damage. The customer is responsible for any loss of and/or damage to the Company's meter(s) on customer's premises.

4. Standard meter height is 4 1/2 to 5 1/2 feet above finished grade. On new single-family residential service underground installations, with prior approval, the height may be reduced to 3 feet on center of the meter socket above the finished grade.

   For multiple-occupancy residential, commercial and industrial installations, contact Distribution Engineering at 877.700.DUKE (3853).

5. Electrical services in flood zones must be elevated above flood plain elevation (see Figure 40). **For meter installations in a flood plain, contact the geographical area's certified inspection agency for height requirements. Additional requirements may be needed for company to access meter. Contact Distribution Engineering for details.**

6. Electric meters and associated equipment shall not be installed: in store show windows; directly under any window; in restrooms; under or behind pipes, valves, steam traps, or other obstructions; close to motors, drive belts, other rotating machinery; or in any other place where they will be subject to vibration. Metering equipment shall not be located where exposed to gases, fumes, vapors, liquids or other agents having a deteriorating effect on the equipment, or where exposed to excessively high temperatures. See Figure 96 for residential electric and gas meter clearances.

7. A clear space at least 3 feet wide, 4 feet deep and 8 feet high must be provided and always be available in front of every meter for reading, inspecting, testing and maintenance operations.

8. Electric metering equipment will not be permitted inside a transformer vault or attached to utility-owned poles or equipment. The metering equipment location must be approved by Distribution Engineering.

9. The electrical contractor should be familiar with the work of other construction crews on the premises so that the electric service system and electric meter installation will not be obstructed. Examples of possible obstructions are plumbing, HVAC and other building structures.

G. Arrangement of Metering

Multiple meter sockets shall be grouped and permanently identified to show which unit is served through each meter position. The Company will not be responsible for any billing errors including those resulting from improperly identified meter positions. Exceptions to the grouping requirement may be permitted for duplex units with dual ownership, multistory buildings six floors or higher or where separate services are permitted by the NEC. Contact Distribution Engineering at 877.700.DUKE (3853) for approval of locations.

1. Permanent marking or identification shall be approved by the Company as acceptable and must be on the customer's metering equipment and cover of the disconnecting devices(s) with the address of the location being served.

    a. Numerals or letters of durable paint or laminated plastic and metal tags fastened securely are types of acceptable permanent identification. The use of marking pens, embossed tape, gummed stickers, paper tags, crayons, chalk or marking scratched or stamped into the enamel finish of the enclosures is not acceptable.

2. Where multiple services are installed or where service disconnecting device(s) are located remotely from the meter, the meter enclosure cover and disconnecting device(s) must be permanently marked with the phase(s), voltage and address of the location being served.

H. Service Equipment Board – Construction & Installation

1. If a service equipment board is used for metering installations requiring instrument transformers, the board must:

    a. Be constructed of pressure treated lumber or plywood, at least three-quarters of an inch think

    b. Be fastened rigidly to a wall of brick, stone, concrete or similar solid and vibration-free construction with an air space of not less than 1 inch between the board and the wall

    c. Not be suspended from joists or the ceiling

2. Metering and service equipment must be installed in accordance with the figures of Section VII.

3. Metering equipment must be installed in a true vertical position.

I. Meters and Connections

1. Meters will be furnished, installed and maintained by the Company. The Company will install and seal the meter at the time the service connection is completed.

2. Metering equipment must not be disconnected, removed or relocated without the permission of Distribution Engineering.

3. No more than one conductor may be attached to a single conductor lug or terminal associated with the metering equipment.

4. The customer is responsible for properly installing and making the primary connections to the Company's current and voltage transformers on transformer-type metering installations (see Section V(E)(3)). The customer must not, under any circumstances, make secondary connections or disturb the short-circuiting strap attached to the Company's current transformers.

5. All unmetered wiring on the customer's premises must be installed in sealable enclosures or sealable service-entrance raceways. On transformer-type metering installations, a separate direct conduit, without junction boxes, must be installed for the metering cable from the metering transformer cabinet to the test-device cabinet or transformer-rated socket. **Switchgear or bus bar installations will require metering cable conduit to terminate near the front of the metering transformer cabinet.** This is to avoid obstructing the pulling of metering cable after the service wiring has been completed.

6. The electric meter should be located as close as possible to the metering transformer cabinet.

7. The metering conduit:

    a. Must not exceed 25 feet in length, including conduit bends. If dimension cannot be met, contact Distribution Engineering at 877.700.DUKE (3853).

    b. Must be a single 2-inch metallic or non-metallic conduit (pad-mount metering conduit must be non-metallic; see Figure 80) or two 1 ½-inch conduits in place of the single 2-inch conduit.

    c. Shall not have more than four 90-degree bends in the run.

    d. Must contain a high-strength polypropylene or equivalent pull string.

8. Company personnel will make final connection of the customer's service to the Company's system.

J. Metal Cabinets to Enclose Metering Transformers

1. The customer must furnish, install and maintain metal cabinets for enclosing current (CT) and voltage transformers (VT) (see Section V(E)).

2. The cabinet material, corrosion protection and painted finish must comply with the National Electric Manufacturers Association (NEMA) and Underwriters Laboratory (UL) standards for outdoor enclosures for electrical equipment. Outdoor cabinets must be raintight with a rain lip on the edge above the door openings. No wood components are allowed within the cabinet.

3. The cabinet must be either:

    a. mounted on a seven-eighths-inch Unistrut between the wall and back of the cabinet or

    b. mounted directly to the wall if a seven-eighths-inch Unistrut is placed on the inside of the cabinet to mount the CTs or

    c. mounted directly to the service equipment board if one is used

4. Metering transformers installed in metal cabinets:

    a. Must be replaceable from the front of the cabinet without disturbing the remainder of the metering assembly or equipment mounting board

    b. Are not permitted to be attached with bolts and nuts that extend outside the back of the metal cabinet

    c. May be installed on a seven-eighths-inch Unistrut mounted with ¼ X 20 stainless steel bolts and spring nuts or mounted with three-quarter-inch 10-32 self-tapping TEK stainless steel screws (depth requirements must be considered when installing Unistrut material)

    d. If the current transformer cabinet is supplied with a stand-off mounting surface (cannot be made of wood), the current transformers must be mounted directly to this surface without the use of Unistrut

5. The top of the metering transformer cabinet shall not be mounted more than 7 feet above the floor level.

6. The bottom of the metering transformer cabinet should be mounted a minimum of 4 inches above the floor level.

7. Only one lug on each end of a bar type CT is acceptable for conductors (single, double, triple, etc.).

K. Specifications of Metal Cabinets to Enclose Metering Transformers for Installations Not Exceeding 600 Volts or 1200 Amps

1. Customer shall provide the cabinet for enclosing the metering transformers. The size and type of cabinets stated in Table IV represent the minimum requirements for proper clearances and working space inside the cabinets. These sizes are adequate for typical installations. Larger cabinets will be specified when additional wiring space is required.

2. Door construction:

   a. Attached at side of the cabinet with non-removable pins and hinges

   b. Tamper-resistant padlock hasp with one-half-inch diameter opening

   c. The doors must be held firmly against the edge of the enclosure with non-removable studs and wing nuts at the top and bottom of the door

   d. No special wrenches or tools required to open or close doors

3. The construction of metal cabinets is subject to approval by Distribution Engineering.

TABLE IV

Current Transformer Cabinets

Phase	Wire	Volts	Service Ampacity Amps	No. of Current Transformers	Min. Inside Dimensions W x H x D (Inches)	U.S. Sheet Steel Gauge (Minimum)
1	3	120/240	Over 400 to 1200*	2	32 x 24 x 10	14
3	4	240/120	Up to 300	3	32 x 24 x 10	14
3	4	208Y/120	Over 400 to 1200*	3	44 x 30 x 10	12
3	4	480Y/277	Up to 200	3	32 x 24 x 10	14
3	4	480Y/277	Over 200 to 1200*	3	44 x 30 x 10	12

*For services having ampacities exceeding 1200 amps, contact Distribution Engineering at 877.700.DUKE (3853).

TABLE V

Clearance Requirement for Uninsulated Components Inside Current Transformer Cabinets

Minimum Clearances		
Service Voltage	**Phase-Phase**	**Phase-Neutral Phase-Ground**
480 and below	2.0 inches	1.0 inch
Recommended Clearances		
Service Voltage	**Phase-Phase**	**Phase-Neutral Phase-Ground**
480 and below	3.5 inches	3.0 inches

L. **Net Metering**

Net metering is a billing arrangement involving the interconnection of customer-owned renewable generation equipment in parallel with Duke Energy. Customer-owned generation may consist of but is not limited to solar panels or small wind turbines and is used to offset a portion of the power consumed by the customer.

Customers interested in net metering must apply for approval. The application can be found here: https://www.duke-energy.com/business/products/renewables/.

All net metering installations must be approved by field metering. The meter base, disconnect and transformer/pole will be tagged by field metering with the correct identifying stickers and plaques signifying the potential for backfeed.

1. The Company's general rule for net metering installations is that the load and the solar installation need to be behind one meter/service point on one customer premise address and sized not to exceed the annual kWh consumption of the customer. (See Figure 146A.)

2. In situations where multiple accounts exist on the same premise, the customer can have multiple solar installations behind all or a select number of the service points providing the total AC nameplate rating does not exceed the customer's consumption at the given premise.

3. In Kentucky the net generator output limit is 30 kW.

4. The generation facility and service point must be located at the same premise address.

5. Customers with the potential to generate greater than 50 kW are required to make an appointment with Distribution Engineering to discuss the design prior to construction.

6. In some cases, additional Company equipment or upgrades may be required due to the customer generation installation. These upgrades or changes may require additional customer expense under excess facilities.

7. A lockable, accessible AC disconnect with visible isolation is required on all generation equipment at the point of interconnection and shall be always accessible to the utility.

8. All net metering installations shall comply with all applicable state tariff and rider requirements.

9. Once the net metering application is approved, Duke Energy will verify or install the correct meter prior to activation of the generating facility. The customer should not activate generation until this step has been completed.

10. All net metering interconnections shall take place at the low voltage secondary side of customer-owned equipment behind one single service point (metering point). Large customers with multiple service points may apply for net metering at each service point/metering point.

11. Under approval of the Company, a primary metered customer may interconnect primary generation BEHIND the primary meter point.

12. Direct connections to the Duke Energy grid for the purposes of generation are not allowed for net metering. Net metering connections are required to be made BEHIND the existing service point/meter.

13. Virtual net metering, installing renewable generation at one location and using it to offset consumption at another address, is not allowed.

14. Net metering interconnections should take place on customer-owned equipment where available. If this is not possible, interconnection is acceptable at the load side of the meter base or CT cabinet. Please refer to **Figures 142A, 142B, 142C, 142D, 142E and 146** to verify that the installation is in compliance with Duke Energy requirements.

Section VI

Fault Current and Arc Flash

A. Fault Current (for Equipment Sizing Only)

The Company has calculated and provided the maximum fault current that can be delivered to the secondary terminals of standard transformers (utilizing the infinite buss methodology) as shown in the following tables. Contact your local Company representative, who will determine the size and voltage of the pad-mounted transformer. From there, select the fault current value from the tables.

For installations involving overhead pole-mounted transformers or underground installations with Duke Energy-provided secondary service conductors, contact your local Company representative for specific fault current data at the actual service point.

B. Arc Flash

The following fault current tables SHALL NOT be utilized in arc flash analysis. In order to provide our customers with electrical data to perform arc flash studies, Duke Energy must receive such requests, in writing, directly from an authorized employee of the customer's company or governmental entity. In order to protect the confidentiality of customer electric service deliveries, Duke Energy will not accept requests directly from consulting engineers or electricians.

A fee will apply to all subsequent arc flash hazard data requests for an unchanged delivery from the same customer.

C. Fault Current Tables

Maximum Fault Current for Typical Single-Phase Overhead Transformer Sizes

kVA	Voltage	Min Z%	X/R	240 Volt Fault	120 Volt Fault
25	120/240	1.50	1.26	6,900	10,400
50	120/240	1.50	1.83	13,900	20,800
100	120/240	1.70	2.37	27,800	41,700
167	120/240	1.70	2.70	40,900	61,400

Maximum Fault Current for Typical Single-Phase Pad-Mounted Transformer Sizes

kVA	Voltage	Min Z%	X/R	240 Volt Fault	120 Volt Fault
25	120/240	1.50	1.54	6,900	10,400
50	120/240	1.50	1.90	13,900	20,800
75	120/240	1.50	2.25	20,800	31,300
100	120/240	1.70	2.74	27,800	41,700
167	120/240	1.70	2.94	40,900	61,400

Maximum Fault Current for Typical Three-Phase Overhead Transformer Sizes

Three Transformers 208Y/120 Volt 4-Wire				
kVA	**Voltage**	**Min Z%**	**X/R**	**Three-Phase Fault**
75 (3 – 25 kVA)	208Y/120	1.5	1.26	13,900
150 (3 – 50 kVA)	208Y/120	1.5	1.83	27,800
300 (3 – 100 kVA)	208Y/120	1.7	2.37	55,600

Three Transformers 480Y/277 Volt 4-Wire				
kVA	**Voltage**	**Min Z%**	**X/R**	**Three-Phase Fault**
75 (3 – 25 kVA)	480	1.5	1.26	6,000
150 (3 – 50 kVA)	480	1.5	1.83	12,000
300 (3 – 100 kVA)	480	1.7	2.37	21,300
500 (3 – 167 kVA)	480	1.7	2.70	35,500
750 (3 – 250 kVA)	480	2.0	2.45	45,100
1000 (3 – 333 kVA)	480	2.5	2.69	48,100

Maximum Fault Current for Typical Three-Phase Pad-Mounted Transformer Sizes

kVA	Voltage	Min Z%	X/R	Three-Phase Fault
75	208Y/120	1.6	1.4	13,010
150	208Y/120	2.0	2.0	20,820
300	208Y/120	3.5	5.1	23,800
500	208Y/120	2.8	4.8	49,570
750	208Y/120	5.32	6.5	39,130
1000	208Y/120	5.32	6.8	52,180

kVA	Voltage	Min Z%	X/R	Three-Phase Fault
75	480Y/277	1.6	1.7	5,640
150	480Y/277	2.0	2.3	9,020
300	480Y/277	3.5	5.3	10,310
500	480Y/277	2.8	3.5	21,480
750	480Y/277	5.32	7.1	16,960
1000	480Y/277	5.32	7.3	22,610
1500	480Y/277	5.32	7.9	33,910
2000	480Y/277	5.32		45,250
2500	480Y/277	5.32	9.4	56,520

kVA	Voltage	Min Z%	X/R	Three-Phase Fault
2500	4160/2400	5.32	10.7	6,520

Section VII

Figures

A. General

The following figures give general specifications for standard metering installations.

For any case not specifically covered by the figures in this section, Distribution Engineering must be contacted for detailed information.

B. Figures

Description	Figure #	Previous Figure #
GENERAL INFORMATION		
How to Apply These Drawings	TOC A	
Service Drop Minimum Clearances, Mast on Building Wall	10	600
Typical Overhead Line Extension	12	601
Typical Installation Using Pad-Mounted Transformer	14	602
TEMPORARY SERVICE		
Support for a 120/240 Volt or 120/208 Volt, Single-Phase Overhead Temporary Service, 3-Wire, 200 Amps or Less	15	640
Support for 120/240 Volt or 120/208 Volt, Single-Phase Underground Temporary Service, 3-Wire, 200 Amps or Less	16	641
OVERHEAD SELF-CONTAINED SERVICES		
Service Contact Below the Roof Level to Residential Service Entrance Cable	20	603
Service Contact Hardware Recommendations (Furnished and Installed by the Customer)	21	604
Service Contacts to a Residential Service Mast	22	605
120/240 Volt, Single-Phase, 3-Wire Metering Outdoor Installation (400 Amp Maximum with Service Disconnect Indoors)	30A	606
120/240 Volt, Single-Phase, 3-Wire Installation (Greater than 200 Amp but Not Exceeding 400 Amps)	30B	609
120/240 Volt, Single-Phase, 3-Wire Parallel Overhead, Outdoor Installation Greater than 200 Amps, Not to Exceed 400 Amps	30C	608
120/240 Volt, Single-Phase, 3-Wire *Indoor Installation (400 Amp Maximum)	31A	607
208Y/120 Volt, Single-Phase, 3-Wire from Three-Phase, 4-Wire Not to Exceed 200 Amps	31B	624
120/240 Volt, Single-Phase, 3-Wire Parallel Overhead, *Indoor Installation Greater than 200 Amps, Not to Exceed 400 Amps	34	610
Billboard Service Entrance Requirements Method “A”	37	

Billboard Service Entrance Requirements Method “B”	38	
120/240 Volt, Single-Phase Metering Pole (Up to 400 Amp Max)	39	611
UNDERGROUND SELF-CONTAINED SERVICE		
Meter Enclosure Installations in Flood Zones	40	
120/240 Volt, Single-Phase, 3-Wire Underground (Not Exceeding 200 Amps)	45	617
120/240 Volt, Single-Phase, 3-Wire Underground (Greater than 200 Amps but Not Exceeding 400 Amps)	46	618
208Y/120 Volt, Three-Phase, 4-Wire Outdoor Underground (Greater than 200 Amps but Not Exceeding 400 Amps)	47	628
Post Type Meter Installation (Self-Contained Metering)	48	642
Post Type Meter & Instrument Transformer (CT & VT) Installation (Non-Preferred Installation)	49	643
208Y/120 Volt (Not > 400 Amps) or 240/120 Volt (Not > 200 Amps) Outdoor, Three-Phase, 4-Wire	50	625
208Y/120 Volt or 240/120 Volt, Three-Phase, 4-Wire (Not > 400 Amps)	51	626
208Y/120 Volt, Three-Phase, 4-Wire Outdoor (Overhead) (Greater than 200 Amps, Not Exceeding 400 Amps)	52	627
208Y/120 Volt, Three-Phase, 4-Wire Panelboard (Greater than 200 Amps but Not Exceeding 400 Amps)	53	629
Typical 240/480 Volt, 480 Volt to Ground Self-Contained Service, 400 Amps or Less, with Non-Automatic Disconnect Device	54	
TYPICAL CURRENT TRANSFOMRER INSTALLATIONS		
CT Cabinet Physical Installation (Not Exceeding 1200 Amps)	60	619, 630
120/240 Volt, Single-Phase, 3-Wire Current Transformer Wiring Diagram (Over 400 Amps but Not Over 1200 Amps)	61	620
208Y/120 Volt (Greater than 400 Amps) or 480Y/277 Volt, Three-Phase, 4-Wire Wiring Diagram	62	631
MULTIPLE METER INSTALLATIONS		
Horizontal Ganged Metering Installation (2-6 Meters) Single-Phase	65	
Vertical Ganged Metering Installation (2-6 Meters) Single-Phase	66	
Modular Meter Center Installation (Main Disconnect – Greater than 6 Meters) Single- and Three-Phase	67	
120/240 Volt, Single-Phase, 3-Wire* (Typical Multiple Metering Installation) No Main Disconnect	68	621
208Y/120 Volt, Three-Phase, 4-Wire* (Typical Multiple Metering Installation)	69	633
120/240 Volt, Single-Phase, 3-Wire* (Typical Multiple Metering Installation with Main Disconnect Before Metering Equipment)	70	622

208Y/120 Volt, Single-Phase, 3-Wire* (From Three-Phase, 4-Wire with Main Disconnect Before Metering Equipment)	71	632
120/240 Volt, Single-Phase, 3-Wire (Pre-Assembled Modular Multiple Metering Installation) (Main Disconnecting Means on the Supply Side of the Metering Units) (See NEC)	74	623
208Y/120 Volt, 3-Wire & 4-Wire Pre-Assembled Modular Metering Installation Where a Main Disconnecting Means Is Required on the Supply Side of the Metering Equipment (See NEC) (200 Amp Maximum)	75	634
208Y/120 Volt (Greater than 400 Amps) or 480Y/277 Volt, Three-Phase, 4-Wire Pad-Mount Metering Serving a Single Customer Only (Not Exceeding 3000 Amps)	80	635
INSTALLATIONS ON POLES		
120/240 Volt, Single-Phase, 3-Wire Pole Type Metering Installation (Maximum Service Ampacity of 4000 Amps)	85A	612
120/240 Volt, Single-Phase, 3-Wire Pole Type Metering Installation (Maximum Service Ampacity of 4000 Amps)	85B	612
120/240 Volt, Single-Phase, 3-Wire Pole Type Metering Installation (Greater than 400 Amps but Not Exceeding 1200A)	86A	614
120/240 Volt, Single-Phase, 3-Wire Pole Type Metering Installation (Greater than 400 Amps but Not Exceeding 1200 Amps)	86B	614
208Y/120 Volt (Greater than 400 Amps) or 480/277 Volt, Three-Phase, 4-Wire Pole Type Metering (Not Exceeding 1200 Amps)	87A	637
208Y/120 Volt (Greater than 400 Amps) or 480/277 Volt, Three-Phase, 4-Wire Pole Type Metering (Not Exceeding 1200 Amps)	87B	637
Method of Mounting Current Transformers and Metering on the Side of a Building	88	638
A Method of Mounting Current Transformers and Metering on a Service Mast	89	639
Construction Details for Underground Services from Poles 600 Volts or Less	90	616
METER CLEARANCE DETAILS		
Frontal and Side Clearances for Metering Installations	95A	
Frontal and Side Clearances for Metering Installations	95B	
Joint Utility Service Metering Arrangements	96	644
UNDERGROUND CONSTRUCTION DETAILS		
Minimum Cable Cover and Separation	100	
Underground Clearances from Other Utilities Not in a Joint Trench Configuration	101	
Service Requirements for Single-Phase Underground Primary Electric Service from an Overhead Distribution Line	105	670

Service Requirements for Duke Energy-Owned Underground Electric Service from an Overhead or Pad-Mounted Transformer to a Residential Single-Family Dwelling up to 400 Amps	106	679
Box Pad for Single-Family Pad-Mounted Transformers	107	671
Service Requirements for Underground Primary Electric Service from an Overhead Distribution Line to Commercial or Industrial Customer	108	672
Absorption Bed for Transformer Pads	110	
Pit Box Pad for Three-Phase 75-300 kVA Pad-Mounted Transformers	111	
Pit Box Pad for Three-Phase 500-2500 kVA Pad-Mounted Transformers	112	
Pit Box Pad Installation Notes	113	
Pre-Approved Supplier List for Pre-Fabricated Concrete Transformer Foundations	114	
Customer-Installed Elevated Pads for Three-Phase Pad-Mounted Transformer 75-2500 kVA	115A	
Customer-Installed Elevated Pads for Three-Phase Pad-Mounted Transformer Notes	115B	
Pad-Mounted Transformer Clearances from Buildings	120	
Pad-Mounted Equipment Working Space and Miscellaneous Clearances	121	
Construction Details for Protecting Pad-Mounted Equipment	122A	675
Protective Bollard Details and Notes	122B	
Manholes – Precast	125	677
Switchgear Cable Pit for Pad-Mounted Equipment	127	678
SELL-ALL GENERATION (RENEWABLE ENERGY)		
Sell-All Generation – Single-Phase Self-Contained Preferred Configuration Service Adding Generation Meter, Self-Contained	130	
Sell-All Generation – Single-Phase Self-Contained Alternate Configuration Service Adding Generation Meter, Self-Contained	131	
Sell-All Generation Single-Phase T-Rated Service Adding Generation Meter, Self-Contained	132	
Sell-All Generation Three-Phase Large T-Rated Existing UG Service Adding Generation Meter, T-Rated or Self-Contained	133A	
Sell-All Generation Three-Phase Large T-Rated Existing OH Service Adding Generation Meter, T-Rated or Self-Contained	133B	
Sell-All Generation Standalone System Three-Phase Secondary Metering	135	
Sell-All Generation Three-Phase Primary Metering with Fused Protection – Overhead Service	141A	
Sell-All Generation Three-Phase Primary Metering with DER Recloser – Overhead Service	141B	

“Net” Generation Metering Single- or Three-Phase Self-Contained Metered Service Residential/Small Commercial OH or UG Service	142A	
“Net” Generation Metering Single- or Three-Phase CT Metered Service Residential/Small Commercial UG Service	142B	
“Net” Generation Metering Single- or Three-Phase Self-Contained Metered Service Residential/Small Commercial OH or UG Service Methods A and B	142C	
“Net” Generation Metering Single- or Three-Phase Self-Contained Metered Service Residential/Small Commercial OH or UG Service Methods C	142D	
“Net” Generation Metering Three-Phase (T-Rated Service) Large Commercial/Industrial	142E	
Service with Standby Generation Auto Transfer Switch Parallel (> 100 Milliseconds) Total Facility Load	143A	
Standby Generation – Protection Requirements (Soft Load Transition > 100 Milliseconds Parallel Time)	143B	
Standby Generation – Protection Requirements Momentary Parallel Generation (Fast Transition ≤ 100 Milliseconds Parallel Time)	144	
Long-Term Parallel Generation (> 20 Seconds) Interconnection Protection Ownership Based on Generator Type and Size	145A	
Long-Term Parallel Generation (> 20 Seconds) Inverter-Based Systems < 1 MW Interconnection Protection Requirements	145B	
Long-Term Parallel Generation (> 20 Seconds) Inverter-Based Systems ≥ 1 MW and All Rotating Machine-Based Generators	145C	
Long-Term Parallel Generation Telemetry and Control Requirements	145D	
Preferred Net Metering Interconnection	146A	
Alternate Net Metering Interconnection	146B	
Installation Requirements for Three-Phase Pad-Mount Transformer Foundations for Commercial or Industrial Customers (Will Not Be Valid for Projects After June 30, 2019)	673	673

*An indoor location of a meter enclosure is not permitted on new installations unless mandated by a community ordinance.

DEC	DEM	DEP	DEF
	X	X	

FIG 2

THE INFORMATION IN THIS FIGURE WOULD BE APPLICABLE TO THE DEM AREA AND DEP AREAS.

DEC	DEO/K	DEP	DEF
	X		

FIG 1A

THE INFORMATION IN THIS FIGURE WOULD BE APPLICABLE TO THE DEO/K AREA ONLY.

DEC	DEO/K	DEP	DEF
X	X	X	X

FIG 1B

THE INFORMATION IN THIS FIGURE WOULD BE APPLICABLE TO THE DEC, DEO/K, DEP, AND DEF AREAS.

NOTES:

1. THE IMAGES SHOWN ABOVE APPEAR IN THE LOWER RIGHT-HAND CORNER OF ALL FIGURES IN THIS MANUAL.
2. THE ACRONYMS ARE AS FOLLOWS:
   - DEC - DUKE ENERGY CAROLINAS (THE FORMER DUKE ENERGY SERVICE TERRITORY IN THE CAROLINAS)
   - DEM - DUKE ENERGY MIDWEST. INCLUDES:
     - DEI - DUKE ENERGY INDIANA
     - DEK - DUKE ENERGY KENTUCKY
     - DEO - DUKE ENERGY OHIO
   - DEP - DUKE ENERGY PROGRESS (THE FORMER PROGRESS ENERGY SERVICE TERRITORY IN THE CAROLINAS)
   - DEF - DUKE ENERGY FLORIDA
3. REFER TO PAGE 6 OF THIS DOCUMENT FOR A SERVICE TERRITORY MAP TO DETERMINE THE APPLICABLE AREA IN WHICH THE WORK IS BEING DONE (DEI).
4. AN 'X' BELOW THE JURISDICTION'S ACRONYM IN THE LEGEND INDICATES THAT THE DRAWING IN QUESTION IS APPLICABLE FOR THAT PARTICULAR AREA. SEE THE IMAGES ABOVE FOR FURTHER EXAMPLES.

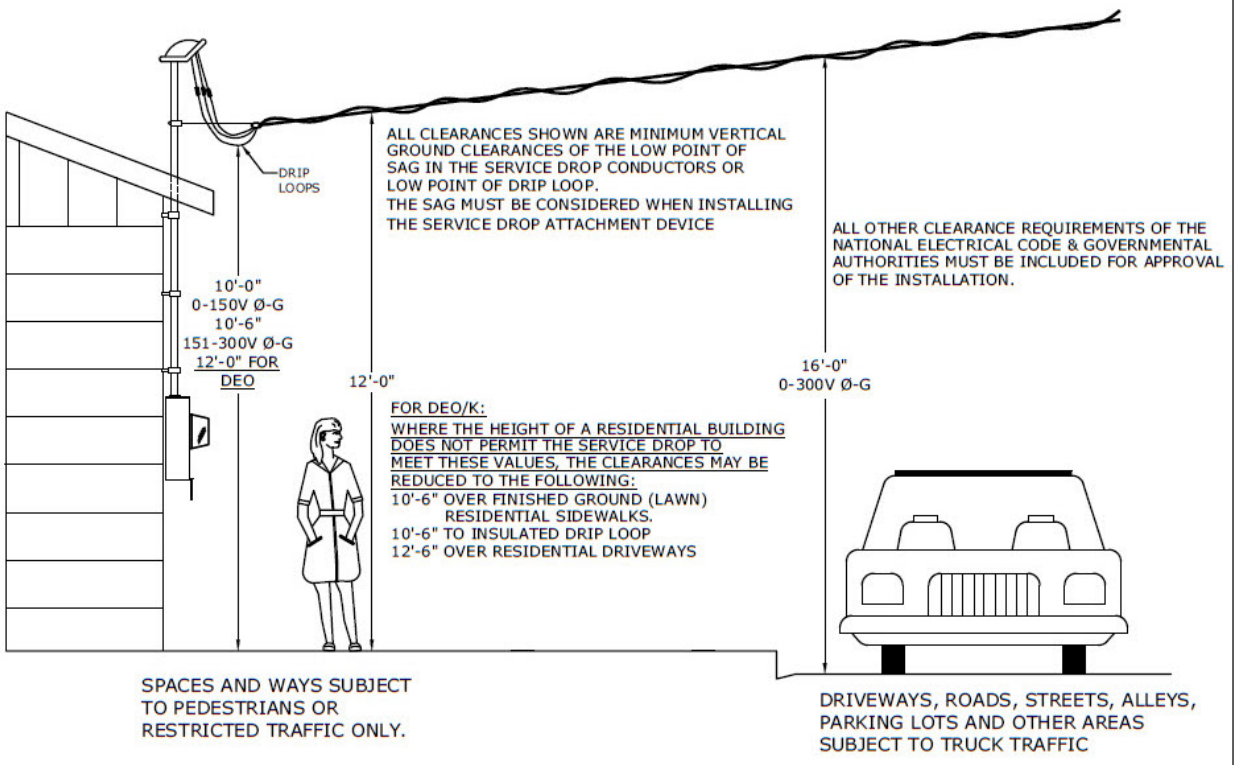
REVISED		BY	CK'D	APPR.
3				
2				
1				
0	9/21/18	DIETERLE	BRUINS	ADCOCK

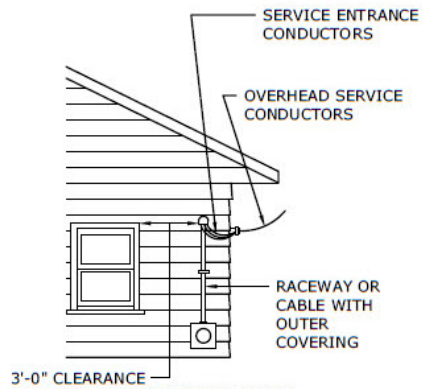
SERVICE REQUIREMENTS FIGURES

HOW TO APPLY THESE DRAWINGS

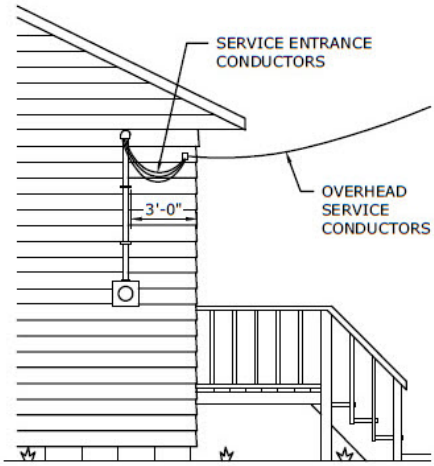
DEC	DEO/K	DEP	DEF
	X		

TOC A





NEC ARTICLE 230



NOTES:

1. THE ABOVE ILLUSTRATIONS GIVE REQUIRED MINIMUM INSTALLATION HEIGHTS. THESE INSTALLATION HEIGHTS ARE APPLICABLE TO SERVICE DROP MULTIPLEX CABLES.
2. POINT OF ATTACHMENT OF SERVICE DROP AT BOTH BUILDING AND POLE MUST BE AT A HEIGHT SUFFICIENT TO ACHIEVE NESC REQUIRED MINIMUM CLEARANCES.
3. SERVICE HEAD SHALL BE LOCATED ABOVE THE POINT OF ATTACHMENT OF THE SERVICE DROP CONDUCTORS TO THE STRUCTURE. EXCEPTION: WHEN THIS IS NOT PRACTICABLE, IT MAY BE LOCATED NOT OVER 24" FROM POINT OF ATTACHMENT [SEE NEC ARTICLE 230.54].
4. CONTACT DISTRIBUTION ENGINEERING FOR THE LOCATION OF THE ELECTRIC EQUIPMENT AND THE SERVICE DROP ATTACHMENT DEVICE.
5. THE SERVICE DROP ATTACHMENT DEVICE MUST NOT BE INSTALLED ON A MASONRY CHIMNEY.
6. CONSIDERATION SHOULD BE GIVEN TO MINIMUM CLEARANCE REQUIRED FOR TELEPHONE AND CABLE TELEVISION COMPANIES. ADDITIONAL CLEARANCES COULD BE REQUIRED TO PROVIDE SPACE FOR OTHER UTILITIES.

DUKE ENERGY.

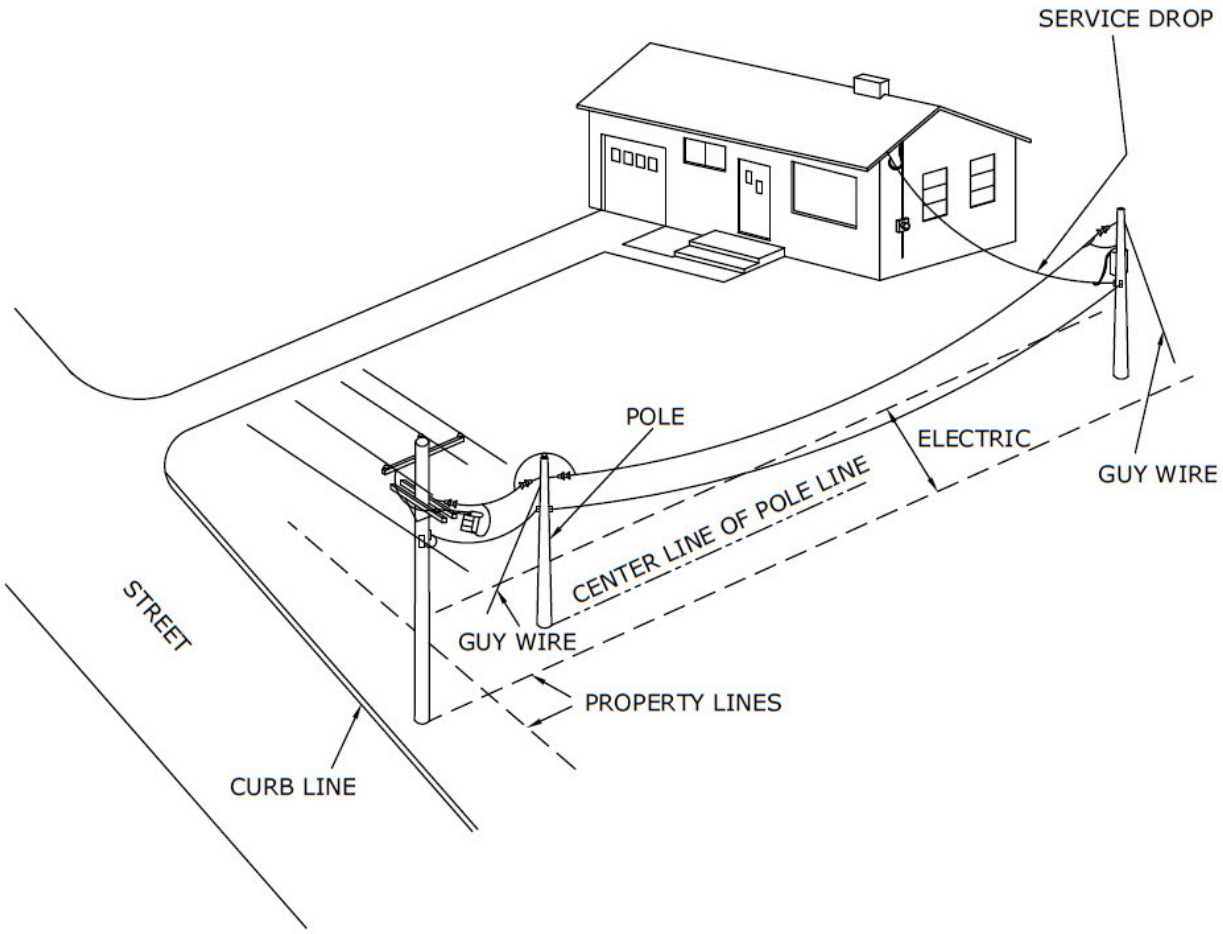
3				
2				
1				
0	7/10/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

SERVICE DROP MINIMUM CLEARANCES

MAST ON BUILDING WALL

DEC	DEM	DEP	DEF
	X		

FIG 10



NOTES:

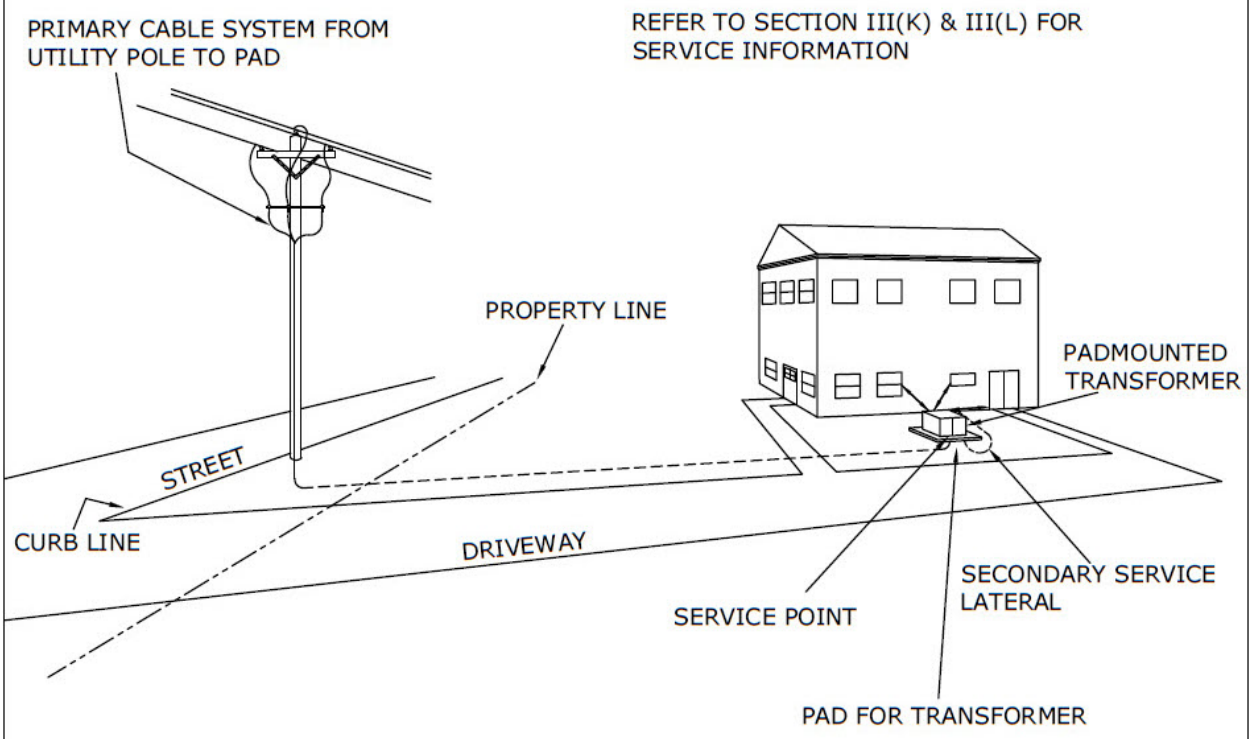
1. CONTACT SERVICE INSTALLATION AT 877.700.DUKE (3853) FOR LOCATION OF THE ELECTRIC METER SOCKET OR EQUIPMENT, SERVICE POLES, AND SERVICE DROP ATTACHMENT DEVICE.
2. REFER TO FIGURE 20 FOR INSTALLING THE SERVICE DROP ATTACHMENT DEVICE.
3. REFER TO FIGURE 10 FOR THE SERVICE DROP CLEARANCE REQUIREMENTS.

DUKE ENERGY.

3					TYPICAL OVERHEAD LINE EXTENSION
2					
1					
0	7/2/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

DEC	DEO/K	DEP	DEF
	X		

FIG 12



NOTES:

1. CONTACT SERVICE INSTALLATION AT 877.700.DUKE (3853) FOR LOCATION, SIZE, CONSTRUCTION DETAILS, AND VEHICULAR PROTECTION REQUIRED WHEN INSTALLING A PAD FOR PAD-MOUNTED TRANSFORMER.
2. REFER TO FIGURES 120 AND 121 FOR TRANSFORMER LOCATION CLEARANCE REQUIREMENTS.
3. REFER TO FIGURES 100-116 FOR UNDERGROUND CONSTRUCTION REQUIREMENTS.

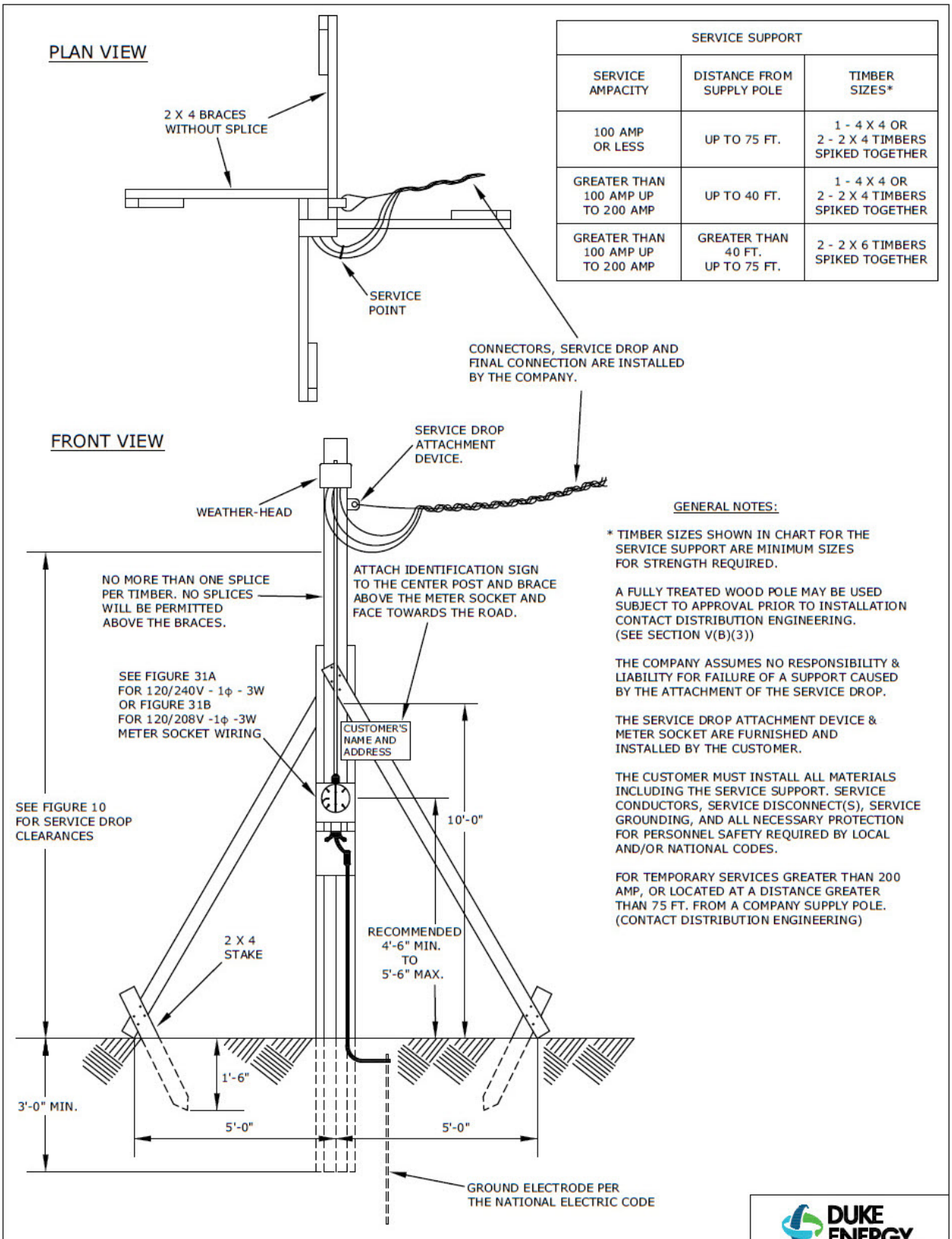
DUKE ENERGY.

3				
2				
1				
0	7/2/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

TYPICAL INSTALLATION USING PAD-MOUNTED TRANSFORMER

DEC	DEO/K	DEP	DEF
	X		

FIG 14



SERVICE SUPPORT		
SERVICE AMPACITY	DISTANCE FROM SUPPLY POLE	TIMBER SIZES*
100 AMP OR LESS	UP TO 75 FT.	1 - 4 X 4 OR 2 - 2 X 4 TIMBERS SPIKED TOGETHER
GREATER THAN 100 AMP UP TO 200 AMP	UP TO 40 FT.	1 - 4 X 4 OR 2 - 2 X 4 TIMBERS SPIKED TOGETHER
GREATER THAN 100 AMP UP TO 200 AMP	GREATER THAN 40 FT. UP TO 75 FT.	2 - 2 X 6 TIMBERS SPIKED TOGETHER

GENERAL NOTES:

* TIMBER SIZES SHOWN IN CHART FOR THE SERVICE SUPPORT ARE MINIMUM SIZES FOR STRENGTH REQUIRED.

A FULLY TREATED WOOD POLE MAY BE USED SUBJECT TO APPROVAL PRIOR TO INSTALLATION CONTACT DISTRIBUTION ENGINEERING. (SEE SECTION V(B)(3))

THE COMPANY ASSUMES NO RESPONSIBILITY & LIABILITY FOR FAILURE OF A SUPPORT CAUSED BY THE ATTACHMENT OF THE SERVICE DROP.

THE SERVICE DROP ATTACHMENT DEVICE & METER SOCKET ARE FURNISHED AND INSTALLED BY THE CUSTOMER.

THE CUSTOMER MUST INSTALL ALL MATERIALS INCLUDING THE SERVICE SUPPORT. SERVICE CONDUCTORS, SERVICE DISCONNECT(S), SERVICE GROUNDING, AND ALL NECESSARY PROTECTION FOR PERSONNEL SAFETY REQUIRED BY LOCAL AND/OR NATIONAL CODES.

FOR TEMPORARY SERVICES GREATER THAN 200 AMP, OR LOCATED AT A DISTANCE GREATER THAN 75 FT. FROM A COMPANY SUPPLY POLE. (CONTACT DISTRIBUTION ENGINEERING)

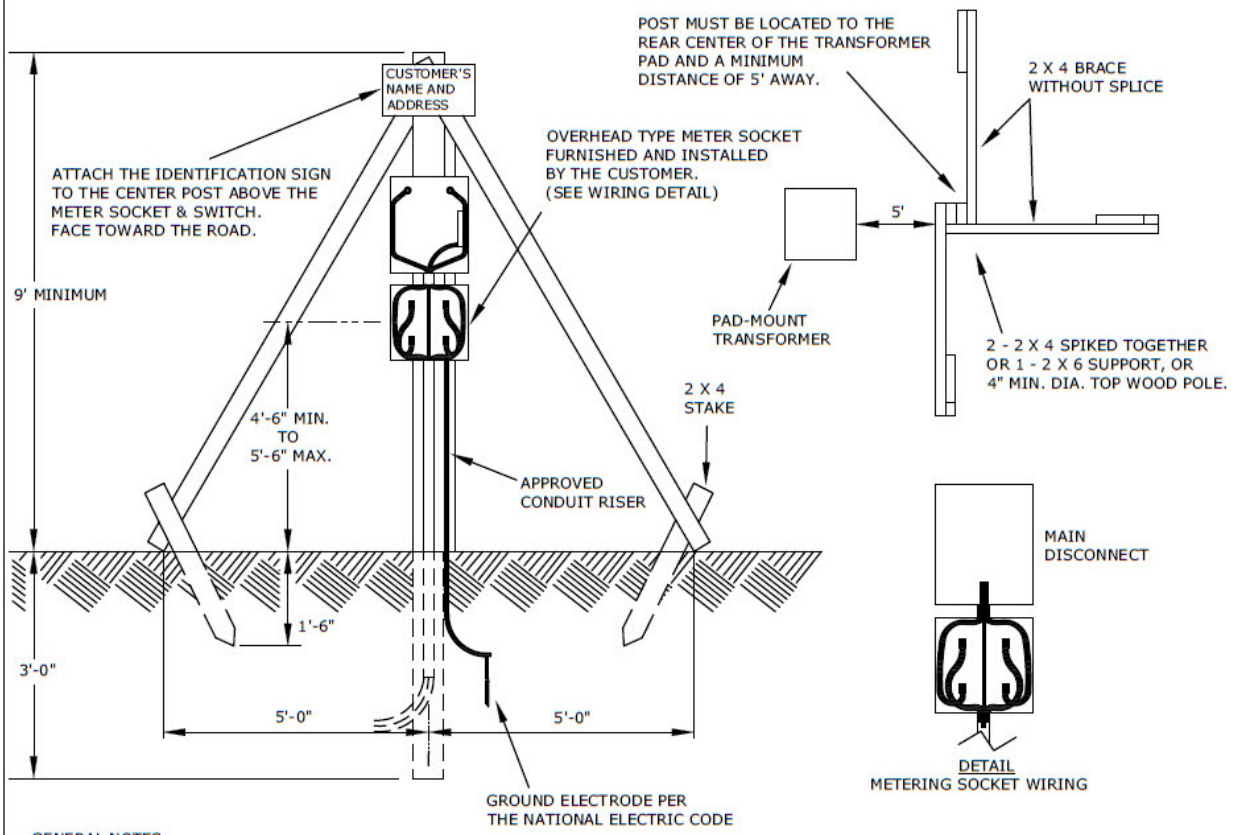
3				
2				
1				
0	7/18/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

SUPPORT FOR A 120/240V OR 120/208V
SINGLE-PHASE OVERHEAD
TEMPORARY SERVICE, 3-WIRE, 200A OR LESS

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 15



GENERAL NOTES:

THIS INSTALLATION IS A BASIC DESIGN FOR A 120/240V - 1ϕ OR 120/208V - 1ϕ TEMPORARY U.G. SERVICE 200 AMPS OR SMALLER.

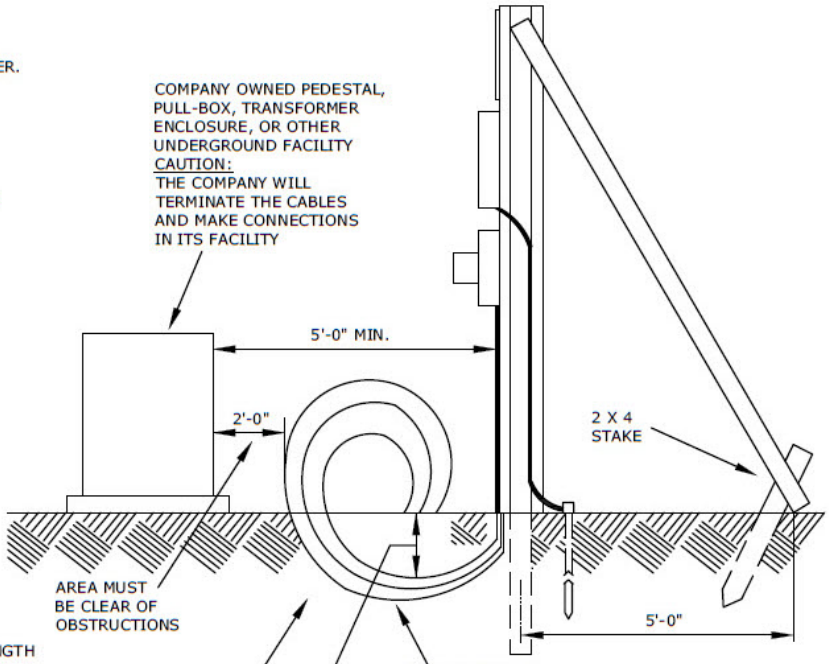
TIMBER SIZES SHOWN FOR SERVICE SUPPORT ARE MINIMUM FOR STRENGTH REQUIRED.

THE CUSTOMER MUST INSTALL THE SERVICE SUPPORT. SERVICE LATERAL CONDUCTORS. SERVICE DISCONNECT(S) SERVICE GROUNDING AND ALL NECESSARY PROTECTION FOR PERSONNEL SAFETY REQUIRED BY LOCAL AND/OR NATIONAL CODES.

THE INSTALLATION REQUIREMENTS AND APPROVAL OF THE SERVICE LATERAL CONDUCTORS (AMPACITY, TYPE, DEPTH, ETC.) ARE UNDER THE AHJ.

THE TEMPORARY SUPPORT MUST BE LOCATED AT LEAST 5' AWAY FROM THE COMPANY'S SERVICE FACILITY.

FOR TEMPORARY SERVICES GREATER THAN 200 AMP CONTACT DISTRIBUTION ENGINEERING.



THE CUSTOMER SHALL PROVIDE SUFFICIENT LENGTH OF CONDUCTOR'S TO REACH AND TO MAKE CONNECTIONS IN AN UNDERGROUND FACILITY. SEAL ENDS OF CONDUCTORS AGAINST MOISTURE. STUB UP OUT OF THE GROUND 2' FROM THE FACILITY.

3				
2				
1				
0	7/19/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

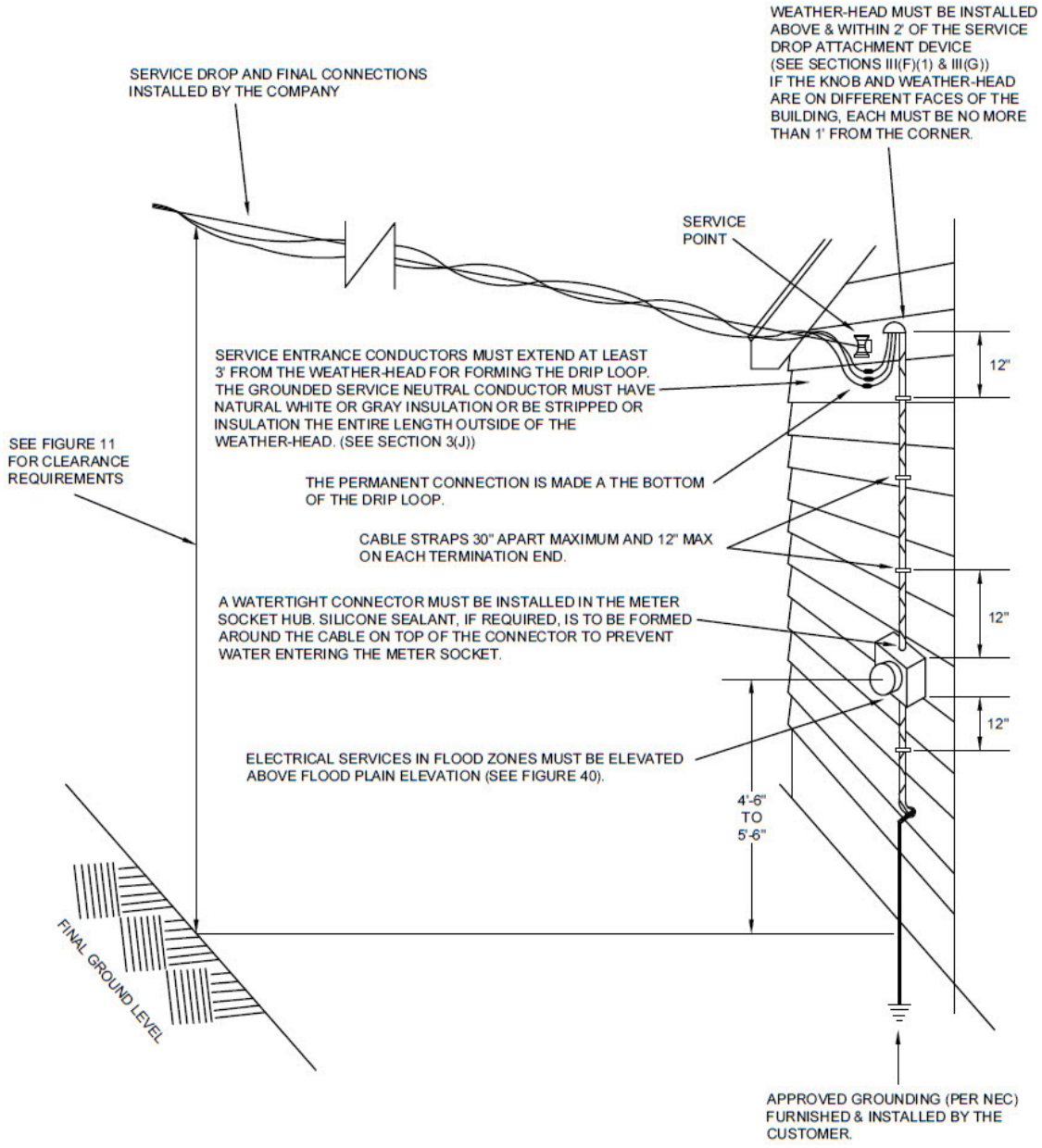
SUPPORT FOR 120/240V OR 120/208V
SINGLE-PHASE UNDERGROUND
TEMPORARY SERVICE, 3-WIRE, 200A OR LESS

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 16

ONLY ONE SERVICE ATTACHMENT DEVICE IS REQUIRED FOR A TRIPLEX SERVICE DROP. THE TYPE OF SERVICE ATTACHMENT DEVICE IS SPECIFIED BY THE COMPANY. THE SERVICE ATTACHMENT DEVICE MUST BE SECURELY ATTACHED TO BUILDING STUDS OR OTHER PARTS OF THE BUILDING STRUCTURE. ALL SERVICE ATTACHMENT DEVICES ARE FURNISHED & INSTALLED BY THE CUSTOMER REFER TO FIGURE 21 FOR SERVICE ATTACHMENT DEVICE INSTALLATION.



3				
2				
1				
0	7/23/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

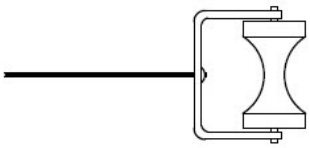
SERVICE CONTACT BELOW THE ROOF LEVEL TO RESIDENTIAL SERVICE ENTRANCE CABLE

DUKE ENERGY.

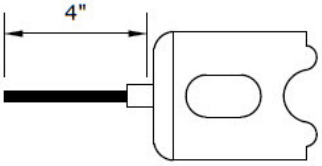
DEC	DEO/K	DEP	DEF
	X		

FIG 20

SEE FIGURE 10 FOR SERVICE CLEARANCES AND
SECTION III(G) FOR ATTACHMENT REQUIREMENTS



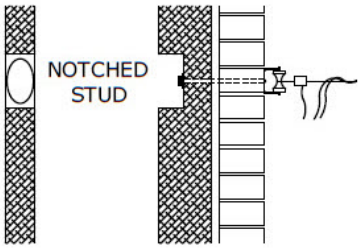
5/8 " THRU-WALL BOLT APPROX. 10" LENGTH
ONE WIRE RACK FOR BRICK OR FRAME
CONSTRUCTION.

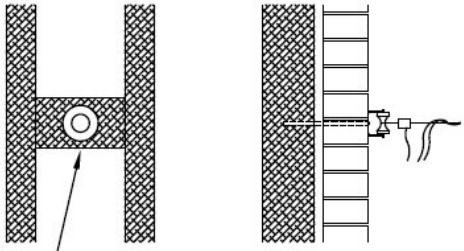


SERVICE WIRE HOLDER FOR
FRAME CONSTRUCTION.

METHOD OF INSTALLATION

BRICK VENEER



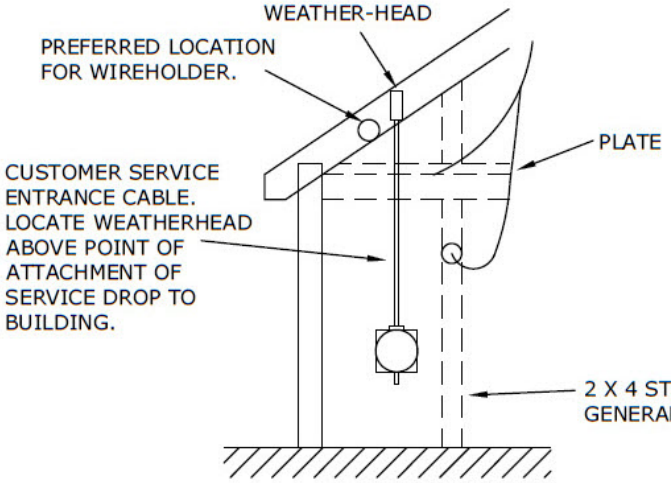


2 X 4 BRACE
NAILED BETWEEN
STUDS.

NOTE: DO NOT MAKE CONTACTS
ON MASONRY CHIMNEYS.

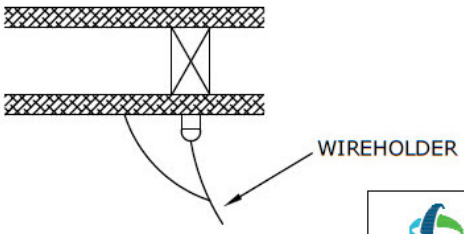
FRAME

ALTERNATE
LOCATION FOR
WIRE HOLDER
REINFORCE WITH
BACKUP TIMBER
IF NECESSARY.



NOTE: WIREHOLDER MUST BE ATTACHED TO A PORTION
OF THE STRUCTURE DESIGNED TO WITHSTAND
LOADING SUCH AS THE BUILDING FRAME ETC.

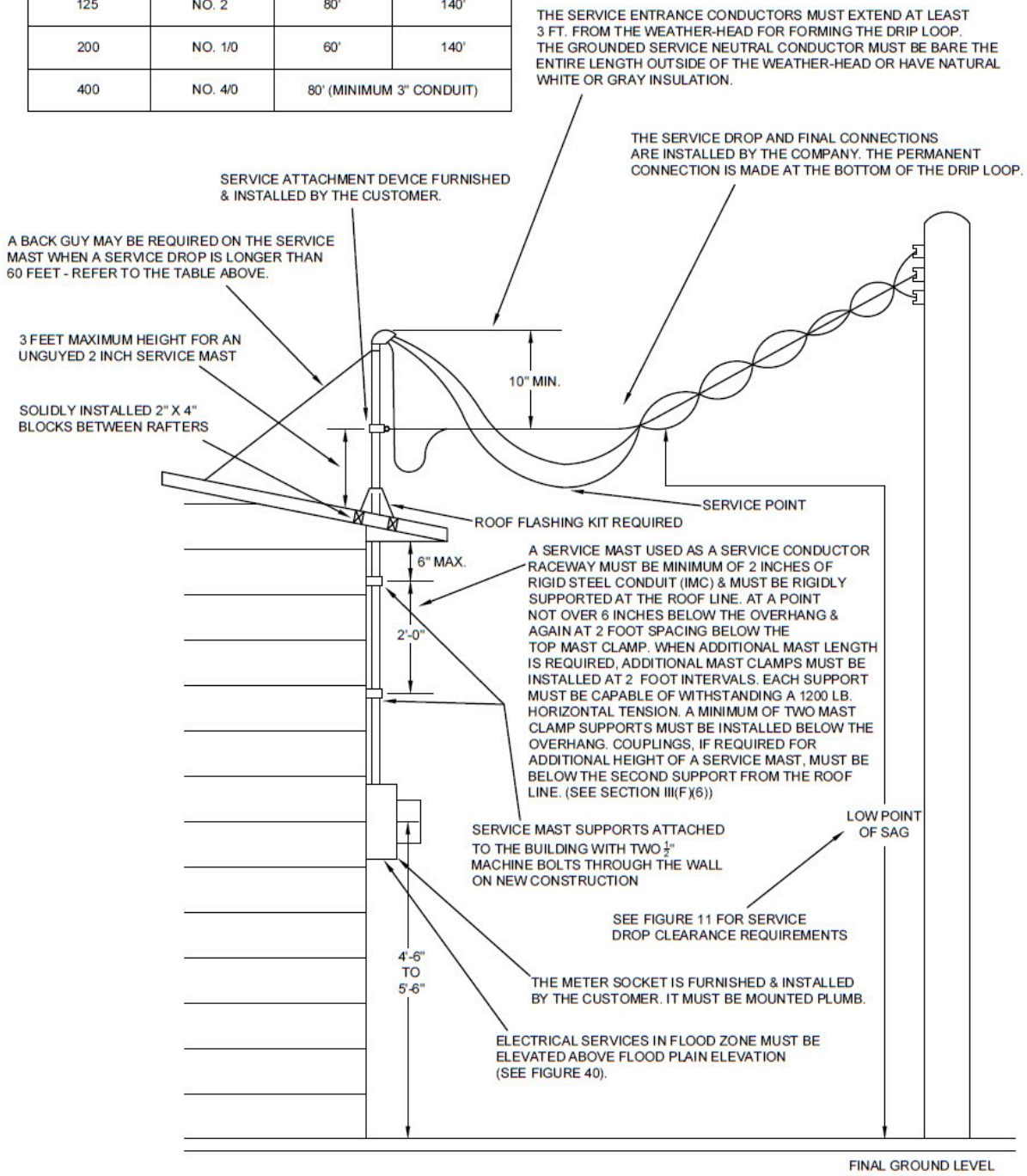
PLAN VIEW



DUKE ENERGY.

3					SERVICE CONTACT HARDWARE RECOMMENDATIONS (FURNISHED AND INSTALLED BY THE CUSTOMER)	DEC	DEO/K	DEP	DEF
2									
1							X		
0	6/29/18	DIETERLE	BRUINS	ADCOCK		FIG 21			
REVISED		BY	CK'D	APPR.					

MAXIMUM SERVICE ENTRANCE CONDUCTOR AMPACITIES	TRIPLEX SERVICE DROP SIZE	MAXIMUM SERVICE DROP LENGTHS FOR UNGUYED MASTS	
		2" CONDUIT	2 ½" CONDUIT
125	NO. 2	80'	140'
200	NO. 1/0	60'	140'
400	NO. 4/0	80' (MINIMUM 3" CONDUIT)	



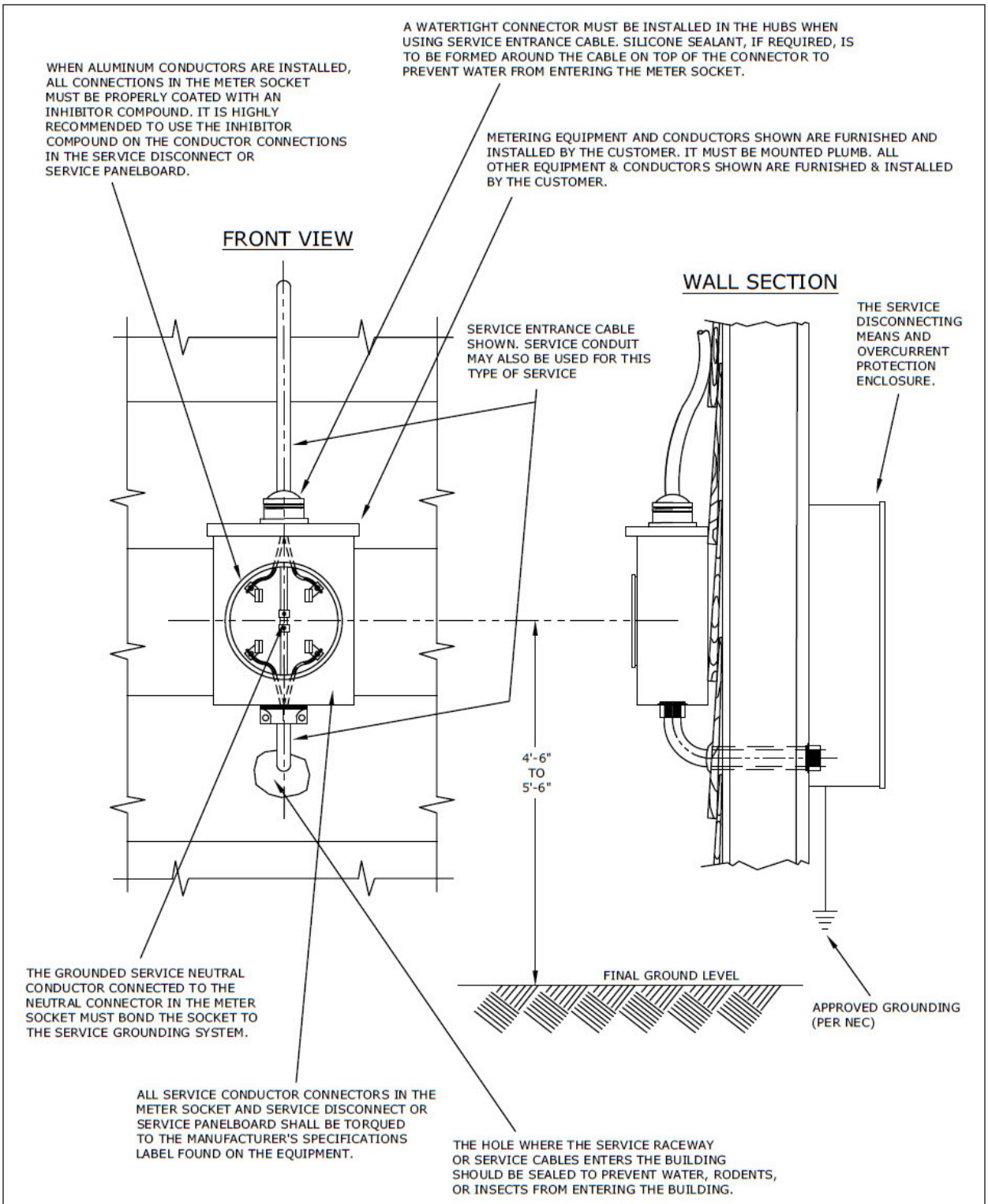
3				
2				
1				
0	7/23/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

SERVICE CONTACTS TO A RESIDENTIAL SERVICE MAST

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 22



OUTDOOR METER REQUIRED ON ALL NEW INSTALLATIONS. CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS.
THIS SOCKET IS ALSO AVAILABLE WITH DUAL LOAD SIDE

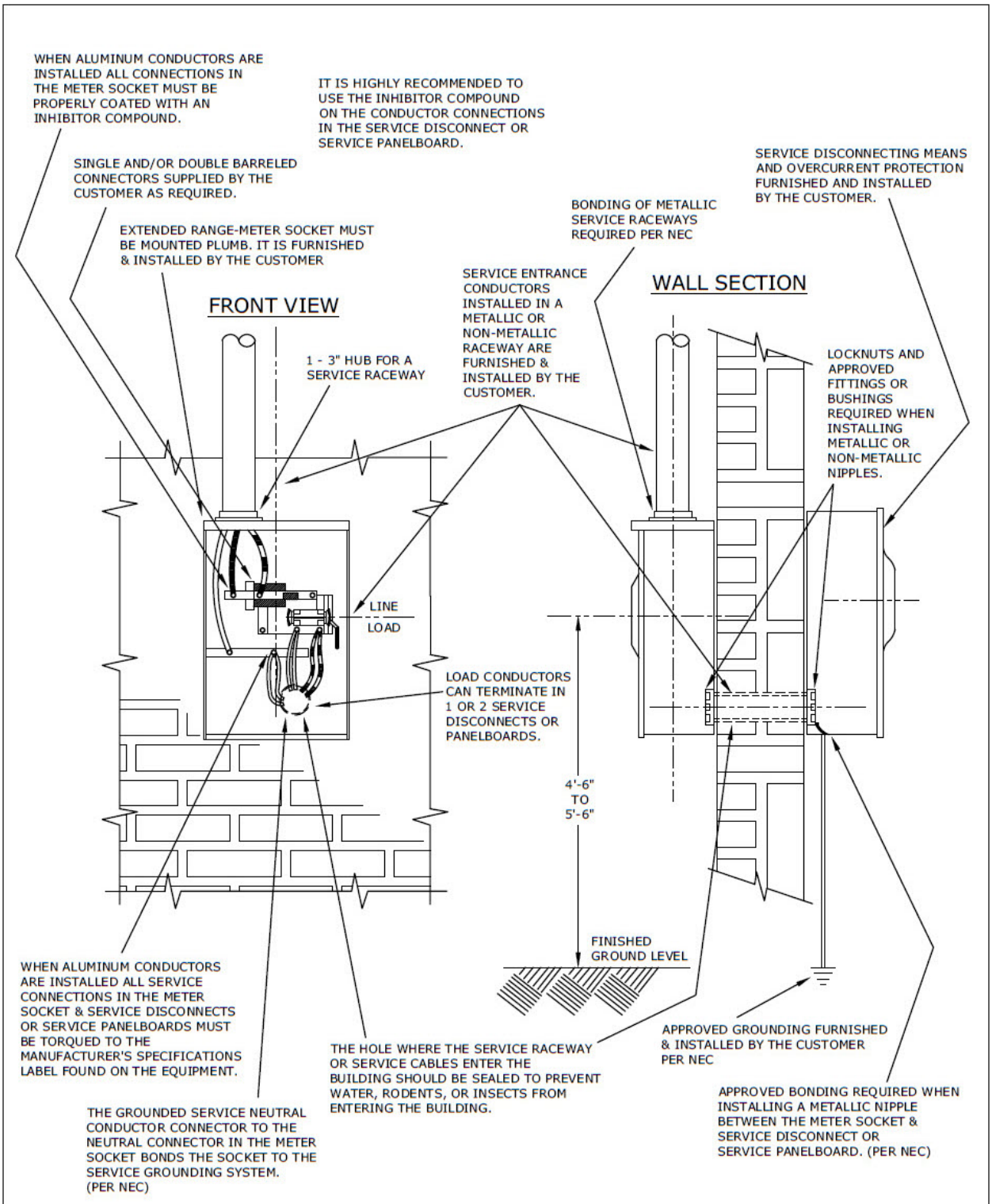
DUKE ENERGY.

REVISED		BY	CK'D	APPR.
3				
2				
1	4/24/19	DIETERLE	BRUINS	ADCOCK
0	7/31/18	DIETERLE	BRUINS	ADCOCK

120/240V, SINGLE-PHASE, 3-WIRE METERING OUTDOOR INSTALLATION (400 AMP MAXIMUM WITH SERVICE DISCONNECT INDOORS)

DEC	DEO/K	DEP	DEF
	X		

FIG 30A



APPLICATIONS - 400 AMPS MAXIMUM WHEN APPROVED BY DISTRIBUTION ENGINEERING
OUTDOOR METER LOCATION REQUIRED ON ALL NEW INSTALLATIONS
CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS

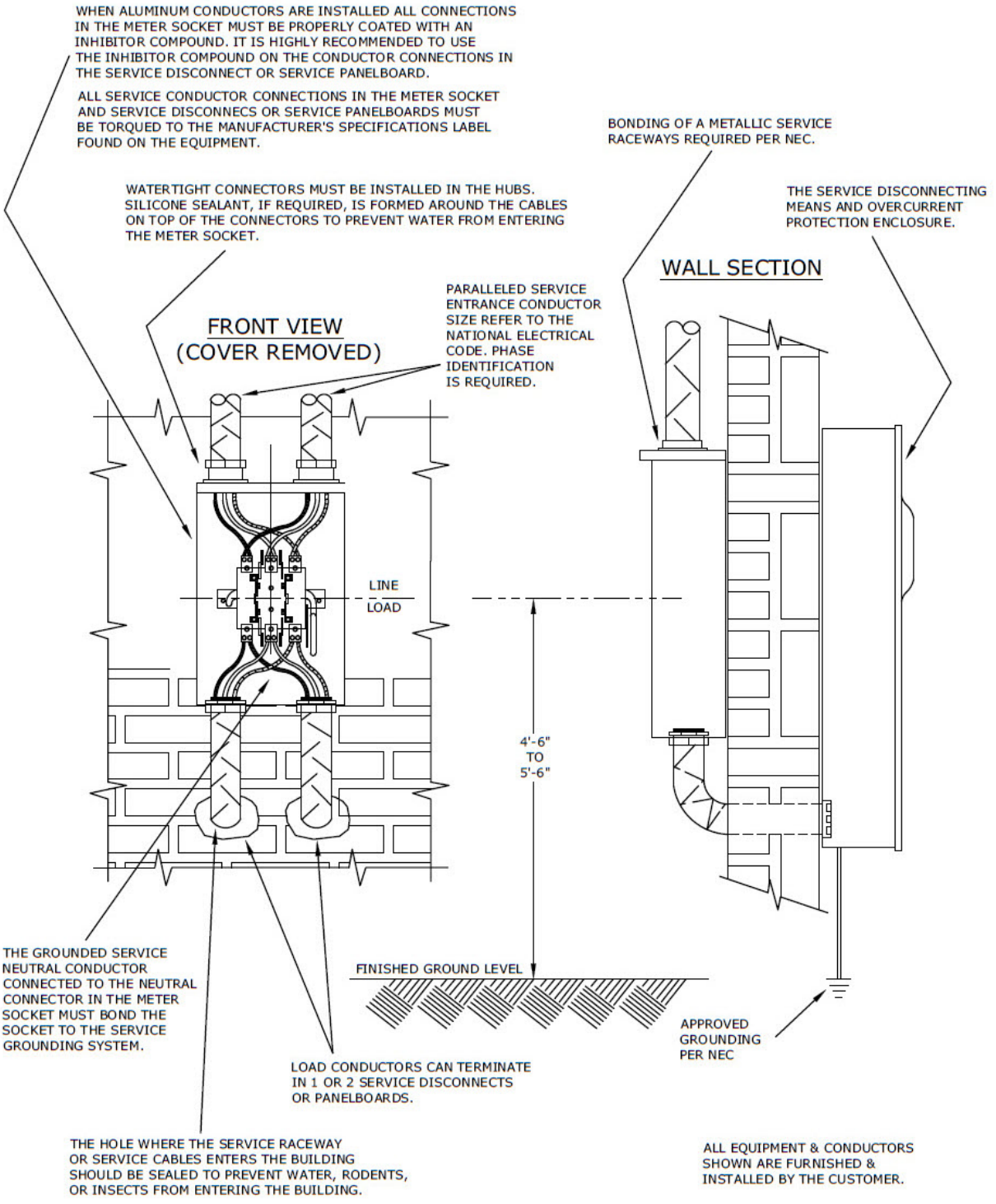
DUKE ENERGY.

3				
2				
1				
0	7/26/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V, SINGLE-PHASE, 3-WIRE INSTALLATION (GREATER THAN 200 AMPS BUT NOT EXCEEDING 400 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 30B



APPLICATIONS - 400 AMPS MAXIMUM WHEN APPROVED BY DISTRIBUTION ENGINEERING
OUTDOOR METER LOCATION REQUIRED ON ALL NEW INSTALLATIONS
CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS

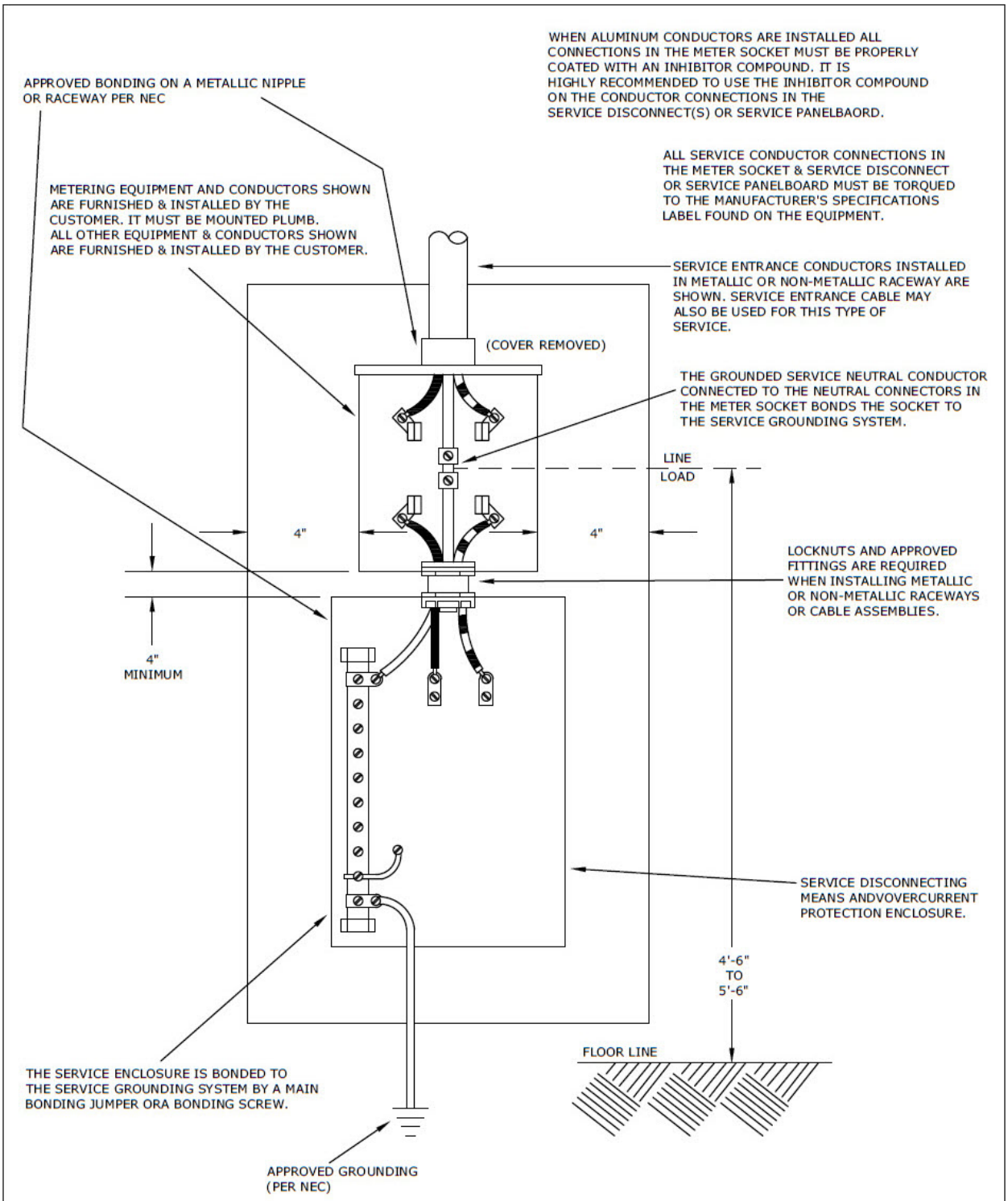
DUKE ENERGY.

3				
2				
1				
0	7/17/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V SINGLE-PHASE, 3-WIRE PARALLEL OVERHEAD, OUTDOOR INSTALLATION GREATER THAN 200A, NOT TO EXCEED 400A

DEC	DEO/K	DEP	DEF
	X		

FIG 30C



* AN INDOOR LOCATION OF A METER SOCKET IS NOT PERMITTED ON NEW INSTALLATIONS. UNLESS MANDATED BY A COMMUNITY ORDINANCE. CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS.

THIS SOCKET IS ALSO AVAILABLE WITH DUAL LOAD SIDE LUGS

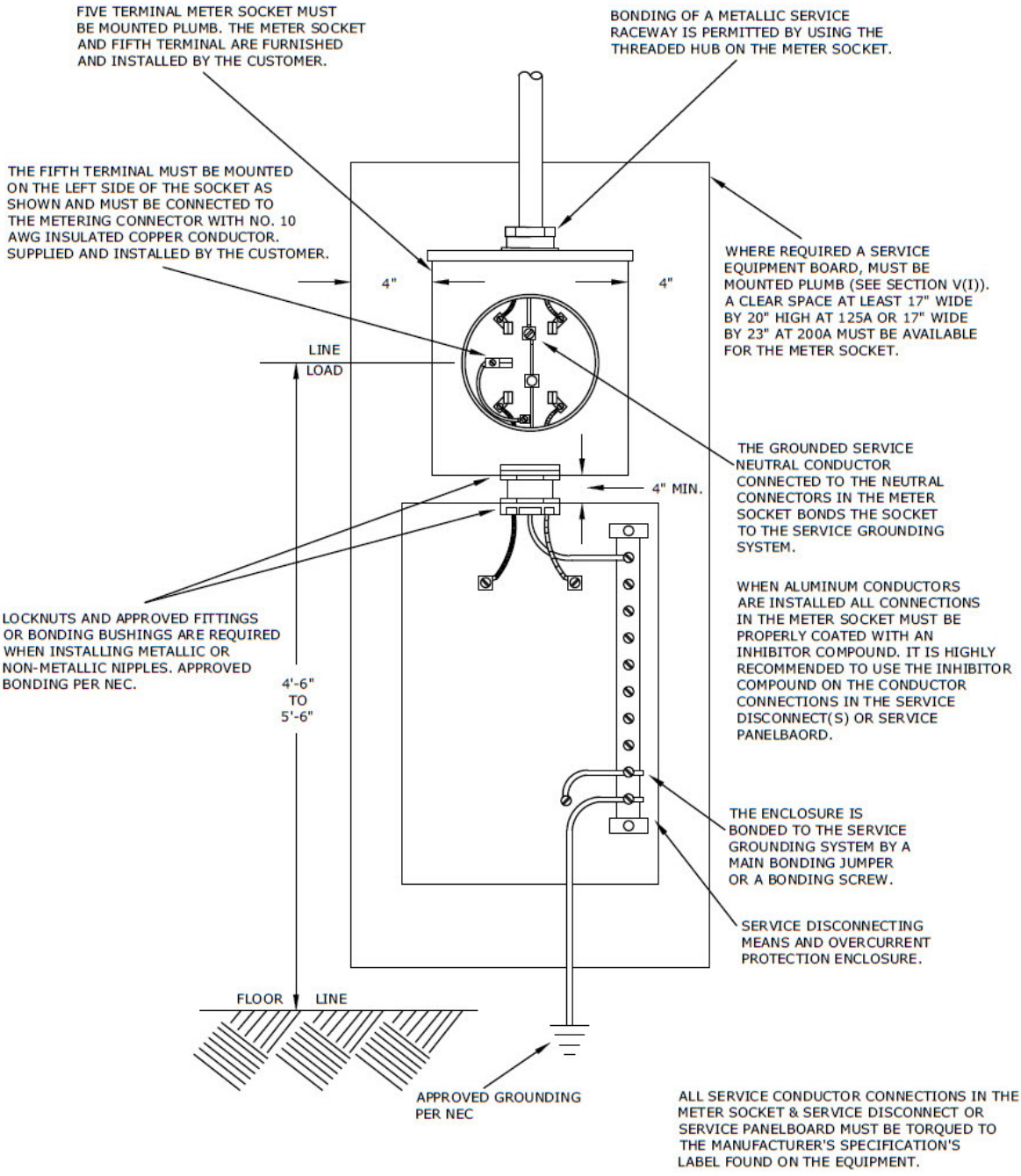
DUKE ENERGY.

REVISED		BY	CK'D	APPR.
3				
2				
1	4/24/19	DIETERLE	BRUINS	ADCOCK
0	7/10/18	DIETERLE	BRUINS	ADCOCK

120/240V, SINGLE-PHASE, 3-WIRE *INDOOR INSTALLATION (400 AMPS MAXIMUM)

DEC	DEO/K	DEP	DEF
	X		

FIG 31A



* AN INDOOR LOCATION OF A METER SOCKET IS NOT PERMITTED ON NEW INSTALLATIONS. UNLESS MANDATED BY A COMMUNITY ORDINANCE. CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS.

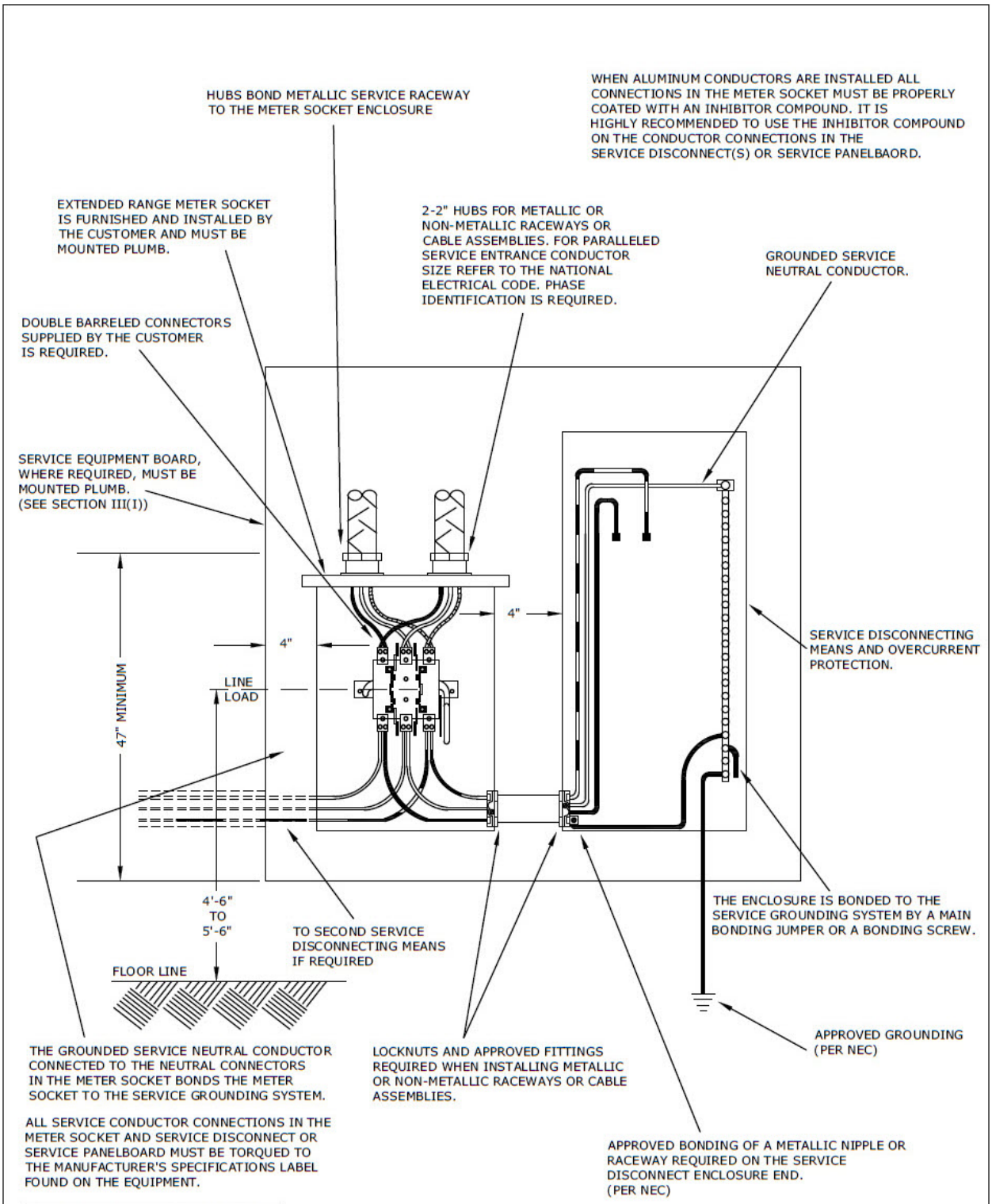
3				
2				
1				
0	8/1/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

208Y/120V, SINGLE-PHASE, 3-WIRE FROM THREE-PHASE, 4-WIRE NOT TO EXCEED 200A

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 31B



* AN INDOOR LOCATION OF A METER SOCKET IS NOT PERMITTED ON NEW INSTALLATIONS. UNLESS MANDATED BY A COMMUNITY ORDINANCE. CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS.

APPLICATIONS - 400 AMPS MAXIMUM WHEN APPROVED BY DISTRIBUTION ENGINEERING
OUTDOOR METER LOCATION REQUIRED ON ALL NEW INSTALLATIONS

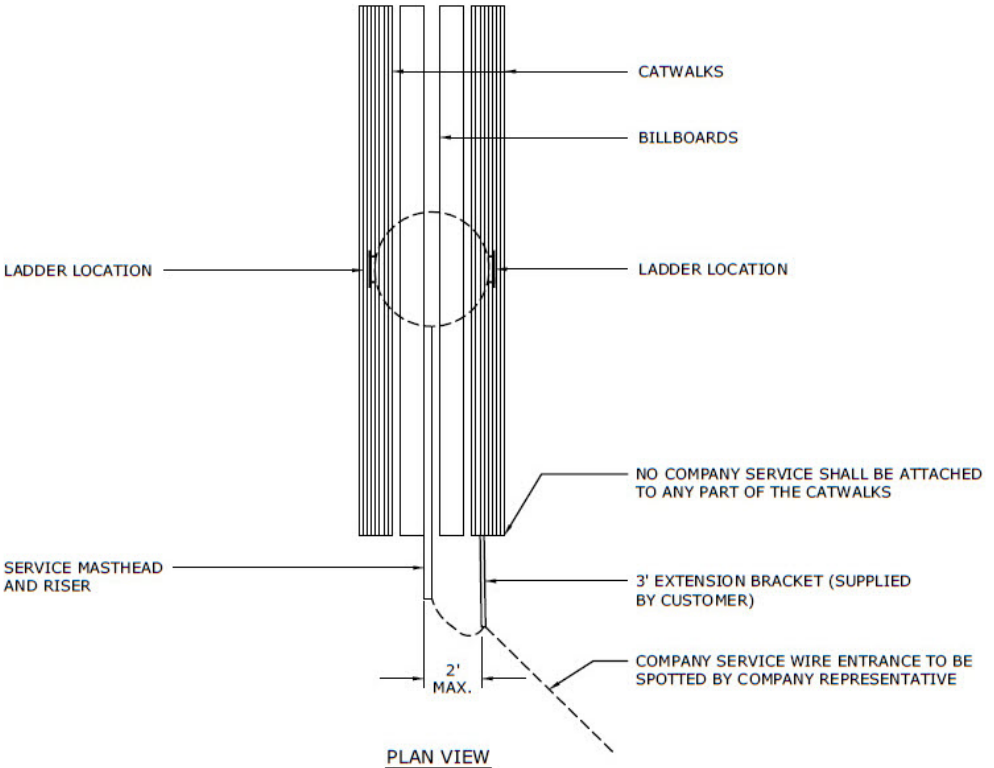
DUKE ENERGY.

REVISED	BY	CK'D	APPR.
3			
2			
1			
0	8/1/18	DIETERLE	BRUINS	ADCOCK

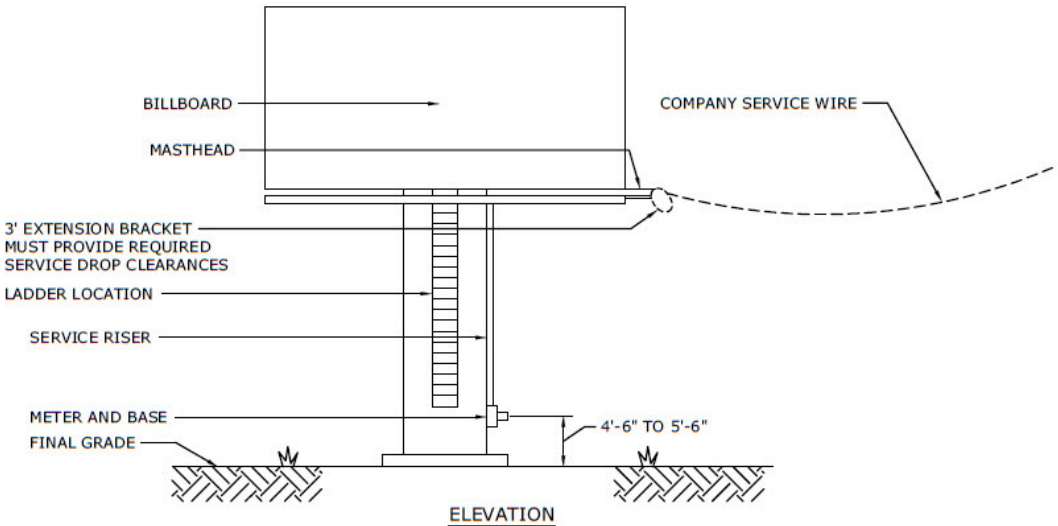
120/240V, SINGLE-PHASE, 3-WIRE PARALLEL OVERHEAD, INDOOR INSTALLATION GREATER THAN 200A, NOT TO EXCEED 400A

DEC	DEO/K	DEP	DEF
	X		

FIG 34



PLAN VIEW



ELEVATION

NOTE:

1. DO NOT PROVIDE SERVICE TO SIGN WHICH DOES NOT HAVE CLEARANCES FROM ADJACENT OVERHEAD CONDUCTORS AS REQUIRED BY NESC AND ANY ADDITIONAL COMPANY SPECIFICATIONS.

DUKE ENERGY.

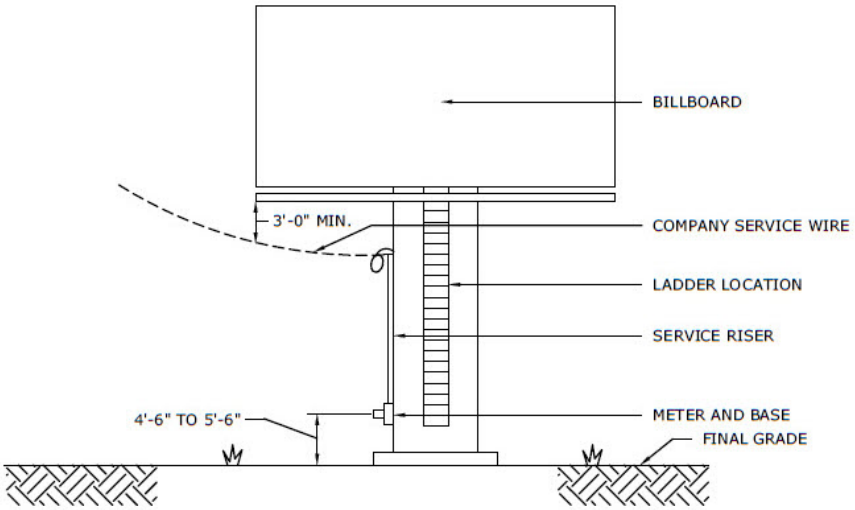
3				
2				
1	12/13/17	DIETERLE	BRUINS	ADCOCK
0	10/28/15	SIMPSON	SIMPSON	CHANDLER
REVISED		BY	CK'D	APPR.

BILLBOARD SERVICE ENTRANCE REQUIREMENTS

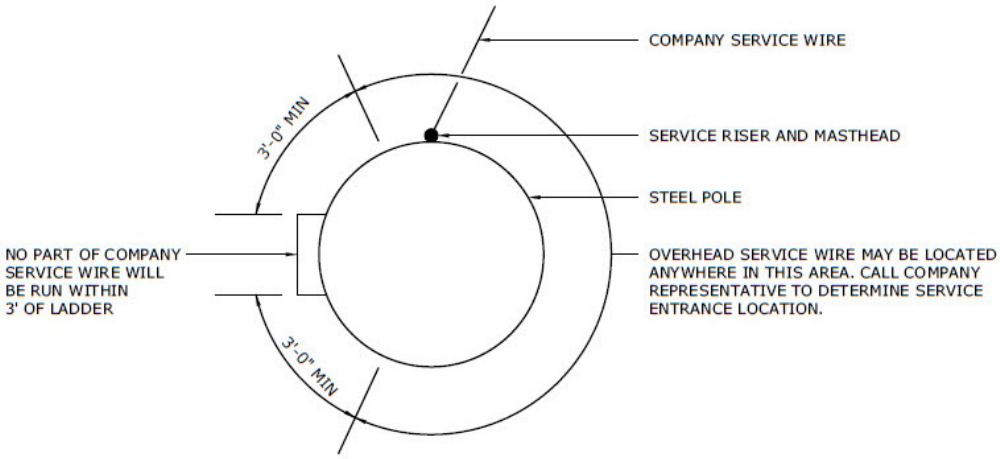
METHOD "A"

DEC	DEM	DEP	DEF
	X		

FIG 37



ELEVATION



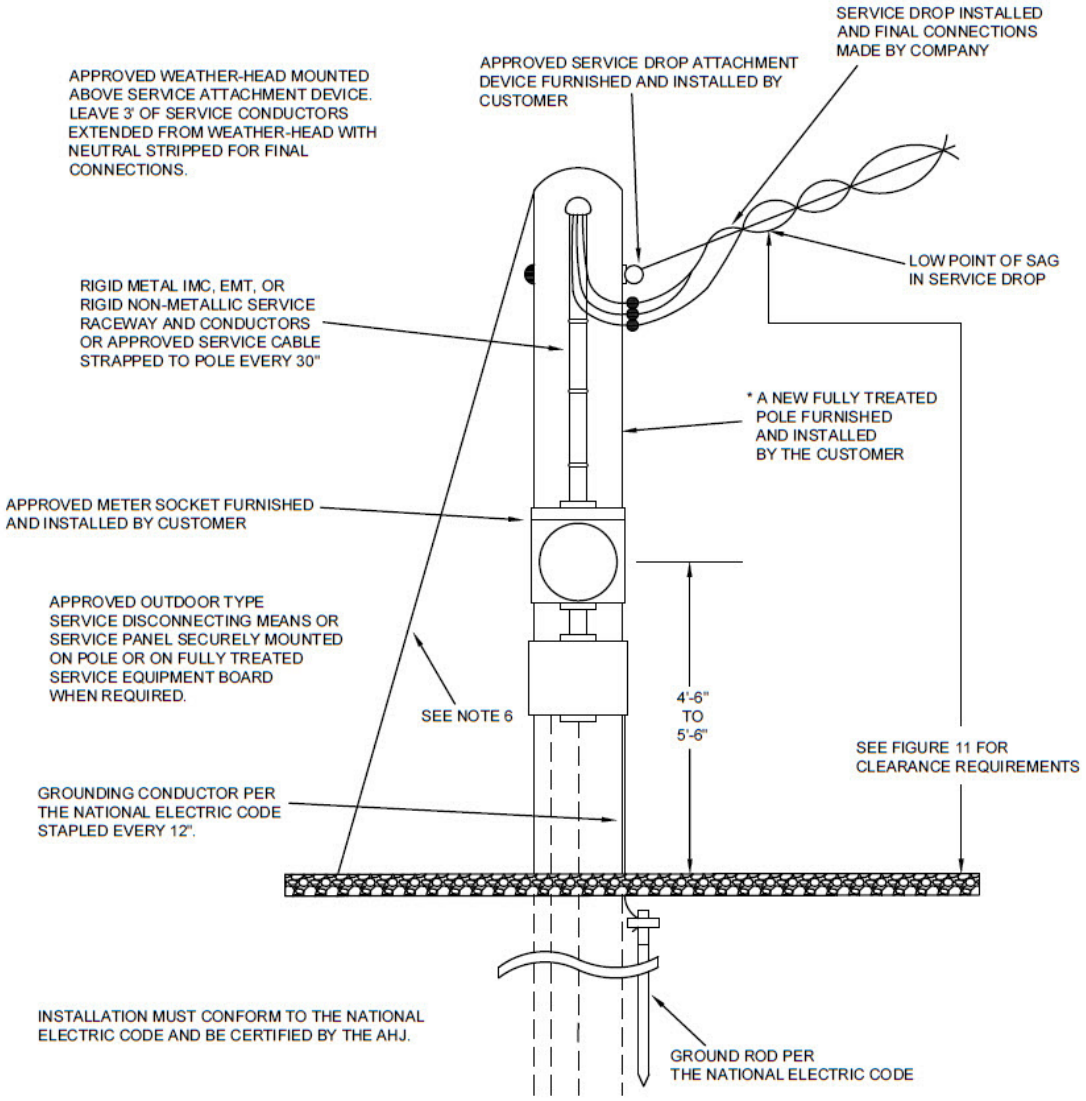
PLAN

DUKE ENERGY.

3					BILLBOARD SERVICE ENTRANCE REQUIREMENTS METHOD "B"
2					
1	12/13/17	DIETERLE	BRUINS	ADCOCK	
0	10/26/15	SIMPSON	EANES	ADCOCK	
REVISED		BY	CK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 38



NOTES: (SEE SECTION V(B)(3))

1) CUSTOMER TO CONTACT DISTRIBUTION ENGINEERING FOR METER POLE LOCATION.

2) CUSTOMER TO PROVIDE NEW, FULLY TREATED, MINIMUM 25' CLASS 7 POLE. ADDITIONAL HEIGHT MAY BE REQUIRED DUE TO TERRAIN, CLEARANCES, OR OTHER FIELD CONDITIONS. HEIGHT MUST BE APPROVED BY COMPANY.

3) CUSTOMER TO DIG 5' DEEP POLE HOLE.

4) POLE AND HOLE MUST BE APPROVED BY COMPANY BEFORE POLE IS SET.

5) BACKFILL MUST BE SOLIDLY TAMPED WHEN POLE IS SET.

6) RAKING, KEYING, OR GUYING OF POLE MAY BE REQUIRED. CONTACT COMPANY FOR DETAILS.

7) CUSTOMER TO FURNISH AND INSTALL ALL MATERIALS.

* METERING POLE LOCATION HEIGHT, CLASS, DEPTH OF SETTING AND GUYING MUST BE APPROVED BY DISTRIBUTION ENGINEERING. DEPTH OF THE HOLE MUST BE CHECKED BY THE COMPANY BEFORE THE POLE IS SET. (SEE SECTION V(B)(3))

DUKE ENERGY.

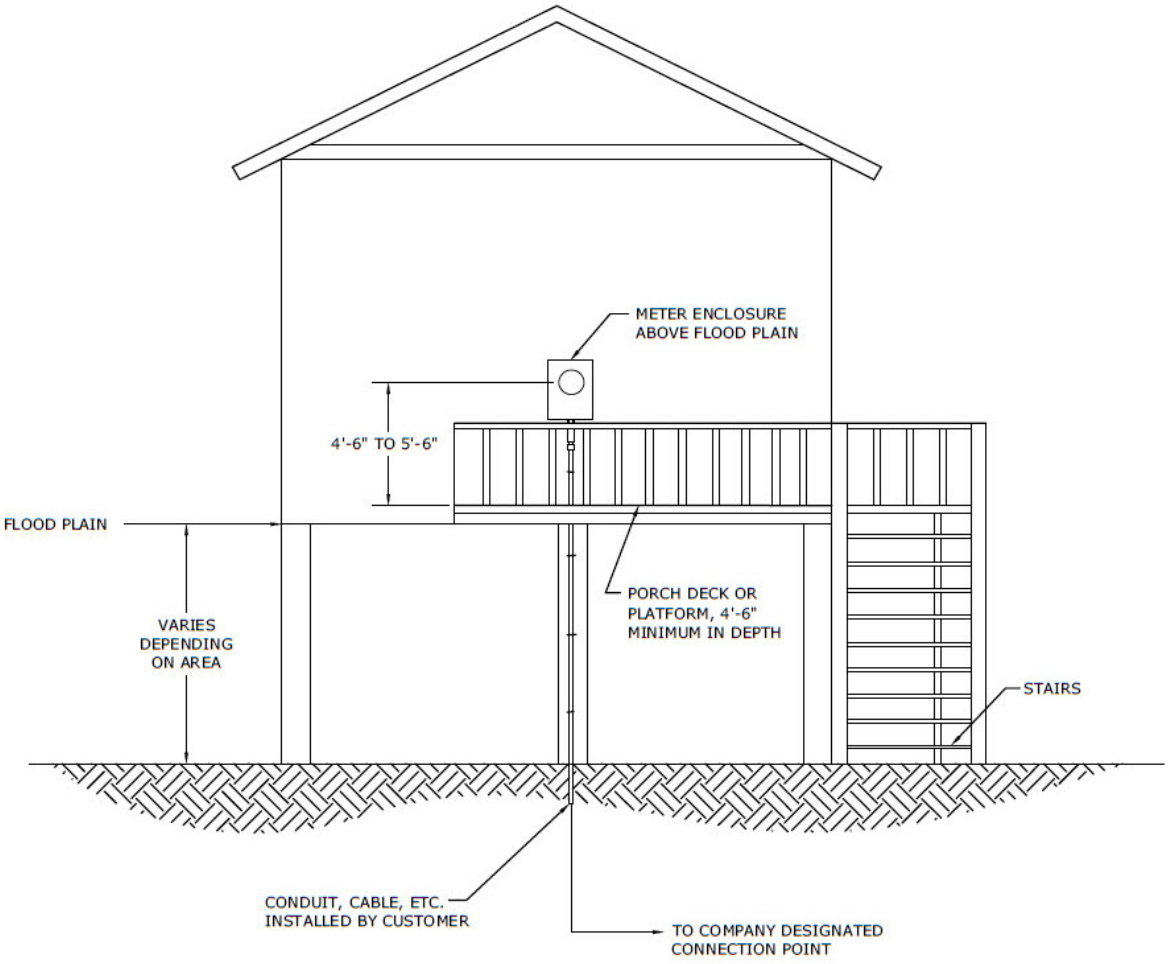
3				
2				
1				
0	7/23/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V, SINGLE-PHASE METERING POLE

(UP TO 400 AMPS MAX)

DEC	DEO/K	DEP	DEF
	X		

FIG 39



NOTES:

1. ELECTRICAL SERVICES IN FLOOD ZONES MUST BE ELEVATED ABOVE THE FLOOD PLAIN ELEVATION, AND ACCESS AND WORKING CLEARANCES MUST COMPLY WITH NEC ARTICLE 110.
2. ALL PLATFORM AND STAIR CONSTRUCTION SHALL BE PROVIDED BY THE CUSTOMER AS REQUIRED BY COMPANY AND MUST MEET ALL APPLICABLE BUILDING CODES.
3. SEE FIGURE 95A FOR PROPER METER CLEARANCES.

REVISED		BY	CK'D	APPR.
3				
2	4/24/19	DIETERLE	BRUINS	ADCOCK
1	12/13/18	DIETERLE	BRUINS	ADCOCK
0	1/13/16	SIMPSON	EANES	CHANDLER

METER ENCLOSURE INSTALLATIONS
IN FLOOD ZONES

DUKE ENERGY.

DEC	DEM	DEP	DEF
	X		

FIG 40

THE GROUNDED SERVICE NEUTRAL CONDUCTOR CONNECTED TO THE NEUTRAL CONNECTOR IN THE METER SOCKET BONDS THE SOCKET TO THE SERVICE GROUNDING SYSTEM. LATERALS MUST LOOP INSIDE METERBASE AS SHOWN.

WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKET MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGHLY RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT OR SERVICE PANELBOARD.

ALL SERVICE CONDUCTOR CONNECTIONS IN THE METER SOCKET AND SERVICE DISCONNECS OR SERVICE PANELBOARDS MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

RESIDENTIAL, COMMERCIAL & INDUSTRIAL APPLICATIONS
OUTDOOR METER REQUIRED ON ALL NEW INSTALLATIONS
CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS

FRONT VIEW
(COVER REMOVED)

EXPANSION COUPLING SHALL BE PROVIDED BY CUSTOMER.

WALL SECTION

THE HIGH CAPACITY UNDERGROUND TYPE METER SOCKET IS FURNISHED AND INSTALLED BY THE CUSTOMER.

LINE LOAD

APPROVED BONDING OF A METALLIC RACEWAY IS REQUIRED. LOCKNUTS, APPROVED FITTINGS OR BONDING BUSHINGS ARE REQUIRED WHEN INSTALLING METALLIC OR NON-METALLIC RACEWAYS. (REFER TO NEC)

4'-6" TO 5'-6"

CONDUIT STRAPS

THE SERVICE DISCONNECTING MEANS AND OVERCURRENT PROTECTION

FINAL GROUND LEVEL

APPROVED GROUNDING PER NEC

THE HOLE WHERE THE SERVICE RACEWAYS OR SERVICE CABLES ENTER THE BUILDING MUST BE SEALED TO PREVENT WATER, RODENTS OR INSECTS FROM ENTERING THE BUILDING.

THE INSTALLATION REQUIREMENTS & APPROVAL OF THE SERVICE LATERALS (DEPTH, AMPACITY, TYPE, ECT.) ARE UNDER THE AHJ.

INSTALL SUFFICIENT CABLE SLACK AT THE FOUNDATION TO ALLOW FOR SETTLING OF THE EARTH ON DIRECT BURIED CABLES. CABLE SLACK IS REQUIRED TO REDUCE HEAVY TENSION ON THE INSULATED BLOCKS OF THE METER SOCKET JAWS.
(SEE ARTICLES SECTION III(K) & III(L) FOR ADDITIONAL INFORMATION ON UNDERGROUND SERVICE LATERALS)

DUKE ENERGY.

3				
2				
1				
0	7/25/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V, SINGLE-PHASE, 3-WIRE UNDERGROUND
(NOT EXCEEDING 200 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 45

ALL SERVICE CONDUCTOR CONNECTIONS IN THE METER SOCKET AND SERVICE DISCONNECT(S) OR SERVICE PANELBOARD(S) MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

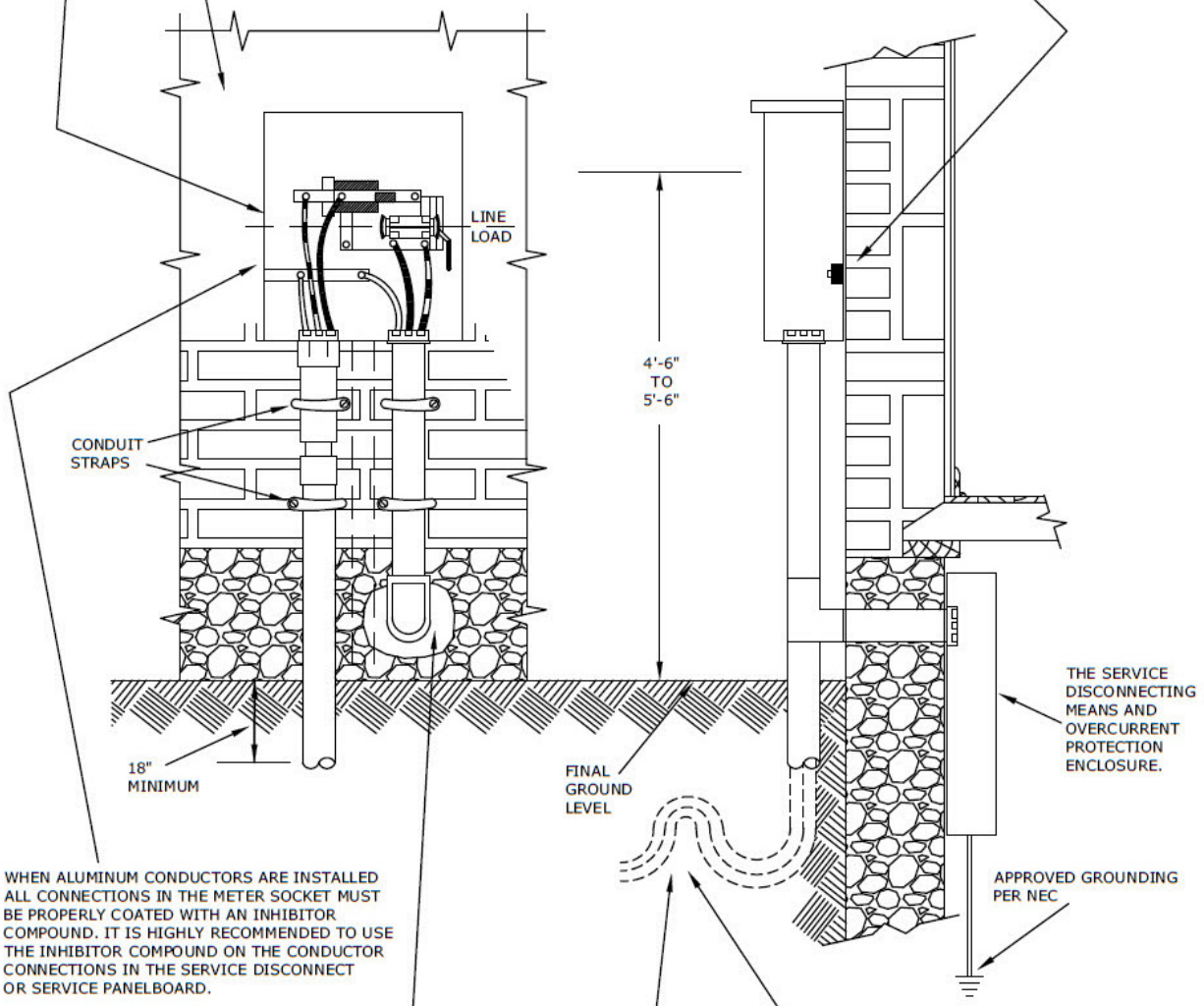
APPLICATIONS - 400 AMPERES MAXIMUM WHEN APPROVED BY DISTRIBUTION ENGINEERING
OUTDOOR METER LOCATION REQUIRED ON ALL NEW INSTALLATIONS
CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS

ALL EQUIPMENT & CONDUCTORS SHOWN ARE FURNISHED & INSTALLED BY THE CUSTOMER. LINE SIDE CONDUCTOR FURNISHED BY COMPANY FOR RESIDENTIAL SINGLE FAMILY DWELLINGS IN OHIO

THE GROUNDED SERVICE NEUTRAL CONDUCTOR CONNECTED TO THE NEUTRAL BUS IN THE METER SOCKET BONDS THE SOCKET TO THE SERVICE GROUNDING SYSTEM.

FRONT VIEW
(COVER REMOVED)

WALL SECTION



WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKET MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGHLY RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT OR SERVICE PANELBOARD.

THE HOLE WHERE THE SERVICE RACEWAYS OR SERVICE CABLES ENTER THE BUILDING MUST BE SEALED TO PREVENT WATER, RODENTS OR INSECTS FROM ENTERING THE BUILDING.

INSTALL SUFFICIENT CABLE SLACK AT THE FOUNDATION TO ALLOW FOR SETTLING OF THE EARTH ON DIRECT BURIED CABLES. CABLE SLACK IS REQUIRED TO REDUCE HEAVY TENSION ON THE INSULATED BLOCKS OF THE METER SOCKET JAWS.

RESIDENTIAL SINGLE FAMILY DWELLINGS SERVICES WILL BE PROVIDED BY DUKE.

(SEE SECTION III(K) AND III(L) FOR ADDITIONAL INFORMATION ON UNDERGROUND SERVICE LATERALS)

DUKE ENERGY.

3				
2				
1				
0	7/25/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V, SINGLE-PHASE, 3-WIRE UNDERGROUND (GREATER THAN 200 AMPS BUT NOT EXCEEDING 400 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 46

ALL SERVICE CONDUCTOR CONNECTIONS IN THE METER SOCKET AND SERVICE DISCONNECT(S) OR SERVICE PANELBOARD(S) MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

APPLICATIONS - 400 AMPS MAXIMUM WHEN APPROVED BY DISTRIBUTION ENGINEERING
OUTDOOR METER LOCATION REQUIRED ON ALL NEW INSTALLATIONS
CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS

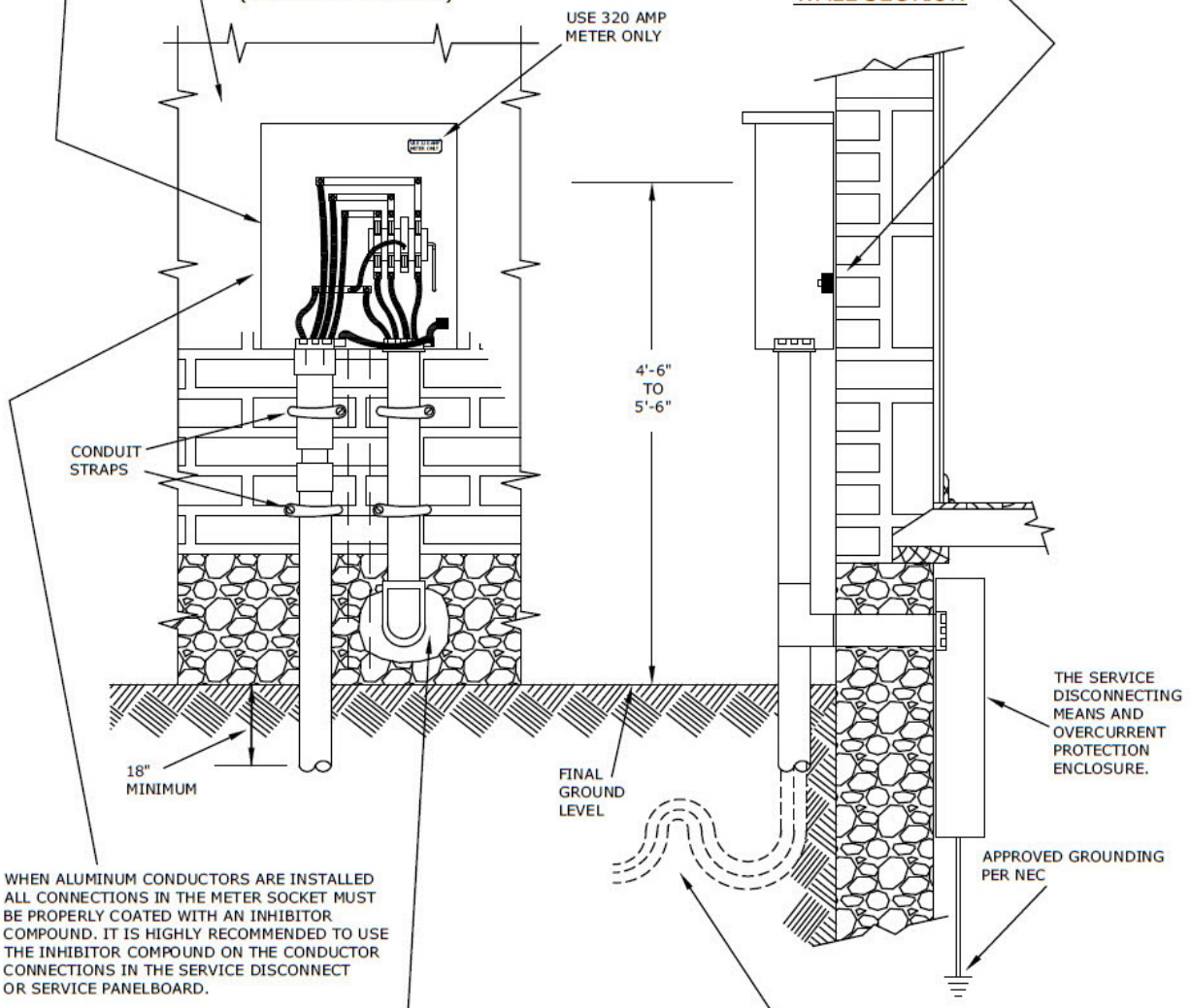
ALL EQUIPMENT & CONDUCTORS SHOWN ARE FURNISHED & INSTALLED BY THE CUSTOMER.

THE GROUNDED SERVICE NEUTRAL CONDUCTOR CONNECTED TO THE NEUTRAL BUS IN THE METER SOCKET BONDS THE SOCKET TO THE SERVICE GROUNDING SYSTEM. APPROVED GROUNDING PER NEC

FRONT VIEW
(COVER REMOVED)

WALL SECTION

USE 320 AMP METER ONLY



WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKET MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGHLY RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT OR SERVICE PANELBOARD.

THE HOLE WHERE THE SERVICE RACEWAYS OR SERVICE CABLES ENTER THE BUILDING MUST BE SEALED TO PREVENT WATER, RODENTS OR INSECTS FROM ENTERING THE BUILDING.

INSTALL SUFFICIENT CABLE SLACK AT THE FOUNDATION TO ALLOW FOR SETTLING OF THE EARTH ON DIRECT BURIED CABLES. CABLE SLACK IS REQUIRED TO REDUCE HEAVY TENSION ON THE INSULATED BLOCKS OF THE METER SOCKET JAWS.

(SEE SECTION III(K) & III(L) FOR ADDITIONAL INFORMATION ON UNDERGROUND SERVICE LATERALS)

DUKE ENERGY.

3				
2				
1				
0	7/25/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

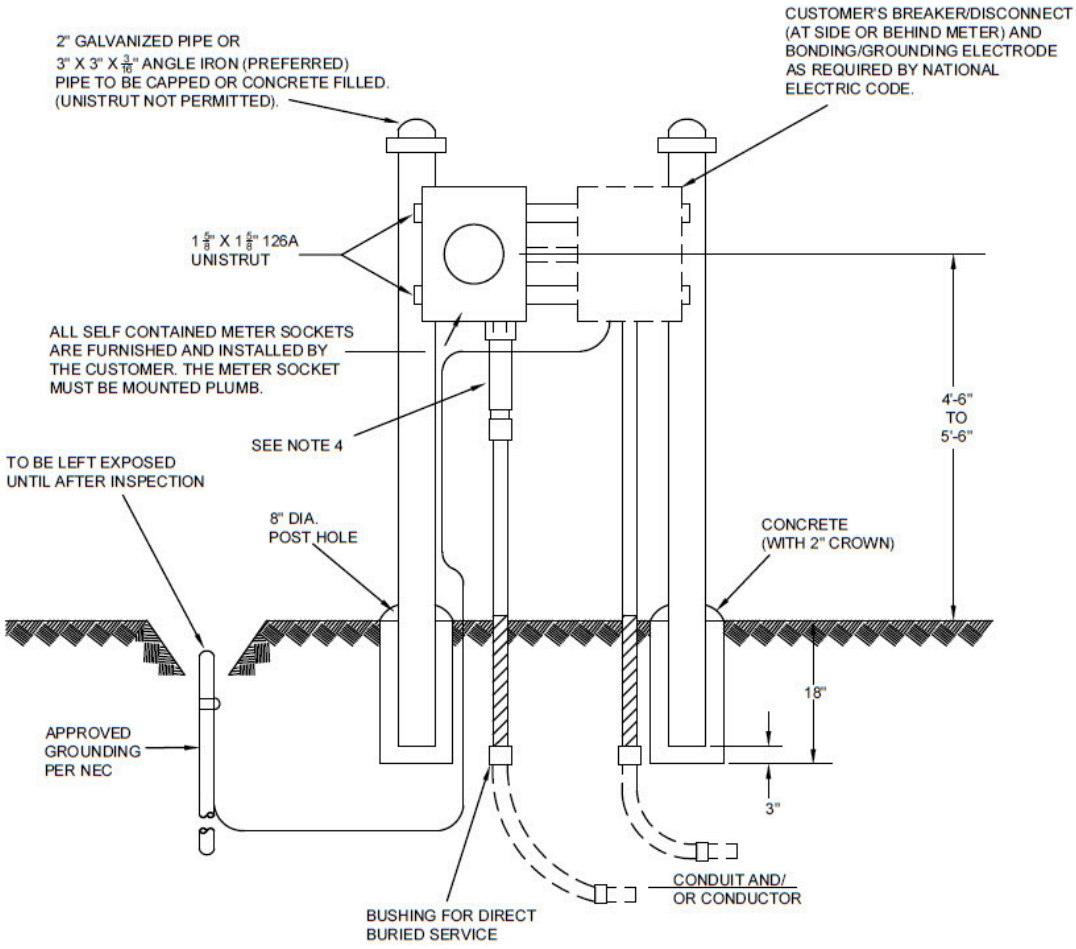
208Y/120V, THREE-PHASE, 4-WIRE OUTDOOR UNDERGROUND (GREATER THAN 200 AMPS BUT NOT EXCEEDING 400 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 47

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED

APPROVED BONDING IS REQUIRED WHEN USING METALLIC CONDUITS OR RACEWAYS. THIS BONDS ALL SERVICE COMPONENTS TO THE SERVICE GROUNDING SYSTEM. WHEN NON-METALLIC CONDUITS ARE USED THE CURRENT TRANSFORMER CABINET AND THE TRANSFORMER RATED METER SOCKET MUST BE BONDED TO THE SERVICE GROUNDING SYSTEM BY USING BONDING CONDUCTORS AND JUMPERS.



NOTES:

1. POST MUST BE EFFECTIVELY GROUNDED
2. SEE SECTION III(K) & III(L) ON UNDERGROUND SERVICE LATERALS.
3. THE INSTALLATION REQUIREMENTS & APPROVAL OF THE SERVICE LATERAL (DEPTH, AMPACITY, TYPE, ETC.) ARE UNDER THE AHJ.
4. EXPANSION JOINT SHALL BE PROVIDED BY CUSTOMER.

DUKE ENERGY.

3					
2					
1					
0	7/24/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

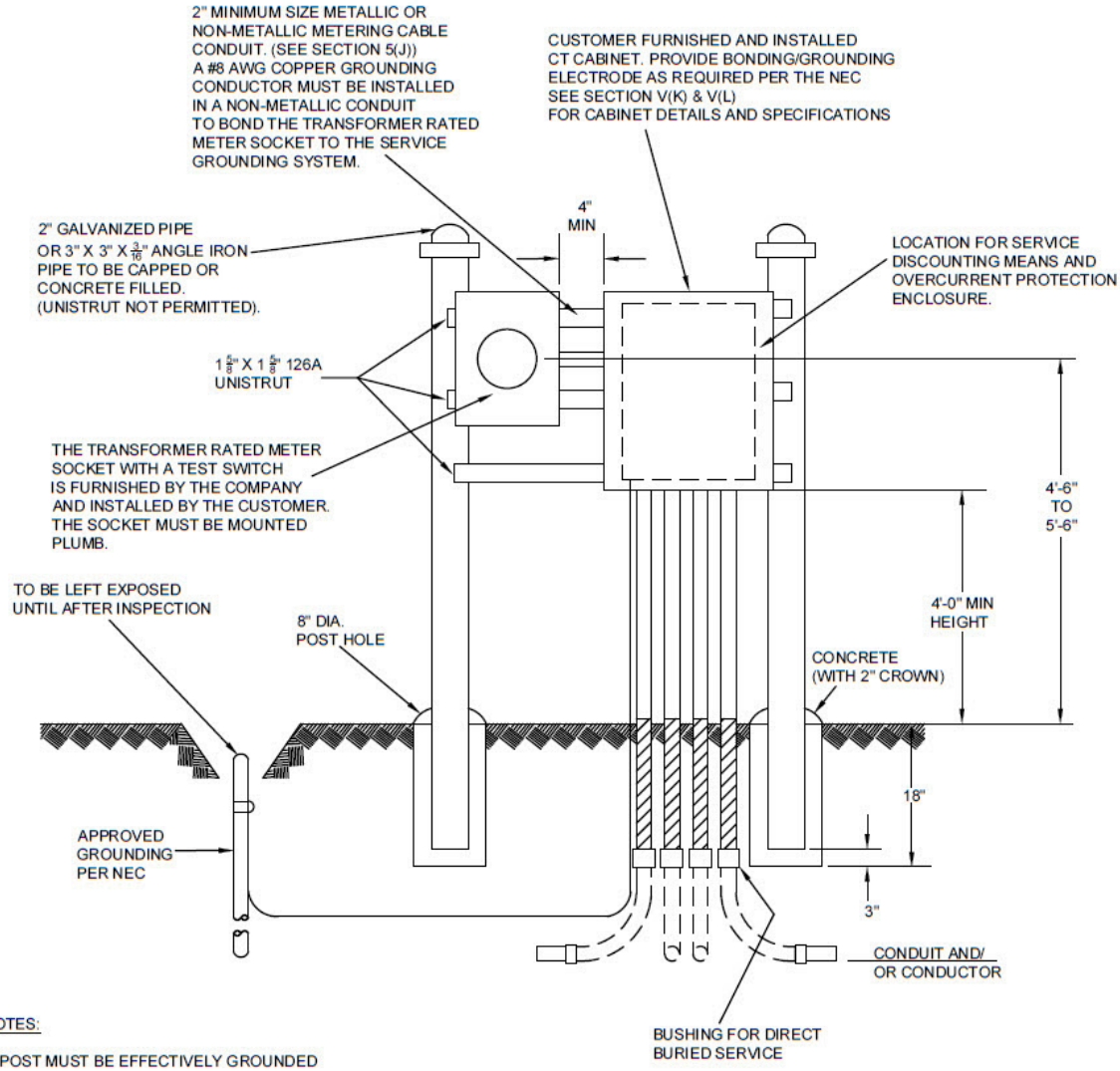
POST TYPE METER INSTALLATION
(SELF-CONTAINED METERING)

DEC	DEO/K	DEP	DEF
	X		

FIG 48

APPROVED BONDING IS REQUIRED WHEN USING METALLIC CONDUITS OR RACEWAYS. THIS BONDS ALL SERVICE COMPONENTS TO THE SERVICE GROUNDING SYSTEM. WHEN NON-METALLIC CONDUITS ARE USED THE CURRENT TRANSFORMER CABINET AND THE TRANSFORMER RATED METER SOCKET MUST BE BONDED TO THE SERVICE GROUNDING SYSTEM BY USING BONDING CONDUCTORS AND JUMPERS.

ALL NON-CURRENT CARRYING METALLIC PARTS TO BE BONDED TO NEUTRAL AND EFFECTIVELY GROUNDED



NOTES:

1. POST MUST BE EFFECTIVELY GROUNDED
2. SEE SECTION III(K) & III(L) ON UNDERGROUND SERVICE LATERALS.
3. VEHICULAR PROTECTION SHOULD BE INSTALLED TO PROTECT EQUIPMENT WHEN INSTALLATION IS IN A TRAFFIC AREA.
4. ADEQUATE CLEARANCE SHALL BE MAINTAINED FROM DRIVEWAYS, OR OTHER OBSTRUCTIONS. MAINTAIN 4' CLEARANCE IN FRONT OF METER AND 2' CLEARANCE AT SIDES OF METER.
5. FOR 277/480V SERVICES. A VT ("VT PACK") IS REQUIRED.
6. THE INSTALLATION REQUIREMENTS & APPROVAL OF THE SERVICE LATERAL (DEPTH, AMPACITY, TYPE, ETC.) ARE UNDER THE AHJ.

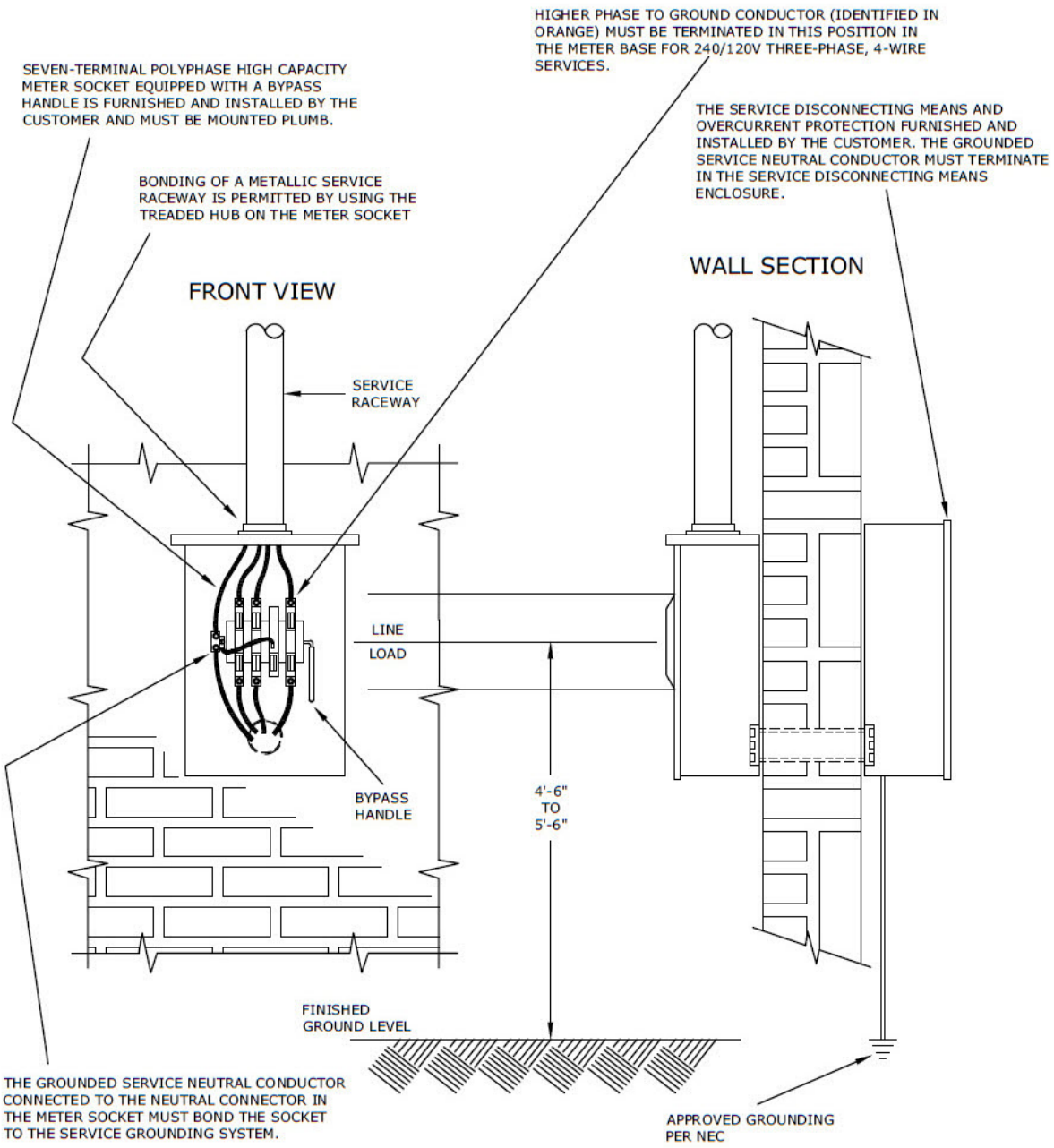
DUKE ENERGY.

3				
2				
1				
0	7/24/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

POST TYPE METER & INSTRUMENT TRANSFORMER (CT & VT) INSTALLATION (NON-PREFERRED INSTALLATION)

DEC	DEO/K	DEP	DEF
	X		

FIG 49



WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKET MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGH RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT OR SERVICE PANELBOARD.

ALL SERVICE CONDUCTORS CONNECTIONS IN THE METER SOCKET & SERVICE DISCONNECTS OR SERVICE PANELBOARDS MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

* LIMITED USE ONLY - CONTACT 877.700.DUKE (3853) FOR AVAILABILITY

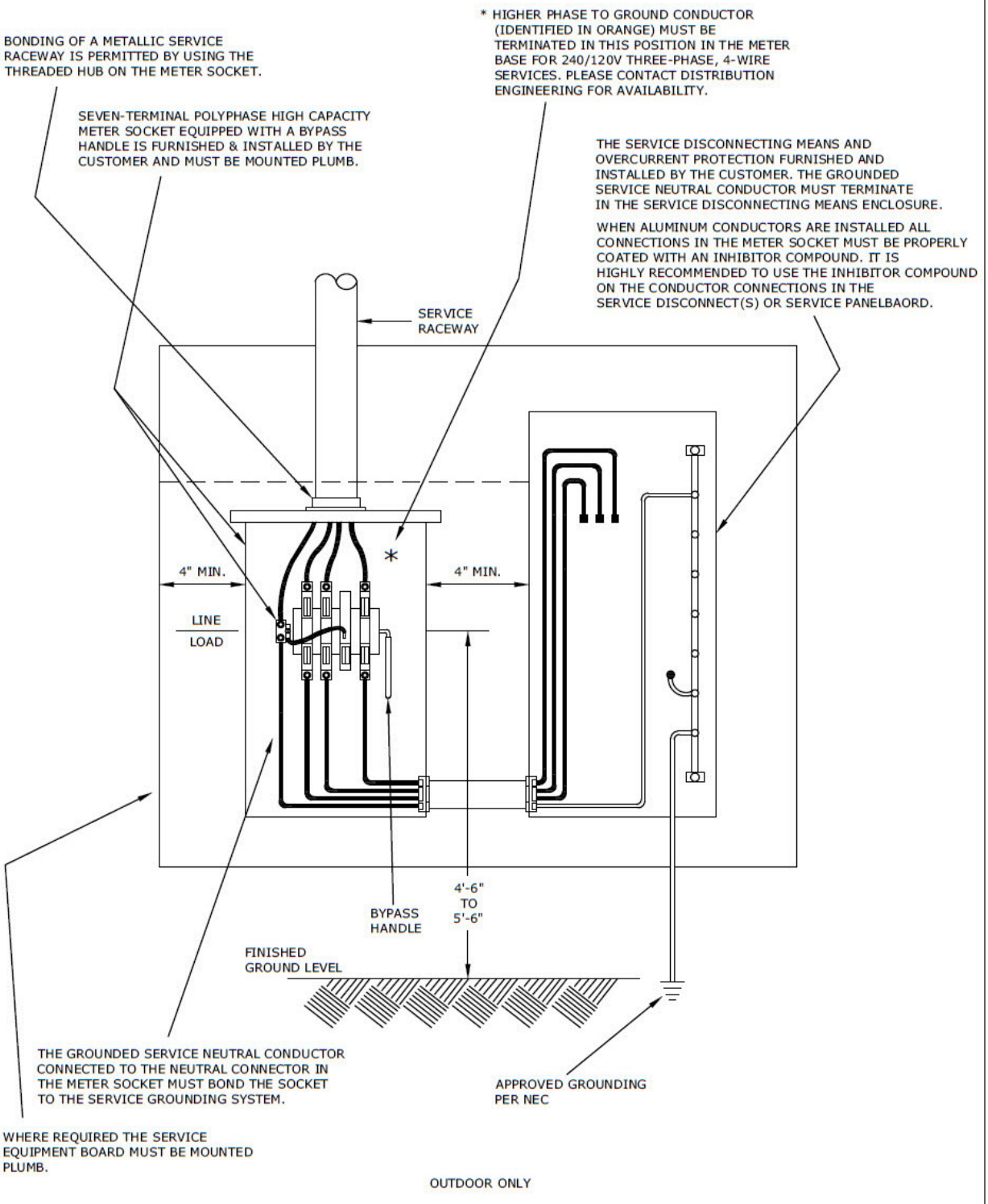
DUKE ENERGY.

3				
2				
1				
0	7/17/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

208Y/120V (NOT > 400A)
*240/120V (NOT > 200A)
OUTDOOR, THREE-PHASE, 4-WIRE

DEC	DEO/K	DEP	DEF
	X		

FIG 50



DUKE ENERGY.

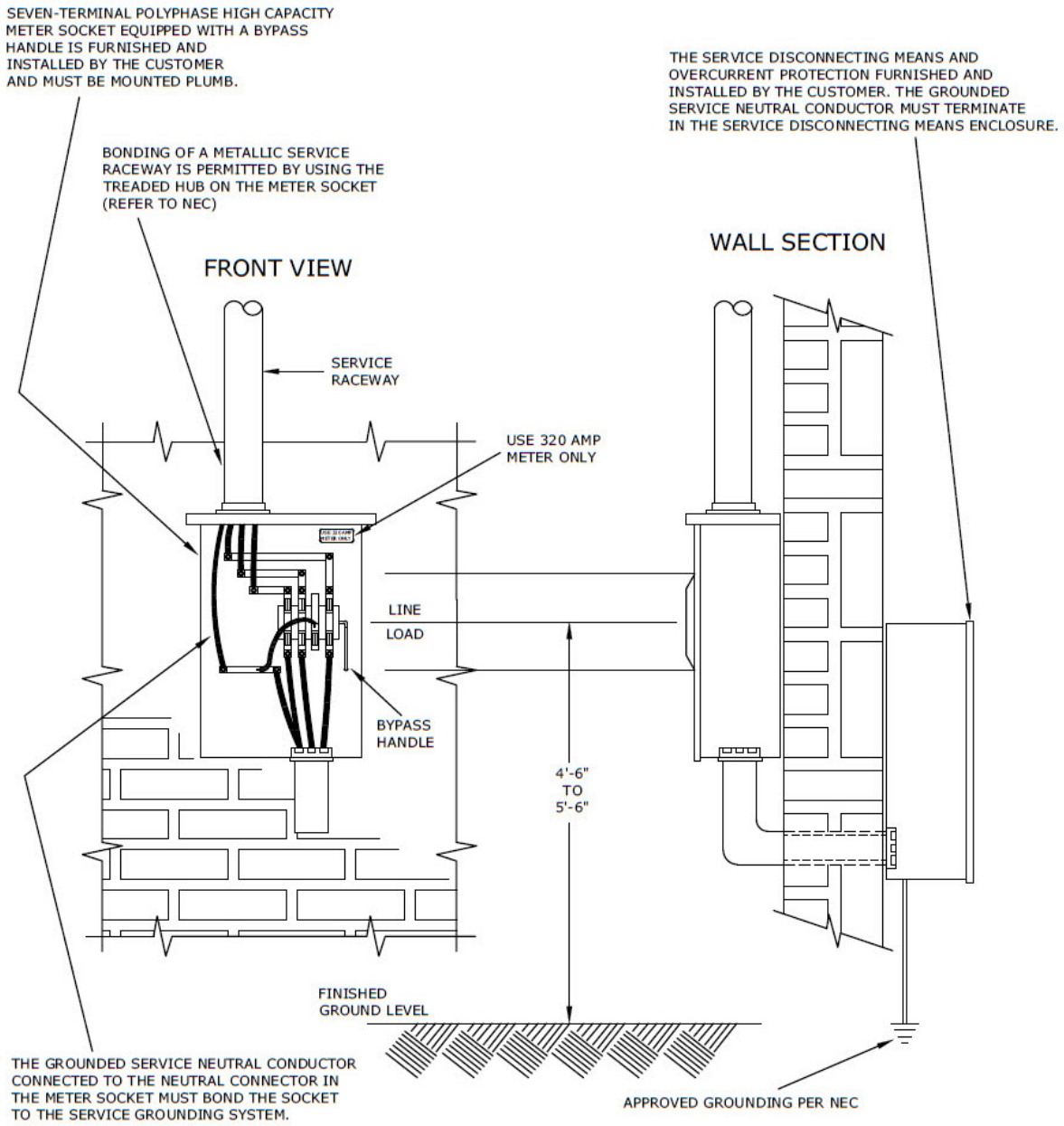
3					
2					
1					
0	7/10/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

208Y/120V OR *240/120V

THREE-PHASE, 4-WIRE (NOT > 400A)

DEC	DEO/K	DEP	DEF
	X		

FIG 51



WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKET MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGH RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT OR SERVICE PANELBOARD.

ALL SERVICE CONDUCTORS CONNECTIONS IN THE METER SOCKET & SERVICE DISCONNECTS OR SERVICE PANELBOARDS MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

DUKE ENERGY.

3					
2					
1					
0	7/17/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

208Y/120V THREE-PHASE, 4-WIRE
OUTDOOR (OVERHEAD) (GREATER THAN 200 AMPS, NOT EXCEEDING 400 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 52

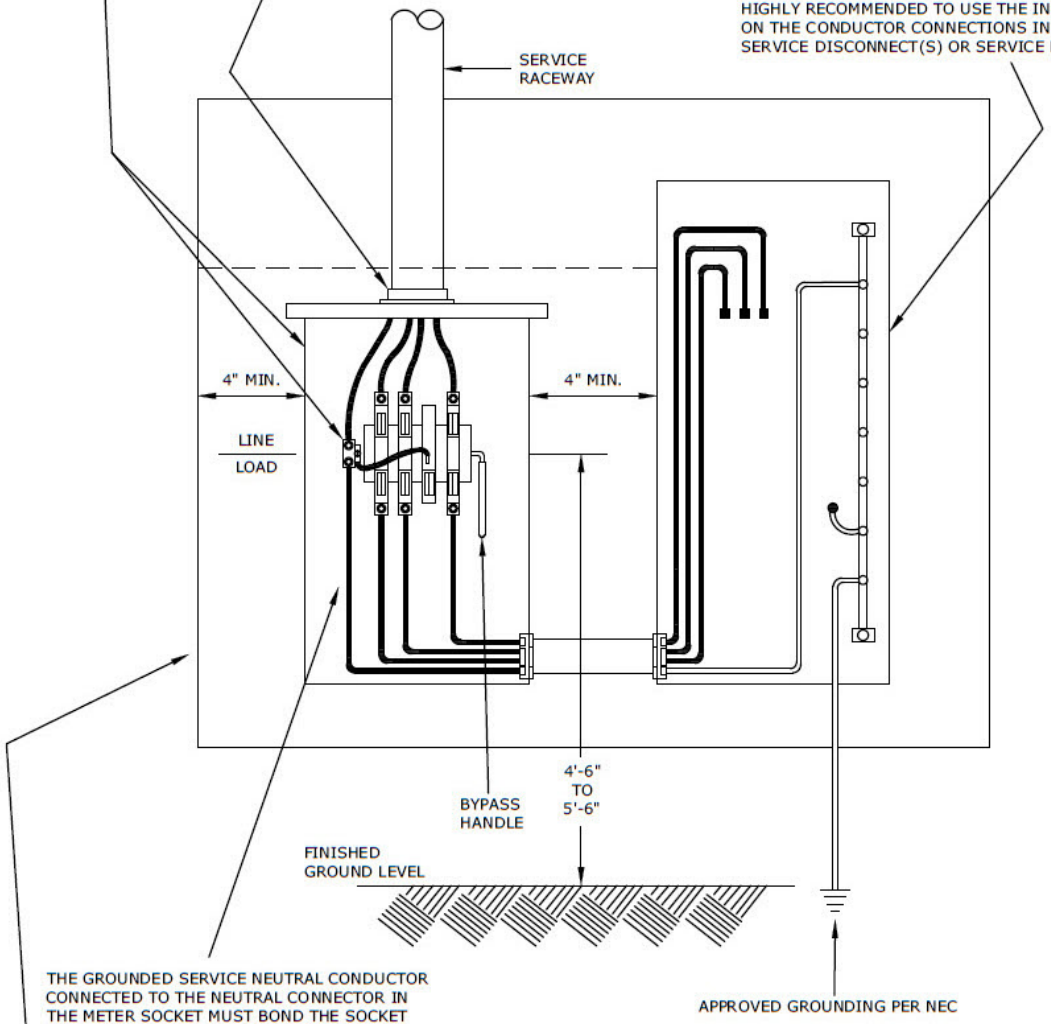
SEVEN TERMINAL POLYPHASE HIGH CAPACITY METER SOCKET EQUIPPED WITH A BYPASS HANDLE IS FURNISHED & INSTALLED BY THE CUSTOMER AND MUST BE MOUNTED PLUMB.

AN INDOOR LOCATION OF A METER SOCKET IS NOT PERMITTED ON NEW INSTALLATIONS UNLESS MANDATED BY A COMMUNITY ORDINANCE. CONTACT DISTRIBUTION ENGINEERING CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS

THE SERVICE DISCONNECTING MEANS AND OVERCURRENT PROTECTION FURNISHED AND INSTALLED BY THE CUSTOMER. THE GROUNDED SERVICE NEUTRAL CONDUCTOR MUST TERMINATE IN THE SERVICE DISCONNECTING MEANS ENCLOSURE.

WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKET MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGHLY RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT(S) OR SERVICE PANELBAORD.

BONDING OF A METALLIC SERVICE RACEWAY IS PERMITTED BY USING THE THREADED HUB ON THE METER SOCKET. (REFER TO NEC)



THE GROUNDED SERVICE NEUTRAL CONDUCTOR CONNECTED TO THE NEUTRAL CONNECTOR IN THE METER SOCKET MUST BOND THE SOCKET TO THE SERVICE GROUNDING SYSTEM.

APPROVED GROUNDING PER NEC

WHERE REQUIRED THE SERVICE EQUIPMENT BOARD MUST BE MOUNTED PLUMB.

ALL SERVICE CONDUCTORS CONNECTIONS IN THE METER SOCKET & SERVICE DISCONNECTS OR SERVICE PANELBOARDS MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

* AN INDOOR LOCATION OF A METER SOCKET IS NOT PERMITTED ON NEW INSTALLATIONS. UNLESS MANDATED BY A COMMUNITY ORDINANCE. CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS.

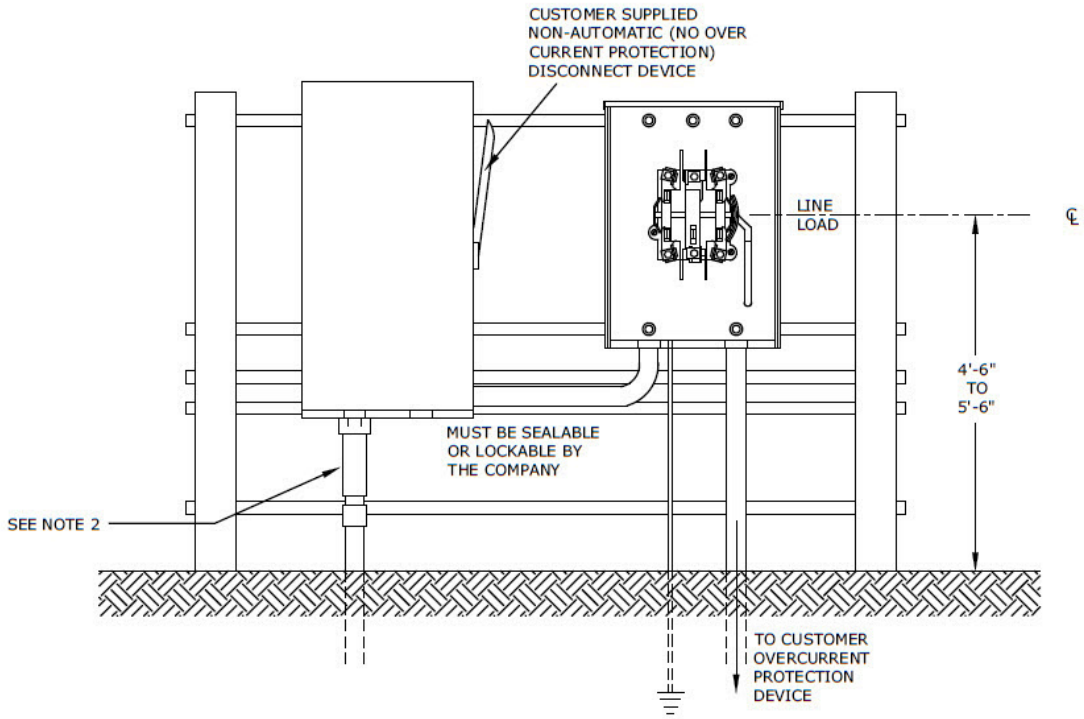
REVISED		BY	CK'D	APPR.
3				
2				
1				
0	7/10/18	DIETERLE	BRUINS	ADCOCK

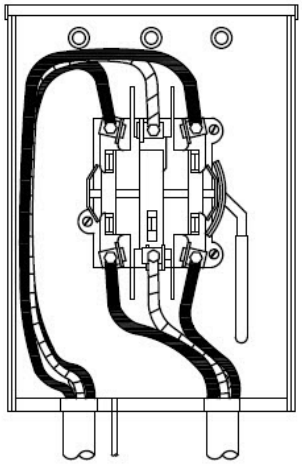
208Y/120V, THREE-PHASE, 4-WIRE PANELBOARD (GREATER THAN 200 AMPS BUT NOT EXCEEDING 400 AMPS)

DUKE ENERGY.

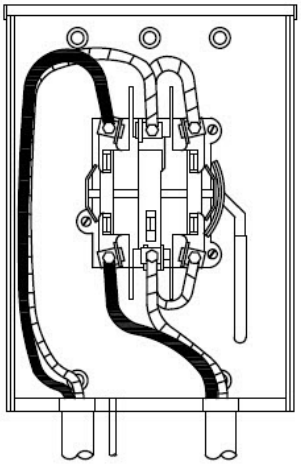
DEC	DEO/K	DEP	DEF
	X		

FIG 53





3-WIRE CONFIGURATION



2-WIRE CONFIGURATION

NOTES:

1. METER ENCLOSURE AND DISCONNECT DEVICE SHALL BE BONDED TO GROUND AS REQUIRED BY THE NEC OR AHJ.
2. EXPANSION JOINT SHALL BE PROVIDED BY CUSTOMER.
3. DEVICE MUST EQUAL OR EXCEED THE CUSTOMER'S MAIN CAPACITY.
4. **FOR DEO/K**, THIS INSTALLATION IS ONLY ALLOWED FOR GOVERNMENTAL (DOT OR MUNICIPAL) ROADWAY LIGHTING.
5. FIVE TERMINAL LEVER BYPASS MEG APPROVED METER ENCLOSURE. FIFTH TERMINAL IN 6 O'CLOCK POSITION.
6. DUKE ENERGY WILL SUPPLY THE METER ENCLOSURE.

DUKE ENERGY.

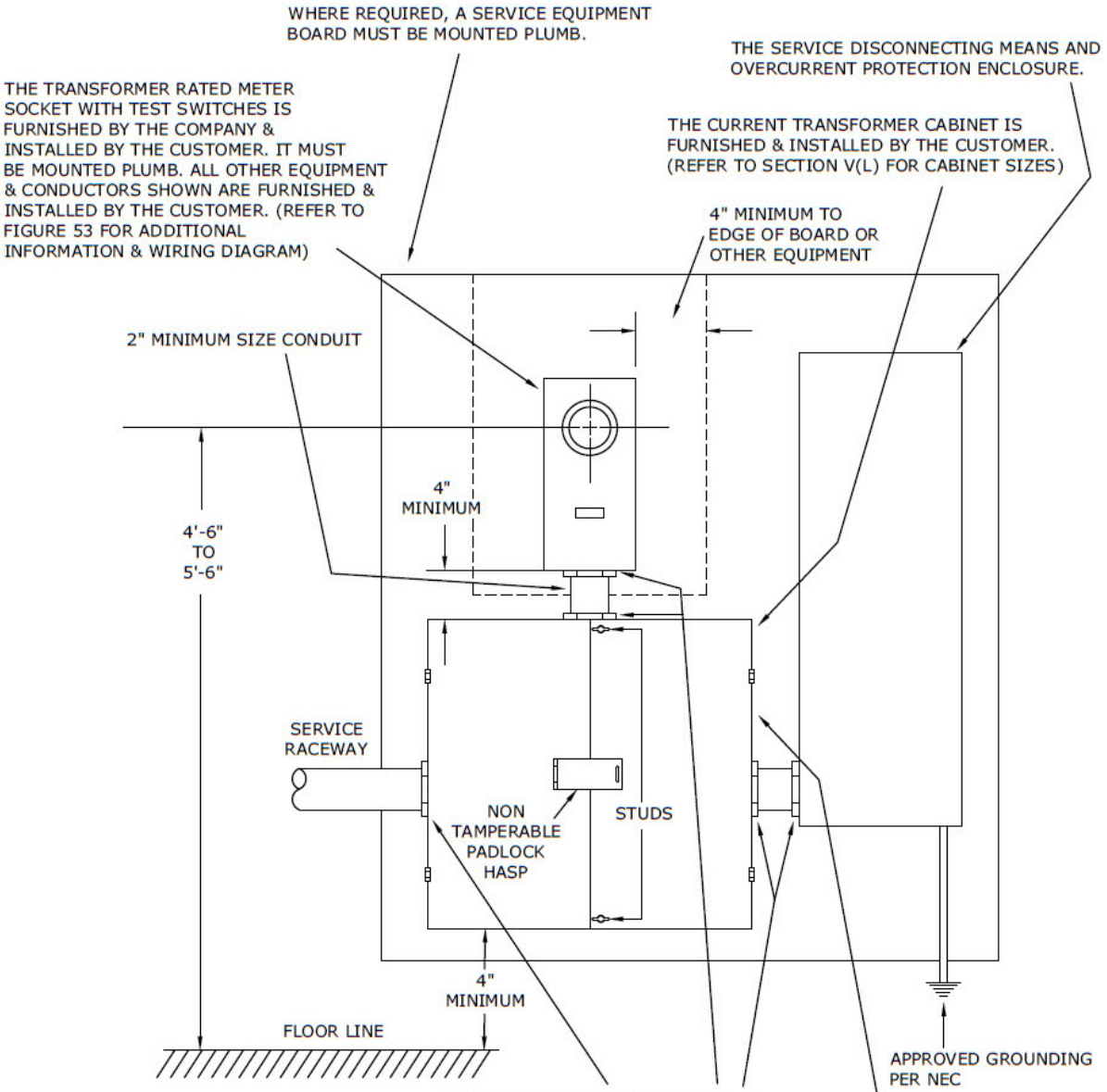
REVISED	BY	CK'D	APPR.
3			
2	5/14/19	DIETERLE	BRUINS	ADCOCK
1	9/6/18	DIETERLE	BRUINS	ADCOCK
0	3/2/17	DANNA	EANES	ADCOCK

TYPICAL 240/480V, 480V TO GROUND SELF-CONTAINED SERVICE, 400 AMPS OR LESS, WITH NON-AUTOMATIC DISCONNECT DEVICE

DEC	DEO/K	DEP	DEF
	X		

FIG 54

FOR SERVICE AMPACITIES GREATER THAN 1200 AMPS,
OR FOR BUS-BAR INSTALLATIONS,
CONSULT DISTRIBUTION ENGINEERING.



FOR:

- 120/240V AND 120/208Y V, GREATER THAN 400A AND NOT EXCEEDING 1200A
- 277/480Y V, ALL SERVICES NOT EXCEEDING 1200A

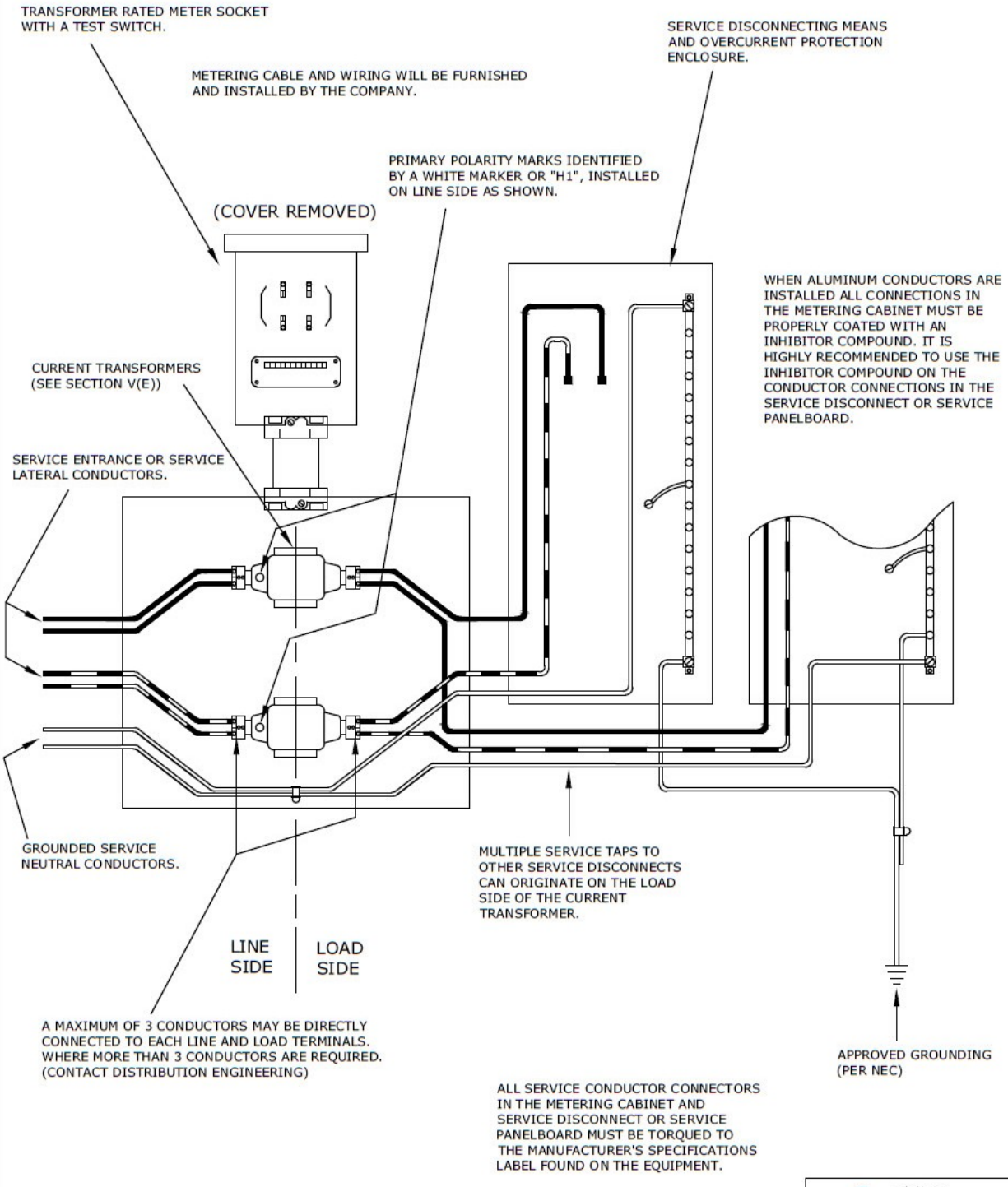
DUKE ENERGY.

3				
2				
1				
0	6/29/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

CT CABINET PHYSICAL INSTALLATION
(NOT EXCEEDING 1200 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 60



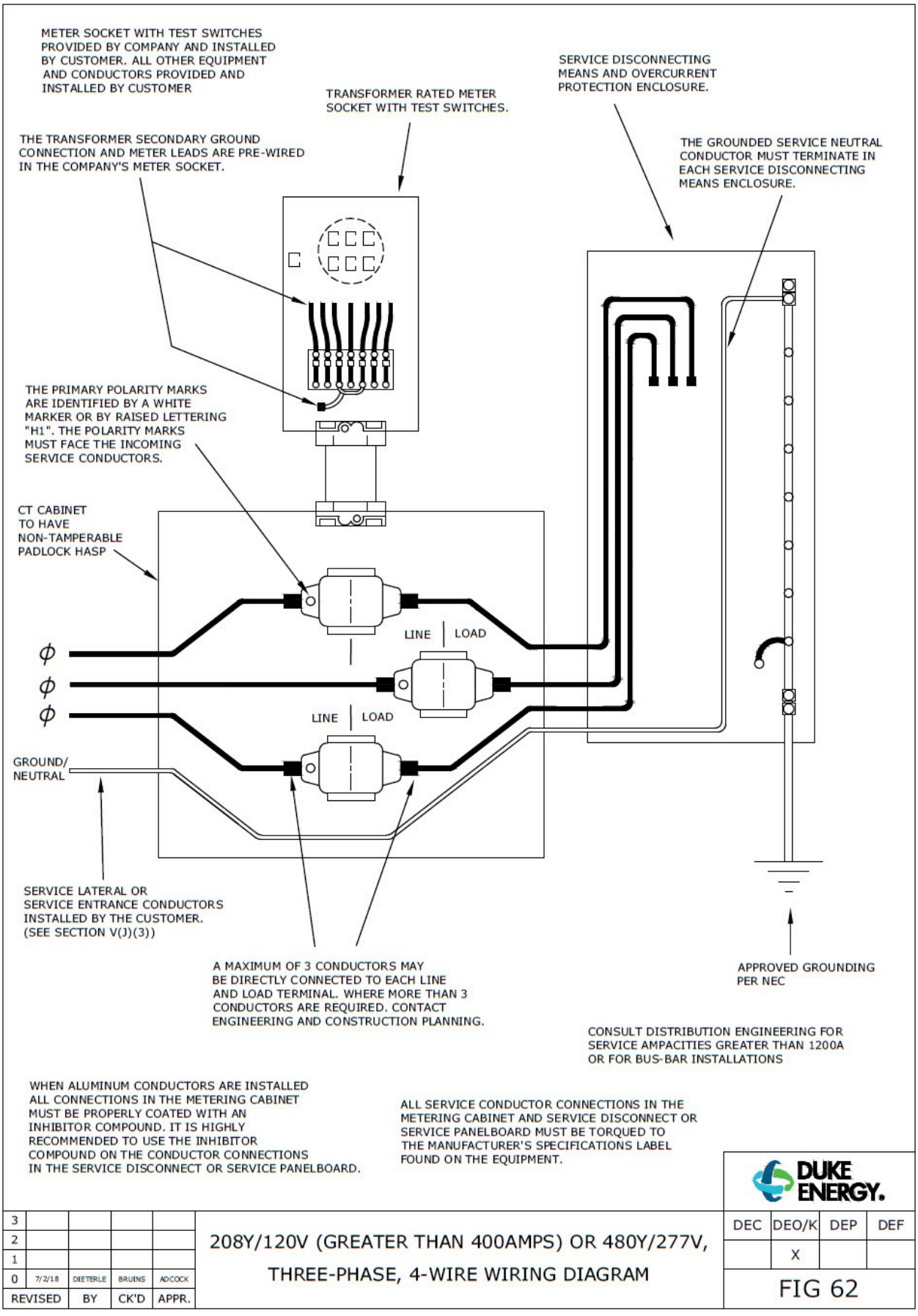
DUKE ENERGY.

3				
2				
1				
0	7/2/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V, SINGLE-PHASE, 3-WIRE CURRENT TRANSFORMER WIRING DIAGRAM (OVER 400 AMPS BUT NOT OVER 1200 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 61



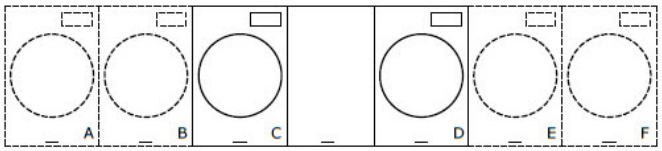
DUKE ENERGY.

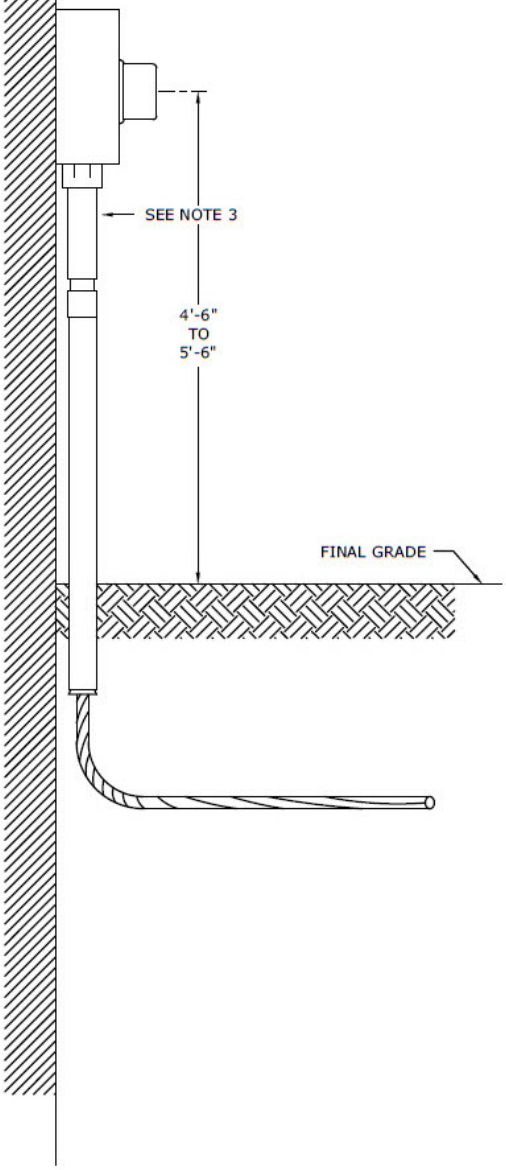
REVISED	BY	CK'D	APPR.
3				
2				
1				
0	7/2/18	DIETERLE	BRUINS	ADCOCK

208Y/120V (GREATER THAN 400AMPS) OR 480Y/277V, THREE-PHASE, 4-WIRE WIRING DIAGRAM

DEC	DEO/K	DEP	DEF
	X		

FIG 62





NOTES:

1. APPROVED GANGED METER SOCKETS TO BE FURNISHED AND OWNED BY CUSTOMER. ELECTRICAL CONTRACTOR TO INSTALL ON OUTSIDE OF BUILDING WALL AND TO BOND TO NEUTRAL.
2. IF ANY OF THE INDIVIDUAL SERVICES REQUIRE A METER SOCKET GREATER THAN 200 AMP. CAPACITY, THEN A GANGED PANEL OF GREATER AMPACITY MUST BE USED.
3. EXPANSION COUPLING SHALL BE PROVIDED BY CUSTOMER.
4. SEE NEC ARTICLE 250 FOR GROUNDING DETAILS.

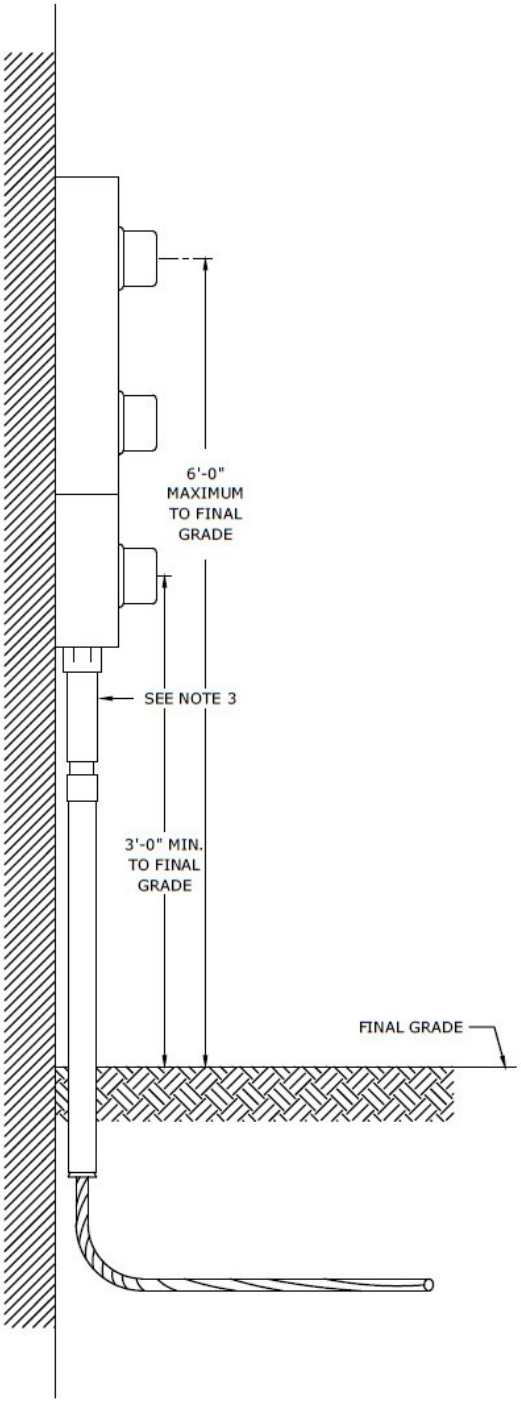
DUKE ENERGY.

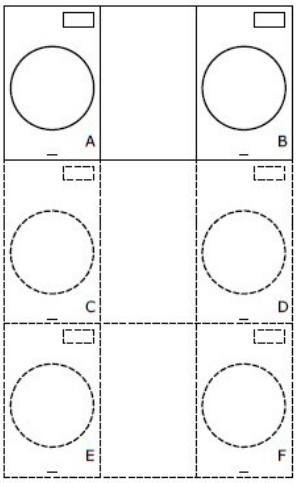
3				
2				
1				
0	2/25/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

HORIZONTAL GANGED METERING INSTALLATION
(2 - 6 METERS)
SINGLE-PHASE

DEC	DEO/K	DEP	DEF
	X		

FIG 65





NOTES:

1. APPROVED METER SOCKETS TO BE FURNISHED AND OWNED BY THE CUSTOMER. ELECTRICAL CONTRACTOR TO INSTALL ON THE THE OUTSIDE OF THE BUILDING WALL AND TO BOND TO NEUTRAL.
2. IF ANY OF THE INDIVIDUAL SERVICES REQUIRE A METER SOCKET GREATER THAN 200 AMP. CAPACITY, THEN A GANGED PANEL OF GREATER AMPACITY MUST BE USED.
3. EXPANSION COUPLING SHALL BE PROVIDED BY CUSTOMER.
4. SEE NEC ARTICLE 250 FOR GROUNDING DETAILS.

USE THIS PANEL ONLY WHEN MOUNTING SPACE PROHIBITS USE OF HORIZONTAL TYPE

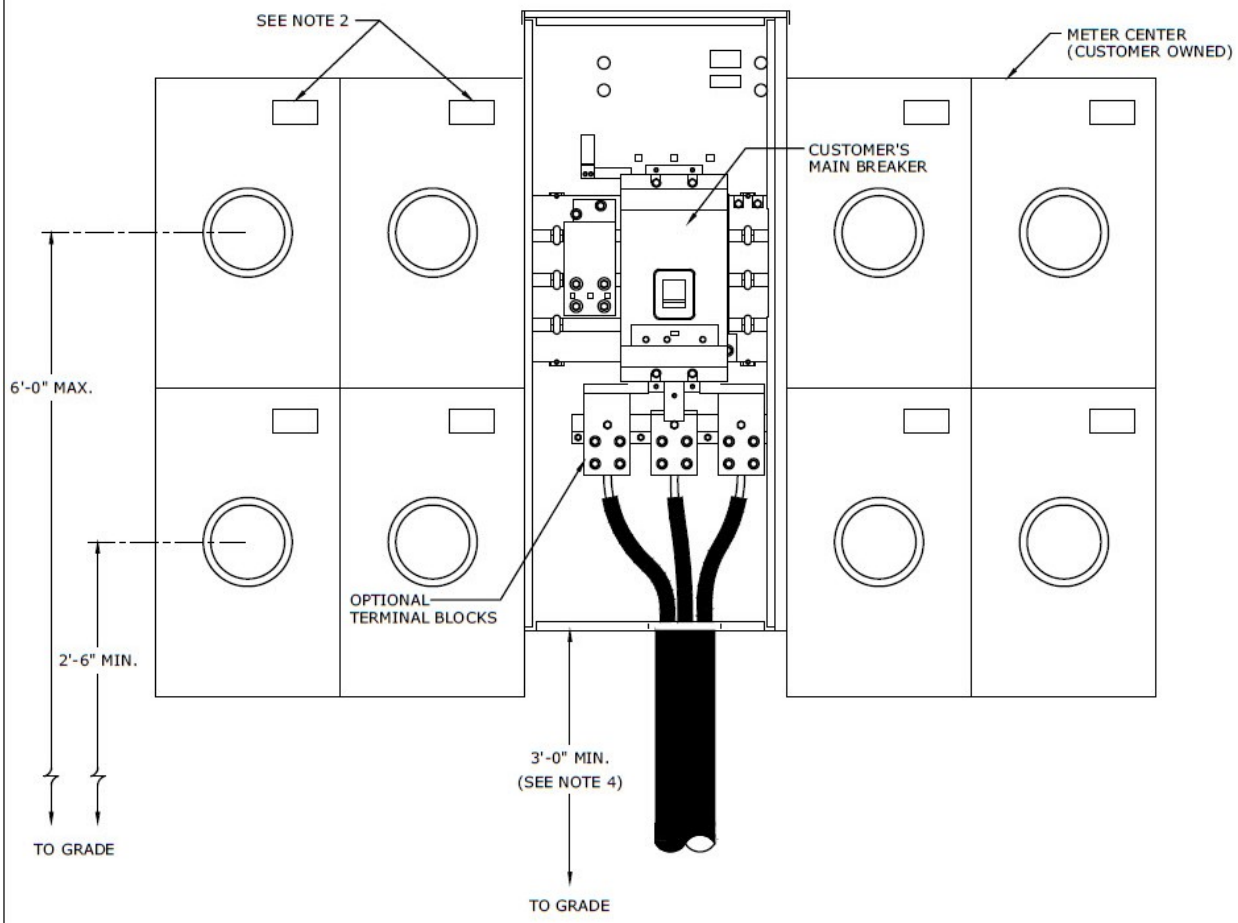
3				
2				
1				
0	2/25/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

VERTICAL GANGED METERING INSTALLATION
(2 - 6 METERS)
SINGLE-PHASE

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 66



NOTES:

1. MEG APPROVED METER CENTER TO BE FURNISHED AND OWNED BY THE CUSTOMER. ELECTRICAL CONDUCTOR TO INSTALL ON THE OUTSIDE OF THE BUILDING WALL AND TO BOND TO NEUTRAL.
2. LABEL EACH SOCKET COVER (SEE SECTION V(G)(1)).
3. SEE NEC ARTICLE 250 FOR GROUNDING DETAILS.
4. IF MINIMUM HEIGHT ABOVE GRADE CANNOT BE OBTAINED, LOWER HEIGHTS WILL BE ALLOWED WITH CERTAIN PROVISIONS. APPROPRIATE METER HEIGHTS MUST STILL BE MAINTAINED IN ALL CASES. CONDUCTOR TERMINAL BLOCKS OR MAIN BREAKER MUST BE OF SUFFICIENT HEIGHT TO ALLOW FOR PROPER TRAINING OF CABLE.

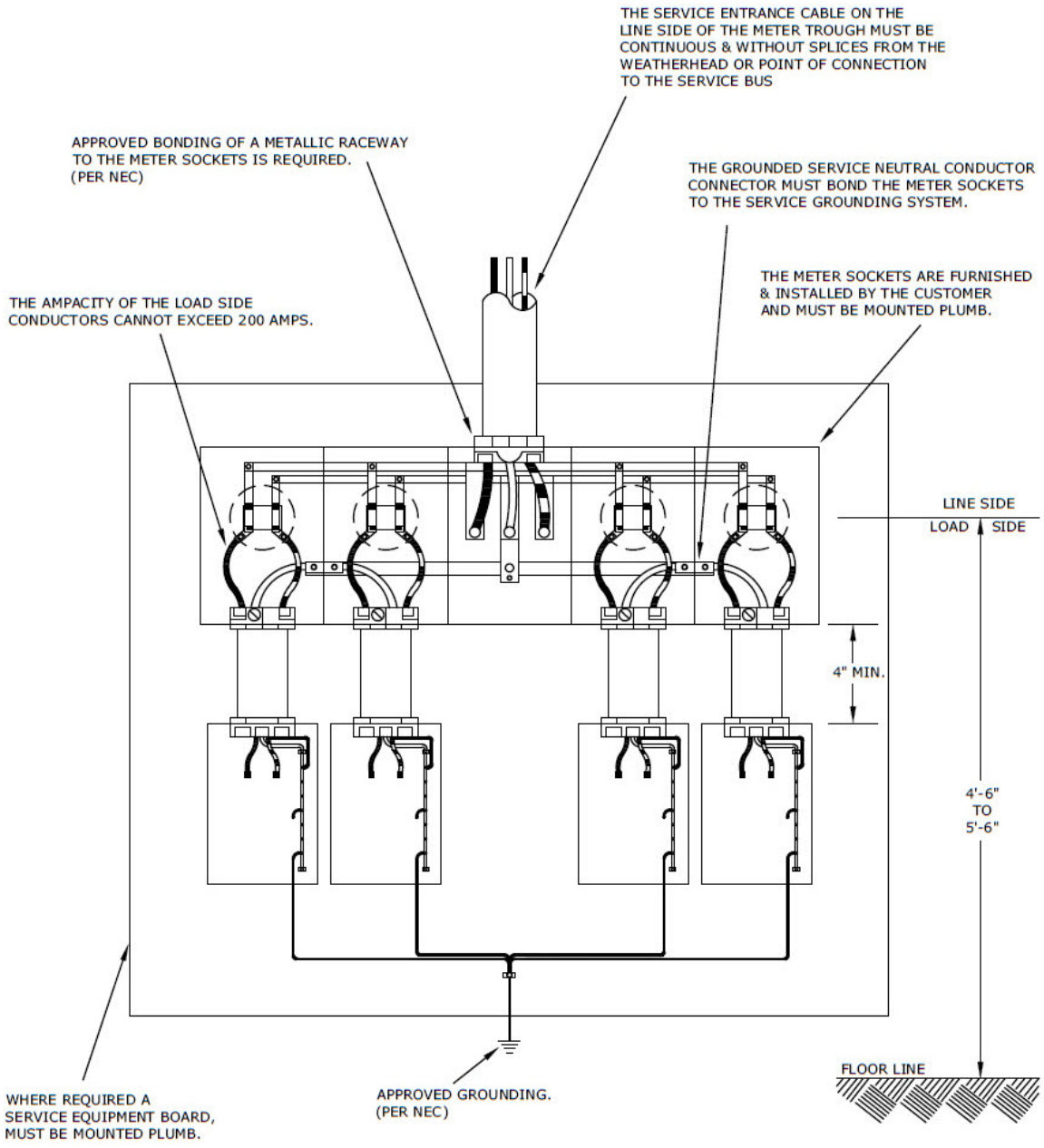
3				
2				
1				
0	2/25/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

MODULAR METER CENTER INSTALLATION
(MAIN DISCONNECT - GREATER THAN 6 METERS)
SINGLE AND THREE-PHASE

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 67



ALL SERVICE CONDUCTOR CONNECTIONS IN THE METER SOCKET & SERVICE DISCONNECTS OR SERVICE PANELBOARDS MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKET MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGHLY RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT OR SERVICE PANELBOARD.

* AN INDOOR LOCATION OF A METER SOCKET IS NOT PERMITTED ON NEW INSTALLATIONS. UNLESS MANDATED BY A COMMUNITY ORDINANCE. CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS.

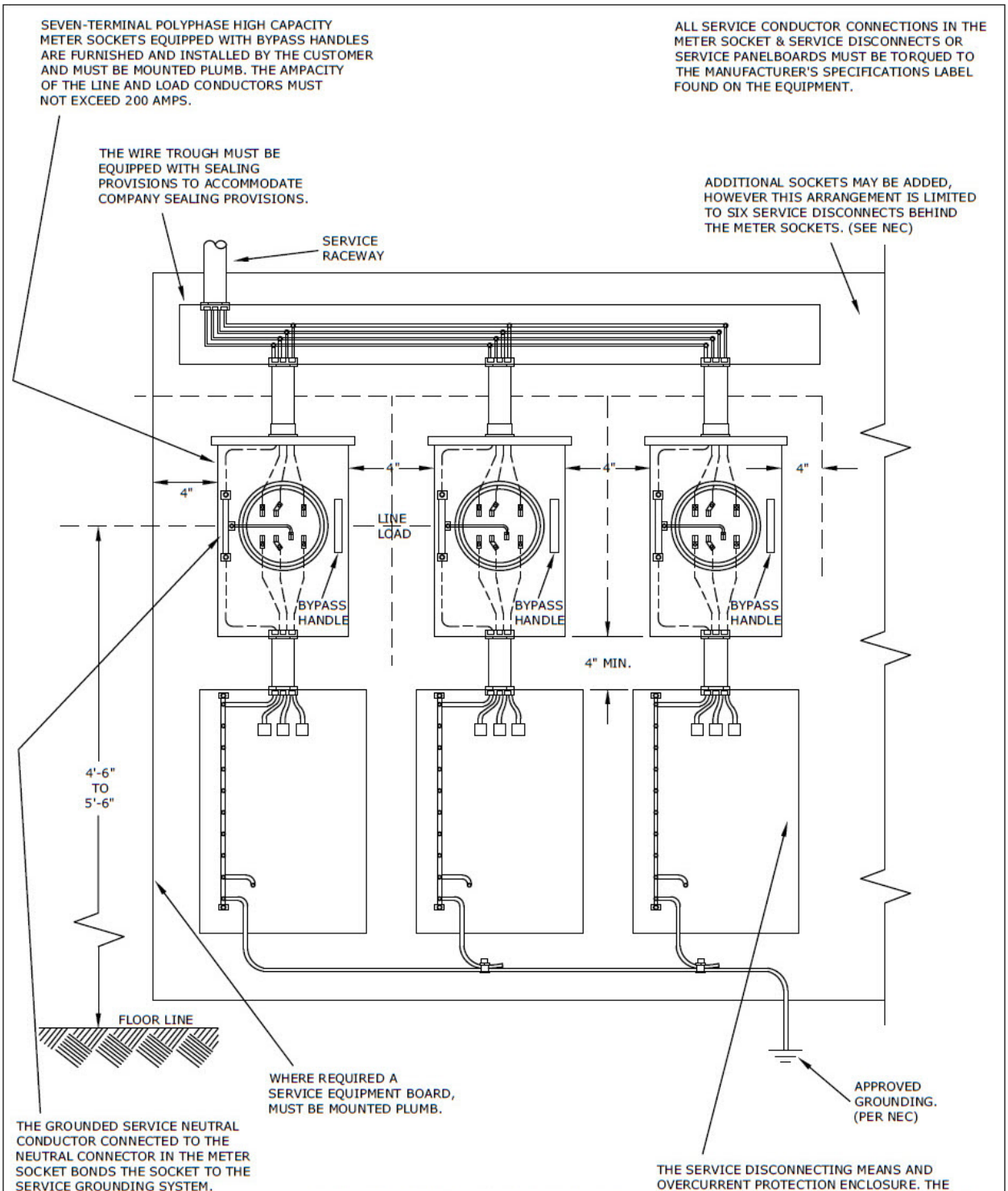
DUKE ENERGY.

3				
2				
1				
0	7/27/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V, SINGLE-PHASE, 3-WIRE*
(TYPICAL MULTIPLE METERING INSTALLATION)
NO MAIN DISCONNECT

DEC	DEO/K	DEP	DEF
	X		

FIG 68



3				
2				
1				
0	8/1/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

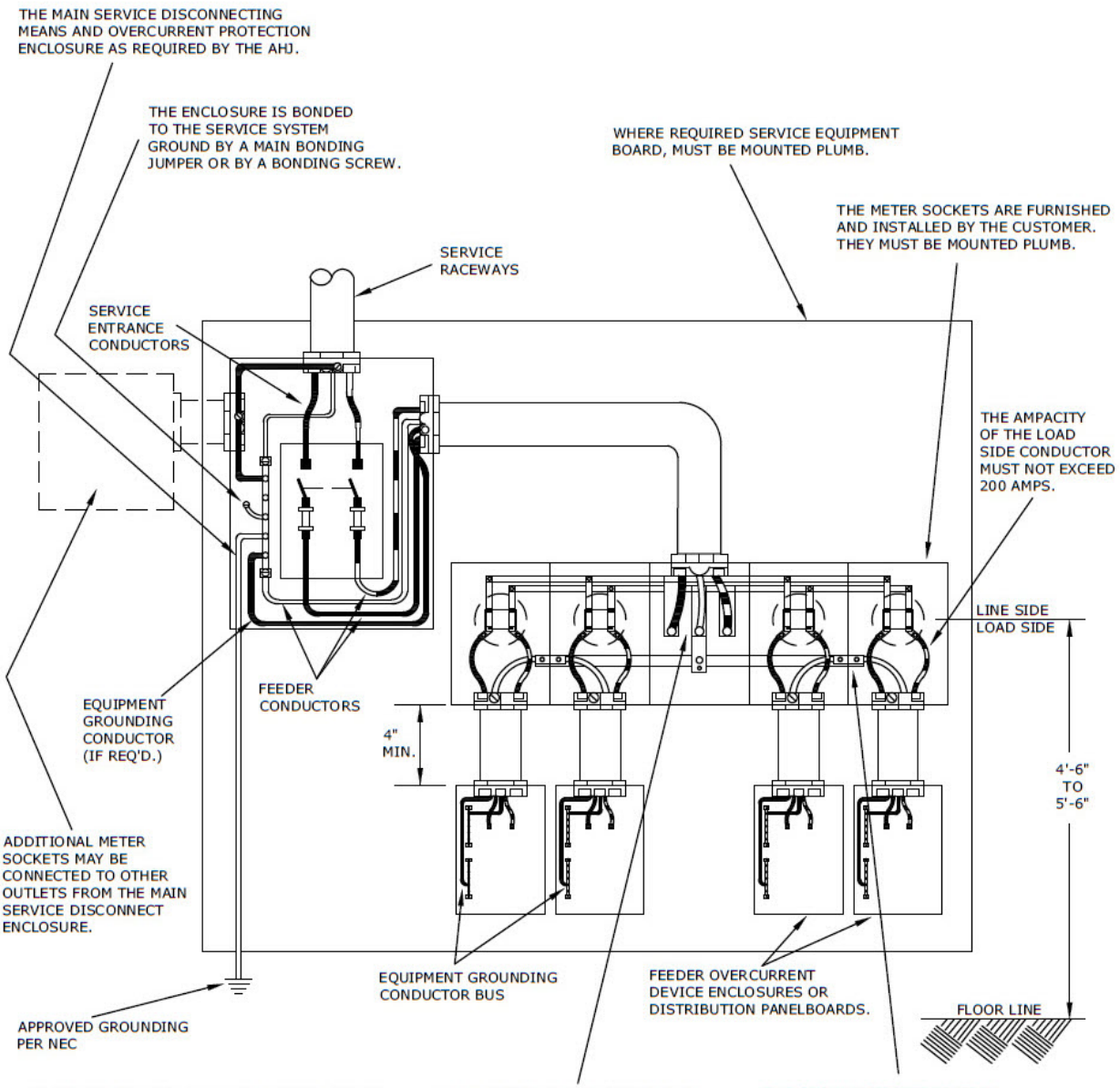
208Y/120V, THREE-PHASE, 4-WIRE*

TYPICAL MULTIPLE METERING INSTALLATION

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 69



WHEN ALUMINUM CONDUCTORS ARE INSTALLED ALL CONNECTIONS IN THE METER SOCKETS MUST BE PROPERLY COATED WITH AN INHIBITOR COMPOUND. IT IS HIGHLY RECOMMENDED TO USE THE INHIBITOR COMPOUND ON THE CONDUCTOR CONNECTIONS IN THE SERVICE DISCONNECT OR SERVICE PANELBOARD.

ALL SERVICE CONNECTIONS IN THE METER SOCKETS & SERVICE DISCONNECT OR PANELBOARDS MUST BE TORQUED TO THE MANUFACTURER'S SPECIFICATIONS LABEL FOUND ON THE EQUIPMENT.

THE FEEDER CABLE BUS ON THE LINE SIDE OF THE METER TROUGH MUST BE CONTINUOUS AND WITHOUT SPLICES FROM THE LOAD SIDE OF THE SERVICE DISCONNECTING MEANS.

THE GROUND CIRCUIT NEUTRAL CONDUCTOR IS PERMITTED TO GROUND THE METER SOCKETS ON THE LOAD SIDE OF THE MAIN SERVICE DISCONNECT WHEN THE ENCLOSURES ARE LOCATED NEAR THE SERVICE DISCONNECTING MEANS AND WHERE NO SERVICE GROUND FAULT PROTECTION IS INSTALLED.

* AN INDOOR LOCATION OF A METER SOCKET IS NOT PERMITTED ON NEW INSTALLATIONS. UNLESS MANDATED BY A COMMUNITY ORDINANCE. CUSTOMER DELIVERY MUST PREAPPROVE METER LOCATIONS.

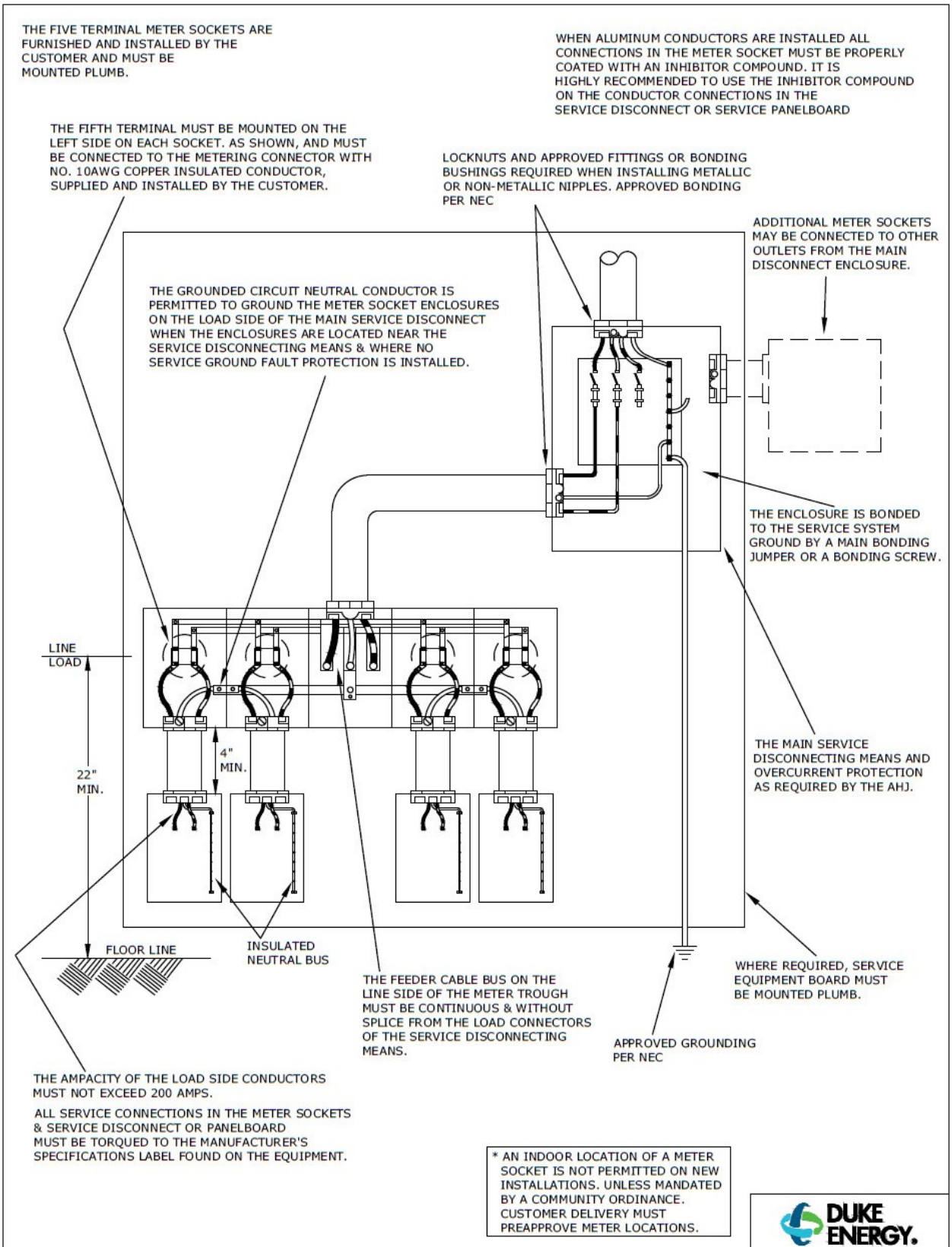
DUKE ENERGY.

3				
2				
1				
0	7/30/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

120/240V, SINGLE-PHASE, 3-WIRE* TYPICAL MULTIPLE METERING INSTALLATION WITH MAIN DISCONNECT BEFORE METERING EQUIPMENT

DEC	DEO/K	DEP	DEF
	X		

FIG 70



REVISED	BY	CK'D	APPR.
3				
2				
1				
0	7/30/18	DIETERLE	BRUINS	ADCOCK

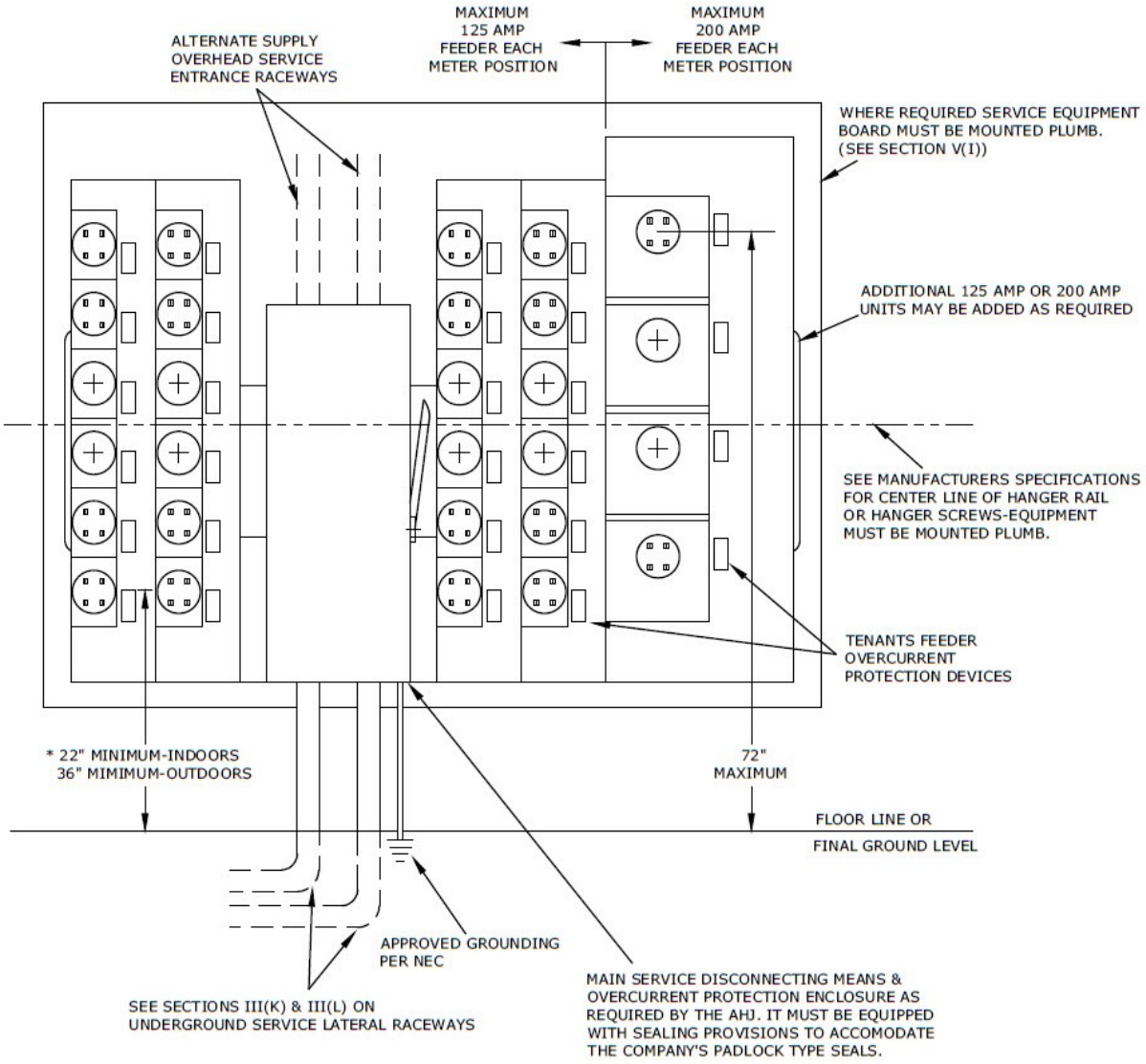
208Y/120V, SINGLE-PHASE, 3-WIRE* (FROM THREE-PHASE, 4-WIRE), WITH MAIN DISCONNECT BEFORE METERING EQUIPMENT

DUKE ENERGY.

DEC	DEO/K	DEP	DEF
	X		

FIG 71

PREASSEMBLED MODULAR METERING UNITS MUST BE APPROVED BY THE COMPANY PRIOR TO INSTALLATION ON THE COMPANY'S SYSTEM. CONTACT DISTRIBUTION ENGINEERING FOR INFORMATION REGARDING ACCEPTABLE UNITS OR THE SUBMITTAL PROCEDURE FOR HAVING UNITS APPROVED FOR INSTALLATION.



* THIS MINIMUM DIMENSION IS ACCEPTABLE WHEN THE MODULAR UNITS ARE MOUNTED OUTDOORS IN A BOXED-IN, VENTED ENCLOSURE.

DUKE ENERGY.

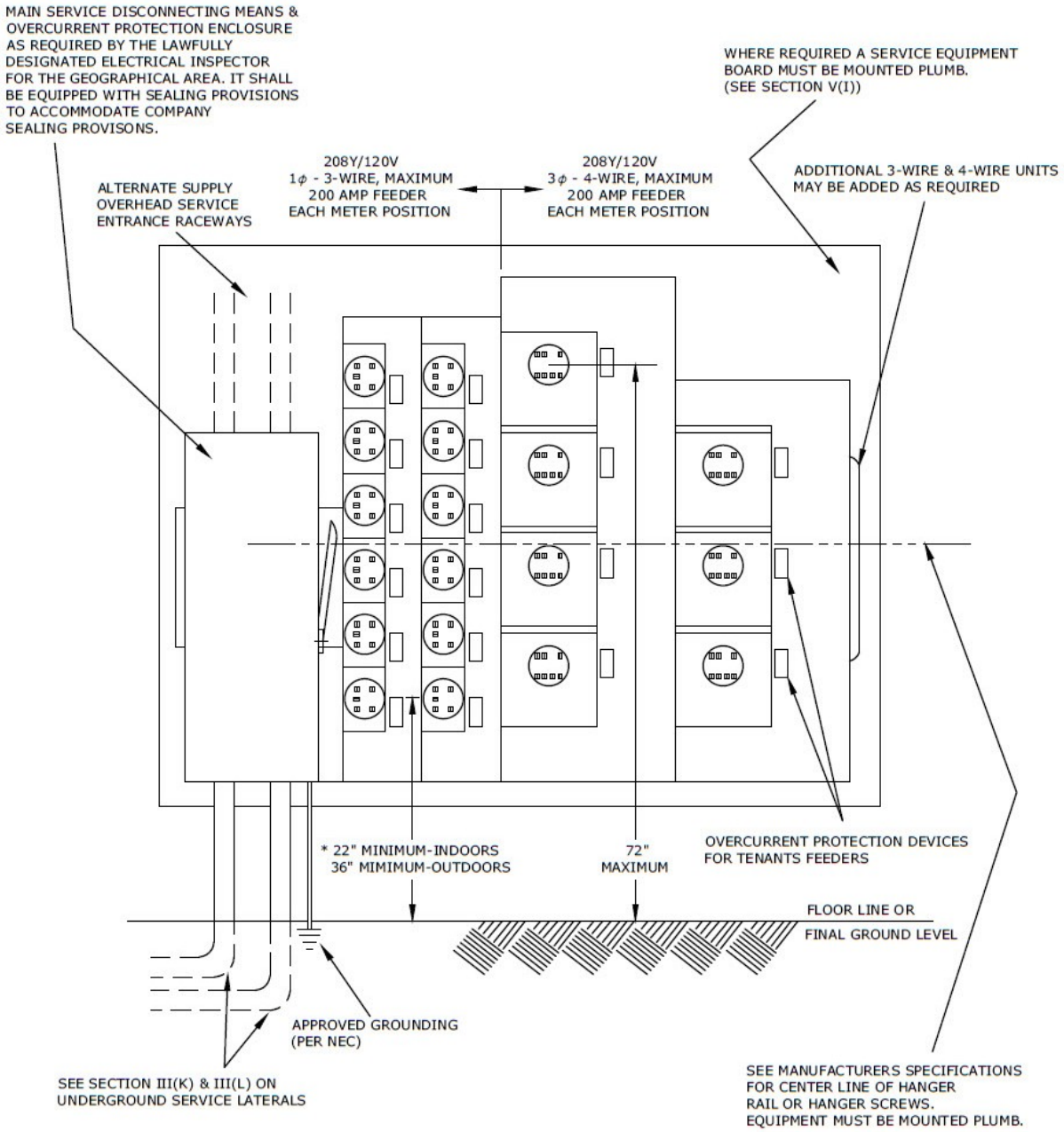
3					
2					
1					
0	7/9/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

120/240V, SINGLE-PHASE, 3-WIRE (PRE-ASSEMBLED MODULAR MULTIPLE METERING INSTALLATION) (MAIN DISCONNECTING MEANS ON THE SUPPLY SIDE OF THE METERING UNITS)(SEE NEC)

DEC	DEO/K	DEP	DEF
	X		

FIG 74

PREASSEMBLED MODULAR METERING UNITS MUST BE APPROVED BY THE COMPANY PRIOR TO INSTALLATION CONTACT DISTRIBUTION ENGINEERING FOR INFORMATION REGARDING ACCEPTABLE UNITS OR THE APPROVAL PROCEDURE.



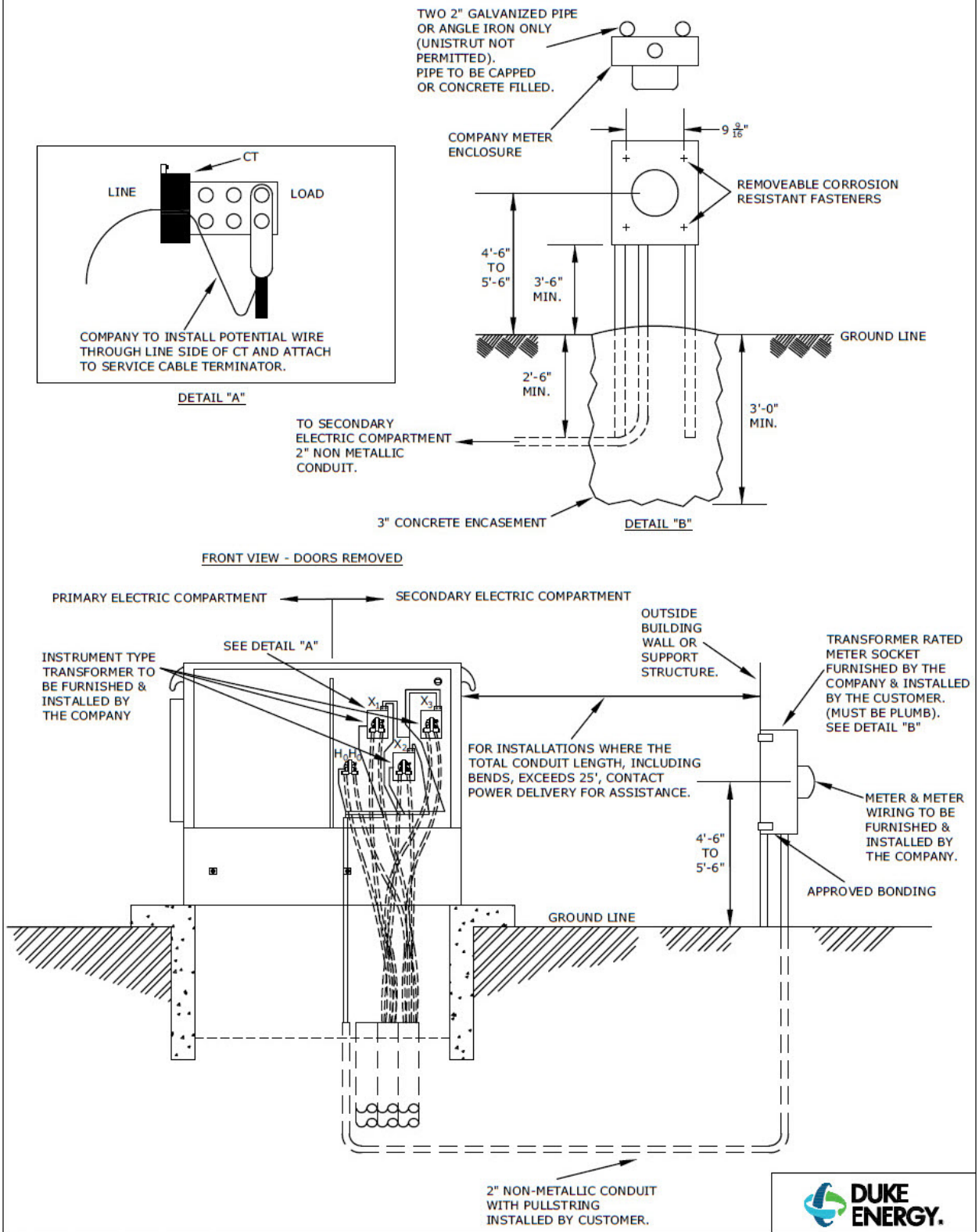
* THIS MINIMUM DIMENSION IS ACCEPTABLE WHEN THE MODULAR UNITS ARE MOUNTED OUTDOORS IN A BOXED-IN, VENTED ENCLOSURE.

DUKE ENERGY.

3					208Y/120V, 3-WIRE & 4-WIRE PRE-ASSEMBLED MODULAR METERING INSTALLATION WHERE A MAIN DISCONNECTING MEANS IS REQUIRED ON THE SUPPLY SIDE OF THE METERING EQUIPMENT (SEE NEC) (200 AMPS MAXIMUM)
2					
1					
0	7/9/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

DEC	DEO/K	DEP	DEF
	X		

FIG 75

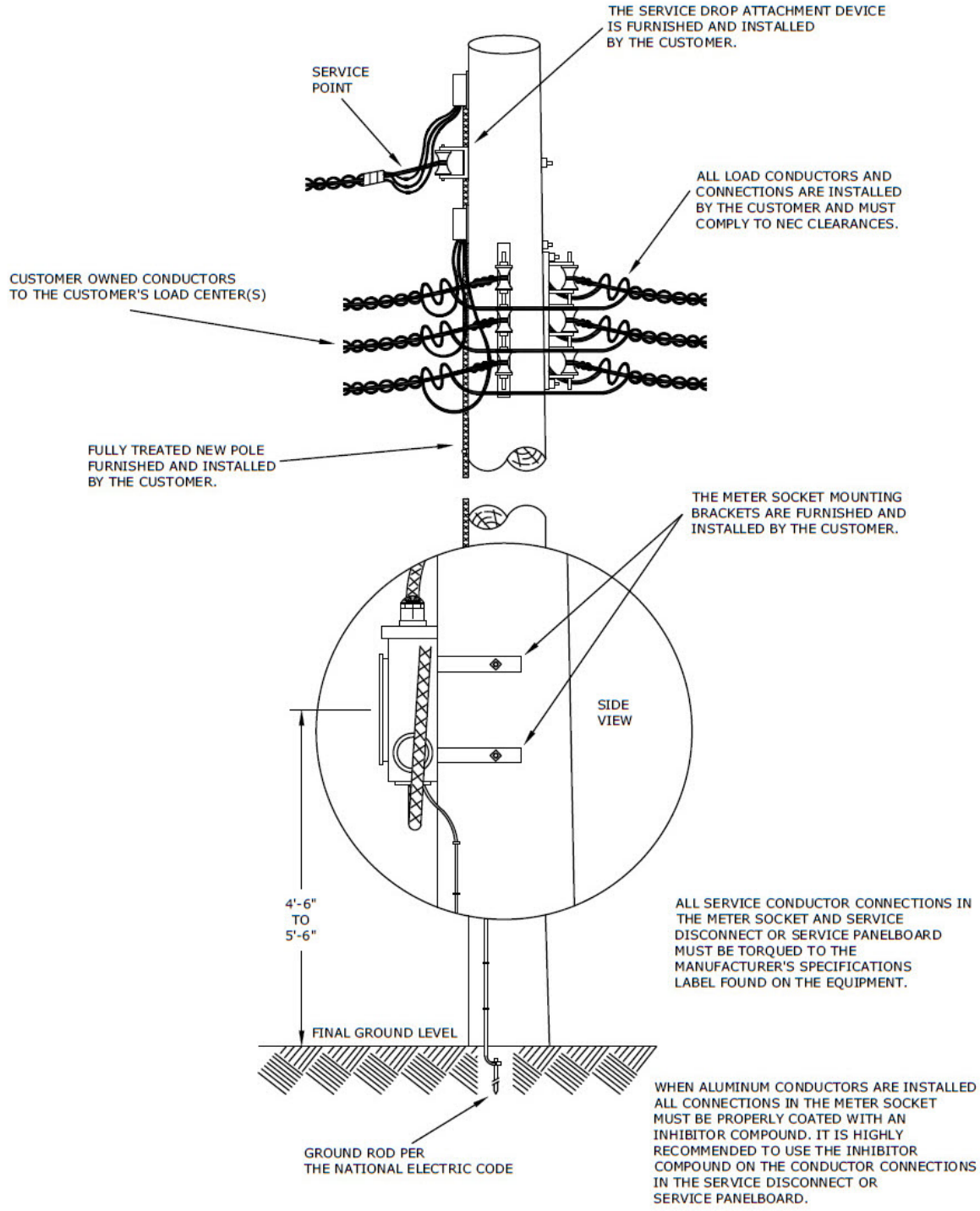


3				
2				
1				
0	7/30/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

208Y/120V (GREATER THAN 400 AMPS) OR 480Y/277V, THREE-PHASE, 4-WIRE PAD-MOUNT METERING SERVING A SINGLE CUSTOMER ONLY (NOT EXCEEDING 3000 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 80



METERING POLE LOCATION, HEIGHT, CLASS, DEPTH OF SETTING AND GUYING MUST BE APPROVED BY DISTRIBUTION ENGINEERING. DEPTH OF HOLE MUST BE CHECKED BY THE COMPANY BEFORE POLE IS SET. (SEE SECTION V(B)(3))

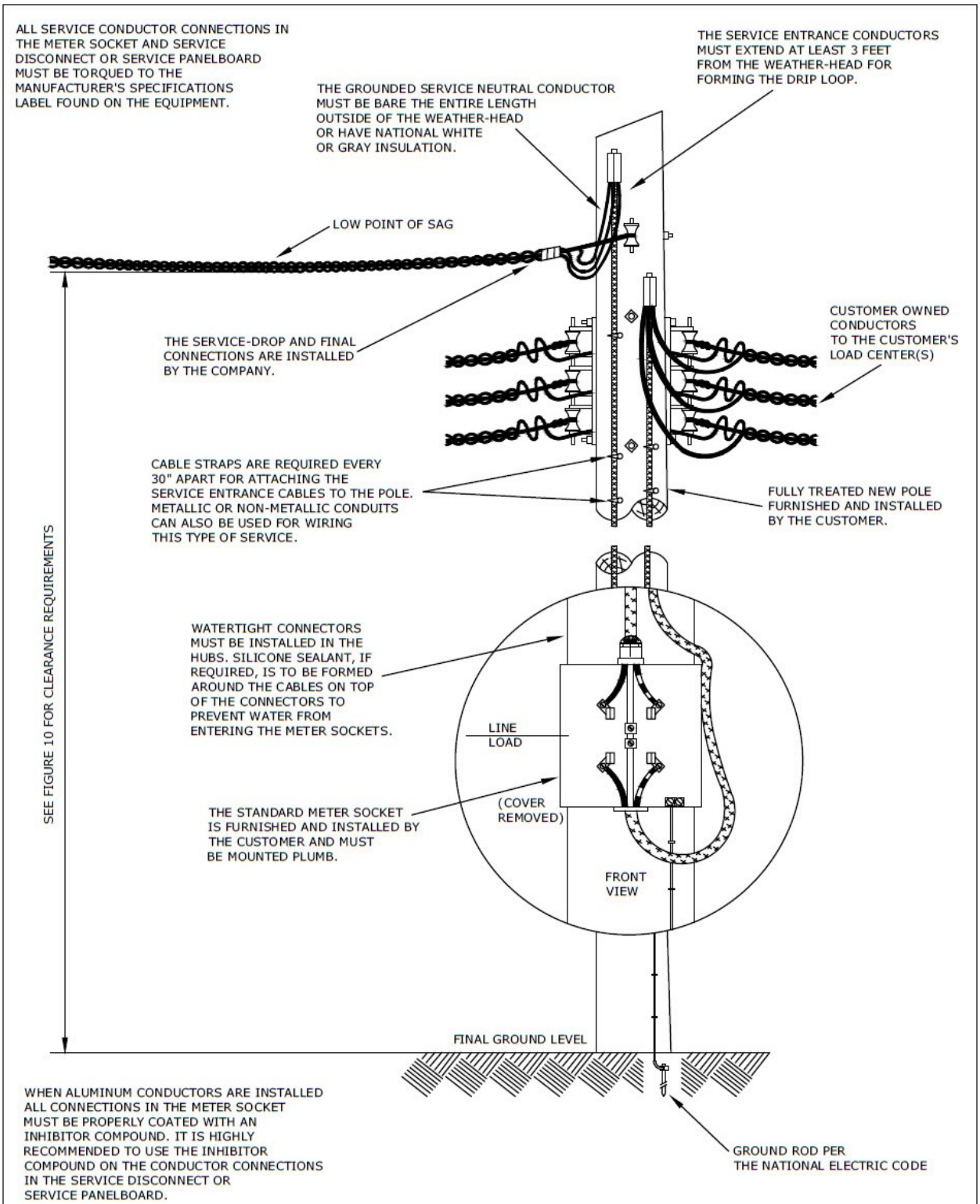
DUKE ENERGY.

3					
2					
1					
0	8/3/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

120/240V, SINGLE-PHASE, 3-WIRE POLE TYPE METERING INSTALLATION (MAXIMUM SERVICE AMPACITY OF 400 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 85A



METERING POLE LOCATION, HEIGHT, CLASS, DEPTH OF SETTING AND GUYING MUST BE APPROVED BY DISTRIBUTION ENGINEERING. DEPTH OF HOLE MUST BE CHECKED BY THE COMPANY BEFORE POLE IS SET. (SEE SECTION V(B)(3))

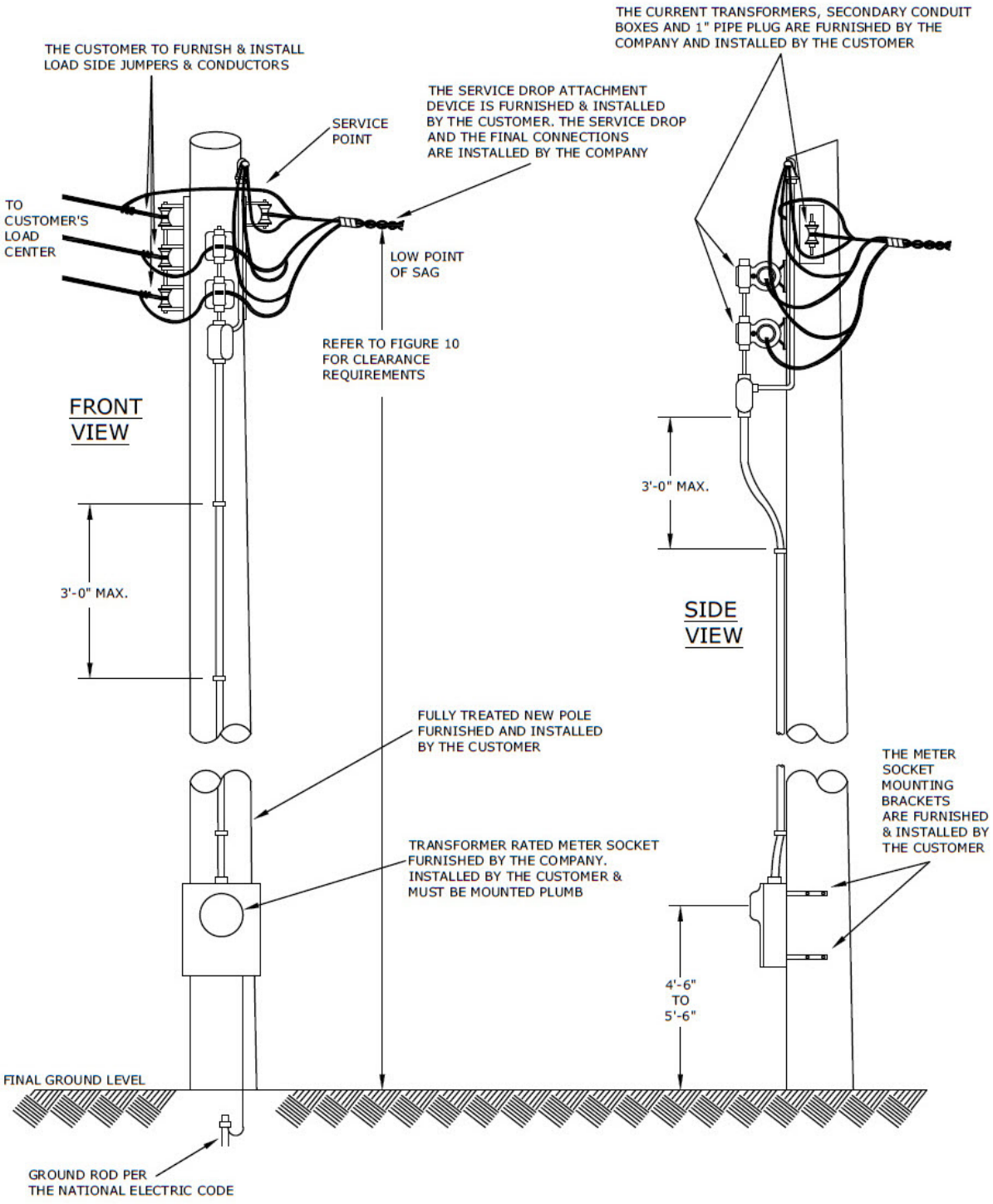
DUKE ENERGY.

REVISED		BY	CK'D	APPR.
3				
2				
1				
0	8/3/18	DIETERLE	BRUINS	ADCOCK

120/240V, SINGLE-PHASE, 3-WIRE POLE TYPE METERING INSTALLATION (MAXIMUM SERVICE AMPACITY OF 400 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 85B



METERING POLE LOCATION, HEIGHT, CLASS, DEPTH OF SETTING AND GUYING MUST BE APPROVED BY DISTRIBUTION ENGINEERING. DEPTH OF HOLE MUST BE CHECKED BY THE COMPANY BEFORE POLE IS SET. (SEE SECTION V(B)(3))

DUKE ENERGY.

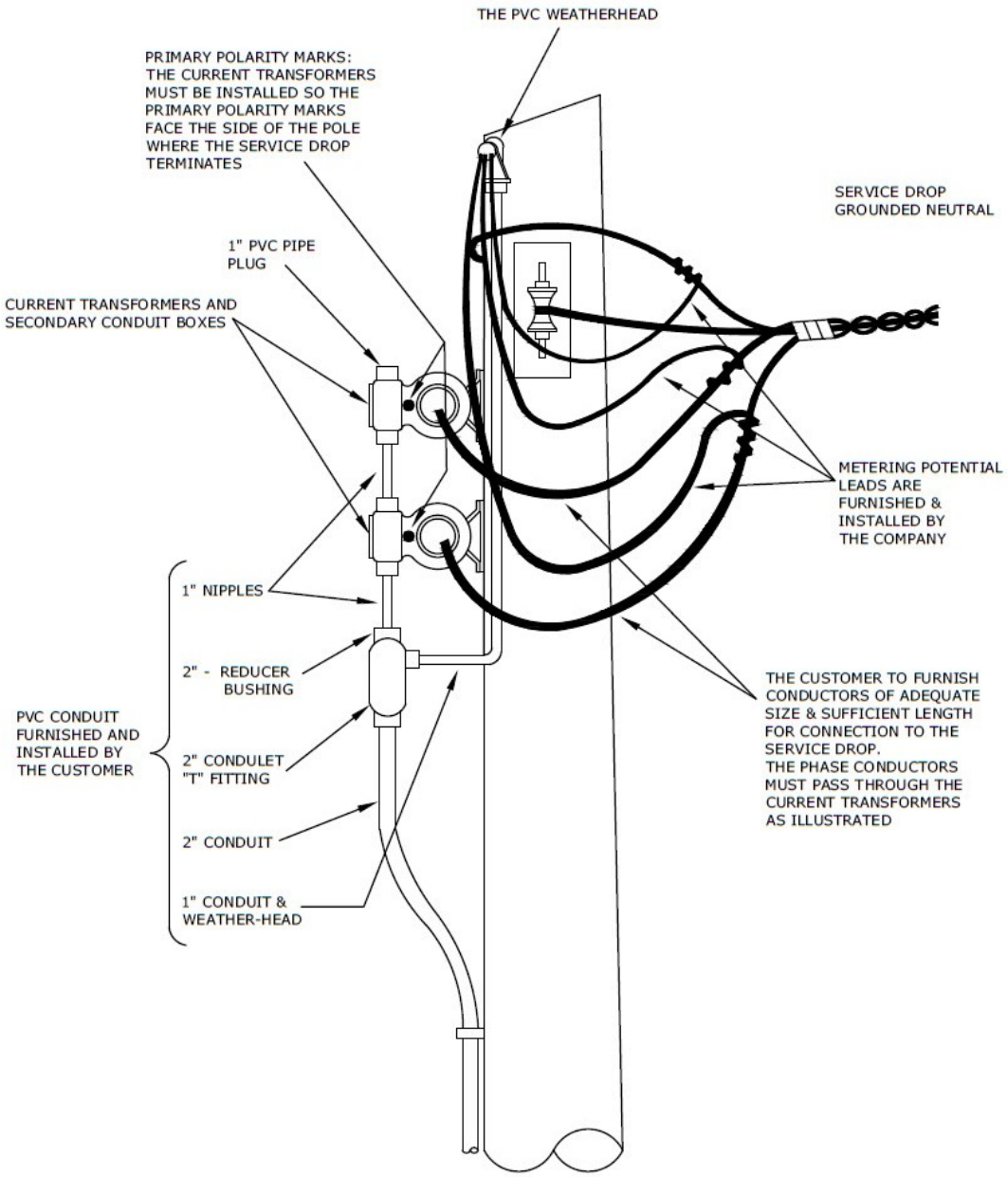
REVISED		BY	CK'D	APPR.
3				
2				
1				
0	8/2/18	DIETERLE	BRUINS	ADCOCK

120/240V, SINGLE-PHASE, 3-WIRE POLE TYPE INSTALLATION (GREATER THAN 400 AMPS BUT NOT EXCEEDING 1200 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 86A

DETAIL OF INSTALLATION OF THE CURRENT TRANSFORMERS



NOTE: LIQUID TIGHT CONDUIT IS NOT ACCEPTABLE.

METERING POLE LOCATION, HEIGHT, CLASS, DEPTH OF SETTING AND GUYING MUST BE APPROVED BY DISTRIBUTION ENGINEERING. DEPTH OF HOLE MUST BE CHECKED BY THE COMPANY BEFORE POLE IS SET. (SEE SECTION V(B)(3))

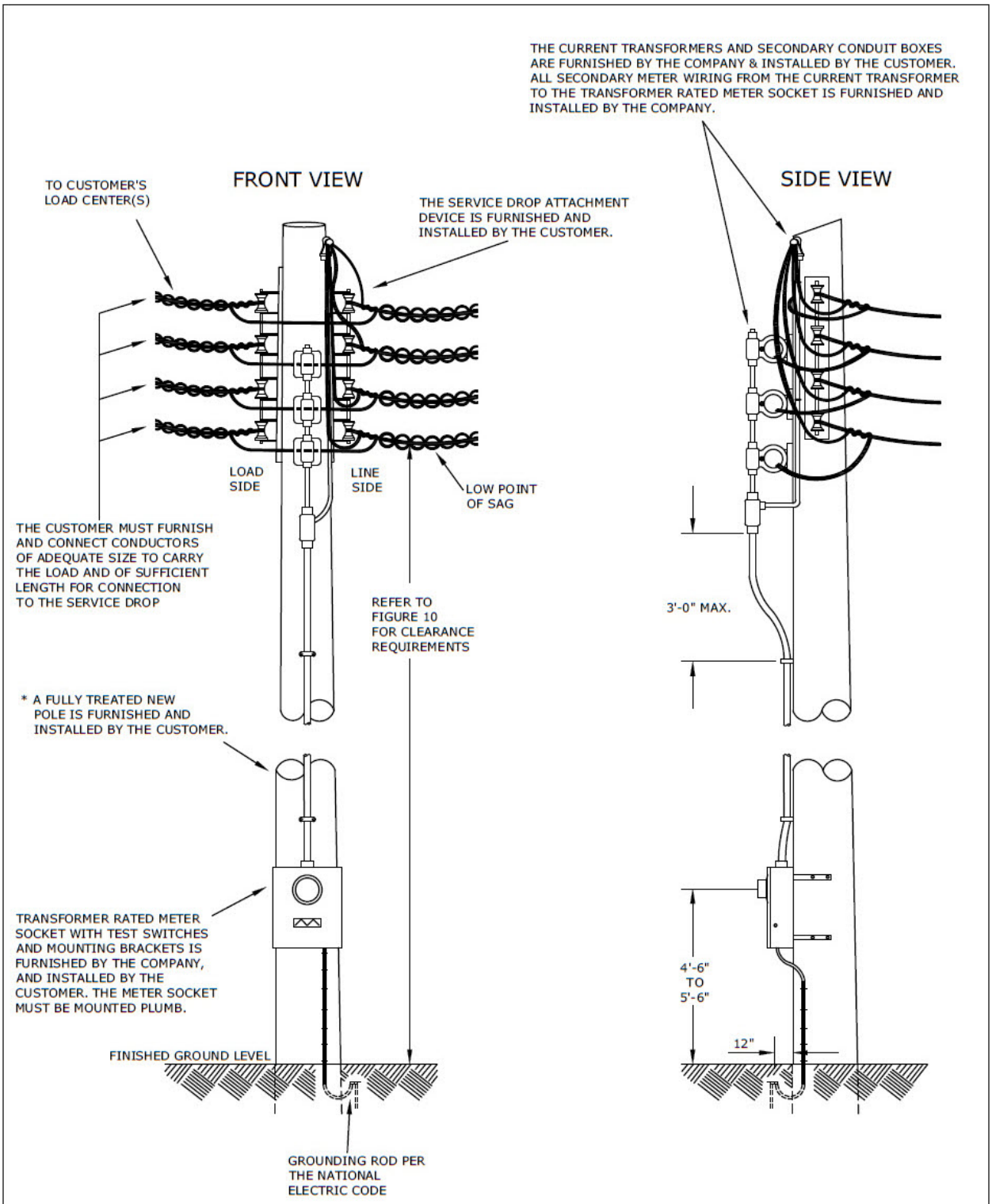
DUKE ENERGY.

3					
2					
1					
0	8/2/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

120/240V, SINGLE-PHASE, 3-WIRE POLE TYPE INSTALLATION (GREATER THAN 400 AMPS BUT NOT EXCEEDING 1200 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 86B



* METERING POLE LOCATION, HEIGHT, CLASS, DEPTH OF SETTING, AND GUYING MUST BE APPROVED BY DISTRIBUTION ENGINEERING. DEPTH OF THE HOLE MUST BE CHECKED BY THE COMPANY BEFORE THE POLE IS SET. (SEE SECTION V(B)(3))

DUKE ENERGY.

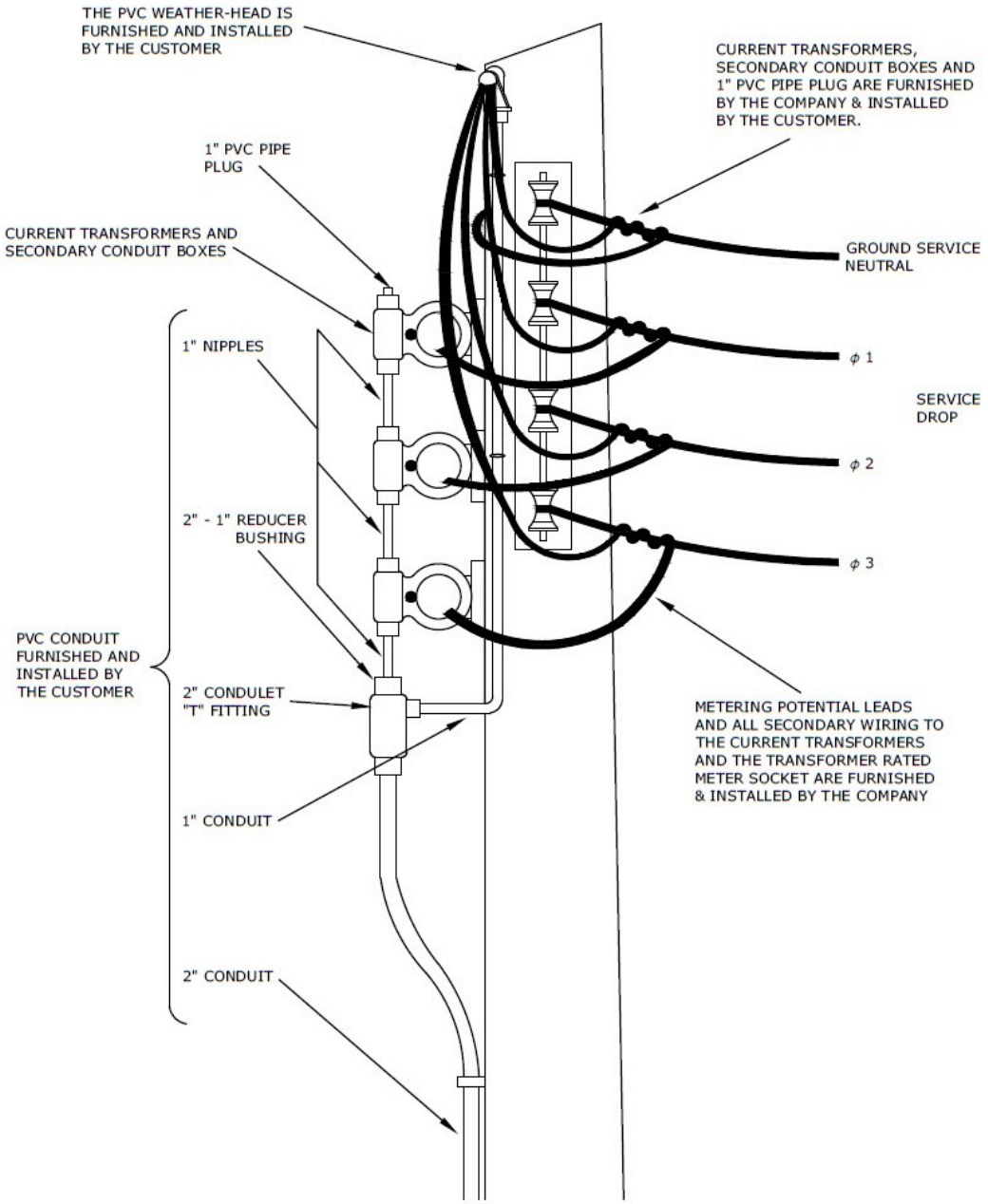
REVISED		BY	CK'D	APPR.
3				
2				
1				
0	8/2/18	DIETERLE	BRUINS	ADCOCK

208Y/120V (GREATER THAN 400 AMPS) OR 480/277V, THREE-PHASE, 4-WIRE POLE TYPE METERING (NOT EXCEEDING 1200 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 87A

DETAIL OF CONNECTIONS TO THE CURRENT TRANSFORMERS ON DRAWING 87A



NOTE: THE CURRENT TRANSFORMERS MUST BE INSTALLED SO THE PRIMARY POLARITY MARKS ARE ON THE SIDE OF THE POLE WHERE THE SERVICE DROP DEAD ENDS

NOTE: LIQUID TIGHT CONDUIT IS NOT ACCEPTABLE.

DUKE ENERGY.

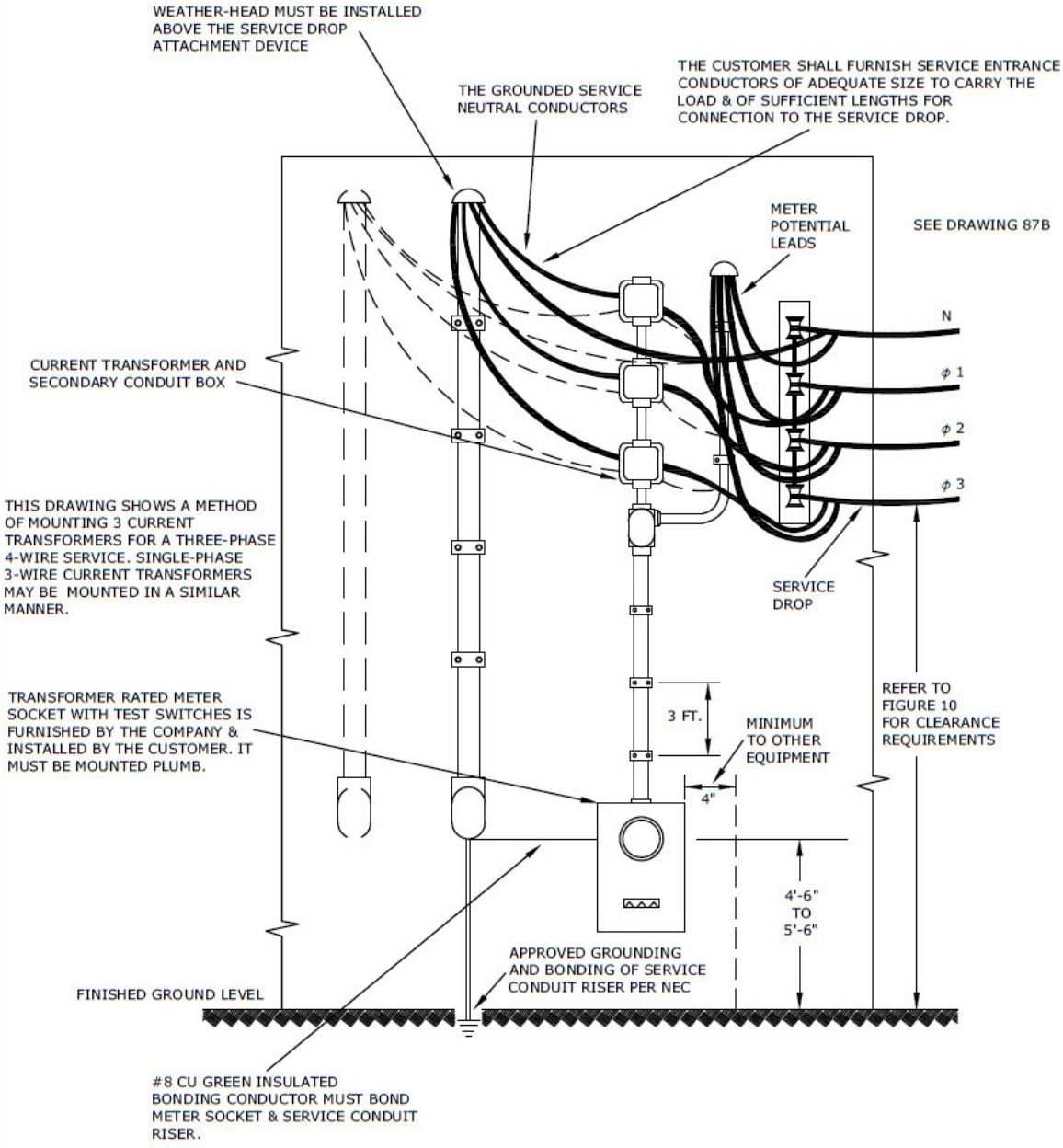
REVISED		BY	CK'D	APPR.
3				
2				
1				
0	8/2/18	DIETERLE	BRUINS	ADCOCK

208Y/120V (GREATER THAN 400 AMPS) OR 480/277V, THREE-PHASE, 4-WIRE POLE TYPE METERING (NOT EXCEEDING 1200 AMPS)

DEC	DEO/K	DEP	DEF
	X		

FIG 87B

THE METER POTENTIAL LEADS, METER CABLES, SERVICE DROP & FINAL CONNECTIONS ARE FURNISHED & INSTALLED BY THE COMPANY. THE TRANSFORMER RATED METER SOCKET. CURRENT TRANSFORMERS, SECONDARY CONDUIT BOXES & 1" PIPE PLUG ARE FURNISHED BY THE COMPANY & INSTALLED BY THE CUSTOMER. SERVICE DROP ATTACHMENT DEVICE TO BE FURNISHED & INSTALLED BY THE CUSTOMERS.



DUKE ENERGY.

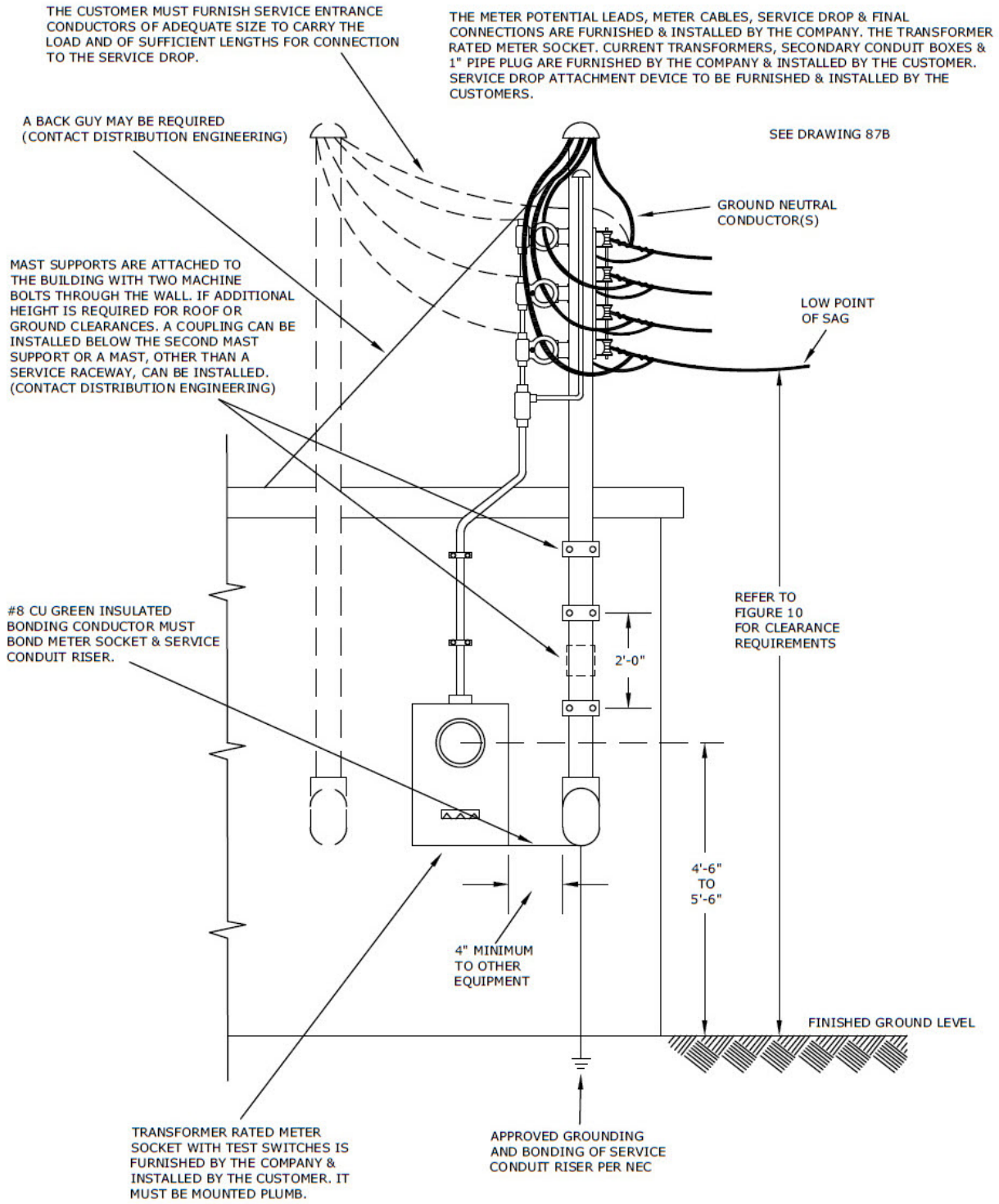
3					
2					
1					
0	7/26/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

METHOD OF MOUNTING CURRENT TRANSFORMERS AND METERING ON THE SIDE OF A BUILDING

DEC	DEO/K	DEP	DEF
	X		

FIG 88

THIS DRAWING SHOWS A METHOD OF MOUNTING 3 CURRENT TRANSFORMERS FOR A THREE-PHASE, 4-WIRE SERVICE. SINGLE-PHASE, 3-WIRE CURRENT TRANSFORMERS MAY BE MOUNTED IN SIMILAR MANNER.



DUKE ENERGY.

3					
2					
1					
0	7/26/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

A METHOD OF MOUNTING CURRENT TRANSFORMERS AND METERING ON A SERVICE MAST

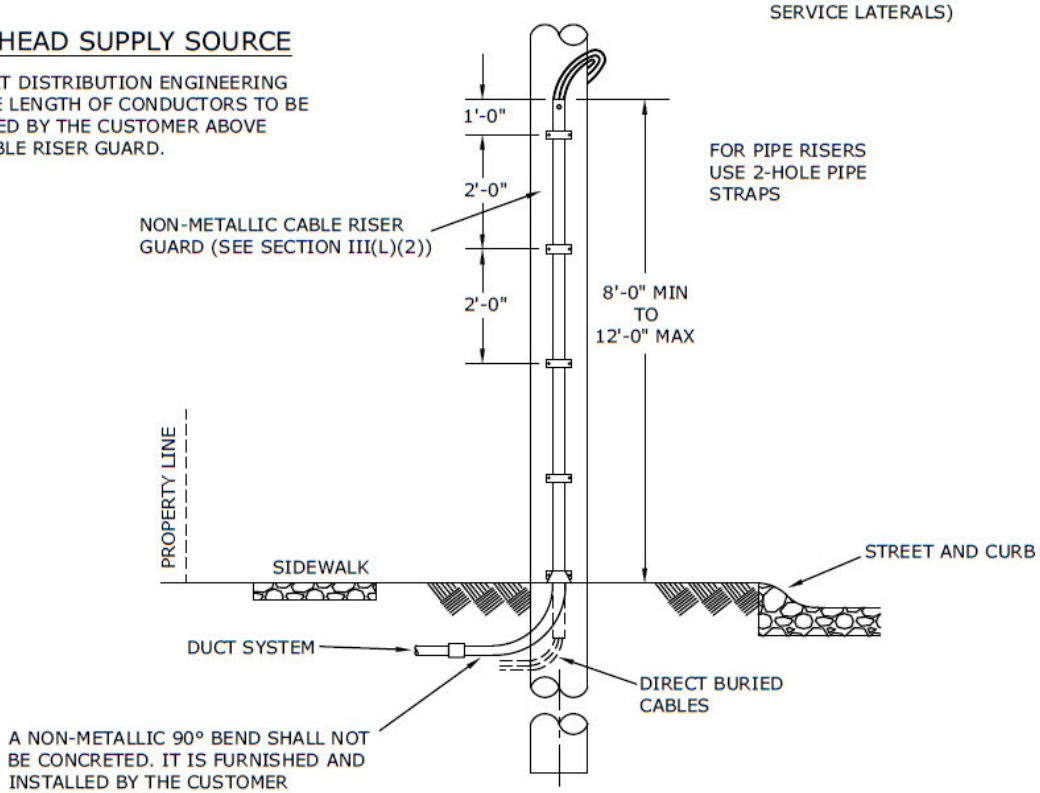
DEC	DEO/K	DEP	DEF
	X		

FIG 89

(SEE SECTION III(L) ON UNDERGROUND SERVICE LATERALS)

OVERHEAD SUPPLY SOURCE

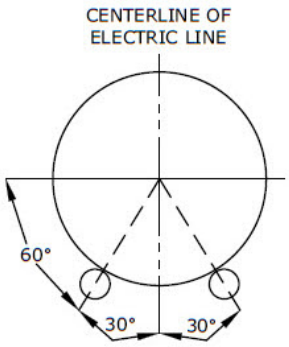
CONSULT DISTRIBUTION ENGINEERING FOR THE LENGTH OF CONDUCTORS TO BE PROVIDED BY THE CUSTOMER ABOVE THE CABLE RISER GUARD.



NO MORE THAN 2 ELECTRIC RISERS ARE PERMITTED ON A POLE.

RISERS FROM UNDERGROUND TO OVERHEAD LINES ARE TO BE LOCATED AS FOLLOWS:

- THE RISERS MUST BE LOCATED 30° TO EITHER SIDE OF THE CENTERLINE OF THE ELECTRIC LINE.
- RISERS ARE TO BE LOCATED ON THE POLE FACE OPPOSITE FROM WHERE THE CROSSARM IS LOCATED
- IF THERE IS NO CROSSARM, THE RISER IS LOCATED ON THE SIDE WHERE THE LINE DEAD-ENDS.



CONTACT DISTRIBUTION ENGINEERING PRIOR TO INSTALLING AN U.G. SERVICE TO A UTILITY POLE.

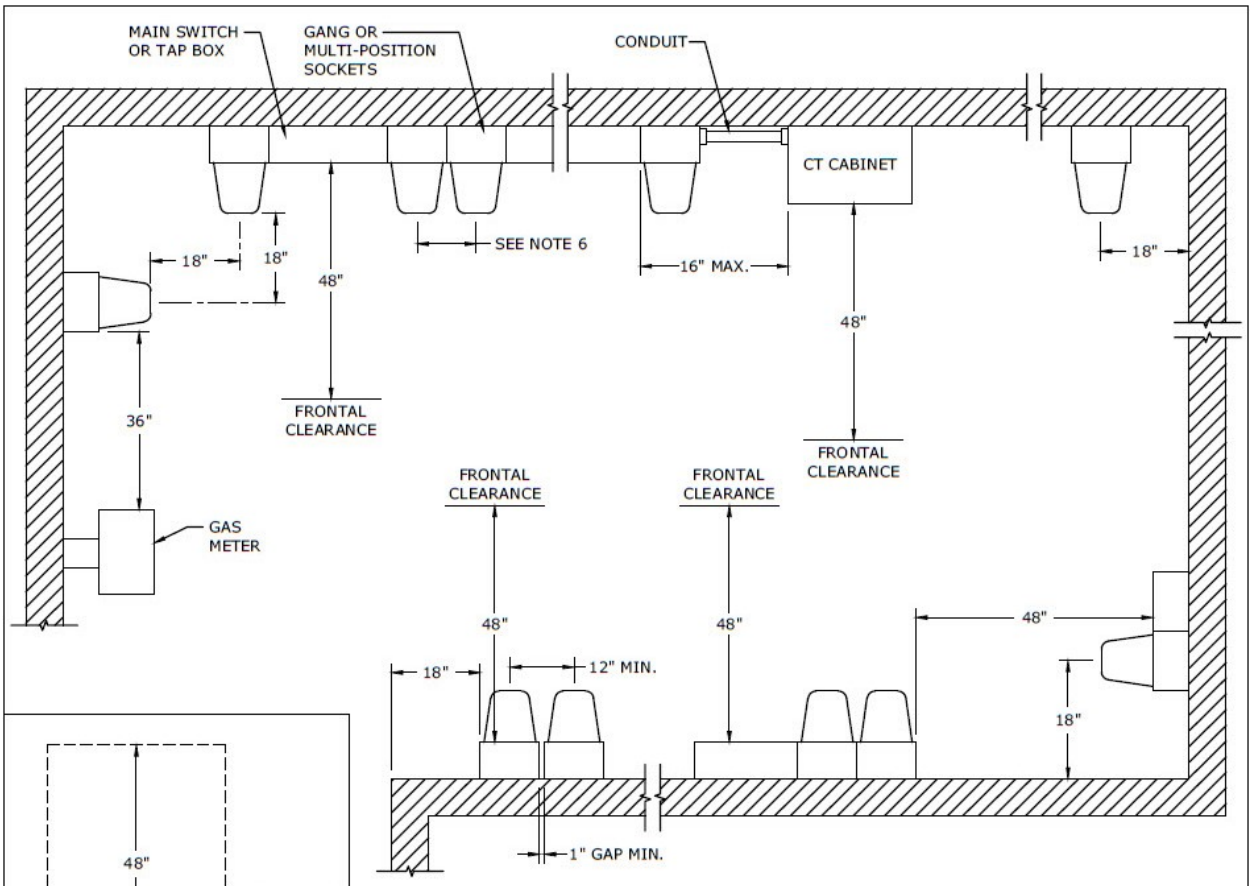
DUKE ENERGY.

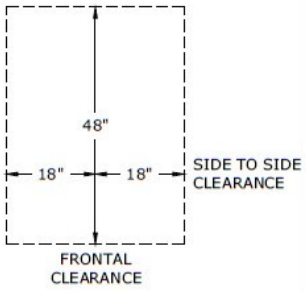
3					
2					
1					
0	7/17/18	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

CONSTRCUTION DETAILS FOR UNDERGROUND SERVICES FROM POLES 600V OR LESS

DEC	DEO/K	DEP	DEF
	X		

FIG 90





WORKING SPACE

NOTES:

1. ALL DIMENSIONS SHOWN ARE MINIMUM DIMENSIONS.
2. METER CONNECTION DEVICE APPROVAL IS NOT A LOCATION OR SPACE APPROVAL. LOCATION OF EQUIPMENT MUST COMPLY WITH DIMENSIONS SHOWN ON THIS SKETCH AND MUST BE AT APPROVED METER MOUNTING HEIGHT DIMENSIONS.
3. THESE DIMENSIONS APPLY WHEN METER STACKS ARE MOUNTED ON ADJACENT CORNER WALLS.
4. METERS ARE NOT TO BE INSTALLED OVER A SIDEWALK, DRIVEWAY OR PAVED AREAS WITHOUT PROTECTIVE BARRIERS. METERS ARE NOT TO BE INSTALLED IN LOCATIONS SUSCEPTIBLE TO DAMAGE.
5. A CLEAR SPACE (MEASURED IN FRONT OF THE METER ENCLOSURE) AT LEAST 36" WIDE (18" ON EACH SIDE OF CENTER LINE OF METER, OR EQUIPMENT WIDTH, WHICHEVER IS GREATER) BY 48" DEEP BY 84" HIGH FROM FINAL GRADE MUST BE PROVIDED AND ALWAYS BE AVAILABLE AROUND EVERY METER FOR READING, INSPECTING, TESTING AND MAINTENANCE OPERATIONS. CLEAR SPACE FOR SAFE ACCESS TO AND EGRESS FROM THE WORKING SPACE MUST BE MAINTAINED. CLEAR SPACE MUST ALLOW FOR THE FULL 90 DEGREE OPENING OF ANY HINGED DOORS OR PANELS.
6. APPROVED MULTI-POSITION OR GANG SOCKET EQUIPMENT MAY VARY FROM 12" MINIMUM SEPARATION THAT IS REQUIRED BETWEEN CENTER LINE OF METERS.

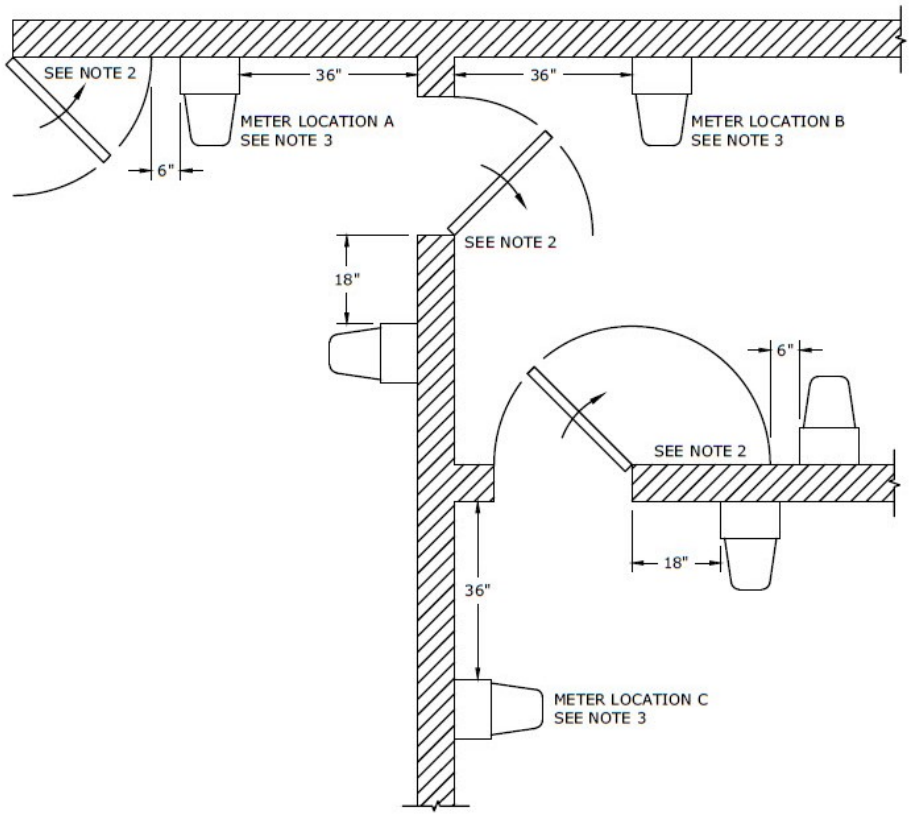
DUKE ENERGY.

3				
2				
1				
0	2/26/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CHK'D	APPR.

FRONTAL AND SIDE CLEARANCES FOR METER INSTALLATIONS

DEC	DEM	DEP	DEF
	X		

FIG95A



NOTES:

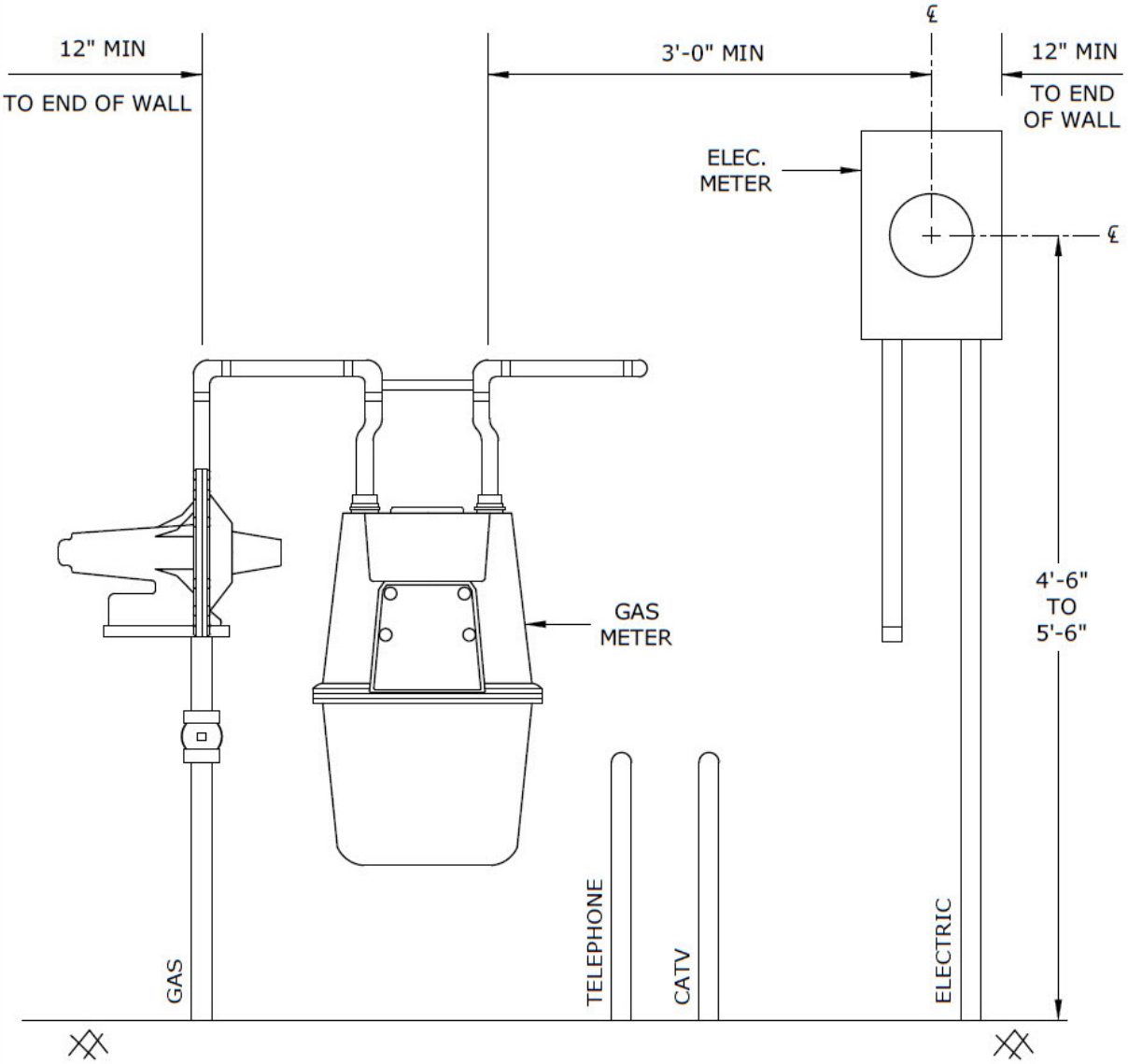
1. ALL DIMENSIONS SHOWN ARE MINIMUM DIMENSIONS.
2. METERS ARE NOT TO BE INSTALLED ON WALLS WHERE THEY WILL BE BEHIND AN OPEN SWINGING DOOR.
3. METERS IN LOCATIONS A, B, AND C MAY REQUIRE PROTECTIVE BARRIERS IF TRAFFIC THROUGH DOORWAY COULD CAUSE METER DAMAGE. A MINIMUM CLEARANCE OF 6" IS REQUIRED FROM THE NEAREST EDGE OF THE METER CONNECTION DEVICE TO THE BARRIER.

DUKE ENERGY.

3					FRONTAL AND SIDE CLEARANCES FOR METER INSTALLATIONS
2					
1					
0	2/26/19	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CHK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 95B



METER LOCATION

REVISED	BY	CK'D	APPR.
3				
2				
1				
0	6/29/18	DIETERLE	BRUINS	ADCOCK

JOINT UTILITY SERVICE METERING ARRANGEMENT

DEC	DEO/K	DEP	DEF
	X		

FIG 96

TABLE 1: MINIMUM COVER FOR DUKE ENERGY CABLES		
CABLE OR APPLICATION	MINIMUM COVER	SPECIFIC NOTES
SERVICE	30"	SEE NOTES 2 & 3
PRIMARY (1Ø OR 3Ø)	36"	SEE NOTES 2 & 3
ROAD CROSSINGS (ANY VOLTAGE)	36"	SEE NOTE 5
RAILROAD CROSSINGS (ANY VOLTAGE)	PERMIT SPECIFIC	SEE NOTE 5
PARKING LOT CROSSINGS (ANY VOLTAGE)	36"	SEE NOTES 2, 3 & 5

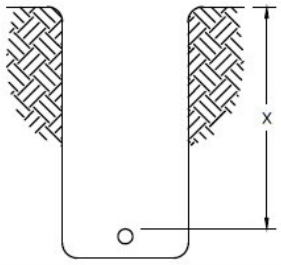


TABLE 2: REQUIRED MINIMUM HORIZONTAL SEPARATION BETWEEN CABLES					
CABLE	SERVICE	PRIMARY, 200A (1Ø OR 3Ø)	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE NOT** PART OF THE SAME LOOP	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE** PART OF THE SAME LOOP	PRIMARY FEEDER, 600A
SERVICE	0"				
PRIMARY, 200A (1Ø OR 3Ø)		0"	0"	36"	36"
PRIMARY FEEDER, 600A		36"	36"		36"

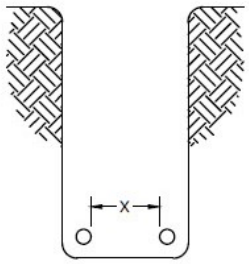
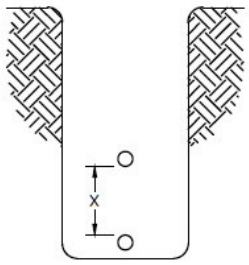


TABLE 3: REQUIRED MINIMUM VERTICAL SEPARATION BETWEEN CABLES					
CABLE	SERVICE	PRIMARY, 200A (1Ø OR 3Ø)	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE NOT** PART OF THE SAME LOOP	PRIMARY, 200A (1Ø OR 3Ø) WHEN BOTH CABLES **ARE** PART OF THE SAME LOOP	PRIMARY FEEDER, 600A
SERVICE	0"				
PRIMARY, 200A (1Ø OR 3Ø)		0"	0"	12"	12" SEE NOTE 5
PRIMARY FEEDER, 600A		12"	12"		12" SEE NOTE 5



NOTES:

1. MINIMUM SEPARATION BETWEEN CABLES MAY BE OBTAINED EITHER HORIZONTALLY OR VERTICALLY.
2. IF REQUIRED MINIMUM DEPTH CANNOT BE OBTAINED, INSTALL CABLE IN SCH. 40 PVC CONDUIT ENCASED IN A MINIMUM 2" CONCRETE ABOVE AND BESIDE CONDUIT WITH A MINIMUM 6" OF ADDITIONAL COVER.
3. RISER CONDUIT BENDS AND BRIDGE TRANSITIONS ARE EXCEPTIONS TO THE MINIMUM COVER REQUIREMENT.
4. IF PERMIT IS REQUIRED, MINIMUM DEPTH WILL BE PERMIT SPECIFIC RATHER THAN THE DEPTH LISTED, BUT NEVER LESS THAN NESC REQUIREMENTS.
5. COVER OF TOP CONDUIT IS 36". TRENCH DEPTH IS AN ADDITIONAL 12" PLUS DIAMETER OF BOTH CABLES/CONDUITS.
6. VERTICAL SEPARATION OF 600A PRIMARY FEEDERS IS NOT AN OPTION.

DUKE ENERGY.

3					
2					
1					
0	2/21/19	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

MINIMUM CABLE COVER AND SEPARATION

DEC	DEM	DEP	DEF
	X		

FIG 100

PRIMARY OR SECONDARY CABLES - DIRECT BURIED OR IN CONDUIT					
PARALLELING	HORIZONTAL SEPARATION (IN)		CROSSING	VERTICAL SEPARATION (IN)	
	PREFERRED (SEE NOTE 2)	NESC MINIMUMS		PREFERRED (SEE NOTE 3)	NESC MINIMUMS
COMMUNICATION LINES	12	SEE NOTE 4	COMMUNICATION LINES	12	SEE NOTE 4
WATER LINES	36	SEE NOTE 2	WATER LINES	12	SEE NOTE 2
SEWER LINES	36	SEE NOTE 2	SEWER LINES	12	SEE NOTE 2
FUEL LINES	36	12 (SEE NOTE 5)	FUEL LINES	12	12 (SEE NOTE 5)
STEAM LINES	60	12 (SEE NOTE 5)	STEAM LINES	36	12 (SEE NOTE 5)
CUSTOMER OWNED CABLES	36	SEE NOTE 2	CUSTOMER OWNED CABLES	12	SEE NOTE 2

PRIMARY OR SECONDARY CABLES - IN A CONDUIT (DUCTBANK) SYSTEM					
PARALLELING	HORIZONTAL SEPARATION (IN)		CROSSING	VERTICAL SEPARATION (IN)	
	PREFERRED (SEE NOTE 2)	NESC MINIMUMS		PREFERRED (SEE NOTE 3)	NESC MINIMUMS
COMMUNICATION LINES	12	3 - CONCRETE 4 - MASONRY	COMMUNICATION LINES	12	3 - CONCRETE 4 - MASONRY
WATER LINES	36	SEE NOTE 2	WATER LINES	12	SEE NOTE 2
SEWER LINES	36	SEE NOTE 2	SEWER LINES	12	SEE NOTE 2
FUEL LINES	36	12 (SEE NOTE 5)	FUEL LINES	12	12 (SEE NOTE 5)
STEAM LINES	60	SEE NOTE 6	STEAM LINES	36	SEE NOTE 6
CUSTOMER OWNED CABLES	36	SEE NOTE 2	CUSTOMER OWNED CABLES	12	SEE NOTE 2

NOTES:

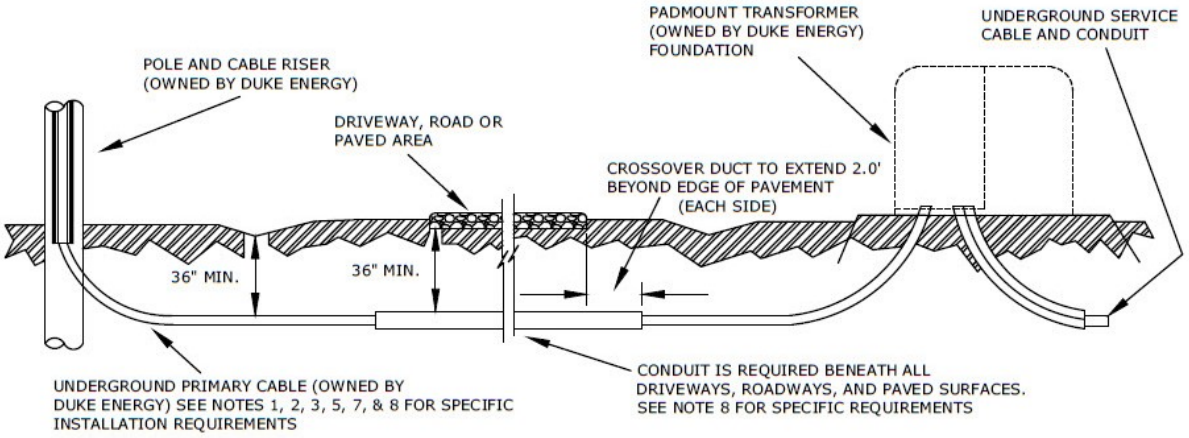
1. THE MINIMUM SEPARATIONS IN THIS DRAWING REFER ONLY TO SEPARATE TRENCH LINES AND DO NOT APPLY TO JOINT TRENCH INSTALLATIONS.
2. THE NESC DOES NOT SPECIFY ACTUAL DISTANCES FROM MOST UTILITIES, BUT INSTEAD STATES THAT THE RADIAL SEPARATION SHOULD BE ADEQUATE TO PERMIT ACCESS TO AND MAINTENANCE OF EITHER FACILITY TO LIMIT DAMAGE TO THE OTHER (RULE 320.B.1 AND RULE 353.A.2). THE DISTANCES SHOWN IN THE ABOVE TABLE HAVE BEEN FOUND TO MEET THESE CRITERIA. LESSER DISTANCES MAY BE ALLOWED WITH AGREEMENT BY ALL OF THE INVOLVED PARTIES.
3. VERTICAL SEPARATION MUST BE SUFFICIENT TO LIMIT THE LIKELIHOOD OF DETRIMENTAL LOAD BEING TRANSFERRED TO EITHER OF THE UTILITIES OR STRUCTURES INVOLVED. THE DISTANCES SHOWN IN THE ABOVE TABLE HAVE BEEN FOUND TO MEET THESE CRITERIA. LESSER DISTANCES MAY BE ALLOWED WITH AGREEMENT BY ALL OF THE INVOLVED PARTIES.
4. DIRECT BURIED APPLICATIONS WITH LESS THAN 12" OF RADIAL SEPARATION BETWEEN COMMUNICATION AND SUPPLY CONDUCTORS ARE CONSIDERED 'RANDOM LAY' AND REQUIRE AGREEMENT BETWEEN THE AFFECTED PARTIES. RANDOM LAY INSTALLATIONS MUST ALSO MEET MORE STRINGENT NESC GUIDELINES AND SHOULD BE AVOIDED UNLESS PART OF A JOINT TRENCH AGREEMENT.
5. DIRECT BURIED PRIMARY AND SECONDARY CABLES SHALL BE INSTALLED WITH A MINIMUM RADIAL SEPARATION OF NOT LESS THAN 12" FROM STEAM LINES, GAS, AND OTHER LINES THAT TRANSPORT FLAMMABLE MATERIAL.
6. ENCASED CONDUIT OR DUCTBANK SYSTEMS SHOULD BE INSTALLED SO AS TO LIMIT THE LIKELIHOOD OF DETRIMENTAL HEAT TRANSFER BETWEEN THE STEAM AND DUCTBANK SYSTEMS.
7. INSTALLATIONS UNDER RAILROAD TRACKS MUST BE A MINIMUM OF 60" BELOW THE TOP OF RAILS. THIS IS THE NESC MINIMUM ONLY. CONSULT WITH THE DUKE ENERGY PERMIT COORDINATOR FOR ACTUAL REQUIREMENTS DICTATED BY INDIVIDUAL RAILROADS.

DUKE ENERGY.

3					UNDERGROUND CLEARANCES FROM OTHER UTILITIES NOT IN A JOINT TRENCH CONFIGURATION
2					
1					
0	12/31/15	EANES	FLETCHER	ADCOCK	
REVISED		BY	CK'D	APPR.	

DEC	DEM	DEP	DEF
X	X	X	X

FIG 101



IF THERE IS MORE THAN ONE CONDUCTOR IN THE TRENCH, SEE FIGURE 100.

SERVICE REQUIREMENTS:

1. EASEMENTS: THE CUSTOMER SHALL PROVIDE AN EASEMENT 15 FEET IN WIDTH FOR THE UNDERGROUND ELECTRIC SYSTEM. THE EASEMENT SHALL BE CLEARED OF ALL OBSTRUCTIONS THAT MAY INTERFERE WITH UNDERGROUND CABLE INSTALLATION, OPERATION, AND MAINTENANCE. THE EASEMENT SHALL BE KEPT CLEAR OF VEGETATION, BUILDING, OR ANY OBSTRUCTIONS.

2. ROUTING: DUKE ENERGY SHALL BE RESPONSIBLE FOR DETERMINING THE FINAL ROUTING FOR UNDERGROUND PRIMARY CABLES. THE CABLE ROUTE MUST BE ACCESSIBLE FOR MAINTENANCE ALONG ITS ENTIRE LENGTH.

3. USE BY OTHER: THE UNDERGROUND TRENCH CONTAINING THE ELECTRIC CABLES IS FOR THE SOLE USE OF DUKE ENERGY. OTHER UTILITIES MAY BE ALLOWED IN THE TRENCH WITH THE EXPRESS PERMISSION OF DUKE ENERGY.

4. ACCEPTANCE: THE COMPANY RESERVES THE RIGHT TO REFUSE SERVICE TO NEW INSTALLATIONS THAT DO NOT MEET DUKE ENERGY REQUIREMENTS AND MAY ELECT TO REMOVE EXISTING SERVICE CABLES IF THE CUSTOMER FAILS TO PROVIDE ADEQUATE MAINTENANCE, TO CUSTOMER OWNED FACILITIES.

5. MATERIAL & LABOR: THE CUSTOMER SHALL PROVIDE ALL MATERIALS AND EXCAVATION LABOR NECESSARY TO INSTALL THE UNDERGROUND PRIMARY CABLE SYSTEM. THIS INCLUDES TRENCHING, BACKFILLING, LEVELING THE TRANSFORMATION PAD LOCATION, INSTALLATION OF CONDUIT AND CONDUIT ACCESSORIES, INSTALLATION OF SPECIAL BACKFILL, ETC.

6. TRENCH DIMENSIONS AND CLEARANCES: THE PRIMARY CABLE CONDUIT SHALL HAVE A MINIMUM OF 36" COVER. THE MAXIMUM DEPTH SHALL BE NO MORE THAN 40". THE TRENCH MUST BE AT LEAST 3 FEET AWAY FROM ADJACENT GAS PIPES OR WATER LINES. IT SHALL BE AT LEAST 1 FOOT AWAY FROM ALL OTHER UNDERGROUND UTILITIES INCLUDING TELEPHONE, CABLE TV, LAWN WATERING SYSTEMS, ETC. THE SURFACE GRADE OVER THE TRENCH SHALL NOT BE CHANGED IN ANY WAY THAT REDUCES OR INCREASES THE DEPTH OF BURIAL.

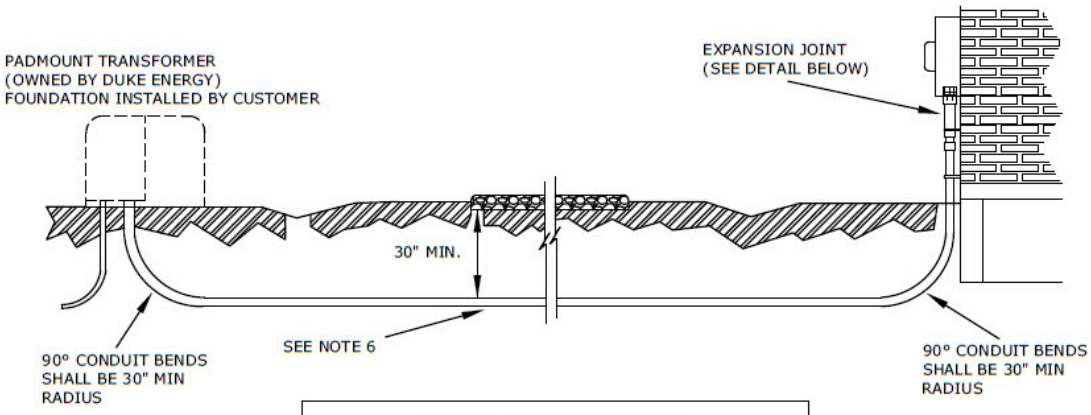
7. CONDUIT: THE CUSTOMER SHALL INSTALL, OWN AND MAINTAIN THE CONDUIT SYSTEM INCLUDING DUCT, MANHOLES, CABLE PITS AND TRANSFORMER FOUNDATIONS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH DUKE ENERGY STANDARDS. THE CONDUIT SHALL BE MADE FROM POLYVINYL CHLORIDE (PVC) AND SUITABLE FOR USE WITH UNDERGROUND ELECTRIC DISTRIBUTION CABLES RATED AT 90°C. ALL CONDUITS SHALL HAVE A UL LISTING AND A SCHEDULE 40 (SCH. 40) RATING CLEARLY PRINTED ON THE EXTERIOR SURFACE. ALL BENDS SHALL BE 90° "SWEEP" BENDS WITH A MINIMUM RADIUS OF 36 INCHES. ALL CONDUITS SHALL HAVE A PULL STRING INSTALLED. ALL CONDUITS SHALL BE CAPPED TO PREVENT DEBRIS FROM ENTERING THE CONDUIT.

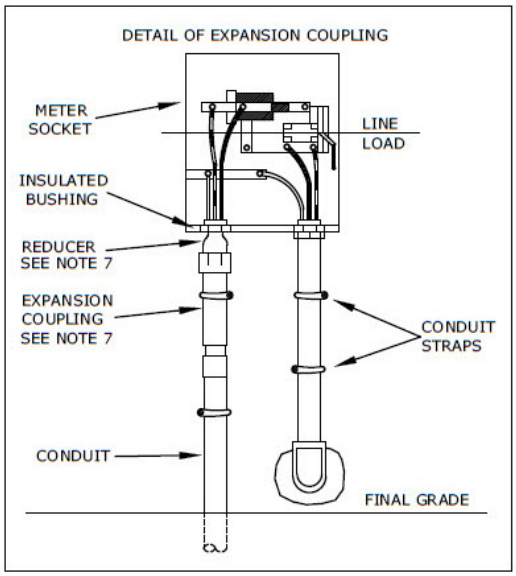
8. IF THE UNDERGROUND PRIMARY SYSTEM MUST PASS BENEATH PAVED AREAS, THE CUSTOMER SHALL INSTALL A CONDUIT ACROSS THE PAVED AREA. THE CONDUIT SHALL HAVE AT LEAST 36 INCHES OF COVER. IT MUST BE AT LEAST 2 INCHES IN DIAMETER. IT MUST EXTEND AT LEAST 2 FEET BEYOND THE EDGE OF PAVEMENT. THE CONDUIT SHALL BE MADE FROM POLYVINYL CHLORIDE (PVC) AND SUITABLE FOR USE WITH UNDERGROUND ELECTRIC DISTRIBUTION CABLES RATED AT 90°C. IT SHALL BE SUITABLE FOR DIRECT BURIAL. A UL LISTING AND A SCHEDULE 40 (SCH. 40) RATING ARE ADEQUATE FOR THIS PURPOSE.

9. SECONDARY SERVICE: WHEN THE CUSTOMER OWNS AND MAINTAINS THE UNDERGROUND SERVICE CONDUCTORS OR CONDUIT ONLY IN OHIO FROM THE TRANSFORMER TO THE ELECTRIC METER, SERVICE CONDUCTORS MUST BE A MINIMUM OF 30 INCHES DEEP. SERVICE CONDUCTORS SHALL BE INSTALLED AT THE PROPER DEPTH TO WITHIN 2 FEET OF THE TRANSFORMER PAD BY THE CUSTOMER. SUFFICIENT CABLE LENGTH WILL BE PROVIDED SO THAT THE CABLE ENDS WILL BE APPROXIMATELY 5 FEET ABOVE THE TRANSFORMER PAD WHEN THE CABLES ARE INSTALLED INTO THE PAD BY DUKE ENERGY. DUKE ENERGY WILL EXTEND THE CABLES INTO THE TRANSFORMER PAD AND MAKE FINAL CONNECTIONS UPON RECEIPT OF PROPER INSPECTION RELEASES.

DUKE ENERGY.

					SERVICE REQUIREMENTS FOR SINGLE-PHASE UNDERGROUND PRIMARY ELECTRIC SERVICE FROM AN OVERHEAD DISTRIBURTON LINE	DEC	DEO/K	DEP	DEF
3									
2									
1							X		
0	7/10/18	DIETERLE	BRUINS	ADCOCK		FIG 105			
REVISED		BY	CK'D	APPR.					





SERVICE REQUIREMENTS:

1. USE BY OTHERS: THE UNDERGROUND TRENCH CONTAINING THE ELECTRIC CABLES IS FOR THE SOLE USE OF DUKE ENERGY. OTHER UTILITIES MAY BE ALLOWED IN THE TRENCH WITH THE EXPRESS PERMISSION OF DUKE ENERGY.

2. ACCEPTANCE: THE COMPANY RESERVES THE RIGHT TO REFUSE SERVICE TO NEW INSTALLATIONS THAT DO NOT MEET DUKE ENERGY REQUIREMENTS AND MAY ELECT TO REMOVE EXISTING SERVICE CABLES IF THE CUSTOMER FAILS TO PROVIDE ADEQUATE MAINTENANCE, TO CUSTOMER OWNED FACILITIES.

3. SYSTEM ROUTE AND EQUIPMENT LOCATION: DUKE ENERGY SHALL BE RESPONSIBLE FOR DETERMINING THE FINAL ROUTING FOR UNDERGROUND SERVICE CABLES. THE CABLE ROUTE MUST BE ACCESSIBLE FOR MAINTENANCE ALONG ITS ENTIRE LENGTH.

4. TRENCH DIMENSIONS AND CLEARANCES: SEE FIGURES 100 AND 101 FOR TRENCH DETAILS. THE SURFACE GRADE OVER THE TRENCH SHALL NOT BE CHANGED IN ANY WAY THAT REDUCES OR INCREASES THE DEPTH OR BURIAL.

5. MATERIALS & LABOR: THE CUSTOMER SHALL PROVIDE ALL MATERIALS AND EXCAVATION LABOR NECESSARY TO INSTALL THE UNDERGROUND CONDUIT SYSTEM. THIS INCLUDES TRENCHING, BACKFILLING, INSTALLATION OF CONDUIT AND CONDUIT ACCESSORIES.

6. CONDUIT: THE CUSTOMER SHALL INSTALL, OWN AND MAINTAIN THE CONDUIT SYSTEM INCLUDING DUCT. IT SHALL BE INSTALLED IN ACCORDANCE WITH DUKE ENERGY STANDARDS. THE CONDUIT SHALL BE MADE FROM POLYVINYL CHLORIDE (PVC) AND SUITABLE FOR USE WITH UNDERGROUND ELECTRIC DISTRIBUTION CABLES RATED AT 90°C. ALL CONDUITS SHALL HAVE A UL LISTING AND A SCHEDULE 40 (SCH. 40) OR LOCAL AHJ REQUIREMENTS RATING CLEARLY PRINTED ON THE EXTERIOR SURFACE. FOR UP TO 200 AMPS. THE MINIMUM INSIDE DIAMETER OF THE CONDUIT SHALL BE 2 INCHES.
FOR UP TO 400 AMPS, A MINIMUM INSIDE DIAMETER OF 4 INCHES IS REQUIRED ALL BENDS SHALL BE 90° "SWEEP" BENDS WITH A MINIMUM RADIUS OF 30 INCHES. ALL CONDUITS SHALL HAVE A PULL STRING INSTALLED. ALL CONDUITS SHALL BE CAPPED TO PREVENT DEBRIS FROM ENTERING THE CONDUIT. THE CONDUIT SYSTEM SHALL HAVE A MAXIMUM OF (3) 90° "SWEEP" BENDS. IF THE CONDUIT SYSTEM IS GOING TO EXCEED 200' PLEASE CONTACT DUKE SERVICE AT 1-877-700-3853.

7. EXPANSION COUPLING: THE CUSTOMER SHALL INSTALL, OWN AND MAINTAIN THE EXPANSION COUPLING. IT SHALL BE INSTALLED SO THAT THE OUTER SLEEVE IS CONNECTED TO THE METER SOCKET AND ON TOP OF THE INNER SLEEVE. THE INNER SLEEVE SHALL BE POSITIONED TO THE MANUFACTURE'S MIDWAY MARK. IF NEEDED, A REDUCER SHOULD BE INSTALLED DIRECTLY BELOW THE METER BASE AT THE INSULATED BUSHING.

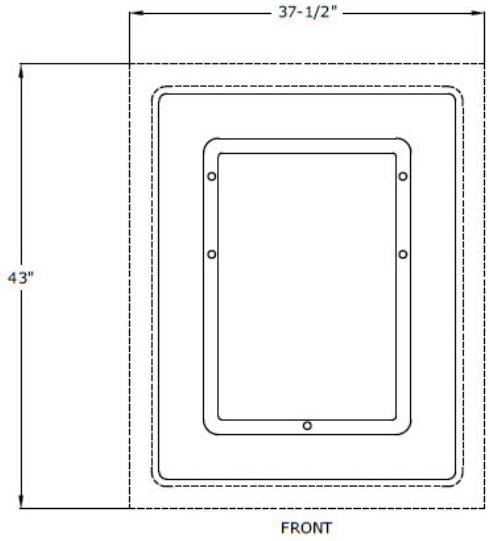
DUKE ENERGY.

REVISED		BY	CK'D	APPR.
3				
2				
1	5/31/19	DIETERLE	BRUINS	ADCOCK
0	7/10/18	DIETERLE	BRUINS	ADCOCK

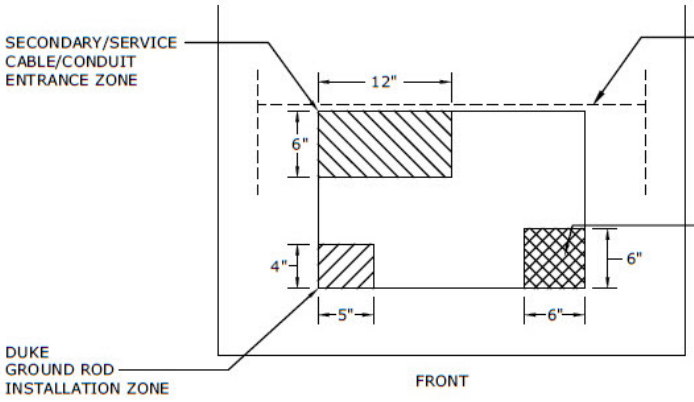
SERVICE REQUIREMENTS FOR DUKE OWNED UNDERGROUND ELECTRIC SERVICE FROM AN OVERHEAD OR PAD-MOUNTED TRANSFORMER TO A RESIDENTIAL SINGLE-FAMILY DWELLING UP TO 400A

DEC	DEM	DEP	DEF
	X		

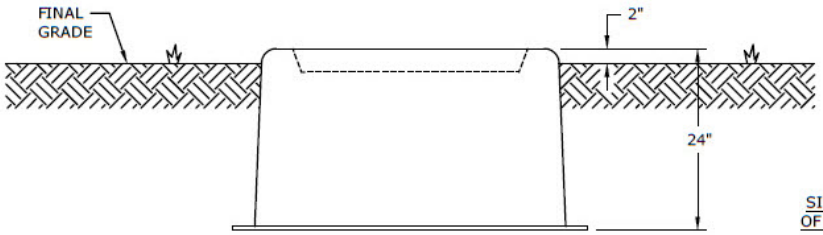
FIG 106



OVERHEAD VIEW
TOP OF BOX PAD



OVERHEAD VIEW
BOTTOM OF BOX PAD



SIDE VIEW
OF BOX PAD

NOTES:

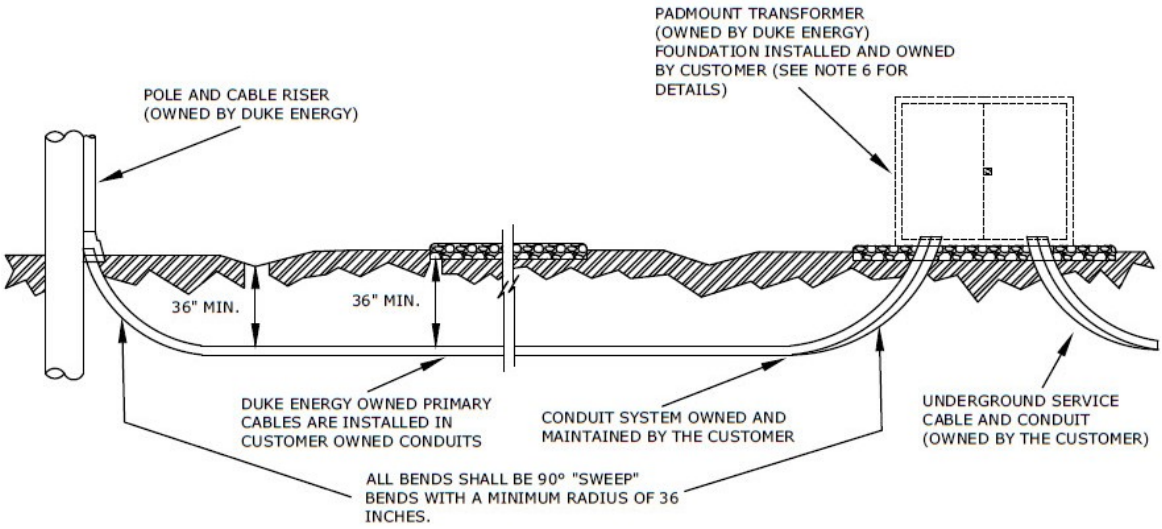
1. SEE FIGURE 110 TO DETERMINE IF CURBING AND ABSORPTION BED IS REQUIRED.
2. PROTECTIVE POLES ARE REQUIRED WHEN TRANSFORMERS ARE EXPOSED TO VEHICLE TRAFFIC. SEE FIGURE 122 FOR PROTECTIVE POLE DETAILS.
3. SEE FIGURE 120 FOR ALL TRANSFORMER CLEARANCES.
4. THE SURFACE OF THE BOX PAD MUST BE LEVEL WITHIN 1" ACROSS IN ALL DIRECTIONS.
5. USE SAND OR BANK RUN GRAVEL IF BACKFILL IS REQUIRED TO LEVEL BOX PAD.
6. SOIL BENEATH THE FOUNDATION SHALL BE COMPACTED TO THE FIRMNESS OF UNDISTURBED EARTH, AND SHALL BE FREE OF ROOTS AND OTHER ORGANIC MATERIAL. BACKFILL AND TAMP THE SOIL AROUND THE PAD SUFFICIENTLY TO PREVENT WASHING.
7. CUT AND CAP ALL CONDUITS 6" ABOVE BASE OF BOX PAD.
8. OTHER UTILITIES SHALL NOT BE INSTALLED UNDER TRANSFORMER PAD. SEE FIGURE 101 FOR MINIMUM CABLE CLEARANCES.

DUKE ENERGY.

3					BOX PAD FOR SINGLE-PHASE PAD-MOUNTED TRANSFORMERS
2					
1	5/30/19	DIETERLE	BRUINS	ADCOCK	
0	2/25/19	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CHK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 107



IF THERE IS MORE THAN ONE CONDUCTOR IN THE TRENCH, SEE FIGURE 100.

SERVICE REQUIREMENTS:

1. EASEMENTS: THE CUSTOMER SHALL PROVIDE AN EASEMENT 15 FEET IN WIDTH FOR THE UNDERGROUND ELECTRIC SYSTEM. THE EASEMENT SHALL BE CLEARED OF ALL OBSTRUCTIONS THAT MAY INTERFERE WITH UNDERGROUND CABLE INSTALLATION, OPERATION, AND MAINTENANCE. THE EASEMENT SHALL BE KEPT CLEAR OF VEGETATION, BUILDING, OR ANY OBSTRUCTIONS.

2. USE BY OTHERS:THE UNDERGROUND TRENCH CONTAINING THE ELECTRIC CABLES IS FOR THE SOLE USE OF DUKE ENERGY. OTHER UTILITIES MAY BE ALLOWED IN THE TRENCH WITH THE EXPRESS PERMISSION OF DUKE ENERGY.

3. ACCEPTANCE: THE COMPANY RESERVES THE RIGHT TO REFUSE SERVICE TO NEW INSTALLATIONS THAT DO NOT MEET DUKE ENERGY REQUIREMENTS AND MAY ELECT TO REMOVE EXISTING SERVICE CABLES IF THE CUSTOMER FAILS TO PROVIDE ADEQUATE MAINTENANCE, TO CUSTOMER OWNED FACILITIES.

4. SYSTEM ROUTE AND EQUIPMENT LOCATION: DUKE ENERGY SHALL BE RESPONSIBLE FOR DETERMINING THE FINAL ROUTING FOR UNDERGROUND PRIMARY CABLES. THE CABLE ROUTE MUST BE ACCESSIBLE FOR MAINTENANCE ALONG ITS ENTIRE LENGTH. THE CUSTOMER SHALL PROVIDE A LEVEL LOCATION AT FINAL GRADE FOR A PAD-MOUNTED TRANSFORMER INSTALLATION AS DIRECTED BY THE COMPANY. THE CUSTOMER SHALL BE RESPONSIBLE FOR CONSTRUCTING A TRANSFORMER PAD IN ACCORDANCE WITH DUKE ENERGY REQUIREMENTS SUITABLE FOR THE LARGEST TRANSFORMER THAT MAY BE REQUIRED. THE TRANSFORMER PAD MUST BE LOCATED WITHIN 10 FEET OF A PERMANENT DRIVEWAY OR OTHER AREA ACCESSIBLE TO DUKE ENERGY CONSTRUCTION AND MAINTENANCE EQUIPMENT. THE CLOSEST PART OF ANY TRANSFORMER (OR TRANSFORMER PAD) MUST BE AT LEAST 10 FEET FROM ANY COMBUSTIBLE WALL, WINDOW, OR VENTILATION OPENING, AND 20 FEET FROM ANY DOORWAY IN A BUILDING. DOORWAY IN A BUILDING. LANDSCAPING MUST BE KEPT AT A MINIMUM OF 3 FEET AWAY FROM THE SIDES AND TO THE REAR OF THE TRANSFORMER (OR TRANSFORMER PAD). THERE MUST BE 10 FEET OF CLEARANCE TO THE FRONT OF THE TRANSFORMER (OR TRANSFORMER PAD). LOCAL REGULATIONS MAY REQUIRE ADDITIONAL CLEARANCES TO PAD-MOUNTED EQUIPMENT.

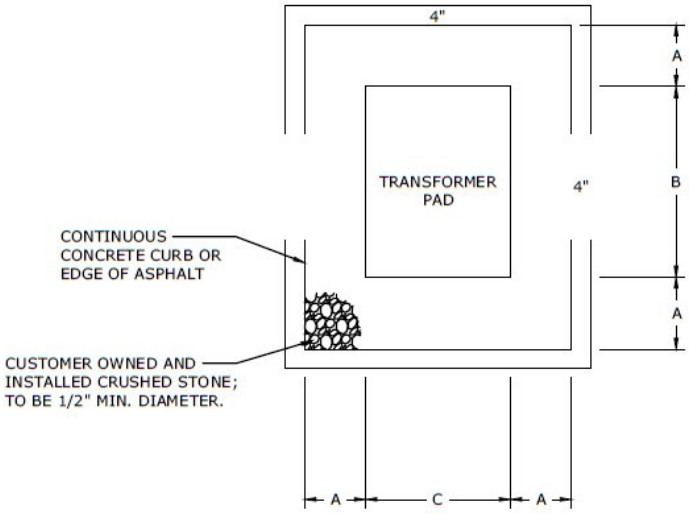
5. TRENCH DIMENSIONS AND CLEARANCES: SEE FIGURES 100 AND 101 FOR TRENCH DETAILS.

6. MATERIALS & LABOR: THE CUSTOMER SHALL PROVIDE ALL MATERIALS AND EXCAVATION LABOR NECESSARY TO INSTALL THE UNDERGROUND CONDUIT SYSTEM. THIS INCLUDES TRENCHING, BACKFILLING, INSTALLATION OF CONDUIT AND CONDUIT ACCESSORIES, INSTALLATION OF PRECAST MANHOLES AND CABLE PITS, INSTALLATION OF TRANSFORMER FOUNDATIONS, ETC.

7. CONDUIT: THE CUSTOMER SHALL INSTALL, OWN AND MAINTAIN THE CONDUIT SYSTEM INCLUDING DUCT, MANHOLES, CABLE PITS AND TRANSFORMER FOUNDATIONS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH DUKE ENERGY STANDARDS. THE CONDUIT SHALL BE MADE FROM POLYVINYL CHLORIDE (PVC) AND SUITABLE FOR USE WITH UNDERGROUND ELECTRIC DISTRIBUTION CABLES RATED AT 90°C. ALL CONDUITS SHALL HAVE A UL LISTING AND A SCHEDULE 40 (SCH. 40) RATING CLEARLY PRINTED ON THE EXTERIOR SURFACE. FOR 3-PHASE, 15KV, 1/0 PRIMARY CABLES, THE MINIMUM INSIDE DIAMETER OF THE CONDUIT SHALL BE 4 INCHES. FOR 3-PHASE, 35KV, 1/0 PRIMARY CABLES, INSIDE DIAMETER OF 6 INCHES IS REQUIRED. ALL BENDS SHALL BE 90° "SWEEP" BENDS WITH A MINIMUM RADIUS OF 36 INCHES. CONDUIT MAY BE DIRECTED IF LOCAL PERMITTING AUTHORITIES WILL ALLOW DIRECT BURIED CONDUIT SYSTEMS. ALL CONDUITS SHALL HAVE A PULL STRING INSTALLED. ALL CONDUITS SHALL BE CAPPED TO PREVENT DEBRIS FROM ENTERING THE CONDUIT.

DUKE ENERGY.

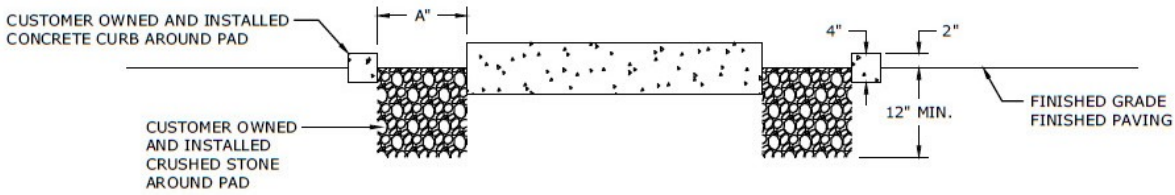
						DEC	DEO/K	DEP	DEF
3					SERVICE REQUIREMENTS FOR UNDERGROUND PRIMARY ELECTRIC SERVICE FROM AN OVERHEAD DISTRIBURTON LINE TO COMMERCIAL OR INDUSTRIAL CUSTOMER				
2									
1							X		
0	7/10/18	DIETERLE	BRUINS	ADCOCK		FIG 108			
REVISED		BY	CK'D	APPR.					



PLAN VIEW

PHASE	TRANSFORMER KVA	A	B	C
1Ø	ALL	12"	SEE NOTE 1	SEE NOTE 1
3Ø	75-300	18"	66"	82"
3Ø	500-2500	28"	104"	98"

CURBING AND ABSORPTION BEDS CAN BE USED TO CONTAIN OIL LEAKS AROUND TRANSFORMERS THAT ARE DEFINED AS A "CRITICAL FACILITY" (PER THE ENVIRONMENTAL HANDBOOK) OR ARE LOCATED IN OR IMMEDIATELY ADJACENT TO PAVED AREAS THAT CONTAIN STORM DRAINS. CONSULT THE ENVIRONMENTAL GROUP FOR PROPER APPLICATION OF THIS STANDARD.



NOTES:

1. REFERENCE FIGURE 107 FOR SPECIFIC SINGLE-PHASE TRANSFORMER PAD DIMENSIONS.
2. TRAFFIC BARRIERS ARE TO BE USED WHEN TRANSFORMER IS EXPOSED TO VEHICLE TRAFFIC. SEE FIGURE 122A & B FOR TRAFFIC BARRIER DETAILS.

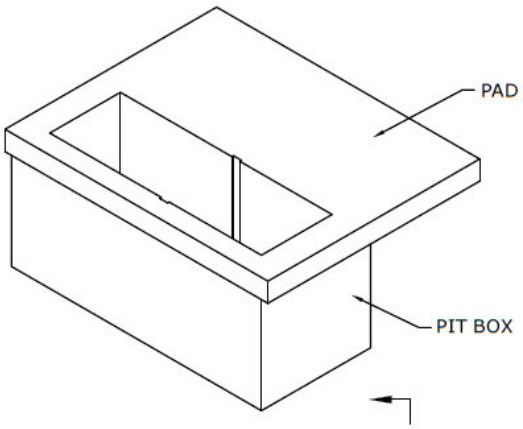
DUKE ENERGY.

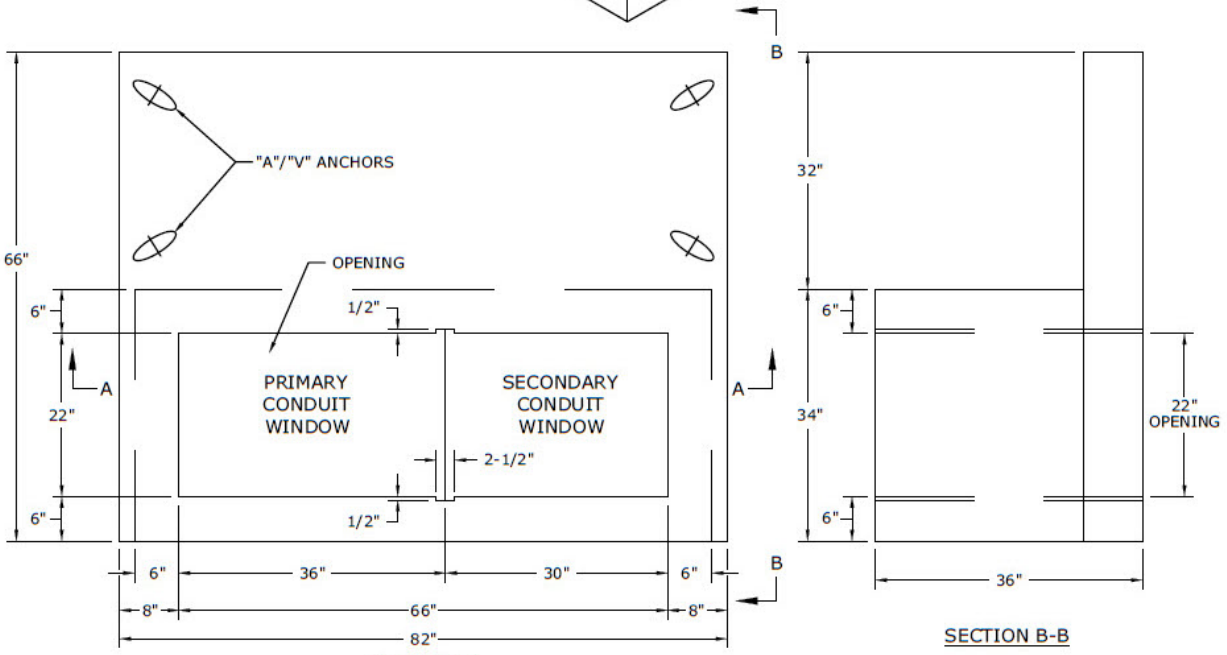
3					ABSORPTION BED FOR TRANSFORMER PADS
2					
1					
0	2/21/19	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CHK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 110

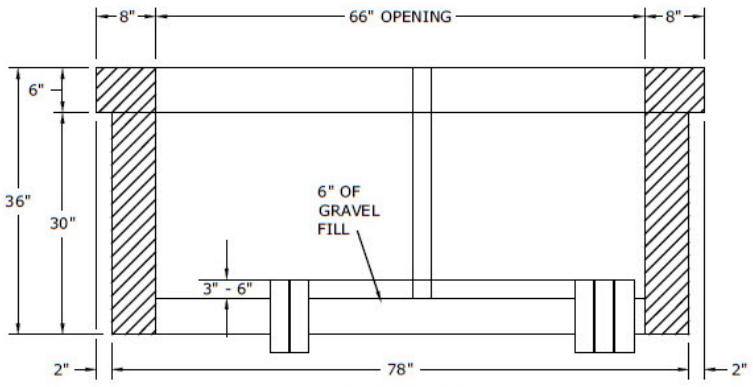
PIT BOX PADS WILL BE REQUIRED FOR ALL PROJECTS INITIATED AFTER JUNE 30, 2019.





PLAN VIEW

SECTION B-B



SECTION A-A

PIT BOX PADS WILL BE REQUIRED FOR ALL PROJECTS INITIATED AFTER JUNE 30, 2019.

NOTES:

1. SEE FIGURE 113 FOR NOTES.
2. A LARGE PIT BOX MAY BE USED WITH A SMALL PAD

3				
2				
1				
0	2/21/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CHK'D	APPR.

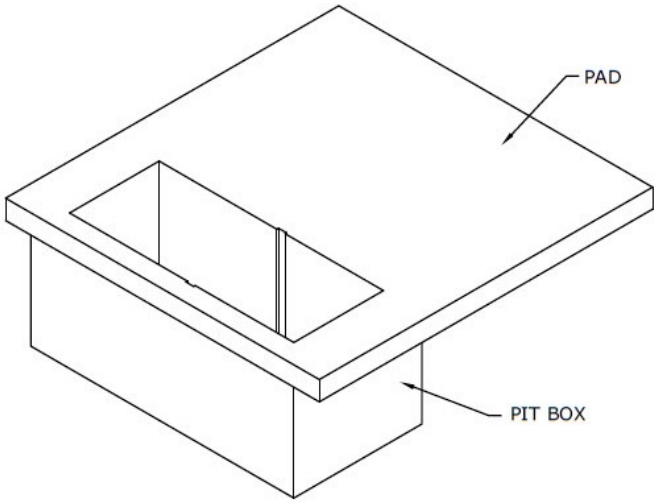
PIT BOX PAD FOR THREE-PHASE 75 - 300 KVA PAD-MOUNTED TRANSFORMERS

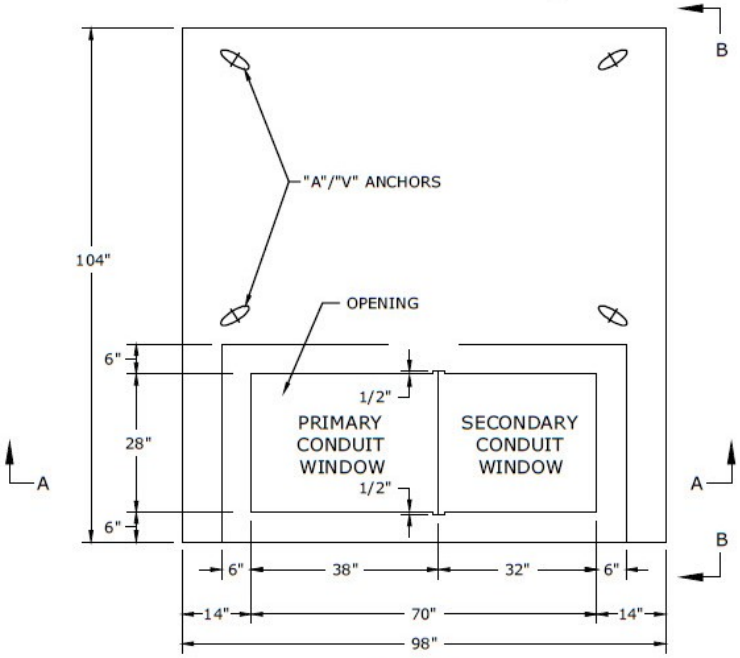
DUKE ENERGY.

DEC	DEM	DEP	DEF
	X		

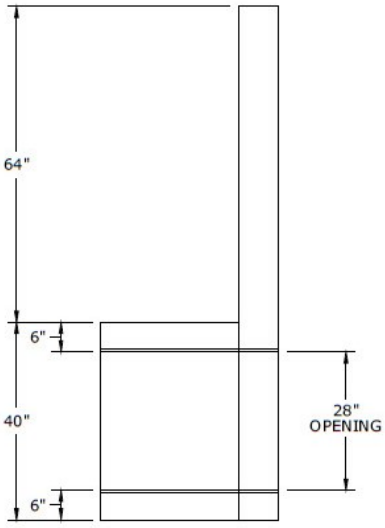
FIG 111

PIT BOX PADS WILL BE REQUIRED FOR ALL PROJECTS INITIATED AFTER JUNE 30, 2019.

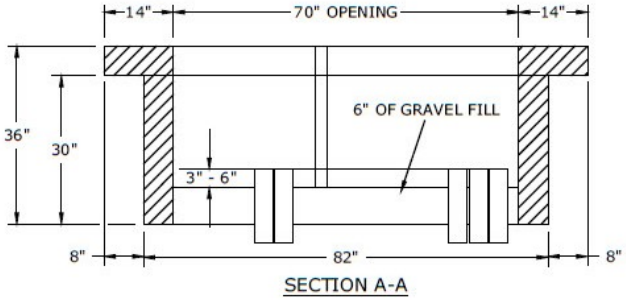




PLAN VIEW



SECTION B-B



SECTION A-A

NOTES:

1. SEE FIGURE 113 FOR NOTES.

PIT BOX PADS WILL BE REQUIRED FOR ALL PROJECTS INITIATED AFTER JUNE 30, 2019.

DUKE ENERGY.

3				
2				
1				
0	2/21/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CHK'D	APPR.

PIT BOX PAD FOR THREE-PHASE 500 - 2500 KVA PAD-MOUNTED TRANSFORMERS

DEC	DEM	DEP	DEF
	X		

FIG 112

PIT BOX PADS WILL BE REQUIRED FOR ALL PROJECTS INITIATED AFTER JUNE 30, 2019.

NOTES:

1. THE COMPANY RESERVES THE RIGHT TO REFUSE SERVICE TO NEW INSTALLATIONS THAT DO NOT MEET DUKE ENERGY REQUIREMENTS.
2. REFERENCE FIGURE 110 TO DETERMINE IF CURBING AND ABSORPTION BED IS REQUIRED.
3. PROTECTIVE BOLLARDS ARE REQUIRED WHEN TRANSFORMERS ARE EXPOSED TO VEHICLE TRAFFIC. SEE FIGURES 112A & B FOR PROTECTIVE BOLLARD DETAILS.
4. THERE SHALL BE MINIMUM CLEARANCES OF 10' IN FRONT OF THE TRANSFORMER AND 3' ON ALL OTHER SIDES OF THE TRANSFORMER. SEE FIGURES 120 AND 121 FOR MORE DETAILS ON CLEARANCES.
5. TRANSFORMER MUST BE LOCATED IN AN AREA THAT ALLOWS SAFE ACCESS BY DUKE ENERGY CONSTRUCTION AND MAINTENANCE EQUIPMENT IN WET OR DRY WEATHER.
6. CONSIDER FROST ACTION, DRAINAGE, AND LOCAL SOIL CONDITIONS WHEN PREPARING SITE FOR PAD. SOIL UNDERNEATH PADS SHALL BE LEVELED AND COMPACTED. SOIL SHALL ALSO BE FREE OF ROOTS AND OTHER ORGANIC MATERIALS TO PREVENT SETTLING AND EROSION. SOD MAY BE REQUIRED AROUND PAD TO PREVENT SOIL EROSION.
7. PROVIDE SMOOTH GRANULAR FILL TO A HEIGHT OF 6" FROM THE BOTTOM OF THE PIT. ALL CONDUITS SHALL BE CUT TO A LEVEL 6" ABOVE THIS GRANULAR FILL.
8. CUSTOMER SHALL INSTALL THE CONDUIT FOR THE PRIMARY CONDUCTORS AS CLOSE TO THE CENTER OF THE PRIMARY AREA AS PRACTICAL. THE SECONDARY CONDUITS SHALL BE INSTALLED TO THE RIGHT INSIDE THE SECONDARY AREA. SEE SERVICE GUIDE FOR PAD INSTALLATION DETAILS AND SPECIFICATIONS.
9. OTHER UTILITIES SHALL NOT BE INSTALLED UNDER TRANSFORMER PAD. SEE FIGURE 101 FOR MINIMUM CABLE CLEARANCES.

PIT BOX PADS WILL BE REQUIRED FOR ALL PROJECTS INITIATED AFTER JUNE 30, 2019.

DUKE ENERGY.

3					PIT BOX PAD INSTALLATION NOTES
2					
1					
0	2/21/19	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CHK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 113

THE LINK BELOW WILL REFERENCE THE USER TO A DOCUMENT THAT DESCRIBES THE VARIOUS TYPES OF THREE-PHASE CONCRETE TRANSFORMER PADS USED, WHICH TRANSFORMER SIZES THEY ARE USED FOR, AND THE STYLE (FLAT OR PIT PAD) THAT IS APPROPRIATE FOR THE SIZE OF SERVICE.

ADDITIONALLY, CERTAIN PROVIDERS OF PRE-CAST CONCRETE PRODUCTS PROVIDE PRE-CAST VERSIONS OF THE FLAT AND PIT PAD DESIGNS DESCRIBED IN THESE DOCUMENTS. DUKE ENERGY DOES NOT ENDORSE ANY SPECIFIC VENDOR VERSUS ANOTHER, BUT HAS PRE-APPROVED THE FOLLOWING PRE-CAST CONCRETE PAD SUPPLIERS FOR USE ON THE DUKE ENERGY SYSTEM. A DUKE ENERGY REPRESENTATIVE WILL INSPECT THESE INSTALLATIONS FOR THE SAME CONSTRUCTION STANDARDS AS A PAD POURED IN PLACE PRIOR TO THE INSTALLATION OF THE TRANSFORMER. THE CUSTOMER MUST CONTACT THE DUKE ENERGY REPRESENTATIVE TO INSPECT THE PAD WHEN IT IS READY FOR THE TRANSFORMER TO BE INSTALLED.

PRE-APPROVED SUPPLIERS OF PRE-FABRICATED CONCRETE PADS

ENCORE PRECAST
CONTACT: JIM MALONEY
PHONE: 513-726-5678 EXT 22
EMAIL: JMALONEY@ENCOREPRECASTLLC.COM
WEBSITE: WWW.ENCOREPRECASTLLC.COM

OLDCASTLE PRECAST
CONTACT: CURTIS JONES
PHONE: 704-305-3280
EMAIL: CURTIS.JONES@OLDCASTLE.COM
WEBSITE: WWW.OLDCASTLEINFRASTRUCTURE.COM
SEARCH: DUKE ENERGY PIT BOX PAD

PBC PRECAST
CONTACT: JOHNATHAN AVERY
PHONE: 910-260-1820
EMAIL: JAVERY@HOGSLAT.COM
WEBSITE: WWW.PBCPRECAST.COM

TRENWA PRECAST
CONTACT: GEORGE SCHURR
PHONE: 859-781-0831 EXT 22
WEBSITE: WWW.TRENWA.COM

PRE-CAST PIT PAD SUPPLIER PART NUMBER				
	ENCORE PRECAST	OLDCASTLE PRECAST	PBC PRECAST	TRENWA
SMALL FLAT	TRPAD082066	668206TP	FP82666	PAD-82X66
LARGE FLAT	TRPAD098104	9810406TP	FP981046	PAD-104X98
SMALL PIT	TRPIT082066	668206TB	PIT783430	PIT-78X34
LARGE PIT	TRPIT098104	9810406TB	PIT824030	PIT-82X40

HTTPS://WWW.DUKE-ENERGY.COM/_/MEDIA/PDFS/PARTNER-WITH-US/PADTRANSFORMERCONCRETEFOUNDSPECS.PDF?LA=EN

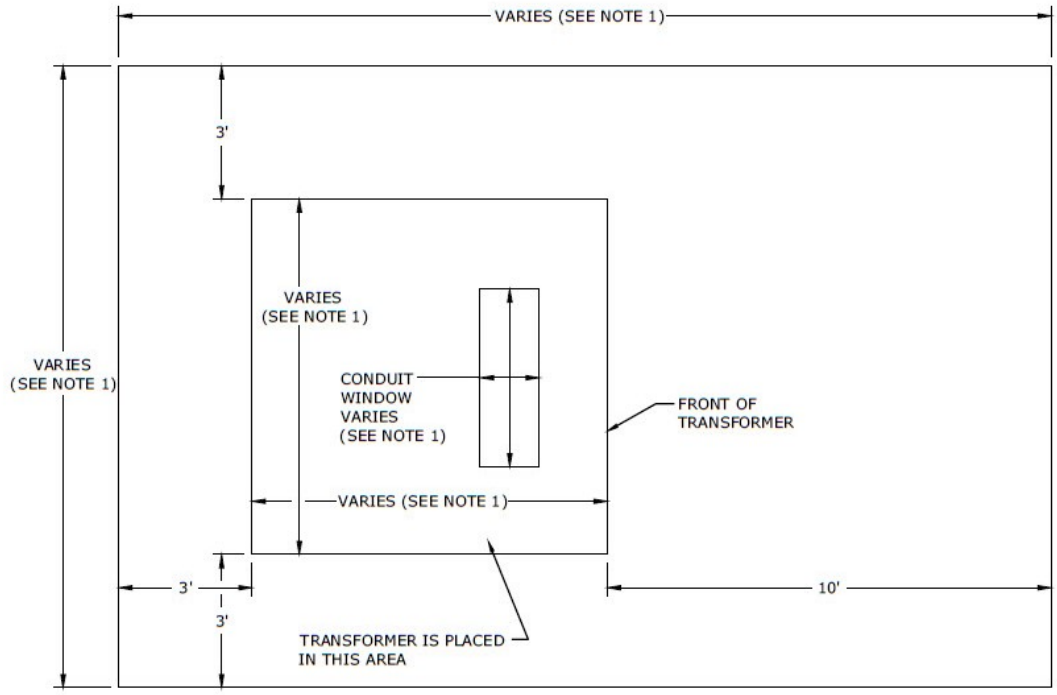
DUKE ENERGY.

3				
2				
1	4/24/19	DIETERLE	BRUINS	ADCOCK
0	2/21/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CHK'D	APPR.

PRE-APPROVED SUPPLIER LIST
FOR PRE-FABRICATED CONCRETE
TRANSFORMER FOUNDATIONS

DEC	DEM	DEP	DEF
	X		

FIG 114



PLAN VIEW

NOTE: PROVIDE ACCESS STAIRWAY AND GUARDRAIL PER OSHA REQUIREMENTS IF PAD ELEVATION IS 4 FT OR HIGHER ABOVE GRADE.

NOTES:

1. THE PAD SIZE VARIES BASED ON THE SIZE OF THE TRANSFORMER. SEE FIGURE 111 AND 112 FOR THE APPROPRIATE THREE-PHASE PAD-MOUNTED TRANSFORMER PAD AND CONDUIT WINDOW DIMENSIONS.

2. SEE FIGURE 115B FOR ADDITIONAL NOTES.

DUKE ENERGY.

3				
2				
1				
0	2/25/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CHK'D	APPR.

CUSTOMER-INSTALLED ELEVATED PADS
FOR THREE-PHASE PAD-MOUNTED TRANSFORMER
75 - 2500 KVA

DEC	DEM	DEP	DEF
	X		

FIG 115A

NOTES:

1. SCOPE: THIS STANDARD APPLIES TO CUSTOMER-INSTALLED ELEVATED PAD STRUCTURES FOR THREE-PHASE PAD-MOUNTED TRANSFORMERS INSTALLED AT ELEVATIONS HIGHER THAN 24 INCHES ABOVE FINAL GRADE. ELEVATED PADS ARE TYPICALLY REQUIRED WHEN PAD-MOUNTED TRANSFORMERS MUST BE PLACED IN A FLOOD PLAIN.

2. ACCEPTANCE: THE COMPANY RESERVES THE RIGHT TO REFUSE SERVICE TO NEW INSTALLATIONS THAT DO NOT MEET DUKE ENERGY REQUIREMENTS AND MAY ELECT TO REMOVE EXISTING FACILITIES IF THE CUSTOMER FAILS TO PROVIDE ADEQUATE MAINTENANCE TO CUSTOMER OWNED FACILITIES.

3. LOCATION: DUKE ENERGY SHALL BE RESPONSIBLE FOR DETERMINING THE FINAL LOCATION FOR THE TRANSFORMER PAD STRUCTURE. THE CUSTOMER SHALL PROVIDE A LEVEL LOCATION FOR A PAD-MOUNTED TRANSFORMER INSTALLATION AS DIRECTED BY THE COMPANY. THE ELEVATED PAD STRUCTURE MUST BE LOCATED ADJACENT TO AND WITHIN 10 FEET OF A DRIVEWAY OR OTHER AREA ACCESSIBLE TO DUKE ENERGY CONSTRUCTION AND MAINTENANCE EQUIPMENT. NO PART OF THE TRANSFORMER PAD MAY BE WITHIN 12 FEET FROM ANY COMBUSTIBLE WALL, WINDOW, OR VENTILATION OPENING AND 20 FEET FROM ANY DOORWAY IN A BUILDING. THE ELEVATED PAD SURFACE FOOTPRINT IS SPECIFIED SO THAT 3 FEET OF CLEARANCE IS MAINTAINED AROUND THE SIDES AND BACK OF THE TRANSFORMER, AND 10 FEET OF CLEARANCE IS PROVIDED TO THE FRONT OF THE TRANSFORMER. SEE FIGURE 120 OF THIS MANUAL FOR ANY ADDITIONAL CLEARANCE REQUIREMENTS FOR OIL-FILLED, PAD-MOUNTED EQUIPMENT.

4. DESIGN: THE CUSTOMER IS RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF AN ELEVATED TRANSFORMER PAD STRUCTURE IN ACCORDANCE WITH DUKE ENERGY REQUIREMENTS FOR THE LARGEST TRANSFORMER THAT MAY BE REQUIRED. THE ELEVATED PAD STRUCTURE SHALL BE DESIGNED IN ACCORDANCE WITH SOUND CIVIL AND STRUCTURAL ENGINEERING PRACTICES, LOCAL CODES AND REQUIREMENTS, AND, WHERE APPLICABLE, OSHA REQUIREMENTS FOR GUARDRAILS AND ACCESS STAIRWAYS. FOR STRUCTURES WITH TOP SURFACE DESIGNED AT 4 FEET OR HIGHER ABOVE FINISHED GRADE, THE CUSTOMER MUST PROVIDE CONSTRUCTION DRAWINGS STAMPED AND SEALED BY A LICENSED PROFESSIONAL ENGINEER FOR REVIEW BY DUKE ENERGY. THE ELEVATED STRUCTURE MAY BE SOLID CONCRETE, FILLED RETAINING WALL STRUCTURE, STRUCTURAL STEEL ELEVATED PLATFORM, OR OTHER DESIGN MUTUALLY AGREED UPON BY THE CUSTOMER AND DUKE ENERGY. IF A STEEL STRUCTURE IS EMPLOYED, IT MUST BE BONDED TO THE TRANSFORMER GROUND. IN ALL CASES, THE TRANSFORMER SHALL BE PLACED ON A CONCRETE SURFACE THAT IS FLAT, SMOOTH, AND LEVEL WITHIN 1 INCH IN ALL DIRECTIONS. SEE FIGURE 115A FOR THE PLAN VIEW DIMENSIONS OF THE ELEVATED PAD SURFACE.

5. MATERIALS AND LABOR: THE CUSTOMER SHALL PROVIDE ALL MATERIALS AND LABOR NECESSARY TO INSTALL THE ELEVATED PAD STRUCTURE. THIS INCLUDES: EXCAVATION, BACKFILLING, INSTALLATION OF CONDUIT AND CONDUIT ACCESSORIES, BUILDING FORMS, POURING AND FINISHING CONCRETE, ETC.

6. CONDUIT: THE CUSTOMER SHALL INSTALL, OWN, AND MAINTAIN THE CONDUIT SYSTEM INCLUDING DUCT, MANHOLES, CABLE PITS, AND TRANSFORMER FOUNDATIONS, ETC. CONDUIT SHALL BE INSTALLED IN ACCORDANCE WITH DUKE ENERGY STANDARDS. THE CONDUIT SHALL BE SCHEDULE 40 PVC SUITABLE FOR USE WITH UNDERGROUND ELECTRIC DISTRIBUTION CABLES RATED AT 90°C. ALL CONDUITS SHALL HAVE A UL LISTING AND A SCHEDULE 40 (SCH 40) RATING CLEARLY PRINTED ON THE EXTERIOR SURFACE. DUKE ENERGY WILL SPECIFY THE INSIDE DIAMETER SIZE OF THE PRIMARY CABLE CONDUITS. ALL BENDS SHALL BE 90° "SWEEP" BENDS WITH A MINIMUM RADIUS OF 36". CONDUIT MAY BE DIRECT BURIED IF LOCAL PERMITTING AUTHORITIES ALLOW DIRECT BURIED CONDUIT SYSTEMS. VERTICAL RUNS OF CONDUIT UP TO THE ELEVATED PLATFORM MUST BE IN A CONCRETE-ENCASED, REINFORCED, AND SUPPORTED DUCT BANK. ALL CONDUITS SHALL HAVE A PULL STRING INSTALLED. ALL CONDUITS SHALL BE CAPPED TO PREVENT DEBRIS FROM ENTERING THE CONDUIT.

7. THE MAXIMUM NUMBER OF SERVICE CONDUITS ENTERING INTO THE SECONDARY AREA OF THE PAD OPENING SHALL BE 12 (4" DIA.) UNLESS SPECIFICALLY APPROVED BY ENGINEERING AND CONSTRUCTION PLANNING.

8. UNLESS THE METER IS MOUNTED DIRECTLY ON THE SIDE OF THE TRANSFORMER, CUSTOMER MUST PROVIDE A 2" SCHEDULE 40 PVC CONDUIT FROM THE SECONDARY AREA OF THE PAD OPENING AND STUB UP AND CAP AT THE METER LOCATION. THE CUSTOMER MUST PROVIDE ACCESS TO DUKE ENERGY'S METER IF THE METER IS LOCATED ON TOP OF THE ELEVATED STRUCTURE.

9. THE CUSTOMER MUST PROVIDE A 1" SCHEDULE 40 PVC CONDUIT FOR A GROUND WIRE FROM THE PRIMARY AREA OF THE PAD OPENING AND STUB AND CAP AT A LOCATION 8" BELOW FINAL GRADE OUTSIDE OF THE ELEVATED STRUCTURE FOOTPRINT WHERE DUKE ENERGY WILL INSTALL A GROUND ROD.

10. FOR TRANSFORMERS LARGER THAN 2500 KVA, CONTACT DISTRIBUTION STANDARDS FOR ELEVATED SURFACE DIMENSIONS.

DUKE ENERGY.

3				
2				
1				
0	2/21/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CHK'D	APPR.

CUSTOMER-INSTALLED ELEVATED PADS FOR THREE-PHASE PAD-MOUNTED TRANSFORMER NOTES

DEC	DEM	DEP	DEF
	X		

FIG 115B

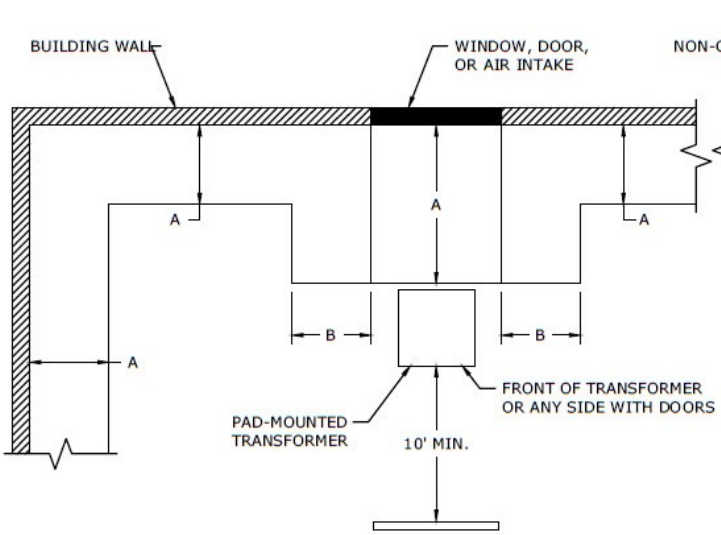


FIGURE 1
ALLOWABLE CLEARANCES

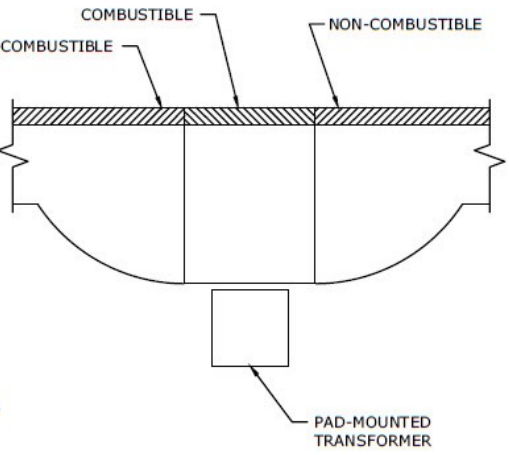


FIGURE 2
BUILDING CONSTRUCTION WITH
COMBUSTIBLE AND NON-COMBUSTIBLE
MATERIAL (SEE NOTE 5)

TYPE OF CONSTRUCTION	DIMENSION A: CLEARANCE EXTENDING OUT FROM BUILDING (FT)	DIMENSION B: SIDE CLEARANCE MEASURED FROM EDGE OF WINDOW, DOOR, ETC. (FT)
NON-COMBUSTIBLE WALLS	3	N/A
COMBUSTIBLE WALLS	10	N/A
DOORS	20	10
WINDOWS (FIRST STORY)	10	10
WINDOWS (SECOND STORY)	REFER TO WALL TYPE	REFER TO WALL TYPE
AIR INTAKES	10	10
FIRE ESCAPES	20	20

NOTES:

1. ADEQUATE PASSAGEWAYS TO ACCOMMODATE CRANES, LINE TRUCKS, OR OTHER NECESSARY LIFTING AND HAULING EQUIPMENT SHALL BE PROVIDED TO ALLOW FOR MAINTENANCE, OPERATION, OR REPLACEMENT.
2. DISTANCES ARE FROM THE PAD OR TRANSFORMER CASING, WHICHEVER IS CLOSER TO THE BUILDING OR OPENING.
3. IF THE BUILDING HAS AN OVERHANG, THE DISTANCE IS MEASURED FROM THE OUTSIDE EDGE OF THE OVERHANG.
4. OUTSIDE WALKWAYS OR STAIRS ATTACHED TO THE BUILDING SHALL BE CONSIDERED AS PART OF THE BUILDING.
5. IF A BUILDING IS CONSTRUCTED OF BOTH COMBUSTIBLE AND NON-COMBUSTIBLE MATERIALS, NO PART OF THE PAD-MOUNTED TRANSFORMER CAN BE WITHIN THE ALLOWABLE DISTANCE FOR THE COMBUSTIBLE MATERIALS IN ANY DIRECTION.
6. DISTANCES LESS THAN THOSE SPECIFIED MAY BE ALLOWED IF APPROVED BY THE APPROPRIATE CODE ENFORCEMENT AUTHORITY, BUT IN NO CASE SHALL DISTANCES TO A BUILDING BE LESS THAN 3 FT. THIS MAY REQUIRE ALTERNATE MEANS OF FIRE PROTECTION INCLUDING FIRE BARRIERS, FIRE RATED WALLS, OIL CONTAINMENT MEANS, OR OTHER APPROVED MEASURES.
7. FIRE-RATED WALLS AROUND TRANSFORMERS MUST BE A MINIMUM OF 1'-0" ABOVE THE ANTICIPATED HEIGHT OF THE INSTALLED TRANSFORMER. NO WALL, WHETHER FOR FIRE PROTECTION OR AESTHETIC PURPOSES, CAN BE HIGH ENOUGH TO PREVENT DUKE ENERGY'S INSTALLATON AND FUTURE MAINTENANCE OF THE TRANSFORMER WITH STANDARD EQUIPMENT AND LIFTING DEVICES AS DETERMINED BY DUKE ENERGY.
8. FINAL GRADE AT THE LOCATION OF THE PAD-MOUNTED TRANSFORMER SHALL PROVIDE FOR MINERAL OIL TO DRAIN FROM THE BUILDING. OTHERWISE, AN OIL CONTAINMENT MEANS IS REQUIRED.
9. CLEARANCES LISTED ARE DUKE ENERGY MINIMUM REQUIREMENTS. THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) MAY HAVE REQUIREMENTS THAT ARE MORE STRINGENT. IT SHALL BE THE CUSTOMER'S RESPONSIBILITY TO CONFORM TO ALL LOCAL BUILDING CODES, INSURANCE REGULATIONS, OR ORDINANCES AFFECTING THE TRANSFORMER LOCATION.

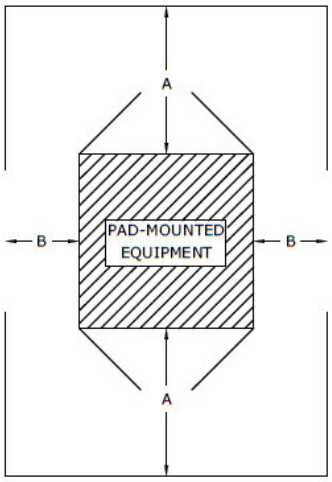
DUKE ENERGY.

3				
2				
1				
0	12/31/15	EANES	FLETCHER	ADCOCK
REVISED		BY	CK'D	APPR.

PAD-MOUNTED TRANSFORMER CLEARANCES
FROM BUILDINGS

DEC	DEM	DEP	DEF
	X		

FIG 120



MINIMUM CLEAR WORKING SPACE AROUND PAD-MOUNTED EQUIPMENT		
TYPE OF PAD-MOUNTED EQUIPMENT	DIMENSION A DOOR SIDES (FT)	DIMENSION B (FT)
TRANSFORMERS (SEE NOTE 4)	10	3
SWITCHGEAR (SEE NOTE 3)	10	5
RECLOSERS, PRIMARY METERS, ETC.	10	3

MISCELLANEOUS CLEARANCES	
TYPE OF EQUIPMENT	CLEARANCE IN ANY DIRECTION (FT)
FUEL OR GAS DISPENSERS	20
CONTAINERS STORING FLAMMABLE LIQUID OR GAS	10
CUSTOMER-OWNED GENERATORS OR TRANSFORMERS	10
FIRE HYDRANTS	SEE NOTE 6
NATURAL GAS METERS	3

NOTES:

1. ADEQUATE PASSAGEWAYS TO ACCOMMODATE CRANES, LINE TRUCKS, OR OTHER NECESSARY LIFTING AND HAULING EQUIPMENT SHALL BE PROVIDED TO ALLOW FOR MAINTENANCE, OPERATION, OR REPLACEMENT.
2. DISTANCES ARE FROM THE PAD OR SURFACE MOUNTED EQUIPMENT, WHICHEVER IS CLOSER TO THE OBJECT IN QUESTION.
3. A MINIMUM CLEAR WORKING SPACE OF 5 FT MUST BE MAINTAINED FROM EACH NON-DOOR SIDE OF THE EQUIPMENT (TO ACCOMMODATE CONTROL CABINETS, ETC.).
4. WHERE A METER IS MOUNTED TO A TRANSFORMER, A CLEAR SPACE AROUND THE METER OF AT LEAST 3 FT WIDE, 4 FT DEEP, AND 8 FT HIGH MUST BE PROVIDED AND ALWAYS AVAILABLE FOR READING, INSPECTING, TESTING, AND MAINTENANCE OPERATIONS.
5. DISTANCES LESS THAN THOSE SPECIFIED MAY BE ALLOWED IF APPROVED BY THE APPROPRIATE CODE ENFORCEMENT AUTHORITY. THIS MAY REQUIRE ALTERNATE MEANS OF FIRE PROTECTION INCLUDING FIRE BARRIERS, FIRE RATED WALLS, SPRINKLER SYSTEMS, OIL CONTAINMENT MEANS, OR OTHER APPROVED MEASURES.
6. 4 FT, MAY BE REDUCED TO 3 FT BY AGREEMENT WITH LOCAL FIRE AUTHORITY.

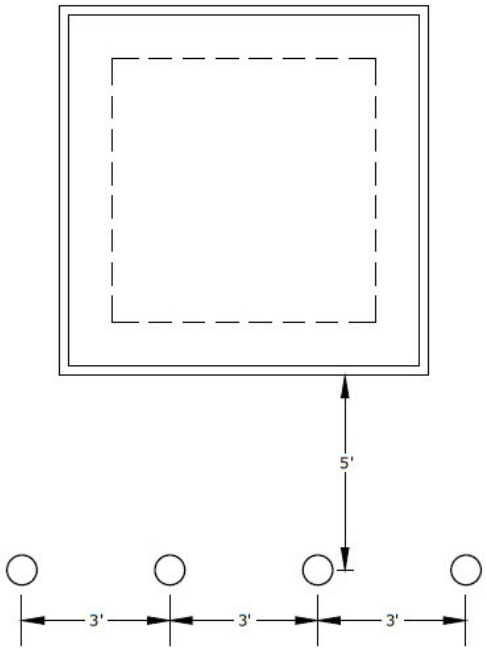
DUKE ENERGY.

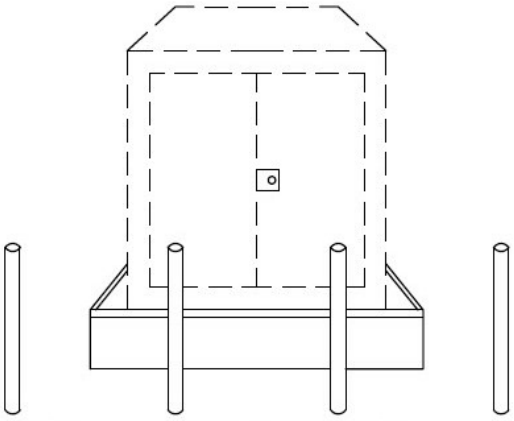
3				
2				
1				
0	2/21/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

PAD-MOUNTED EQUIPMENT WORKING SPACE AND MISCELLANEOUS CLEARANCES

DEC	DEM	DEP	DEF
	X		

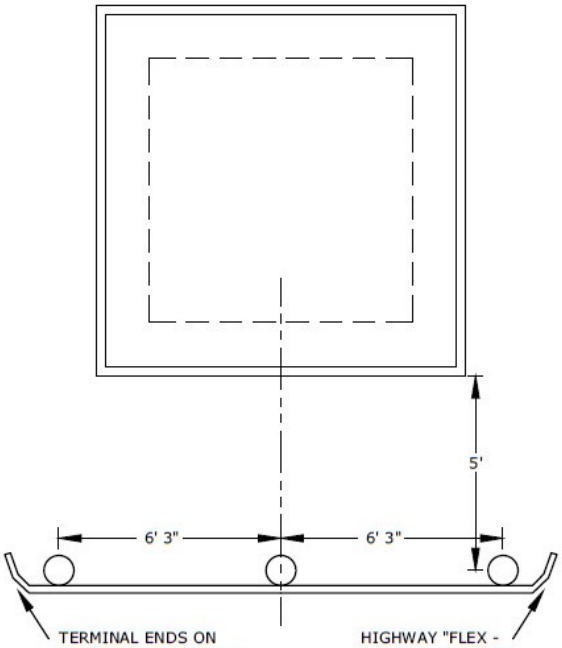
FIG 121





BOLLARDS MAY BE 4' TO 6' STEEL PIPE. ALL MUST BE FILLED WITH CONCRETE.

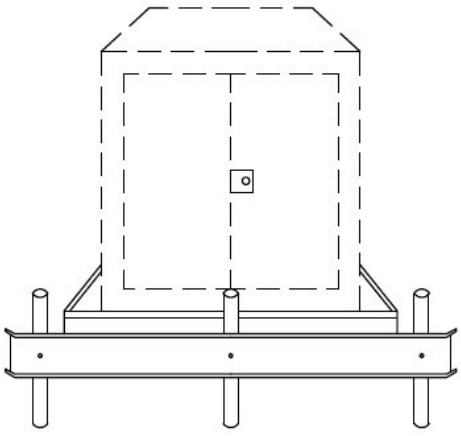
HEIGHT OF BOLLARDS WILL VARY DEPENDING ON THE INSTALLATION.



TERMINAL ENDS ON GUARD RAIL BARRIERS ARE OPTIONAL

HIGHWAY "FLEX - BEAM" GUARDRAIL (10 OR 12 GA.)

GUARD POSTS MUST BE SPACED TO ALLOW UNRESTRICTED ACCESS TO THE PRIMARY COMPARTMENT OF THE TRANSFORMER. SEE DRAWINGS 52 & 53 FOR PROPER SPACING AND PLACEMENT.



PROTECTIVE POSTS OR BARRIERS MAY ALSO BE REQUIRED ALONG THE SIDES OF DUKE ENERGY OWNED PADMOUNT EQUIPMENT. SIDE PROTECTION SHALL BE LOCATED AT LEAST 3 FEET AWAY FROM THE BACK OR SIDES OF THE EQUIPMENT CABINET OR AS DIRECTED BY THE DUKE ENERGY REPRESENTATIVE.

SEE FIGURE 122B FOR BOLLARD DETAILS AND NOTES

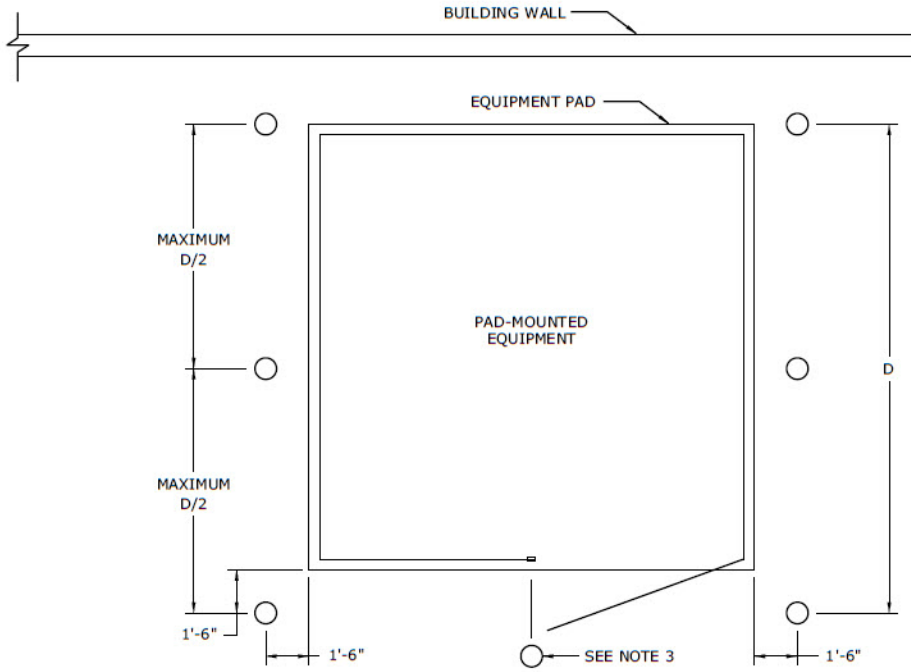
DUKE ENERGY.

3				
2				
1				
0	7/10/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

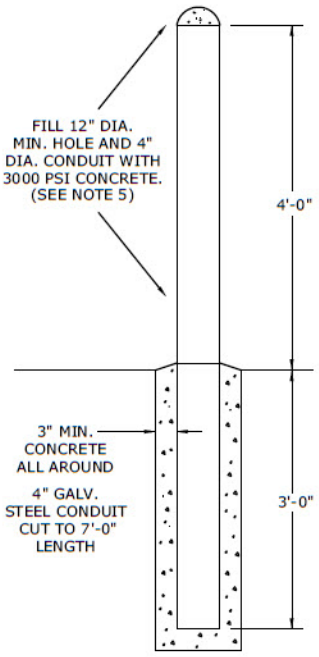
CONSTRUCTION DETAILS FOR PROTECTING PAD-MOUNTED EQUIPMENT

DEC	DEO/K	DEP	DEF
	X		

FIG 122A



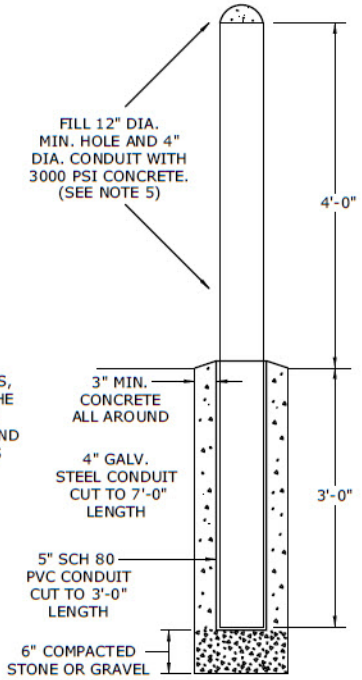
PLAN VIEW



STANDARD BOLLARD

NOTES:

1. PROTECTIVE POLES CAN BE INSTALLED ON ALL SIDES OF PAD-MOUNTED EQUIPMENT THAT ARE SUBJECT TO REGULAR VEHICLE TRAFFIC. THEIR USE IS AT THE DISCRETION OF LOCAL ENGINEERING AND WILL BE THE CUSTOMER'S RESPONSIBILITY TO PROVIDE AND INSTALL AFTER ALL REASONABLE EFFORTS TO LOCATE THE PAD-MOUNTED EQUIPMENT ELSEWHERE HAVE BEEN EXHAUSTED.
2. POLES SHOULD BE EVENLY SPACED ALONG THE SIDES OF THE PAD-MOUNTED EQUIPMENT, NO WIDER THAN HALF THE DIMENSION OF THE SIDE THEY ARE PROTECTING. EXCEPTIONS TO THIS ALONG SIDES WITH DOORS ARE ALLOWED IN ORDER TO ACCOMMODATE NOTE 3.
3. ON ANY SIDE OF PAD-MOUNTED EQUIPMENT WITH DOORS, THIS POLE SHOULD BE CENTRALLY LOCATED BETWEEN THE DOORS AND MUST ACCOMMODATE THE DOOR SWING OF THE EQUIPMENT. IT SHALL BE EITHER REMOVABLE BY HAND OR COLLAPSIBLE. REMOVABLE OR COLLAPSIBLE DESIGNS OTHER THAN WHAT ARE SHOWN MUST BE APPROVED BY LOCAL ENGINEERING.
4. POLES LOCATED ON ANY SIDE OF PAD-MOUNTED EQUIPMENT SHALL NOT INTERFERE WITH THE SAFE OPERATION AND EXPECTED MAINTENANCE OR REPLACEMENT OF THAT EQUIPMENT.
5. POLES SHALL BE PAINTED YELLOW OR OUTFITTED WITH A YELLOW BOLLARD COVER OR POST SLEEVE.
6. ALL POLES SHALL HAVE A 2" REFLECTIVE TAPE APPLIED EITHER AROUND THE TOP OF THE BOLLARD OR EXTENDING VERTICALLY DOWN THE LENGTH OF THE BOLLARD FOR 24". VERTICAL APPLICATIONS MUST BE ON THE SIDE FACING ANY ANTICIPATED TRAFFIC.



REMOVABLE BOLLARD

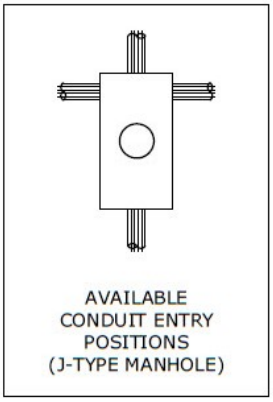
REVISED	BY	CK'D	APPR.
3				
2				
1	5/30/19	DIETERLE	BRUINS	ADCOCK
0	2/25/19	DIETERLE	BRUINS	ADCOCK

PROTECTIVE BOLLARD DETAILS AND NOTES

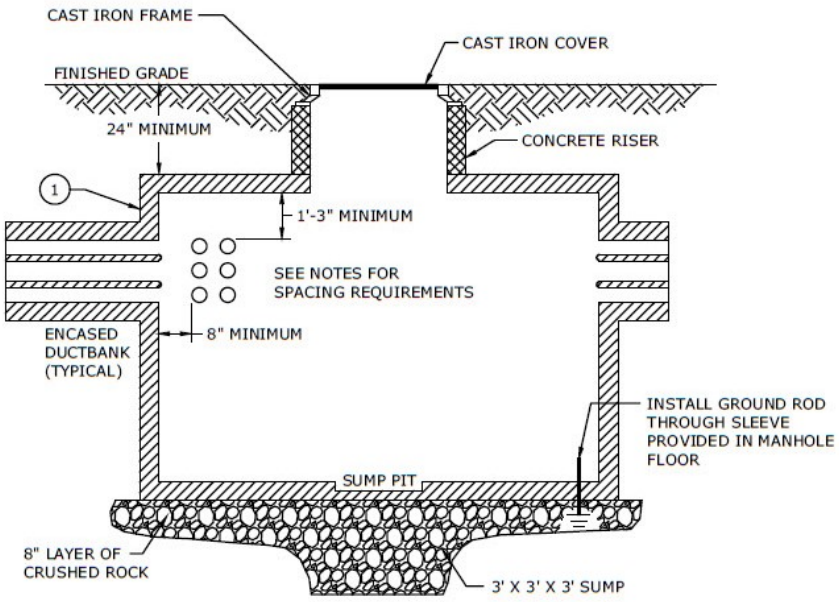
DUKE ENERGY.

DEC	DEM	DEP	DEF
	X		

FIG 122B



AVAILABLE
CONDUIT ENTRY
POSITIONS
(J-TYPE MANHOLE)



STANDARD DUKE ENERGY MANHOLE SIZES	
FOR STRAIGHT LINE URD SYSTEMS (CONCENTRIC NEUTRAL CABLES)	8L X 4W X 7D
FOR CORNERS IN URD (CONCENTRIC NEUTRAL CABLES, SMALLER THAN 500MCM)	10L X 5W X 7D
FOR LARGER POWER CABLE SYSTEMS (LARGER THAN 500MCM CABLES)	12L X 6W X 7D

NOTES:

1. CONTACT DISTRIBUTION ENGINEERING FOR DUKE ENERGY PRE-APPROVED SUPPLIERS. DELIVERY TO THE JOBSITE AND PLACEMENT IN THE EXCAVATION AREA ARE INCLUDED IN THE PURCHASE PRICE. CUSTOMER TO COORDINATE DELIVERY OF THE MANHOLE BASED ON JOB SCHEDULE.
2. THE BOTTOM OF THE EXCAVATION FOR THE PRECAST MANHOLE SHALL BE FILLED WITH A LEVEL AREA OF 8" THICK LAYER OF CRUSHED ROCK. A SUMP OR "FRENCH DRAIN", 3 FT SQUARE AND 3 FT DEEP AND FILLED WITH GRAVEL MUST BE PLACED UNDER THE SUMP HOLE KNOCKOUT IN THE MANHOLE. THE SUMP HOLE MUST BE OPENED AFTER THE MANHOLE IS SET.
3. ALL PRECAST MANHOLES ARE CONFIGURED AS CORNER MANHOLES (TYPE "J"). IN ADDITION TO DUCT TERMINATORS FOR SIX (6) 6" DUCTS IN EACH END, THERE ARE SIX (6) 6" DUCT TERMINATORS IN BOTH ENDS OF THE MANHOLE.
4. MANHOLES COME WITH GALVANIZED STEEL CABLE RACKS AND ARMS THAT MOUNT TO INSERTS PRE-INSTALLED IN THE WALLS. SEE DISTRIBUTION ENGINEERING FOR CABLE RACKING DETAILS.
5. MANHOLE COVERS IN OHIO AND KENTUCKY MUST IDENTIFY THE OWNER OF THE MANHOLE. INDIANA INSTALLATIONS MAY USE A LID MARKED "ELECTRIC". SEE DISTRIBUTION ENGINEERING FOR MORE DETAILS.
6. MANHOLE CHIMNEYS, GRADE RING RISERS, INFRA-RISERS AND MANHOLE COVER FRAME MAY BE USED TO FILL THE GAP BETWEEN THE TOP OF THE MANHOLE AND FINISHED GRADE. SEE DISTRIBUTION ENGINEERING FOR MORE DETAILS.
7. EIGHT (8) ROLLS OF MANHOLE SEALANT (14.5 FT IN LENGTH) ARE PROVIDED WITH EACH PRE-CAST MANHOLE INSTALLATION. SEALANT IS TO BE PLACED AT JOINTS BETWEEN THE CONCRETE SECTIONS AND CONCRETE RISERS.

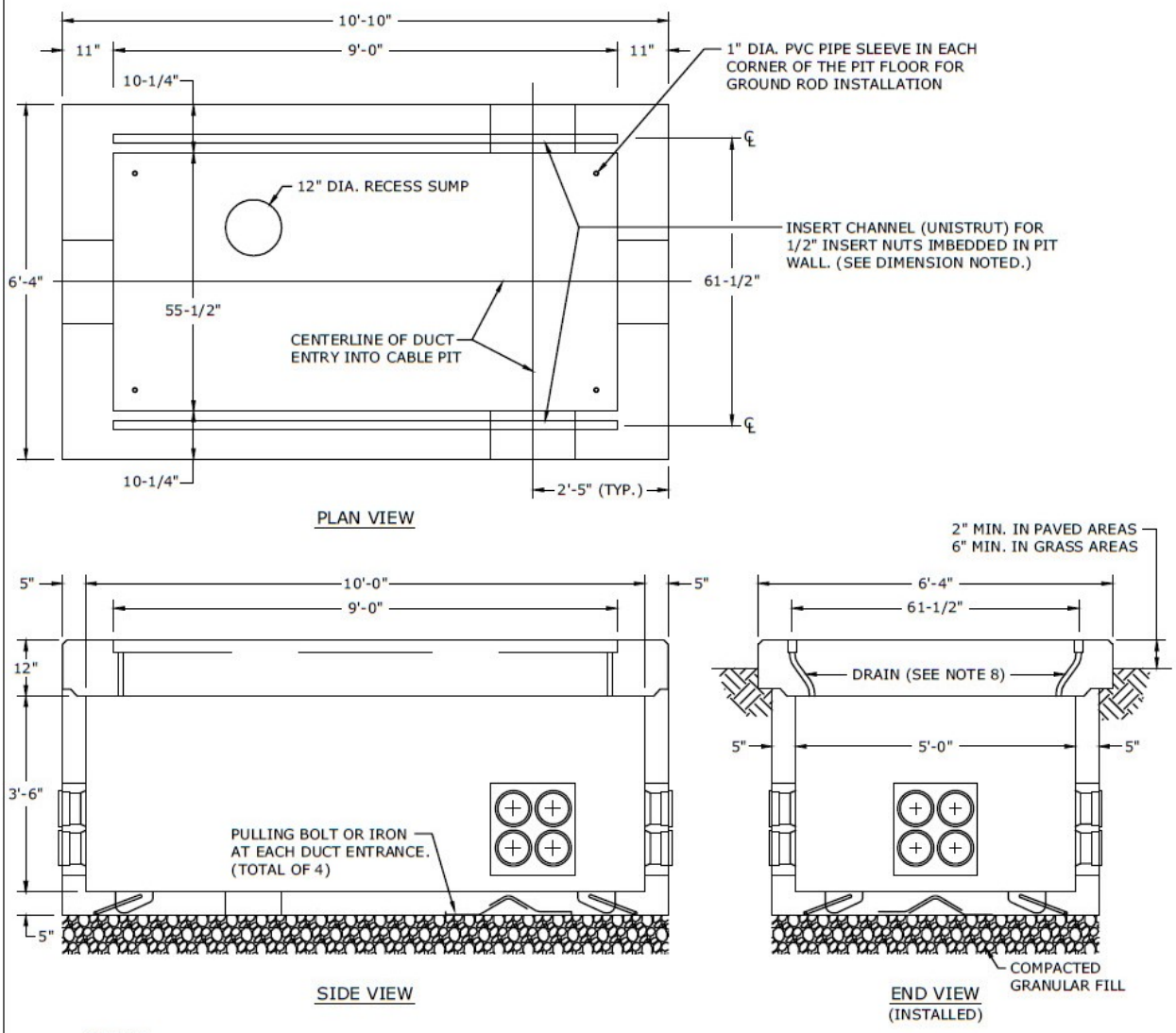
DUKE ENERGY.

3				
2				
1				
0	3/18/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

MANHOLES - PRECAST

DEC	DEM	DEP	DEF
	X		

FIG 125



NOTES:

1. THE INTERIOR (OPEN) DIMENSIONS FOR THE PRE-CAST CABLE PIT ARE APPROXIMATELY 5 FT. WIDE X 10 FT. LONG X 4'-6" DEEP. HOWEVER, THE CLEAR OPENING AT THE TOP WHERE THE EQUIPMENT IS POSITIONED MUST BE 9 FT. LONG TO ENSURE PROPER FIT FOR THE COVER PLATES.
2. EACH LONG WALL HAS A 9 FT. SECTION OF IMBEDDED UNISTRUT ALONG THE LENGTH OF THE OPENING. THESE UNISTRUT CHANNELS MUST BE LOCATED 61-1/2" APART CENTER TO CENTER.
3. THE BOTTOM OF THE EXCAVATION FOR THE PRECAST CABLE PIT MUST BE LEVEL WITH A MINIMUM OF 8" OF COMPACTED GRANULAR FILL. A SUMP OR FRENCH DRAIN 3 FT. SQUARE AND 3 FT. DEEP WITH GRAVEL FILL IS TO BE PROVIDED UNDER THE SUMP HOLE KNOCKOUT IN THE FLOOR OF THE CABLE PIT.
4. WALLS AND FLOORS MUST BE OF A THICKNESS SUCH THAT THE CABLE PIT IS STRUCTURALLY SOUND AND CAPABLE OF CARRYING THE WEIGHT OF THE SWITCHGEAR (2000 LBS. MAXIMUM).
5. THERE ARE (4) 1" I.D. PVC PIPE SLEEVES THROUGH THE FLOOR LOCATED APPROXIMATELY 1 FT. FROM EACH CORNER FOR INSTALLING GROUND RODS.
6. THERE ARE (4) DUCT ENTRY POINTS, ONE AT EACH SIDE AS SHOWN. MANUFACTURER IS TO PROVIDE KNOCKOUTS, SLEEVES, OR INSERTS TO ACCOMMODATE (4) 6" I.D. SCH. 40 PVC DUCTS AT EACH ENTRY LOCATION.
7. INDIVIDUAL CONDUITS ARE TO BE SEPARATED BY 4" (OUTSIDE TO OUTSIDE) WHERE THEY ENTER THE PIT. END OF CONDUIT TO BE TERMINATED IN A BELL END FITTING THAT IS FINISHED FLUSH WITH THE INSIDE WALL OF THE CABLE PIT.
8. 3/4" PVC DRAIN IS PROVIDED AT EACH CORNER TO ALLOW WATER TO DRAIN FROM UNISTRUT INTO CABLE PIT.

DUKE ENERGY.

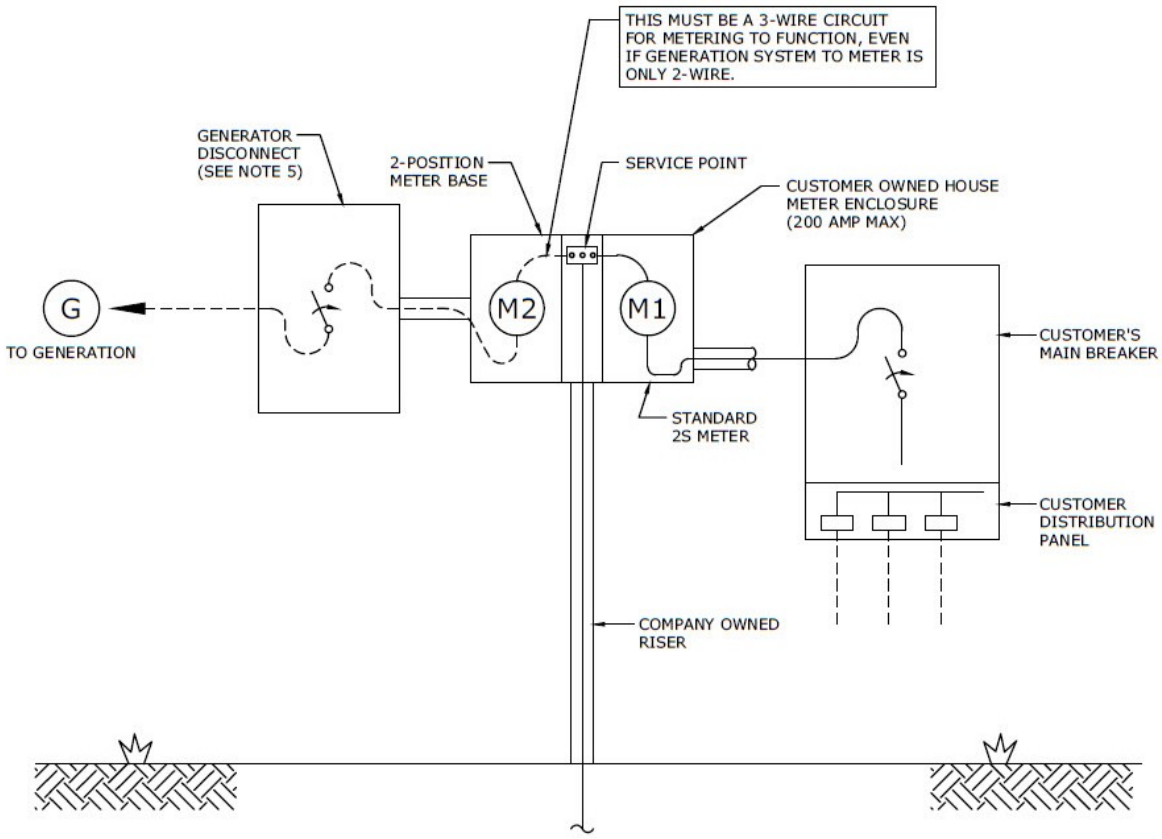
3					
2					
1					
0	7/31/17	GORLEY	EANES	ADCOCK	
REVISED		BY	CK'D	APPR.	

SWITCHGEAR CABLE PIT

FOR PAD-MOUNTED EQUIPMENT

DEC	DEM	DEP	DEF
	X		

FIG 127

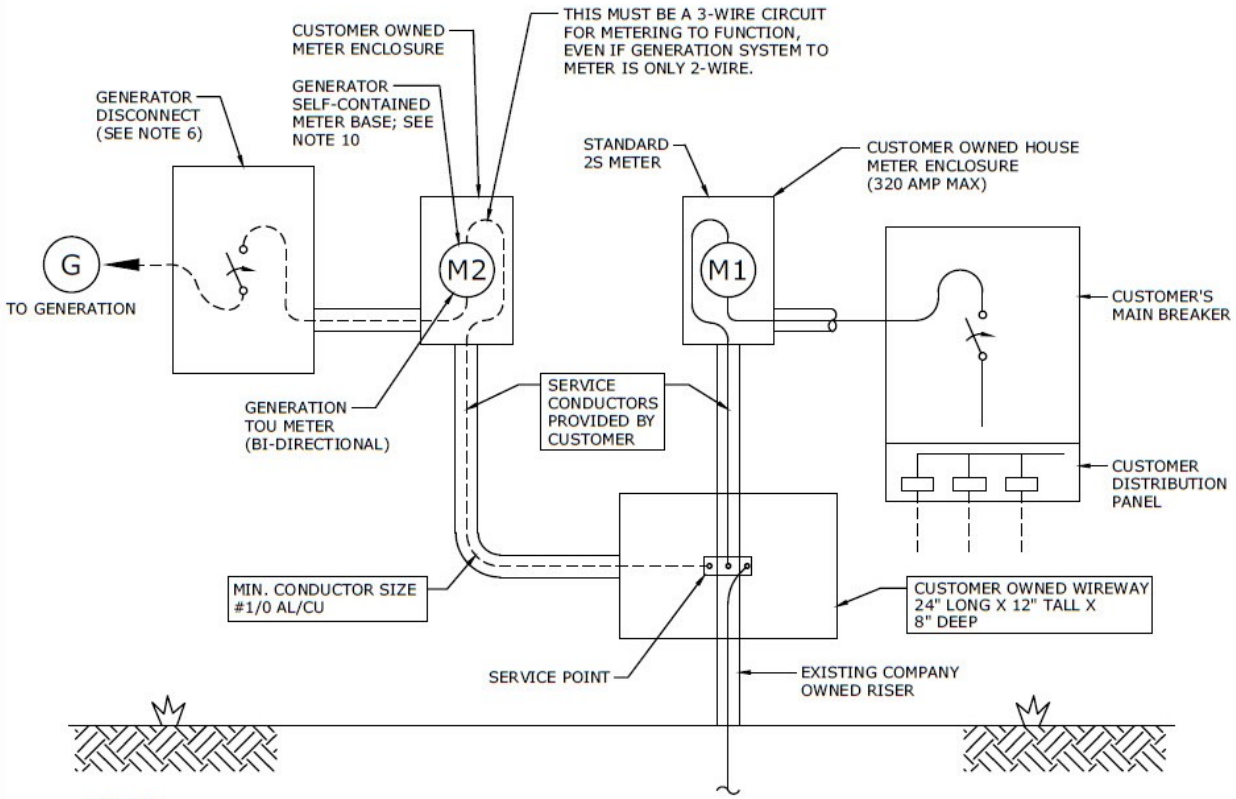


NOTES:

1. USE THIS WIRING METHOD FOR A SMALL POWER PRODUCER (USUALLY A PHOTOVOLTAIC SYSTEM) WHO SELLS ENTIRE OUTPUT OF GENERATION TO DUKE ENERGY.
2. PREFERRED CONFIGURATION FOR 200 AMP HOUSE SERVICE IS A 2-POSITION METER BASE AS SHOWN ABOVE. IF THE HOUSE SERVICE REQUIRES A 320 AMP METER, THEN A SEPARATE WIREWAY AND TWO SEPARATE METER BASES ARE REQUIRED (SEE FIGURE 131). THE HOUSE METER BASE SHALL BE RATED 320 AMPS AND THE GENERATION SYSTEM METER BASE SHALL BE RATED 200 AMPS. COMPANY TO CONNECT CONDUCTORS IN WIREWAY USING CONNECTOR BLOCKS.
3. FOR SELL ALL METERS, METERING WILL INSTALL A BI-DIRECTIONAL METER.
4. ALL SMALL POWER PRODUCER INSTALLATIONS SHALL HAVE WARNING LABELS PLACED AT METER AND AT GENERATOR DISCONNECT.
5. CUSTOMER OWNED DISCONNECT MUST BE ADJACENT TO METER, LOAD-BREAK RATED, LOCKABLE IN **OPEN** POSITION AND PROVIDE A "VISIBLE OPENING".
6. GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.

DUKE ENERGY.

					SELL-ALL GENERATION - SINGLE-PHASE SELF-CONTAINED PREFERRED CONFIGURATION SERVICE ADDING GENERATION METER, SELF-CONTAINED	DEC	DEM	DEP	DEF
3									
2									
1							X		
0	12/13/17	DIETERLE	BRUINS	ADCOCK		FIG 130			
REVISED		BY	CK'D	APPR.					



NOTES:

1. USE THIS WIRING METHOD FOR A SMALL POWER PRODUCER (USUALLY A PHOTOVOLTAIC SYSTEM) WHO SELLS ENTIRE OUTPUT OF GENERATION TO COMPANY.
2. FOR SELL-ALL CONFIGURATIONS, A BI-DIRECTIONAL METER WILL BE INSTALLED.
3. ALL SMALL POWER PRODUCER INSTALLATIONS SHALL HAVE WARNING LABELS PLACED AT METER AND AT GENERATOR DISCONNECT.
4. CUSTOMER'S ELECTRICIAN MUST MAKE ARRANGEMENTS WITH COMPANY FOR A CLEARANCE ON EXISTING SERVICE, REMOVE COMPANY-OWNED RISER, INSTALL WIREWAY AND RECONNECT RISER ABOVE AND BELOW WIREWAY.
5. COMPANY TO CONNECT CONDUCTORS IN WIREWAY USING CONNECTOR BLOCKS.
6. CUSTOMER OWNED DISCONNECT MUST BE ADJACENT TO METER, LOAD-BREAK RATED, LOCKABLE IN **OPEN** POSITION AND PROVIDE A "VISIBLE OPENING".
7. GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.
8. PREFERRED CONFIGURATION FOR 200 AMP HOUSE SERVICE AND 200 AMP PV LOAD IS A 2-GANG METER ENCLOSURE AS SHOWN IN FIGURE 130, BUT CUSTOMER MAY USE THIS ALTERNATE CONFIGURATION AS AN OPTION. IF HOUSE SERVICE IS 320 AMP, THEN THIS ALTERNATE CONFIGURATION MUST BE UTILIZED FOR GENERATION CONNECTION.
9. FOR VERY CONFINED SPACES (NO ROOM FOR WIREWAY), CUSTOMER CAN INSTALL DOUBLE LUGS ON SOURCE SIDE OF METER ENCLOSURE (SIZE #4 - 500 KCMIL) FOR COMPANY CONDUCTORS AND SIZED TO FIT GENERATOR CONDUCTORS.
10. A GENERATOR SELF-CONTAINED METER BASE IS REQUIRED WHEN THE LARGEST SIZED GENERATION PROTECTION DEVICE DOES NOT EXCEED 400 AMPS. LOCATE ADJACENT TO ELECTRIC SERVICE METER.

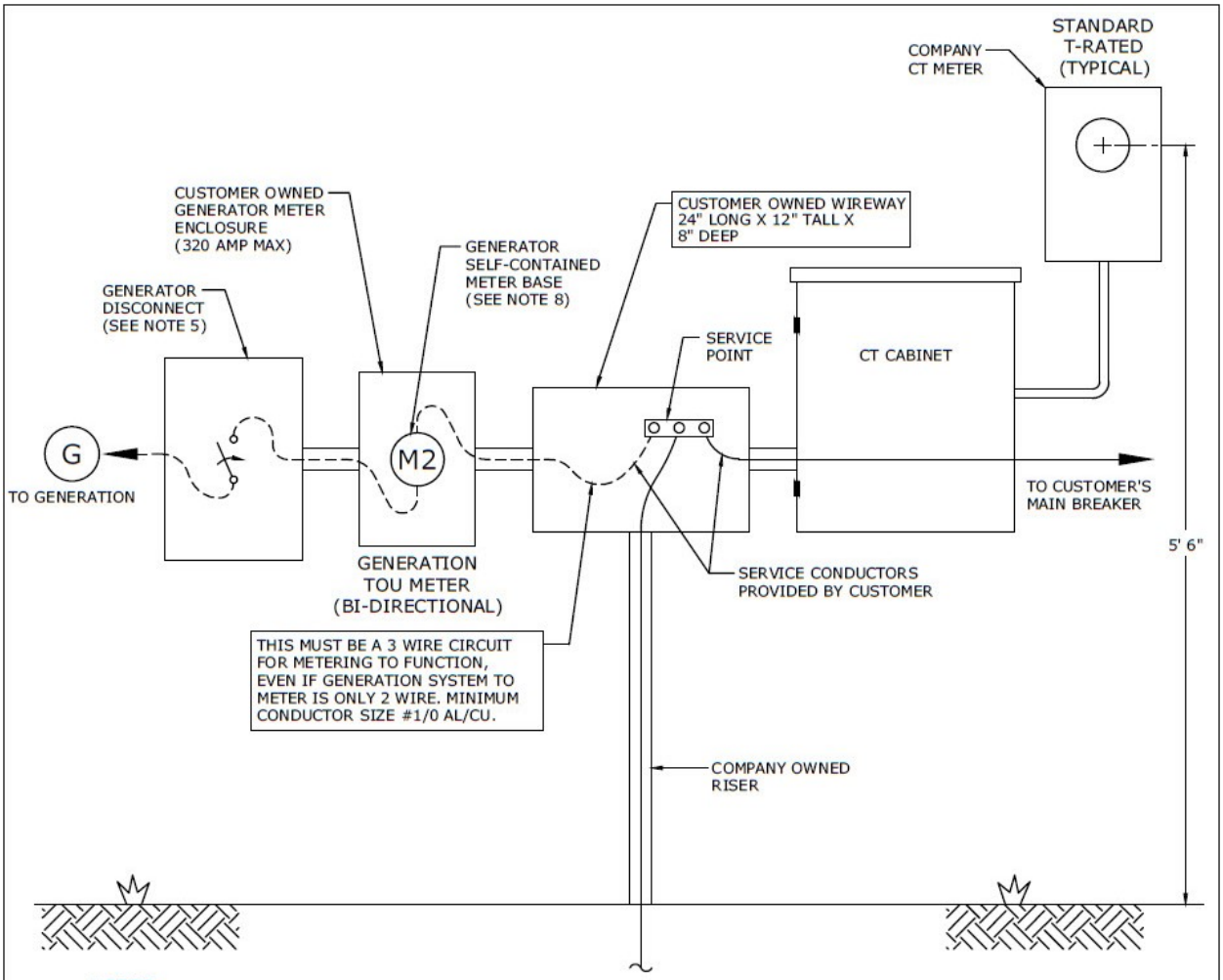
DUKE ENERGY.

REVISED		BY	CK'D	APPR.
3				
2				
1				
0	12/13/17	DIETERLE	BRUINS	ADCOCK

SELL-ALL GENERATION - SINGLE-PHASE
SELF-CONTAINED ALTERNATE CONFIGURATION SERVICE
ADDING GENERATION METER, SELF-CONTAINED

DEC	DEM	DEP	DEF
	X		

FIG 131



NOTES:

1. USE THIS WIRING METHOD FOR A SMALL POWER PRODUCER (USUALLY A PHOTOVOLTAIC SYSTEM) WHO SELLS ENTIRE OUTPUT OF GENERATION TO COMPANY.
2. COMPANY TO CONNECT CONDUCTORS IN WIREWAY USING CONNECTOR BLOCKS.
3. FOR SELL ALL METERS, METERING WILL INSTALL A STANDARD METER PROGRAMMED FOR SGS-TOU WITH ALL DATA REGISTERED AS RECEIVED.
4. ALL SMALL POWER PRODUCER INSTALLATIONS SHALL HAVE WARNING LABELS PLACED AT METER AND AT GENERATOR DISCONNECT.
5. CUSTOMER OWNED DISCONNECT MUST BE ADJACENT TO METER, LOAD-BREAK RATED, LOCKABLE IN **OPEN** POSITION AND PROVIDE A "VISIBLE OPENING".
6. GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.
7. FOR EXISTING UG T-RATED SERVICE, CUSTOMER'S ELECTRICIAN MUST MAKE ARRANGEMENTS WITH COMPANY FOR A CLEARANCE ON EXISTING SERVICE, REMOVE COMPANY SERVICE RISER, INSTALL WIREWAY AND RISER TO CT CABINET. SERVICE POINT IN WIREWAY.
8. A GENERATOR SELF-CONTAINED METER BASE IS REQUIRED WHEN THE LARGEST SIZED GENERATION PROTECTION DEVICE DOES NOT EXCEED 400 AMPS. LOCATE ADJACENT TO ELECTRIC SERVICE METER.

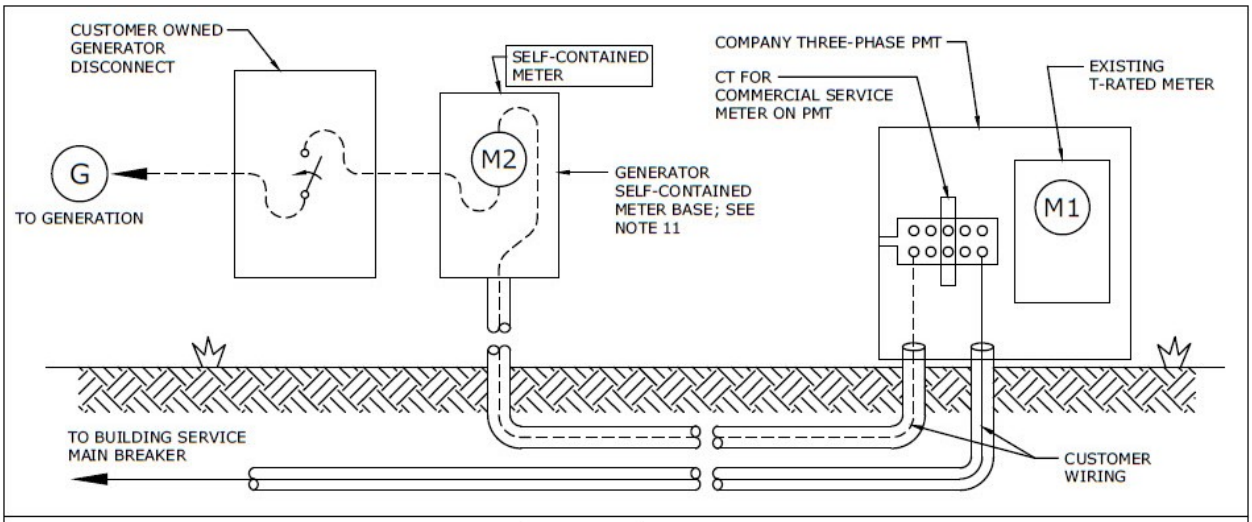
DUKE ENERGY.

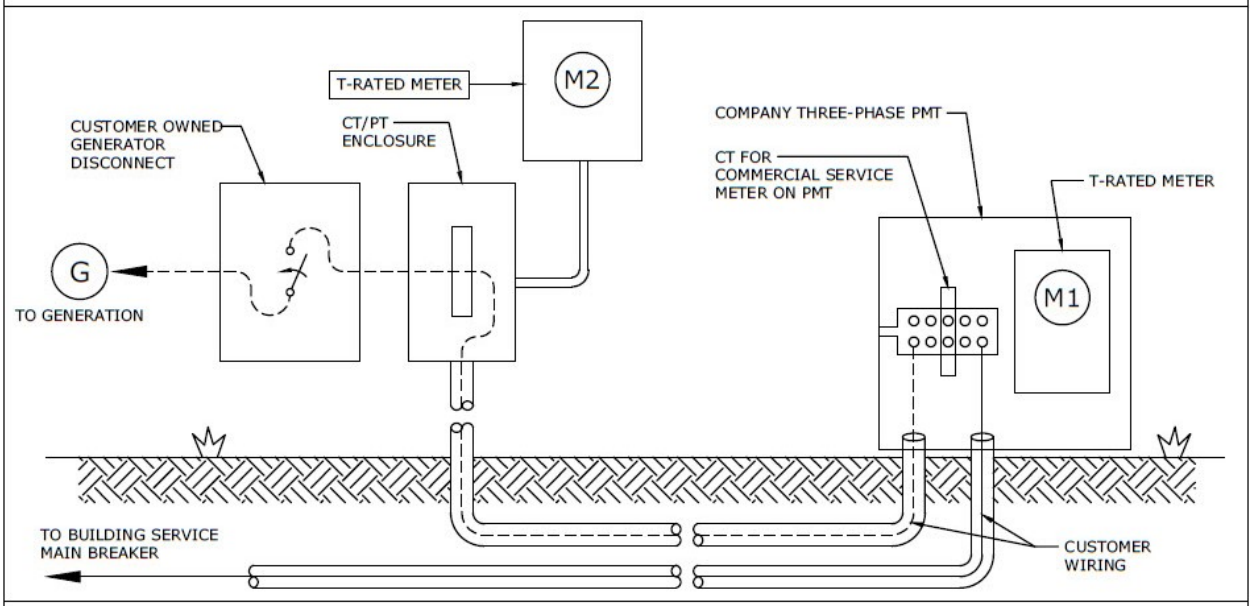
REVISED		BY	CK'D	APPR.
3				
2				
1				
0	12/13/17	DIETERLE	BRUINS	ADCOCK

SELL-ALL GENERATION
SINGLE-PHASE T-RATED SERVICE
ADDING GENERATION METER, SELF-CONTAINED

DEC	DEM	DEP	DEF
	X		

FIG 132





NOTES:

1. CUSTOMER MAIN SERVICE IS METERED ON PMT. GENERATION SERVICE IS METERED ON BUILDING AND WIRING PULLED TO PMT AND CONNECTED ON SOURCE SIDE OF CT'S IN PMT AS SHOWN.
2. TOTAL NUMBER OF CONDUCTORS (COMPANY AND CUSTOMER) CANNOT EXCEED 8 CONDUCTORS.
3. MAXIMUM CUSTOMER CONDUCTOR SIZE IS 750 KCM AL/CU.
4. BOTH ENDS OF ALL CUSTOMER CABLES MUST BE CLEARLY AND SPECIFICALLY MARKED FOR PHASE AND LABELED WITH A TAG TO IDENTIFY THE LOCATION OF THE SOURCE AND LOAD ENDS OF THE CONDUCTOR. THE LOAD END OF EACH CABLE SHALL BE LABELED TO IDENTIFY THE SOURCE. EACH SOURCE END SHALL BE LABELED TO IDENTIFY THE LOCATION OF THE LOAD END OF THE CABLE (WIREWAY NUMBER, SWITCH PANEL NUMBER, ETC.). METER ENCLOSURE MUST BE LABELED.
5. GENERATOR KVA CAPACITY CANNOT EXCEED KVA RATING OF PMT FOR T-RATED SERVICE OR 12KW FOR NETWORK SELF-CONTAINED METER.
6. WARNING LABEL TO BE PLACE AT METER AND CUSTOMER DISCONNECT.
7. SINGLE LINE CONDUCTOR SHOWN FOR CLARITY.
8. CUSTOMER OWNED DISCONNECT MUST BE ADJACENT TO METER, LOAD-BREAK RATED, LOCKABLE IN OPEN POSITION AND PROVIDE A "VISIBLE OPENING". EXCEPTION: FOR FEEDER DISCONNECTS RATED ≥1000 AMPS AT 480Y/277 VOLTS, NO VISIBLE OPEN IS REQUIRED, BUT ALL OTHER PROVISIONS MUST BE MET.
9. GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.
10. "SNAKING" OF CUSTOMER WIRING THRU EXISTING CT'S IS NOT ALLOWED.
11. A GENERATOR SELF-CONTAINED METER BASE IS REQUIRED WHEN THE LARGEST SIZED GENERATION PROTECTION DEVICE DOES NOT EXCEED 400 AMPS. LOCATE ADJACENT TO ELECTRIC SERVICE METER.

DUKE ENERGY.

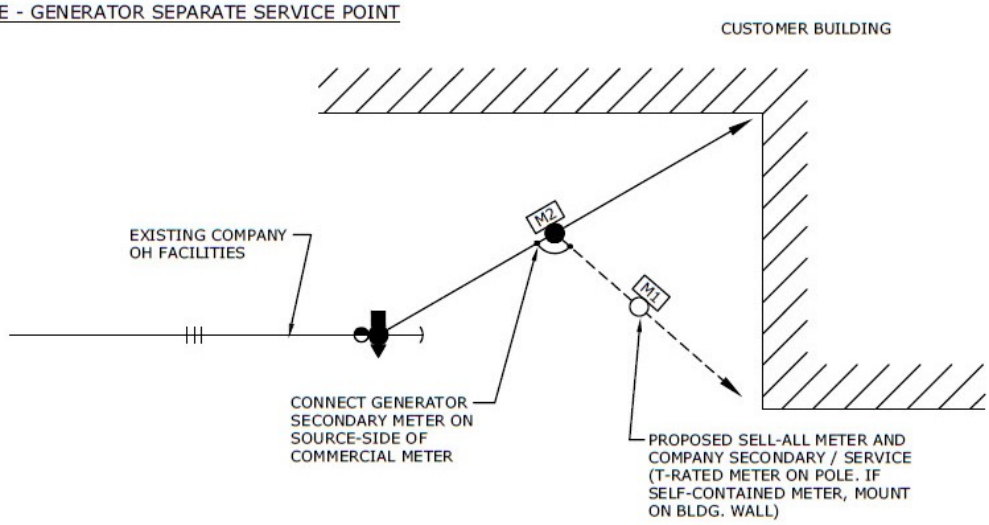
3				
2				
1				
0	12/13/17	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

SELL-ALL GENERATION
THREE-PHASE LARGE T-RATED EXISTING UG SERVICE
ADDING GENERATION METER, T-RATED OR
SELF-CONTAINED

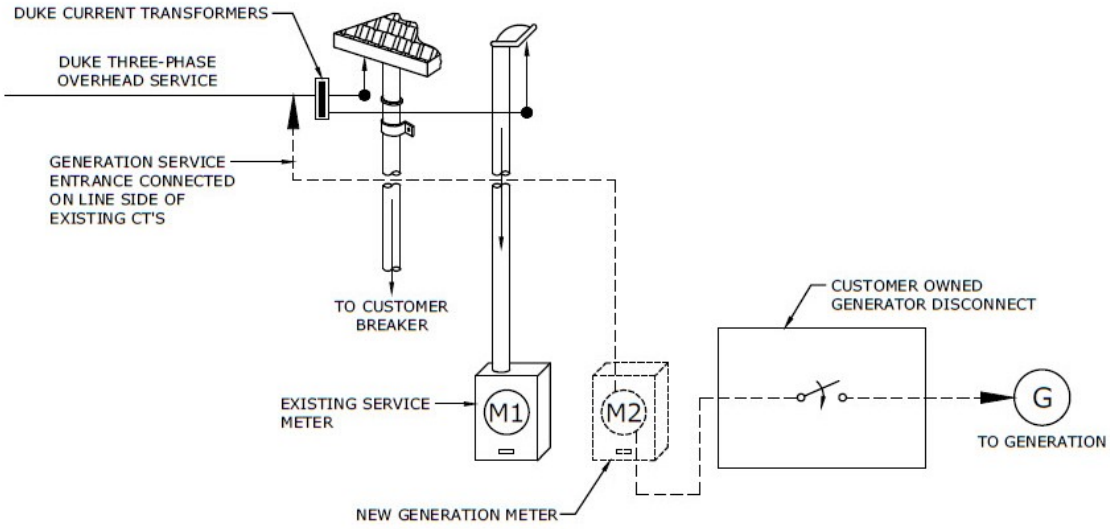
DEC	DEM	DEP	DEF
	X		

FIG 133A

OH SERVICE - GENERATOR SEPARATE SERVICE POINT



OH SERVICE - GENERATOR RISER AT EXISTING RISER



NOTES:

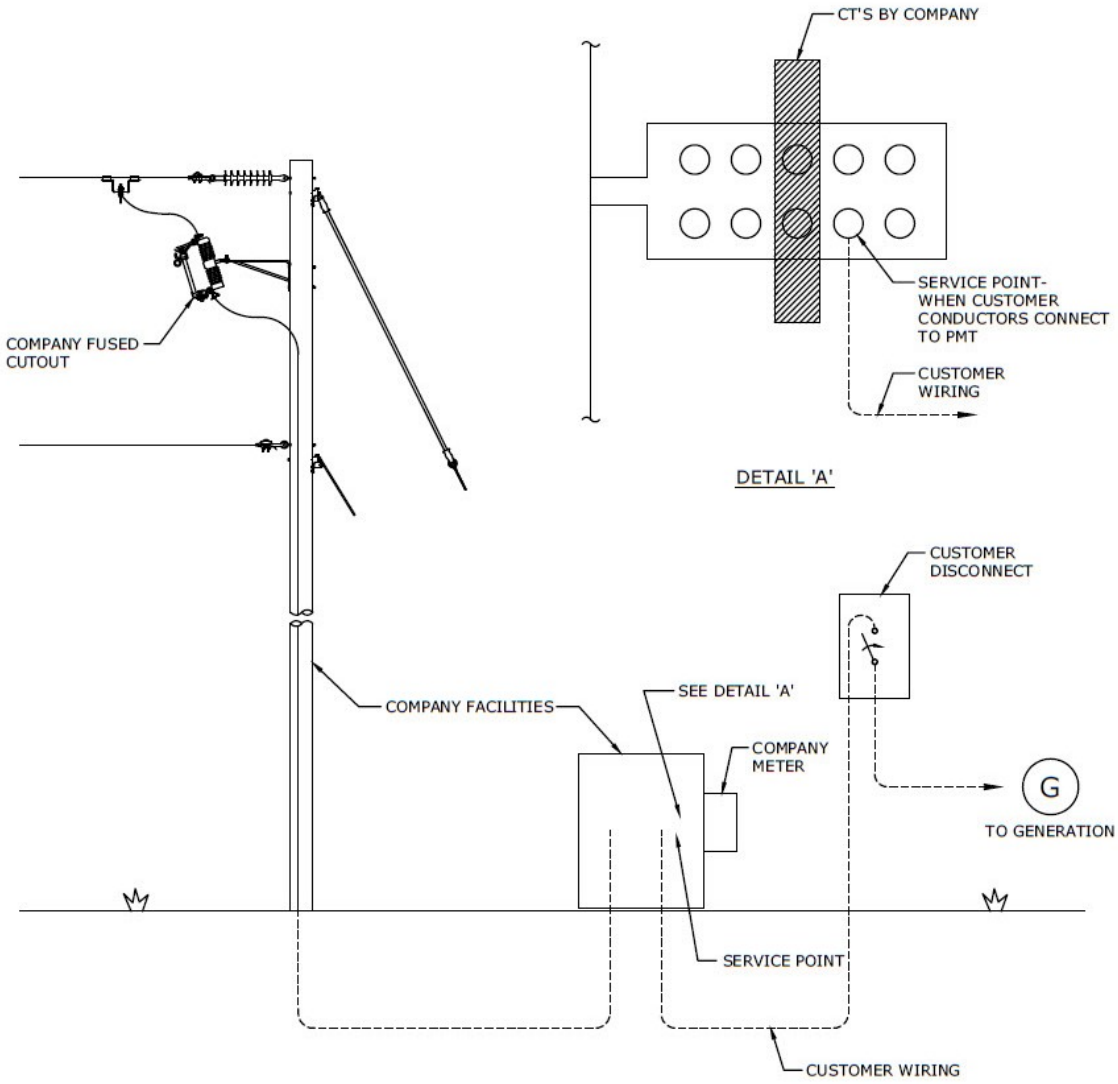
1. GENERATOR KVA CAPACITY CANNOT EXCEED KVA RATING OF OH BANK OR PLATFORM.
2. WARNING LABELS TO BE PLACED AT METER, CUSTOMER DISCONNECT AND TRANSFORMER POLE.
3. SINGLE LINE CONDUCTOR SHOWN FOR CLARITY.
4. CUSTOMER-OWNED DISCONNECT MUST BE ADJACENT TO METER, **READILY ACCESSIBLE TO COMPANY OPERATING PERSONNEL**, LOAD-BREAK RATED, LOCKABLE IN THE OPEN POSITION AND PROVIDE A "VISIBLE OPENING". GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.
5. IF GENERATOR IS BEING ADDED WITHIN A SERVICE THAT UTILIZES SUBSTATION-STYLE TRANSFORMERS, CONTACT DISTRIBUTION STANDARDS FOR GUIDANCE ON CONNECTION.
6. SERVICE LATERAL CLEARANCE MUST MEET FIGURE 10 REQUIREMENTS.

DUKE ENERGY.

3					SELL-ALL GENERATION THREE-PHASE LARGE T-RATED EXISTING OH SERVICE ADDING GENERATION METER, T-RATED OR SELF-CONTAINED
2					
1					
0	12/13/17	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 133B



NOTES:

1. THIS SERVICE ARRANGEMENT IS USED TO CONNECT TO A LARGE STANDALONE POWER PRODUCING SYSTEM WHERE COMPANY PROVIDES TRANSFORMATION.
2. WARNING LABEL TO BE PLACED AT METER AND CUSTOMER DISCONNECT.
3. CUSTOMER OWNED DISCONNECT MUST BE ADJACENT TO METER, LOAD-BREAK RATED, LOCKABLE IN **OPEN** POSITION AND PROVIDE A "VISIBLE OPENING". **EXCEPTION:** FOR FEEDER DISCONNECTS RATED ≥1000 AMPS AT 480Y/277 VOLTS, NO VISIBLE OPEN IS REQUIRED, BUT ALL OTHER PROVISIONS MUST BE MET.
4. GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.

5 TOTAL CUSTOMER CONDUCTORS CANNOT EXCEED 12 CONDUCTORS.

6. MAXIMUM CUSTOMER CONDUCTOR SIZE IS 750 KCMIL AL/CU.
7. SINGLE LINE DIAGRAM SHOWN FOR CLARITY.

DUKE ENERGY.

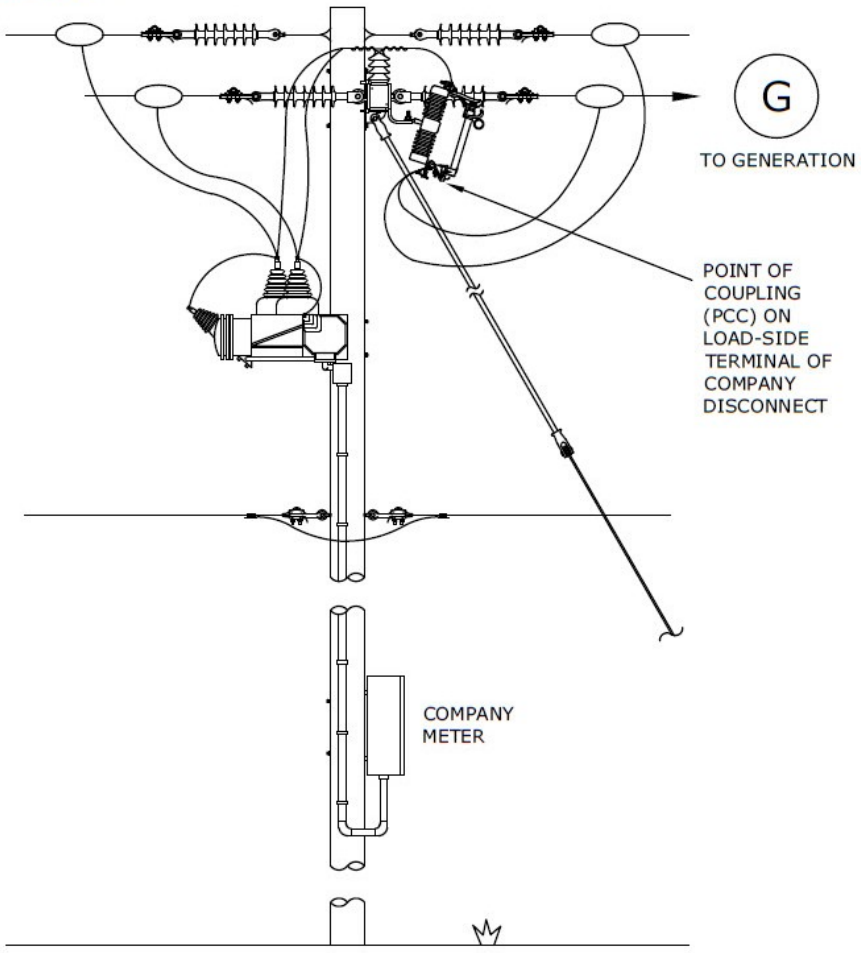
3				
2				
1				
0	12/13/17	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

SELL-ALL GENERATION
STANDALONE SYSTEM
THREE-PHASE SECONDARY METERING

DEC	DEM	DEP	DEF
	X		

FIG 135

DUKE ENERGY



DUKE ENERGY PRIMARY METER POLE

NOTES:

1. THIS SERVICE ARRANGEMENT IS USED TO CONNECT TO LARGE STANDALONE GENERATION (DER) SYSTEMS WHERE COMPANY PROVIDES FUSING FOR PROTECTION. DER SYSTEM PROVIDER CONNECTS TO PRIMARY VOLTAGE AND PROVIDES THEIR OWN TRANSFORMATION AND OVERHEAD FACILITIES. THE RECLOSER SHALL BE LOCATED ON THE PROPERTY OF THE DER SYSTEM OR AT A PRE-APPROVED LOCATION THAT MINIMIZES POTENTIAL IMPACTS TO OTHER CUSTOMERS.

2. DER OWNER PROVIDES AND INSTALLS ALL MATERIAL AND EQUIPMENT BEYOND THE POINT OF COMMON COUPLING.

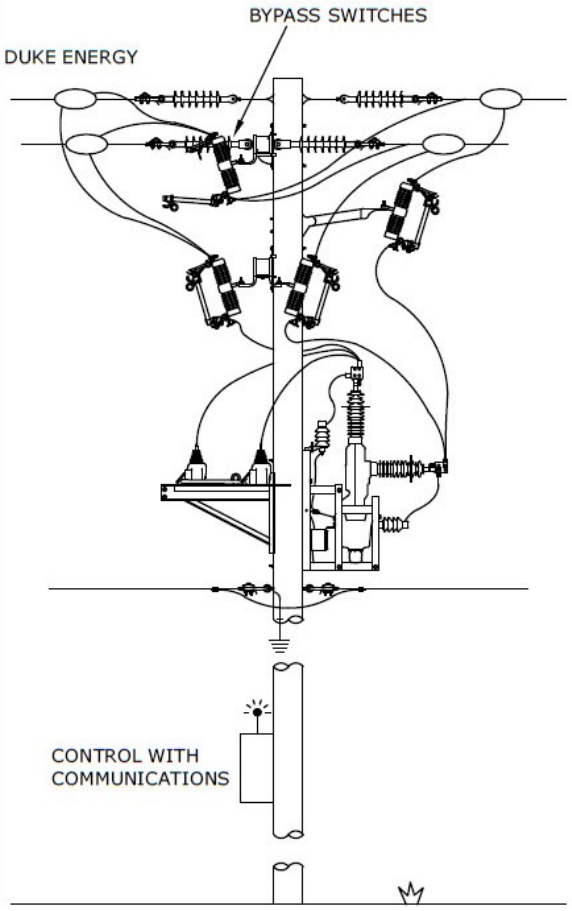
3. COMPANY PROVIDES ALL FACILITIES TO THE POINT OF COMMON COUPLING. DER SYSTEM PROVIDER MUST PROVIDE A LOCATION FOR COMPANY FACILITIES THAT MUST:
   - BE LOCATED OUT OF WETLANDS AND OTHER AREAS SUBJECT TO FLOODING.
   - HAVE MAINTAINED ACCESS ROADS, PREFERABLY WITH GRAVEL BED AND ADEQUATE DRAINAGE FOR ACCESS BY STANDARD COMPANY EQUIPMENT DURING ALL ADVERSE WEATHER CONDITIONS.
   - BE FREE OF VEGETATION FOR BUCKET TRUCK ACCESS.
   - BE LOCATED OUTSIDE A LOCKED GATE OR FACILITY FENCE. IF THIS CAN NOT BE ACCOMPLISHED, ANY GATES OR ACCESS POINTS MUST ACCOMMODATE A COMPANY LOCK AND BE ACCESSIBLE AT ANY AND ALL TIMES.

DUKE ENERGY.

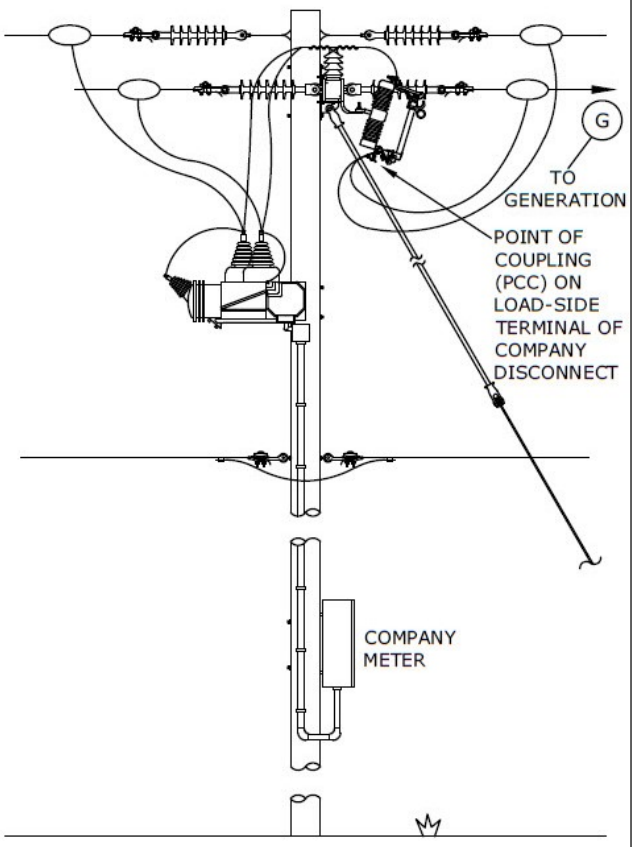
3					SELL-ALL GENERATION THREE-PHASE PRIMARY METERING WITH FUSED PROTECTION - OVERHEAD SERVICE
2					
1					
0	1/11/19	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 141A



DUKE ENERGY RECLOSER POLE



DUKE ENERGY PRIMARY METER POLE

NOTES:

1. THIS DRAWING IS A REPRESENTATION OF THE DUKE ENERGY PROTECTIVE AND METERING PACKAGE FOR GENERATION SITES (DER SYSTEMS).

2. THIS SERVICE ARRANGEMENT IS USED TO CONNECT TO LARGE (> 1 MW) STANDALONE DER SYSTEMS WHERE COMPANY PROVIDES A RECLOSER FOR PROTECTION. DER SYSTEM PROVIDER CONNECTS TO PRIMARY VOLTAGE AND PROVIDES THEIR OWN TRANSFORMATION AND OVERHEAD FACILITIES. THE RECLOSER SHALL BE LOCATED ON THE PROPERTY OF THE DER SYSTEM OR AT A PRE-APPROVED LOCATION THAT MINIMIZES POTENTIAL IMPACTS TO OTHER CUSTOMERS.

3. DER OWNER PROVIDES AND INSTALLS ALL MATERIAL AND EQUIPMENT BEYOND THE POINT OF COMMON COUPLING.

4. COMPANY PROVIDES ALL FACILITIES TO THE POINT OF COMMON COUPLING. DER SYSTEM PROVIDER MUST PROVIDE A LOCATION FOR COMPANY FACILITIES THAT MUST:
   - BE LOCATED OUT OF WETLANDS AND OTHER AREAS SUBJECT TO FLOODING.
   - HAVE MAINTAINED ACCESS ROADS, PREFERABLY WITH GRAVEL BED AND ADEQUATE DRAINAGE FOR ACCESS BY STANDARD COMPANY EQUIPMENT DURING ALL ADVERSE WEATHER CONDITIONS.
   - BE FREE OF VEGETATION FOR BUCKET TRUCK ACCESS.
   - BE LOCATED OUTSIDE A LOCKED GATE OR FACILITY FENCE. IF THIS CANNOT BE ACCOMPLISHED, ANY GATES OR ACCESS POINTS MUST ACCOMMODATE A COMPANY LOCK AND BE ACCESSIBLE AT ANY AND ALL TIMES.

5. BYPASS SWITCHES WILL BE REMOVED FOLLOWING THE COMMISSIONING OF THE RECLOSER.

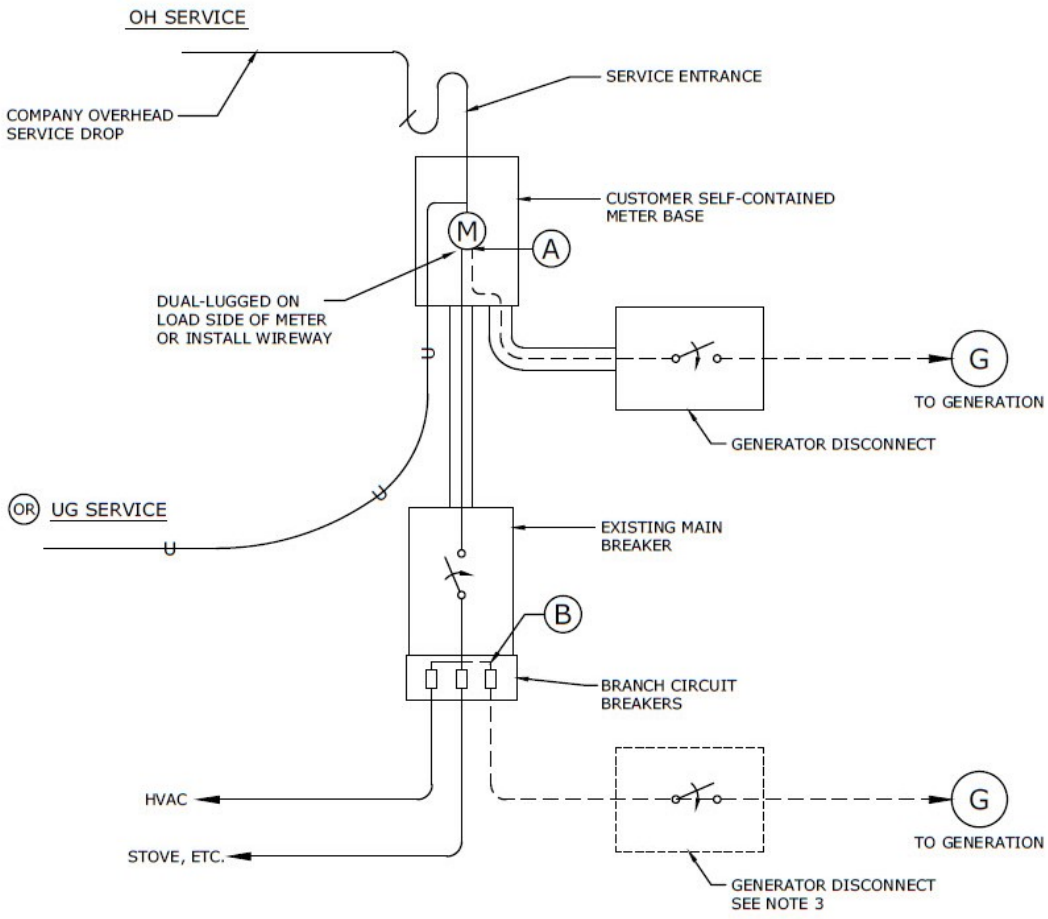
DUKE ENERGY.

3				
2				
1				
0	1/11/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

SELL-ALL GENERATION
THREE-PHASE PRIMARY METERING WITH
DER RECLOSER - OVERHEAD SERVICE

DEC	DEM	DEP	DEF
	X		

FIG 141B



NOTES:

1. GENERATION DISCONNECT CAN BE CONNECTED AT EITHER (A) OR (B).
2. GENERATOR DISCONNECT POSITION (A) REQUIREMENTS: MUST BE LOAD-BREAK RATED, LOCKABLE OPEN POSITION, PROVIDE VISIBLE OPEN AND LOCATED ADJACENT TO METER.
3. GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.
4. GENERATOR DISCONNECT POSITION (B) REQUIREMENTS: MUST BE LOAD-BREAK RATED AND LOCKABLE OPEN PROVISION.
5. EXISTING METER MUST BE REPLACED WITH BI-DIRECTIONAL METER.
6. WARNING LABEL MUST BE PLACED AT METER AND GENERATOR DISCONNECT.
7. CUSTOMER ELECTRICIAN TO REPLACE EXISTING LOAD SIDE METER LUGS WITH A DUAL-LUGGED CONNECTOR TO ACCEPT WIRING. IF CORRECT CONNECTORS ARE NOT AVAILABLE, REPLACE METER SOCKET OR A WIREWAY MUST BE INSTALLED BELOW METER BASE.

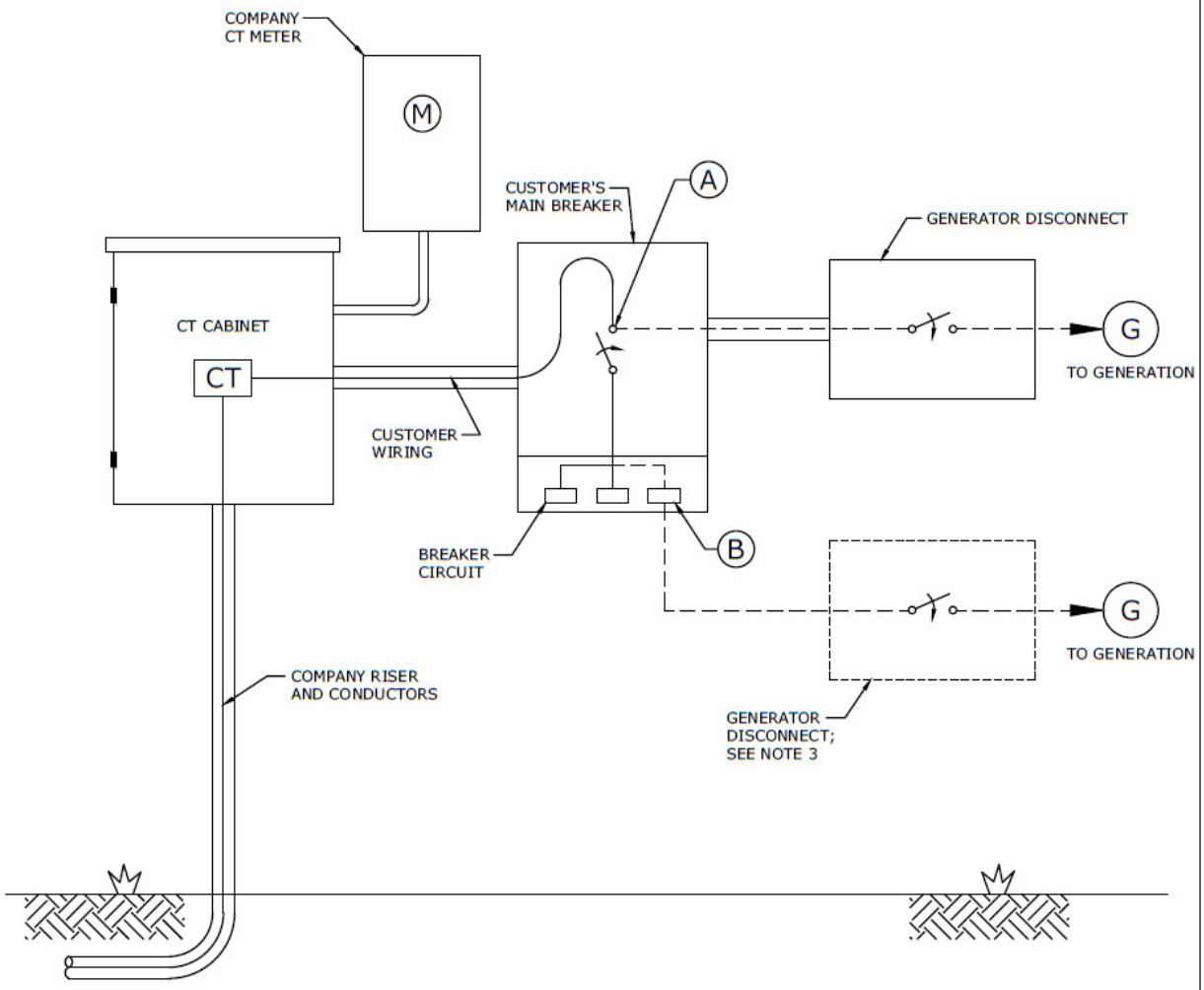
DUKE ENERGY.

3				
2				
1				
0	12/13/17	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

"NET" GENERATION METERING SINGLE OR THREE-PHASE SELF-CONTAINED METERED SERVICE RESIDENTIAL/SMALL COMMERCIAL OH OR UG SERVICE

DEC	DEM	DEP	DEF
	X		

FIG 142A



NOTES:

1. GENERATION DISCONNECT CAN BE CONNECTED AT EITHER (A) OR (B).
2. GENERATOR DISCONNECT POSITION (A) REQUIREMENTS: MUST BE LOAD-BREAK RATED, LOCKABLE OPEN POSITION, PROVIDE VISIBLE OPEN AND LOCATED ADJACENT TO METER.
3. GENERATOR DISCONNECT REQUIRED FOR ALL LOADS AND MUST BE ADJACENT TO METER.
4. GENERATOR DISCONNECT POSITION (B) REQUIREMENTS: MUST BE LOAD-BREAK RATED AND LOCKABLE OPEN PROVISION.
5. EXISTING METER MUST BE REPLACED WITH BI-DIRECTIONAL METER.
6. WARNING LABEL MUST BE PLACED AT METER AND GENERATOR DISCONNECT.
7. FOR CONNECTION (A), CUSTOMER ELECTRICIAN TO REPLACE EXISTING SOURCE SIDE CONNECTORS ON CUSTOMER MAIN BREAKER WITH A DUAL-LUGGED CONNECTOR TO ACCEPT WIRING. IF CORRECT CONNECTORS ARE NOT AVAILABLE, A WIREWAY MUST BE INSTALLED ON SOURCE SIDE OF CUSTOMER MAIN BREAKER AND GENERATOR DISCONNECT.

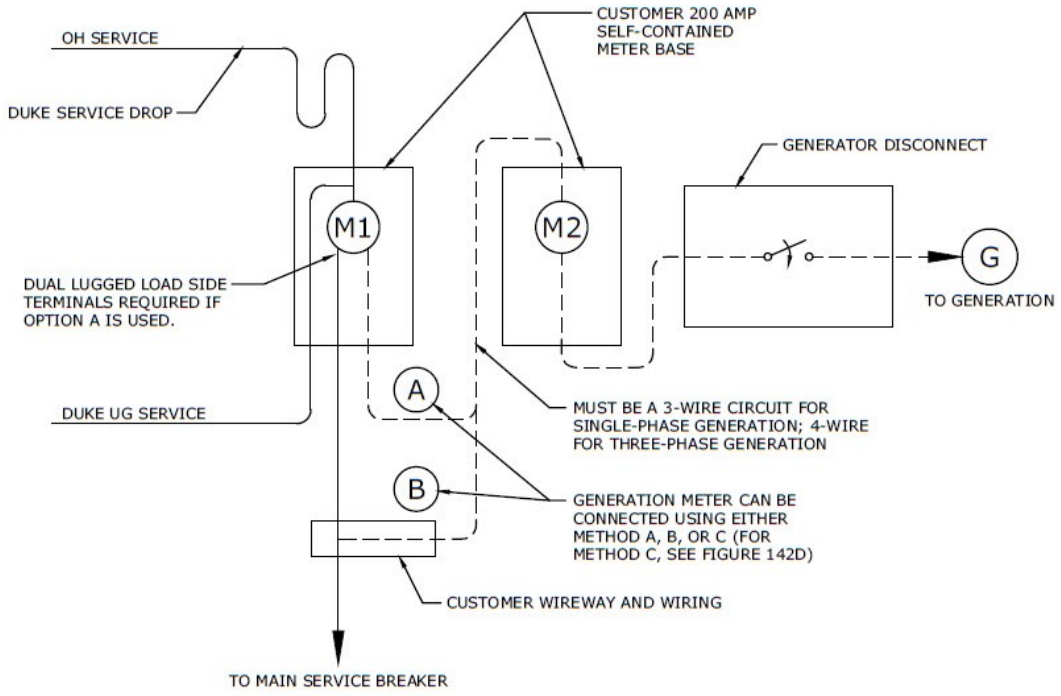
DUKE ENERGY.

3				
2				
1				
0	12/13/17	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

"NET" GENERATION METERING
SINGLE OR THREE-PHASE CT METERED
SERVICE RESIDENTIAL/SMALL
COMMERCIAL UG SERVICE

DEC	DEM	DEP	DEF
	X		

FIG 142B



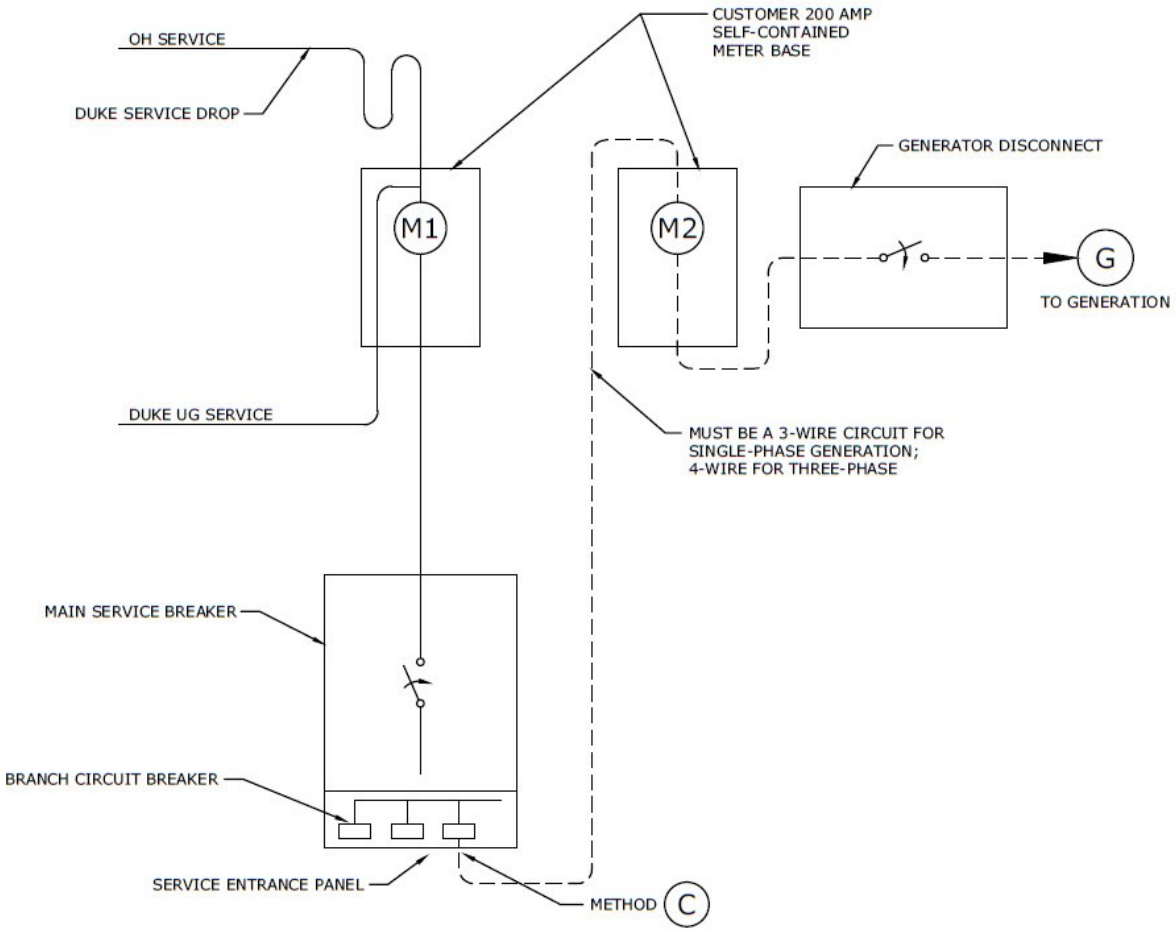
M1 SERVICE METER - EXISTING METER MUST BE REPLACED WITH A BI-DIRECTIONAL METER.

M2 GENERATION METER - MUST BE INSTALLED ADJACENT TO SERVICE METER AND MUST BE BI-DIRECTIONAL.

NOTES:

1. GENERATION CAN BE CONNECTED USING METHOD A OR B SHOWN OR METHOD C SHOWN ON FIGURE 72D. FOR METHOD A, CUSTOMER ELECTRICIAN MUST REPLACE EXISTING LOAD SIDE METER BASE LUGS WITH DUAL LUG CONNECTOR. IF METHOD B IS USED, THE WIREWAY MUST BE INSTALLED BELOW THE EXISTING METER BASE.
2. GENERATOR DISCONNECT MUST BE ACCESSIBLE TO COMPANY PERSONNEL, LOAD-BREAK RATED, LOCKABLE IN THE OPEN POSITION, PROVIDE A VISIBLE OPEN, AND LOCATED ADJACENT TO SERVICE METER.
3. REQUIRED WARNING LABELS MUST BE PLACED AT SERVICE METER AND DISCONNECT.
4. THE CUSTOMER'S WIRING AND ELECTRICAL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE ADOPTED EDITION OF THE NEC AND LOCAL ORDINANCES.

3					"NET" GENERATION METERING SINGLE OR THREE-PHASE SELF-CONTAINED METERED SERVICE RESIDENTIAL/SMALL COMMERCIAL OH OR UG SERVICE METHODS A AND B	DEC	DEM	DEP	DEF
2									
1							X		
0	12/13/17	DIETERLE	BRUINS	ADCOCK		FIG 142C			
REVISED		BY	CK'D	APPR.					



M1 SERVICE METER - EXISTING METER MUST BE REPLACED WITH A BI-DIRECTIONAL METER.

M2 GENERATION METER - MUST BE INSTALLED ADJACENT TO SERVICE METER AND MUST BE BI-DIRECTIONAL.

NOTES:

1. THE GENERATOR DISCONNECT MUST BE ACCESSIBLE TO COMPANY PERSONNEL, LOAD-BREAK RATED LOCKABLE IN THE OPEN POSITION PROVIDING A VISIBLE OPEN, AND LOCATED ADJACENT TO THE SERVICE METER.
2. REQUIRED WARNING LABELS MUST BE PLACED AT SERVICE METER AND DISCONNECT.
3. THE CUSTOMER'S WIRING AND ELECTRICAL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE ADOPTED EDITION OF THE NEC AND LOCAL ORDINANCES.

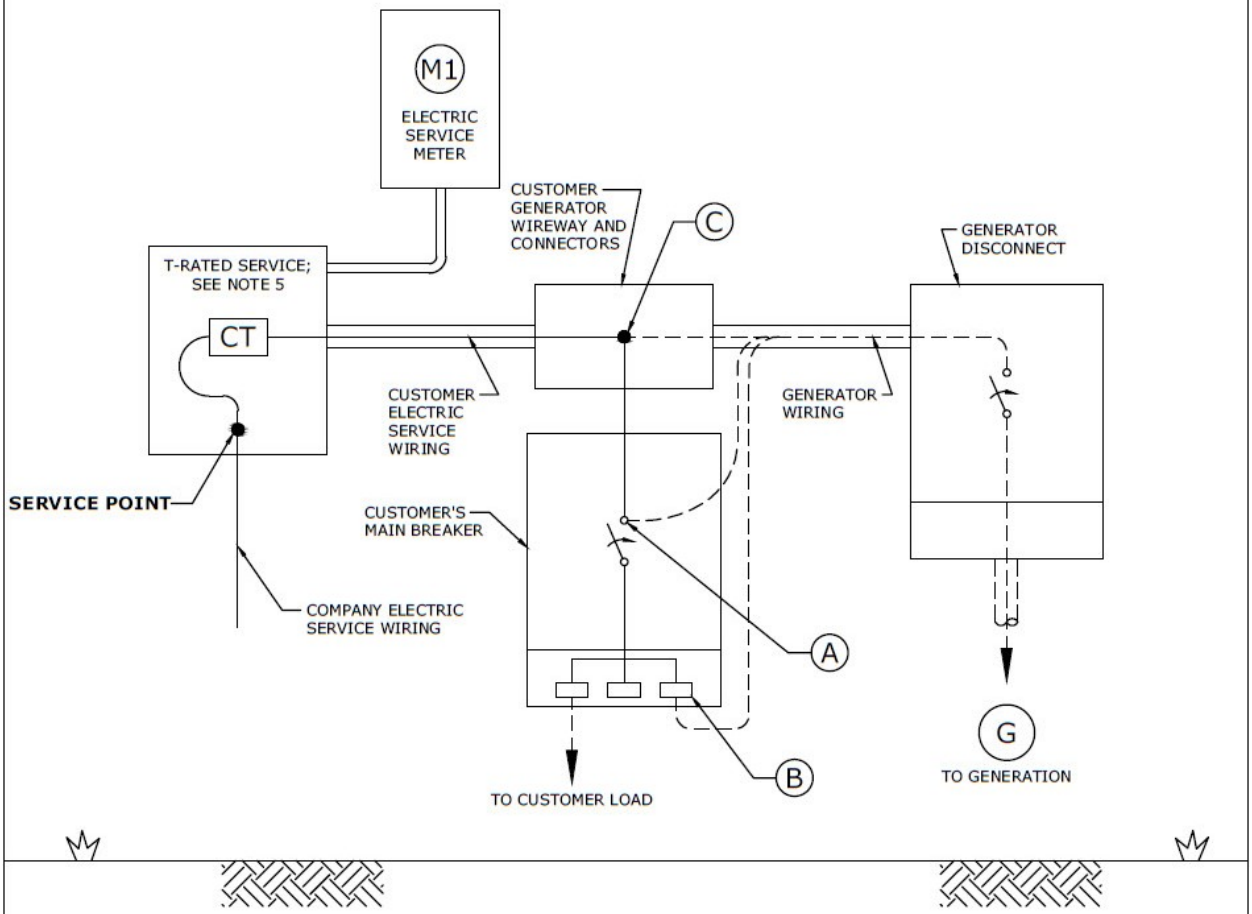
DUKE ENERGY.

REVISED		BY	CK'D	APPR.
3				
2				
1				
0	12/13/17	DIETERLE	BRUINS	ADCOCK

"NET" GENERATION METERING SINGLE OR THREE-PHASE SELF-CONTAINED METERED SERVICE RESIDENTIAL/ SMALL COMMERCIAL OH OR UG SERVICE METHOD C

DEC	DEM	DEP	DEF
	X		

FIG 142D



NOTES:

1. GENERATOR DISCONNECT CAN BE CONNECTED AT EITHER (A), (B), OR (C).
2. GENERATOR DISCONNECT, LOAD-BREAK RATED, LOCKABLE OPEN. PROVIDE VISIBLE OPEN.
3. COMPANY METER MUST BE BI-DIRECTIONAL.
4. DUKE WILL PLACE GENERATION WARNING LABELS AT METER AND GENERATOR DISCONNECT.
5. COMPANY ELECTRIC SERVICE CT'S MAY BE IN A PADMOUNT TRANSFORMER, CT CABINET MOUNTED ON THE BUILDING, A MAST, OR UTILITY POLE. (CUSTOMER PROVIDES CABINET) FOR INSTANCES WHERE SERVICE IS PROVIDED BY A PAD-MOUNT TRANSFORMER, THE GENERATOR WIRING MAY BE CONNECTED WITHIN THE SECONDARY COMPARTMENT OF THE TRANSFORMER ONLY IF THERE IS ADEQUATE SPACE AVAILABLE ON THE THE TRANSFORMER SPADES. THIS EXCEPTION MUST BE VERIFIED IN THE FIELD PRIOR TO ANY FINAL DESIGN APPROVAL.

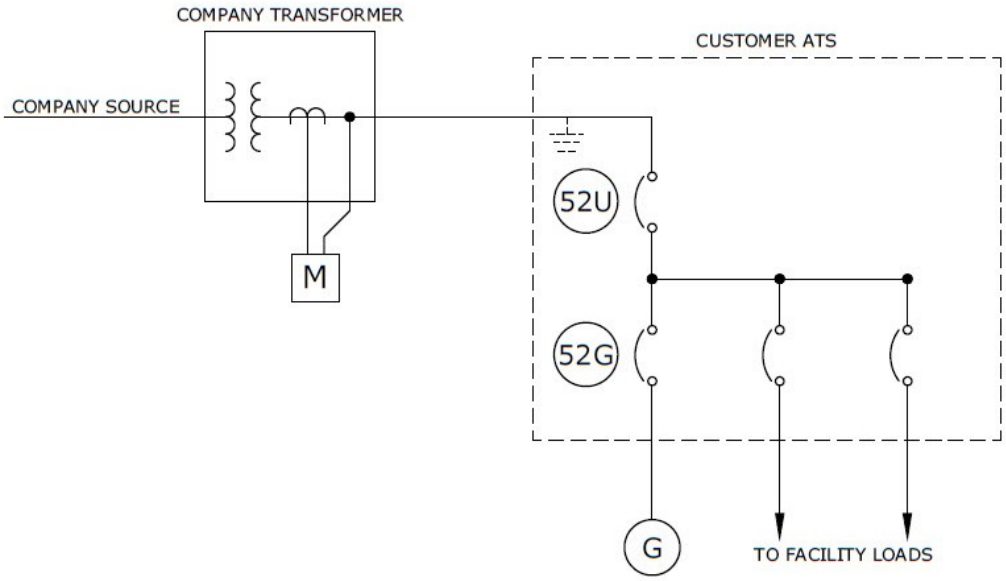
DUKE ENERGY.

3					
2					
1					
0	12/13/17	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

"NET" GENERATION METERING
THREE-PHASE (T-RATED SERVICES)
LARGE COMMERCIAL/INDUSTRIAL

DEC	DEM	DEP	DEF
	X		

FIG 142E



LEGEND:

- G — GENERATOR
- M — METER
- ATS — AUTO-TRANSFER SWITCH
- 52U — UTILITY-SIDE BREAKER WITH LOCKABLE OPEN FEATURE
- 52G — GENERATOR-SIDE BREAKER
- GROUNDING PROVISION PROVIDED BY CUSTOMER TO MEET THE FOLLOWING SPECIFICATIONS:

A. ACCESSIBLE TO COMPANY PERSONNEL

B. 10' CLEARANCE

C. GROUND BALL STUD(S) ON EACH PHASE AND NEUTRAL
1. MOUNTED IN HORIZONTAL POSITION
2. 25MM OR 30MM DIAMETER
3. 4" MIN. LENGTH, INCLUDING BALL
4. FAULT CURRENT RATED FOR GEAR BUSS.
5. MULTIPLE GROUND BALL STUDS MAY BE NEEDED TO MEET AVAILABLE FAULT CURRENT.

DUKE ENERGY.

3				
2				
1				
0	2/25/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

SERVICE WITH STANDBY GENERATION
AUTO TRANSFER SWITCH
PARALLEL (>100 MILLISECONDS)
TOTAL FACILITY LOAD

DEC	DEM	DEP	DEF
X	X	X	X

FIG 143A

INTERCONNECTION EVALUATION

SYSTEMS IN THIS CATEGORY REQUIRE APPROVAL IN WRITING FROM DUKE ENERGY BEFORE BEING CONNECTED. SPECIFICALLY, INTERCONNECTION OF GENERATING FACILITIES IN THIS CATEGORY MUST BE EVALUATED AND APPROVED BY THE DISTRIBUTION PROTECTION AUTOMATION AND CONTROL GROUP WITHIN DUKE ENERGY.

INTERCONNECTION PROTECTION (RELAYING) REQUIREMENTS

FOR INTERCONNECTION PROTECTION, THE GENERATING FACILITY'S INTERCONNECTION EQUIPMENT MUST EITHER BE LISTED AS FULLY COMPLIANT WITH UL1741 (FOR INVERTER-BASED EQUIPMENT) OR MUST BE COMPLIANT WITH IEEE 1547 SECTION 4 (GENERAL INTERCONNECTION TECHNICAL SPECIFICATIONS AND PERFORMANCE REQUIREMENTS). ADDITIONAL REQUIREMENTS ARE LISTED BELOW:

1. THE DER UNIT SHALL PARALLEL WITH THE AREA EPS WITHOUT CAUSING A STEP CHANGES IN THE RMS VOLTAGE AT THE PCC EXCEEDING 3% OF NOMINAL WHEN THE PCC IS AT MEDIUM VOLTAGE, OR EXCEEDING 5% OF NOMINAL WHEN THE PCC IS AT LOW VOLTAGE. (IEE 1547-2018 SECTION 4.10.1 SYNCHRONIZATION)

2. THE DER UNIT SHALL NOT ENERGIZE THE COMPANY DISTRIBUTION SYSTEM WHEN THE AREA COMPANY DISTRIBUTION SYSTEM IS DE-ENERGIZED. (IEEE 1547-2018 SECTION 4.9 INADVERTENT ENERGIZATION OF THE AREA COMPANY DISTRIBUTION SYSTEM)

3. INTERCONNECTION PROTECTION RELAYING MUST MEASURE VOLTAGES ON THE "UTILITY" SIDE OF 52U. RELAY VOLTAGE INPUTS MUST BE FROM THREE SEPARATE PHASE-TO-GROUND VOLTAGES (FOR 4-WIRE SERVICES) OR FROM THREE SEPARATE PHASE-TO-PHASE VOLTAGES (FOR 3-WIRE SERVICES). REVERSE POWER RELAY (32R) MUST MEASURE CURRENT AT THE 52U BREAKER.

4. INTERCONNECTION PROTECTION RELAYING MUST HAVE FIVE PROTECTIVE ELEMENTS LISTED BELOW WITH SETTINGS AS SPECIFIED:
   A. 27 (UNDER VOLTAGE): 0.88 PER UNIT, 10 CYCLE TIME DELAY
   B. 59 (OVER VOLTAGE): 1.10 PER UNIT, 10 CYCLE TIME DELAY
   C. 81U (UNDER FREQUENCY): 59.5 HZ, 10 CYCLE TIME DELAY
   D. 81O (OVER FREQUENCY): 60.5 HZ, 10 CYCLE TIME DELAY
   E. 32R (REVERSE POWER): WATTS SET AT 5% OF TOTAL GENERATING CAPACITY, WITH A 1.0 SECOND TIME DELAY

5. INTERCONNECTION PROTECTION RELAY TRIP FUNCTIONS MUST CAUSE SEPARATION OF THE GENERATION FROM THE UTILITY, EITHER BY (1) TRIPPING ALL GENERATORS [52G] BREAKERS OR BY (2) TRIPPING ALL UTILITY MAIN [52U] BREAKERS.

6. SERVICE ENTRANCE DISCONNECTING EQUIPMENT WITH VISIBLE OPENING CAPABILITY AND GROUNDING PROVISIONS. THIS INCLUDES THE ABILITY TO LOCK OPEN OR "RACK-OUT" THEIR UTILITY BREAKER OR SERVICE ENTRANCE DISCONNECT.

7. THE INTERCONNECTION PROTECTION EQUIPMENT MUST HAVE A SYNCHRONIZATION CHECK FUNCTION (25 RELAY).

8. CUSTOMER MUST PROVIDE A DOCUMENT STAMPED BY A LICENSED PROFESSIONAL ENGINEER (LICENSED IN THE STATE WHERE THE GENERATING FACILITY IS TO BE LOCATED) SHOWING APPROVAL OF CUSTOMER'S DESIGN AND TESTING OF SYSTEM OPERATION MEETS DUKE ENERGY REQUIREMENTS FOR MOMENTARY PARALLEL OPERATION.

9. CUSTOMER MUST SIGN AN INTERCONNECTION AGREEMENT BEFORE MOMENTARY PARALLEL OPERATION IS ALLOWED.

10. MAXIMUM PARALLEL TIME SHALL NOT EXCEED 20 SECONDS.

11. INSTRUMENT TRANSFORMERS (CT'S AND PT'S) SHALL COMPLY WITH ANSI/IEEE C57.13 (LATEST REVISION).

DUKE ENERGY.

					STANDBY GENERATION - PROTECTION REQUIREMENTS (SOFT LOAD TRANSITION >100 MILLISECONDS PARALLEL TIME)	DEC	DEM	DEP	DEF
3									
2									
1							X		
0	2/25/19	DIETERLE	BRUINS	ADCOCK		FIG 143B			
REVISED		BY	CK'D	APPR.					

INTERCONNECTION EVALUATION

SYSTEMS IN THIS CATEGORY REQUIRE APPROVAL IN WRITING FROM DUKE ENERGY BEFORE BEING CONNECTED. SPECIFICALLY, INTERCONNECTION OF GENERATING FACILITIES IN THIS CATEGORY MUST BE EVALUATED AND APPROVED BY THE DISTRIBUTION PROTECTION AUTOMATION AND CONTROL GROUP WITHIN DUKE ENERGY.

INTERCONNECTION PROTECTION (RELAYING) REQUIREMENTS

FOR INTERCONNECTION PROTECTION, THE GENERATING FACILITY'S INTERCONNECTION EQUIPMENT MUST EITHER BE LISTED AS FULLY COMPLIANT WITH UL1741 (FOR INVERTER-BASED EQUIPMENT) OR MUST BE COMPLIANT WITH IEEE 1547 SECTION 4 (INTERCONNECTION TECHNICAL SPECIFICATIONS AND REQUIREMENTS); VOLTAGE AND FREQUENCY SET-POINTS MUST BE SAME AS "DEFAULT" UNLESS OTHERWISE APPROVED BY DUKE ENERGY. ADDITIONAL REQUIREMENTS ARE LISTED BELOW:

1. THE DER UNIT SHALL PARALLEL WITH THE COMPANY DISTRIBUTION SYSTEM WITHOUT CAUSING A VOLTAGE FLUCTUATION AT THE POD GREATER THAN +/-5% OF THE PREVAILING VOLTAGE LEVEL OF THE COMPANY DISTRIBUTION SYSTEM AT THE POD. (IEEE 1547-2018 SECTION 4.10.1 SYNCHRONIZATION)

2. THE DER UNIT SHALL NOT ENERGIZE THE COMPANY DISTRIBUTION SYSTEM WHEN THE COMPANY DISTRIBUTION SYSTEM IS DE-ENERGIZED. (IEEE 1547-2003 SECTION 4.1.5 INADVERTENT ENERGIZATION OF THE COMPANY DISTRIBUTION SYSTEM)

3. SERVICE ENTRANCE DISCONNECTING EQUIPMENT WITH VISIBLE OPENING CAPABILITY AND GROUNDING PROVISIONS. THIS INCLUDES THE ABILITY TO LOCK OPEN OR "RACK-OUT" THEIR UTILITY BREAKER OR SERVICE ENTRANCE DISCONNECT.

4. THE INTERCONNECTION EQUIPMENT MUST HAVE A SYNCHRONIZATION CHECK FUNCTION (25 RELAY).

5. THE INTERCONNECTION EQUIPMENT MUST HAVE A SEPARATE TIMER THAT WILL INITIATE THE SEPARATION OF THE GENERATOR AND THE UTILITY IF THE PARALLELING TIME EXCEEDS 100MS.

6. THE DER UNIT SHALL NOT BACK FEED (INTENDED OR NON-INTENDED) THE UTILITY SYSTEM.

7. CUSTOMER MUST PROVIDE A DOCUMENT STAMPED BY A LICENSED PROFESSIONAL ENGINEER (LICENSED IN THE STATE WHERE THE GENERATING FACILITY IS TO BE LOCATED) SHOWING APPROVAL OF CUSTOMER'S DESIGN AND TESTING OF SYSTEM OPERATION MEETS DUKE ENERGY REQUIREMENTS FOR MOMENTARY PARALLEL OPERATION.

8. CUSTOMER MUST SIGN AN INTERCONNECTION AGREEMENT BEFORE MOMENTARY PARALLEL OPERATION IS ALLOWED.

DUKE ENERGY.

					STANDBY GENERATION - PROTECTION REQUIREMENTS MOMENTARY PARALLEL GENERATION (FAST TRANSITION ≤100 MILLISECONDS PARALLEL TIME)	DEC	DEM	DEP	DEF
3									
2									
1							X		
0	2/25/19	DIETERLE	BRUINS	ADCOCK		FIG 144			
REVISED		BY	CK'D	APPR.					

GENERAL REQUIREMENTS APPLICABLE TO ALL PARALLELING GENERATION

1. THE INTERCONNECTION OF ANY DISTRIBUTED ENERGY RESOURCE (DER) UNIT ON THE DUKE ENERGY SYSTEM WILL NOT BE PERMITTED IF IT DEGRADES SERVICE TO OTHER CUSTOMERS. INTERCONNECTION CUSTOMERS ARE RESPONSIBLE FOR THE COST OF ANY NECESSARY CHANGES OR UPGRADES TO THE DUKE ENERGY DISTRIBUTION AND/OR TRANSMISSION SYSTEM REQUIRED TO PROPERLY INTEGRATE THE GENERATION SO AS TO MAINTAIN APPROPRIATE SERVICE TO DUKE ENERGY CUSTOMERS.

2. THE INTERCONNECTION CUSTOMER IS SOLELY RESPONSIBLE FOR THE ELECTRICAL PROTECTION OF THEIR FACILITIES. DUKE ENERGY EQUIPMENT MAY INADVERTENTLY PROVIDE SOME PROTECTION TO THE DER CUSTOMER'S FACILITY AS IT OPERATES TO PROTECT THE UTILITY SYSTEM, HOWEVER, NO LIABILITY IS ASSUMED BY DUKE ENERGY.

3. DUKE ENERGY OWNED INTERCONNECTION PROTECTION EQUIPMENT (WHEN PROVIDED), IS FOR THE PROTECTION OF THE DISTRIBUTION SYSTEM FROM MALFUNCTION OR MISOPERATION OF THE DER UNIT.

4. DUKE ENERGY MAY DISCONNECT A DER FACILITY FROM THE DISTRIBUTION SYSTEM AT ANY TIME PURSUANT TO, BUT NOT LIMITED TO, THE FOLLOWING CONDITIONS:

   - EXPIRATION, TERMINATION, OR LACK OF INTERCONNECTION AGREEMENT (IF ORIGINALLY APPLICABLE)
   - NON-COMPLIANCE WITH TECHNICAL REQUIREMENTS
   - CASES WHERE CONTINUED INTERCONNECTION WILL ENDANGER PERSONS OR PROPERTY
   - A FORCED OR PLANNED OUTAGE OF THE DISTRIBUTION SYSTEM FOR REPAIRS OR MAINTENANCE
   - UNDER HOT LINE TAG CONDITIONS (UTILITY REPAIR OR MAINTENANCE WORK ON FACILITIES WHILE ENERGIZED)
   - ANY OTHER SYSTEM EMERGENCY

5. DER FACILITIES MUST COMPLY WITH THE NATIONAL ELECTRIC CODE AND MUST PASS A SUCCESSFUL INSPECTION BY LOCAL JURISDICTIONAL AUTHORITIES. IF THE GOVERNING ELECTRICAL INSPECTOR INDICATES THAT THE INSTALLATION IS EXEMPT FROM INSPECTION, A WRITTEN, SIGNED STATEMENT FROM THE GOVERNING ELECTRICAL INSPECTOR FOR THE SPECIFIC INSTALLATION WILL BE REQUIRED BEFORE DUKE ENERGY WILL INSTALL A METER.

INTERCONNECTION PROTECTION OWNERSHIP BASED ON GENERATOR TYPE AND SIZE

IN GENERAL, DISTRIBUTED GENERATION SYSTEMS ARE CLASSIFIED IN TWO MAIN CATEGORIES: INVERTER BASED SYSTEMS AND ROTATING MACHINE BASED SYSTEMS.

DG CATEGORY AND SIZE	INTERCONNECTION PROTECTION OWNERSHIP
INVERTER BASED < 250KW	CUSTOMER OWNED
INVERTER BASED ≥ 250KW TO <1MW	OPTIONAL, CUSTOMER OWNED OR UTILITY OWNED
INVERTER BASED ≥ 1MW AND ALL ROTATING BASED	UTILITY OWNED

DUKE ENERGY.

					LONG TERM PARALLEL GENERATION (>20 SECONDS) INTERCONNECTION PROTECTION OWNERSHIP BASED ON GENERATOR TYPE AND SIZE	DEC	DEM	DEP	DEF
3									
2						X	X	X	X
1									
0	2/25/19	DIETERLE	BRUINS	ADCOCK		FIG 145A			
REVISED		BY	CK'D	APPR.					

INTERCONNECTION PROTECTION REQUIREMENTS

INVERTER BASED SYSTEMS <250KW

FOR GENERATING FACILITIES IN THIS CATEGORY, INTERCONNECTION PROTECTION WILL BE OWNED AND OPERATED BY THE INTERCONNECTION CUSTOMER. DUKE ENERGY'S MINIMUM REQUIREMENTS FOR CUSTOMER OWNED INTERCONNECTION PROTECTION IN THIS CATEGORY IS AS FOLLOWS:

1. INVERTERS HAVE TO BE TESTED AND LISTED FOR COMPLIANCE WITH THE LATEST PUBLISHED EDITION OF UNDERWRITER LABORATORIES INC., UL 1741 FOR UTILITY INTERACTIVE INVERTERS.
2. INTERCONNECTION PROTECTION EQUIPMENT SHALL COMPLY WITH THE LATEST EDITION OF IEEE 1547 AND APPLICABLE SERIES STANDARDS.
3. SINGLE-PHASE INVERTERS SHALL BE MANUFACTURED AFTER NOVEMBER 7, 2000.
4. THREE-PHASE INVERTERS SHALL BE MANUFACTURED AFTER MAY 7, 2007
5. VOLTAGE AND FREQUENCY SET-POINTS MUST BE SAME AS "DEFAULT".
6. CUSTOMER SHALL PROVIDE A MANUAL LOAD-BREAK RATED DISCONNECT SWITCH TO SERVE AS A CLEAR VISIBLE INDICATION OF SWITCH POSITION BETWEEN THE UTILITY AND THE INTERCONNECTION CUSTOMER. THE SWITCH MUST BE LOCKABLE IN THE OPEN POSITION, ADJACENT TO THE METER AND READILY ACCESSIBLE TO UTILITY PERSONNEL. (SEE FIGURE 135.)

INVERTER BASED SYSTEMS ≥250KW TO <1MW

FOR GENERATING FACILITIES IN THIS CATEGORY, INTERCONNECTION PROTECTION OWNERSHIP WILL BE OPTIONAL. INTERCONNECTION PROTECTION EQUIPMENT MAY BE OWNED AND OPERATED BY THE INTERCONNECTION CUSTOMER OR BY DUKE ENERGY.

CUSTOMER OWNED INTERCONNECTION PROTECTION EQUIPMENT AND SETTINGS FOR GENERATING FACILITIES IN THIS CATEGORY MUST BE EVALUATED AND APPROVED BY THE DISTRIBUTION PROTECTION AUTOMATION AND CONTROL GROUP WITHIN DUKE ENERGY. DUKE ENERGY'S MINIMUM REQUIREMENTS FOR CUSTOMER OWNED INTERCONNECTION PROTECTION IN THIS CATEGORY IS AS FOLLOWS:

1. REQUIREMENTS 1, 2 AND 4 FROM SECTION ABOVE (INVERTERS <250KW).
2. INVERTER PROTECTIVE SETTINGS SHALL BE SET PER THE FOLLOWING:

UNDER VOLTAGE SET-POINT #1 (27-1)	0.88 PER UNIT, 2 SECOND DELAY
UNDER VOLTAGE SET-POINT #2 (27-2)	0.50 PER UNIT, 0.16 SECOND DELAY
OVER VOLTAGE SET-POINT #1 (59-1)	1.10 PER UNIT, 1.0 SECOND DELAY
OVER VOLTAGE SET-POINT #2 (59-2)	1.20 PER UNIT, 0.16 SECOND DELAY
UNDER FREQUENCY SET-POINT (81U)	59.3, 0.16 SECOND DELAY
OVER FREQUENCY SET-POINT (81O)	60.5, 0.16 SECOND DELAY

3. INVERTER PROTECTIVE SETTINGS SHALL BE DOCUMENTED IN A COMMISSIONING TEST REPORT SUBMITTED TO DUKE ENERGY.
4. CUSTOMER SHALL PROVIDE A MANUAL LOAD-BREAK RATED DISCONNECT SWITCH TO SERVE AS A CLEAR VISIBLE INDICATION OF SWITCH POSITION BETWEEN THE UTILITY AND THE INTERCONNECTION CUSTOMER. THE SWITCH MUST BE LOCKABLE IN THE OPEN POSITION, ADJACENT TO THE METER AND READILY ACCESSIBLE TO UTILITY PERSONNEL. (SEE FIGURE 135.)
5. CUSTOMER MUST PROVIDE A REPORT STAMPED BY A LICENSED PROFESSIONAL ENGINEER (LICENSED IN THE STATE WHERE THE GENERATING FACILITY IS TO BE LOCATED) DOCUMENTING CUSTOMER'S EQUIPMENT, SYSTEM DESIGN AND INTERCONNECTION PROTECTION MEETS DUKE ENERGY'S REQUIREMENTS, IEEE 1547 AND UL 1741.

DUKE ENERGY.

3					LONG TERM PARALLEL GENERATION (>20 SECONDS) INVERTER BASED SYSTEMS <1MW INTERCONNECTION PROTECTION REQUIREMENTS
2					
1					
0	2/25/19	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

DEC	DEM	DEP	DEF
	X		

FIG 145B

INVERTER BASED SYSTEMS ≥1MW AND ALL ROTATING MACHINE BASED GENERATORS

FOR GENERATING FACILITIES IN THIS CATEGORY, INTERCONNECTION PROTECTION EQUIPMENT WILL BE OWNED AND OPERATED BY DUKE ENERGY. INTERCONNECTION PROTECTION EQUIPMENT SETTINGS WILL BE EVALUATED AND APPROVED BY THE DISTRIBUTION PROTECTION AUTOMATION AND CONTROL GROUP WITHIN DUKE ENERGY. DUKE ENERGY'S MINIMUM REQUIREMENTS FOR INTERCONNECTION PROTECTION IN THIS CATEGORY IS AS FOLLOWS:

1. DUKE ENERGY'S PROTECTION EQUIPMENT WILL INCLUDE A RECLOSER, RELAYING (CONTROL) AND REMOTE COMMUNICATIONS FOR MONITORING AND OPERATIONS.
2. DUKE ENERGY'S PROTECTION EQUIPMENT SHALL INCLUDE OVER CURRENT, OVER/UNDER VOLTAGE AND OVER/UNDER FREQUENCY RELAYING.
3. INVERTERS HAVE TO BE TESTED AND LISTED FOR COMPLIANCE WITH THE LATEST PUBLISHED EDITION OF UNDERWRITER LABORATORIES INC., UL 1741 FOR UTILITY INTERACTIVE INVERTERS.
4. CUSTOMER'S INTERCONNECTION SYSTEM SHALL COMPLY WITH THE LATEST EDITION OF IEEE 1547 AND APPLICABLE SERIES STANDARDS.
5. DUKE ENERGY SHALL PROVIDE A MANUAL LOAD-BREAK RATED DISCONNECT SWITCH TO SERVE AS A CLEAR VISIBLE INDICATION OF SWITCH POSITION BETWEEN THE UTILITY AND THE INTERCONNECTION CUSTOMER. THE SWITCH MUST BE READILY ACCESSIBLE TO UTILITY PERSONNEL.

DUKE ENERGY.

3				
2				
1				
0	8/31/18	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CK'D	APPR.

LONG TERM PARALLEL GENERATION (>20 SECONDS)
INVERTER BASED SYSTEMS ≥1MW AND
ALL ROTATING MACHINE BASED GENERATORS

DEC	DEM	DEP	DEF
	X		

FIG 145C

TELEMETRY AND CONTROL REQUIREMENTS:

1. DISTRIBUTED ENERGY RESOURCES (DER) HAVE A SIGNIFICANT IMPACT ON THE DUKE ENERGY GENERATION, TRANSMISSION, AND DISTRIBUTION SYSTEM, EVEN AFTER INTERCONNECTION STUDIES HAVE ACCOUNTED FOR THEIR PRESENCE. DUKE ENERGY REQUIRES, FOR DER FACILITIES 250 KW AND LARGER, INSTALLATION OF TELEMETRY AND CONTROL EQUIPMENT IN ORDER TO MANAGE THE OPERATION OF DER ON DUKE ENERGY SYSTEM. REAL-TIME TELEMETRY OF CERTAIN DER ELECTRICAL VALUES AND ENABLE/ DISABLE CONTROL OF DER FACILITIES IS CRITICAL FOR REAL-TIME DISTRIBUTION MANAGEMENT SYSTEM OPERATING FUNCTIONS, AND IS ALSO CRITICAL FOR GENERATION/ TRANSMISSION AND BALANCING AUTHORITY OPERATIONS. USE OF THE ENABLE/ DISABLE CONTROL FUNCTION IS INTENDED FOR ATYPICAL SYSTEM OPERATING SITUATIONS ONLY.

2. THE POINT OF MEASUREMENT AND CONTROL IS GENERALLY AT THE POINT OF INTERCONNECTION FOR EXPORTING GENERATING FACILITIES AND AT THE POINT OF GENERATION FOR "NET METERING" OR "SELL EXCESS" FACILITIES. THERE MAY BE SPECIAL CASES DEPENDING UPON THE NATURE OF THE FACILITY.

3. FOR FACILITIES 1 MW AND LARGER, REQUIRED TELEMETRY & CONTROL FUNCTIONALITY IS TYPICALLY ACCOMPLISHED AS PART OF THE REQUIRED INTERCONNECTION PROTECTION FACILITIES AS DESCRIBED IN FIGURE 145C AND AS SHOWN IN FIGURE 141B. FOR DER FACILITIES ≥250 KW AND <1 MW, SEE THE FOLLOWING TABLE FOR TELEMETRY & CONTROL REQUIREMENTS:

REQUESTED INTERCONNECTION VOLTAGE	TYPE OF FACILITY	REQUIREMENTS FOR TELEMETRY AND CONTROL
PRIMARY DISTRIBUTION VOLTAGE (>600V)	EXPORTING GENERATING FACILITY	DEFAULT: INTERCONNECTION RECLOSER (REFERENCE FIGURES 141B AND 145C) OPTION: "IR2" SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1)
PRIMARY DISTRIBUTION VOLTAGE (>600V)	NET METERING/ SELL EXCESS FACILITY	DEFAULT: "IR2" SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1) OPTION: INTERCONNECTION RECLOSER OR OTHER SPECIAL DESIGN IF APPROPRIATE (SEE NOTE 2)
SECONDARY DISTRIBUTION VOLTAGE (≤ 600V)	EXPORTING GENERATING FACILITY	DEFAULT: "IR2" SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1) OPTION: OTHER SPECIAL DESIGN IF APPROPRIATE (SEE NOTE 2)
SECONDARY DISTRIBUTION VOLTAGE (≤ 600V)	NET METERING/SELL EXCESS FACILITY	DEFAULT: "IR2" SMALL DG INTERCONNECTION INTERFACE (SEE NOTE 1) OPTION: OTHER SPECIAL DESIGN IF APPROPRIATE (SEE NOTE 2)

NOTES:

1. THE "IR2" SMALL DG INTERCONNECTION INTERFACE CONSISTS OF A UTILITY-PROVIDED INTERFACE DEVICE AND CABINET WITH PRE-DESIGNED INTERCONNECTION WIRING TO SUPPORT THE INTERFACE TO THE CUSTOMER'S FACILITIES. THE CUSTOMER MUST PROVIDE VOLTAGE AND CURRENT INPUTS TO THE UTILITY DEVICE (FOR TELEMETRY NEEDS) AND ALSO "RUN PERMISSIVE" CONTROL CAPABILITY WHICH CAN ENABLE/DISABLE THEIR GENERATOR OPERATION, FROM A SINGLE SOURCED FROM THE UTILITY DEVICE. DUKE ENERGY WILL MAKE IR2 INTERFACE DETAILS AVAILABLE UPON REQUEST OR AS NORMAL PART OF THE INTERCONNECTION REQUEST AND EVALUATION PROCESS, WHEN APPLICABLE.

2. IN MOST SITUATIONS DUKE ENERGY EXPECTS TELEMETRY AND CONTROL REQUIREMENTS TO BE MET WITH ITS STANDARD DESIGN INTERCONNECTION RECLOSER OR THE SMALL DG INTERCONNECTION INTERFACE. UTILIZING THESE STANDARDS DESIGNS HELPS DUKE ENERGY MINIMIZE COST TO THE INTERCONNECTION CUSTOMER AND TO MAXIMIZE EFFECTIVE TECHNICAL SUPPORT OF INTERCONNECTION FACILITIES. DUKE ENERGY RECOGNIZES THAT OCCASIONALLY UNIQUE CUSTOMER SITUATIONS MAY CALL FOR AN ALTERNATIVE DESIGN WHICH STILL MEETS THE TELEMETRY AND CONTROL REQUIREMENTS, AND SUCH SITUATIONS WILL BE HANDLED ON A CASE-BY-CASE BASIS.

DUKE ENERGY.

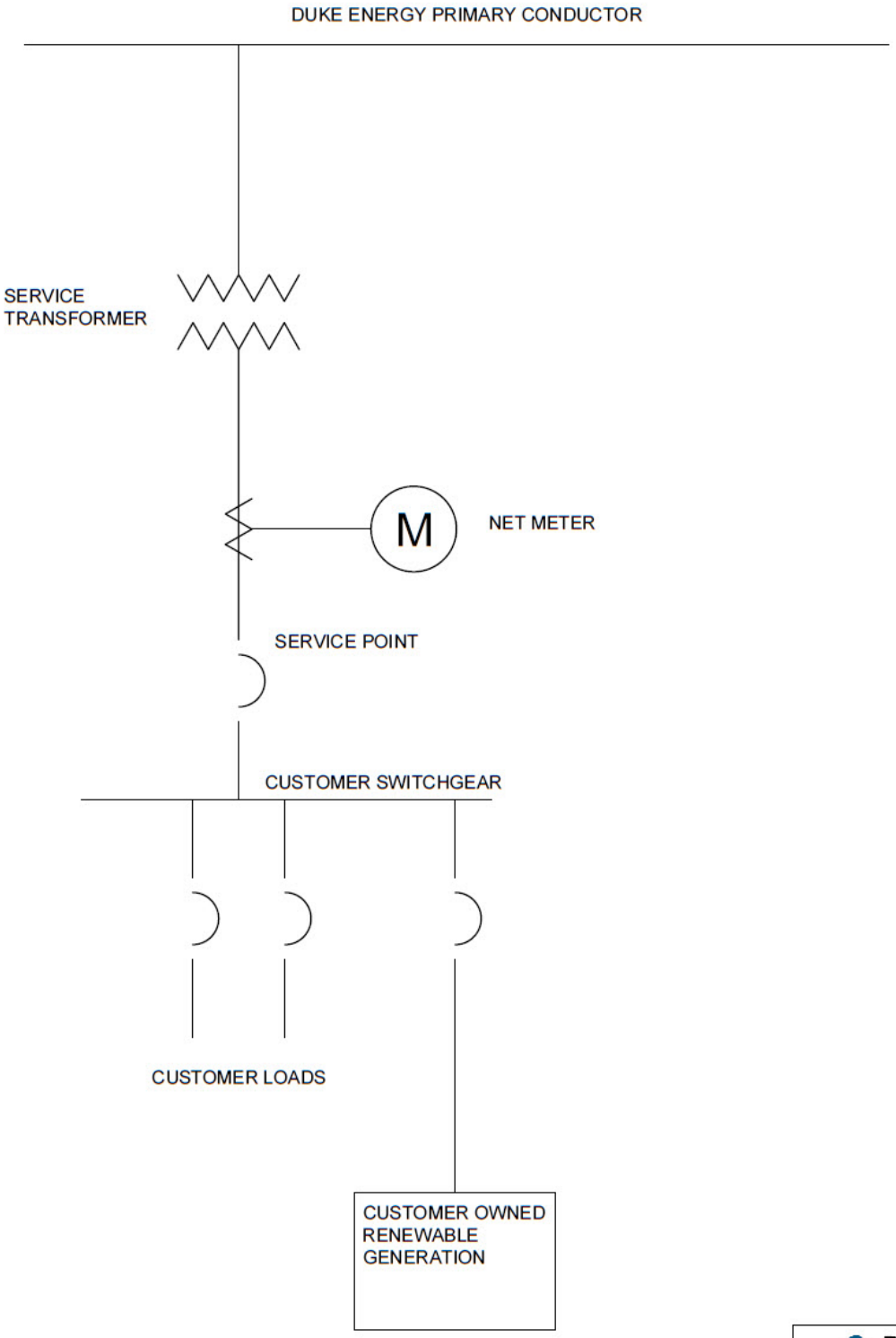
3				
2				
1				
0	2/25/19	DIETERLE	BRUINS	ADCOCK
REVISED		BY	CHK'D	APPR.

LONG TERM PARALLEL GENERATION

TELEMETRY AND CONTROL REQUIREMENTS

DEC	DEM	DEP	DEF
	X		

FIG 145D



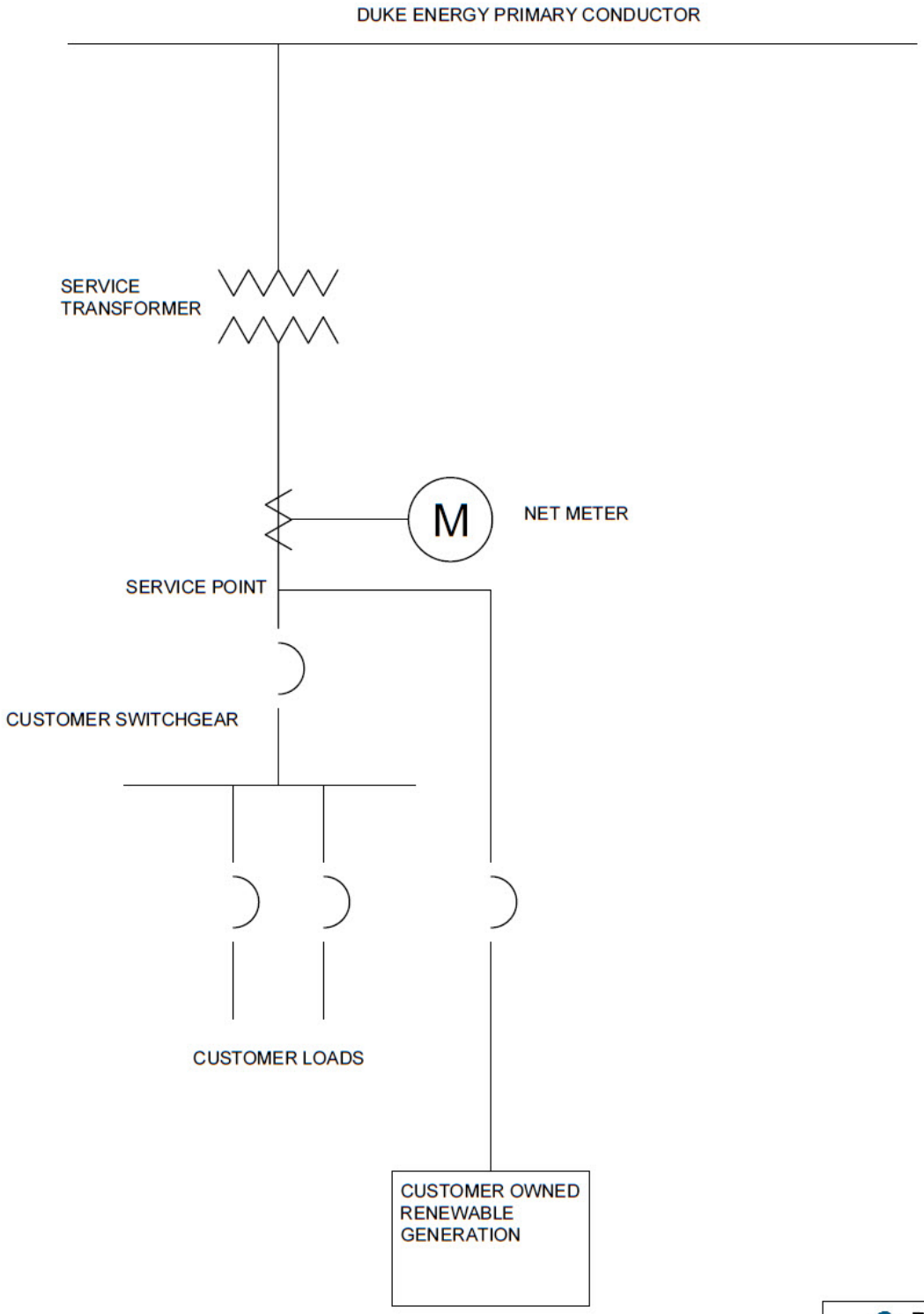
DUKE ENERGY.

3					
2					
1					
0	12/13/17	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

PREFERRED NET METERING INTERCONNECTION

DEC	DEM	DEP	DEF
	X		

FIG 146A



DUKE ENERGY.

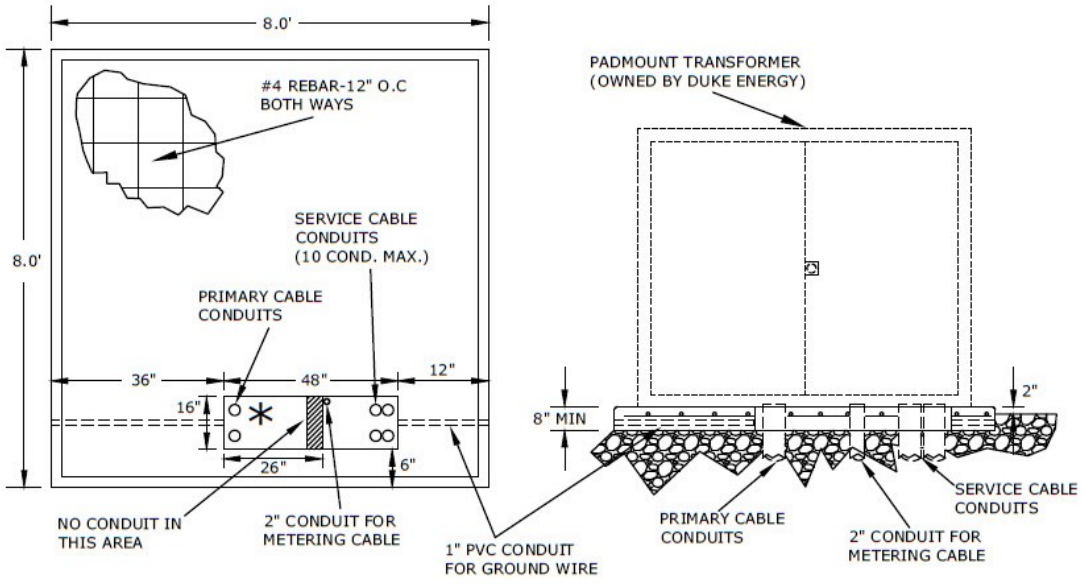
3					
2					
1					
0	12/13/17	DIETERLE	BRUINS	ADCOCK	
REVISED		BY	CK'D	APPR.	

ALTERNATE NET METERING INTERCONNECTION

DEC	DEM	DEP	DEF
	X		

FIG 146B

WILL NOT BE VALID FOR PROJECTS AFTER JUNE 30, 2019.



* THIS AREA MUST NOT BE POURED SOLID WITH CONCRETE

INSTALLATION REQUIREMENTS:

1. ACCEPTANCE: THE COMPANY RESERVES THE RIGHT TO REFUSE SERVICE TO NEW INSTALLATIONS THAT DO NOT MEET DUKE ENERGY REQUIREMENTS AND MAY ELECT TO REMOVE EXISTING SERVICE CABLES IF THE CUSTOMER FAILS TO PROVIDE ADEQUATE MAINTENANCE TO CUSTOMER OWNED FACILITIES.

2. LOCATION: DUKE ENERGY SHALL BE RESPONSIBLE FOR DETERMINING THE FINAL LOCATION FOR THE TRANSFORMER PAD. THE CUSTOMER SHALL PROVIDE A LEVEL LOCATION FOR A PADMOUNTED TRANSFORMER INSTALLATION AS DIRECTED BY THE COMPANY.THE TRANSFORMER MUST BE LOCATED ADJACENT TO AND WITHIN 10 FEET OF A DRIVEWAY OR OTHER AREA ACCESSIBLE TO DUKE ENERGY CONSTRUCTION AND MAINTENANCE EQUIPMENT. NO PART OF THE TRANSFORMER (OR TRANSFORMER PAD) MAY BE WITHIN 12 FEET FROM ANY COMBUSTIBLE WALL, WINDOW, OR VENTILATION OPENING AND 20 FEET FROM ANY DOORWAY IN A BUILDING. THERE MUST BE AT LEAST 3 FEET OF CLEARANCE BETWEEN CUSTOMER EQUIPMENT OR LANDSCAPING AND THE SIDE OF THE TRANSFORMER (OR TRANSFORMER PAD) AND 10 FEET OF CLEARANCE TO THE FRONT TO THE FRONT OF THE TRANSFORMER (OR TRANSFORMER PAD). SEE DUKE ENERGY STD. 99134.

3. DESIGN: THE CUSTOMER IS RESPONSIBLE FOR CONSTRUCTING A TRANSFORMER PAD IN ACCORDANCE WITH DUKE ENERGY REQUIREMENTS SUITABLE FOR THE LARGEST TRANSFORMER THAT MAY BE REQUIRED. THE CUSTOMER SHOULD CONSIDER FROST ACTION, DRAINAGE AND LOCAL SOIL CONDITIONS WHEN DEVELOPING THE STRUCTURAL DESIGN OF THE TRANSFORMER PAD. SPECIFIC REQUIREMENTS INCLUDE:
   - THE TRANSFORMER PAD SHALL BE A MINIMUM OF 8 INCHES THICK. THE TOP SURFACE SHALL BE A MINIMUM OF 2 INCHES ABOVE THE SURROUNDING GRADE. REINFORCING STEEL IS REQUIRED AND SHALL BE AT LEAST #4 BARS OR LARGER. REINFORCING BARS SHALL BE INSTALLED A MINIMUM OF 6 INCHES AND A MAXIMUM 12 INCHES O.C. BOTH WAYS.
   - THE TRANSFORMER PAD SHALL BE INSTALLED ON A BED OF GRANULAR FILL MATERIALS THAT HAS BEEN COMPACTED PRIOR TO POURING CONCRETE.
   - THE SURFACE OF THE TRANSFORMER PAD SHALL BE FLAT, SMOOTH AND LEVEL WITHIN 1 INCH IN ALL DIRECTIONS.
   - THE EDGE OF THE TRANSFORMER PAD SHALL HAVE A 1 INCH BEVEL FORMED INTO THE TOP EDGE.
   - A 1" ID PVC CONDUIT SHALL BE INSTALLED IN THE CONCRETE AS SHOWN IN THE SKETCH FOR THE INSTALLATION OF GROUNDING CONDUCTORS (BY DUKE ENERGY) FOR ADJACENT COMMUNICATIONS EQUIPMENT (REQUIRED BY THE NESC).

4. MATERIALS & LABOR: THE CUSTOMER SHALL PROVIDE ALL MATERIALS AND EXCAVATION LABOR NECESSARY TO INSTALL THE TRANSFORMER PAD. THIS INCLUDES: EXCAVATION, BACKFILLING, INSTALLATION OF CONDUIT AND CONDUIT ACCESSORIES, BUILDING FORMS, PORING AND FINISHING CONCRETE, ETC.

5. CONDUIT: THE CUSTOMER SHALL INSTALL, OWN AND MAINTAIN THE CONDUIT SYSTEM INCLUDING DUCT, MANHOLES, CABLE PITS AND TRANSFORMER FOUNDATIONS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH DUKE ENERGY STANDARDS. THE CONDUIT SHALL BE MADE FROM POLYVINYL CHLORIDE (PVC) AND SUITABLE FOR THE USE WITH UNDERGROUND ELECTRIC DISTRIBUTION CABLES RATED AT 90°C. ALL CONDUITS SHALL HAVE A UL LISTING AND SCHEDULE 40 (SCH. 40) RATING CLEARLY PRINTED ON THE EXTERIOR SURFACE. FOR PRIMARY 3-PHASE 15KV RATED JACKETED CONCENTRIC NEUTRAL PRIMARY CABLES, THE MINIMUM INSIDE DIAMETER OF THE CONDUIT SHALL BE 4 INCHES. FOR ALL OTHER PRIMARY CABLES, A MINIMUM INSIDE DIAMETER OF 6 INCHES IS REQUIRED. ALL BENDS SHALL BE 90° "SWEEP" BENDS WITH A MINIMUM RADIUS OF 36 INCHES. CONDUIT MAY BE DIRECTED BURIED IF LOCAL PERMITTING AUTHORITIES WILL ALLOW DIRECT BURIED CONDUIT SYSTEMS. ALL CONDUITS SHALL HAVE A PULL STRING INSTALLED. ALL CONDUITS SHALL BE CAPPED TO PREVENT DEBRIS FROM ENTERING THE CONDUIT.

6. THE MAXIMUM NUMBER OF CONDUITS ENTERING INTO THE SECONDARY AREA OF THE PAD OPENING SHALL BE 10 (4" DIA.) UNLESS SPECIFICALLY APPROVED BY ENGINEERING AND CONSTRUCTION PLANNING.

WILL NOT BE VALID FOR PROJECTS AFTER JUNE 30, 2019.

DUKE ENERGY.

3					INSTALLATION REQUIREMENTS FOR THREE-PHASE PAD-MOUNT TRANSFORMER FOUNDATIONS FOR COMMERCIAL OR INDUSTRIAL CUSTOMERS
2					
1					
0	7/11/18	DIETERLE	BRUINS	ADCOCK	WILL NOT BE VALID FOR PROJECTS AFTER JUNE 30, 2019
REVISED		BY	CK'D	APPR.	

DEC	DEO/K	DEP	DEF
	X		

FIG 673