The Empire District Electric Company

Requirements For
Electric Service And Meter Installations

Commercial & Industrial

SERVICES YOU COUNT ON

(800) 206 – 2300

The latest revision of this book can be found at www.empiredistrict.com under the “Customer Service” tab.

Effective 07/01/2010

Some of the information in this booklet is based on governmental codes and ordinances as well as the National Electrical Code and the tariffs of The Empire District Electric Company on file with the Public Service Commissions. These requirements and guidelines are issued with the intent of complying with all applicable codes, ordinances and tariffs; however, in the case of conflict, the appropriate code, ordinance and tariff will supersede the interpretation offered in this booklet. In addition, these requirements are subject to change in the event that the governing codes, ordinances and tariffs are changed. Empire does not assume responsibility for keeping this book current and should be consulted in case of doubt on the applicability of any terms.

When the term "contact the Company" is used in this booklet, it shall mean for each and every installation, not a single contact.

This publication includes a number of changes and supersedes all previous editions.

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Revised: 07/01/2010

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TABLE OF FIGURES

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1 INTRODUCTION

The Empire District Electric Company (EDECo or Empire) constantly strives to maintain a high standard of service to all Customers. This booklet has been prepared for use by Customers, architects, engineers, electrical contractors and local inspecting authorities so they may receive full benefit from our service. We believe you will find it helpful when planning new electrical installations, upgrading, or adding additional equipment. Copies are available at the Empire District Electric Company's Corporate office, service centers, and web site. All holders of Requirements For Electric Service and Meter Installations booklets are encouraged to submit comments to aid in future revisions. Please submit comments as follows:

1. Give section, paragraph and page number to which the comment pertains.
2. Submit comments in writing; giving details, sketches, drawings, and all supporting pertinent information.
3. Mail, FAX, or Email to:

   THE EMPIRE DISTRICT ELECTRIC COMPANY

   Manager of Meters and Transformers

   PO Box 127

   Joplin MO 64802

   FAX #: (417) 625 –5149

   Email: sshull@empiredistrict.com

The impression generally prevails that compliance with the National Electrical Code (NEC), or the various electrical ordinances guarantees to the Customer a wiring installation complete and adequate for the full use of electric service now and in the future. This is not necessarily the case. The NEC and these guidelines are designed to provide the minimum requirements considered necessary for safety. **(The 2005 NEC, Article 90-1(b) itself states, "Compliance therewith and proper maintenance will result in an installation essentially free from hazard, but not necessarily efficient, convenient or adequate for good service for future expansion of electrical use.")** Careful design and installation often results in a wiring system that exceeds NEC requirements.

THE EMPIRE DISTRICT ELECTRIC COMPANY, as a utility, must meet the requirements of the National Electrical Safety Code (NESC), which sometimes differ from the National Electrical Code (NEC).

The Company shall have the right to disconnect or refuse service to any installation which violates local, municipal, NEC or NESC regulations. The Company shall also have the right to disconnect or refuse service for installations that are hazardous to the public, or negatively impacts service to other Customers, or Company facilities.

Except for the installation and maintenance of its own property, THE EMPIRE DISTRICT ELECTRIC COMPANY does not install or repair wiring or equipment beyond the point of delivery. Therefore, EDECo is not responsible for the voltage levels beyond the point of delivery and does not assume any responsibility for Customer facilities beyond the point of delivery. Your cooperation will be greatly appreciated and will enable you to receive prompt and satisfactory service.

2 GENERAL INFORMATION

2.1 DEFINITIONS

Company	THE EMPIRE DISTRICT ELECTRIC COMPANY.
Conduit	Pipe used to protect the electrical conductors. Rigid Steel or Schedule 80 Electrical Grade PVC is required on the wall when an underground service is provided.
Conduit Strap	A properly sized strap or clamp used with screws or nails to securely attach conduit to the structure.
Conduit Reducer	A fitting that provides a way to connect together different sized conduits.
Conduit Vent	A fitting used to provide an outlet so that gases or fluids can be released externally from the conduit. This is commonly used in hilly terrain.
Contribution-in-Aid of Construction	An amount to be paid to the Company by a Customer or developer when the Company has to install electrical facilities over and above what is normally required to provide service. This is required when the cost to serve is not justified by the expected revenue provided by the service.
Customer	User of the Company's electric service or user's authorized representative (architect, engineer, electrical contractor, etc.).
Drip Loop	Short length of the customer's service entrance conductors (wire) extending out of the weatherhead which allows connection to the Company's service drop.
Inspector or Inspection Authority	A person or agency authorized by a governmental body to inspect and approve electrical installations.
Interconnection-Cogeneration and Small Power Producers	An electric service where cogenerators and small power producers operate in parallel with the Company's electric system. Energy may flow in either direction through an interconnection.
Intersystem Ground Connector (Intersystem Bonding Termination)	A device that provides a means for connecting communications system(s) grounding conductor(s) and bonding conductor(s) at the service equipment or at the disconnecting means for buildings or structures supplied by a feeder or branch circuit.
Line of Sight	Is a straight line from the EDECo designated service source, i.e. Service Pole, Transformer Pole, Pad Mounted Transformer, Secondary Pedestal, etc. to the EDECo Point of Delivery.
Main Disconnect	This term as used in this document refers to a combination of a disconnecting and overcurrent protection device, e.g. fuse and manual switch or circuit breaker. EDE recommends that a circuit breaker be used to accomplish this function. See Figure 3.
Maximum Available Fault Current (at the point of delivery)	The maximum current that would flow due to a direct short circuit from one conductor to ground or between conductors. This can be calculated by the company and furnished to the customer upon request.
Manufactured Home/Building	Shall be defined by the following requirements: A. The structure shall be installed on and secured to a permanent foundation. This does not mean block piers with cable or strap tie downs. B. The structural integrity of the manufactured home is sufficient to support the metered service equipment per NEC 550.32.

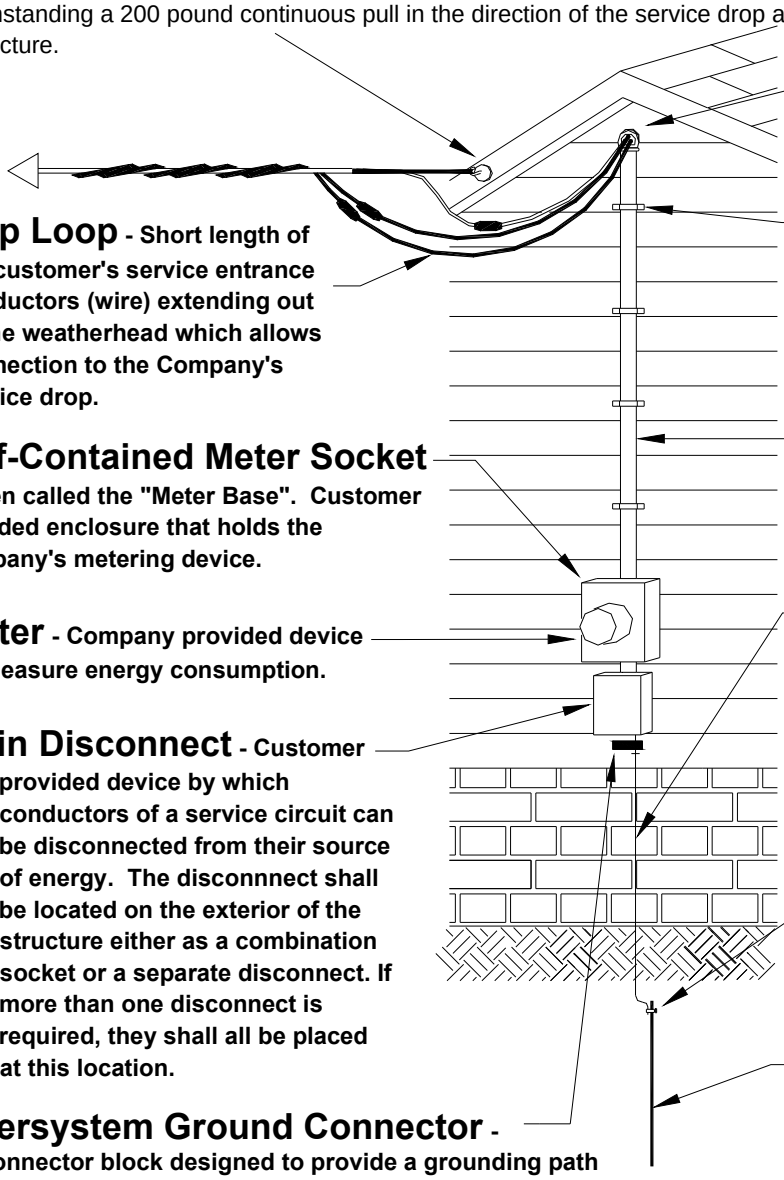
Meter Loop	Customer provided wire and enclosure connecting the Customer's service equipment to the Company's service drop. Consists of the following: Point of Attachment, wires, weatherhead, conduit, conduit straps, and meter socket / disconnect combination. These can be separate components.
Mobile Home	Shall be defined as any other type of structure moved to a site that does not match the Manufactured Building definition of this document.
NEC	The latest edition of the National Electrical Code.
NESC	The latest edition of the National Electrical Safety Code.
Point of Attachment	The point as ***designated by the Company*** at which the Company's service drop is attached to the Customer's facility. Can be attached to the structure or to rigid steel conduit. It must be capable of withstanding a 200 pound continuous pull in the direction of the service drop and be electrically insulated from the structure.
Point of Delivery	The point as ***designated by the Company*** where the Company's facilties terminate at the Customer's facilties.
Readily Accessible	Capable of being reached quickly, for operation, renewal, or inspections without requiring those to whom ready access is a requisite to climb over or remove obstacles or resort to portable ladders, etc.
Self-Contained Meter Socket	A meter socket that is installed in line with the service entrance or lateral conductors. If the socket were replaced with conductor, the power could flow straight through to the service equipment.
Service	The supply by the Company of electricity to the Customer, including the readiness and availability of electrical energy at the point of delivery, at the standard available voltage whether or not utilized by the Customer.
Service Drop	The overhead service conductors between Company's last pole or other aerial support to and including the connectors to the service entrance conductors at the point of delivery to the Customer's property.
Service Entrance	Customer owned conductors and enclosures connecting the Customer's service equipment to the Company's service drop or service lateral.
Service Lateral	The underground service conductors between the Company's secondary pedestal or transformer, including any risers at a pole or other structure and the point of delivery.
Sweep Elbow or ELL	Conduit Bend.
Undisturbed Earth	Soil that has not been moved by construction or recompacted soil that approximates such. In engineering terms, it is top soil or clay void of rotting debris that has been recompacted in 1 foot lifts to the desired level using a vibrating roller or sheeps-foot roller and achieving a 95% modified Proctor Density at each lift.
Wire Size	This refers to the AWG (American Wire Gauge) designation of copper wire unless otherwise specified. Should another approved conductor material be used, a size having the equivalent current carrying capacity shall be selected.

DEFINITIONS ONLY

REFER TO INSTALLATION SPECIFICATION AND FIGURES FOR CONSTRUCTION DETAILS

Meter Loop - Customer provided wire and enclosure connecting the Customer's service equipment to the Company's service drop. Consists of the following: Point of Attachment, wires, weatherhead, conduit, conduit straps, and meter socket.

Point of Attachment - The point as ***designated by the Company*** at which the Company's service drop is attached to the Customer's facility. Can be attached to the structure or to rigid steel conduit. It must be capable of withstanding a 200 pound continuous pull in the direction of the service drop and be electrically insulated from the structure.



Weatherhead - Device attached to the top of the conduit to protect the enclosed conductors from the weather.

Drip Loop - Short length of the customer's service entrance conductors (wire) extending out of the weatherhead which allows connection to the Company's service drop.

Conduit Strap - properly sized strap used with screws or nails to securely attach conduit to the structure.

Self-Contained Meter Socket - Often called the "Meter Base". Customer provided enclosure that holds the Company's metering device.

Conduit - Pipe used to protect the electrical conductors.

Meter - Company provided device to measure energy consumption.

Ground Wire - Referred to as "Grounding Electrode Conductor" by the NEC. Conductor used to connect the Ground Rod to the meter socket grounding connector at the service entrance. It must be securely attached to the structure.

Main Disconnect - Customer provided device by which conductors of a service circuit can be disconnected from their source of energy. The disconnnect shall be located on the exterior of the structure either as a combination socket or a separate disconnect. If more than one disconnect is required, they shall all be placed at this location.

Ground Rod Clamp - Clamp specifically designed to connect ground wire to ground rod.

Ground Rod - Referred to as a "Grounding Electrode" by the NEC. Copper clad steel rod, 5/8" x 8', driven in undisturbed earth as close to the service entrance as possible.

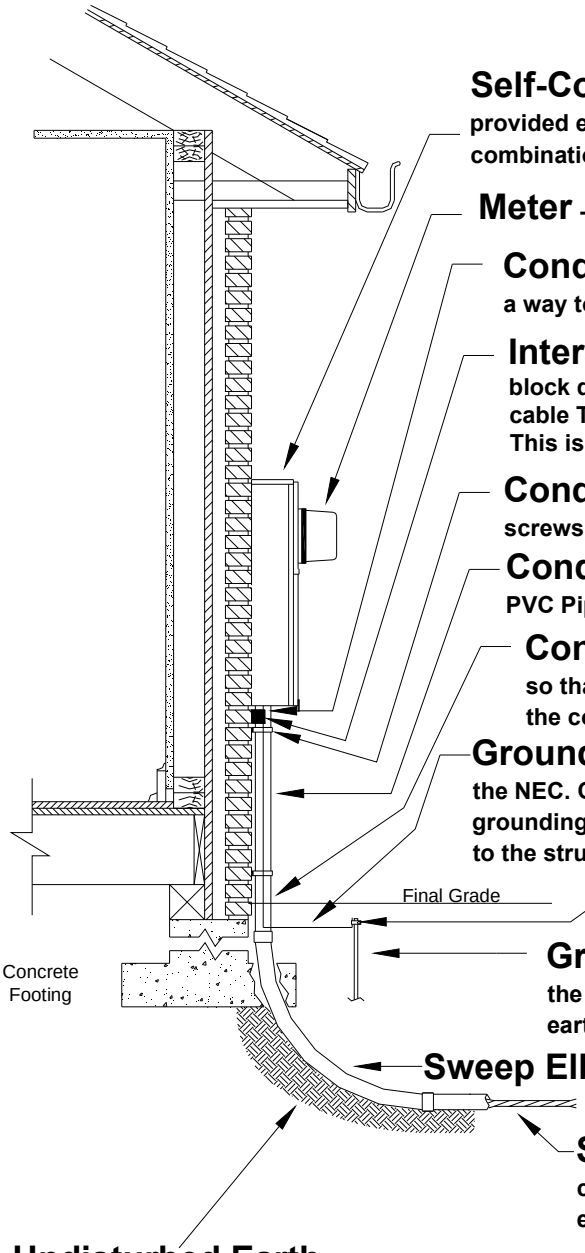
Intersystem Ground Connector - A connector block designed to provide a grounding path so that others, i.e. cable TV, telephone, may have easy access to ground bonding. This is as per 2008 NEC 250.94 (3).

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
12/30/04 SDS REVISIONS	DEFINITIONS
	DWG. NO. V96A06 MS9603
	DRAWN: JEB — DATE: 5/13/96
	SCALE: NTS — FIGURE 1

Figure 1: Definitions

DEFINITIONS ONLY

REFER TO INSTALLATION SPECIFICATION AND FIGURES FOR CONSTRUCTION DETAILS



Self-Contained Combination Meter Socket - Customer provided enclosure that holds the Company's metering device and is a combination of a Meter Socket (Meter Base) and a Main Disconnect.

Meter - Company provided device to measure energy consumption.

Conduit Reducer - A fitting used to provide a way to connect together different sized conduits.

Intersystem Ground Connector - A connector block designed to provide a grounding path so that others, i.e. cable TV, telephone, may have easy access to ground bonding. This is as per 2008 NEC 250.94 (3).

Conduit Strap - properly sized strap or clamp used with screws or nails to securely attach conduit to the structure.

Conduit - Rigid Steel or Schedule 80 Electrical Grade PVC Pipe used to protect the electrical conductors.

Conduit Vent - A fitting used to provide an outlet so that gases or fluids can be released externally from the conduit. This is commonly used in hilly terrain.

Ground Wire - Referred to as "Grounding Electrode Conductor" by the NEC. Conductor used to connect the Ground Rod to the meter socket grounding connector at the service entrance. It must be securely attached to the structure.

Ground Rod Clamp - Clamp specifically designed to connect ground wire to ground rod.

Ground Rod - Referred to as a "Grounding Electrode" by the NEC. Copper clad steel rod, 5/8" x 8', driven in undisturbed earth as close to the service entrance as possible.

Sweep Elbow or Sweep ELL - Conduit bend

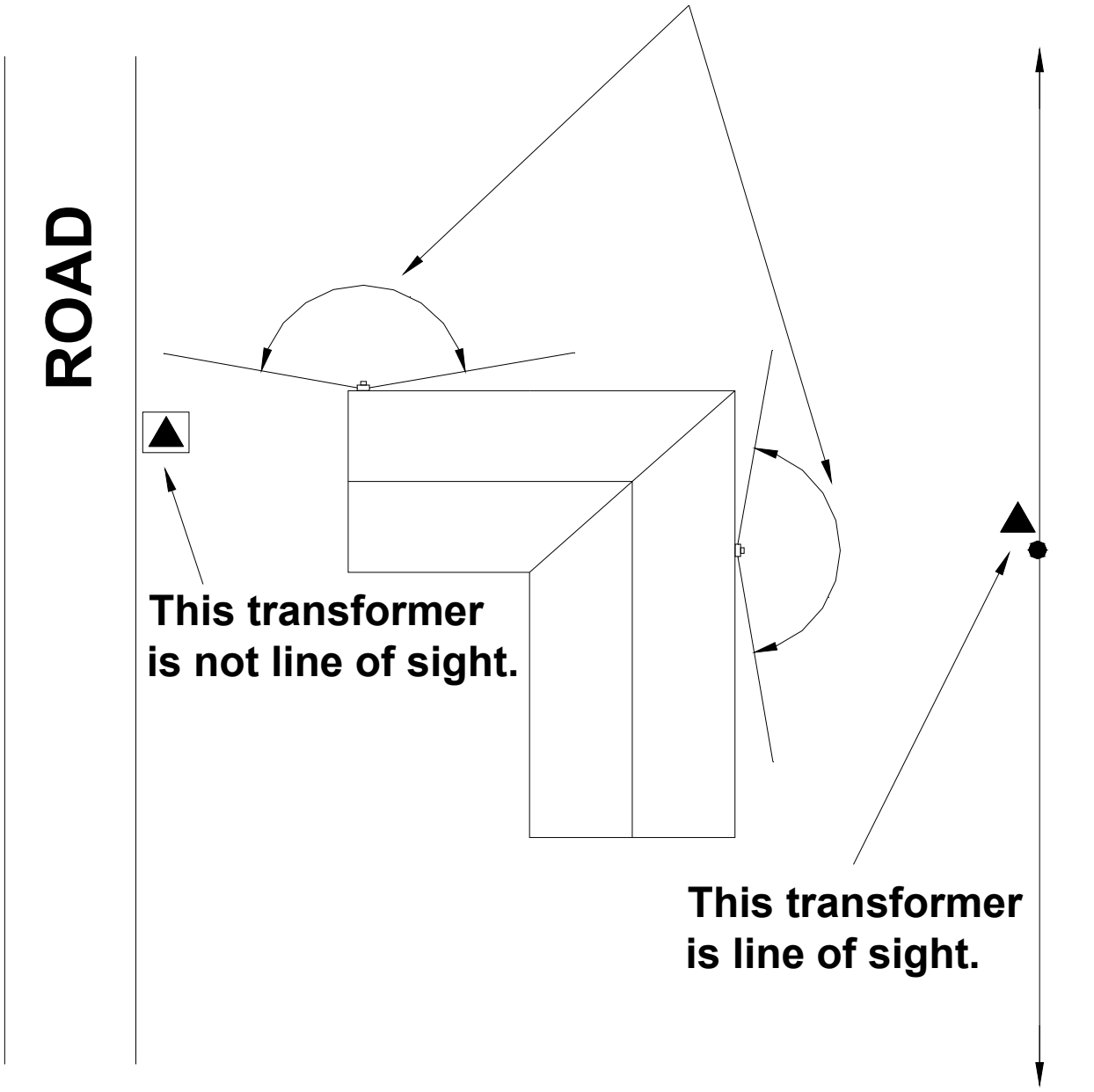
Service Lateral - Conductor that is provided in most cases by EDE that connects the customer to the source of energy

Undisturbed Earth - Soil that has not been moved by construction or recompacted soil that approximates such. In engineering terms, it is top soil or clay void of rotting debris that has been recompacted in 1 foot lifts to the desired level using a vibrating roller or sheeps-foot roller and achieving a 95% modified Proctor Density at each lift.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
SDS 01/26/09 REVISIONS	DEFINITIONS	
	DWG. NO. V06A01 MS0601	
	DRAWN: SDS	DATE: 11/06/06
	SCALE: NTS	FIGURE 2

Figure 2: Definitions

DEFINITIONS ONLY



	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	DEFINITIONS
	DWG. NO. V09A10 MS0910
	DRAWN: SDS — DATE: 10/01/09
	SCALE: NTS — FIGURE 3

Figure 3: Definitions

2.2 AVAILABILITY AND LOCATION OF SERVICE

Before construction is started, the Customer shall request the Company to designate a point of delivery, and submit appropriate load data to the Company. The load data should include the anticipated demand and list of equipment. The Customer shall provide a set of building plans, a survey and a copy of the warranty deed. It is requested that the Customer provide the building plans as an AutoCAD file (.DWG) format.

It is important that the Company and Customer be in agreement on the planned location of all service-related equipment before construction is started. This equipment includes, but may not be limited to; meter sockets, risers, pedestals, conduit and trench location, pull boxes, padmounted transformers, CT/connection cabinets, pole, lines and anchors.

The Customer is responsible to contact customer service to submit a Request For Service. Customer Service can be reached by calling (800) 206 – 2300.

Failure to comply could result in time delays and/or additional cost to the Customer.

2.3 TYPE AND CHARACTER OF SERVICE

1. **IT IS ESSENTIAL THAT THE CUSTOMER CONSULT THE COMPANY REGARDING THE TYPE OF SERVICE WHICH CAN BE FURNISHED AT A PARTICULAR LOCATION BEFORE PROCEEDING WITH PURCHASE OF EQUIPMENT OR INSTALLATION OF WIRING.**
2. The voltage and/or number of phases which will be supplied will depend on the type, size and location of the load, and existing Company facilities.

   a. The table below lists the standard service voltages that are available.

	SINGLE PHASE	THREE PHASE
Pole Mounted Transformer	120/240 Volts, 3-Wire Up to 167 KVA 120/208 Volts, 3-Wire (Limited Applications)	120/240 Volts, 4-Wire DELTA$^{\Phi}$ Up to 75 KVA 120/208 Volts, 4-Wire WYE***** Up to 500 KVA 277/480 Volts, 4-Wire WYE***** Up to 500 KVA
Pad Mounted Transformer	120/240 Volts, 3-Wire Up to 167 KVA	120/208 Volts, 4-wire WYE***** Up to 1000 KVA 277/480 Volts, 4-Wire WYE***** Up to 2500 KVA

Note: $^{\Phi}$ *The Company **will not** provide a 120/240 volt, four-wire delta service when the surrounding area is served by an underground primary distribution system or service is required from a padmounted transformer. The maximum single postion transformer size is 25 kVA.*

***** *All wye services require a neutral conductor.*

b. In some instances, three-phase service at the primary voltage of 7,200/12,470 volts Grd Y or 2,400/4,160 volts Grd Y may be provided. However, this service must be approved by the Company.

3. The manner in which single-phase loads are connected by the Customer is critical when **three-phase four-wire WYE** service is provided. All single-phase loads should be split evenly among the three phases. Connections made otherwise may result in an overload or single-phase condition with the possibility of damage to the Customer's three-phase equipment.
4. The manner in which single-phase loads are connected by the Customer is critical when **three-phase four-wire DELTA** service is provided. No single-phase loads should be connected to the power leg. Inappropriate connections of single phase equipment to the power leg may result in damage to the connected equipment. The Customer shall provide a load schedule detailing the three phase and single phase loads to be served.
5. **The Customer is responsible for providing the necessary equipment and devices to protect any three phase equipment from damage due to a single phasing condition that may occur on the Company's service.**
6. All single phase motors over 6.5 hp and all three phase motors over 15 Hp must be approved in advance by the Company. If an adjustable speed drive or DC drive is used, the Customer shall notify the Company so that characteristics particular to the solid state motor control can be taken into account in all studies.

2.4 GENERAL REQUIREMENTS

1. The Customer's wiring and electrical equipment shall be safe, in conformance with the NEC and with all applicable federal, state, and local codes and ordinances.
2. The Main Disconnect ampacity determines the wire size used in the Service Riser as well as the wire size from the Meter Socket to the Main Disconnect.
3. All wiring installations must be inspected and approved by an authorized electrical inspector as required by governmental authority.

   The Company shall have the right to disconnect or refuse service to any installation which violates local, municipal, NEC or NESC regulations. The Company shall also have the right to disconnect or refuse service for installations that are hazardous to the public, or negatively impacts service to other Customers, or Company facilities.
4. The Customer's equipment (motors, welders, etc.) shall operate so as not to impose a voltage drop on the Company's primary system that will exceed the Company's flicker curve limitations. The Customer shall be responsible for the necessary modifications to the equipment to correct the problem.
5. For all 3 phase, 4 wire, wye services supplied by the Customer, a full rated neutral (Grounded Conductor) shall be provided unless the Customer provides documentation from a registered engineer allowing derating of the neutral (Grounded Conductor).
6. Before service can be connected, the 911 address must be displayed at the location.

2.5 ALTERATIONS AND ADDITIONS

1. **SERVICE CONNECTIONS, METERS, OR METERING EQUIPMENT SHALL NOT BE REMOVED OR RELOCATED EXCEPT BY EMPLOYEES OF THE COMPANY OR ITS AUTHORIZED AGENTS.**
2. Connection to the Customer's premises is made with facilities designed to properly supply adequate electric service for the Customer's operation using information provided at the time of application for service. Therefore, no additions of major load, or alterations of the Customer's installation should be made without first notifying the Company. Failure to provide such notification may affect the quality and reliability of the Customer's own service, as well as that of other Customers.
3. When alterations or repairs require the relocation or temporary removal of service drop wires, meters and metering equipment, the Customer shall make appropriate advance arrangements with the Company to perform the relocation or temporary removal. The new location must be approved by the Company before the Customer begins work. All alterations or repairs must meet the applicable codes that are in effect at the time work is done. When alterations or repairs have been satisfactorily completed by the Customer and the necessary inspection approvals obtained, the Company will make the connections to provide service.
4. **Since *serious injury or death* could result from a person coming in contact with an energized electrical circuit or equipment, neither the Customer nor the Customer's agents shall remove an energized meter from its socket. Meters are not designed to be a disconnecting device under load. Arcing, fire, explosion, etc. could occur with the possibility of burns, injury, or death as well as damage to adjacent or surrounding structures and equipment. The Customer will be held legally responsible for such injury, death, or damage if caused by the unauthorized breaking of the seals, tampering, or otherwise interfering with the Company's meter or other equipment of the Company installed on the Customer's premises. No one except authorized employees or agents of the Company will be allowed to make any repairs or adjustments to any meter or other equipment belonging to the Company. The Company will be responsible for disconnecting service and removing the meter prior to the Customer's repair or replacement of the Customer's meter socket.**

3 METERING

3.1 GROUNDING

1. GENERAL

Unless otherwise noted, the Customer shall supply and install a 5/8" x 8' ground rod with ground rod clamp outside of the building wall. It shall be totally driven and be within two (2) feet of the structure at the meter socket location. If other grounding methods are used, all grounding systems must be bonded together as per NEC.

2. SELF – CONTAINED

When using self-contained meter sockets, the ground wire shall originate at the factory installed grounding connector in the meter socket and terminate at the ground rod clamp on the ground rod. The size of the ground wire shall be as specified in the applicable drawings.

3. CURRENT TRANSFORMER (CT)

When the metering installation requires the use of current transformers, a single ground rod may not be adequate. Consult the NEC for further information.

4. Minimum Ground Wire

Main Disconnect*	Ground Wire Size
600 A	2/0 CU
800 A	2/0 CU
1000 A	2/0 CU
1200 A	3/0 CU
*For smaller service disconnects, the applicable drawings in this document will specify the ground wire size.	

3.2 METERING EQUIPMENT LOCATIONS

1. The metering equipment shall be located outdoors and approved by the Company.

2. Metering equipment shall be located where it is readily accessible to Company employees without special keys or entry requirements (public entry).

3. Metering accuracy is of utmost importance to the Company and its Customers. Therefore, any location where the environment could affect the accuracy of the meter will not be acceptable. These conditions could include, but are not limited to: corrosion, vibration, dust, magnetic interference, etc.

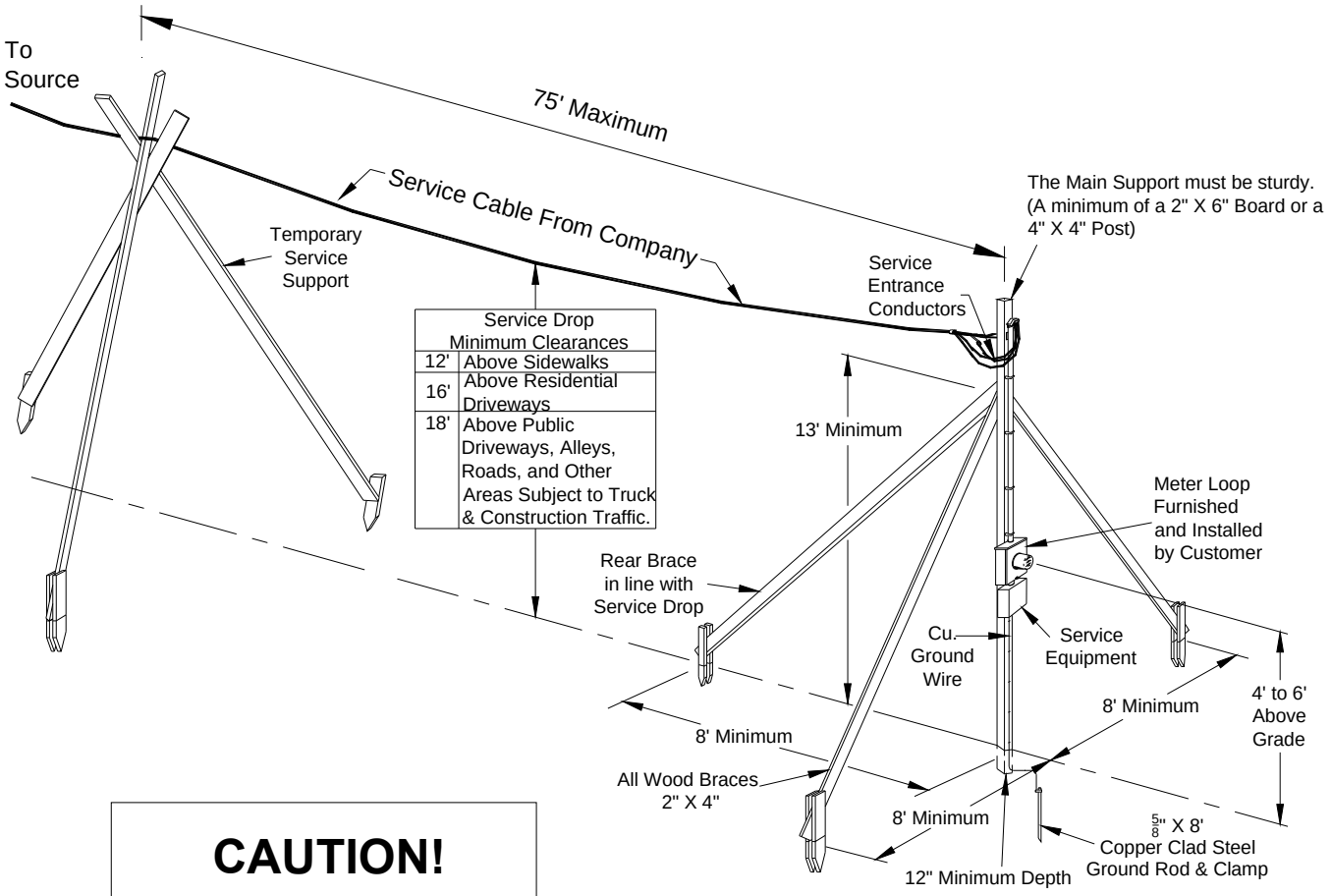
4.0 INFORMATION APPLYING TO ALL SERVICES

1. There will only be one service voltage available at a location, and only one point of delivery for each building, except as allowed by the NEC and approved by the Company. If multiple service points are approved by the Company, the service points shall be marked as per NEC 230.2.E. Engraved Placards shall be attached with screws, bolts, or rivets.
2. **The point of delivery shall be designated by the Company prior to beginning construction.**
3. **All utilities must be notified and all underground facilities located and marked prior to any excavation. This shall include any Customer owned facilties.**
4. All service entrance facilities, including meter sockets, shall be located in an exposed and readily accessible area.
5. **Copper conductors are highly recommended**. Where allowed by local authority, aluminum conductors may be installed per NEC requirement; provided the meter socket is approved for use with aluminum conductors, and a corrosion inhibiting compound recommended by the cable manufacturer is properly applied to the meter socket terminals.
6. When an existing service entrance using copper conductors is replaced by a service entrance using aluminum conductors, the existing meter socket, if not marked AL-CU, must be replaced with one approved for use with aluminum conductors.
7. Service entrance conductors between the Company's point of delivery and the self–contained metering point, or the first disconnect shall be enclosed in conduit. **Troughs and electrical gutters are not allowed on either side of disconnects on the outside of the building.**
8. Unless otherwise noted, the conduit is to be galvanized rigid steel. **Water pipes, sewer pipes and / or fittings are NOT acceptable.** Unless otherwise stated all sweep ells shall be rigid steel, and the following minimum sweep radius of these will be; 4" – 16", 3" – 13", and 2" – 9.5".
9. The neutral conductors of all services shall be grounded at the metering point as shown on the applicable drawings.
10. Conductor marking
    a. All neutral conductors shall be clearly marked with white tape at the point of delivery and at the meter location.
    b. The power leg of each 120/240 volt, three-phase, four-wire delta service shall be clearly marked with orange tape at the point of delivery and at the meter location.
11. Phase Rotation

    On three-phase installations to insure proper equipment operation, the Customer is responsible for verifying phase rotation at the time of service connection.

5.0 TEMPORARY SERVICES

1. The Company must be provided with detailed plans of each installation where temporary service is to be supplied. Installations requiring special service, meter, or other work for construction purposes, exhibits of short duration, etc., **will be made at the expense of the Customer**.
2. Temporary services over 500 feet are not available. Temporary services over 300 feet are not recommended. **The Company will not be responsible for damage done to equipment with temporary services.**
3. **Temporary service equipment shall not be installed on trees or the Company's Poles.**
4. Temporary installation of service entrance, other wiring, and meters shall meet the same requirements as permanent installations, including inspection and approval.
5. **Temporary single phase service for construction purposes may be provided from either overhead or underground facilities. Arrangements for temporary construction service are shown in Figures 4, 5, 6, and 7.**
6. Prior to connection of permanent service, all temporary service drops or temporary construction wires or cables shall be removed from the finished structure's permanent distribution panels.
7. Overhead temporary meter loops shall have a driven ground rod as shown in Figure 4.
8. The typical temporary service is 120/240v, single phase. Single phase temporary service requiring over 100 amps capacity and three phase temporary may be available. Contact the Company for more details, additional costs may apply.
9. **All temporary installations shall be safe and in good working condition as judged by a Company field representative before the service will be connected.**
10. Temporary service will be available at the site as long as construction is in progress or is otherwise limited by the Local Authority. Once the project is substantially completed the temporary service shall be disconnected.
11. EDECo is not required to provide electric service to temporary Customers at locations that require the extension of Company lines unless the full cost of erection and removal, including indirect costs of construction, of the extension be contributed by the Customer.



CAUTION!

Contact All Utilities Before Digging, Staking or Driving a Ground Rod.

Wire Sizes		
Service Size	Minimum	
	Neutral*	Line
100 Amp	#4 Cu.	#4 Cu.
* Neutral May Be Reduced Under Specific Conditions Allowed By NEC.		

Refer to NEC for Ground Fault Circuit Interrupter Requirements

Service Size	Ground Wire
100 Amp	#6 Cu.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Temporary Service From Overhead Facilities

DWG. NO. V94A15 MS9412
DRAWN: AMA DATE: 01/01/96
SCALE: NTS

07/15/06 SDS REVISIONS

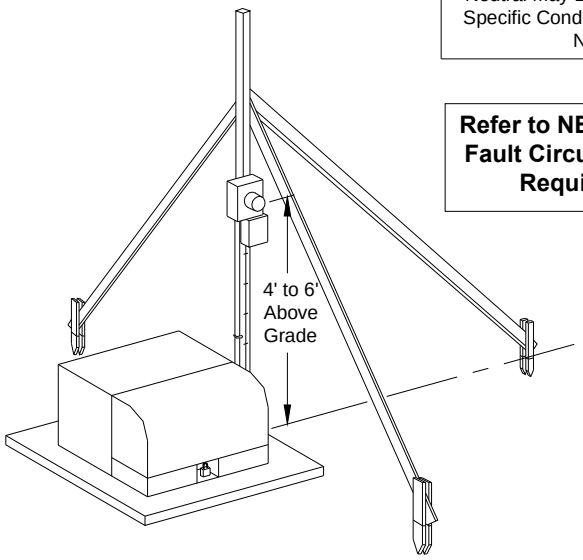
FIGURE 4

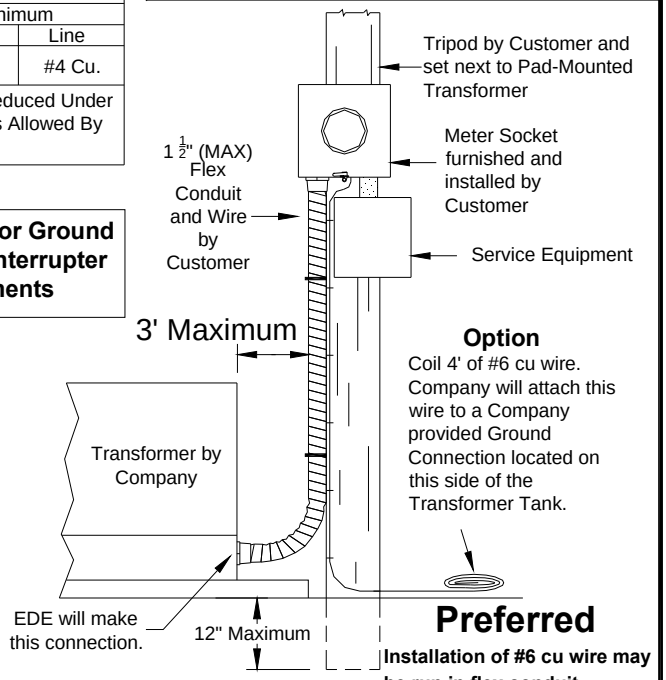
Figure 4: Temporary Service From Overhead Facilities

COMMERCIAL & INDUSTRIAL

Wire Sizes		
Service Size	Minimum	
	Neutral*	Line
100 Amp	#4 Cu.	#4 Cu.
* Neutral May Be Reduced Under Specific Conditions Allowed By NEC.		

Refer to NEC for Ground Fault Circuit Interrupter Requirements





Preferred

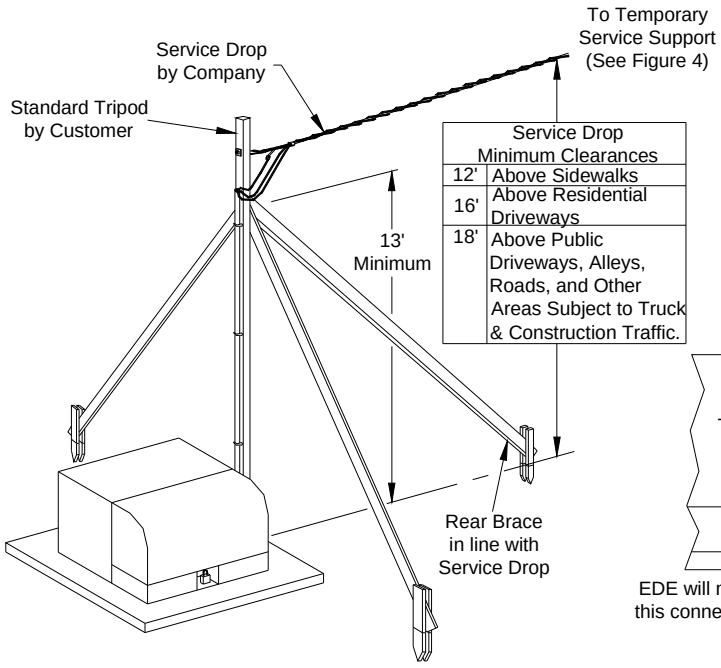
Installation of #6 cu wire may be run in flex conduit.

Company will attach this wire to a Company provided Ground.

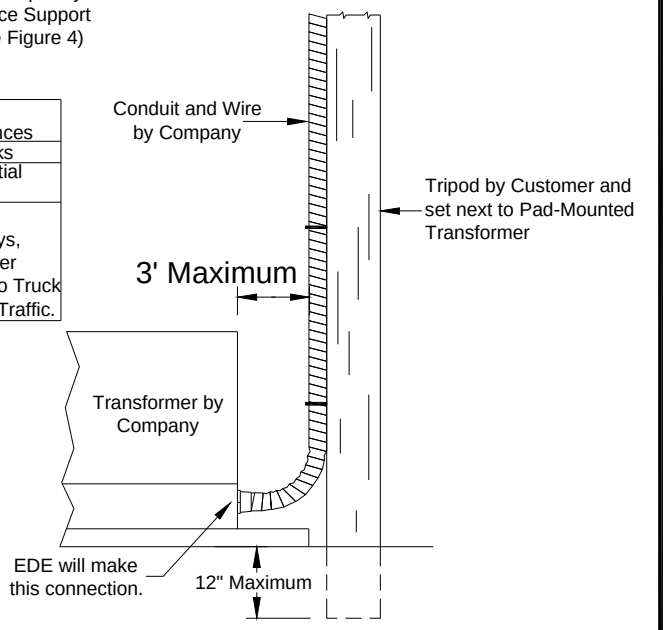
Temporary Meter Loop Shall Be As Shown

CAUTION!

Contact All Utilities Before Digging or Staking.



Service Drop Minimum Clearances	
12'	Above Sidewalks
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.



All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Temporary Service From Underground Facilities

DWG. NO. V96A16 MS9613

DRAWN: AMA DATE: 01/01/97

SCALE: NTS

FIGURE 5

REVISIONS 07/15/06 SDS

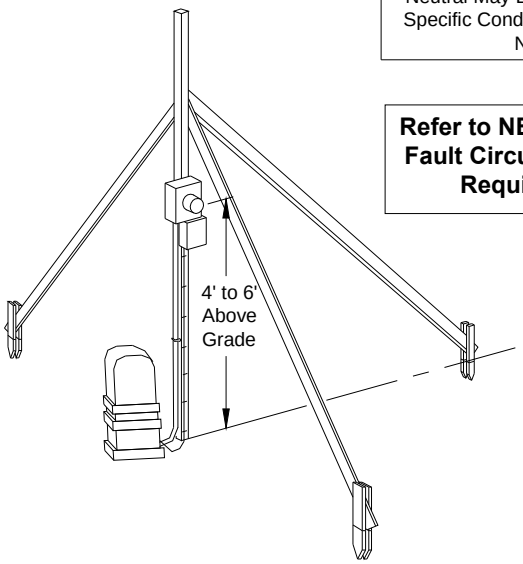
Figure 5: Temporary Service From Underground Facilities

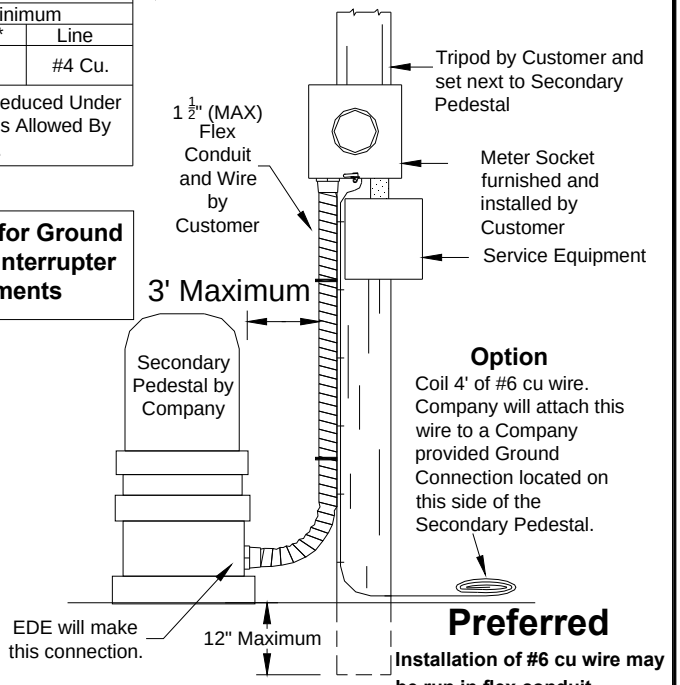
COMMERCIAL & INDUSTRIAL

Wire Sizes		
Service Size	Minimum	
	Neutral*	Line
100 Amp	#4 Cu.	#4 Cu.

* Neutral May Be Reduced Under Specific Conditions Allowed By NEC.

Refer to NEC for Ground Fault Circuit Interrupter Requirements





Option

Coil 4' of #6 cu wire. Company will attach this wire to a Company provided Ground Connection located on this side of the Secondary Pedestal.

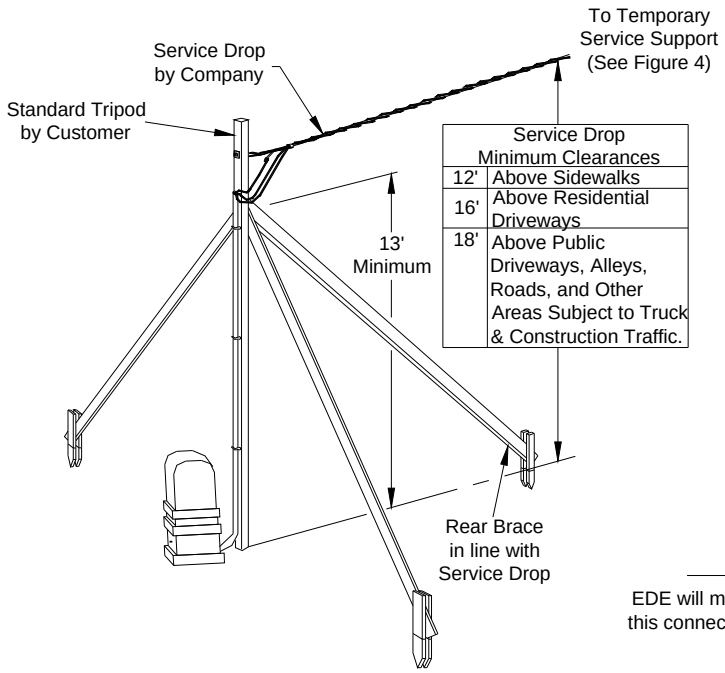
Preferred

Installation of #6 cu wire may be run in flex conduit. Company will attach this wire to a Company provided Ground.

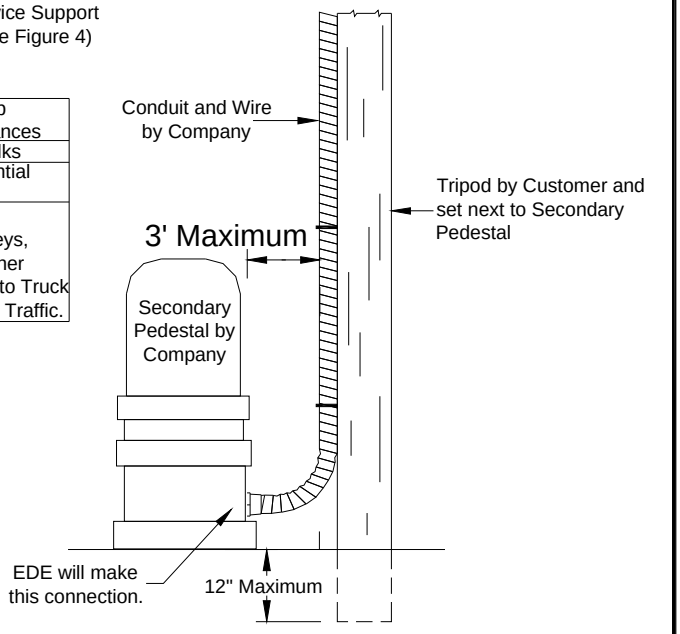
Temporary Meter Loop Shall Be As Shown

CAUTION!

Contact All Utilities Before Digging or Staking.



Service Drop Minimum Clearances	
12'	Above Sidewalks
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.



All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Temporary Service From Underground Facilities (Continued)

DWG. NO. V96A16 MS9613

DRAWN: AMA DATE: 01/01/97

SCALE: NTS

REVISIONS 07/15/06 SDS

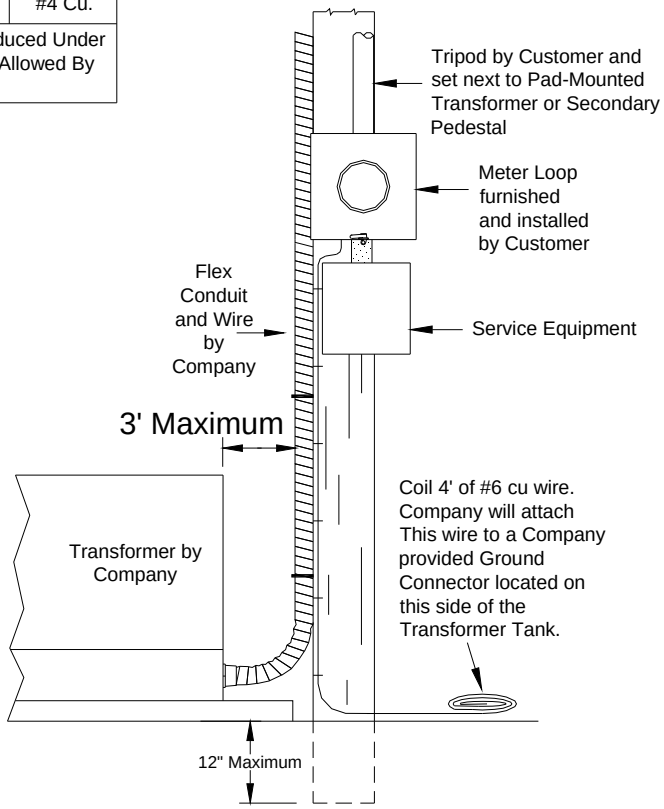
FIGURE 6

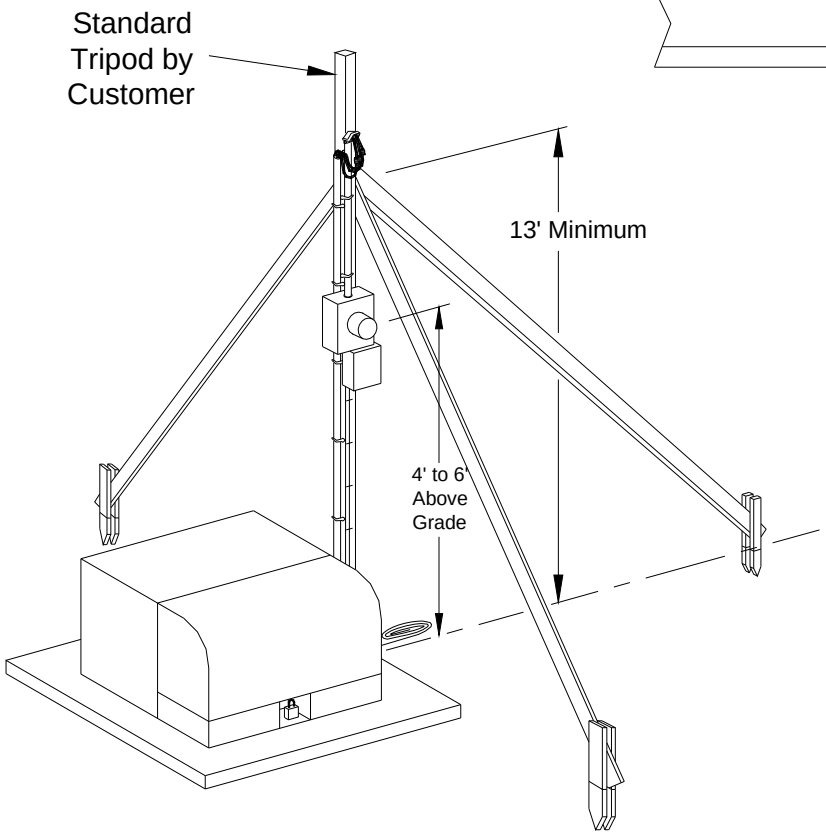
Figure 6: Temporary Service From Underground Facilities (Continued)

Wire Sizes		
Service Size	Minimum	
	Neutral*	Line
100 Amp	#4 Cu.	#4 Cu.
* Neutral May Be Reduced Under Specific Conditions Allowed By NEC.		

Refer to NEC for Ground Fault Circuit Interrupter Requirements

Temporary Meter Loop Shall Be Installed As Shown





CAUTION!

Contact All Utilities Before Digging or Staking.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Temporary Service From Underground Facilities (Continued)

DWG. NO. V96A16 MS9614

DRAWN: AMA DATE: 01/01/97

SCALE: NTS

FIGURE 7

07/15/06 SDS REVISIONS

Figure 7: Temporary Service From Underground Facilities (Continued)

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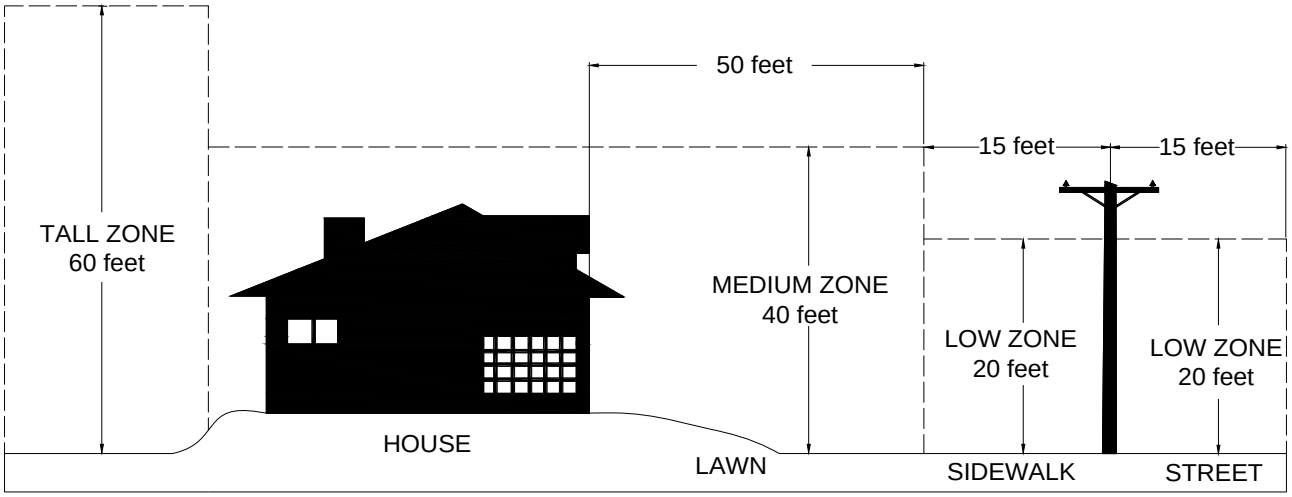
6.0 OVERHEAD SERVICES

6.1 GENERAL INFORMATION

1. The Customer shall provide an insulated Point of Attachment within 24" of the weatherhead which is capable of withstanding a continuous force of 200 lbs. in the direction of pull of the Service Drop. The weatherhead shall be above the point of attachment, where practical. The weatherhead location shall not be farther than 24 inches from the Point of Attachment.

3. A minimum of 24 inches of service entrance conductor shall extend from a single weatherhead for connection to the service drop. **If the installation requires more than one service riser, it is the responsibility of the Customer to provide enough conductor so that a single connection point per phase can be made at one common location.**

2. The Customer shall provide a clear and unobstructed path for the Company's service drop to the attachment point. The Customer shall request the Company to designate the location of the point of delivery for each service location before construction is started. This shall be done to increase the reliability of electric service. Trees growing into or near power lines are one of the most common causes of power outages. Help avoid the need for future trimming by planting the right tree in the right place. For a list of appropriate trees for the TALL ZONE, MEDIUM ZONE AND LOW ZONE pictured below, please contact your EDECo. representative.



Continued on next page

4. The point of attachment of the service drop conductors shall be located by the Customer so as to allow not less than the minimum clearances for the service drop as shown in the table below. Greater clearances may be required by local authorities. **In no case shall the attachment height be lower than 12' above final grade.**

MINIMUM CLEARANCES OF SERVICE DROP CABLES*

Above roads, streets, alleys, parking lots, commercial and industrial driveways subject to truck traffic	18 feet
Above residential driveways	16 feet
Above space accessible to pedestrians only(including decks and porches)	12 feet
Above or below roofs or balconies accessible to pedestrians	11 feet
Above or below roofs or projections not accessible to pedestrians	8 feet
Horizontal to any structure	5 feet
Horizontal from directly below conductor to edge of swimming pool (This is for either an above ground or in ground swimming pool.)	10 feet

**Note: The point of attachment shall normally be 2' - 3' higher than these minimum required clearances to allow for sag of the service cable. Open wire service drops may require additional clearance.*

5. Street access driveways, where vehicular traffic may pass under service conductors, must maintain the minimum clearances from ground to service conductors required for roads, streets, alleys, and parking lots in the above table. For further details and items not covered above, contact the Company.

6. The point of delivery will be at the weatherhead connections.

6.2 100 AMP, 200 AMP, AND 400 AMP SINGLE PHASE OVERHEAD SERVICE

A. General Notes:

1. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, weatherhead, lock nuts, bushings, 200 amp meter socket, meter socket hub, main disconnect, service drop attachment device, and miscellaneous mounting hardware furnished and installed by the Customer.
2. Meter, service connectors, and service drop furnished and installed by Company.
3. The meter socket should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket. Prior approval is required for placement of the meter socket in alleyways or areas where it may be subjected to damage.
4 Installation requiring a steel service mast shall be installed by the Customer as specified in Figure 9.
5. The 100 amp and 200 amp meter socket shall meet the latest revision of U.L. 414 and ANSI C12.7 standards. These sockets shall be ring style.

APPROVED INDIVIDUAL METER SOCKETS

SERVICE SIZE	MILBANK CAT. NO.	EATON/ CUTLER HAMMER CAT. NO.	DURHAM or SQUARE D CAT. NO.
100 AMP	U7490RLTG	UTRRS101	UTRRS101
		UTRRS111	UTRRS111
200 AMP	U7017RLTG	UTRRS202	UTRRS202B
	U7018RLTG	UTRRS213	UTRRS213B

Note: On 120/208 service, the Company will provide the fifth lug only on these meter sockets.

APPROVED COMBINATION METER SOCKETS

SERVICE SIZE	MILBANK CAT. NO.	EATON/ CUTLER HAMMER CAT. NO..	SQUARE D CAT. NO.	DURHAM	MIDWEST ELECTRIC
100 AMP	U5169*	MB816B200BTS*	RCB816F100CH	1009663*	M181CB1*
200 AMP	U5169	MB816B200BTS	RCB816F200CH	1009663	M282CB1

Note: On 120/208 service, the Company will provide the fifth lug only on these combination meter sockets.

* To provide 100A service, this socket will be installed and a separate customer supplied 100A breaker will be installed to supply the 100A service.

6. **The 400 amp meter socket, 3 inch hub, and connectors shall be purchased from the Company and installed by the Customer.**
7. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility’s ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.

RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

B. Mounting:

1. Meter socket , ground wire, and conduit shall be surface mounted and securely fastened to the structure. The meter socket shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service riser conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a supporting frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.
3. Wire not enclosed in conduit shall be a minimum of 36 inches away from any window or door opening.

C. Connections:

1. Do not score line or load wire when removing insulation.
2. The Customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

D. Conductor Marking:

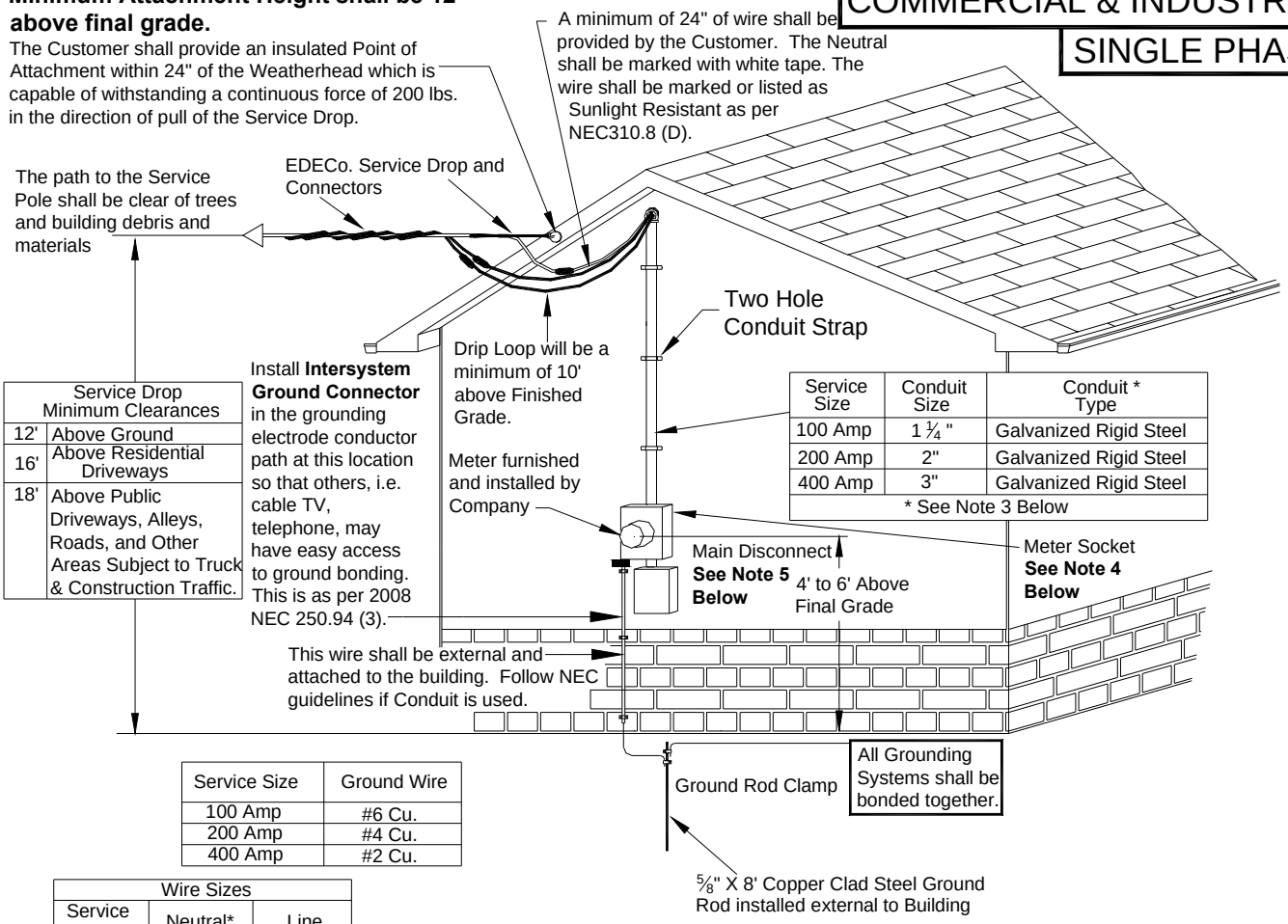
All neutral conductors shall be clearly marked with white tape at the point of delivery and at the meter socket.

Minimum Attachment Height shall be 12' above final grade.

The Customer shall provide an insulated Point of Attachment within 24" of the Weatherhead which is capable of withstanding a continuous force of 200 lbs. in the direction of pull of the Service Drop.

COMMERCIAL & INDUSTRIAL

SINGLE PHASE



Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Service Size	Conduit Size	Conduit * Type
100 Amp	1 ¼ "	Galvanized Rigid Steel
200 Amp	2"	Galvanized Rigid Steel
400 Amp	3"	Galvanized Rigid Steel
* See Note 3 Below		

Service Size	Ground Wire
100 Amp	#6 Cu.
200 Amp	#4 Cu.
400 Amp	#2 Cu.

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.
400 Amp	2 Runs 3/0 Cu.	2 Runs 3/0 Cu.
* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC.		

NOTE

Ground Rod and Wire **MUST** be Installed and Ground Wire **MUST** be attached to the structure before Service will be Connected.

Notes:

1. If minimum vertical clearance cannot be maintained with the installation of an attachment as shown above, the Customer shall install a rigid steel service mast as shown in Figure 9.
2. Connections between the Service Drop and Service Entrance Conductors shall be made by Company Personnel below the Weatherhead, forming a Drip Loop.
3. Other types of conduit may be allowed depending on Local Code Requirements. These may include EMT, Electrical Grade PVC, and Rigid Aluminum. **However, the Service Drop shall not be attached to any of these.**
4. 100 amp and 200 amp meter sockets shall be furnished by the Customer. 400 amp meter socket and 3" hub shall be purchased from the Company.
5. The disconnnect shall be located on the exterior of the structure either as a combination socket or an separate disconnect. If more than one disconnect is required, they shall all be placed at this location. It shall not be closer than 1" nor farther than 1' from the meter socket.

All Equipment Furnished and Installed By Customer Unless Noted

REVISIONS	
01/01/97	AMA
05/17/05	SDS
07/15/06	SDS
07/10/09	SDS
03/18/10	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100 / 200 / 400 Amp Overhead Service

DWG. NO. V96A17 MS9615

DRAWN: AMA DATE: 01/01/95

SCALE: NTS

FIGURE 8

Figure 8: 100/200/400 Amp Single Phase Overhead Service

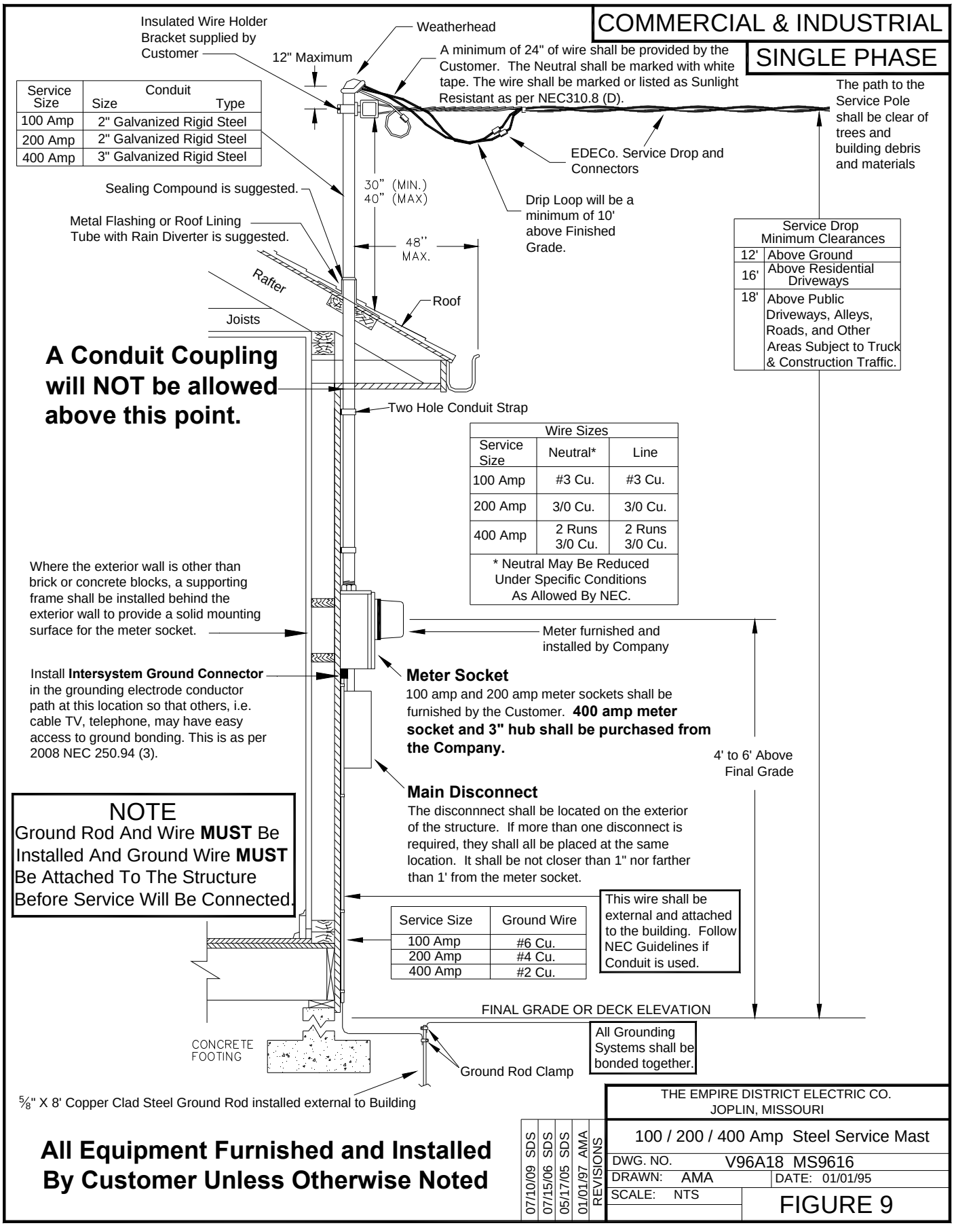


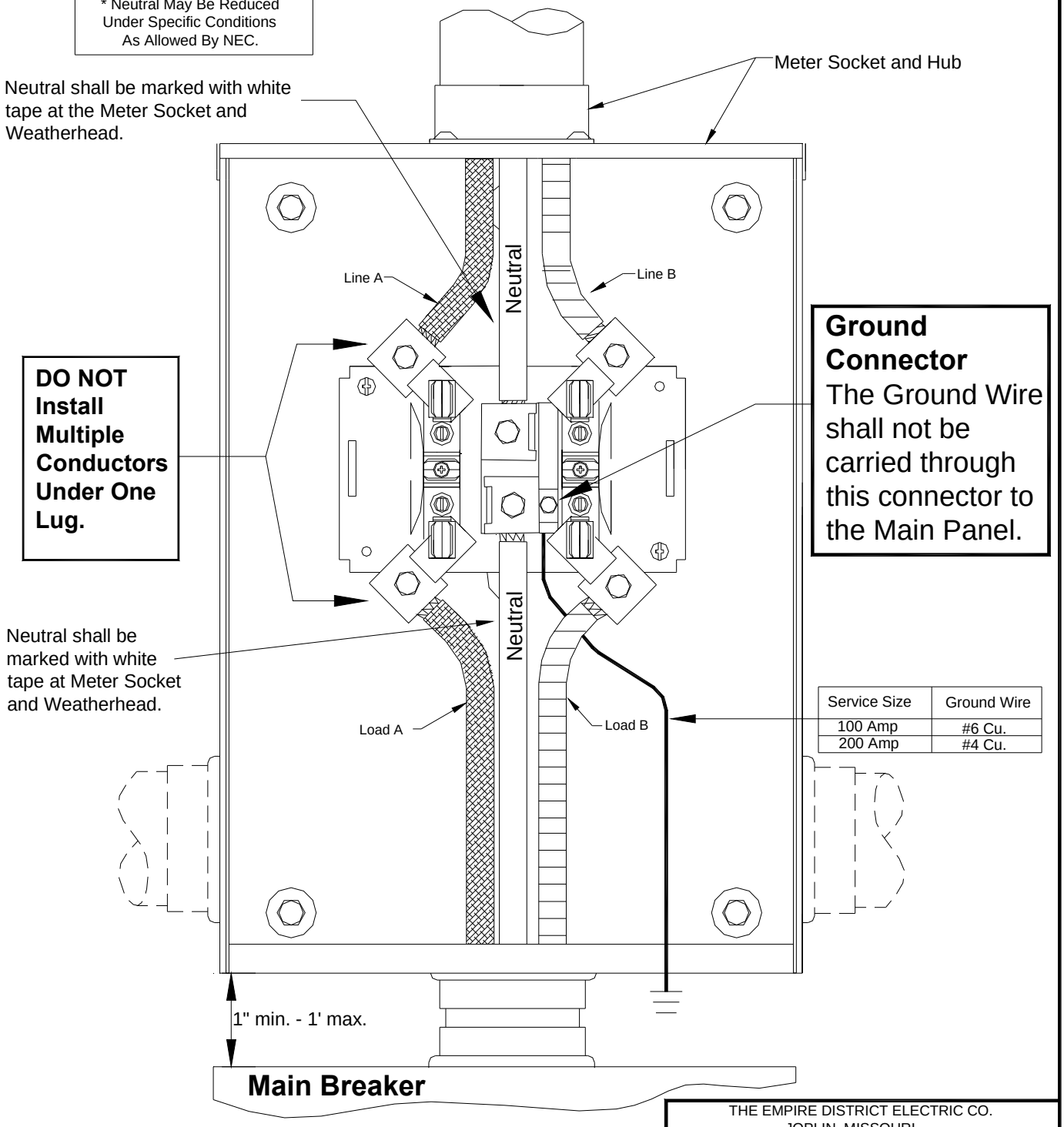
Figure 9: 100/200/400 Amp Single Phase Steel Service Mast

COMMERCIAL & INDUSTRIAL

SINGLE PHASE

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.

* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC.



All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100/200 Amp Meter Socket, Overhead Service

DWG. NO. V96A19 MS9617

DRAWN: AMA DATE: 01/01/95

SCALE: NTS

FIGURE 10

REVISIONS
01/01/97 AMA
05/17/05 SDS
07/10/09 SDS

Figure 10: 100/200 Amp Meter Socket, Single Phase Overhead Service

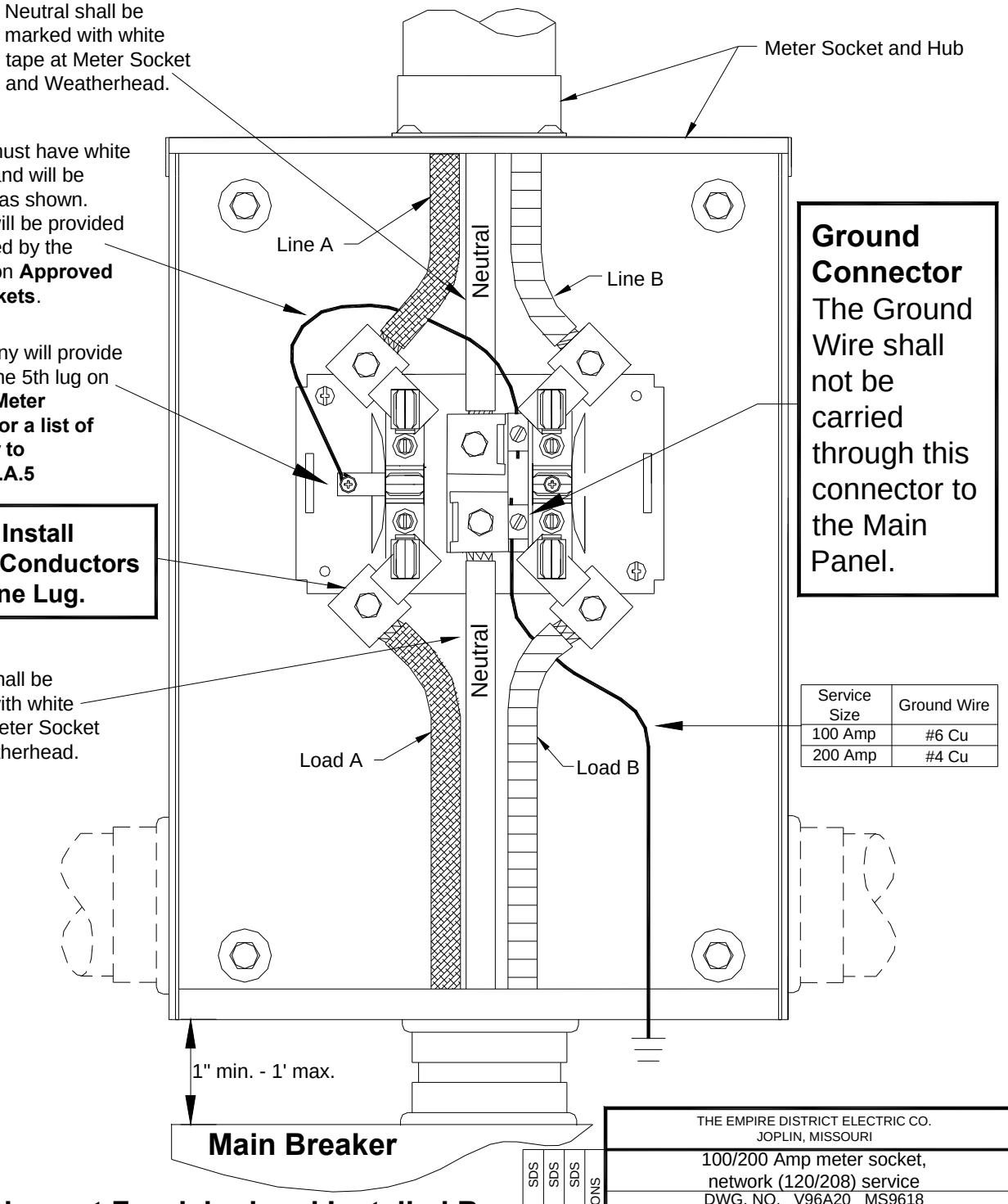
COMMERCIAL & INDUSTRIAL

SINGLE PHASE

Note:
This application for 120/208v, 3 wire service

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.

* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC.



Ground Connector
The Ground Wire shall not be carried through this connector to the Main Panel.

Service Size	Ground Wire
100 Amp	#6 Cu
200 Amp	#4 Cu

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS	SDS	SDS	SDS
	05-17-05	07-15-06	07-10-09

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100/200 Amp meter socket, network (120/208) service

DWG. NO. V96A20 MS9618

DRAWN: AMA DATE: 07/01/97

SCALE: NTS

FIGURE 11

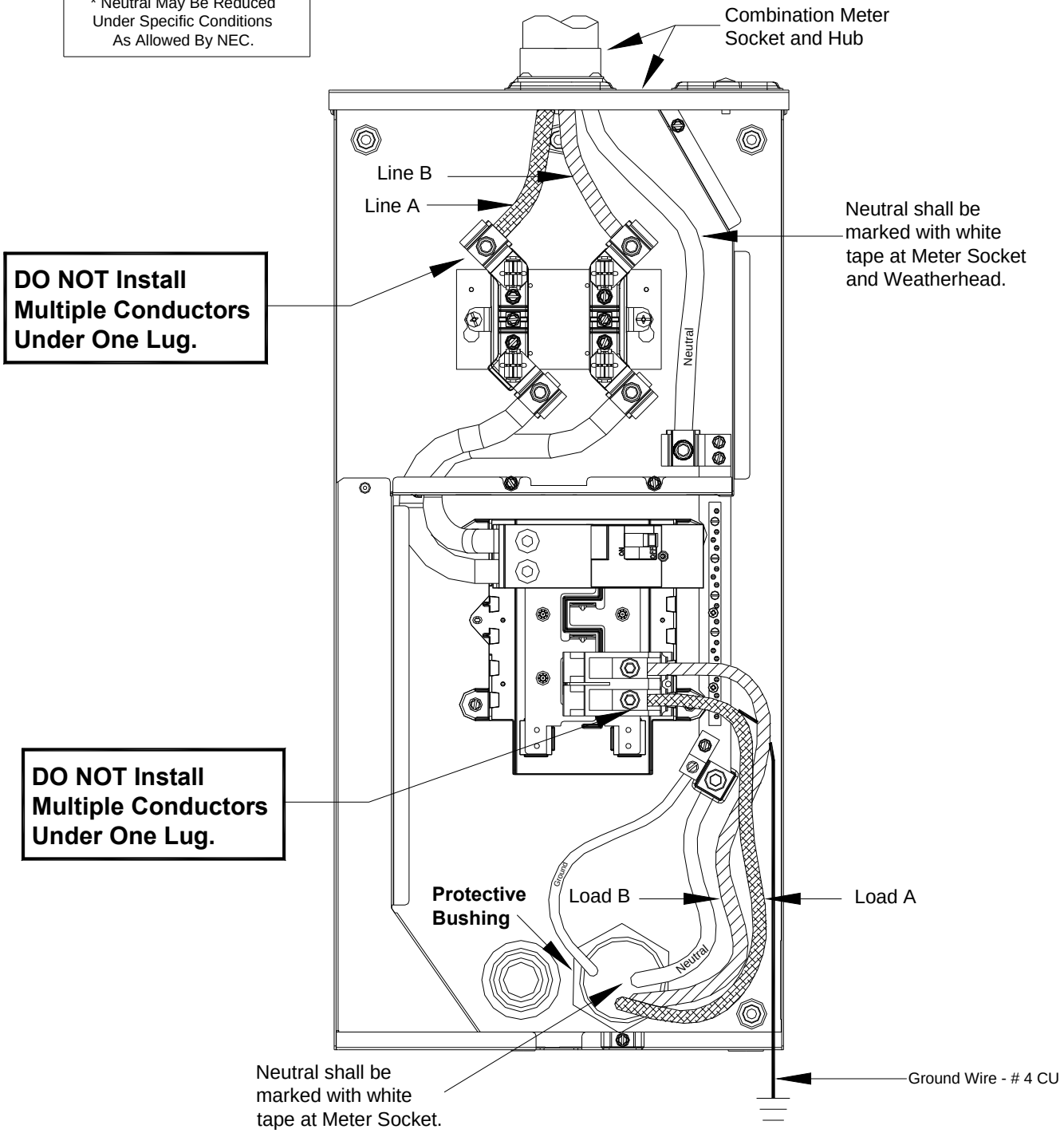
Figure 11: 100/200 Amp Meter Socket, Single Phase (120/208) Overhead Service

COMMERCIAL & INDUSTRIAL

SINGLE PHASE

Wire Sizes		
Service Size	Neutral*	Line
200 Amp	3/0 Cu.	3/0 Cu.

* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC.



All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

200 Amp Combination Meter Socket

DWG. NO. V06A02 MS0602

DRAWN: AMA DATE: 11/10/06

SCALE: NTS

FIGURE 12

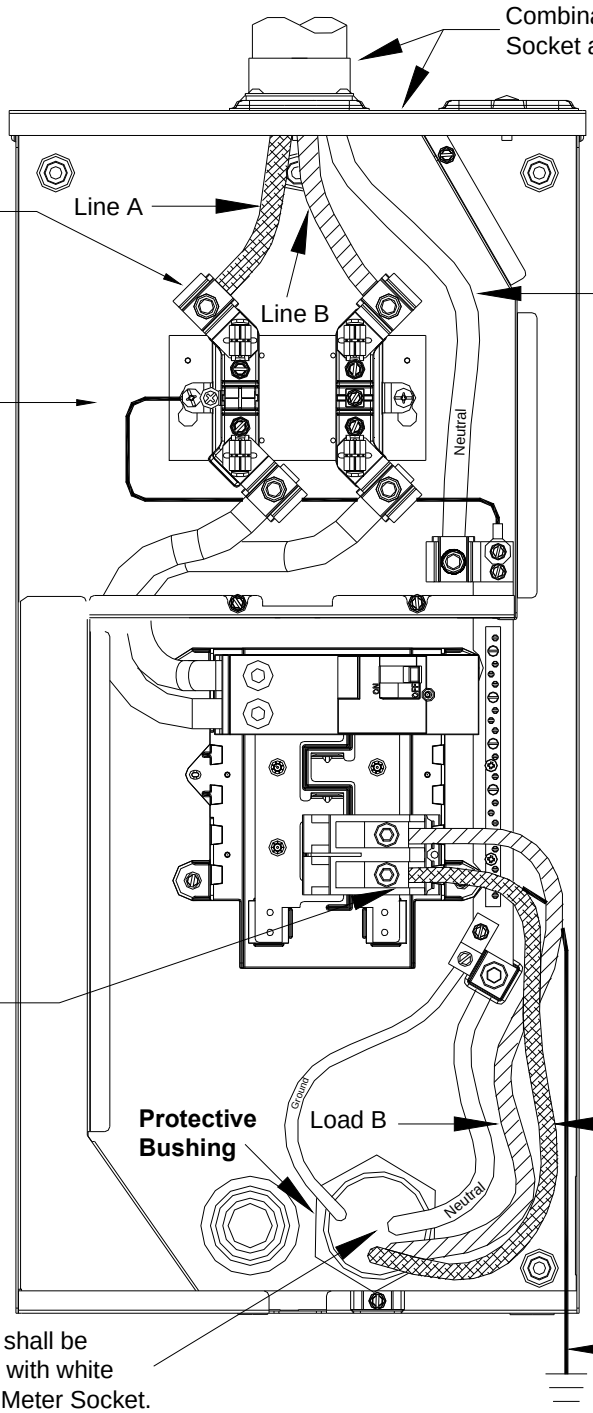
07/10/09 SDS REVISIONS

Figure 12: 200 Amp Combination Meter Socket, Single Phase Overhead Service

COMMERCIAL & INDUSTRIAL

SINGLE PHASE

Note:
This application for 120/208v, 3 wire service



DO NOT Install Multiple Conductors Under One Lug.

Neutral shall be marked with white tape at Meter Socket and Weatherhead.

This wire must have white insulation and will be connected as shown. This wire will be provided and installed by the Company on **Recommended Meter Sockets**.

The Company will provide and install the 5th lug on **Recommended Meter Sockets. For a list of these, refer to Section 6.2.A.5**

DO NOT Install Multiple Conductors Under One Lug.

Protective Bushing

Neutral shall be marked with white tape at Meter Socket.

Ground Wire - # 4 CU

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

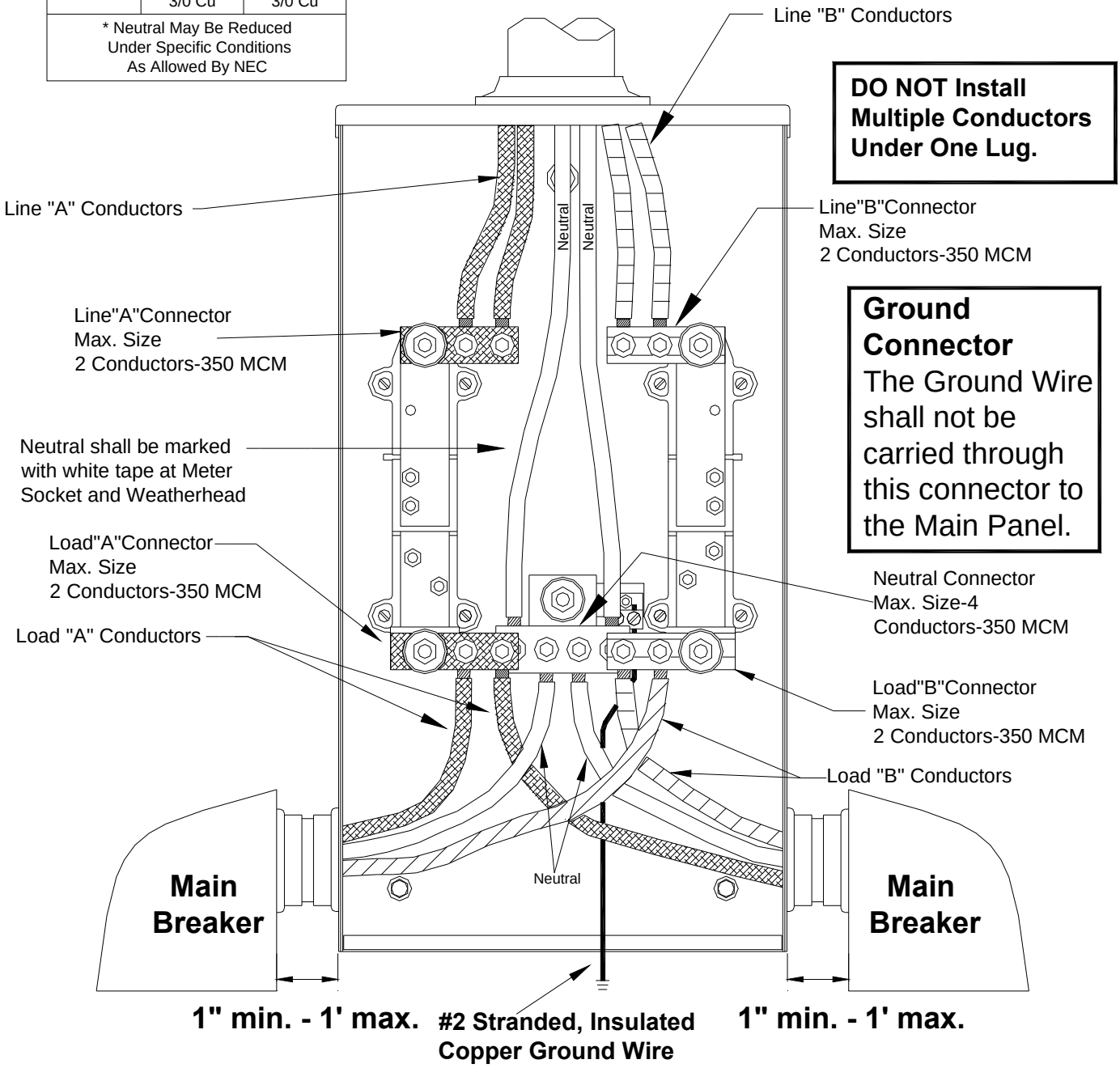
	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
07-10-09 SDS REVISIONS	200 Amp Combination Meter Socket, network (120/208) service
	DWG. NO. V06A03 MS0603
	DRAWN: AMA — DATE: 11/10/06
	SCALE: NTS — FIGURE 13

Figure 13: 200 Amp Combination Meter Socket, Single Phase (120/208) Overhead Service

COMMERCIAL & INDUSTRIAL

SINGLE PHASE

Service Size	Wire Sizes	
	Neutral*	Line
400 Amp	2 Runs 3/0 Cu	2 Runs 3/0 Cu
* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC		



Meter Socket and Hub Purchased From The Company And Installed By Customer

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS	
01-01-97	AMA
05-17-05	SDS
07-10-09	SDS
03-18-10	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

400 AMP METER SOCKET
OVERHEAD SERVICE

DWG. NO. V96A21 MS9619

DRAWN: AMA DATE: 01/01/95

SCALE: NTS

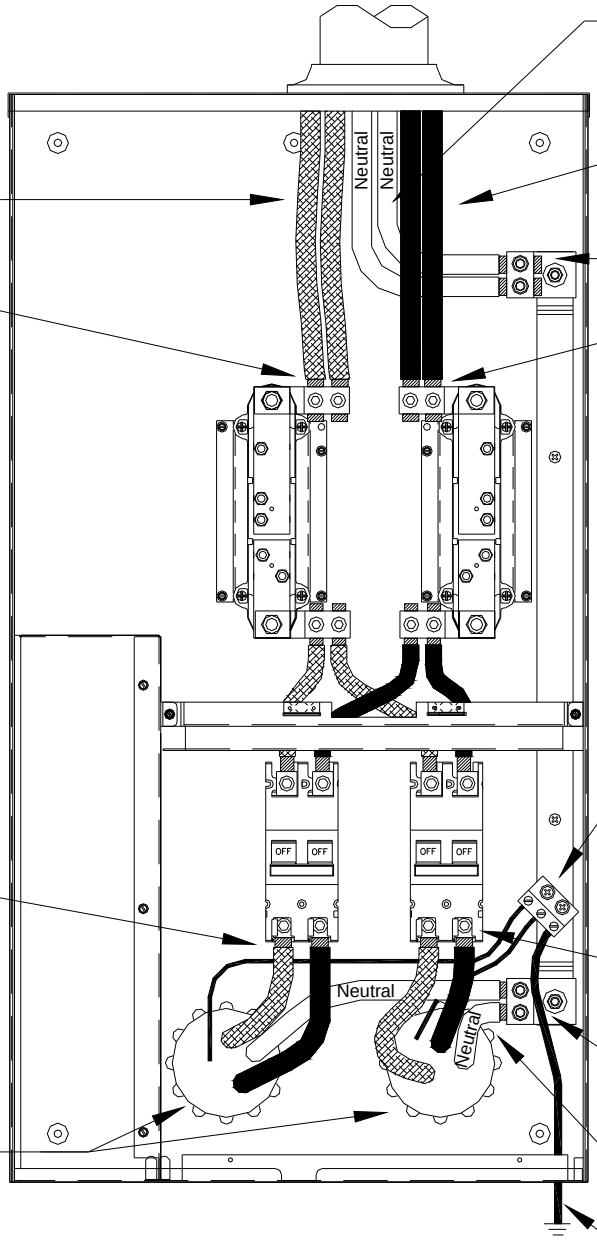
FIGURE 14

Figure 14: 400 Amp Meter Socket, Single Phase Overhead Service

COMMERCIAL & INDUSTRIAL

SINGLE PHASE

Service Size	Wire Sizes	
	Neutral*	Line
400 Amp	2 Runs 3/0 Cu	2 Runs 3/0 Cu
* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC		



Neutral shall be marked with white tape at Meter Socket and Weatherhead

Line "B" Conductors

Line "A" Conductors

2 Conductors Maximum Size - 350 MCM

Line"A"Connector Max. Size 2 Conductors-350 MCM

Line"B"Connector Max. Size 2 Conductors-350 MCM

DO NOT Install Multiple Conductors Under One Lug.

3 Conductors Minimum Size - #4 Maximum Size - 2/0

1 Conductor per position Maximum Size - 300 MCM

1 Conductor per position Maximum Size - 300 MCM

These enclosure openings are to be cut by the Customer. No knockouts are available for these positions.

2 Conductors Maximum Size - 350 MCM

Neutral shall be marked with white tape at Meter Socket and Panel.

#2 Stranded, Insulated Copper Ground Wire

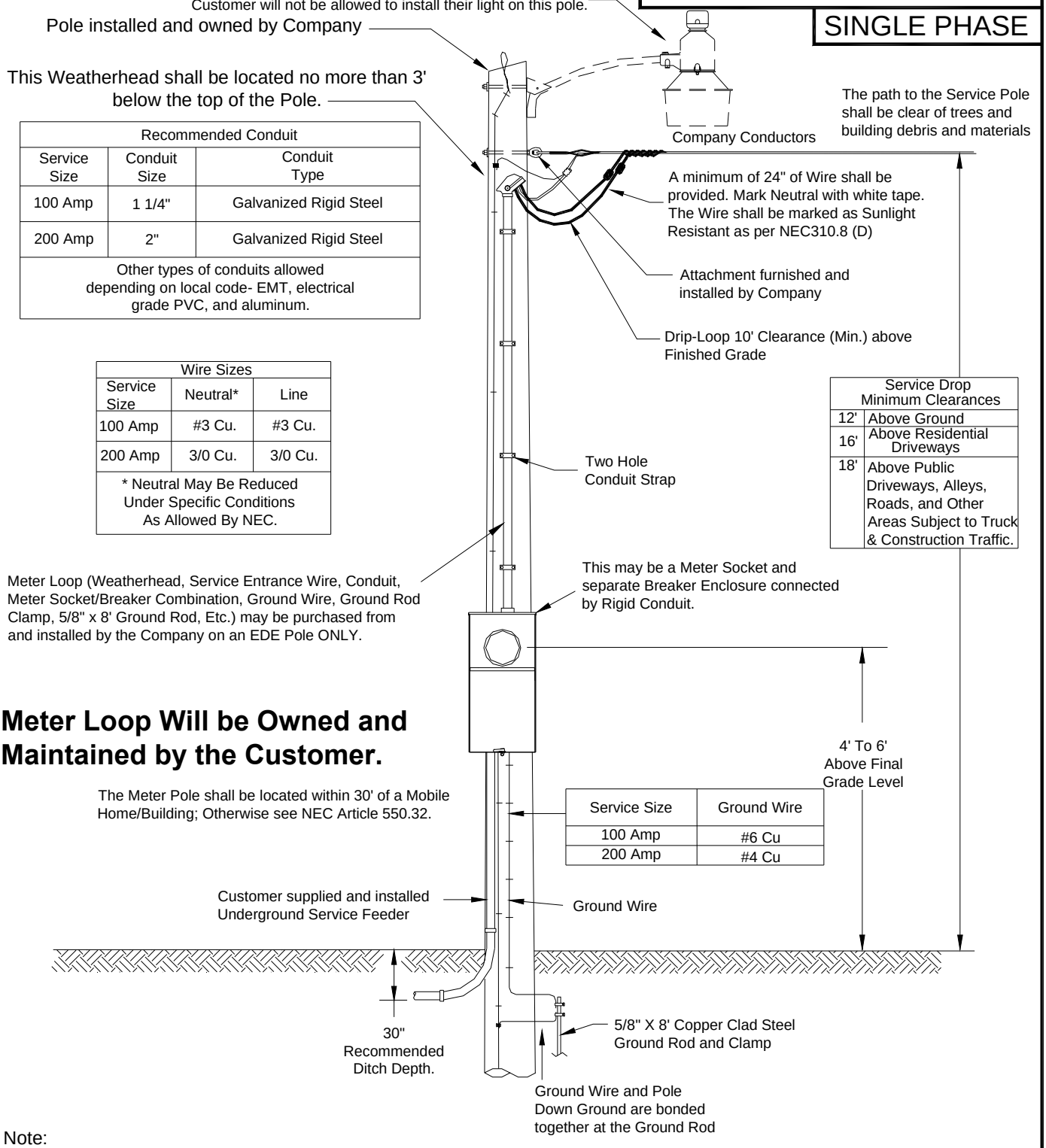
Meter Socket and Hub Purchased From The Company And Installed By Customer

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
REVISIONS	400 AMP COMBINATION METER SOCKET OVERHEAD SERVICE
	DWG. NO. V09A01 MS0901
	DRAWN: SDS — DATE: 01/06/09
	SCALE: NTS — FIGURE 15

Figure 15: 400 Amp Combination Meter Socket, Overhead Service

COMMERCIAL & INDUSTRIAL
SINGLE PHASE



Recommended Conduit		
Service Size	Conduit Size	Conduit Type
100 Amp	1 1/4"	Galvanized Rigid Steel
200 Amp	2"	Galvanized Rigid Steel
Other types of conduits allowed depending on local code- EMT, electrical grade PVC, and aluminum.		

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.
* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC.		

Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Service Size	Ground Wire
100 Amp	#6 Cu
200 Amp	#4 Cu

Meter Loop Will be Owned and Maintained by the Customer.

Note:
Meter Loop will not be installed on Primary Power Poles.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS	
01-01-97	AMA
05-17-05	SDS
07-15-06	SDS
07-10-09	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100/200 Amp Meter Pole
Underground Feeder

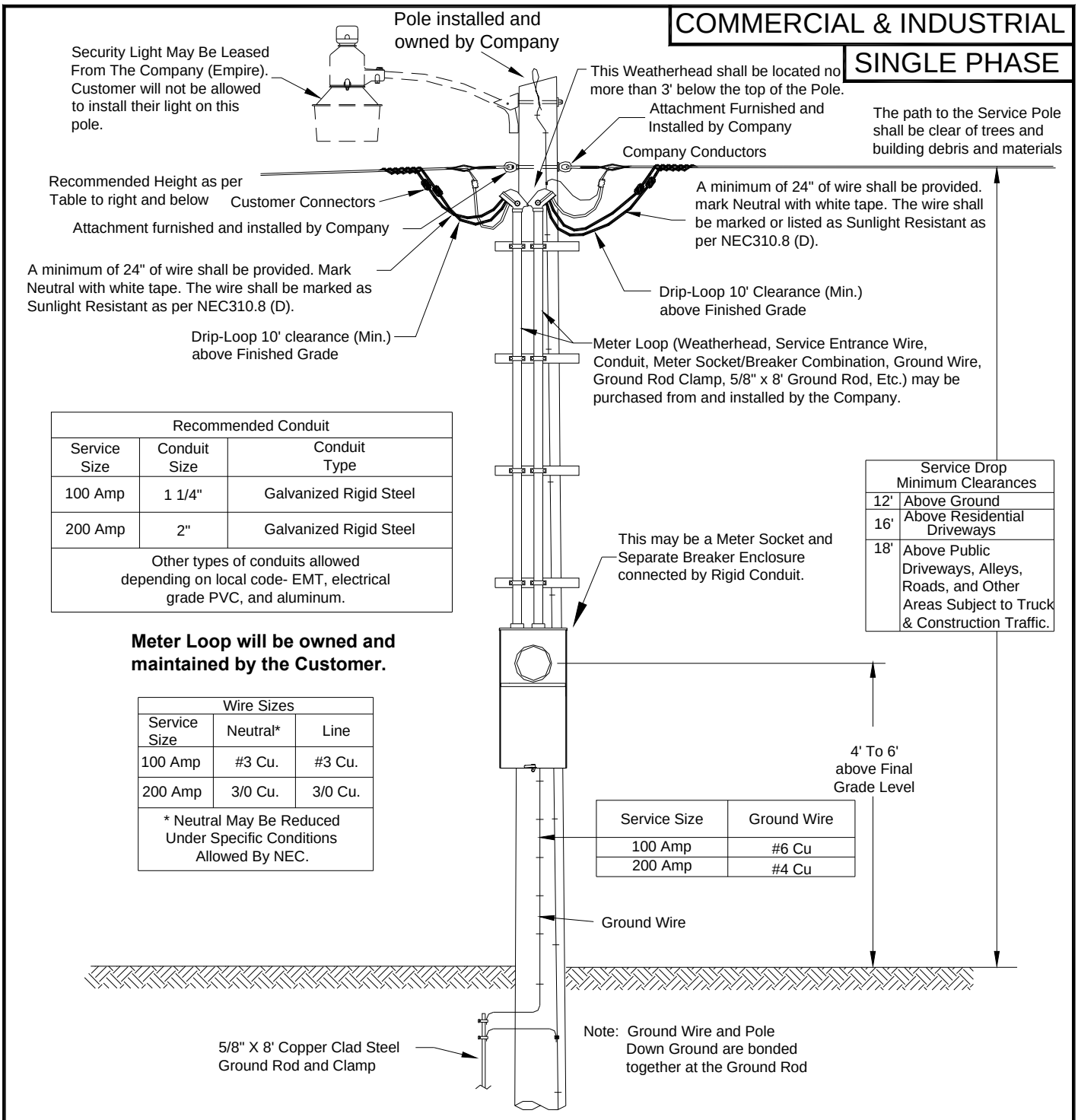
DWG. NO. V96A22 MS9620

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 16

Figure 16: 100/200 Amp Single Phase Meter Pole, Underground Feeder



Recommended Conduit		
Service Size	Conduit Size	Conduit Type
100 Amp	1 1/4"	Galvanized Rigid Steel
200 Amp	2"	Galvanized Rigid Steel
Other types of conduits allowed depending on local code- EMT, electrical grade PVC, and aluminum.		

Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Meter Loop will be owned and maintained by the Customer.

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.
* Neutral May Be Reduced Under Specific Conditions Allowed By NEC.		

Service Size	Ground Wire
100 Amp	#6 Cu
200 Amp	#4 Cu

Note:
Meter Loop will not be installed on Primary Power Poles.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS	
01-01-97	AMA
05-17-05	SDS
07-15-06	SDS
07-10-09	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100/200 Amp Meter Pole
Overhead Feeder

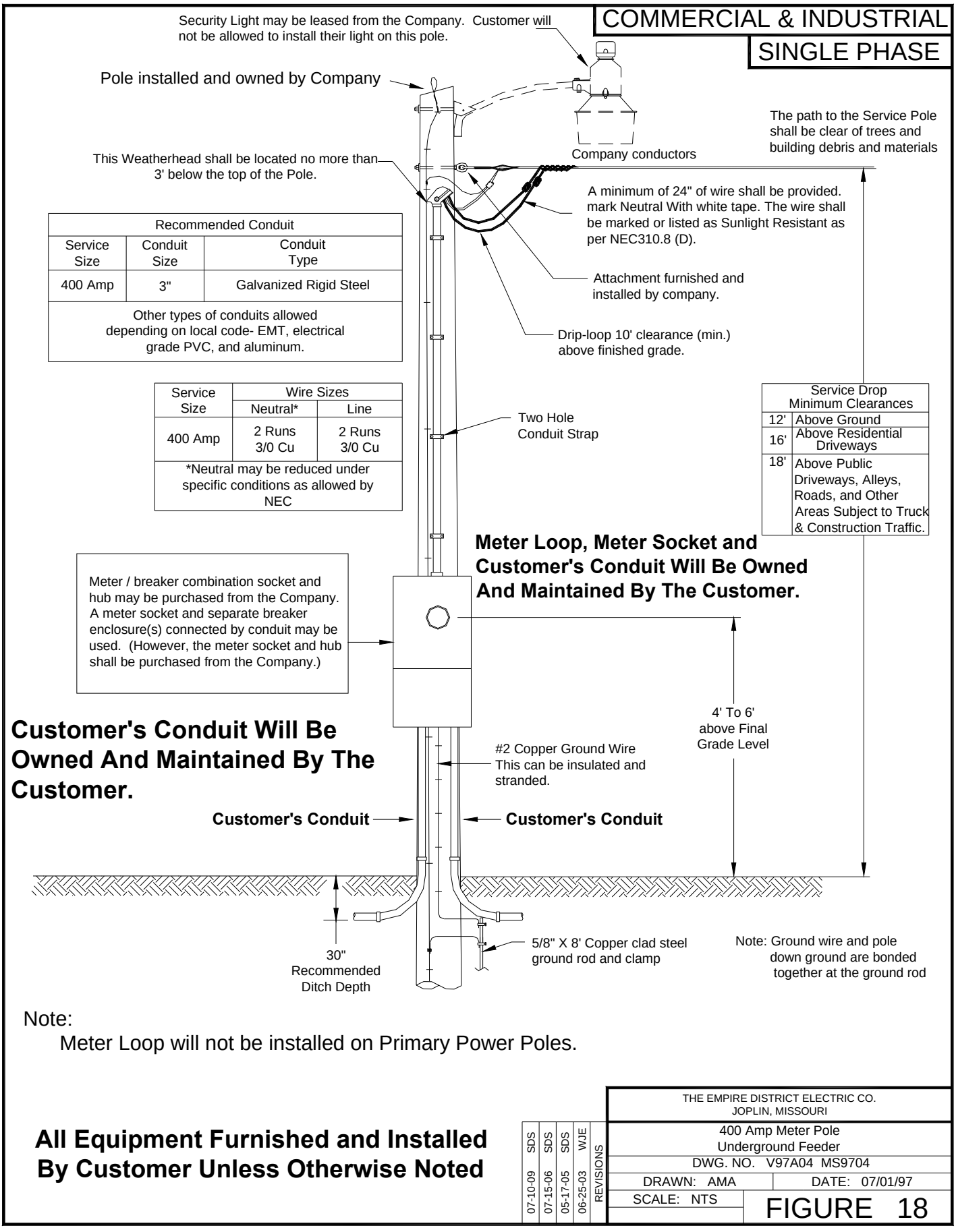
DWG. NO. V96A23 MS9621

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 17

Figure 17: 100/200 Amp Single Phase Meter Pole, Overhead Feeder



Recommended Conduit		
Service Size	Conduit Size	Conduit Type
400 Amp	3"	Galvanized Rigid Steel
Other types of conduits allowed depending on local code- EMT, electrical grade PVC, and aluminum.		

Service Size	Wire Sizes	
	Neutral*	Line
400 Amp	2 Runs 3/0 Cu	2 Runs 3/0 Cu
*Neutral may be reduced under specific conditions as allowed by NEC		

Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Note:
Meter Loop will not be installed on Primary Power Poles.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS		
06-25-03	WJE	
05-17-05	SDS	
07-15-06	SDS	
07-10-09	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

400 Amp Meter Pole
Underground Feeder

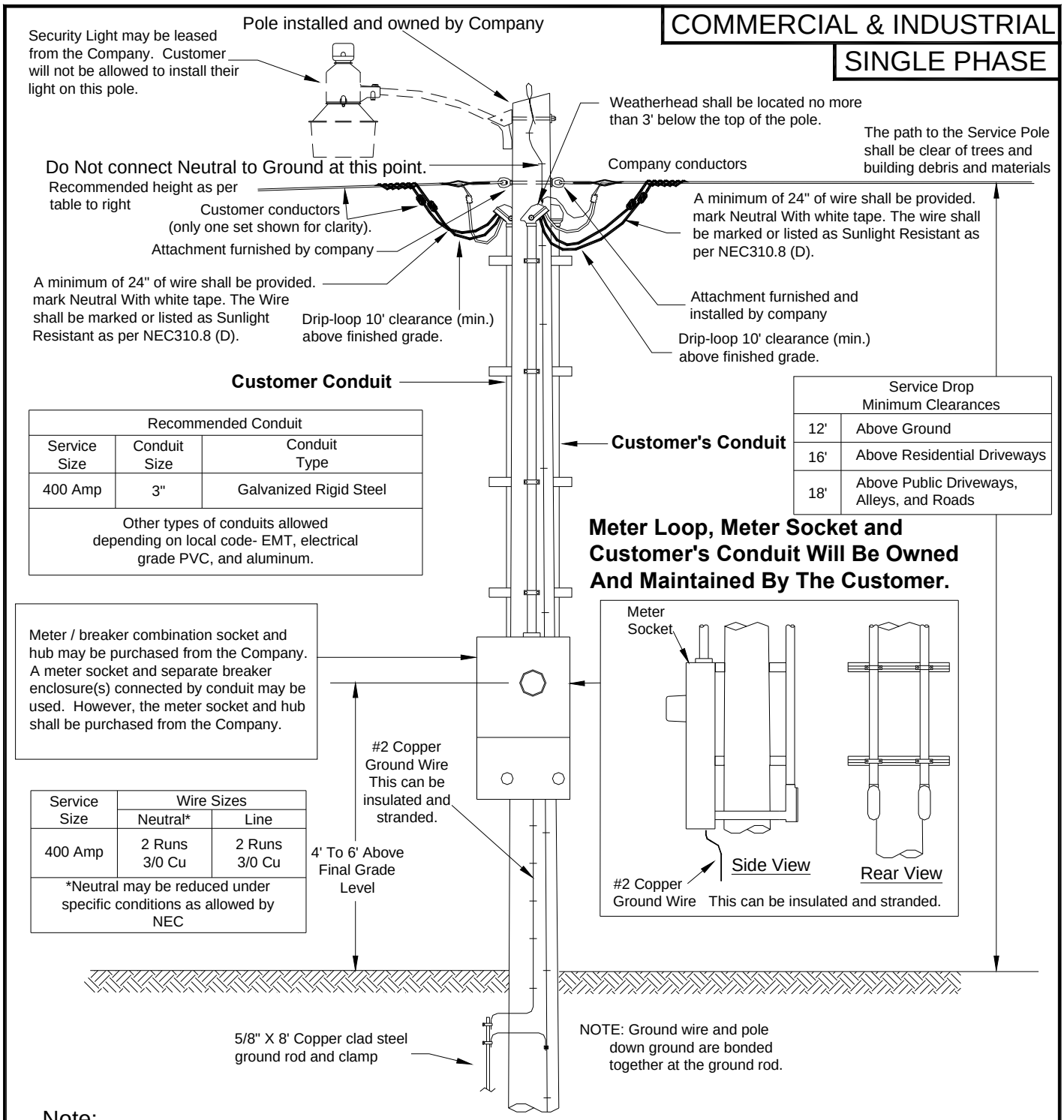
DWG. NO. V97A04 MS9704

DRAWN: AMA | DATE: 07/01/97

SCALE: NTS

FIGURE 18

Figure 18: 400 Amp Single Phase Meter Pole, Underground Feeder



Note:

Meter Loop will not be installed on Primary Power Poles.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS		
07-15-09	SDS	
07-15-06	SDS	
07-15-05	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

400 Amp Meter Pole
Overhead Feeder

DWG NO. V97A03 MS9703

DRAWN: AMA | DATE: 07/01/97

SCALE: NTS

FIGURE 19

Figure 19: 400 Amp Single Phase Meter Pole, Overhead Feeder

6.3 600 AMP TO 800 AMP CT METERING, SINGLE PHASE OVERHEAD SERVICE

A. General Notes:

1. This arrangement may be utilized for services above 400 amps and less than or equal to 800 amps.
2. The disconnection method may be composed of multiple disconnects to make up the full 800 amp capacity of the service as long as there are not more than 6. If one disconnect is used and it is greater than 400 amps, it may be located on the interior of the building unless the authority having jurisdiction dictates otherwise. Disconnects of 400 amps and below will be located on the exterior of the building. **Please note that in all cases all disconnects making up this service will be at the same location.**
3. Service drop and meter furnished and installed by the Company.
4. Current transformers(CT) furnished by the Company and may be issued to Customer for installation or installed by Company employees.
5. Meter socket shall be purchased from the Company and installed by Customer.
6. One inch (1") conduit and weatherhead furnished and installed by Customer.
7. Metering control cable furnished and installed by the Company.
8. The meter socket should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket. Prior approval is required for placement of the meter socket in alleyways or areas where it may be subjected to damage.
9. **The length of service drop over the roof shall not exceed four (4) feet.**
10. An intersystem bonding termination arrangement may be required. Consult the NEC for the particular application of this type of device.

B. Mounting:

1. Meter socket , ground wire, and conduit shall be surface mounted and securely fastened to the structure. The meter socket shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service riser conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a supporting frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.
3. Wire not enclosed in conduit shall be a minimum of 36 inches away from any window or door opening.

C. Connections:

1. All connections shall be made by the Company.

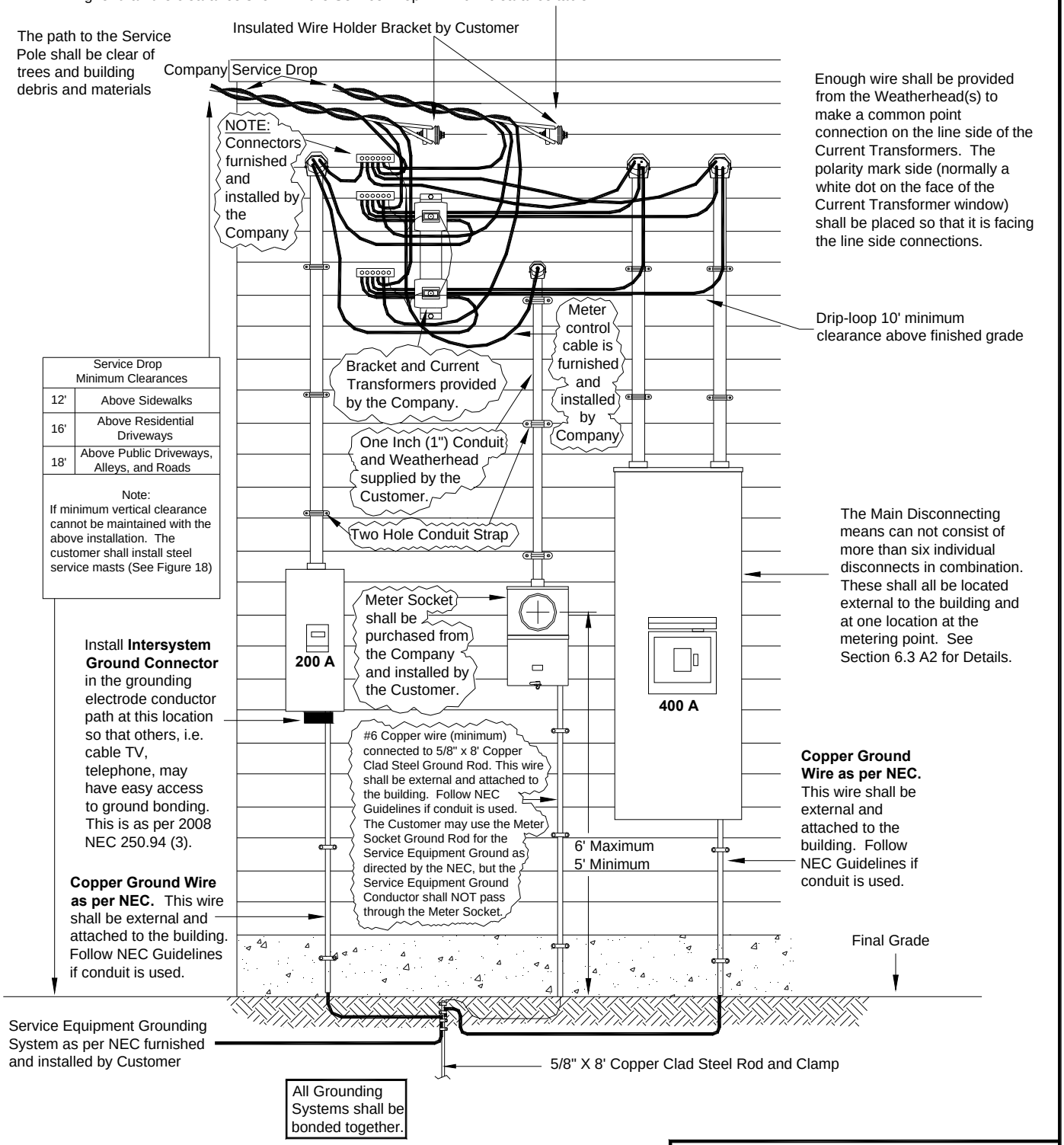
D. Conductor Marking:

All neutral conductors shall be clearly marked with white tape at the point of delivery.

COMMERCIAL & INDUSTRIAL

SINGLE PHASE

The Customer shall provide an insulated Point of Attachment within 24 inches of the Weatherhead capable of withstanding a continous force of 200 lbs. in the direction of the Service Drop. The height for the Point of Attachment shall normally be 2ft. to 3ft. higher than the clearance shown in the Service Drop minimum clearance table.



All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS		
07-15-06	SDS	
05-20-07	SDS	
07-13-09	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

600 Amp to 800 Amp Current Transformer overhead service

DWG NO. V96A24 MS9622

DRAWN: AMA DATE: 01/01/96

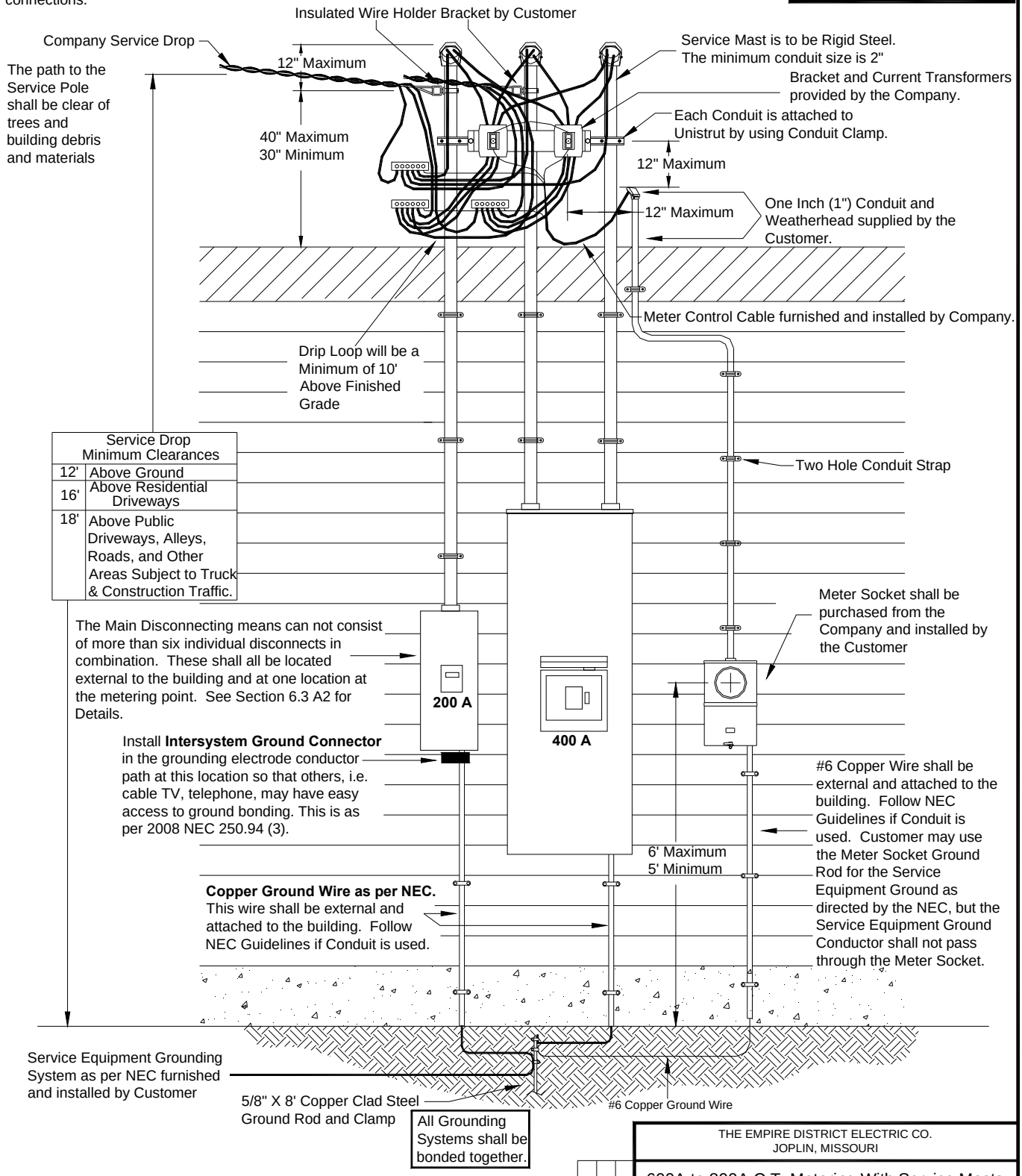
SCALE: NTS

FIGURE 20

Figure 20: 600 Amp to 800 Amp CT Metering, Single Phase Overhead Service

Enough wire shall be provided from the Weatherhead(s) to make a common point connection on the line side of the Current Transformers. The polarity mark side (normally a white dot on the face of the Current Transformer window) shall be placed so that it is facing the line side connections.

COMMERCIAL & INDUSTRIAL
SINGLE PHASE

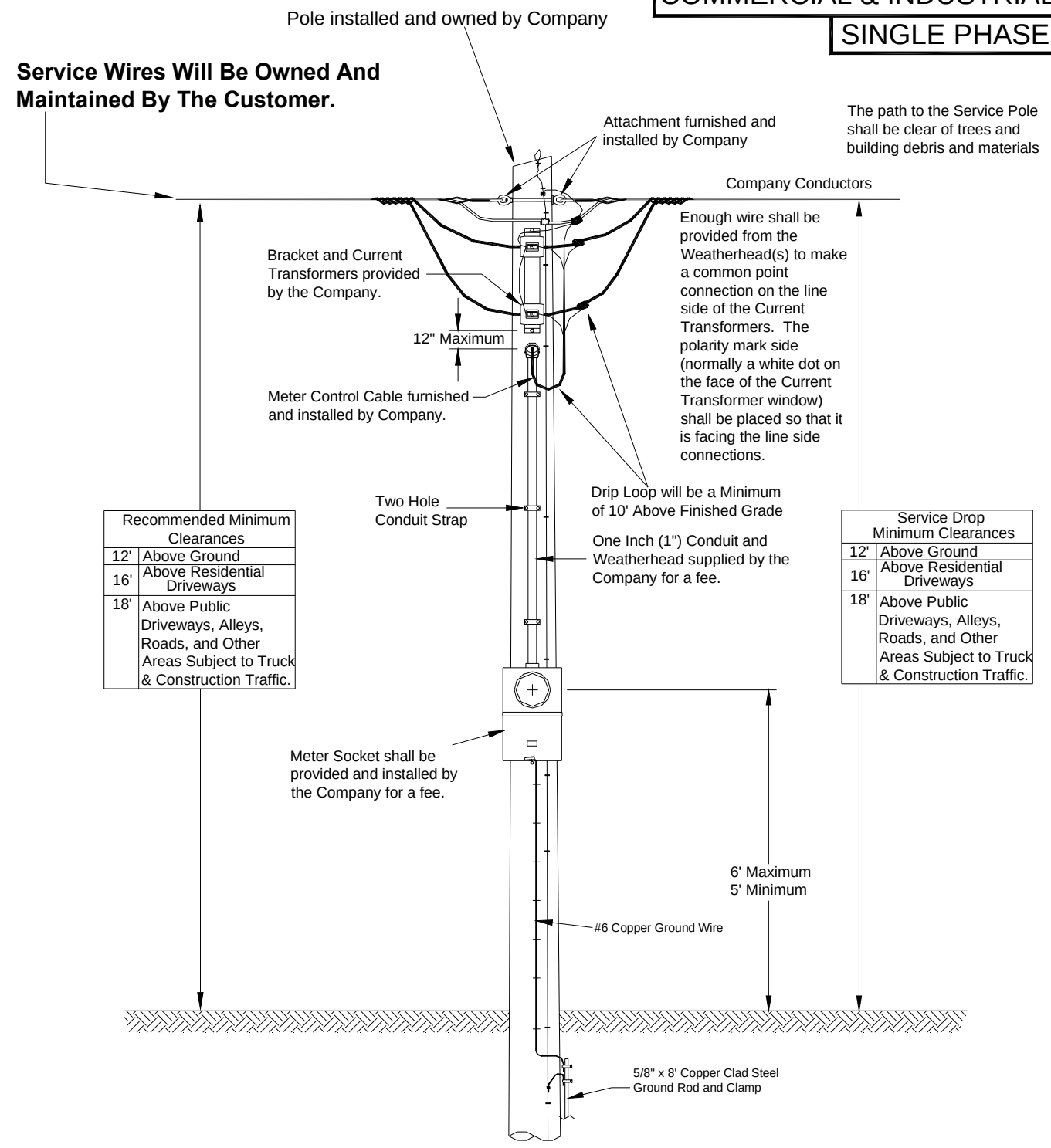


All Equipment Furnished and Installed By Customer Unless Otherwise Noted

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
	600A to 800A C.T. Metering With Service Masts
	DWG. NO. V96A25 MS9623
	DRAWN: AMA — DATE: 01/01/96
	SCALE: NTS — FIGURE 21

REVISIONS
07-15-06 SDS
07-13-09 SDS

Figure 21: 600 Amp to 800 Amp CT Metering, Single Phase Steel Service Masts



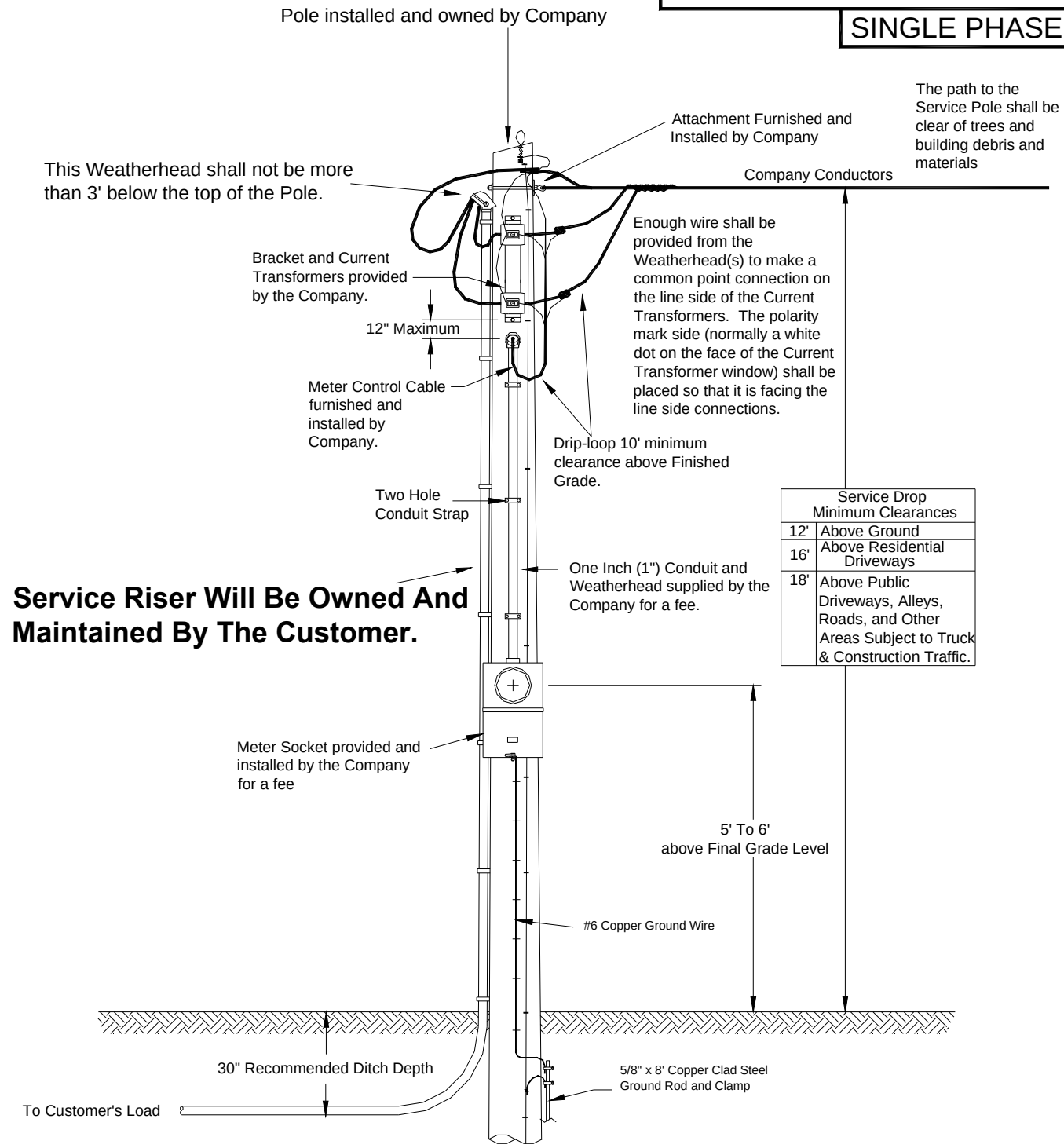
Meter Loop will not be installed on Primary Power Poles.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
07-15-06 SDS REVISIONS	600A to 800A C.T. Metering Pole
	DWG. NO. V96A26 MS9624
	DRAWN: AMA — DATE: 01/01/96
	SCALE: NTS — FIGURE 22

Figure 22: 600 Amp to 800 Amp CT Metering, Single Phase Meter Pole, Overhead Feeder

COMMERCIAL & INDUSTRIAL

SINGLE PHASE



Meter Loop will not be installed on Primary Power Poles.

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

600A to 800A C.T. Metering Pole Underground Feeder

DWG. NO. V06A04 MS0604

DRAWN: AMA | DATE: 07/15/06

SCALE: NTS

REVISIONS

FIGURE 23

Figure 23: 600 Amp to 800 Amp CT Metering, Single Phase Meter Pole, Underground Feeder

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6.4 MULTIPLE METERS, SINGLE PHASE OVERHEAD SERVICE

A. General Notes:

1. If more than six meters are required, consult the Company for approval of equipment prior to purchase.
2. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, weatherhead, lock nuts, bushings, meter socket assembly, meter socket assembly hub, service drop attachment device, and miscellaneous mounting hardware furnished and installed by the Customer.
3. Meters, service connectors, and service drop furnished and installed by Company.
4. The meter socket assembly should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket assembly. Prior approval is required for placement of the meter socket assembly in alleyways or areas where it may be subjected to damage.
5 If the Company is required to attach the service drop directly to the Customer’s meter loop conduit, the Customer shall install a steel service mast.
6. The meter sockets shall meet the latest revision of U.L. 414 and ANSI C12.7 standards. These sockets shall be ring style.

APPROVED DUPLEX METER SOCKETS

SERVICE SIZE	SQUARE D CAT. NO.	EATON/ CUTLER HAMMER CAT. NO.	SIEMANS CAT. NO.	MILBANKCAT. NO.
2 – 100	MP42200 with 100 amp Breakers	1MP2204R with 100 amp breakers	SP4212 with 100 amp breakers	U2852-X-HSP
2 – 200	MP42200	1MP2204R	SP4212	U2862-X-HSP

Please consult with the Company before purchasing this type of equipment.

7. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility’s ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.

RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

8. When single phase service is provide from a three phase source (120 / 208 GRD Y V), the meter sockets will be purchased by the Customer with the fifth lug installed by the manufacturer at the 9:00 clock position in the meter socket.

B. Mounting:

1. Meter socket , ground wire, and conduit shall be surface mounted and securely fastened to the structure. The meter socket shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service riser conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a supporting frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.
3. Wire not enclosed in conduit shall be a minimum of 36 inches away from any window or door opening.

C. Connections:

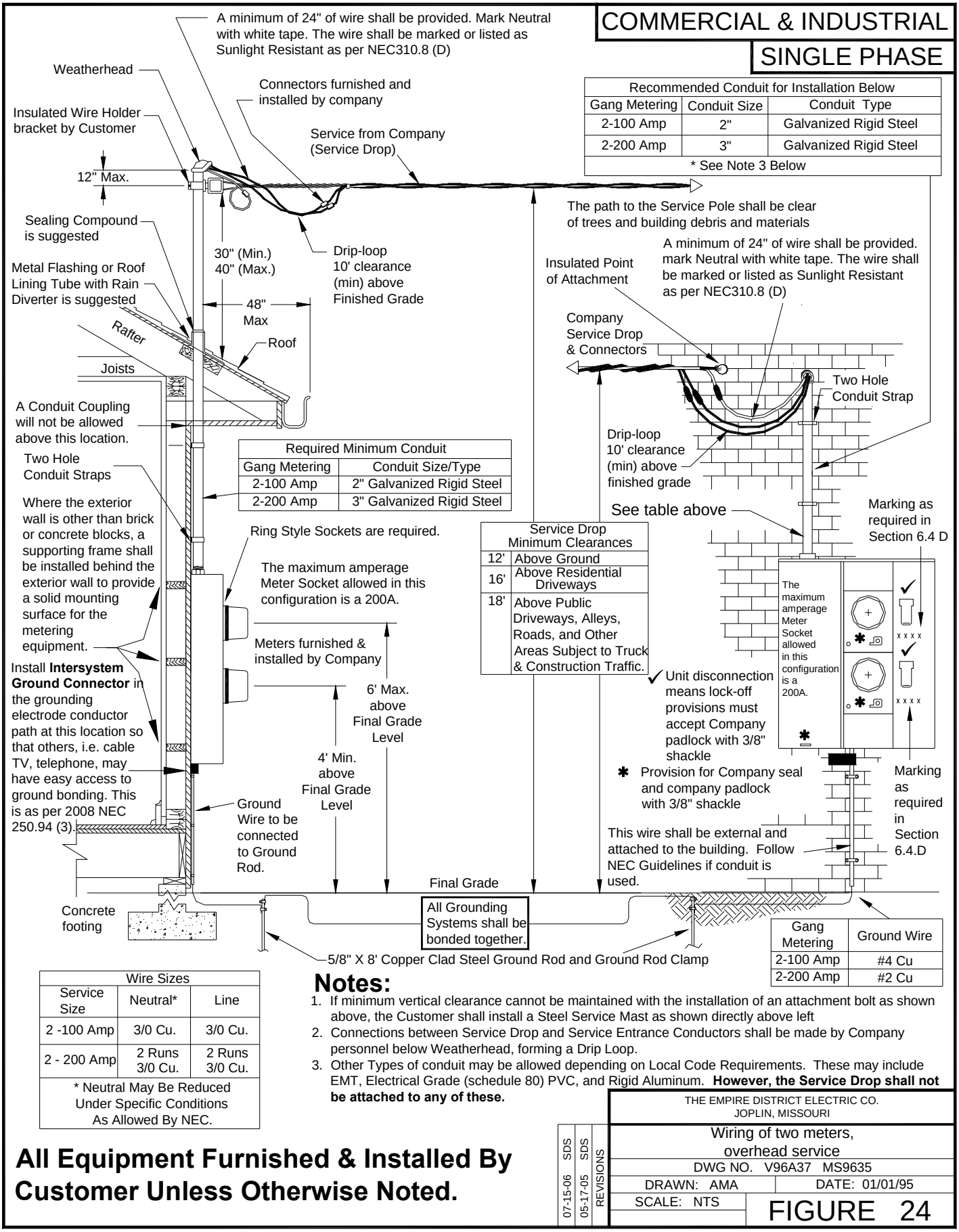
1. The Customer is responsible for termination of the incoming wiring if the wire terminates in a main breaker or fuse holder. The Company will terminate the incoming wire if it terminates on bus bar terminals. The main breaker will be removed when the service wire is being pulled by the Company.
2. Do not score line or load wire when removing insulation.
3. The Customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

D. Meter Socket Marking:

1. **Before the meters are installed, each socket position and corresponding building unit, i.e. apt number or letter, Suite number or letter, tenant number or letter, or physical address served shall be accurately, clearly, and permanently labeled with an engraved plate. These shall be screwed, bolted or riveted externally to the equipment. See the figures for proper location. If the equipment is marked incorrectly, the customer shall be responsible for all costs incurred by EDECo for correcting the meter socket identification. Please note that marker ink or adhesive labels are examples of non-permanent labeling.**
2. **Letters or numbers on the engraved plate shall be a minimum of one (1) inch in height of contrasting color, i.e., black and white, red and green, orange and blue, etc.**

E. Conductor Marking:

All neutral conductors shall be clearly marked with white tape at the point of delivery and at the meter socket assembly.



Recommended Conduit for Installation Below		
Gang Metering	Conduit Size	Conduit Type
2-100 Amp	2"	Galvanized Rigid Steel
2-200 Amp	3"	Galvanized Rigid Steel
* See Note 3 Below		

Required Minimum Conduit	
Gang Metering	Conduit Size/Type
2-100 Amp	2" Galvanized Rigid Steel
2-200 Amp	3" Galvanized Rigid Steel

Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Gang Metering	Ground Wire
2-100 Amp	#4 Cu
2-200 Amp	#2 Cu

Wire Sizes		
Service Size	Neutral*	Line
2 -100 Amp	3/0 Cu.	3/0 Cu.
2 - 200 Amp	2 Runs 3/0 Cu.	2 Runs 3/0 Cu.
* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC.		

Notes:

1. If minimum vertical clearance cannot be maintained with the installation of an attachment bolt as shown above, the Customer shall install a Steel Service Mast as shown directly above left
2. Connections between Service Drop and Service Entrance Conductors shall be made by Company personnel below Weatherhead, forming a Drip Loop.
3. Other Types of conduit may be allowed depending on Local Code Requirements. These may include EMT, Electrical Grade (schedule 80) PVC, and Rigid Aluminum. **However, the Service Drop shall not be attached to any of these.**

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
05-17-05	SDS	
07-15-06	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Wiring of two meters, overhead service

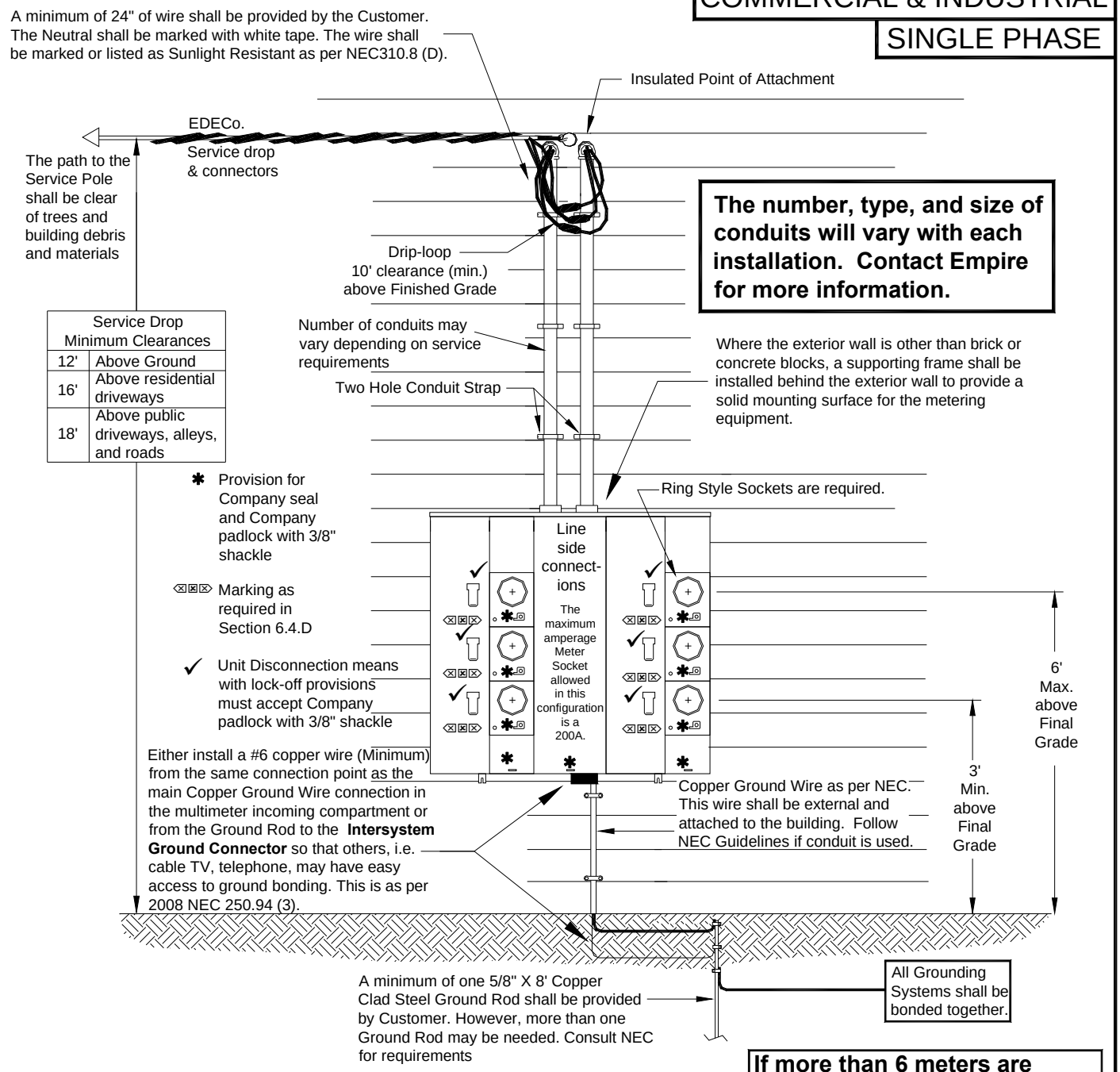
DWG NO. V96A37 MS9635

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 24

Figure 24: Wiring of Two Meters, Single Phase Overhead Service



If more than 6 meters are required, please contact the Company for configuration. As a minimum, EDE will require the riser diagram as proposed by the Electrical Engineer.

Notes:

1. If minimum vertical clearance cannot be maintained with the installation of an attachment point as shown above, contact the Company for requirements.
2. Connections between Service Drop and Service Entrance Conductors shall be made by Company personnel below Weatherhead, forming a Drip Loop.
3. Service Entrance Conductors shall be sized as per NEC

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
07-13-09	SDS	
07-15-06	SDS	
05-17-05	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Three to six meters, overhead service

DWG NO. V96A29 MS9627

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 25

Figure 25: Three to Six Meters, Single Phase Overhead Service

6.5 200 AMP THREE PHASE OVERHEAD SERVICE

A. General Notes:

1. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, weatherhead, lock nuts, bushings, service drop attachment device, meter socket, main disconnect, meter socket hub, and miscellaneous mounting hardware furnished and installed by the Customer.

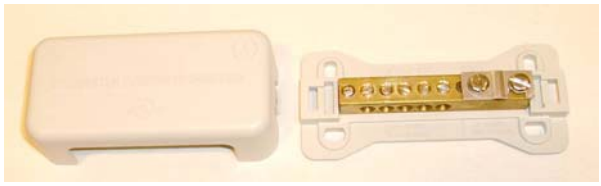
2. Meter, service connectors, and service drop furnished and installed by Company.

3. The meter socket should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket. Prior approval is required for placement of the meter socket in alleyways or areas where it may be subjected to damage.

4 Installation requiring a steel service mast shall be installed by the Customer as specified in Figure 27.

5. **The 200 amp meter socket and 2 inch hub shall be purchased from the Company and installed by the Customer.**

6. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility’s ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.



RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

B. Mounting:

1. Meter socket , ground wire, and conduit shall be surface mounted and securely fastened to the structure. The meter socket shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service riser conduit embedded in a wall will not be permitted.**

2. Where the exterior wall is other than brick or concrete blocks, a supporting frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.

3. Wire not enclosed in conduit shall be a minimum of 36 inches away from any window or door opening.

C. Connections:

1. Do not score line or load wire when removing insulation.

2. The Customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

D. Conductor marking

1. All neutral conductors shall be clearly marked with white tape at the point of delivery and at the meter socket.

2. The power leg of each 120/240 volt, three-phase, four-wire delta service shall be clearly marked with orange tape at the point of delivery and at the meter location (refer to Figure 29).

E. Phase Rotation

1. On three-phase installations to insure proper equipment operation, the Customer is responsible for verifying phase rotation at the time of service connection.

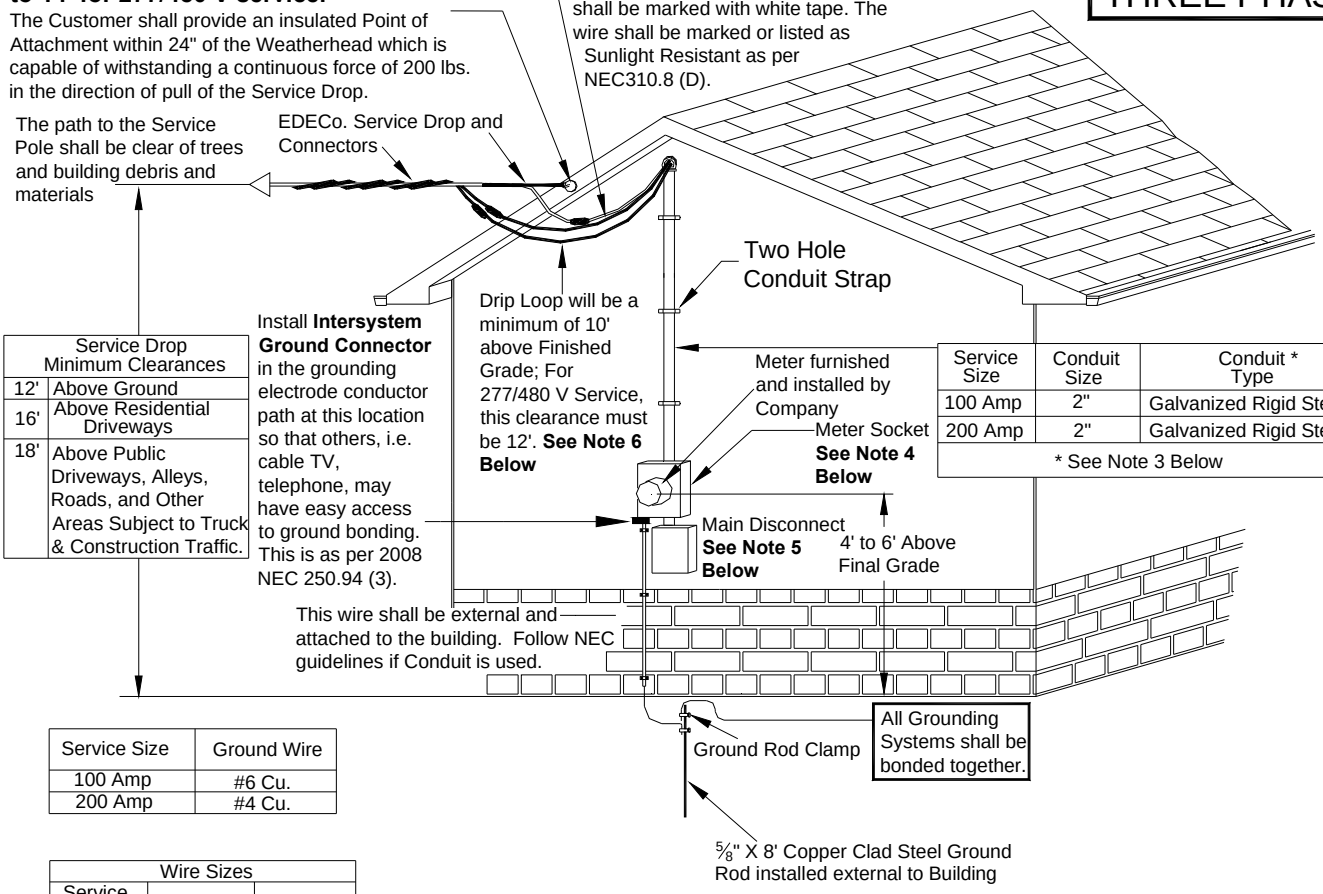
COMMERCIAL & INDUSTRIAL

THREE PHASE

Minimum Attachment Height shall be 12' above final grade. This will be increased to 14' for 277/480 V service.

The Customer shall provide an insulated Point of Attachment within 24" of the Weatherhead which is capable of withstanding a continuous force of 200 lbs. in the direction of pull of the Service Drop.

A minimum of 24" of wire shall be provided by the Customer. The Neutral shall be marked with white tape. The wire shall be marked or listed as Sunlight Resistant as per NEC310.8 (D).



Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Service Size	Conduit Size	Conduit * Type
100 Amp	2"	Galvanized Rigid Steel
200 Amp	2"	Galvanized Rigid Steel
* See Note 3 Below		

Service Size	Ground Wire
100 Amp	#6 Cu.
200 Amp	#4 Cu.

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.
* Neutral May Be Reduced See Section 2.4.5		

NOTE

Ground Rod and Wire **MUST** be Installed and Ground Wire **MUST** be attached to the structure before Service will be Connected.

Notes:

1. If minimum vertical clearance cannot be maintained with the installation of an attachment as shown above, the Customer shall install a Rigid Steel Service Mast as shown in Figure 27.
2. Connections between the Service Drop and Service Entrance Conductors shall be made by Company Personnel below the Weatherhead, forming a Drip Loop.
3. Other types of conduit may be allowed depending on Local Code Requirements. These may include EMT, Electrical Grade PVC, and Rigid Aluminum. **However, the Service Drop shall not be attached to any of these.**
4. The 200 amp meter socket and 2" Hub shall be purchased from the Company.
5. The disconnnect shall be located on the exterior of the structure. If more than one disconnect is required, they shall all be placed at this location. The disconnect(s) shall not be closer than 1" nor farther than 1' from the meter socket.
6. If this clearance can not be obtained, then the service must be installed underground. See Figure 49.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS	
01/01/97	AMA
05/17/05	SDS
07/15/06	SDS
07/10/09	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100 / 200 / 400 Amp Overhead Service

DWG. NO. V96A41 MS9639

DRAWN: AMA DATE: 01/01/95

SCALE: NTS

FIGURE 26

Figure 26: 100/200 Amp Three Phase Overhead Service

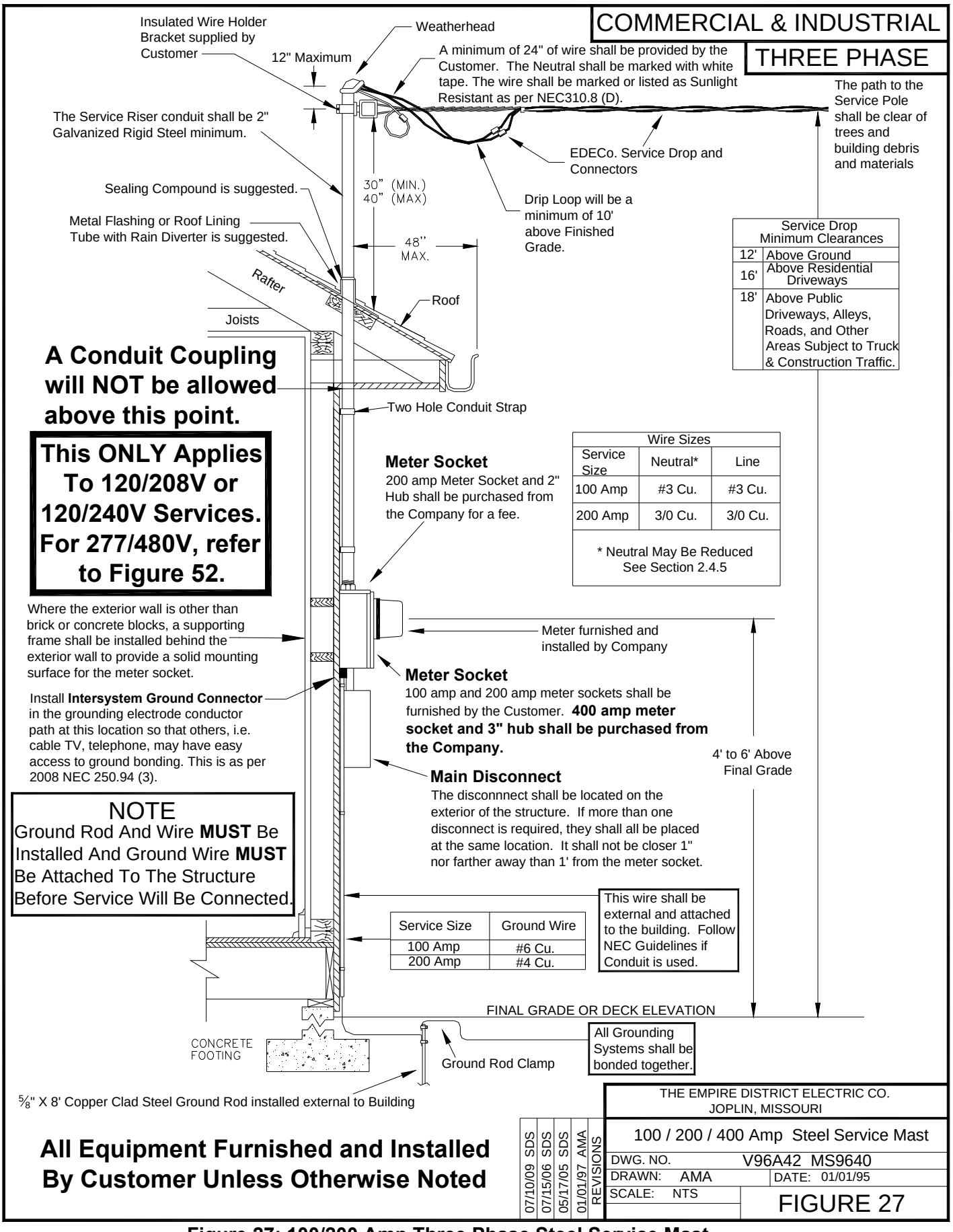


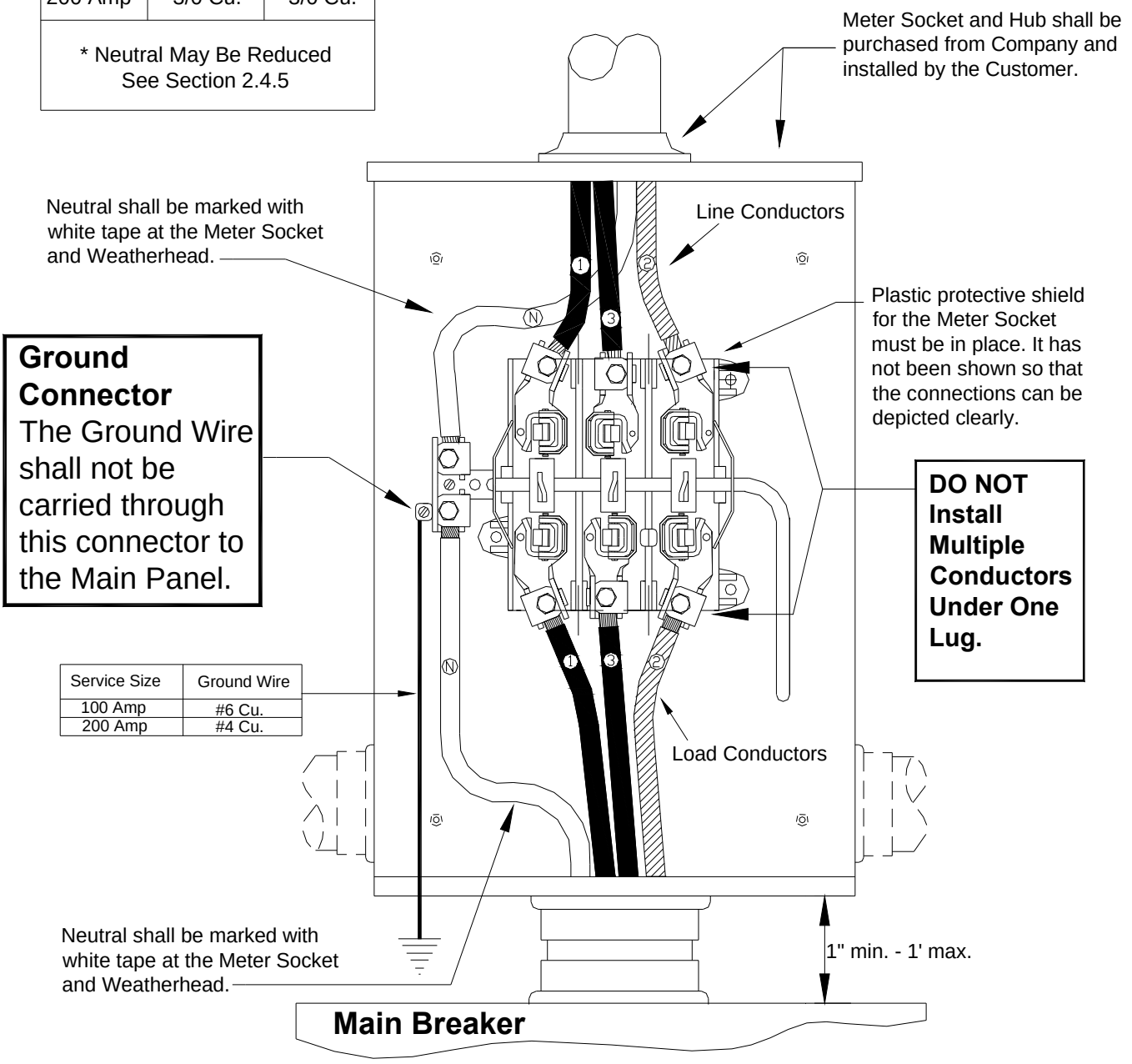
Figure 27: 100/200 Amp Three Phase Steel Service Mast

COMMERCIAL & INDUSTRIAL

THREE PHASE

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.

* Neutral May Be Reduced
See Section 2.4.5



Note:
On delta installation, number 3 position must be the Power (High) Leg
(See Figure 29)

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

REVISIONS	DATE	BY
	03/18/10	SDS
	07/13/09	SDS
	07/15/06	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100 / 200 Amp Meter Socket, Overhead Service

DWG. NO. V96A43 MS9641
DRAWN: AMA DATE: 01/01/96
SCALE: NTS

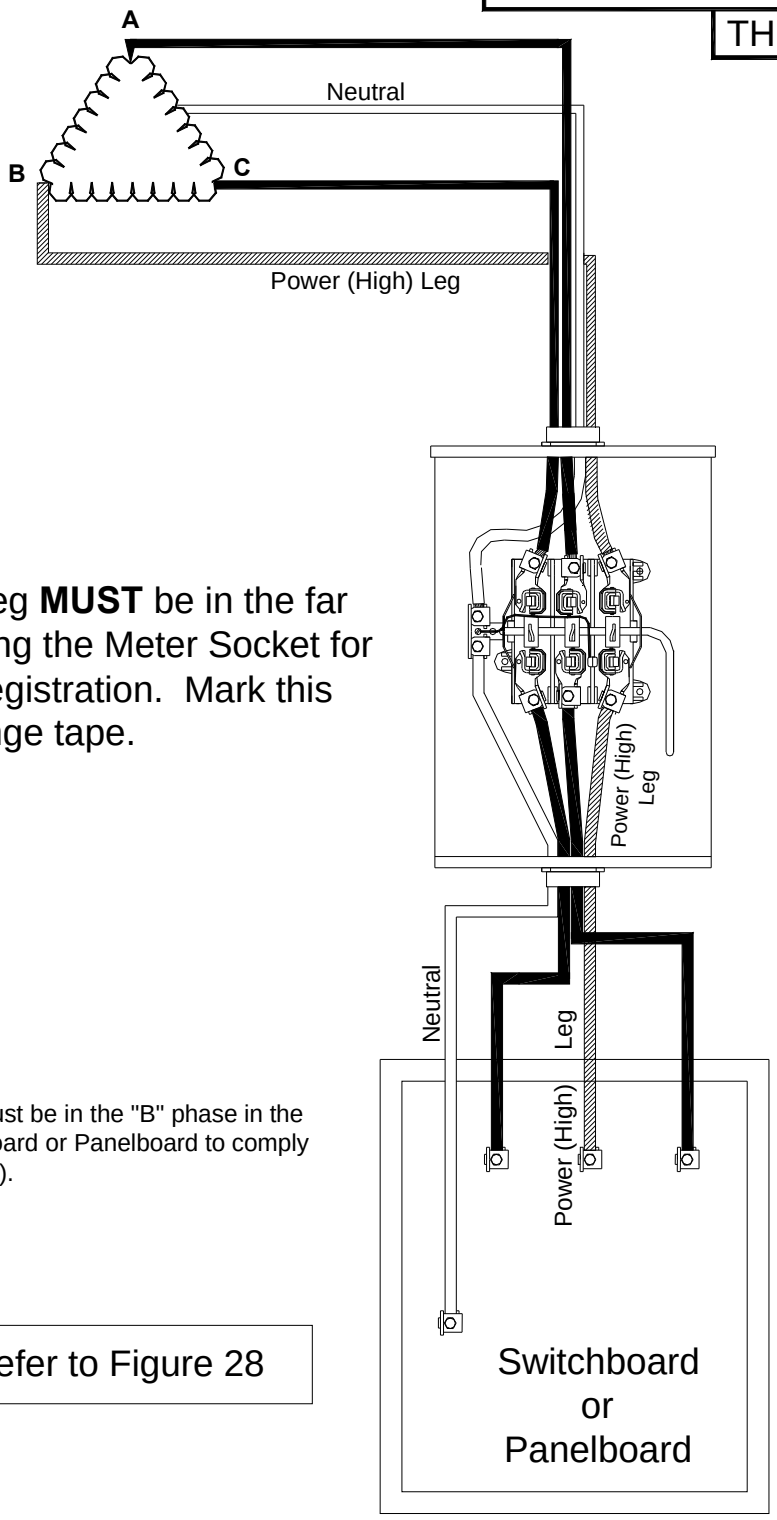
FIGURE 28

Figure 28: 100/200 Amp Meter Socket, Three Phase Overhead Service

COMMERCIAL & INDUSTRIAL

THREE PHASE

Delta Connected Transformer Bank This is for Pole Mounted Transformers only and it is limited to 75 kVA Transformer Bank Capacity.



Power (High) Leg **MUST** be in the far right lug as facing the Meter Socket for correct meter registration. Mark this phase with orange tape.

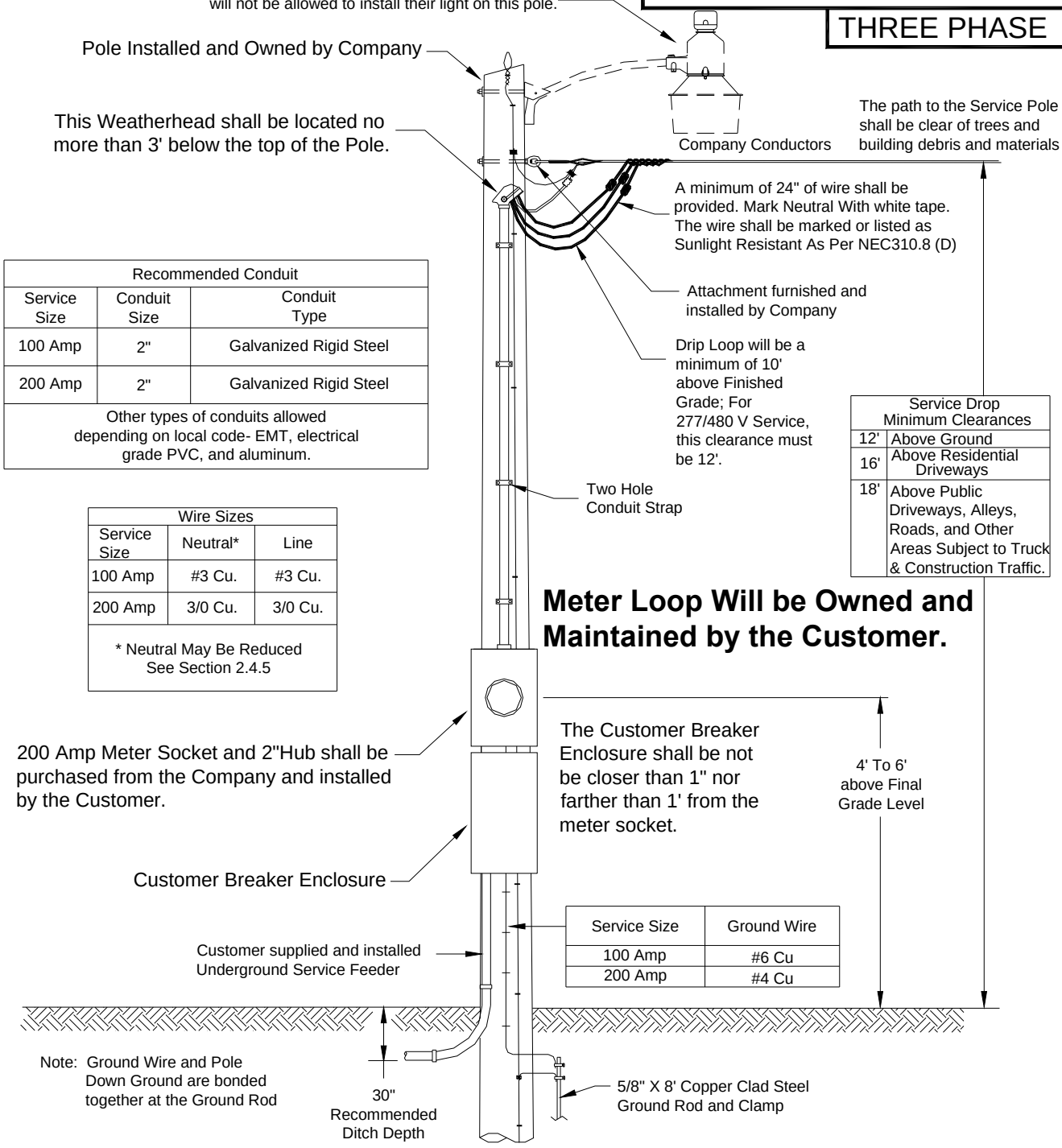
Power (High) Leg must be in the "B" phase in the Customer's Switchboard or Panelboard to comply with NEC 408.3(3)(E).

Also refer to Figure 28

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
07/15/06 SDS REVISIONS	Power Leg Connection on Three Phase, Four Wire, Delta Connected Systems
	DWG. NO. V96A44 MS9642
	DRAWN: AMA DATE: 01/01/96
	SCALE: NTS FIGURE 29

Figure 29: Power Leg Connection on 3 Phase, Four - Wire Delta Connected Systems

COMMERCIAL & INDUSTRIAL
THREE PHASE



Recommended Conduit		
Service Size	Conduit Size	Conduit Type
100 Amp	2"	Galvanized Rigid Steel
200 Amp	2"	Galvanized Rigid Steel
Other types of conduits allowed depending on local code- EMT, electrical grade PVC, and aluminum.		

Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Wire Sizes		
Service Size	Neutral*	Line
100 Amp	#3 Cu.	#3 Cu.
200 Amp	3/0 Cu.	3/0 Cu.
* Neutral May Be Reduced See Section 2.4.5		

Service Size	Ground Wire
100 Amp	#6 Cu
200 Amp	#4 Cu

Meter Loop will not be installed on Primary Power Poles.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

100/200 Amp Meter Pole
Underground Feeder

DWG. NO. V96A22 MS9620

DRAWN: AMA | DATE: 01/01/96

SCALE: NTS

07-15-06 SDS REVISIONS

FIGURE 30

Figure 30: 100/200 Amp Meter Pole, Three Phase Underground Feeder

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6.6 400 AMP TO 1200 AMP CT METERING, THREE PHASE OVERHEAD SERVICE

A. General Notes:

1. This arrangement may be utilized for services above 200 amps.
2. The disconnection method may be composed of multiple disconnects to make up the full 1200 amp capacity of the service as long as there are not more than 6. If one disconnect is used and it is greater than 400 amps, it may be located on the interior of the building unless the authority having jurisdiction dictates otherwise. Disconnects of 400 Amps and below will be located on the exterior of the building. **Please note that in all cases all disconnects making up this service will be at the same location.**
3. Service drop and meter furnished and installed by the Company.
4. Current transformers (CT) furnished by the Company and may be issued to Customer for installation or installed by Company employees.
5. Meter socket shall be purchased from the Company and installed by Customer.
6. One inch (1") conduit and weatherhead furnished and installed by Customer.
7. Metering control cable furnished and installed by the Company.
8. The meter socket should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket. Prior approval is required for placement of the meter socket in alleyways or areas where it may be subjected to damage.
9. **The length of service drop over roof shall not exceed four (4) feet.**
10. An intersystem bonding termination arrangement may be required. Consult the NEC for the particular application of this type of device.

B. Mounting:

1. Meter socket , ground wire, and conduit shall be surface mounted and securely fastened to the structure. The meter socket shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service riser conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a supporting frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.
3. Wire not enclosed in conduit shall be a minimum of 36 inches away from any window or door opening.

C. Connections:

1. All connections shall be made by the Company.
2. For service situations that require more than four (4) service risers, contact the Company.

D. Conductor marking

All neutral conductors shall be clearly marked with white tape at the point of delivery.

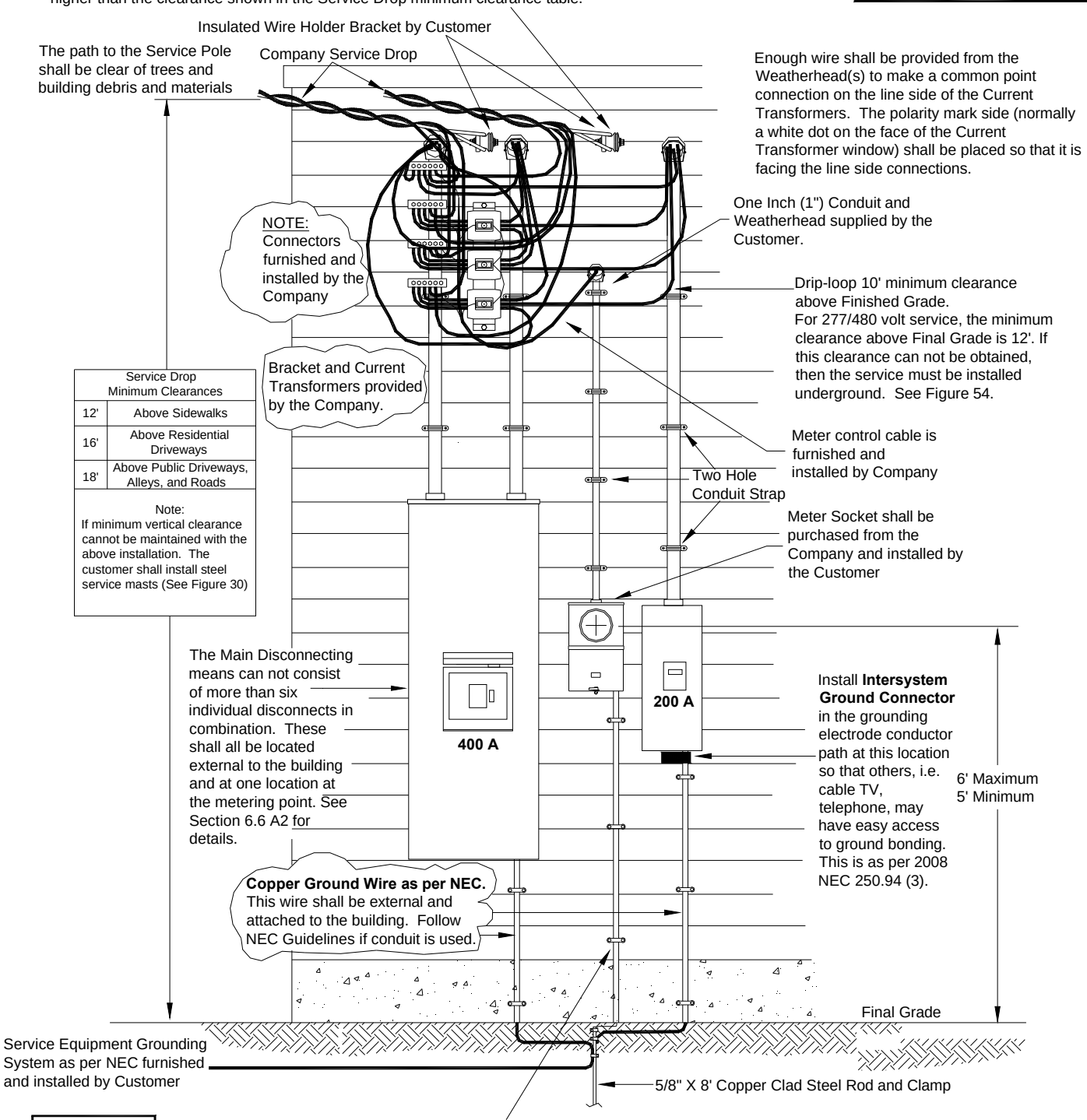
E. Phase Rotation

1. On three-phase installations to insure proper equipment operation, the Customer is responsible for verifying phase rotation at the time of service connection.

COMMERCIAL & INDUSTRIAL

THREE PHASE

The Customer shall provide an insulated point of attachment within 24 inches of the Weatherhead capable of withstanding a continous force of 200 lbs. in the direction of the Service Drop. The height for the Point of Attachment shall normally be 2 ft. to 3 ft. higher than the clearance shown in the Service Drop minimum clearance table.



All Grounding Systems shall be bonded together.

#6 copper wire (minimum) connected to 5/8" x 8' Copper Clad Steel Ground Rod. This wire shall be external and attached to the building. Follow NEC Guidelines if conduit is used. The Customer may use the Meter Socket Ground Rod for the service equipment ground as directed by the NEC, but the Service Equipment Ground Conductor shall **NOT** pass through the Meter Socket.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

400 Amp to 1200 Amp Current Transformer overhead service

DWG NO. V96A47 MS9645

DRAWN: AMA | DATE: 01/01/96

SCALE: NTS

REVISIONS
06-16-07 SDS
07-15-06 SDS

FIGURE 31

Figure 31: 400 Amp to 1200 Amp CT Metering, Three Phase Overhead Service

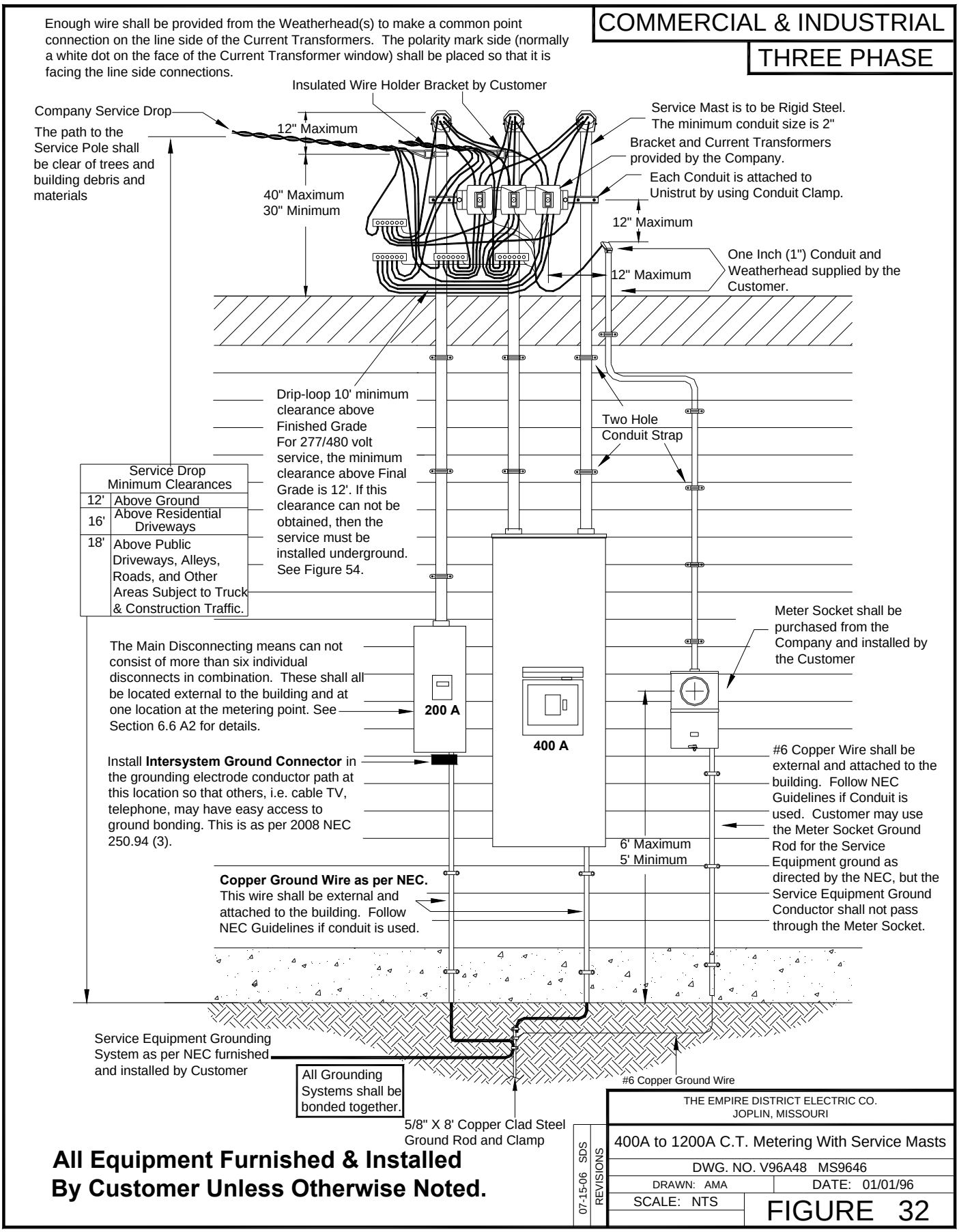
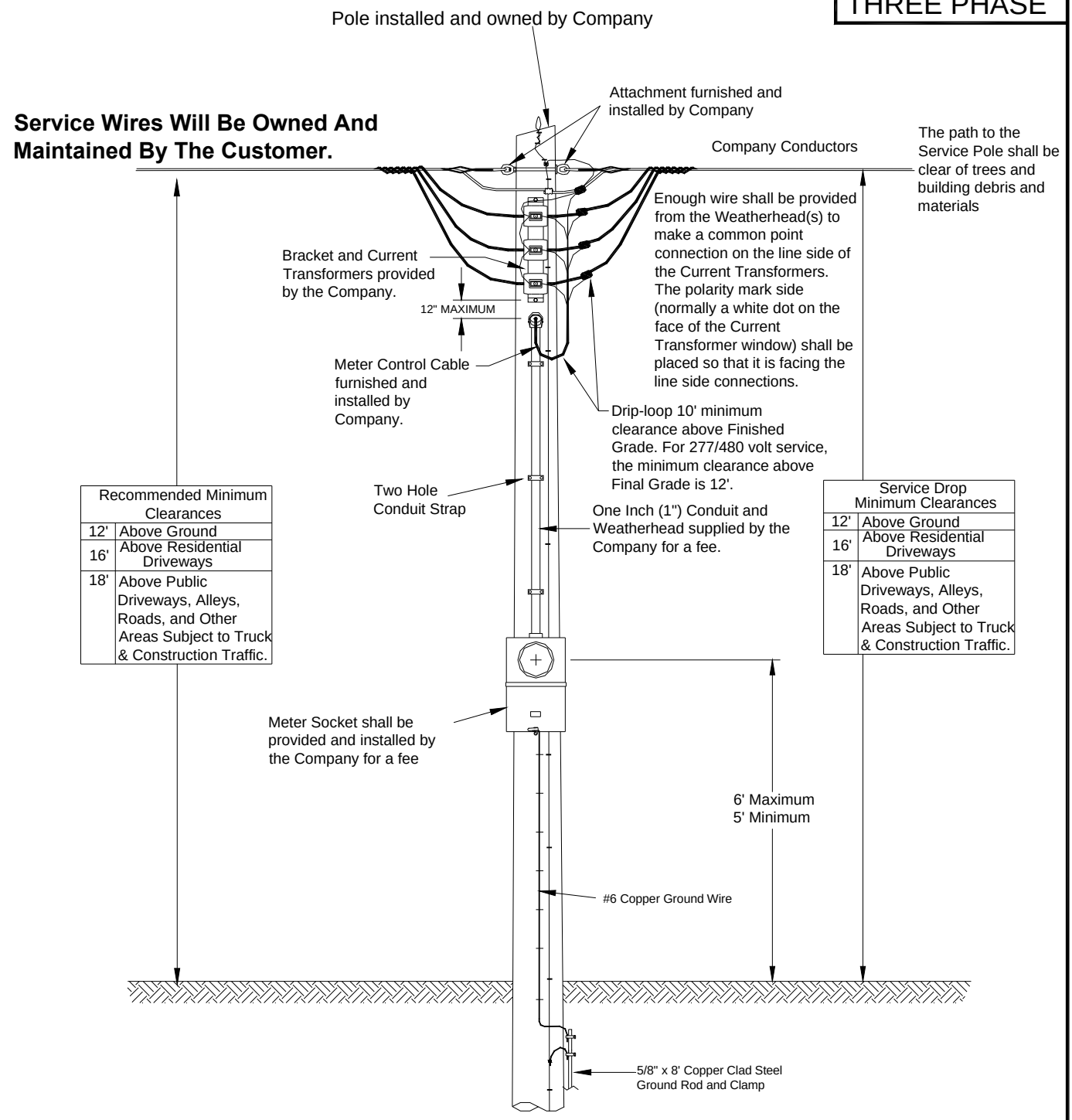


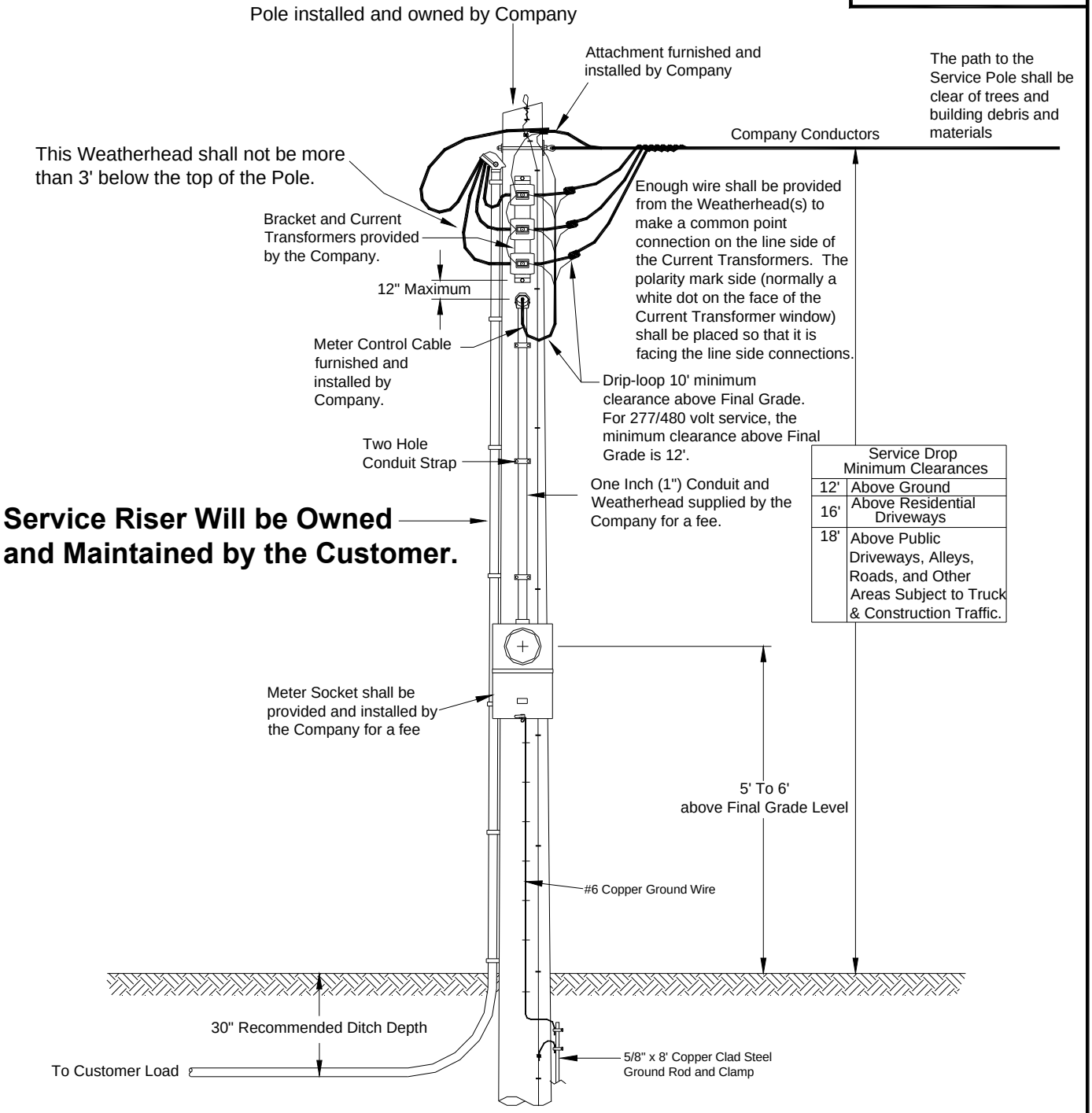
Figure 32: 400 Amp to 1200 Amp CT Metering, Three Phase Steel Service Masts



Meter Loop will not be installed on Primary Power Poles.

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
400A to 1200A C.T. Metering, Meter Pole	
DWG. NO. V96A49 MS9647	
DRAWN: AMA	DATE: 01/01/96
SCALE: NTS	FIGURE 33
07-15-06 SDS REVISIONS	

Figure 33: 400 Amp to 1200 Amp CT Metering, Three Phase Meter Pole, Overhead Feeder



Meter Loop will not be installed on Primary Power Poles.

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
400A to 1200A C.T. Metering Pole Underground Feeder	
DWG. NO. V96A49 MS9647	
DRAWN: AMA	DATE: 01/01/96
SCALE: NTS	FIGURE 34

07-15-06 SDS REVISIONS

Figure 34: 400 Amp to 1200 Amp CT Metering, Three Phase Meter Pole, Underground Feeder

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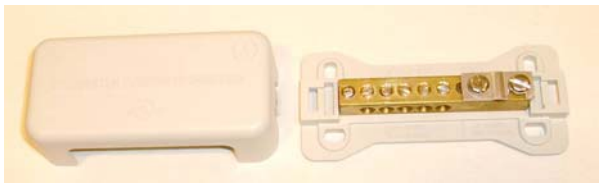
6.7 MULTIPLE METERS, THREE PHASE OVERHEAD SERVICE

A.General Notes:

1. If more than six meters are required, consult the Company for approval of equipment prior to purchase.
2. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, weatherhead, lock nuts, bushings, meter socket assembly, meter socket assembly hub, service drop attachment device, and miscellaneous mounting hardware furnished and installed by the Customer.
3. Meters, service connectors, and service drop furnished and installed by Company.
4. The meter socket assembly should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket assembly. Prior approval is required for placement of the meter socket assembly in alleyways or areas where it may be subjected to damage.
5 If the Company is required to attach the service drop directly to the Customer’s meter loop conduit, the Customer shall install a steel service mast.
6. The meter sockets shall meet the latest revision of U.L. 414 and ANSI C12.7 standards.
7. All meter sockets shall be equipped with L&G HQ-7 or Milbank 911500-EC heavy duty jaw clamping & bypass socket mechanism.
8. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility’s ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.



RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

9. When single phase service is provide from a three phase source (120 / 208 GRD Y V), the meter sockets will be purchased by the Customer with the fifth lug installed by the manufacturer at the 3:00 clock position in the meter socket.

B. Mounting:

1. Meter socket assembly, ground wire, and conduit shall be surface mounted and be securely fastened to the structure. The meter socket assembly shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service riser conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a support frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket assembly.
3. Wire not enclosed in conduit shall be a minimum of 36 inches away from any window or door opening.

C. Connections:

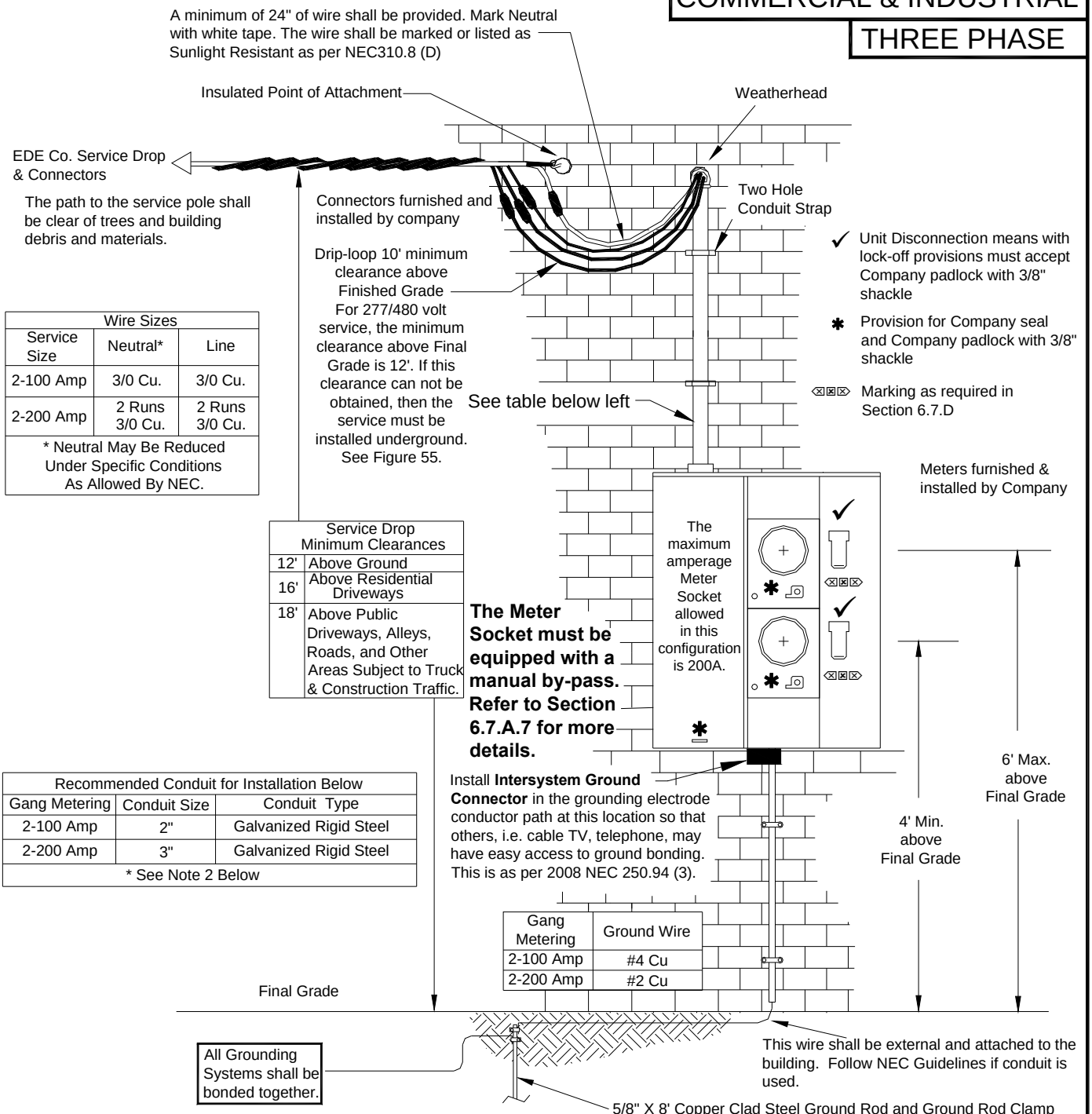
1. The Customer is responsible for termination of the incoming wiring if the wire terminates in a main breaker or fuse holder. The Company will terminate the incoming wire if it terminates on bus bar terminals. The main breaker will be removed when the service wire is being pulled by the Company.
2. Do not score line or load wire when removing insulation.
3. The Customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

D. Meter Socket Marking:

1. **Before the meters are installed, each socket position and corresponding building unit, i.e. apt number or letter, Suite number or letter, tenant number or letter, or physical address served shall be accurately, clearly, and permanently labeled with an engraved plate. These shall be screwed, bolted or riveted externally to the equipment. See figures for proper location. If the equipment is marked incorrectly, the customer shall be responsible for all costs incurred by EDECo for correcting the meter socket identification. Please note that marker ink or adhesive labels are examples of non-permanent labeling.**
2. **Letters or numbers on the engraved plate shall be a minimum of one (1) inch in height of contrasting color, i.e., black and white, red and green, orange and blue, etc.**

E. Conductor Marking:

1. All neutral conductors shall be clearly marked with white tape at the point of delivery and at the meter socket assembly.
2. The power leg of each 120/240 volt, three-phase, four-wire delta service shall be clearly marked with orange tape at the point of delivery and at the meter socket assembly.



Wire Sizes		
Service Size	Neutral*	Line
2-100 Amp	3/0 Cu.	3/0 Cu.
2-200 Amp	2 Runs 3/0 Cu.	2 Runs 3/0 Cu.
* Neutral May Be Reduced Under Specific Conditions As Allowed By NEC.		

Service Drop Minimum Clearances	
12'	Above Ground
16'	Above Residential Driveways
18'	Above Public Driveways, Alleys, Roads, and Other Areas Subject to Truck & Construction Traffic.

Recommended Conduit for Installation Below		
Gang Metering	Conduit Size	Conduit Type
2-100 Amp	2"	Galvanized Rigid Steel
2-200 Amp	3"	Galvanized Rigid Steel
* See Note 2 Below		

Gang Metering	Ground Wire
2-100 Amp	#4 Cu
2-200 Amp	#2 Cu

NOTES:

1. Connections between service drop and service entrance conductors shall be made by Company personnel below weatherhead, forming a Drip Loop.
2. Other types of conduit may be allowed depending on Local Code Requirements. These may include EMT, Electrical Grade PVC, and Rigid Aluminum. **However, the Service Drop shall not be attached to any of these.**

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Wiring of two meters, overhead service

DWG NO. V96A51 MS9649

DRAWN: AMA | DATE: 01/01/96

SCALE: NTS

FIGURE 35

REVISIONS		
07-13-09	SDS	
07-15-06	SDS	

Figure 35: Wiring of Two Meters, Three Phase Overhead Service

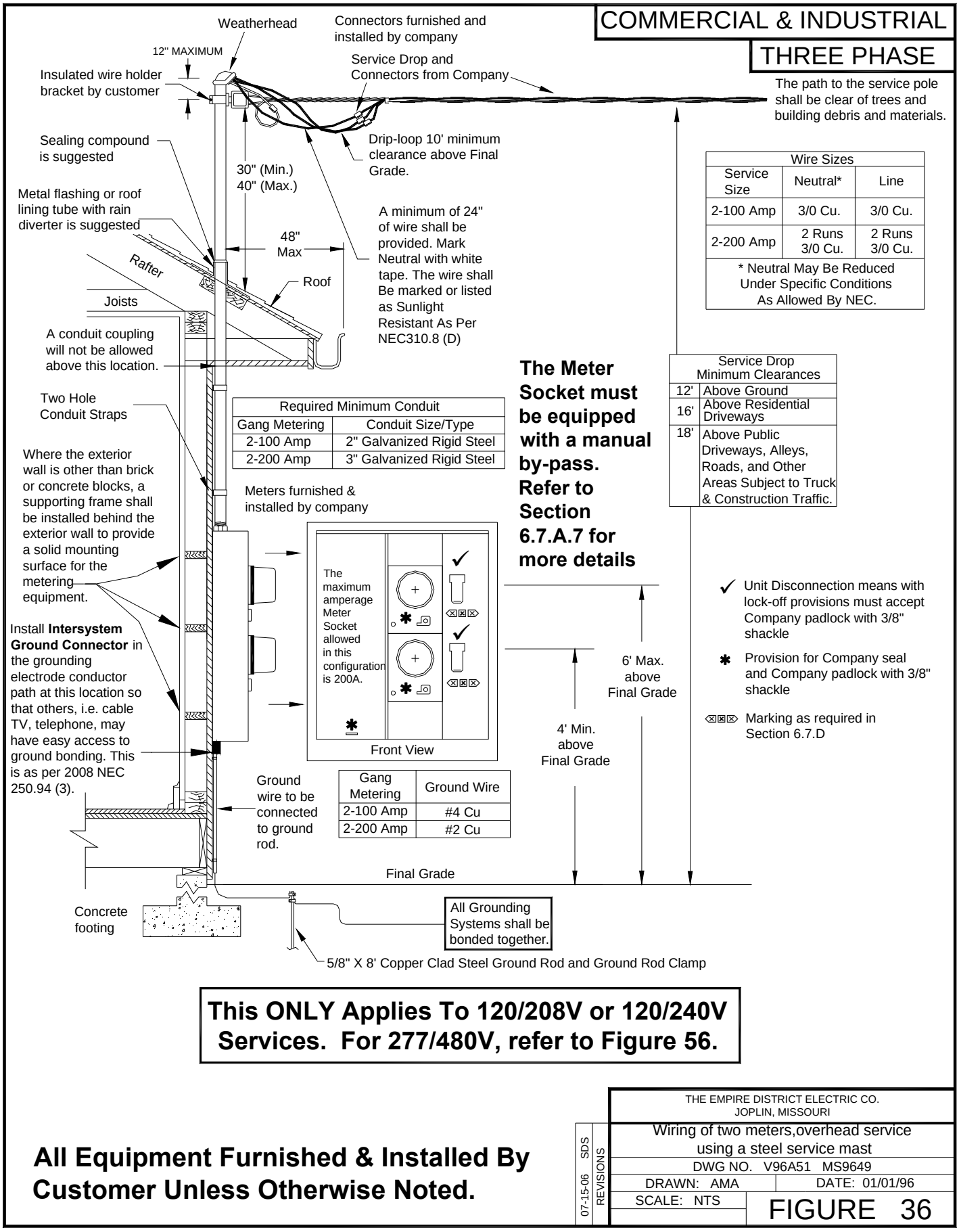
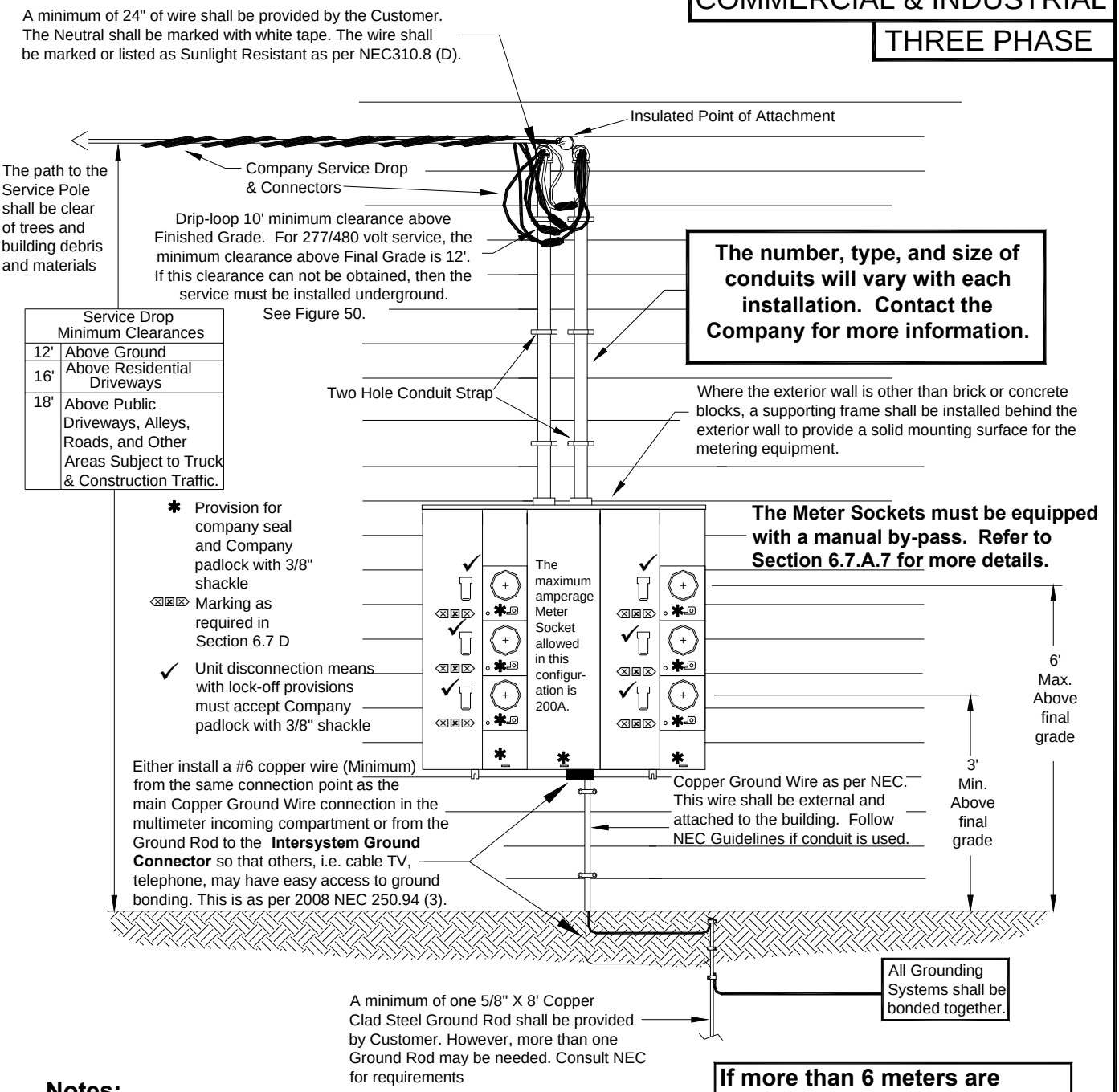


Figure 36: Wiring of Two Meters, Three Phase Overhead Service Using a Steel Service Mast



Notes:

1. Connections between Service Drop and Service Entrance Conductors shall be made by Company personnel below Weatherhead, forming a Drip Loop.
2. Galvanized rigid steel conduit is recommended. Other types of conduit, i.e. electrical grade PVC or rigid Aluminum, may be allowed depending on the local code requirements.
3. Service Entrance Conductors shall be sized as per NEC.

If more than 6 meters are required, please contact the Company for configuration. As a minimum, EDE will require the riser diagram as proposed by the Electrical Engineer.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
03-18-10	SDS	
07-15-06	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Three to six meters, overhead service

DWG NO. V96A52 MS9650

DRAWN: AMA | DATE: 01/01/96

SCALE: NTS

FIGURE 37

Figure 37: Three to Six Meters, Three Phase Overhead Service

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7.0 UNDERGROUND SERVICES

7.1 GENERAL INFORMATION

1. PLEASE CONTACT THE COMPANY BEFORE PLANNING FOR AN UNDERGROUND SERVICE.

2. **MINIMUM CLEARANCES OF SERVICE LATERALS IN CONDUIT**

Horizontal from gas, water, and sewer lines	5 feet
Horizontal from telephone or cable television lines.....	1 foot
Horizontal to any structures (including footings and foundations).....	5 feet
Horizontal from conductor to edge of swimming pool ..... (This is for either an above ground or in ground swimming pool)	10 feet

Note: If within ten feet of service point, this clearance does not apply to structures served.

3. Help avoid the need for future trimming by planting trees and shrubs in the right place.

4. The service lateral shall not cross a sewer lateral field.

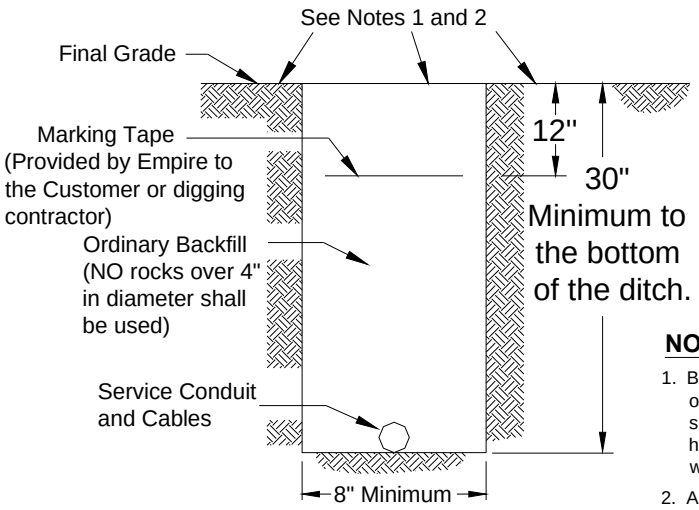
5. The Customer shall request the Company to designate the location of the point of delivery for each service location before construction is started.

6. Before doing any excavation, contact all Utilities to locate their underground facitlites. The following are the One Call numbers for each state listed.

Missouri	(800) 344 – 7483
Kansas	(800) 344 – 7233
Arkansas	(800) 482 – 8998
Oklahoma	(800) 522 – 6543

7. The Customer will be held responsible to locate and mark all privately owned (Customer's or other's) underground facilities.

8. Guard Posts maybe required on any underground service installation to protect the Company's Equipment. Contact the Company for requirements.



Caution !
Contact all Utilities before digging

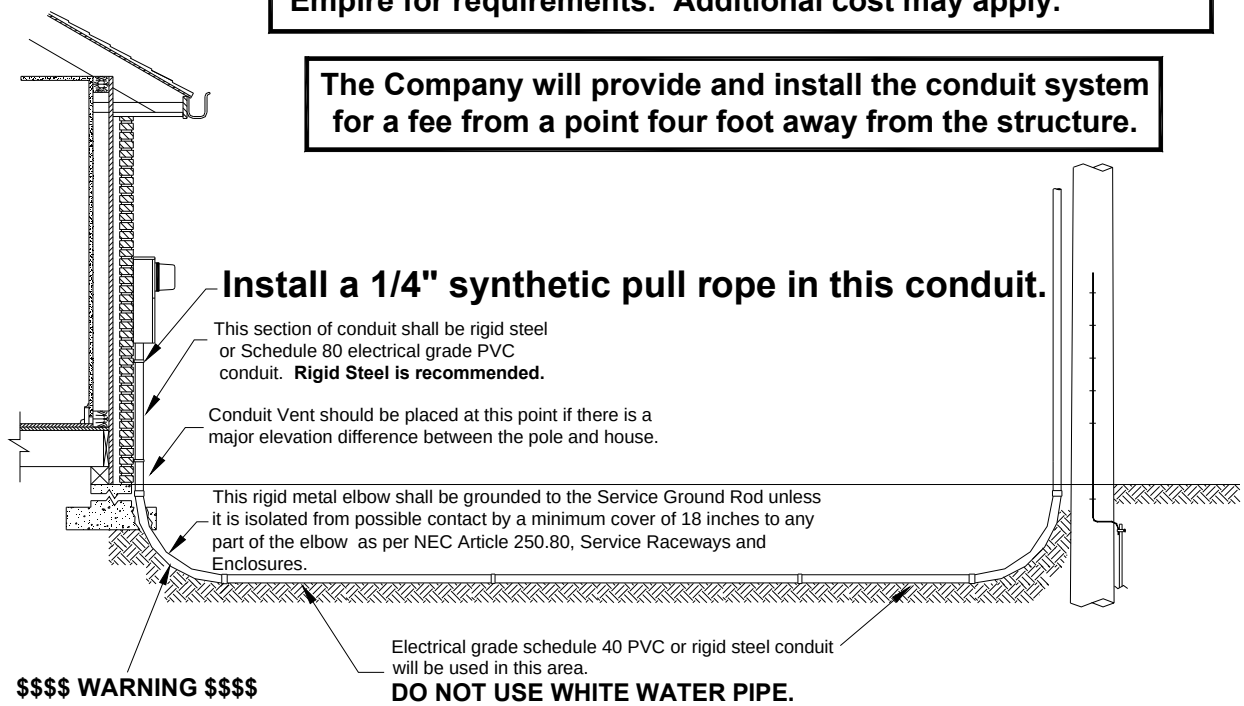
Ditch Profile

NOTES:

1. Backfill shall be compacted with the wheels of the excavation equipment or by other suitable means prior to final backfilling. The top of the backfilled trench shall be approximately level with the surrounding grade. Excess soil shall be hauled away. Final backfilling and cleanup shall not be done during adverse weather conditions.
2. An area on each side of the trench will be disturbed by the trenching, backfilling and cleanup operations. The area shall be leveled with the surrounding grade and cleanup, and it is the responsibility of the property owner to replant it with grass and to do any future landscaping that might be needed.

Service is provided as line of sight from Meter Socket location to service source. If the service route differs from this due to obstructions or terrain or is longer than 100 feet, contact Empire for requirements. Additional cost may apply.

The Company will provide and install the conduit system for a fee from a point four foot away from the structure.



$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the meter socket resulting in a possible failure of the service.

This denotes undisturbed earth.

If the Customer digs the ditch, a Ditch Inspection is REQUIRED. Contact the Company to schedule an inspection.

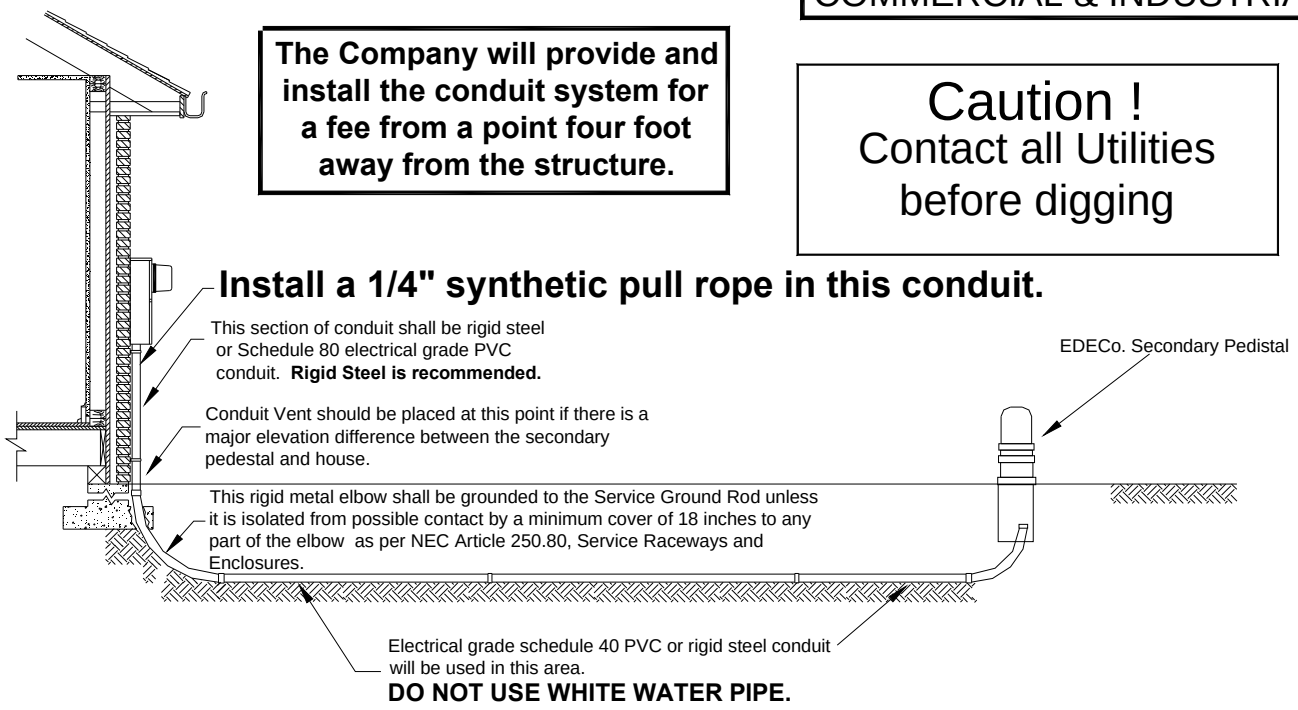
THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
Underground Service Detail	
DWG. NO. V94A04 MS9404	
DRAWN: SDS	DATE: 06/06/03
SCALE: NTS	FIGURE 38

REVISIONS
05-17-05 SDS
04-01-09 SDS

Figure 38: Undergound Service Detail

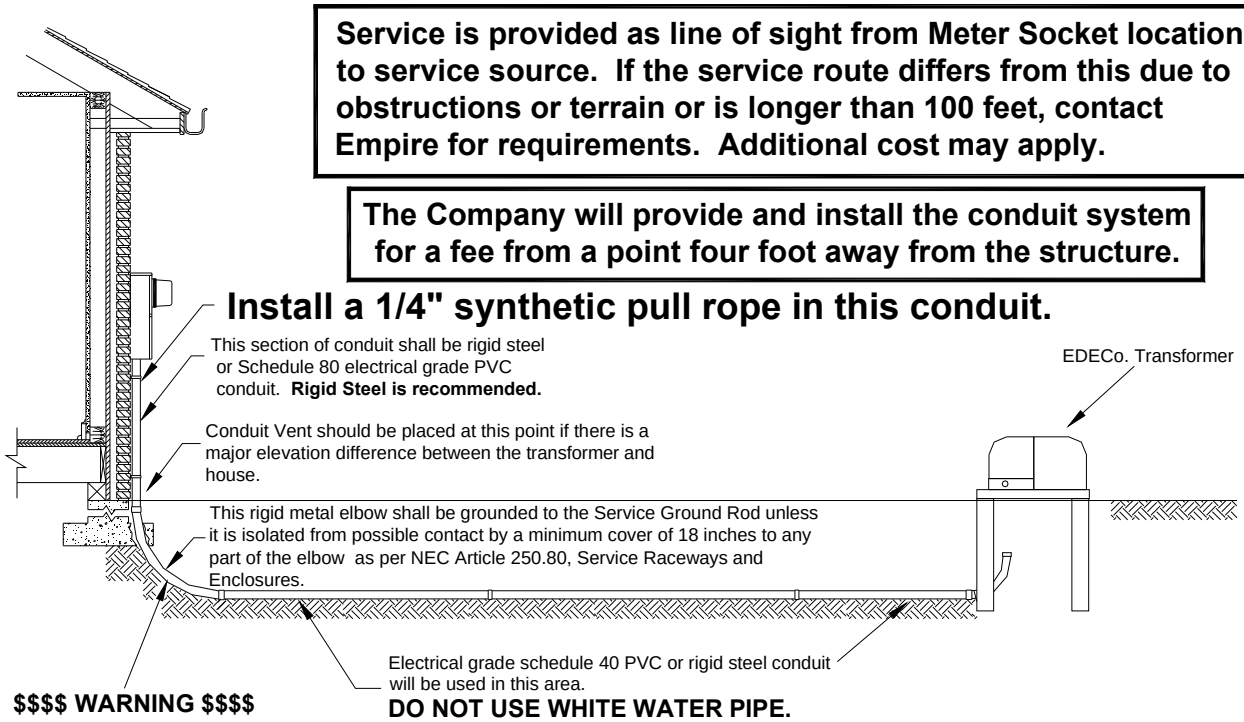
The Company will provide and install the conduit system for a fee from a point four foot away from the structure.

Caution !
Contact all Utilities before digging



Service is provided as line of sight from Meter Socket location to service source. If the service route differs from this due to obstructions or terrain or is longer than 100 feet, contact Empire for requirements. Additional cost may apply.

The Company will provide and install the conduit system for a fee from a point four foot away from the structure.



$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the meter socket resulting in a possible failure of the service.

This denotes undisturbed earth.

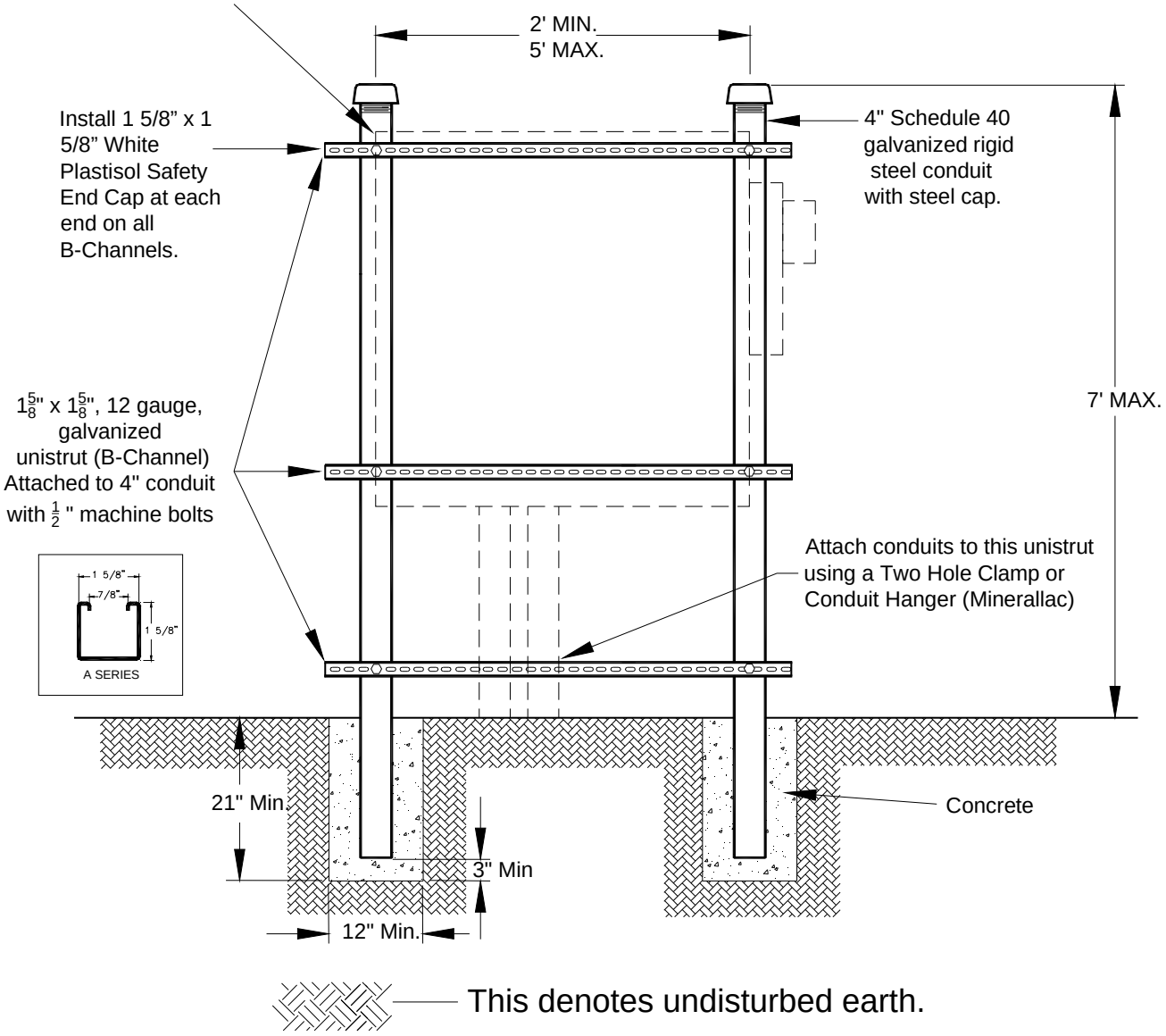
If the Customer digs the ditch, a Ditch Inspection is REQUIRED. Contact the Company to schedule an inspection.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
04-01-09 SDS REVISIONS	Underground Service Detail (Continued)
DWG. NO.	V06A10 MS0610
DRAWN: SDS	DATE: 07/15/06
SCALE: NTS	FIGURE 39

Figure 39: Undergound Service Detail (Continued)

COMMERCIAL & INDUSTRIAL

Service Equipment shall be installed as shown in these Service Standards. Install this equipment on front side of this structure.



Contact EDECo. for the Location and orientation before installing this structure.

Caution !
Contact all Utilities before digging

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
	Underground Service Structure
REVISIONS	DWG. NO. V06A05 MS0605
	DRAWN: SDS — DATE: 07/15/06
	SCALE: NTS — FIGURE 40

Figure 40: Underground Service Structure

7.2 200 AMP AND 400 AMP SINGLE PHASE UNDERGROUND SERVICE

A. General Notes:

1. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, lock nuts, bushings, 200 amp meter socket, main disconnect, hub closing plate, and miscellaneous mounting hardware furnished and installed by customer.
2. Meter and service lateral conductors furnished and installed by Company.
3. The meter socket should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket. Prior approval is required for placement of the meter socket in alleyways or areas where it may be subjected to damage.
4. The 200 amp meter socket shall meet the latest revision of U.L. 414 and ANSI C12.7 standards. These sockets shall be ring style.

APPROVED INDIVIDUAL METER SOCKETS

SERVICE SIZE	MILBANK CAT. NO.	EATON/ CUTLER HAMMER CAT. NO.	DURHAM or SQUARE D CAT. NO.
200 AMP	U7018RLTG	UTRRS213	UTRRS213B

Note: On 120/208 service, the Company will provide the fifth lug only on these meter sockets.

APPROVED COMBINATION METER SOCKETS

SERVICE SIZE	MILBANK CAT. NO.	EATON/ CUTLER HAMMER CAT. NO..	SQUARE D CAT. NO.	DURHAM	MIDWEST ELECTRICAL
200 AMP	U5169	MB816B200BTS	RC816F200CH	1009663	M282CB1

Note: On 120/208 service, the Company will provide the fifth lug only on these combination meter sockets.

5. **The 400 amp meter socket, hub closing plate, and connectors shall be purchased from the Company and installed by the Customer.**
6. Conduit system shall be installed as per Figure 38 or 39.

B. Mounting:

1. Meter socket, ground wire, and conduit shall be surface mounted and securely fastened to the exterior structure. The meter socket shall be installed in a level and plumb position. **Flush mounted metering or recessed equipment and service lateral conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.
3. For 200 amp service, a minimum of two inch (2") galvanized rigid steel or electrical grade Schedule 80 PVC conduit shall be furnished and installed by Customer as shown in Figure 41.
4. For 400 amp service, a minimum of three inch (3") galvanized rigid steel or electrical grade Schedule 80 PVC conduit shall be furnished and installed by Customer as shown in Figure 41.

5. If PVC is used for the conduit attached to the meter socket, the rigid metal elbow shall be grounded/bonded to the service ground rod unless it is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow as per NEC Article 250.80, Service Raceways and Enclosures. The following are samples of approved grounding clamps

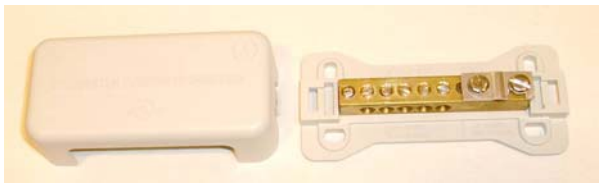
FCI – Burndy

Catalog Number	Water Pipe Range in	Conductor Range of Tap
C-11	1/2-1	10 Sol.-2 Str.
C-22	1 1/4-2	10 Sol.-2 Str.
C-4	2 1/2-4	10 Sol.-2 Str.
C-8	4 1/2-6	10 Sol.-2 Str.

Penn-Union

Catalog Number	Water Pipe Range in	Conductor Range of Tap
KP-1	1/2-1	10 Sol.-2 Str.
KP-2	1 1/4-2	10 Sol.-2 Str.
KP-4	2 1/2-4	10 Sol.-1/0 Sol.

6. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility's ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.



RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

C. Connections:

1. Do not score load wire when removing insulation.
2. The customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

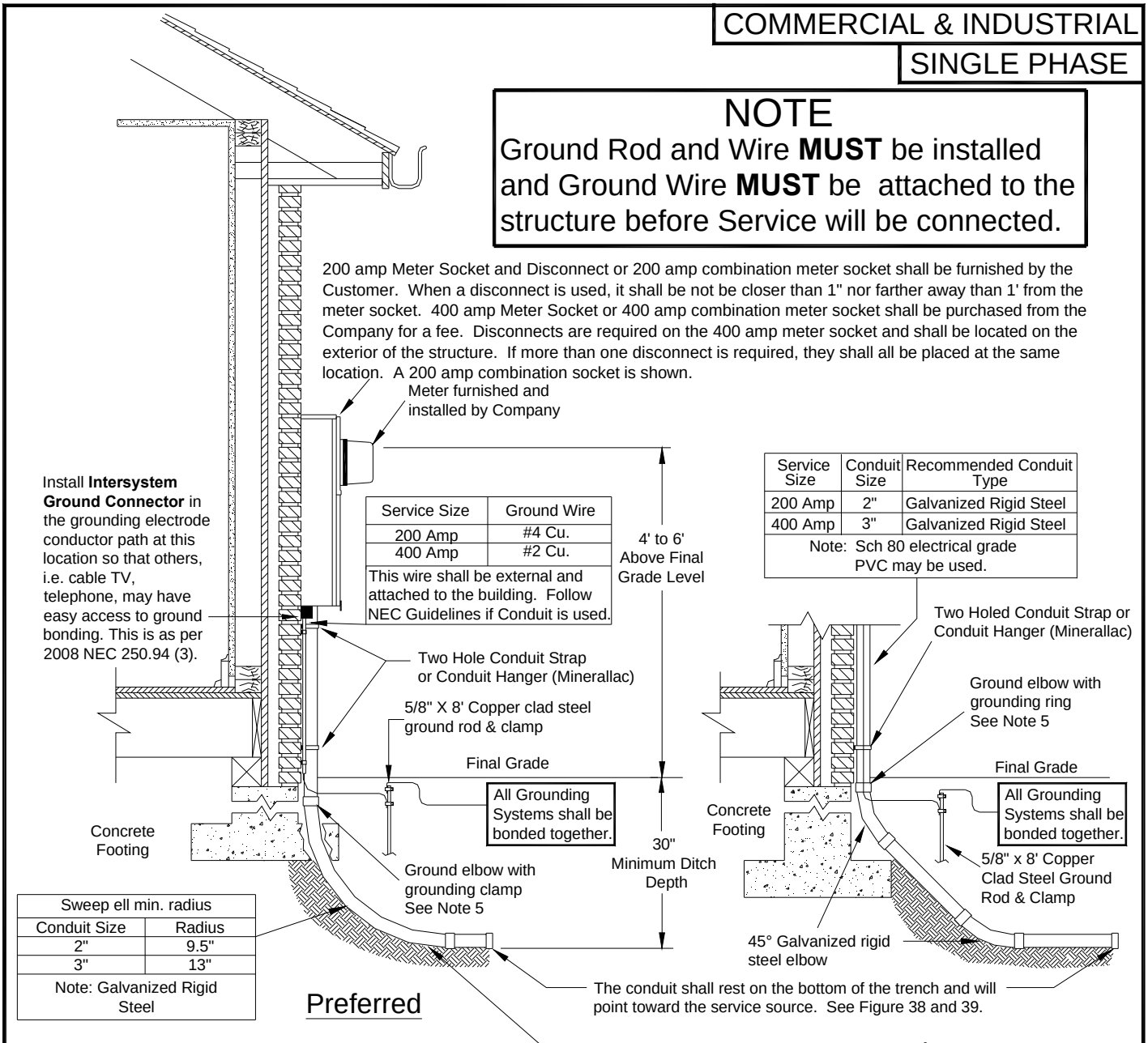
D. Conductor Marking:

All neutral conductors shall be clearly marked with white tape at the meter socket.

NOTE

Ground Rod and Wire **MUST** be installed and Ground Wire **MUST** be attached to the structure before Service will be connected.

200 amp Meter Socket and Disconnect or 200 amp combination meter socket shall be furnished by the Customer. When a disconnect is used, it shall be not be closer than 1" nor farther away than 1' from the meter socket. 400 amp Meter Socket or 400 amp combination meter socket shall be purchased from the Company for a fee. Disconnects are required on the 400 amp meter socket and shall be located on the exterior of the structure. If more than one disconnect is required, they shall all be placed at the same location. A 200 amp combination socket is shown.



Service Size	Ground Wire
200 Amp	#4 Cu.
400 Amp	#2 Cu.
This wire shall be external and attached to the building. Follow NEC Guidelines if Conduit is used.	

Service Size	Conduit Size	Recommended Conduit Type
200 Amp	2"	Galvanized Rigid Steel
400 Amp	3"	Galvanized Rigid Steel
Note: Sch 80 electrical grade PVC may be used.		

Sweep ell min. radius	
Conduit Size	Radius
2"	9.5"
3"	13"
Note: Galvanized Rigid Steel	

Preferred

Alternate

Caution! Contact all Utilities before digging

$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the meter socket resulting in a possible failure of the service.

This denotes undisturbed earth.

Notes:

1. **If a conduit reducer is used, it must be located immediately below the Meter Socket.**
2. Line of Sight installation is required. See Definitions.
3. A conduit vent may be needed depending on the service arrangement and terrain.
4. If the service route is longer than 100 feet, contact Empire for conduit requirements.
5. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
AMA	01-01-97	
SDS	05-17-05	
SDS	07-15-06	
SDS	04-01-09	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

200/400 Amp
Underground Service

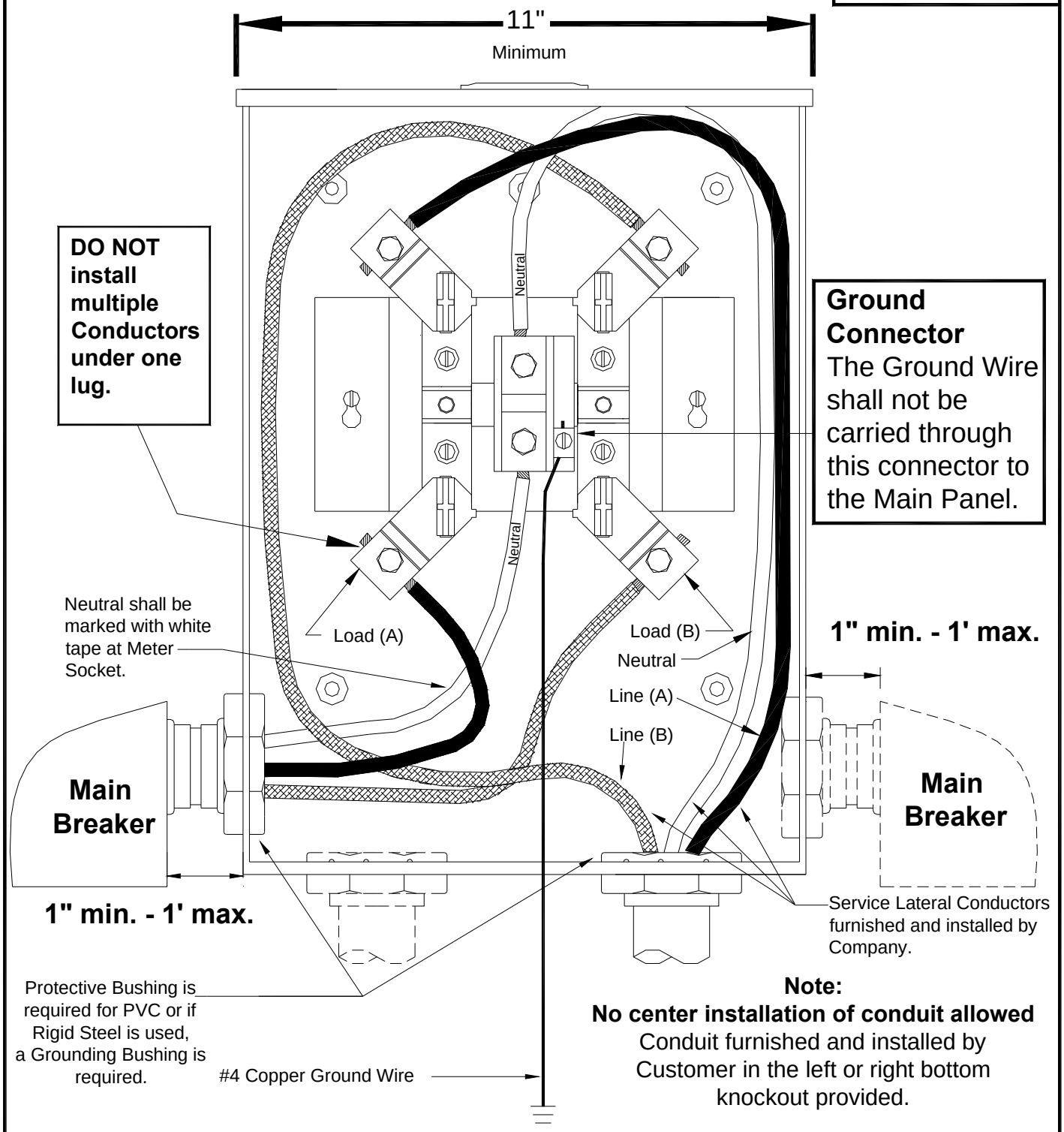
DWG NO. V96A31 MS9629

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 41

Figure 41: 200/400 Amp, Single Phase Underground Service



All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
AMA	01-01-97	
SDS	05-17-05	
SDS	07-15-06	
SDS	01-22-09	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

200 Amp meter socket,
underground service

DWG NO. V96A32 MS9630

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 42

Figure 42: 200 Amp Meter Socket, Single Phase Underground Service

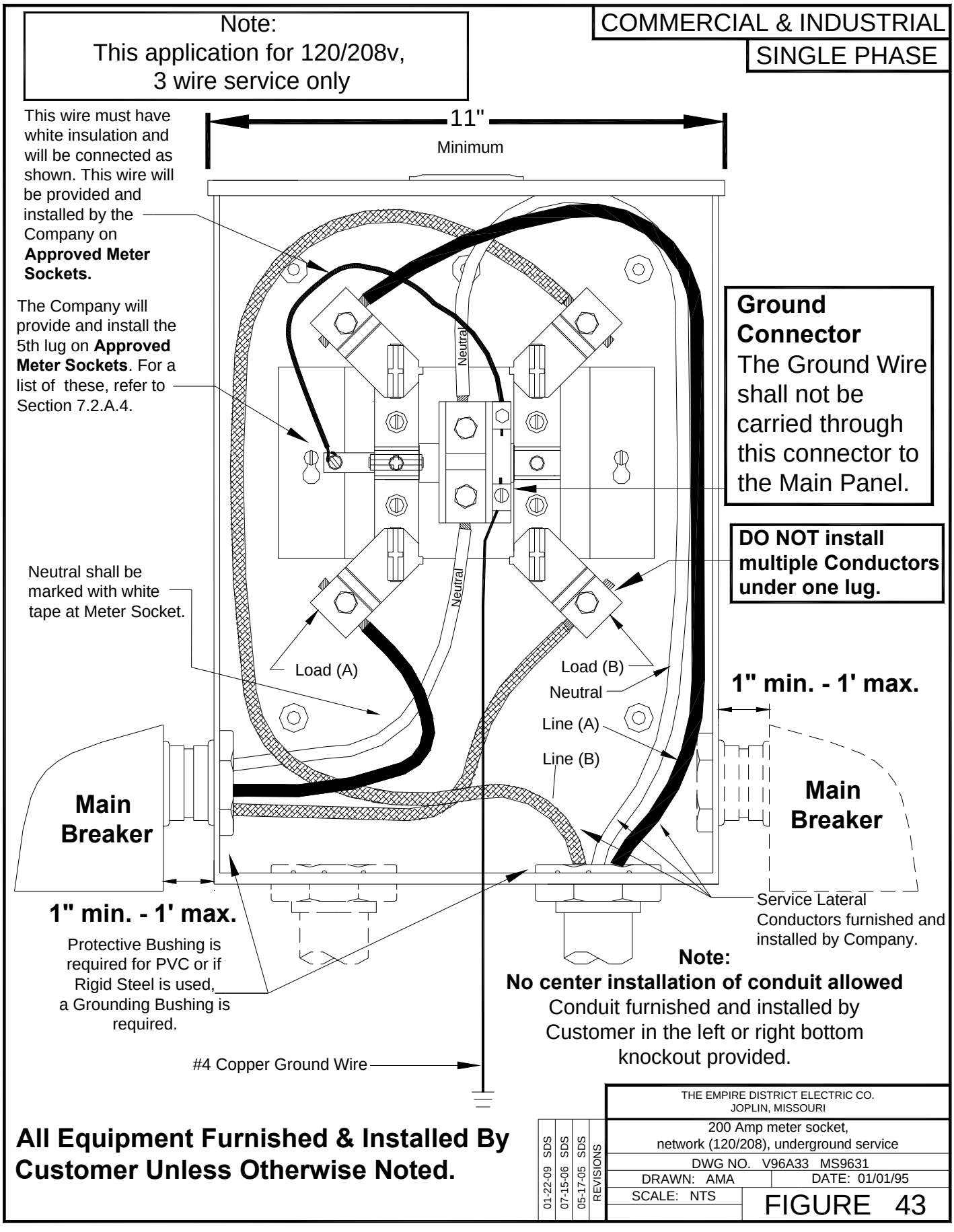
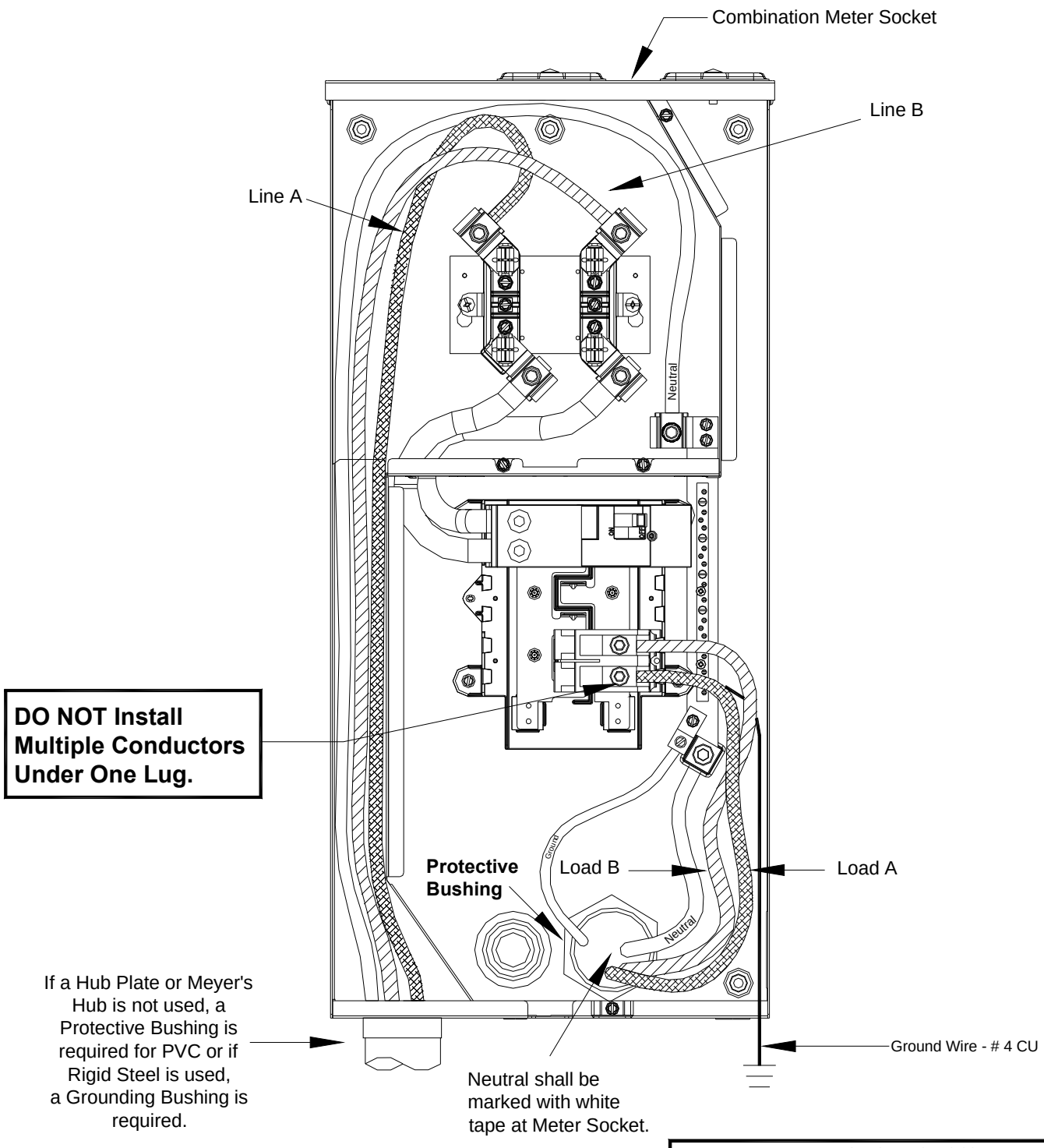


Figure 43: 200 Amp Meter Socket, Single Phase (120/208) Underground Service



All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

200 Amp Combination Meter Socket, Underground Service

DWG. NO. V06A06 MS0606

DRAWN: SDS | DATE: 11/10/06

SCALE: NTS

FIGURE 44

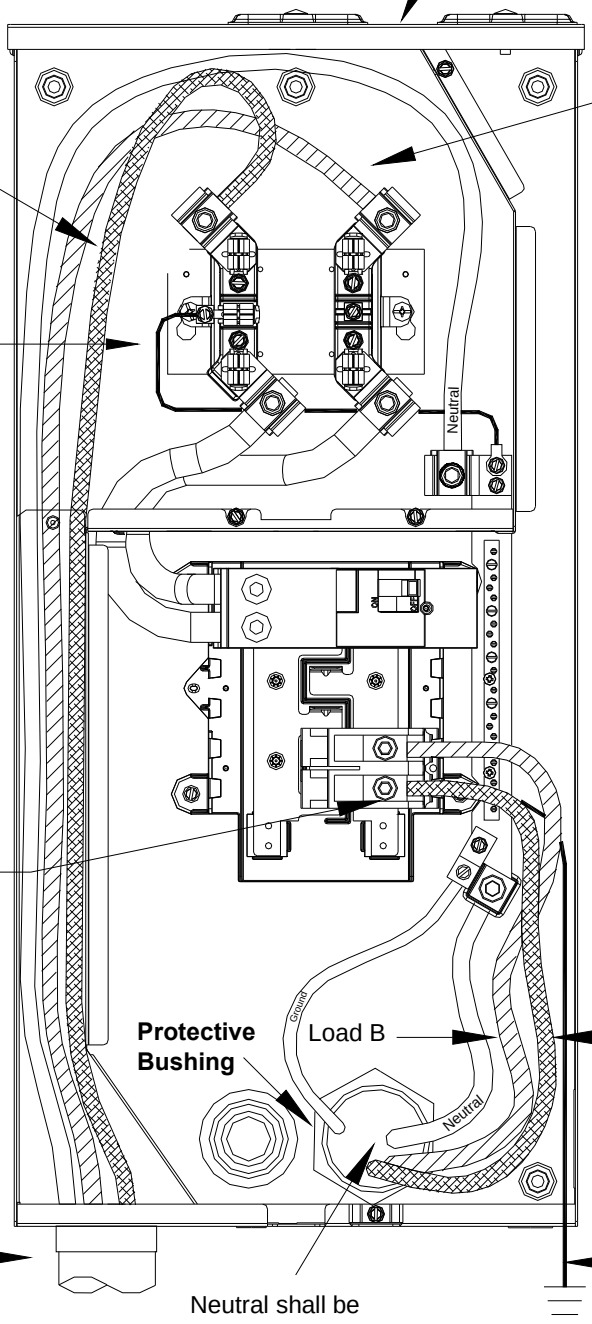
REVISIONS 04/01/09 SDS

Figure 44: 200 Amp Combination Meter Socket, Single Phase Underground Service

COMMERCIAL & INDUSTRIAL

SINGLE PHASE

Note:
This application for 120/208v, 3 wire service



This wire must have white insulation and will be connected as shown. This wire will be provided and installed by the Company on **Approved Meter Sockets**.

The Company will provide and install the 5th lug on **Recommended Meter Sockets. For a list of these, refer to Section 7.2.A.5**

DO NOT Install Multiple Conductors Under One Lug.

Protective Bushing

Load B

Load A

If a Hub Plate or Meyer's Hub is not used, a Protective Bushing is required for PVC or if Rigid Steel is used, a Grounding Bushing is required.

Ground Wire - # 4 CU

Neutral shall be marked with white tape at Meter Socket.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

200 Amp Combination Meter Socket, Underground Service

DWG. NO. V06A07 MS0607

DRAWN: AMA | DATE: 11/10/06

SCALE: NTS

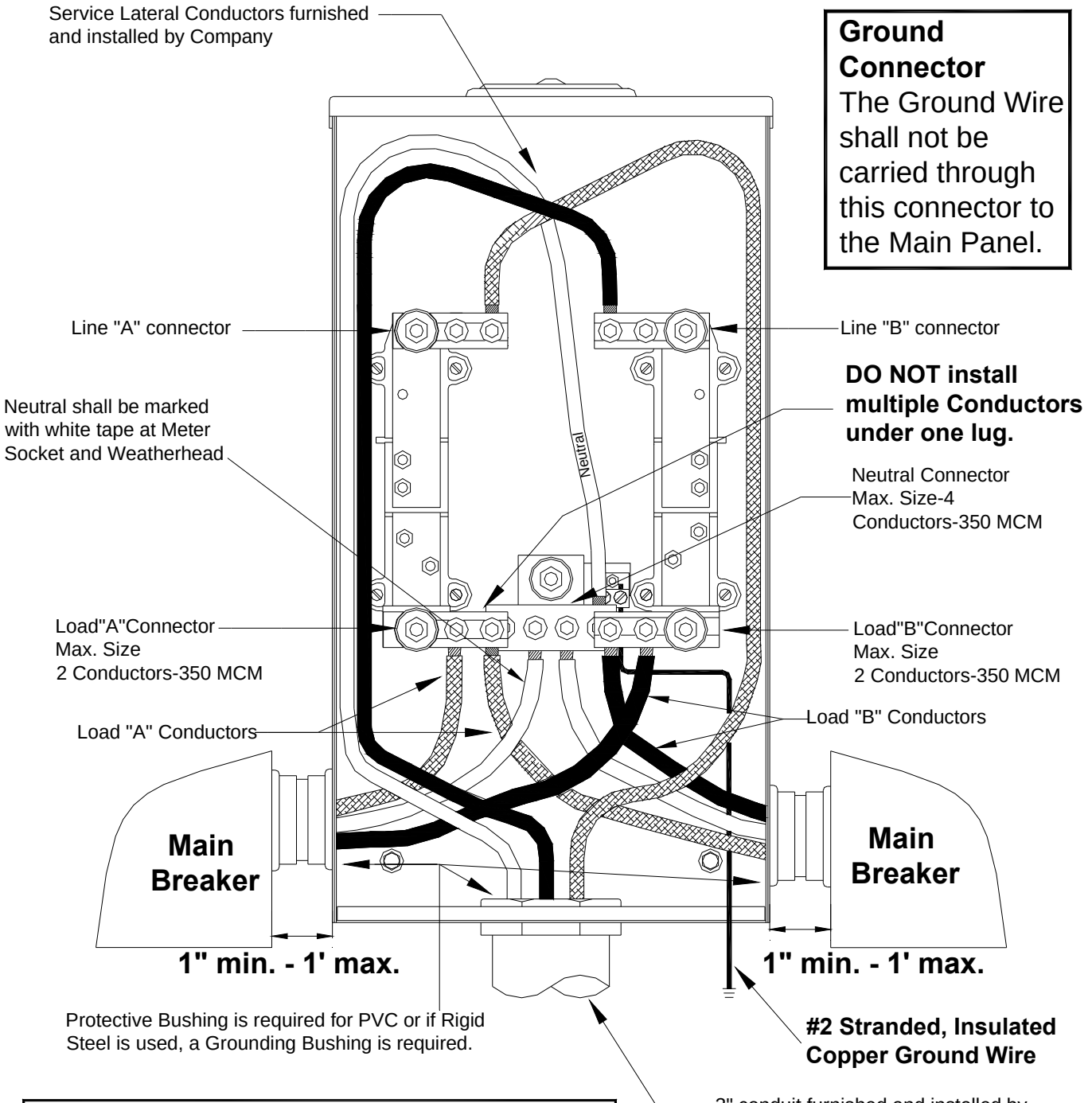
REVISIONS SDS 04/01/09

FIGURE 45

Figure 45: 200 Amp Combination Meter Socket, Single Phase (120/208) Underground Service

COMMERCIAL & INDUSTRIAL

SINGLE PHASE



Meter Socket and Hub Closing Plate shall be purchased from Company and installed by Customer

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS	
01-01-97	AMA
05-17-05	SDS
07-17-06	SDS
01-22-09	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

400 Amp meter socket, underground service

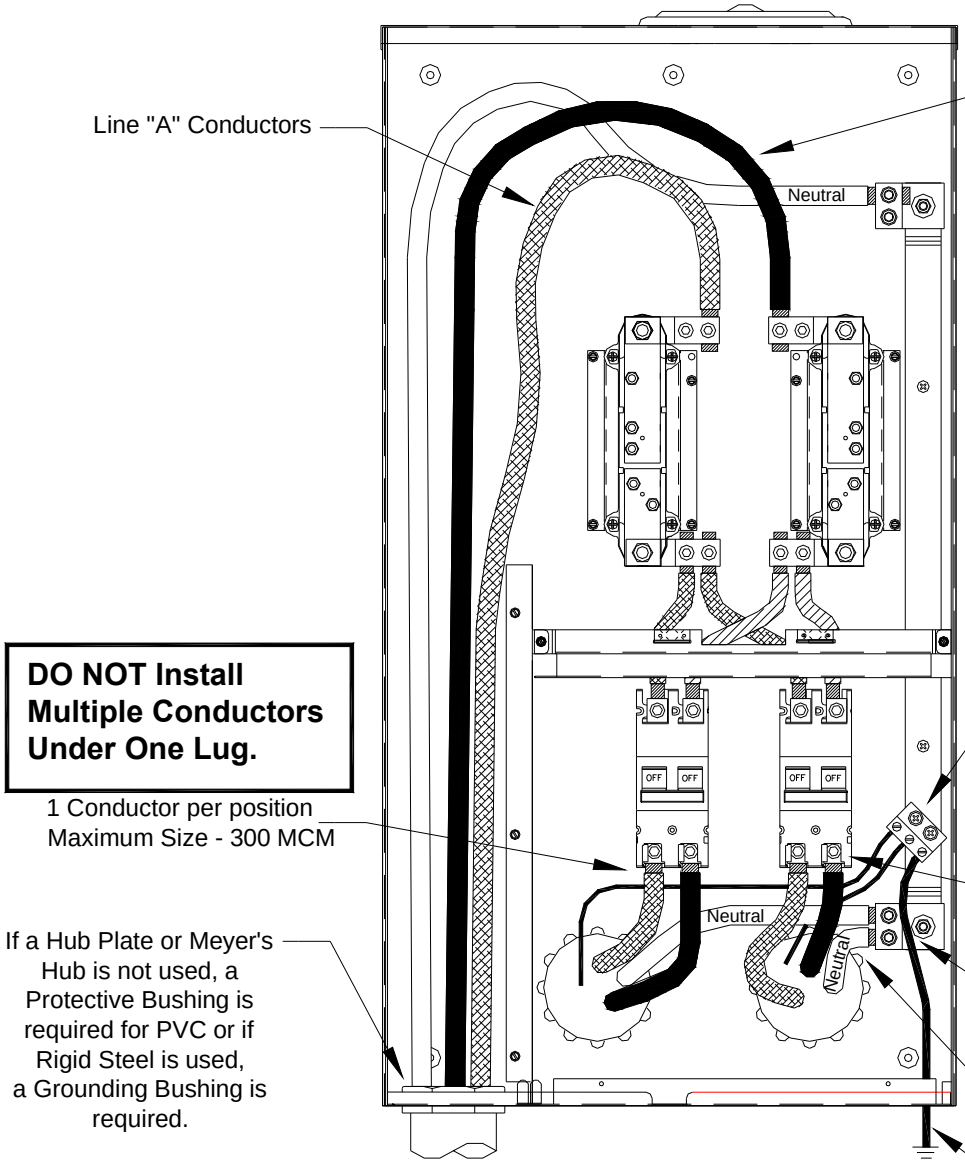
DWG NO. V96A34 MS9632

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 46

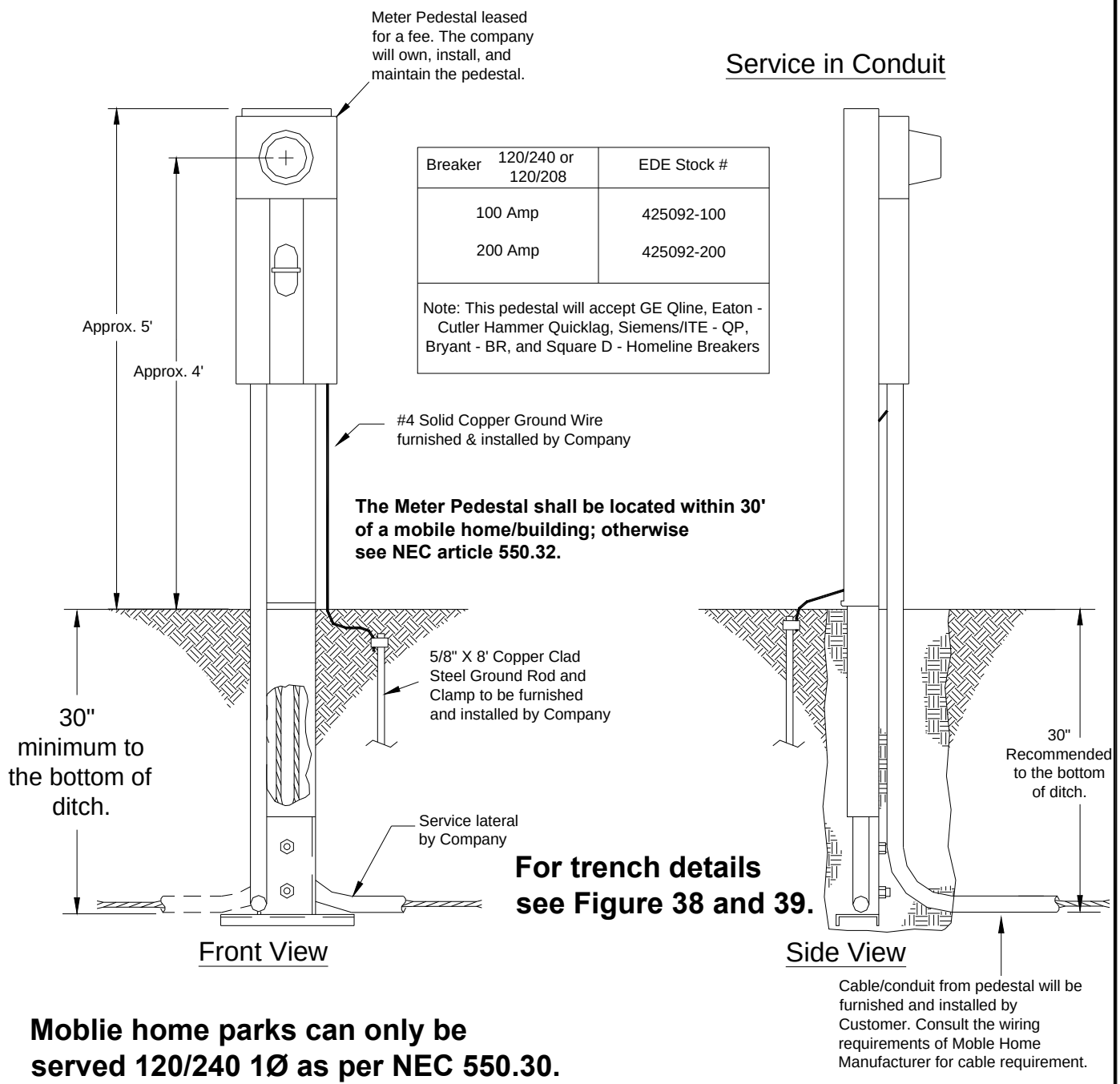
Figure 46: 400 Amp Meter Socket, Single Phase Underground Service



THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
REVISIONS	400 AMP COMBINATION METER SOCKET UNDERGROUND SERVICE
	DWG. NO. V09A02 MS0902
DRAWN: SDS	DATE: 01/26/09
SCALE: NTS	FIGURE 47

Figure 47: 400 Amp Combination Socket, Single Phase Underground Service

Caution!
Contact all utilities before digging



Breaker 120/240 or 120/208	EDE Stock #
100 Amp	425092-100
200 Amp	425092-200
Note: This pedestal will accept GE Qline, Eaton - Cutler Hammer Quicklag, Siemens/ITE - QP, Bryant - BR, and Square D - Homeline Breakers	

Moblie home parks can only be served 120/240 1Ø as per NEC 550.30.

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Meter Pedestal

DWG NO. V96A35 MS9633

DRAWN: AMA | DATE: 01/01/96

SCALE: NTS | FIGURE 48

REVISIONS
01-01-97 AMA
07-15-06 SDS

Figure 48: Single Phase Meter Pedestal

7.3 600 AMP TO 800 AMP CT METERING, SINGLE PHASE UNDERGROUND SERVICE

A. General Notes:

1. This arrangement may be utilized for services above 400 amps and less than or equal to 800 amps.
2. The disconnection method may be composed of multiple disconnects to make up the full 800 amp capacity of the service as long as there are not more than 6. If one disconnect is used and it is greater than 400 amps, it may be located on the interior of the building unless the authority having jurisdiction dictates otherwise. Disconnects of 400 amps and below will be located on the exterior of the building. **Please note that in all cases all disconnects making up this service will be at the same location.**
3. The service lateral conductors and meter are furnished and installed by the Company. Customer will provide approximate final grade level within six inches (6") prior to service lateral installation.
4. The current transformers (CT) are furnished by the Company. These may be issued to the Customer for installation or installed by Company employees. **The Customer shall provide and install the CT/connection cabinet. The approved suppliers are shown in the table below.**

Service Size	CT/Connection Cabinet (H x W x D)	Accessories Needed	Suppliers		
600 amp To 800 amp	36" x 36" x 16" This shall be equipped with two doors with lift-off hinges, 3 point latching, and no center post.	¾ " Exterior Plywood Panel Installed in back of Cabinet Provision to secure the cabinet shut using a 3/8" Shackle padlock	Durham Cat# 1005693	Milbank Cat# 363616-CT3R-WB	Austin Enclosures Cat# 363616WLD001

5. The meter socket shall be purchased from the Company and installed by the Customer. The Location of this CT Cabinet and Meter will determined by EDECo.
6. The metering control cable is furnished and installed by the Company.
7. The metering equipment should be "readily accessible" (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the metering equipment. Prior approval is required for placement of the metering equipment in alleyways or areas where it may be subjected to damage.
8. An intersystem bonding termination arrangement may be required. Consult the NEC for the particular application of this type of device.

B. Mounting:

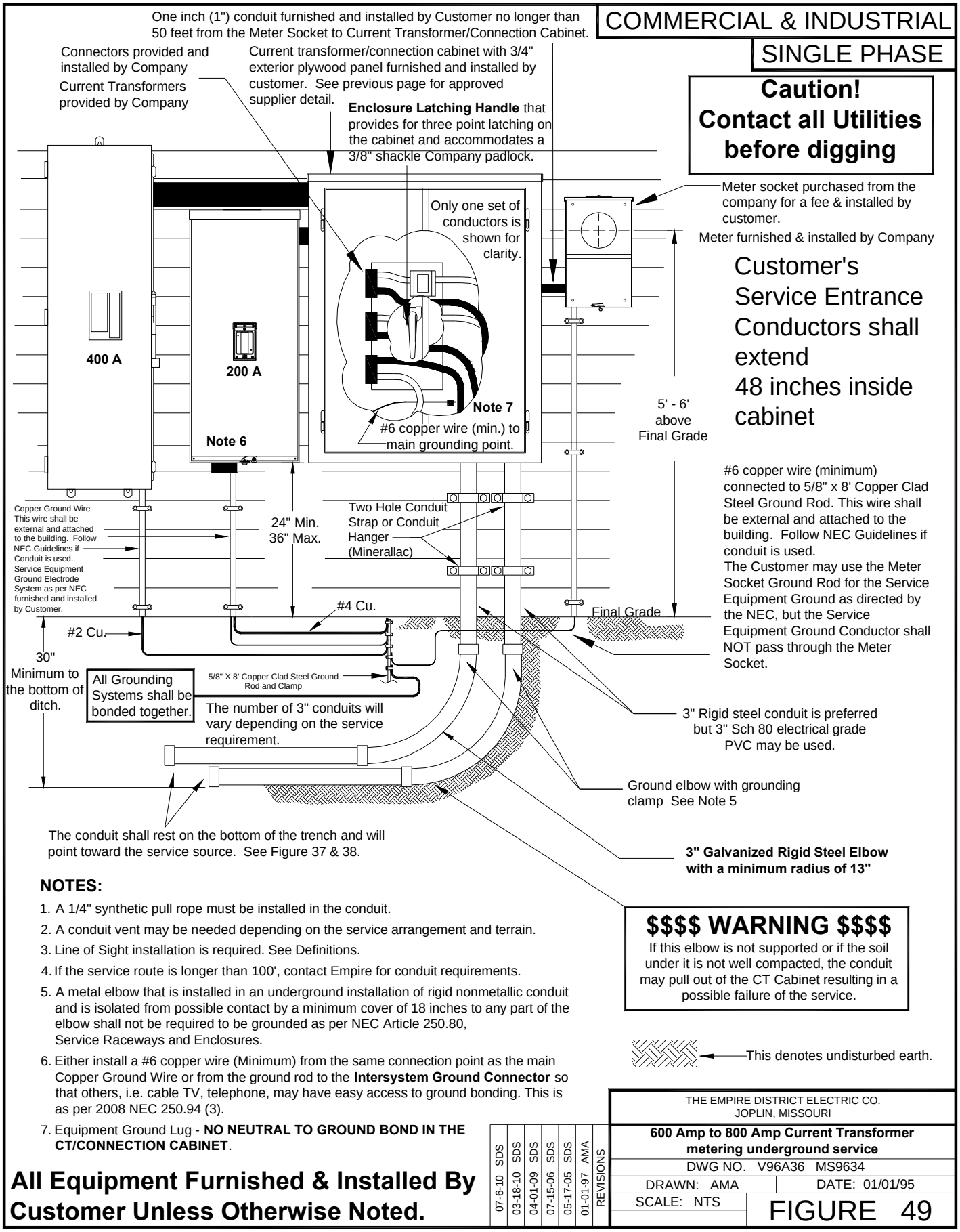
1. Meter socket, ground wire, CT/connection cabinet, and conduits for service lateral and metering control cable shall be surface mounted and securely fastened to the structure. The meter socket shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service lateral conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a support frame shall be installed behind the exterior wall to provide a solid mounting surface for the metering equipment.
3. Conduits shall be furnished and installed by Customer.

C. Connections:

All connections inside the CT/connection cabinet shall be made by Company. The Company shall provide the connectors.

D. Conductor Marking:

All neutral conductors shall be clearly marked with white tape at the point of delivery.



NOTES:

1. A 1/4" synthetic pull rope must be installed in the conduit.
2. A conduit vent may be needed depending on the service arrangement and terrain.
3. Line of Sight installation is required. See Definitions.
4. If the service route is longer than 100', contact Empire for conduit requirements.
5. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures.
6. Either install a #6 copper wire (Minimum) from the same connection point as the main Copper Ground Wire or from the ground rod to the **Intersystem Ground Connector** so that others, i.e. cable TV, telephone, may have easy access to ground bonding. This is as per 2008 NEC 250.94 (3).
7. Equipment Ground Lug - **NO NEUTRAL TO GROUND BOND IN THE CT/CONNECTION CABINET**.

$$$$ WARNING $$$$

If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the CT Cabinet resulting in a possible failure of the service.

This denotes undisturbed earth.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS	
01-01-97	AMA
05-17-05	SDS
07-15-06	SDS
04-01-09	SDS
03-18-10	SDS
07-6-10	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

600 Amp to 800 Amp Current Transformer metering underground service

DWG NO. V96A36 MS9634

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 49

Figure 49: 600 Amp to 800 Amp CT Metering, Single Phase Underground Service

7.4 MULTIPLE METERS, SINGLE PHASE UNDERGROUND SERVICE

A. General Notes:

1. If more than six meters are required, consult the Company for approval of equipment prior to purchase.
2. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, lock nuts, bushings, meter socket assembly, hub closing plate, and miscellaneous mounting hardware furnished and installed by the Customer.
3. Meters, service connectors, and service lateral conductors furnished and installed by Company.
4. The meter socket assembly should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket assembly. Prior approval is required for placement of the meter socket assembly in alleyways or areas where it may be subjected to damage.
5. The meter sockets shall meet the latest revision of U.L. 414 and ANSI C12.7 standards.

APPROVED DUPLEX METER SOCKETS

SERVICE SIZE	SQUARE D CAT. NO.	EATON/ CUTLER HAMMER CAT. NO.	SIEMANS CAT. NO.	MILBANKCAT. NO.
2 – 100	MP42200 with 100 amp Breakers	1MP2204R with 100 amp breakers	SP4212 with 100 amp breakers	U2852-X-HSP
2 – 200	MP42200	1MP2204R	SP4212	U2862-X-HSP

Please consult with the Company before purchasing this type of equipment.

6. If PVC is used for the conduit attached to the meter socket, the rigid metal elbow shall be grounded/bonded to the service ground rod unless it is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow as per NEC Article 250.80, Service Raceways and Enclosures. The following are samples of approved grounding clamps

FCI – Burndy

Catalog Number	Water Pipe Range in	Conductor Range of Tap
C-11	1/2-1	10 Sol.-2 Str.
C-22	1 1/4-2	10 Sol.-2 Str.
C-4	2 1/2-4	10 Sol.-2 Str.
C-8	4 1/2-6	10 Sol.-2 Str.

Penn-Union

Catalog Number	Water Pipe Range in	Conductor Range of Tap
KP-1	1/2-1	10 Sol.-2 Str.
KP-2	1 1/4-2	10 Sol.-2 Str.
KP-4	2 1/2-4	10 Sol.-1/0 Sol.

7. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility's ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.

RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

B. Mounting:

1. Meter socket assembly, ground wire, and conduit shall be surface mounted and securely fastened to the structure. The meter socket assembly shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service lateral conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a support frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.
3. Conduit ends shall be equipped with a proper bushing to protect the conductors.

C. Connections:

1. The Customer is responsible for termination of the incoming wiring if the wire terminates in a main breaker or fuse holder. The Company will terminate the incoming wire if it terminates on bus bar terminals. The main breaker will be removed when the service wire is being pulled by the Company.
2. Do not score load wire when removing insulation.
3. The Customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

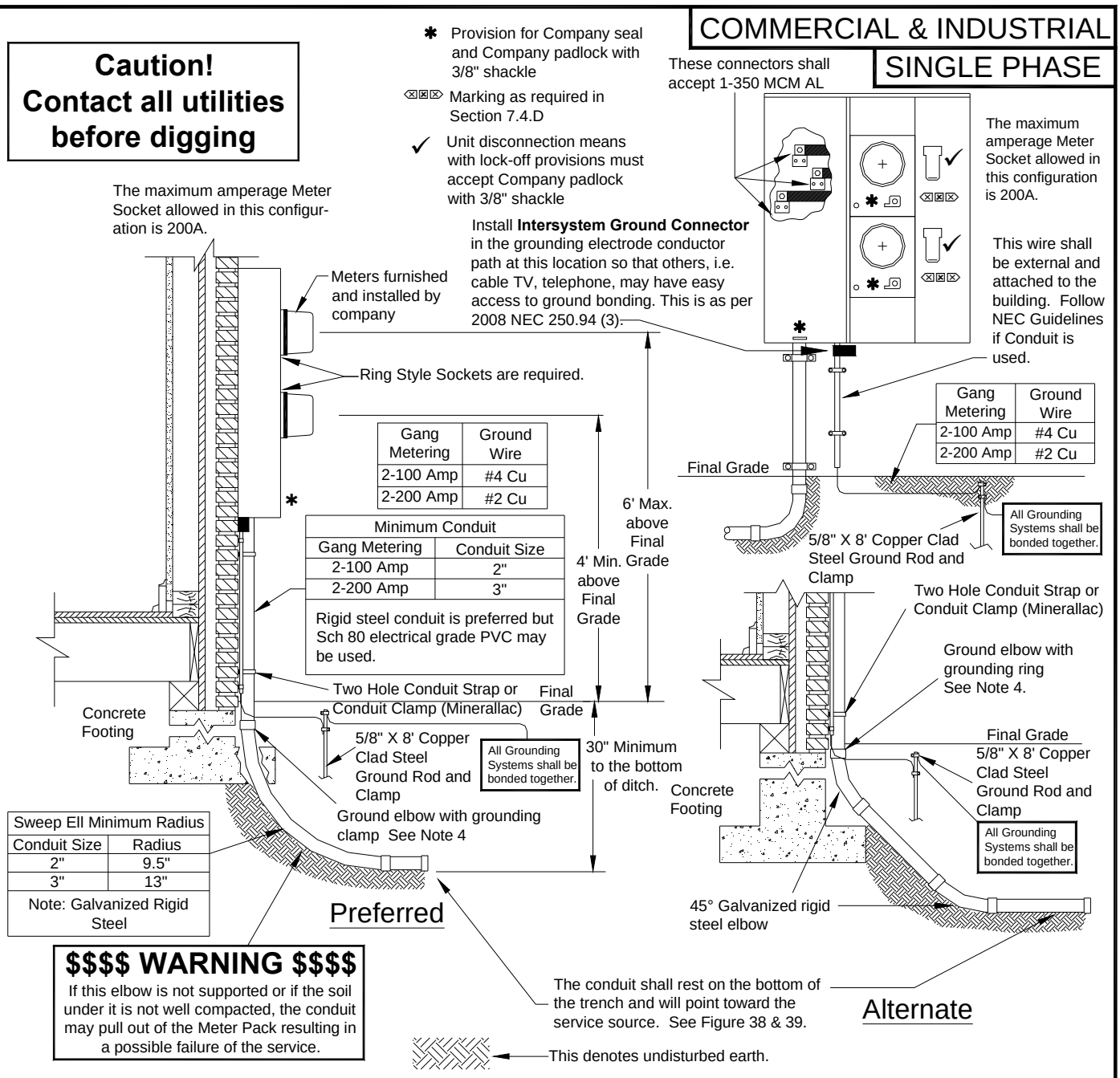
D. Meter Socket Marking:

1. Before the meters are installed, each socket position and corresponding building unit, i.e. apt number or letter, Suite number or letter, tenant number or letter, or physical address served shall be accurately, clearly, and permanently labeled with an engraved plate. These shall be screwed, bolted or riveted externally to the equipment. See figures for proper location. If the equipment is marked incorrectly, the customer shall be responsible for all costs incurred by EDECo for correcting the meter socket identification. Please note that marker ink or adhesive labels are examples of non-permanent labeling.

2. Letters or numbers on the engraved plate shall be a minimum of one (1) inch in height of contrasting color, i.e., black and white, red and green, orange and blue, etc.

E. Conductor Marking:

All neutral conductors shall be clearly marked with white tape at the meter socket assembly.



Notes:

1. A Conduit Vent may be needed depending on the service arrangement and terrain.
2. Line of Sight installation is required. See Definitions.
3. If the service route is longer than 100', contact the Company for conduit requirements.
4. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures.
5. A ¼" synthetic pull rope must be installed in the conduit.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
05-17-05	SDS	
07-15-05	SDS	
07-14-09	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Wiring of two meters, underground service

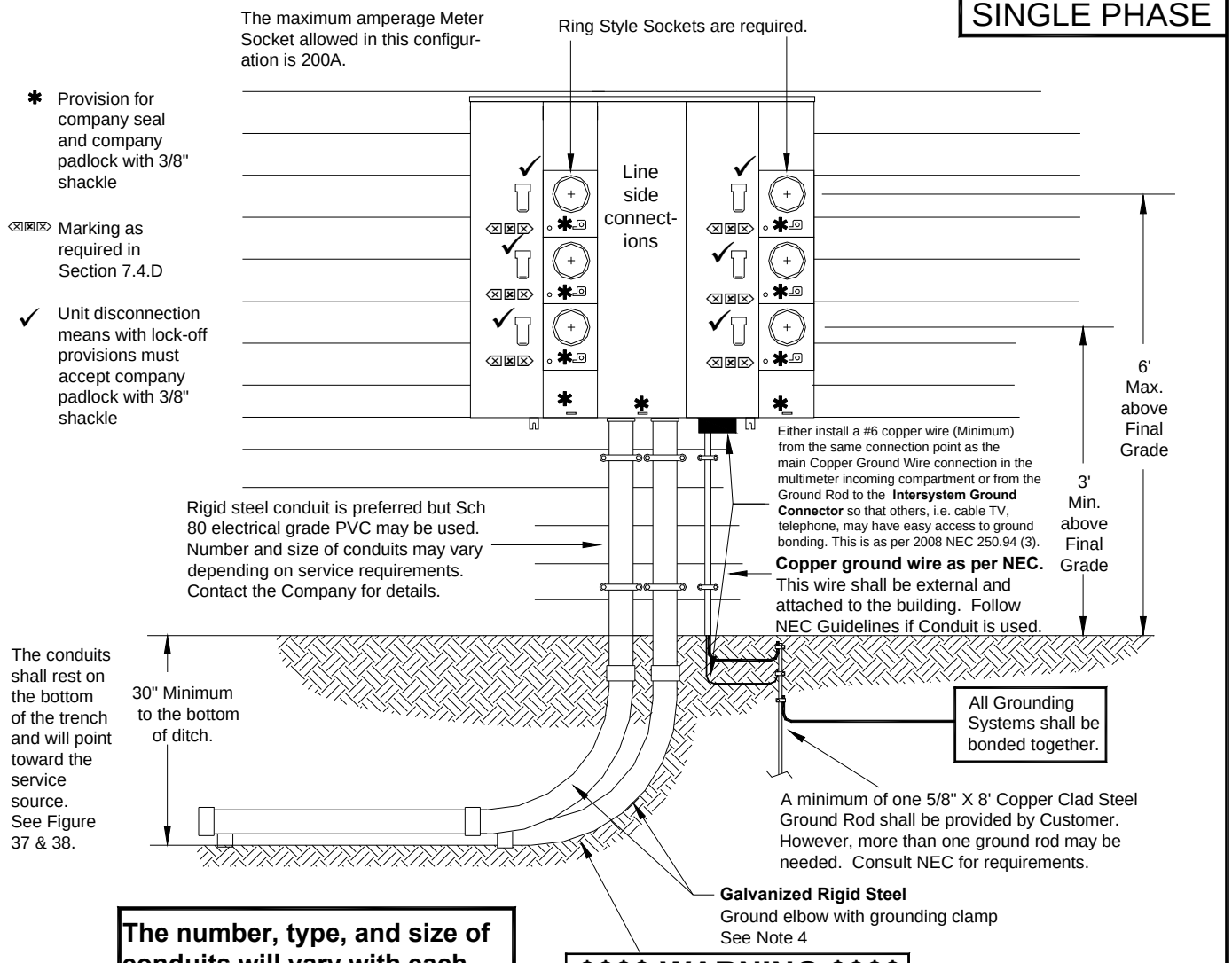
DWG NO. V96A37 MS9635

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 50

Figure 50: Two Meters, Single Phase Underground Service



The number, type, and size of conduits will vary with each installation. Contact the Company for more information.

$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the Meter Pack resulting in a possible failure of the service.

If more than 6 meters are required, please contact the Company for configuration. As a minimum, EDE will require the riser diagram as proposed by the Electrical Engineer.

Caution! Contact all utilities before digging

Notes:

1. A conduit vent may be needed depending on the service arrangement and terrain.
2. Line of Sight installation is required. See Definitions.
3. If the service route is longer than 100', contact the Company for conduit requirements.
4. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures
5. A ¼" synthetic pull rope must be installed in the conduit.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
01-01-97	AMA	
05-17-05	SDS	
07-15-06	SDS	
07-14-09	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Three to six meters, underground service

DWG NO. V94A36 MS9437

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 51

Figure 51: Three to Six Meters, Single Phase Underground Service

7.5 200 AMP THREE PHASE UNDERGROUND SERVICE

A. General Notes:

1. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, lock nuts, bushings, meter socket, main disconnect and miscellaneous mounting hardware furnished and installed by Customer.

2. Meter and service lateral conductors furnished and installed by Company.

3. The meter socket should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket. Prior approval is required for placement of the meter socket in alleyways or areas where it may be subjected to damage.

4. **The 200 amp meter socket, and hub closing plate shall be purchased from the Company and installed by the Customer.**

5. Conduit system shall be installed as per Figure 38 & 39.

B. Mounting:

1. Meter socket, ground wire, and conduit shall be surface mounted and securely fastened to the exterior structure. The meter socket shall be installed in a level and plumb position. **Flush mounted metering or recessed equipment and service lateral conduit embedded in a wall will not be permitted.**

2. Where the exterior wall is other than brick or concrete blocks, a support frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket.

3. For 200 amp service, a minimum of three inch (3") galvanized rigid steel or electrical grade Schedule 80 PVC conduit shall be furnished and installed by Customer as shown in Figure 52.

4. If PVC is used for the conduit attached to the meter socket, the rigid metal elbow shall be grounded to the service ground rod unless it is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow as per NEC Article 250.80, Service Raceways and Enclosures.

5. If PVC is used for the conduit attached to the meter socket, the rigid metal elbow shall be grounded/bonded to the service ground rod unless it is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow as per NEC Article 250.80, Service Raceways and Enclosures. The following are samples of approved grounding clamps

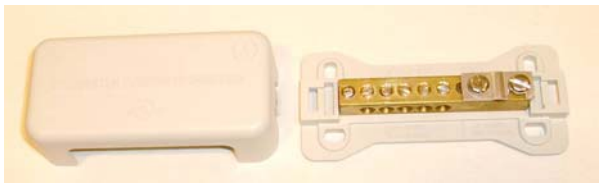
FCI – Burndy

Catalog Number	Water Pipe Range in	Conductor Range of Tap
C-11	1/2-1	10 Sol.-2 Str.
C-22	1 1/4-2	10 Sol.-2 Str.
C-4	2 1/2-4	10 Sol.-2 Str.
C-8	4 1/2-6	10 Sol.-2 Str.

Penn-Union

Catalog Number	Water Pipe Range in	Conductor Range of Tap
KP-1	1/2-1	10 Sol.-2 Str.
KP-2	1 1/4-2	10 Sol.-2 Str.
KP-4	2 1/2-4	10 Sol.-1/0 Sol.

6. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility's ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.



RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

C. Connections:

1. Do not score load wire when removing insulation.

2. The Customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

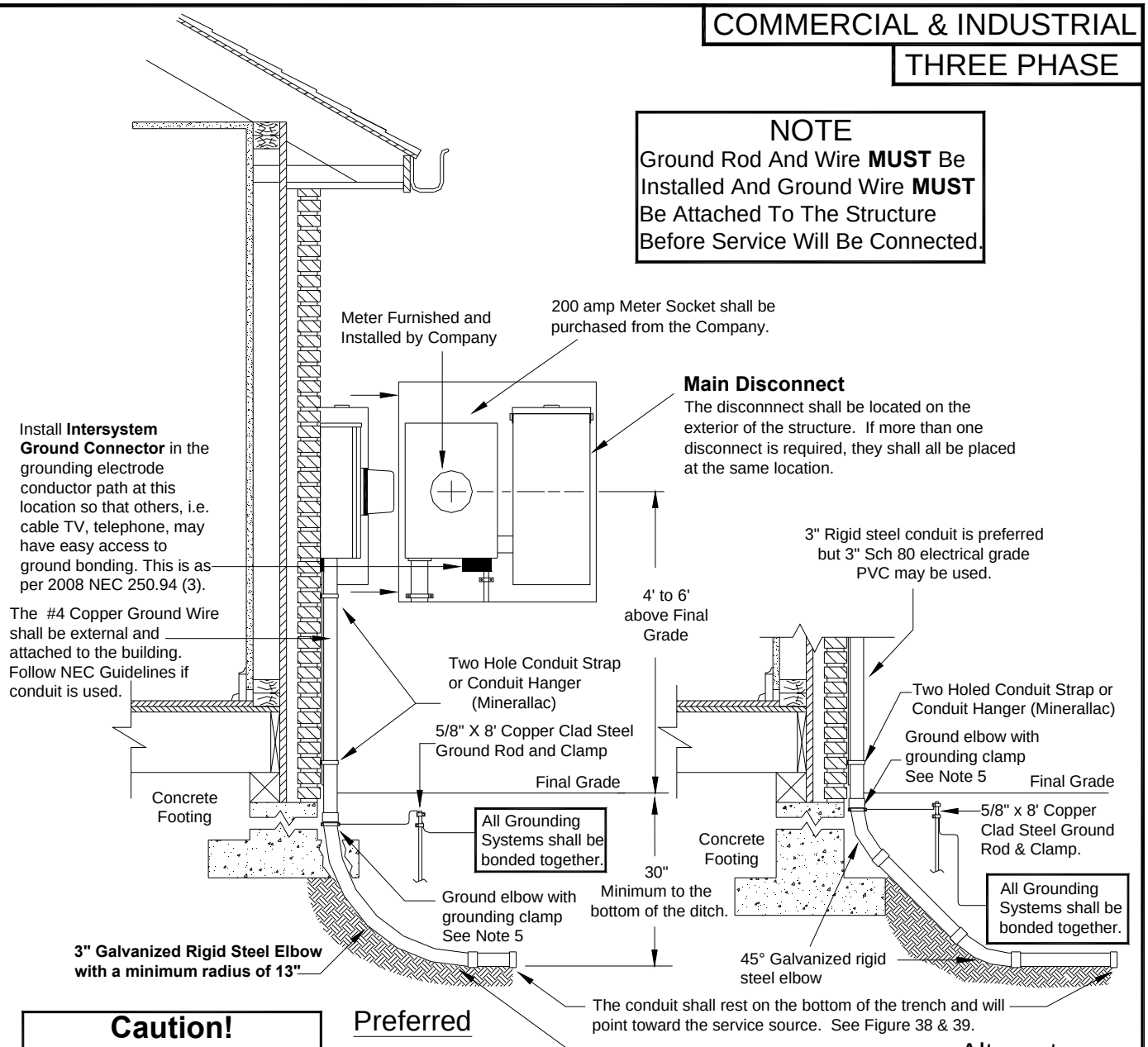
D. Conductor marking

1. All neutral conductors shall be clearly marked with white tape at the point of delivery and at the meter socket.

2. The power leg of each 120/240 volt, three-phase, four-wire delta service shall be clearly marked with orange tape at the point of delivery and at the meter socket (refer to Figure 54).

E. Phase Rotation

On three-phase installations to insure proper equipment operation, the Customer is responsible for verifying phase rotation at the time of service connection.



Caution! Contact all Utilities before digging

$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the Meter Socket resulting in a possible failure of the service.

This denotes undisturbed earth.

Notes:

1. If a conduit reducer is used, it must be located immediately below the Meter Socket.
2. A conduit vent may be needed depending on the service arrangement and terrain.
3. Line of Sight installation is required. See Definitions.
4. If the service route is longer than 100', contact the Company for conduit requirements.
5. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures
6. A ¼" synthetic pull rope must be installed in the conduit.

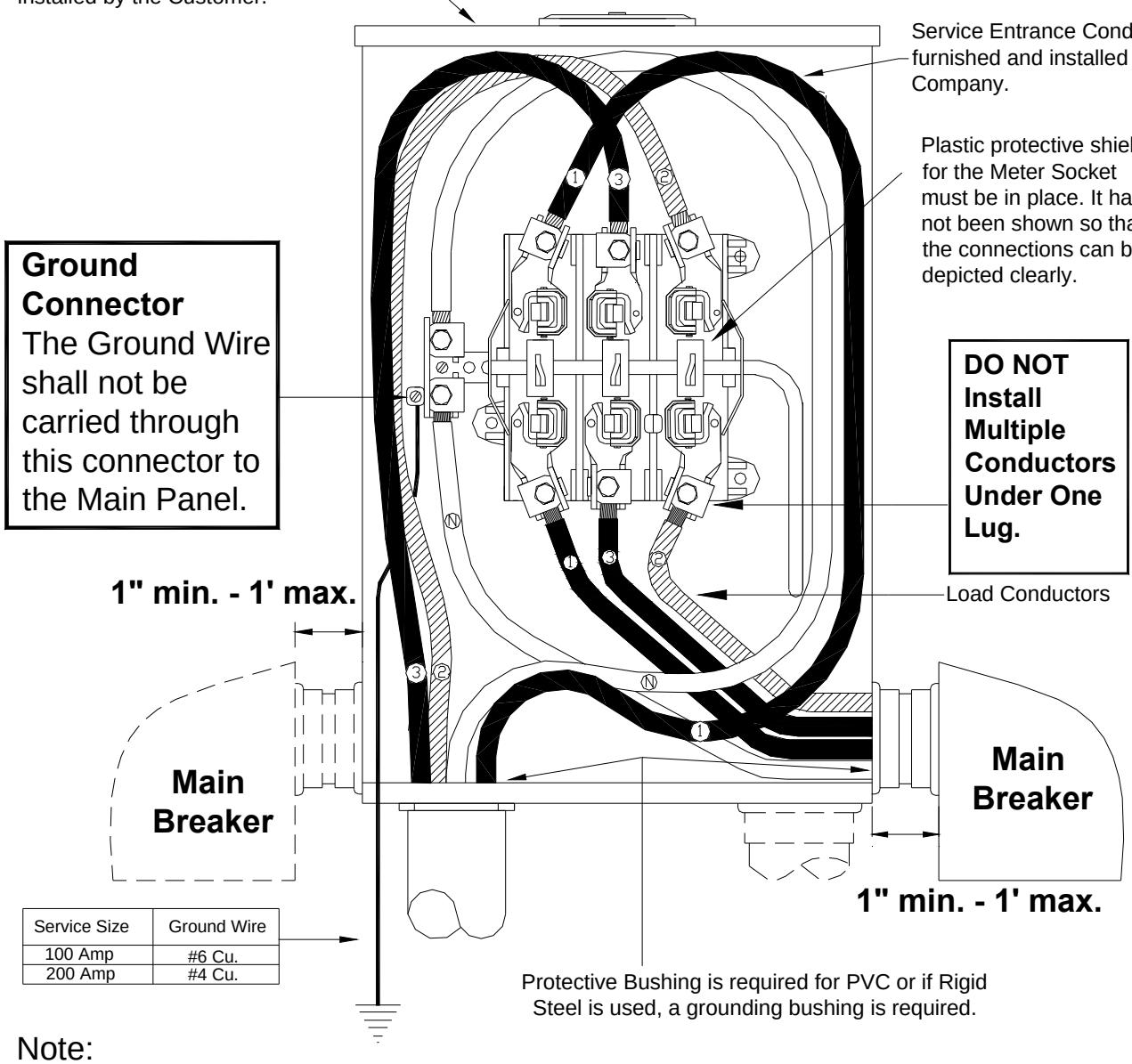
All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
07/10/09 SDS 07-15-06 SDS REVISIONS	200 Amp Underground Service
	DWG NO. V96A54 MS9652
	DRAWN: AMA — DATE: 01/01/96
	SCALE: NTS — FIGURE 52

Figure 52: 200 Amp, Three Phase Underground Service

COMMERCIAL & INDUSTRIAL

THREE PHASE



Note:

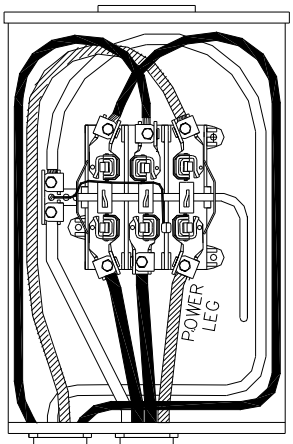
1. On delta installation, number 3 position must be the Power (High) Leg (See Figure 54)
2. **No center installation of conduit allowed.** Conduit furnished and installed by Customer in the left or right bottom knockout provided.

All Equipment Furnished and Installed By Customer Unless Otherwise Noted

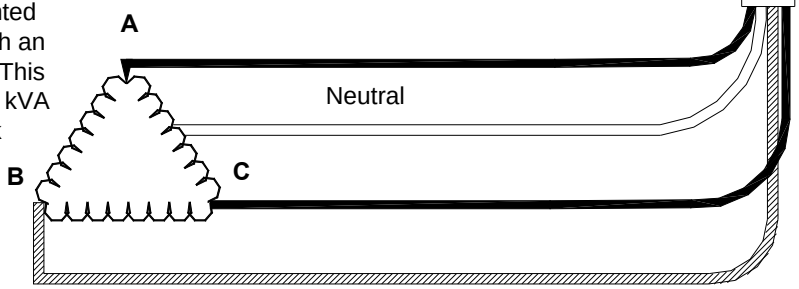
	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
07/15/09 SDS 07/15/06 SDS REVISIONS	100 / 200 Amp Meter Socket, Underground Service
	DWG. NO. V96A55 MS9653
	DRAWN: AMA DATE: 01/01/96
	SCALE: NTS FIGURE 53

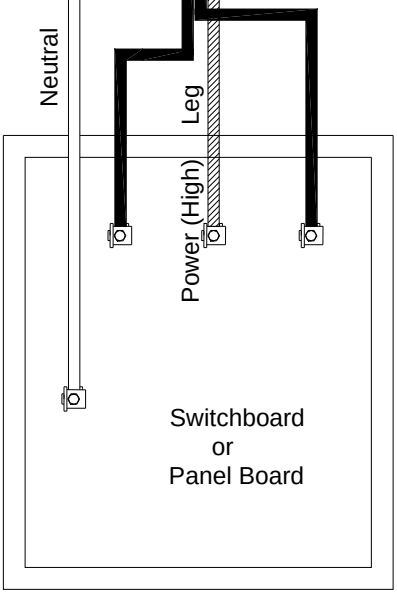
Figure 53: 100/200 Amp Meter Socket, Three Phase Underground Service

Power (High) Leg **MUST** be in the far right hand lug as facing the Meter Socket for correct meter registration. Mark this phase with orange tape.



Delta Connected Transformer Bank
This is for Pole Mounted Transformers only with an underground service. This service is limited to 75 kVA Transformer Bank Capacity.





Power (High) Leg must be in the "B" phase in the Customer's Switchboard or Panelboard to comply with NEC 408.3(3)(E).

Also refer to Figure 53

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
07/15/06 SDS REVISIONS	Power Leg Connection on Three Phase, Four Wire, Delta Connected Systems
DWG. NO. V96A65 MS9663	
DRAWN: AMA	DATE: 01/01/96
SCALE: NTS	FIGURE 54

Figure 54: Power Leg Connection on Three - Phase, Four - Wire Delta Connected Systems

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7.6 400 AMP TO 1200 AMP CT METERING, THREE PHASE UNDERGROUND SERVICE

A. General Notes:

1. This arrangement may be utilized for services from 400 amps and less than or equal to 1200 amps. **For services greater than 1200 amps, contact the Company.**
2. The disconnection method may be composed of multiple disconnects to make up the full 1200 amp capacity of the service as long as there are not more than 6. If one disconnect is used and it is greater than 400 amps, it may be located on the interior of the building unless the authority having jurisdiction dictates otherwise. Disconnects of 400 amps and below will be located on the exterior of the building. **Please note that in all cases all disconnects making up this service will be at the same location.**
3. The service lateral conductors and meter are furnished and installed by the Company. Customer will provide approximate final grade level within six inches (6") prior to service lateral installation.
4. The current transformers (CT) are furnished by the Company. These may be issued to the Customer for installation or installed by Company employees. **The Customer shall provide and install the CT/connection cabinet. The approved suppliers are shown in the table below.**

Service Size	CT/Connection Cabinet H x W x D	Accessories Needed	Supplier		
400 - 800 amp	36” x 36” x 16” This shall be equipped with two doors with lift-off hinges, 3 point latching, and no center post.	1. ¾ “ Exterior Plywood Panel Installed in back of Cabinet 2. Provision to Padlock the Cabinet shut using a 3/8” Shackle padlock	Durham Cat# 1005693	Milbank Cat# 363616-CT3R-WB	Austin Enclosures Cat# 363616WLD001
1000 - 1200 amp	48” x 48” x 16” This shall be equipped with two doors with lift-off hinges, 3 point latching, and no center post.	1. ¾ “ Exterior Plywood Panel Installed in back of Cabinet 2. Provision to Padlock the Cabinet shut using a 3/8” Shackle padlock	Durham Cat# 1005735	Milbank Cat# 484816-CT3R-WB	Austin Enclosures Cat# 484816WLD001

5. The meter socket shall be purchased from the Company and installed by the Customer.
6. The metering control cable is furnished and installed by the Company.
7. The metering equipment should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the metering equipment. Prior approval is required for placement of the metering equipment in alleyways or areas where it may be subjected to damage.
8. An intersystem bonding termination arrangement may be required. Consult the NEC for the particular application of this type of device.

B. Mounting:
   1. Metering equipment, ground wire, and conduits for service lateral and metering control cable shall be surface mounted and securely fastened to the structure. The meter equipment shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service lateral conduit embedded in a wall will not be permitted.**
   2. Where the exterior wall is other than brick or concrete blocks, a support frame shall be installed behind the exterior wall to provide a solid mounting surface for the metering equipment.
   3. Conduits shall be furnished and installed by Customer.

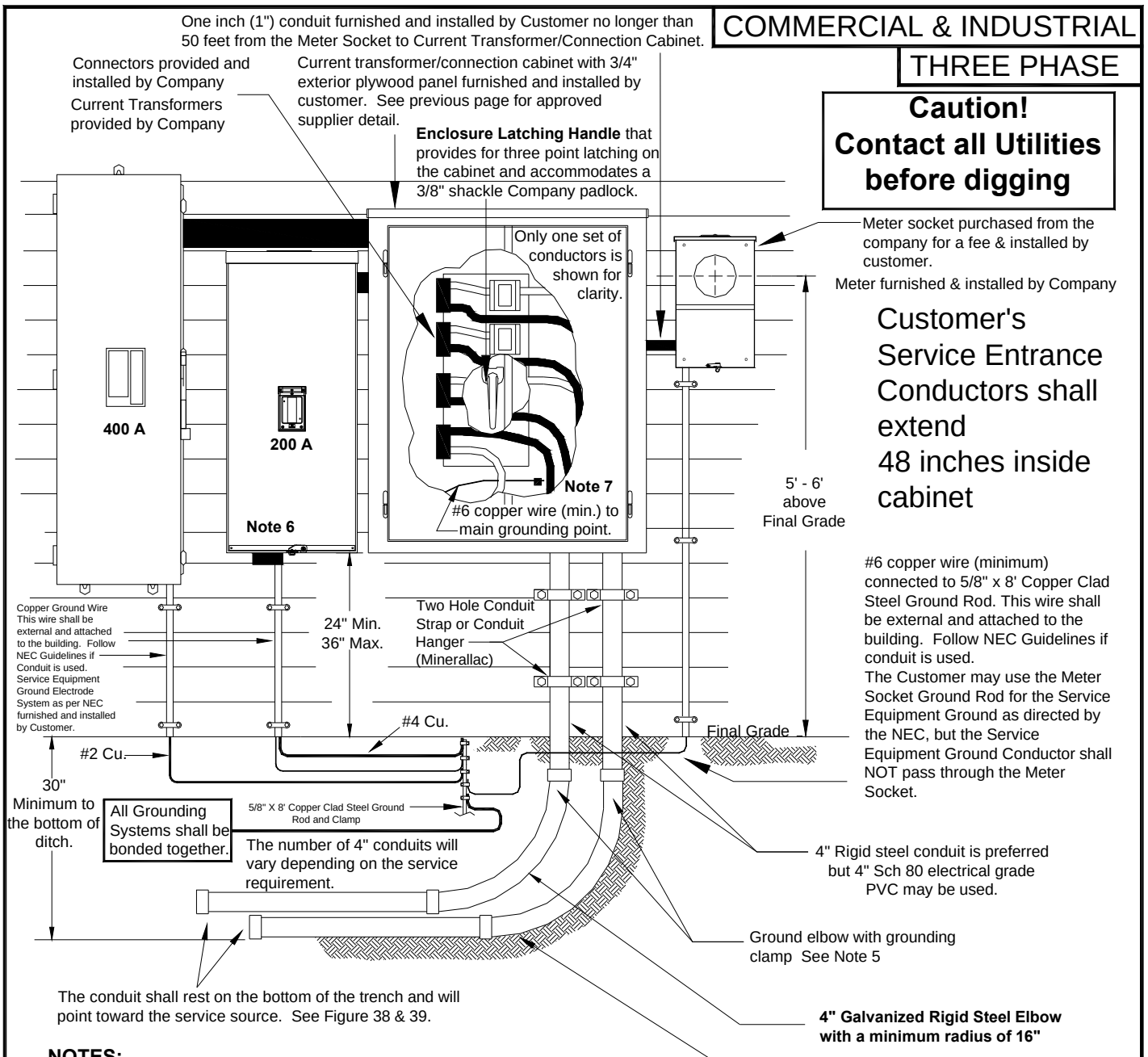
C. Connections:
   1. All connections inside the CT/connection cabinet shall be made by Company. The Company shall provide the connectors.
   2. The point of delivery for this type of service is at the connectors in the CT/connection cabinet.

D. Conductor marking
   All neutral conductors shall be clearly marked with white tape at the point of delivery.

E. Phase Rotation
   On three-phase installations to insure proper equipment operation, the Customer is responsible for verifying phase rotation at the time of service connection.

COMMERCIAL & INDUSTRIAL

THREE PHASE



NOTES:

1. A 1/4" synthetic pull rope must be installed in the conduit.
2. A conduit vent may be needed depending on the service arrangement and terrain.
3. Line of Sight installation is required. See Definitions.
4. If the service route is longer than 100', contact Empire for conduit requirements.
5. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures.
6. Either install a #6 copper wire (Minimum) from the same connection point as the main Copper Ground Wire in the Service Disconnect or from the ground rod to the **Intersystem Ground Connector** so that others, i.e. cable TV, telephone, may have easy access to ground bonding. This is as per 2008 NEC 250.94 (3).
7. Equipment Ground Lug - **NO NEUTRAL TO GROUND BOND IN THE CT/CONNECTION CABINET**.

$$$$ WARNING $$$$

If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the CT Cabinet resulting in a possible failure of the service.

This denotes undisturbed earth.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS	
01-01-97	AMA
05-17-05	SDS
07-15-06	SDS
07-15-09	SDS
03-18-10	SDS
07-6-10	SDS

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

400 Amp to 1200 Amp Current Transformer metering underground service

DWG NO. V94A20 MS9420

DRAWN: AMA | DATE: 01/01/95

SCALE: NTS

FIGURE 55

Figure 55: 400 Amp to 1200 Amp CT Metering, Three Phase Underground Service

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7.7 MULTIPLE METERS, THREE PHASE UNDERGROUND SERVICE

A. General Notes:

1. If more than six meters are required, consult the Company for approval of equipment prior to purchase.
2. Service entrance conductors, 5/8" x 8' copper clad steel ground rod, ground rod clamp, ground wire, conduit, conduit straps, lock nuts, bushings, meter socket assembly, hub closing plate, and miscellaneous mounting hardware furnished and installed by the Customer.
2. Meters and service lateral conductors furnished and installed by Company.
3. The meter socket assembly should be “readily accessible” (see definitions). The Company requires a level and unobstructed work space of 78 inches tall, 18 inches on either side, and 48 inches in front of the meter socket assembly. Prior approval is required for placement of the meter socket assembly in alleyways or areas where it may be subjected to damage.
4. The meter sockets meet the latest revision of U.L. 414 and ANSI C12.7 standards.
5. All meter sockets shall be equipped with L&G HQ-7 or Milbank 911500-EC heavy duty jaw clamping & bypass socket mechanism.
6. When single phase service is provide from a three phase source (120 / 208 GRD Y V), the meter sockets will be purchased by the Customer with the fifth lug installed by the manufacturer at the 3:00 clock position in the meter socket.

B. Mounting:

1. Meter socket assembly, ground wire, and conduit shall be surface mounted and be securely fastened to the structure. The meter socket assembly shall be installed in a level and plumb position. **Flush mounted or recessed metering equipment and service lateral conduit embedded in a wall will not be permitted.**
2. Where the exterior wall is other than brick or concrete blocks, a support frame shall be installed behind the exterior wall to provide a solid mounting surface for the meter socket assembly.
3. Conduit ends shall be equipped with a proper bushing to protect the conductors.
4. If PVC is used for the conduit attached to the meter socket, the rigid metal elbow shall be grounded to the service ground rod unless it is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow as per NEC Article 250.80, Service Raceways and Enclosures.
5. If PVC is used for the conduit attached to the meter socket, the rigid metal elbow shall be grounded/bonded to the service ground rod unless it is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow as per NEC Article 250.80, Service Raceways and Enclosures. The following are samples of approved grounding clamps

FCI – Burndy

Catalog Number	Water Pipe Range in	Conductor Range of Tap
C-11	1/2-1	10 Sol.-2 Str.
C-22	1 1/4-2	10 Sol.-2 Str.
C-4	2 1/2-4	10 Sol.-2 Str.
C-8	4 1/2-6	10 Sol.-2 Str.

Penn-Union

Catalog Number	Water Pipe Range in	Conductor Range of Tap
KP-1	1/2-1	10 Sol.-2 Str.
KP-2	1 1/4-2	10 Sol.-2 Str.
KP-4	2 1/2-4	10 Sol.-1/0 Sol.

8. An intersystem bonding termination bar shall be installed to facilitate the connection of other utility's ground to a common ground. The location of this device shall be located directly below the meter socket or meter combination socket.

RECOMMENDED

Manufacturer	Catalog Number
EriTech (Erico)	IBTB

RECOMMENDED

Manufacturer	Catalog Number
Arlington	GB5

C. Connections:

1. The Customer is responsible for termination of the incoming wiring if the wire terminates in a main breaker or fuse holder. The Company will terminate the incoming wire if it terminates on bus bar terminals. The main breaker will be removed when the service wire is being pulled by the Company.
2. Do not score load wire when removing insulation.
3. The Customer shall use wire brush or sandpaper to clean all conductors, apply a non-grit type inhibitor and tighten to manufacturer's specifications.

D. Meter Socket Marking:

1. Before the meters are installed, each socket position and corresponding building unit, i.e. apt number or letter, Suite number or letter, tenant number or letter, or physical address served shall be accurately, clearly, and permanently labeled with an engraved plate. These shall be screwed, bolted or riveted externally to the equipment. See figures for proper location. If the equipment is marked incorrectly, the customer shall be responsible for all costs incurred by EDECo for correcting the meter socket identification. Please note that marker ink or adhesive labels are examples of non-permanent labeling.

2. Letters or numbers on the engraved plate shall be a minimum of one (1) inch in height of contrasting color, i.e., black and white, red and green, orange and blue, etc.

E. Conductor marking
All neutral conductors shall be clearly marked with white tape at the meter socket assembly.

COMMERCIAL & INDUSTRIAL

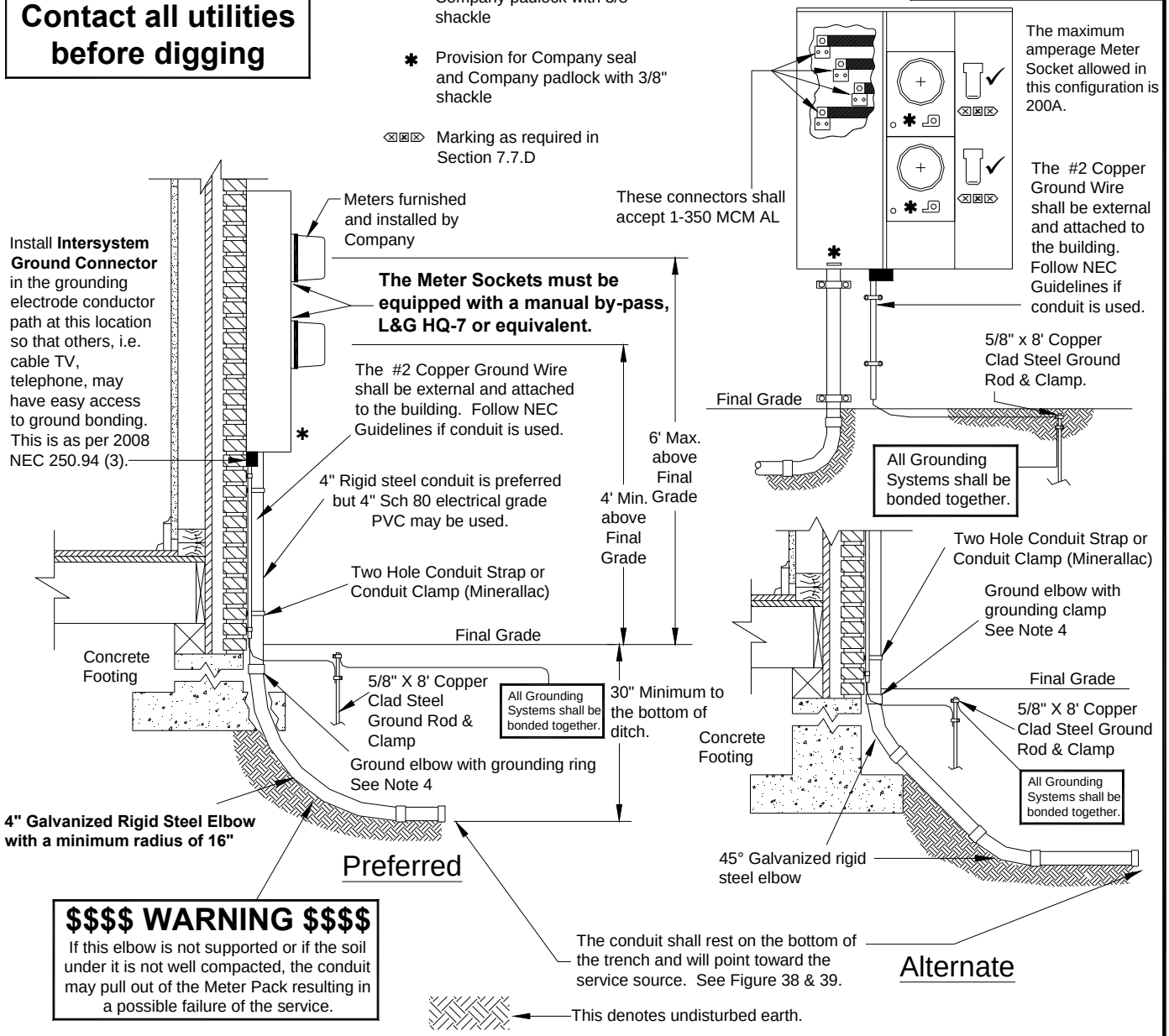
THREE PHASE

Caution!
Contact all utilities before digging

✓ Unit Disconnection means with lock-off provisions must accept Company padlock with 3/8" shackle

✱ Provision for Company seal and Company padlock with 3/8" shackle

⌧⌧⌧ Marking as required in Section 7.7.D



$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the Meter Pack resulting in a possible failure of the service.

Notes:

1. A Conduit Vent may be needed depending on the service arrangement and terrain.
2. Line of Sight installation is required. See Definitions.
3. If the service route is longer than 100', contact Empire for conduit requirements.
4. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures.
5. A ¼" synthetic pull rope must be installed in the conduit.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Wiring of two meters, underground service

DWG NO. V96A58 MS9656

DRAWN: AMA | DATE: 01/01/96

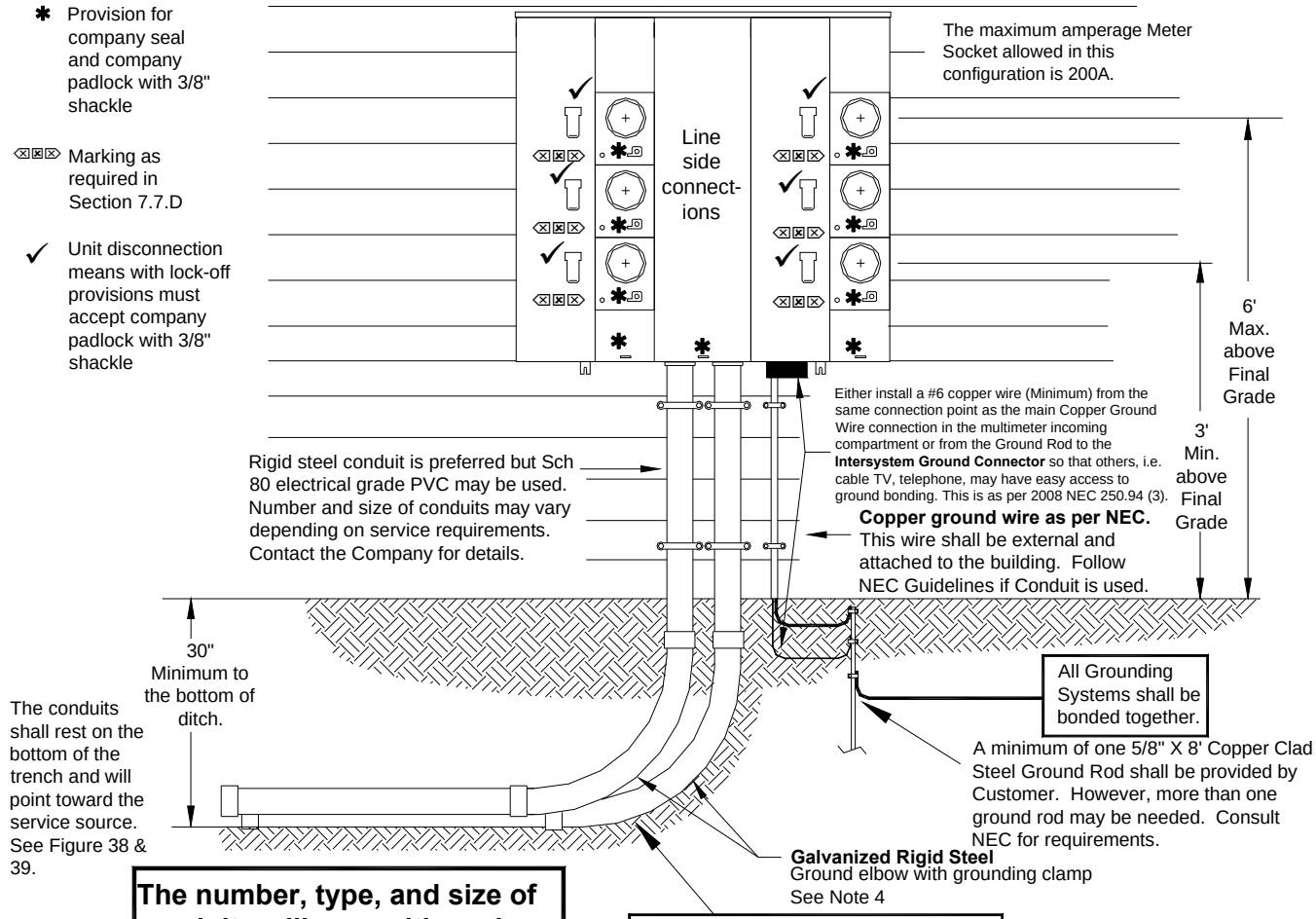
SCALE: NTS

FIGURE 56

REVISIONS	SDS	SDS
	07-15-05	07-15-09

Figure 56: Two Meters, Three Phase Underground Service

The Meter Sockets must be equipped with a manual by-pass, L&G HQ-7 or equivalent.



The number, type, and size of conduits will vary with each installation. Contact the Company for more information.

$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may pull out of the Meter Pack resulting in a possible failure of the service.

If more than 6 meters are required, please contact the Company for configuration. As a minimum, EDE will require the riser diagram as proposed by the Electrical Engineer.

This denotes undisturbed earth.

Caution! Contact all utilities before digging

Notes:

1. A Conduit Vent may be needed depending on the service arrangement and terrain.
2. Line of Sight installation is required. See Definitions.
3. If the service route is longer than 100', contact Empire for conduit requirements.
4. A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 inches to any part of the elbow shall not be required to be grounded as per NEC Article 250.80, Service Raceways and Enclosures.
5. A ¼" pull rope must be installed in the conduit.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

REVISIONS		
03-18-10	SDS	
07-15-09	SDS	
05-17-05	SDS	

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

Three to six meters, underground service

DWG NO. V94A59 MS9457

DRAWN: AMA | DATE: 01/01/96

SCALE: NTS

FIGURE 57

Figure 57: Three to Six Meters, Three Phase Underground Service

8.0 UNDERGROUND SERVICE FROM A THREE PHASE PADMOUNT TRANSFORMER

8.1 CT METERING ON THE TRANSFORMER (Preferred Method)

A. General Notes:

1. **This method of service must be approved by the Company. This type of installation is limited to one Customer per transformer.**
2. The disconnection method may be composed of multiple disconnects to make up the full capacity of the service as long as there are not more than 6. If one disconnect is used and it is greater than 400 amps, it may be located on the interior of the building unless the authority having jurisdiction dictates otherwise. Disconnects of 400 amps and below will be located on the exterior of the building. **Please note that in all cases all disconnects making up this service will be at the same location.**
3. **120/240 volt delta service is not available from a Pad Mounted Transformer.**
4. This arrangement may be utilized for services from 400 amps through 3000 amps.
5. **The Customer shall furnish and install the following: transformer pad, secondary trench and backfill, 8' x 5/8" copper clad ground rod, secondary conduits, and secondary conductors.**
6. The Customer shall install one - 4 inch galvanized rigid steel sweep ell (36" radius) in the primary side of the transformer pad throat (see Figures 58 & 60). Consult with the Company for the direction the conduit is to be pointed from the transformer pad.
7. The current transformers (CT), metering control cable, and meter will be furnished by the Company.
8. The Customer's Ground Wire (Grounding Conductor) is not required and will not be connected to the Company's transformer grounding system.

B. Installation:

1. The Customer shall provide and install the secondary conductors and conduit system. The secondary conductors shall extend above the transformer pad as per the table below:

Transformer Size (KVA)	Minimum Conductor Length (INCHES)
75-500	48
750-2500	72

2. The point of delivery for this type of service is the secondary terminals of the transformer.
3. **The Customer is responsible for all future maintenance on the secondary service lateral conductors and conduit from the secondary terminals of the three phase transformer to the Customer's service equipment.**
4. The meter socket shall be provided and installed on the transformer by the Company.
5. The current transformers (CT) will be installed in the transformer secondary compartment by the Company.

C. Connections:

1. **The Company shall connect all secondary conductors to the secondary terminals of the three phase transformer. The Company shall provide the connectors.**
2. The Company will install and terminate the metering cable in the transformer and meter socket.

D. Conductor marking

All customer provided phase and neutral conductors shall be clearly marked with tape at the point of delivery.

E. Phase Rotation

On three-phase installations to insure proper equipment operation, the Customer is responsible for verifying phase rotation at the time of service connection.

NOTES:

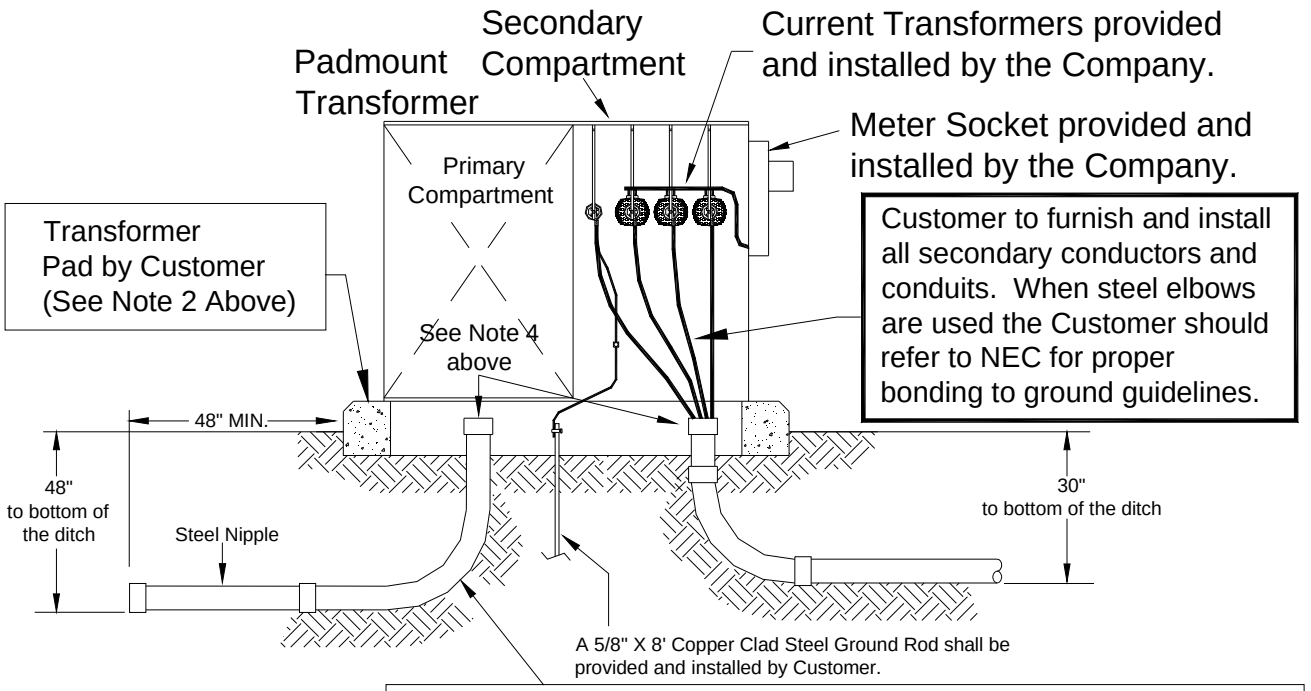
1. This method of service must be approved by the Company.

2. The Customer shall provide the Transformer Pad per the Company's specifications. The Company is to inspect the pad forms, reinforcement, and conduits before the transformer pad is poured.

3. All equipment to be furnished and installed by the Customer prior to any work by the Company unless otherwise noted.

4. Protective Bushings are required on all conduits. Conduits shall be a minimum of 6" below the top of the concrete pad.

5. The Company shall make all Secondary Conductor Connections in the transformer and all metering control cable connections in the Meter Socket and transformer secondary compartment.



$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may sink resulting in a possible failure of the service.

4" galvanized rigid steel sweep elbow (36" radius) furnished by the Customer. This must extend beyond the edge of the Transformer Pad. Consult with the Company for direction from the Transformer Pad.

This denotes undisturbed earth.

Amount of Conductor Provided in Transformer Secondary Compartment as Measured From the Top of the Transformer Pad	
Transformer Size (kVA)	Minimum Conductor Length
75 - 500	48"
750 - 2500	72"

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
05-17-05 SDS REVISIONS	Three Phase, Padmount Transformer Serving One Customer with Meter on Transformer.
	DWG NO. V96A57 MS9655
	DRAWN: AMA DATE: 01/01/96
	SCALE: NTS FIGURE 58

Figure 58: Three Phase Padmount Transformer Serving One Customer with Meter on Transformer

8.2 METERING ON THE BUILDING

A. General Notes:

1. **This method of service must be approved by the Company.**

2. The disconnection method may be composed of multiple disconnects to make up the full capacity of the service as long as there are not more than 6. If one disconnect is used and it is greater than 400 amps, it may be located on the interior of the building unless the authority having jurisdiction dictates otherwise. Disconnects of 400 amps and below will be located on the exterior of the building. **Please note that in all cases all disconnects making up this service will be at the same location.**

3. **120/240 volt delta service is not available from a Pad Mounted Transformer.**

4. This arrangement may be utilized for services from 400 amps through 3000 amps.

5. **The Customer is responsible for the following: transformer pad, secondary trench and backfill, and secondary conduits.**

6. The Company shall provide and install the secondary conductor and connectors.

7. The Customer shall install one - 4 inch galvanized rigid steel sweep ell (36" radius) in the primary side of the transformer pad throat (see Figures 59 & 60). Consult with the Company for the direction the conduit is to be pointed from the transformer pad.

8. The metering for this type of service is as described in Section 7.6 or 7.7.

B. Installation:

1. The point of delivery for this type of service is at the connections inside the metering equipment.

2. **The Company is responsible for all future maintenance of the secondary service lateral conductors and conduit from the secondary terminals of the three-phase transformer to the metering equipment.**

C. Connections:

The Company shall connect all service lateral conductors to the secondary terminals of the three phase transformer, and in the metering equipment.

NOTES:

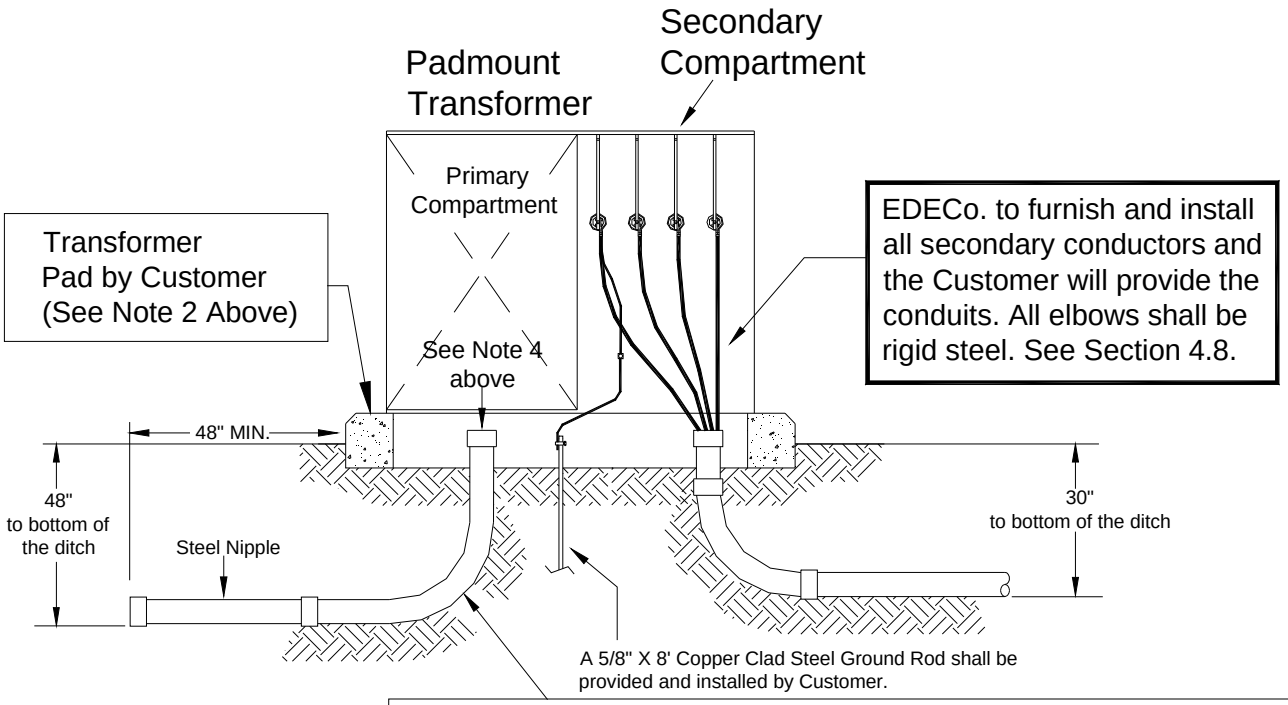
1. This method of service must be approved by the Company.

2. The Customer shall provide the Transformer Pad per the Company's specifications. The Company is to inspect the pad forms, reinforcement, and conduits before the transformer pad is poured.

3. All equipment to be furnished and installed by the Customer prior to any work by the Company unless otherwise noted.

4. Protective Bushings are required on all conduits. Conduits shall be a minimum of 6" below the top of the concrete pad.

5. The Company shall make all Secondary Conductor Connections in the transformer and all metering control cable connections in the Meter Socket and transformer secondary compartment.



$$$$ WARNING $$$$
If this elbow is not supported or if the soil under it is not well compacted, the conduit may sink resulting in a possible failure of the service.

4" galvanized rigid steel sweep elbow (36" radius) furnished by the Customer. This must extend beyond the edge of the Transformer Pad. Consult with the Company for direction from the Transformer Pad.

This denotes undisturbed earth.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

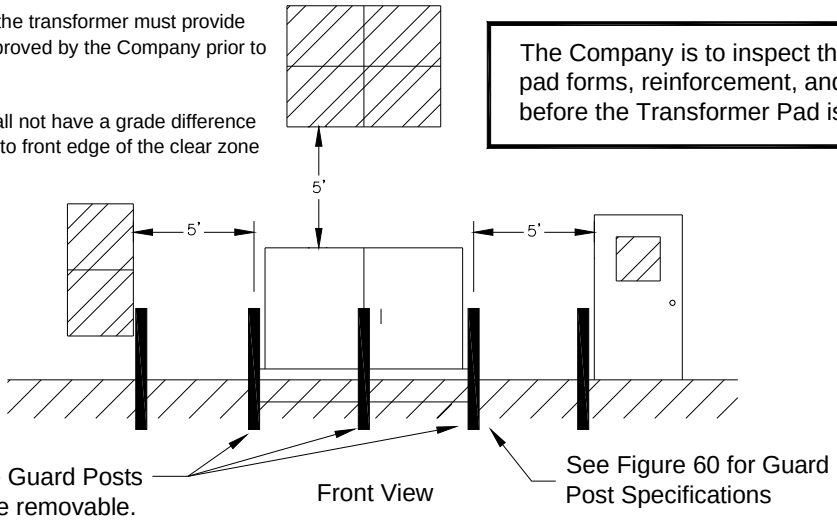
	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	Three Phase, Padmount Transformer Installation
	DWG NO. V06A09 MS0609
	DRAWN: AMA — DATE: 12/03/06
	SCALE: NTS — FIGURE 59

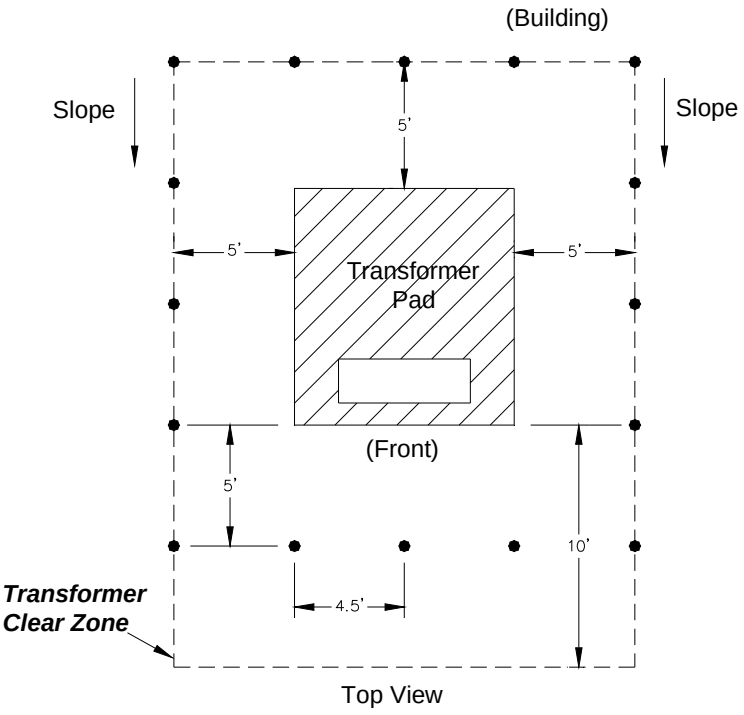
Figure 59: Three Phase Padmount Transformer Installation

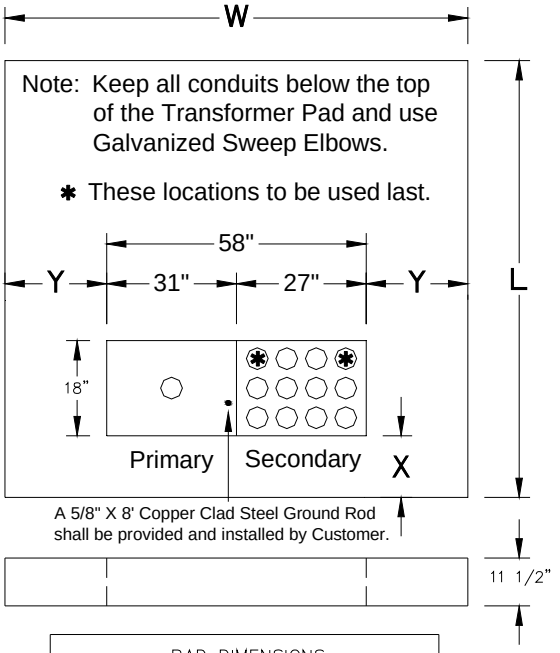
NOTES:

1. No portion of the building will extend over the ***Transformer Clear Zone***.
2. The Transformer must be accessible at all times. There shall not be any obstruction to access the transformer at any time or in any way.
3. All fencing, barriers, etc. around the transformer must provide adequate ventilation shall be approved by the Company prior to installation.
4. Clear zone to the transformer shall not have a grade difference or more than 1' from the building to front edge of the clear zone and side to side.

The Company is to inspect the transformer pad forms, reinforcement, and conduits before the Transformer Pad is poured.







PAD DIMENSIONS					
SIZE (kva)		L	W	X	Y
MIN.	MAX.				
75	500	72"	72"	6"	7"
750	2500	96"	102"	12"	22"

The ***Transformer Clear Zone*** is illustrated above by dashed lines. The ***Transformer Clear Zone*** shall not be obstructed in anyway. Unless the Transformer is otherwise protected from vehicular traffic, Guard Posts shall be installed with 5' spacing on the exposed sides as shown.

THE EMPIRE DISTRICT ELECTRIC CO.
JOPLIN, MISSOURI

TRANSFORMER PAD, PHYSICAL SPECIFICATIONS

DWG. NO. V96A61 MS9659

DRAWN: AMA DATE: 01/01/96

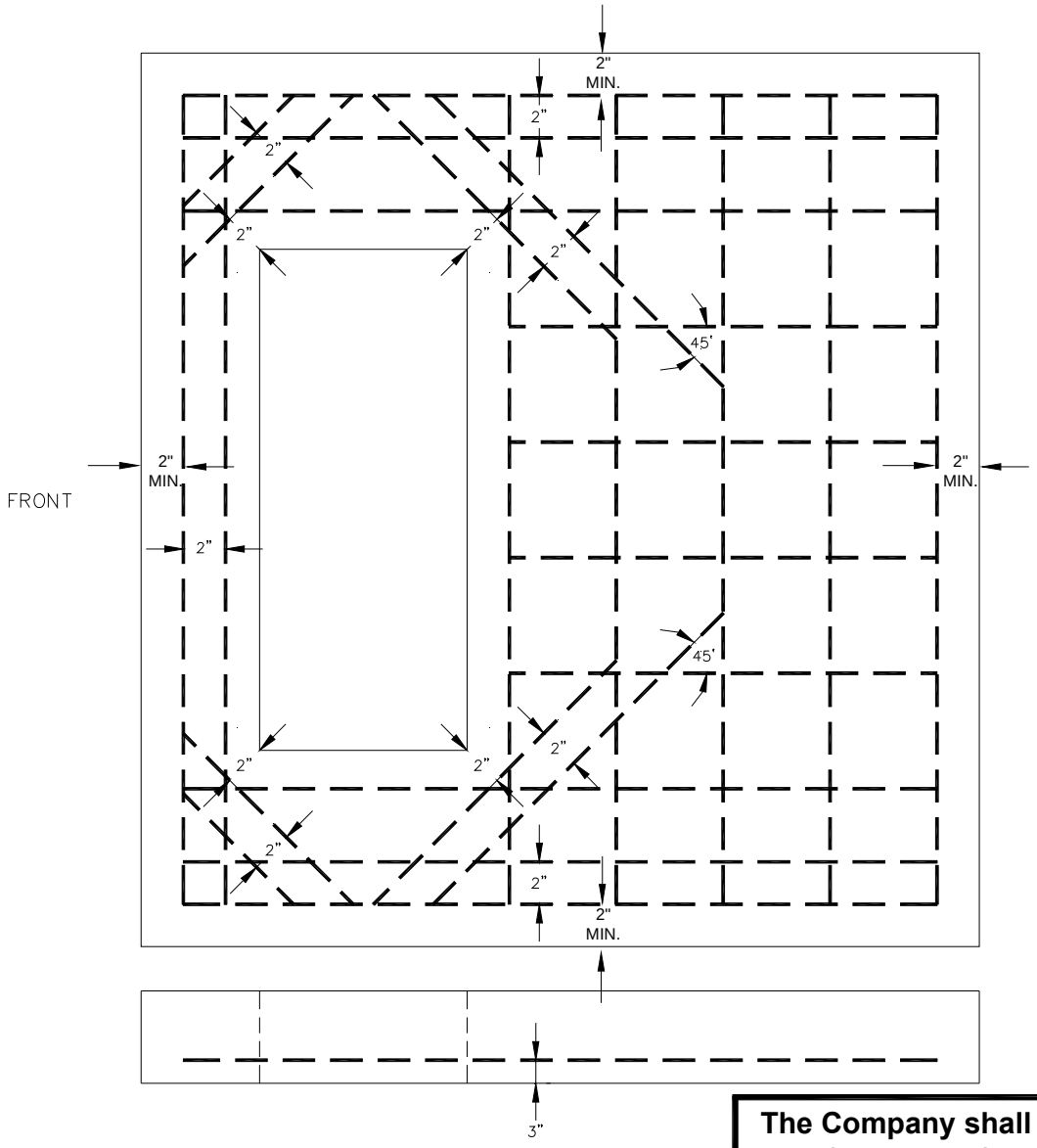
SCALE: NTS

REVISIONS

FIGURE 60

Figure 60: Transformer Pad, Physical Specifications

EQUALLY SPACE REINFORCING BAR UNLESS SPECIFIC DIMENSIONS ARE SHOWN.



The Company shall inspect the pad forms, reinforcement, and conduit placement before the pad is poured. If this is not done, the customer will be required to remove the poured pad and reinstall it.

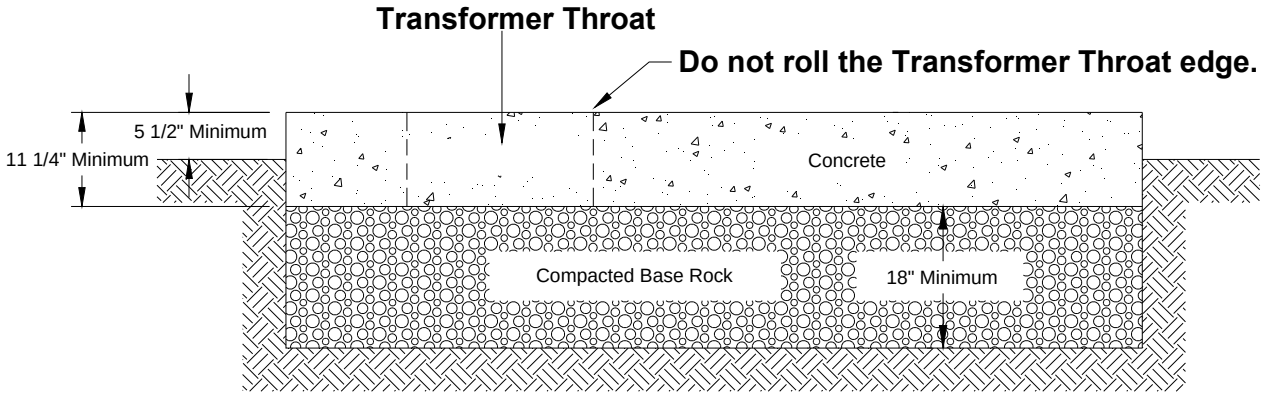
Notes:

1. TIE STEEL AT ALL POINTS OF INTERSECTION.
2. USE 3" SOLID PRECAST CONCRETE BLOCK OR REINFORCING CHAIR TO SUPPORT REBAR WHILE POURING. DO NOT USE DRIVEN REINFORCING BAR TO SUPPORT REINFORCING BAR WHILE POURING.
3. ALL REINFORCING BARS SHALL BE #5 (5/8") GRADE 60. MAXIMUM BAR SPACING SHALL NOT EXCEED 12" ON CENTER.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	TRANSFORMER PAD REINFORCING BAR SPECIFICATIONS
	DWG. NO. V96A62 MS9660
	DRAWN: AMA DATE: 01/01/96
	SCALE: NTS FIGURE 61

Figure 61: Transformer Pad Reinforcing Bar Specifications

The Company shall inspect the pad forms, reinforcement, and conduit placement before the pad is poured. If this is not done, the customer will be required to remove the poured pad and reinstall it.



NOTE: CROSSHATCHED AREA DENOTES UNDISTURBED OR COMPACTED SOIL, FAILURE TO PROVIDE COMPACTED SOIL MAY RESULT IN DAMAGE TO CABLES, CONDUIT, AND TRANSFORMER ENCLOSURE.

NOTES:

1. ALL CONCRETE SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI. ALL EXPOSED EXTERIOR CONCRETE SHALL BE AIR ENTRAINED (6%±1%). SLUMP OF 3" SHALL BE USED.

2. CLEAR CONCRETE COVER FOR STEEL SHALL BE AS FOLLOWS:
   CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH.....3"

   CONCRETE EXPOSED TO EARTH OR WEATHER (FORMED & POURED).....2"

3. THE USE OF ADMIXTURES, INCLUDING CALCIUM CHLORIDE, IS NOT PERMITTED.

4. PAD SHALL BE POURED MONOLITHICALLY, WITH NO COLD JOINTS.

5. HONEY COMBING OR POT MARKS IN THE FACE OF THE SLAB ARE NOT ACCEPTABLE. IF THIS OCCURS, THE CUSTOMER MAY BE REQUIRED TO REPLACE THE TRANSFORMER PAD.

6. NO FOOTING IS TO BE EXCAVATED WITHOUT HAVING REINFORCING AND CONCRETE READY TO PLACE WITHIN THAT WORKING DAY.

7. IN THE EVENT THAT ORGANIC SOIL IS FOUND BELOW FOOTING, THE SOIL SHALL BE REMOVED AND REPLACED WITH COMPACTED BASE ROCK.

8. ALL REINFORCING BARS SHALL BE DEFORMED #5 BILLET STEEL CONFORMING TO ASTM A615, GRADE 60. BARS SHALL BE FREE OF ANY GREASE, RUST, OR SCALE AT THE TIME OF PLACEMENT.

9. TOP SURFACES OF CONCRETE SHALL HAVE A STEEL TROWEL FINISH.

10. GROUT PLACED UNDER EQUIPMENT SHALL BE NON-SHRINK.

11. THE TRANSFORMER PAD SHALL BE POURED FOR A MINIMUM OF 4 DAYS BEFORE ANY TRANSFORMER CAN BE SET AND ALL FORMS MUST BE REMOVED.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	TRANSFORMER PAD SPECIFICATIONS, CONCRETE & FOUNDATION DETAIL
	DWG. NO. V96A63 MS9661
	DRAWN: AMA — DATE: 01/01/96
	SCALE: NTS — FIGURE 62

Figure 62: Transformer Pad Specifications, Concrete & Foundation Detail

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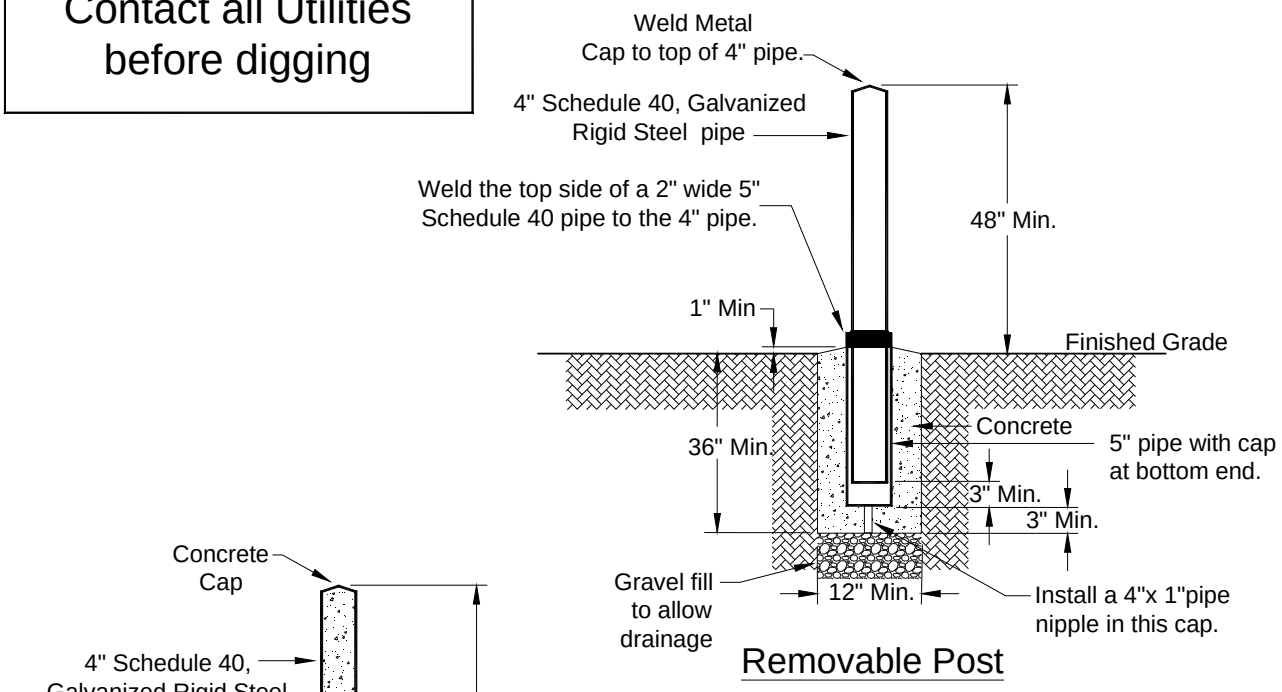
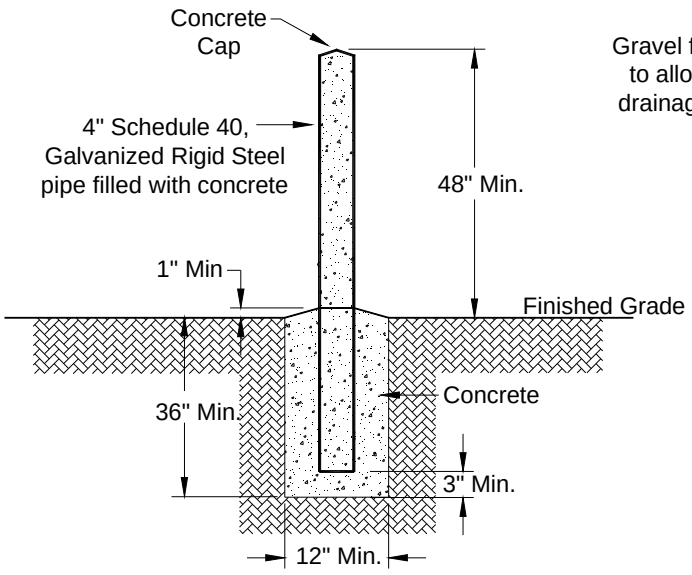
Caution !
Contact all Utilities before digging



Removable Post



Fixed Post

The post may be painted with color of the customer's choice or covered with a plastic post sleeve.

This denotes undisturbed earth.

All Equipment Furnished & Installed By Customer Unless Otherwise Noted.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	Guard Post Installation
	DWG NO. V06A08 MS0608
	DRAWN: SDS — DATE: 11/08/06
	SCALE: NTS — FIGURE 63

Figure 63: Guard Post Installation

Appendix A

These excerpts from the 2008 NEC are placed here for your convenience. For more detail information, please consult the NEC.

VI. Service Equipment - Disconnecting Means

230.70 General. Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors.

(A) Location. The service disconnecting means shall be installed in accordance with 230.70(A)(1), (A)(2), and (A)(3).

(1) Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building* or structure or inside nearest the point of entrance of the service conductors.

(2) Bathrooms. Service disconnecting means shall not be installed in bathrooms.

(3) Remote Control. Where a remote control device(s) is used to actuate the service disconnecting means, the service disconnecting means shall be located in accordance with 230.70(A)(1).

(**B) Marking.** Each service disconnect shall be permanently marked to identify it as a service disconnect.

(C) Suitable for Use. Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the requirements of Articles 500 through 517.

* EDECo requires an external disconnect.

230.71 Maximum Number of Disconnects

(A) General. The service disconnecting means for each service permitted by 230.2, or for each set of service-entrance conductors permitted by 230.40, Exception No. 1, 3, 4, or 5, shall consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be not more than six sets of disconnects per service grouped in any one location.

Table 250.66 Grounding Electrode Conductor for Alternating-Current Systems

Size Of Largest Service-Entrance Conductor Or Equivalent Area For Parallel Conductors[a] (AWG/kcmil)		Size Of Grounding Electrode Conductor (AWG/kcmil)	
Copper	Aluminum or Copper-Clad Aluminum	Copper	Aluminum or Copper-Clad Aluminum[b]
2 or smaller	1/0 or smaller	8	6
1 or 1/0	2/0 or 3/0	6	4
2/0 or 3/0	4/0 or 250	4	2
Over 3/0 through 350	Over 250 through 350	2	1/0
Over 350 through 600	Over 500 through 900	1/0	3/0
Over 600 through1100	Over 900 through 1750	2/0	4/0
Over 1100	Over 1750	3/0	250kcmil

Notes:

1. Where multiple sets of service-entrance conductors are used as permitted in 230.40, Exception No. 2, the equivalent size of the largest service-entrance conductor shall be determined by the largest sum of the areas of the corresponding conductors of each set.

2. Where there are no service-entrance conductors, the grounding electrode conductor size shall be determined by the equivalent size of the largest service-entrance conductor required for the load to be served.

aThis table also applies to the derived conductors of separately derived ac systems.

bSee installation restrictions in 250.64(A)

Table 310.15(B)(2)(a)
Adjustment Factors for More Than Three Current-Carrying Conductors in a Raceway or Cable

Number of Current-Carrying Conductors	Percent of Values in Tables 310.16 through 310.19 as Adjusted for Ambient Temperature if Necessary
4 – 6	80
7 – 9	70
10 – 20	50
21 – 30	45
31 – 40	40
40 and above	30

Table 310.16. Allowable Ampacities of Insulated Conductors Rated 0 Through 2000 Volts, 60°C Through 90°C (140°F Through 194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)

Size	Temperature Rating of Conductor [See Table 310.13(A).]						Size
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
AWG kcmil	TYPES TW*, UF*	TYPES FEPW*, RH*, RHW*, THHW*, THW*, THWN*, XHHW*, USE*, ZW*	TYPES TBS, SA SIS, FEP*, FEPB*, MI RHH*, RHW-2, THHN*, THHW*, THW-2*, THWN-2*, USE-2, XHH, XHHW* XHHW-2, ZW-2	TYPES TW*, UF*	TYPES RH*, RHW*, THHW*, THW*, THWN*, XHHW*, USE*	TYPES TBS, SA, SIS, THHN*, THHW*, THW-2, THWN-2, RHH*, RHW-2, USE-2, XHH, XHHW, XHHW- 2, ZW-2	AWG kcmil
	COPPER			ALUMINUM OR COPPER-CLAD ALUMINUM			
18	—	—	14	—	—	—	—
16	—	—	18	—	—	—	—
14*	20	20	25	—	—	—	—
12*	25	25	30	20	20	25	12*
10*	30	35	40	25	30	35	10*
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000

CORRECTION FACTORS

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

* See 240.4(D)..

Most Common Reasons For Delays in Service Connection

- **CUSTOMER HAS NOT APPLIED FOR SERVICE**
- **THE SERVICE PATH WAS NOT CLEAR**
- **METER SOCKET WAS NOT GROUNDED**
- **NO GROUND ROD OR IMPROPER GROUND ROD**
- **METER SOCKET WAS EITHER TOO HIGH OR LOW**
- **METER SOCKET WAS NOT PROPERLY ATTACHED**
- **METER SOCKET WAS IMPROPERLY WIRED**
- **WEATHERHEAD WAS TOO LOW**
- **NO SERVICE ATTACHMENT POINT OR BRACKET**
- **SERVICE ATTACHMENT POINT WAS TOO LOW**
- **WRONG SIZE OR TYPE OF CONDUIT (WATER PIPE IS NOT ALLOWED)**
- **NO STRAPS ON THE CONDUIT**
- **TRENCH WAS TOO SHALLOW**
- **TRENCH PATH WAS NOT LINE OF SIGHT**
- **WRONG GROUND WIRE SIZE**
- **GROUND WIRE WAS NOT ATTACHED**
- **NO PROTECTIVE BUSHINGS ON THE CONDUITS**
- **CONDUIT WAS NOT PROPERLY SUPPORTED IN THE BOTTOM OF THE TRENCH**
- **LOCAL INSPECTION NOT OBTAINED (AS REQUIRED)**
- **MULTIPLE SOCKETS/SERVICES WERE NOT LABELED CORRECTLY**
- **CONSTRUCTION FEES NOT PAID**