



ELECTRIC SERVICE MANUAL

2014

ELECTRIC SERVICE MANUAL

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ELECTRIC SERVICE MANUAL

INTRODUCTION

Purpose

The purpose of this manual is to supply essential information to anyone concerned with the electrical installations of MidAmerican Energy Company (Company) customers, such as:

- Customers
- Customers' representatives
- Employees
- Architects
- Engineers
- Contractors

It is the Company's objective to cooperate with and assist customers to obtain safe, efficient electric service.

Code Compliance

Nothing contained in this manual shall be construed to relieve or lessen the responsibility of the customer or the customer's representative from complying with all applicable codes, rules and regulations.

Company Liability

Consistent with the Company's tariff, no inspection by the Company, nor failure to object to the customer's installation, shall render the Company liable for injury or damage resulting from any defective installation by the customer.

Drawings

The drawings and written portion of this manual supplement each other.

Materials and workmanship specified or implied by one and not the other shall be supplied and installed in accordance with the more stringent of the requirements.

The drawings are general in nature and are not intended to be design specifications.

CUSTOMERS TO CALL 48 HOURS BEFORE DIGGING TO LOCATE UNDERGROUND FACILITIES

In Illinois call	(800) 892-0123
In Iowa call	(800) 292-8989
In South Dakota call	(800) 781-7474
In Nebraska call	(800) 331-5666
Universal Call	811

Continued on next page

INTRODUCTION, Continued

Safety Codes and Regulations

The information in this manual is based on management-approved interpretations of the intended safe and practical applications of the following:

- *National Electrical Code (NEC)**
- Regulations of the governing state's utilities commission/board
- MidAmerican Energy Company tariff

Local governing authorities may impose more stringent requirements than shown in this manual.

The governing state's electrical safety code and National Electrical Safety Code (NESC) contain provisions relating to Company installations and work practices.

- * *The National Electrical Safety Code* is a registered trademark of the Institute of Electrical and Electronic Engineers, Inc., New York, New York 10016. The *NEC* is registered trademarks of the National Fire Protection Association, Inc., Quincy, MA 02269.
-

Manual Does Not Cover

This manual does not cover:

- Electric utility installations that are under the exclusive control of the Company for the purpose of:
 - Metering
 - Generation
 - Control
 - Transformation
 - Transmission
 - Distribution
 - Associated work practices of the Company in the exercise of its function as a utility.
-

Specific Problems

If you desire to discuss specific problems not covered or resolved by this manual, contact your Company representative.

Additional Copies of the Electric Service Manual

For additional copies of the 2014 Electric Service Manual, contact your Company Representative. An electronic version of the 2014 Electric Service Manual is also available online at www.midamericanenergy.com, under the “For Contractors” tab.

Continued on next page

INTRODUCTION, continued

Communities

STATE	INC	TOWN	COUNTY	STATE	INC	TOWN	COUNTY
Iowa		Ackley	Hardin	Iowa		Buck Grove	Crawford
Iowa		Ackworth	Warren	Iowa		Buffalo (Whsle)	Scott
Iowa		Adel	Dallas	Iowa	No	Burnside	Webster
Iowa		Alleman	Polk	Iowa		Bussey	Marion
Iowa		Allison	Butler	Iowa	No	California Junction	Harrison
Iowa		Altoona	Polk	Iowa		Callender (Whsle)	Webster
Iowa		Alvord	Lyon	Iowa		Calumet	O'Brien
Iowa	No	Anderson	Fremont	Iowa		Camanche	Clinton
Iowa		Ankeny	Polk	Iowa	No	Capitol Heights	Polk
Iowa		Arcadia	Carroll	Iowa		Carbon	Adams
Iowa		Archer	O'Brien	Iowa	No	Carbondale	Polk
Iowa		Aredale	Butler	Iowa		Carlisle (Whlse)	Warren
Iowa		Arion	Crawford	Iowa	No	Carmel	Sioux
Iowa		Arthur	Ida	Iowa	No	Carnarvon	Sac
Iowa		Aspinwall	Crawford	Iowa	No	Carnes	Sioux
Iowa	No	Astor	Crawford	Iowa	No	Carney	Polk
Iowa		Athelstan	Taylor	Iowa		Carroll	Carroll
Iowa	No	Attica	Marion	Iowa		Carson	Pottawattamie
Iowa		Auburn (Whsle)	Sac	Iowa		Castana	Monona
Iowa		Audubon	Audubon	Iowa	No	Cedar	Mahaska
Iowa	No	Austinville	Butler	Iowa	No	Chapin	Franklin
Iowa		Avoca	Pottawattamie	Iowa		Charles City	Floyd
Iowa	No	Avon Lake	Polk	Iowa		Charter Oak	Crawford
Iowa		Ayrshire	Palo Alto	Iowa		Chatsworth	Sioux
Iowa		Badger	Webster	Iowa		Cherokee	Cherokee
Iowa		Barnes City	Mahaska	Iowa	No	Churchville	Warren
Iowa		Barnum	Webster	Iowa		Clare	Webster
Iowa	No	Bartlett	Fremont	Iowa		Clarinda	Page
Iowa		Battle Creek	Ida	Iowa		Clarion	Wright
Iowa		Beacon	Mahaska	Iowa		Clarksville	Butler
Iowa		Bedford	Taylor	Iowa		Cleghorn	Cherokee
Iowa	No	Beech	Warren	Iowa	No	Climbing Hill	Woodbury
Iowa	No	Beeds Lake	Franklin	Iowa		Clive	Dallas/Polk
Iowa	No	Beloit	Lyon	Iowa	No	Coalville	Webster
Iowa	No	Bentley	Pottawattamie	Iowa		Coburg	Montgomery
Iowa	No	Berwick	Polk	Iowa		Coin	Page
Iowa		Bettendorf	Scott	Iowa		Colfax	Jasper
Iowa		Bevington	Madison	Iowa		College Springs	Page
Iowa	No	Bingham/Norwich	Page	Iowa	No	Columbia	Marion
Iowa		Blanchard	Page	Iowa	No	Conger	Warren
Iowa		Blencoe	Monona	Iowa		Coralville	Johnson
Iowa		Blue Grass	Scott	Iowa	No	Corley	Shelby
Iowa		Bode	Humboldt	Iowa	No	Cornelia	Wright
Iowa		Bondurant	Polk	Iowa		Correctionville	Woodbury
Iowa	No	Booneville	Dallas	Iowa	No	Cosgrove	Johnson
Iowa	No	Botna	Shelby	Iowa		Council Bluffs	Pottawattamie
Iowa	No	Bowsher	Polk	Iowa		Craig	Plymouth
Iowa		Boyden	Sioux	Iowa		Crescent	Pottawattamie
Iowa	No	Boyer	Crawford	Iowa		Cumming	Warren
Iowa		Braddyville	Page	Iowa		Cushing	Woodbury
Iowa		Bradgate	Humboldt	Iowa		Cylinder	Palo Alto
Iowa		Brayton	Audubon	Iowa		Dakota City	Humboldt
Iowa		Breda (Whsle)	Carroll	Iowa		Dallas Center	Dallas
Iowa	No	Bremer	Bremer	Iowa		Danbury	Woodbury
Iowa		Bristow	Butler	Iowa		Davenport	Scott
Iowa		Bronson	Woodbury	Iowa		Dedham	Carroll
Iowa	No	Brooks	Adams	Iowa		Defiance	Shelby
Iowa		Brunsville	Plymouth	Iowa		Deloit	Crawford

INC = Incorporated

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INTRODUCTION, Continued

Communities

STATE	INC	TOWN	COUNTY	STATE	INC	TOWN	COUNTY
Iowa		Denver (Whlse)	Bremer	Iowa		Hansell	Franklin
Iowa		Des Moines	Polk	Iowa		Hardy	Humboldt
Iowa		Desoto	Dallas	Iowa		Hartford	Warren
Iowa	No	Dewar	Black Hawk	Iowa		Harvey	Marion
Iowa		Doon	Lyon	Iowa		Hastings	Mills
Iowa		Dougherty	Cerro Gordo	Iowa	No	Hawleyville	Page
Iowa		Dow City	Crawford	Iowa		Henderson	Mills
Iowa		Dumont	Butler	Iowa		Hepburn	Page
Iowa		Duncombe	Webster	Iowa	No	Holly Springs	Woodbury
Iowa		Dunkerton	Black Hawk	Iowa	No	Holmes	Wright
Iowa		Dunlap	Harrison	Iowa		Holstein	Ida
Iowa		Eagle Grove	Black Hawk	Iowa		Hornick	Woodbury
Iowa		Earlham	Madison	Iowa	No	Horton	Bremer
Iowa		Earling	Shelby	Iowa		Hospers	Sioux
Iowa		Early	Sac	Iowa		Hudson	Black Hawk
Iowa		Eldridge (Whlse)	Scott	Iowa		Hudson (Whlse)	Black Hawk
Iowa		Elk Horn	Shelby	Iowa		Hull	Sioux
Iowa		Elk Run Heights	Black Hawk	Iowa		Humboldt	Humboldt
Iowa		Elkhart	Polk	Iowa		Ida Grove	Ida
Iowa		Elliott	Montgomery	Iowa		Imogene	Fremont
Iowa		Emerson	Mills	Iowa		Inwood	Lyon
Iowa		Emmetsburg	Palo Alto	Iowa		Iowa City	Johnson
Iowa		Essex	Page	Iowa		Ireton	Sioux
Iowa		Estherville (Whlse)	Emmet	Iowa		Irwin	Shelby
Iowa		Evansdale	Black Hawk	Iowa	No	Jacksonville	Shelby
Iowa		Exira	Audubon	Iowa	No	James	Plymouth
Iowa		Farnhamville	Calhoun	Iowa		Janesville	Bremer
Iowa		Farragut	Fremont	Iowa		Jesup	Buchanan
Iowa	No	Faulkner	Franklin	Iowa	No	Joetown	Johnson
Iowa	No	Fern	Grundy	Iowa		Johnston	Polk
Iowa	No	Fiscus	Audubon	Iowa		Jolley	Calhoun
Iowa	No	Flagler	Marion	Iowa	No	Kalo	Webster
Iowa		Floyd	Floyd	Iowa		Kalona	Washington
Iowa		Fonda (Whlse)	Pocahontas	Iowa		Keomah Village	Mahaska
Iowa		Fort Dodge	Webster	Iowa	No	Kesley	Butler
Iowa		Galva	Ida	Iowa		Kingsley	Plymouth
Iowa	No	Gaza	O'Brien	Iowa		Kirkman	Shelby
Iowa		Geneva	Franklin	Iowa		Kirkville	Wapello
Iowa	No	Germantown	O'Brien	Iowa		Kiron	Crawford
Iowa		Gilbertville	Black Hawk	Iowa		Knierim	Calhoun
Iowa		Gilmore City	Humboldt/ Pocahontas	Iowa	No	Knoke	Pocahontas
Iowa		Glenwood	Mills	Iowa	No	Knoxville	Marion
Iowa		Goldfield	Wright	Iowa		Lacey	Mahaska
Iowa		Granger	Dallas	Iowa		Lake City	Calhoun
Iowa	No	Grant Center	Woodbury	Iowa		Lakeside	Buena Vista
Iowa	No	Grant City	Sac	Iowa		Lakeview (Whlse)	Sac
Iowa		Granville	Sioux	Iowa		Lanesboro	Carroll
Iowa		Gravity	Taylor	Iowa		Larrabee	Cherokee
Iowa		Gray	Audubon	Iowa	No	Latimer	Franklin
Iowa		Grimes	Polk	Iowa		Lavinia	Calhoun
Iowa		Griswold	Cass	Iowa		Lawton	Woodbury
Iowa		Halbur	Carroll	Iowa		Le Mars	Plymouth
Iowa		Hamburg	Fremont	Iowa		LeClaire	Scott
Iowa		Hamilton	Marion	Iowa		Leighton	Mahaska
Iowa	No	Hamlin	Audubon	Iowa	No	Lewis	Cass
Iowa		Hampton	Franklin	Iowa		Liberty Center	Warren
Iowa		Hancock	Pottawattamie	Iowa		Lidderdale	Carroll
				Iowa		Linwood	Scott

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INTRODUCTION, continued

Communities

STATE	INC	TOWN	COUNTY	STATE	INC	TOWN	COUNTY
Iowa		Little Sioux	Harrison	Iowa		Otho	Webster
Iowa	No	Littleton	Buchanan	Iowa	No	Otley	Marion
Iowa		Logan	Harrison	Iowa		Oto	Woodbury
Iowa		Lohrville	Calhoun	Iowa		Ottosen	Humboldt
Iowa	No	Loveland	Pottawattamie	Iowa		Oyens	Plymouth
Iowa		Lovilia	Monroe	Iowa		Pacific Junction	Mills
Iowa	No	Lovington	Polk	Iowa		Palmer	Pocahontas
Iowa	No	Luton	Woodbury	Iowa	No	Palmyra	Warren
Iowa		Luverne	Kossuth	Iowa		Panama	Shelby
Iowa		Lytton	Calhoun	Iowa		Panorama Park	Scott
Iowa		Macedonia	Pottawattamie	Iowa		Parkersburg	Butler
Iowa		Magnolia	Harrison	Iowa		Patterson	Madison
Iowa		Malvern	Mills	Iowa	No	Peoria	Mahaska
Iowa		Manson	Calhoun	Iowa	No	Percival	Fremont
Iowa	No	Maple River	Carroll	Iowa	No	Perkins	Sioux
Iowa		Marcus	Cherokee	Iowa	No	Pershing	Marion
Iowa		Marne	Cass	Iowa		Persia	Harrison
Iowa		Martensdale	Warren	Iowa		Pierson	Woodbury
Iowa		Marysville	Marion	Iowa		Pioneer	Humboldt
Iowa		Maurice	Sioux	Iowa		Pisgah	Harrison
Iowa		McClelland	Pottawattamie	Iowa		Plainfield	Bremer
Iowa	No	McPaul	Fremont	Iowa		Pleasant Hill	Polk
Iowa		Melcher-Dallas	Marion	Iowa	No	Pleasant Valley	Scott
Iowa		Meriden	Cherokee	Iowa		Pleasantville	Marion
Iowa		Merrill	Plymouth	Iowa		Pocahontas (Whsle)	Pocahontas
Iowa	No	Middleburg	Sioux	Iowa		Polk City	Polk
Iowa		Milo	Warren	Iowa		Pomeroy	Calhoun
Iowa		Minburn	Dallas	Iowa	No	Ponderosa	Poweshiek
Iowa		Minden	Pottawattamie	Iowa	No	Port Neal	Woodbury
Iowa	No	Mineola	Mills	Iowa		Portsmouth	Shelby
Iowa		Mingo	Jasper	Iowa	No	Powersville	Floyd
Iowa		Missouri Valley	Harrison	Iowa		Prairie City	Jasper
Iowa		Mitchellville	Polk	Iowa		Princeton	Scott
Iowa		Modale	Harrison	Iowa	No	Prole	Warren
Iowa		Mondamin	Harrison	Iowa		Quimby	Cherokee
Iowa		Monroe	Jasper	Iowa		Randolph	Fremont
Iowa		Moorhead	Monona	Iowa		Raymond	Black Hawk
Iowa		Moorland	Webster	Iowa		Red Oak	Montgomery
Iowa	No	Morse	Johnson	Iowa	No	Red Rock	Marion
Iowa	No	Mount Carmel	Carroll	Iowa	No	Richards	Calhoun
Iowa		Mount Joy	Scott	Iowa		Ricketts	Crawford
Iowa		Moville	Woodbury	Iowa	No	Rising Sun	Polk
Iowa		Nashua	Chickasaw	Iowa	No	River Sioux	Harrison
Iowa		Nemaha	Sac	Iowa		Riverdale	Scott
Iowa		New Hartford	Butler/Grundy	Iowa		Riverton	Fremont
Iowa		New Liberty	Scott	Iowa		Rock Valley	Sioux
Iowa		New Market	Taylor	Iowa		Rockwell	Cerro Gordo
Iowa		New Sharon	Mahaska	Iowa		Rockwell City	Calhoun
Iowa		Newell	Buena Vista	Iowa		Rodney	Monona
Iowa	No	Newkirk	Sioux	Iowa	No	Roselle	Carroll
Iowa		Nodaway	Adams	Iowa	No	Ross	Audubon
Iowa		Northboro	Page	Iowa		Runnells	Polk
Iowa		Norwalk	Warren	Iowa		Ruthven	Palo Alto
Iowa	No	Norwich	Page	Iowa		Rutland	Humboldt
Iowa		Oakland	Pottawattamie	Iowa		Sac City	Sac
Iowa	No	Oasis	Johnson	Iowa		Salix	Woodbury
Iowa		Odebolt	Sac	Iowa		Sandyville	Warren
Iowa		Oskaloosa	Mahaska	Iowa		Saylorville	Polk

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INTRODUCTION, continued

Communities

Iowa		Schaller	Sac	Iowa		Waukee	Dallas
Iowa		Schleswig	Crawford	Iowa		Webster City	Hamilton
Iowa	No	Scotch Ridge	Warren	Iowa		West Des Moines	Polk
Iowa	No	Seney	Plymouth	Iowa	No	Weston	Pottawattamie
Iowa		Sergeant Bluff (Whlse)	Woodbury	Iowa		Westphalia	Shelby
Iowa		Shambaugh	Page	Iowa		Westside	Crawford
Iowa		Sheffield	Franklin	Iowa		Whiting	Monona
Iowa		Sheldon	O'Brien	Iowa	No	Wick	Warren
Iowa		Shell Rock	Butler	Iowa		Willey	Carroll
Iowa		Shenandoah	Page	Iowa	No	Windham	Johnson
Iowa		Sidney	Fremont	Iowa		Windsor Heights	Polk
Iowa		Silver City	Mills	Iowa	No	Wright	Mahaska
Iowa		Sioux City	Woodbury	Iowa		Yetter	Calhoun
Iowa		Sloan	Woodbury	Iowa		Yorktown	Page
Iowa		Smithland	Woodbury				
Iowa		Soldier	Monona				
Iowa		Somers	Calhoun				
Iowa	No	Spring Hill	Warren				
Iowa		St Charles	Madison				
Iowa	No	St Joseph	Kossuth				
Iowa		St Marys	Warren				
Iowa		Storm Lake	Buena Vista				
Iowa		Stout	Butler				
Iowa	No	Strahan	Mills				
Iowa		Struble	Plymouth				
Iowa	No	Sulphur Springs	Buena Vista				
Iowa	No	Summerset	Warren				
Iowa		Sutherland	O'Brien				
Iowa	No	Swan	Marion				
Iowa		Tabor	Fremont				
Iowa	No	Taintor	Mahaska				
Iowa		Templeton	Carroll				
Iowa	No	Tenville	Page				
Iowa		Thor	Humboldt				
Iowa		Thurman	Fremont				
Iowa	No	Tracy	Marion				
Iowa		Treynor	Pottawattamie				
Iowa		Truesdale	Buena Vista				
Iowa		Turin	Monona				
Iowa	No	Twin Lakes	Calhoun				
Iowa	No	Ulmer	Sac				
Iowa		Underwood	Pottawattamie				
Iowa	No	Union Mills	Mahaska				
Iowa		University Heights	Johnson				
Iowa	No	University Park	Mahaska				
Iowa		Urbandale	Dallas/Polk				
Iowa		Ute	Monona				
Iowa		Vail	Crawford				
Iowa	No	Valeria	Jasper				
Iowa		Van Meter	Dallas				
Iowa		Varina	Pocahontas				
Iowa		Vincent	Webster				
Iowa	No	Voorhies	Black Hawk				
Iowa		Wall Lake (Whlse)	Sac				
Iowa		Walnut	Pottawattamie				
Iowa	No	Washburn	Black Hawk				
Iowa		Washta	Cherokee				
Iowa		Waterloo	Black Hawk				

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INTRODUCTION, continued

Communities

Illinois		Andalusia	Rock Island	South Dakota		Alcester	Union
Illinois		Andover	Henry	South Dakota	No	Dakota Dunes	Union
Illinois		Barstow	Rock Island	South Dakota		Fairview	Lincoln
Illinois	No	Boden	Mercer	South Dakota		Hudson	Lincoln
Illinois	No	Buffalo Prairie	Rock Island	South Dakota		Jefferson	Union
Illinois	No	Cable	Mercer	South Dakota		North Sioux City	Union
Illinois		Carbon Cliff	Rock Island				
Illinois		Cleveland	Henry				
Illinois		Coal Valley	Rock Island				
Illinois		Colona	Henry				
Illinois		Cordova	Rock Island				
Illinois	No	Coyne Center	Rock Island				
Illinois		East Moline	Rock Island				
Illinois	No	Edgington	Rock Island				
Illinois	No	Green River	Henry				
Illinois		Green Rock	Henry				
Illinois	No	Hamlet	Mercer				
Illinois		Hampton	Rock Island				
Illinois		Hillsdale	Rock Island				
Illinois	No	Illinois City	Rock Island				
Illinois	No	Joslin	Rock Island				
Illinois	No	Lynn Center	Henry				
Illinois		Matherville	Mercer				
Illinois		Milan	Rock Island				
Illinois	No	Millersburg	Mercer				
Illinois		Moline	Rock Island				
Illinois		Oak Grove	Rock Island				
Illinois	No	Ophiem	Henry				
Illinois		Orion	Henry				
Illinois	No	Osborne	Rock Island				
Illinois	No	Osco	Henry				
Illinois		Port Byron	Rock Island				
Illinois	No	Preemption	Mercer				
Illinois		Rapids City	Rock Island				
Illinois		Reynolds	Rock Island				
Illinois		Rock Island	Rock Island				
Illinois		Sherrard	Mercer				
Illinois		Silvis	Rock Island				
Illinois	No	Swedona	Mercer				
Illinois	No	Taylor Ridge	Rock Island				

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Effective April 1, 2015

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1.0 AVAILABILITY AND CHARACTERISTICS OF SERVICE

Introduction The electric service supplied by the Company is 60 hertz alternating current.

Service Voltages One service voltage will be provided to each service location.

The following table lists:

- Nominal voltages offered to the customer.
- Maximum size service entrance that the Company can accommodate without special consideration.

SERVICE VOLTAGES AND LIMITATIONS					
Type of Service			Max. Service Entrance Size (Amperes)		
Voltage	Wire	Phase	Overhead	Overhead to URD	Underground
120 volt	2-wire	Single-phase	60	60	60
120/240 volt	3-wire	Single-phase	800	800	1000
120Y/208 volt	3-wire	Single-phase	(see note)*	(see note)*	(see note)*
120Y/208 volt	4-wire	Three-phase	1000	800	3000
120/240 volt	4-wire delta	Three-phase	800	800	(see note)**
277Y/480 volt	4-wire	Three-phase	400	400	4000*

Higher voltage service may be available for approved loads upon application to the Company.

It is the customer's responsibility to contact the Company prior to design of the customer's electrical system to determine the type of service available at any specific location.

The customer should be aware that not all voltages are available at all locations or for all loads. It is recommended that the customer contact the Company before purchasing equipment.

Calculations are based on 80% load level per *NEC* overhead transformer sizes, based on a combined 300 kVA. Contact your Company representative for service availability on 100% rated panels.

* Contact your Company representative for service availability.

** Not available from a padmounted transformer.

Continued on next page

1.0 AVAILABILITY AND CHARACTERISTICS OF SERVICE, Continued

**Extension
Policies**

All extensions of service will be installed according to the Company's tariff.
Extension cost information is available at Company business offices or online at
<http://www.midamericanenergy.com/rates1.aspx>

2.0 DIVERSION OF SERVICE OR TAMPERING

Diversion and Tampering Prohibited

The following are prohibited:

- Tampering with Company equipment
- Breaking of meter seals
- Opening or damaging of Company locks
- Interference with operation of Company equipment
- Unauthorized work performed on meter installations or other property of the Company

If access to Company equipment is needed, the Company requires a minimum of 24-hours notice.

Disconnection

The Company will disconnect service to the customer and remove the meters and metering equipment in the event of such diversion or tampering.

Customer Cost

The customer shall be responsible for payment of all costs which result from such diversion or tampering.

3.0 PROTECTION OF CUSTOMER EQUIPMENT

Introduction The Company will use reasonable diligence to supply continuous and sufficient electric service to its customers that meets or exceeds all regulatory requirements.

In some instances, such as major storms where lightning, high winds or similar adverse conditions occur, the Company's electrical system may experience momentary outages and/or voltage spikes.

Protection of Motors and Other Equipment The customer is advised to provide adequate protection against the effects of outages or voltage spikes in accordance with the *NEC* or other pertinent sources of information for all types of motors and other equipment.

Equipment that should be protected includes, but is not limited to:

- Motors
- Computers
- Electronics equipment
- Equipment in which computers or electronics form an integral operating part

Equipment should be protected under all conditions, including:

- Overload
- Loss of voltage
- High or low voltage
- Loss of phase(s) (e.g. single phasing on polyphase motors)
- Re-establishment of service after any of the foregoing
- Phase reversal
- Motors that cannot be subjected to full voltage on starting
- Harmonics or wave form irregularities

Failure to provide such protection may result in needless damage to equipment and the expense of delay and repair.

Continued on next page

3.0 PROTECTION OF CUSTOMER EQUIPMENT, Continued

Microprocessor-Based Electronics

Sensitive electronics, such as microprocessor-based home electronics and business computers, are susceptible to damage due to voltage spikes or surges.

Before any microprocessor-based electronics are installed:

- Wiring practices that meet manufacturer specifications need to be assured. (For example, proper grounding and dedicated circuits are important.)
- Consideration should be given to installing transient voltage surge suppression at the:
 - Main service entrance and
 - Point of use
- An uninterruptible power supply (battery backup) should be considered if a momentary voltage dip or outage would cause loss of data.

Additional Information

If you have any questions concerning minimum protective requirements, contact the equipment supplier or your Company representative.

4.0 MOTORS AND SPECIAL EQUIPMENT

Introduction The proper operation of motors and other electrical equipment is necessary to:

- Minimize objectionable motor starting effects.
- Protect the service integrity to other customers.

All motors require starting currents substantially greater than their normal running currents. Normal starting currents can be five to six times greater than the running current. Excessive starting currents will result in objectionable drops in the supply voltage to customers in the vicinity. Per the MidAmerican Energy Electric Tariff No. 1 filed with the Iowa Utilities Board, *customer facilities must be maintained and operated so they do not adversely affect service to other customers.*

Therefore, the customer's equipment must normally conform to the following requirements. Any exceptions thereto will be subject to a distribution engineering review and documented in a written agreement between MidAmerican Energy and the customer.

For all motor installations greater than five horsepower, customers are required to fill out the motor data form located at www.midamericanenergy.com under the “For Contractors” tab. Contact your local distribution engineering representative with the completed form.

It is imperative an engineering system study be completed prior to any motor purchases. Starting current limitations on the electric distribution system may force the Company to make upgrades at the customer’s expense in order to accommodate the load. Each customer should recognize the possible need to upgrade an existing electric service entrance in order to properly serve the new load.

Guidelines for Motor Sizes

Single-Phase Motor	Guideline
Up to 2 horsepower	May be operated on 120 volts
2 horsepower and larger	Must be operated on 208 or 240 volts
5 horsepower and smaller	May be operated without special means of reducing starting current
Larger than 5 horsepower	May be permitted with Company approval if: • Company facilities are adequate to supply the service and • The use of such motor does not interfere with quality of service to other customers.

Single-phase motors rated 230-240 volts may not operate satisfactorily on 208 volts. Check manufacturer’s specifications.

Continued on next page

4.0 MOTORS AND SPECIAL EQUIPMENT, Continued

Poly-phase Motor	Guideline
Larger than 5 hp operated from single-phase service by use of phase converter	May be allowed only with Company approval
15 horsepower and over	May be permitted with Company approval if: • Company facilities are adequate to supply the service and • The use of such motor does not interfere with quality of service to other customers. Company may require customer to limit the motor starting current by use of reduced voltage starters or other acceptable means.

Reduced-voltage starting requirements for the larger motors, single-phase or poly-phase, must be equivalent to the maximum allowable across-the-line starting current for smaller motors, five horsepower and under. Contact Company representative regarding any starting current limitations or information on high-efficiency motors.

Special Equipment

The installation of certain special types of equipment may have an adverse effect upon the electric service to adjacent customers. The customer is responsible for any cost associated with alleviating adverse effects caused by the installation of special equipment.

Types of special equipment in this category include, but are not limited to:

- Grain bin motors
- Welders
- X-ray equipment
- Diathermy equipment
- Radio transmitters
- Geothermal heat pumps
- Tankless water heaters

Prior to installation, contact Company representatives to determine if any specific installation requirements are necessary.

Power Factor

A low power factor in a customer's electric system produces an adverse effect on the:

- Company's electric supply system and
- Customer's electrical equipment

Continued on next page

4.0 MOTORS AND SPECIAL EQUIPMENT, Continued

Additional charges may be imposed on the customer when the customer's power factor falls below a specified limit, as stated in the rate schedules of the Company's tariff.

It may be cost-effective for the customer to install high power factor equipment and/or capacitors to maintain an acceptable power factor.

Contact your Company representative for information regarding power factor correction techniques.

Load Balance If poly-phase service is provided, the customer must maintain reasonable electrical balance between the phases as measured at the meter.

5.0 SERVICE INFORMATION

Company	To avoid unnecessary expenses or delays, the customer is required to contact a Company representative before construction or remodeling begins.
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Customer Responsibility	For residential services, the customer must submit the following to a Company representative:
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- ◆ A completed and signed service application
- ◆ Electrical service entrance diagram and location
- ◆ Must post address prior to installation of service
- ◆ Site must meet requirements identified on the service application

For all service other than residential (single family or duplex), the customer must submit the following to a Company representative:

- ◆ A minimum of two sets of
 - Plot plans
 - Building elevations
 - Electrical service entrance diagrams
 - Connected load
 - Anticipated demand
- ◆ An electronic copy of site plan in CAD file
- ◆ A completed and signed application
- ◆ Must post address prior to installation of service

These items will be used to discuss the most economical and mutually beneficial service location.

Service Agreement	A Company representative will submit an agreement or proposal to the customer to be signed and returned.
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Service Location	A Company representative will discuss and determine the service location with the customer or his representative.
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The Company may refuse connection to any service entrance not installed in an approved location.

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5.0 SERVICE INFORMATION, continued

Customer Contribution	If a customer contribution is required, a Company representative will make arrangements with the customer for payment.
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Inspection and Approval	When the installation is ready for service, the customer should contact the Company and, if required, the appropriate governmental authority to request inspection(s). When accepted by a Company representative and, if required, approved by the appropriate governmental authority, the service and meter will be installed.
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Recreational Vehicle Parks	Service to vacation and recreational vehicle parks will normally be: • Supplied through one metering installation or as determined by Company representative. • Billed to the park owner/operator on the applicable general service or commercial/industrial rate. Any variation to the above will require approval by a Company Representative. Service will be extended as provided in the Company's tariff.
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Pole Attachments	Nothing shall be attached to Company poles without a contractual agreement with the Company.
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6.0 SERVICE AND SERVICE ENTRANCES (General)

One Service	Unless stated otherwise in the rate, price schedule, or tariff, the Company will normally permit only one service per customer.
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Disconnection Means	Section 230.70 of the <i>NEC</i> requires a service to have a disconnecting means.
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The main switch and fuses or circuit breakers shall be of ample capacity to:

- Carry the load
- Safely interrupt the available fault current at the particular location

If fault current information is required, contact your Company representative for the available fault current.

If the customer's load is larger than that which can be protected with standard fusing, the customer will be required to install a disconnecting means acceptable to the Company.

Location of Disconnection Means	The service disconnecting means shall be installed at a readily accessible location per <i>NEC</i> and shall comply with applicable local electrical codes, and shall be:
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- Outside of the building or structure, or
 - Inside nearest the point of entrance of the service conductors, or
 - On the meter pole when applicable.
-

Overcurrent Device	An overcurrent device (fused or breakered):
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- May not be required adjacent to the metering point, but
 - Shall be installed in accordance with the *NEC* at each entrance served through the meter.
-

Customer Supplied Equipment	The customer must provide, install and maintain the additional equipment necessary for the service, including the meter socket.
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The customer must provide a service attachment of adequate strength to support the Company's service conductors. (*NEC* Section 230.27, 230.28, 230.29). See Figures 3 and 4.

Continued on next page

6.0 SERVICE AND SERVICE ENTRANCES (General), Continued

Conductor Sizing

It is recommended that customer-installed service conductor ampacity be matched to the main breaker size.

The minimum size allowed for service entrance conductors is #8 AWG.

Although it is not recommended, the grounded neutral may be reduced in ampacity in accordance with the *NEC*. However, if the neutral is reduced more than two sizes, calculations justifying the reduction must be accepted by the Company. The grounded neutral may be bare copper conductor or may be insulated and marked with a white or natural gray color. (*NEC* Section 200.6, 200.7, 230.41).

Equipment Specifications

All service entrance equipment shall be UL listed.

Meter sockets shall meet Company specifications and shall be UL Listed. See Appendix A.

Contact your Company representative for an approved meter socket list or see MidAmerican Energy website.

Service entrances for residential customers shall have a rated ampacity of at least 100 amperes at 120/240 volts, three-wire, single-phase. A minimum 200 amp meter socket is required for all underground residential services smaller than 200 amps.

If the service size is 400 amps or less, self-contained metering will be used.

Service Entrance Conductors

Only service entrance conductors shall be installed in the service entrance conduit.

Service entrance conductors shall not exceed 10 per phase.

The service drop and attachment point shall not be enclosed within any buildings, alteration, facade or addition.

The point of attachment shall be on the side of the structure adjacent to the distribution facilities.

Clearance Requirements

If changes occur to a customer's property, such as grade changes or construction of decks or garages, which result in inadequate clearance, the customer will be required to relocate or bring the service into compliance with current *NEC* and/or *NESC* requirements. Refer to Figures 1 and 2.

Continued on next page

6.0 SERVICE AND SERVICE ENTRANCES (General), Continued

Meter Location	All meter and related metering equipment locations shall be approved by the Company. Unless Company approval of an exception is given, all meters and related metering equipment must be: • Installed outside and securely attached to a permanent structure • Located on the front half of the structure • Accessible to Company employees • Protected from physical damage • Provided with adequate traffic protection, if deemed necessary by the Company • Separated from a source of combustion by at least 3 feet • In compliance with Figure 1
Meter Poles	If a meter pole is used, it shall be: • Owned and installed by the customer (except for primary-metered customers) • In a location mutually agreed upon between the customer and the Company • In an accessible location out of the way of traffic
Meters Not On Permanent Buildings	Meters shall not be installed on a trailer, mobile home or any building not on a permanent foundation. Typical meter installations for these applications are referenced in Figure 14 for meter pedestal and Figure 15 for meter pole.
Meter Clearances	A clear working space of not less than: • 36 inches in front of the meter • 30 inches wide must be maintained at all times or the meter will be relocated at the customer's expense. (<i>NEC</i> Section 110.26)
Multiple Meters	Two or more meter sockets installed on the same building must be grouped. Unused meter sockets shall have a plastic protective cover and shall be sealed. Before service is connected, the following information, where applicable, must be plainly marked on each meter socket cover, socket back plate and associated breaker or fuse panel with a permanent marker such as a paint stick, etc. Magic Markers, tape, pencil or label makers are not considered permanent and are not acceptable. • Apartment numbers • Duplex numbers • House meter • Water heater, etc. Identification and marking of these meter sockets and the breaker or fuse panel for each individual unit or apartment, is the responsibility of the customer. See Figures 24 and 26.

6.1 OVERHEAD SERVICE

Company Responsibility	The Company will install, operate and maintain all overhead facilities located between the customer's property line and the first point of attachment to the customer's building or other structure.
Customer Responsibility	The customer shall install, own, operate and maintain all overhead facilities on private property beyond the point of attachment, except for certain metering and transformation equipment.
Requirements	Attachment of the customer's metering equipment and distribution wiring will not be allowed on Company poles without a contractual agreement including an acceptable hold harmless provision with the Company. Service entrance conductors, between the weatherhead and the main disconnect, must be installed in conduit and will extend 36 inches beyond the weatherhead. The service drop should not cross adjoining property or livestock areas. Conduit must be installed between the meter socket and main disconnect. Check with your Company representative concerning service and metering applications over 600 volts.

6.2 UNDERGROUND SERVICE

Residential Service

Individual residential and duplex underground services will normally be installed, owned and maintained by the Company.

The cost of the underground service is governed by the Company's tariff and state rules and regulations in effect at the time of installation.

Customer-Installed, Residential Service

Upon prior approval from the Company, the customer may be allowed to make the underground service installation.

- Customer-installed, Company-owned cable shall be approved by and installed in a manner satisfactory to the Company. All cable must be installed between 30" and 42" below final grade.
 - Customer-installed residential and duplex underground services will be owned and maintained by the Company per applicable tariff.
 - The customer will be required to pay the applicable income tax surcharge.
-

Commercial, Industrial and Other Services

For commercial, industrial, and other services (including residential properties with multiple meters in one location and cross-functional buildings) the service will be furnished, installed, owned, and maintained by the Customer. The Company will terminate the cables in the transformer.

Network services are typically furnished, installed, owned, and maintained by the Company. Contact local distribution engineering personnel to see if network service is available.

Mobile Home Park Services

Underground services for mobile home parks will be furnished, installed, owned and maintained by the Customer.

Continued on next page

6.2 UNDERGROUND SERVICE, continued

Placement of Transformer	Consult your local governing authority regarding placement of transformers adjacent to buildings and building openings. It is necessary to have adequate and unobstructed space for the installation and maintenance of padmounted transformers. Minimal clearances are shown in Appendix B-1 for Company installation and maintenance requirements. A 3'-0" minimum clearance is to be maintained from pad sides and back, to the nearest structure. A level graded, 10'-0" minimum clearance is to be maintained from the front of the pad, to the nearest fixed structure. When traffic protection is necessary, contact local distribution engineering for requirements.
Transformer Pads	Pads for single-phase transformers will be furnished and installed by the Company. Three-phase transformer pads must be: • Installed by the customer at the customer's expense • Constructed in a manner satisfactory to the Company, in a mutually agreed upon location with hard surface access and unobstructed work space for large vehicles See concrete pad specifications in Appendix B. Contact the appropriate Company office for an inspection after the framework is placed. A two business days notice shall be given to the Company for this inspection.
UG Service Installed by Customer in OH Areas	Sufficient cable shall be left at the base of the service riser pole to connect to the Company's overhead system. The dimensional limitations and acceptable arrangements of conduit exits are shown on Figure 9.
Requirements	Conduit must be installed between the meter socket and main disconnect.

6.3 UNDERGROUND CONDUIT

**Polyphase
Customers**

All Company-owned polyphase cables (primary and secondary) installed on commercial/industrial customer property must be installed in a Company approved, customer provided conduit system, which may include manholes or vaults.

**Single-phase
Customers**

Customers requiring single-phase service will be required to install conduit for the following conditions:

- Under existing or likely future hard surface areas
 - Where area available for trenching is limited by any of the following:
 - Less than 10 feet clear width
 - Less than 10 feet clear height
 - Slope greater than 1 to 3
 - Distance between paved areas is less than 50 feet
 - Where the edge of the non-trenchable surface on property line is parallel to and within 5 feet of the structure foundation
 - Where a single corridor is used for multiple utilities
 - Where existing or future landscaping or obstructions will make cable installation, location and repair difficult
 - Where the customer wants to expedite cable installation
 - Where a developer is paving a street with islands or medians, and it is necessary to install cable (either street lighting or primary)
-

Continued on next page

6.3 UNDERGROUND CONDUIT, Continued

Typical Conduit Requirements (All Customers)

Size:	single phase primary - 2 inch three phase primary 4/0 or smaller - 4 inch three phase primary 500 kcmil or larger - 6 inch single phase secondary 1/0, 4/0 and 350 - 4 inch single phase services 1/0, 4/0 - 2.5 inch Single phase services 350 kcmil - 3 inch
Number:	one for residential, local distribution engineering's discretion for commercial/industrial
Material:	schedule 40 PVC stick or schedule 40 HDPE coilable
Riser:	service riser conduit must be galvanized rigid or schedule 80 PVC
Color:	gray, or black with red stripe only, no other colors allowed

Local Engineering must be contacted before installation.

Sweep Requirements (All Customers)

Material:	fiberglass, or steel (which must be grounded), or HDPE coilable with special approval. Sweeps must be burn-proof (exceeding burn resistant rating) and steel sweeps must include ground lugs and must be bonded where exposed, per the <i>NEC</i> .
Radius:	3" or less - 36" sweep over 3" - 48" sweep

Installation Requirements (All Customers)

Conduit materials and installation methods must be acceptable to the Company.

- All conduit depth measurements are from finished grade.
- Conduit for primary cables shall have a minimum cover of 42 inches and maximum cover of 48 inches.
- Conduit for secondary and streetlight cables shall have a minimum cover of 30 inches and maximum of 42 inches.
- Customer will install a synthetic, 1/4-inch pull line of 200 lb. test in the conduit.
- Customer will cap the end of the conduit and mark it with a stake. A Company supplied locator ball may be required in addition to a stake.
- The bottom of the trench in which the conduit is placed should be relatively smooth, undisturbed earth, well-tamped earth or sand.
- No more than 270° in a pull.

The customer may choose to install the service entrance at a location on the building that eliminates the necessity for MEC cables to be in conduit. The location must meet the requirements of Section 6.0 of this manual. Reference Appendix G for other installation instructions.

Where the customer owns and maintains the service, the requirements to install the conduit may be waived by the Company.

6.4 OVERHEAD PRIMARY METERING (Over 600 volts)

Company Responsibility

The Company will provide and install the following:

- Primary service drop conductors
- Primary meter pole
- Meter socket
- Instrument transformers
- Meter grounding
- Meter
- Meter wiring

Location and design of the metering shall be referred to appropriate Company technical personnel. See local distribution engineering for pole location.

The primary meter pole will be located at the property line.

The design of the customer's primary system should be submitted to the Company representative for approval by appropriate technical personnel.

Customer Responsibility (For Untrans- Formed Service Voltages)

The customer will have the following responsibilities:

- Install and maintain overhead conductors beyond the primary meter pole.
 - Maintain proper clearances in accordance with the NESC.
 - Own, install and maintain a group operated visible break disconnecting means and over current protection immediately beyond the metering pole.
 - Ensure that all wiring and equipment installed beyond the meter are in accordance with the NESC in addition to the requirements of the *NEC*.
-

6.5 UNDERGROUND PRIMARY METERING (Over 600 volts)

Provided by Company

The Company will provide and install the following:

- Primary underground conductors between the Company's distribution system and the first point of attachment in the customer-supplied switchgear
- Meters

The Company will provide instrument transformers for metering, which are to be installed by the customer.

Provided by Customer

The customer must provide, in a Company-approved location:

- Company-approved enclosed upright or padmount switchgear
 - Fuses
 - Grounding bails
 - Metering cubicle
 - Concrete pads
 - Conduits
-

Clearances

The customer must maintain adequate clearances around the switchgear for operating purposes.

These clearance requirements will be determined by Company technical personnel and meet minimum NESC requirements.

Customer Switchgear

In the design, purchase, and installation of the switchgear package, close coordination is necessary between the customer, switchgear manufacturer and Company personnel.

The customer must furnish a minimum of three copies of the switchgear drawings and site plan for Company engineering approval.

A letter of agreement between the Company and the customer is recommended before the switchgear is ordered.

Wiring

The customer must provide and install all wiring connected to and beyond the metal-clad switchgear according to the NESC in addition to the requirements of the *NEC*.

Continued on next page

6.5 UNDERGROUND PRIMARY METERING (Over 600 volts), Continued

Transformers Beyond Primary Metering	For any new primary metering, the customer must furnish, own, maintain, and operate all transformers located beyond the first point of attachment. Padmount transformer installations should be in accordance with Appendix B. All indoor, rooftop, or specialty transformers must be furnished and maintained by the customer.
Company- Owned Transformers	For existing primary metered customers, the Company may provide standard distribution transformers located beyond the first point of attachment. The customer must provide primary fusing determined to be necessary by the Company to protect Company transformers. The Company will provide loadbreak bushing inserts for Company-owned padmount transformers. All Company transformers will be located in an area accessible to Company vehicles and will meet the clearance requirements of the NESC.

7.0 CONDUCTOR IDENTIFICATION

Neutral Conductor

Neutral conductor identification shall be in accordance with *NEC* Section 200.6.

Insulated Neutral	Identification
No. 6 or smaller	An insulated grounded conductor of 6 AWG or smaller shall be identified by a continuous white or gray outer finish or by three continuous white stripes on other than green insulation along its entire length.
Larger than No. 6	An insulated grounded conductor larger than 6 AWG shall be identified either by a continuous white or gray outer finish or by three continuous white stripes on other than green insulation along its entire length or at the time of installation by a distinctive white marking at its terminations. This marking shall encircle the conductor or insulation.

A neutral conductor may be uninsulated in accordance with *NEC* Section 230.41, except for neutral jumpers as indicated in Figures 27, 29, 30, 31 and 32.

High Phase Conductor

High phase (wild leg) conductor identification shall be marked orange or by other effective means and shall be in accordance with *NEC* Section 110.15 and Section 230.56.

The high phase (wild leg) conductor must be located on the **RIGHT HAND TERMINALS OF SELF-CONTAINED METER SOCKETS**. See Figure 30 of this book and *NEC* Section 408.3(e).

Multiple Conductors Per Phase

When multiple conductors per phase are needed for a service, the phase wires must be identified with colored tape so the proper grouping can be determined. The tape must be installed below the termination height so the grouping remains identifiable after cutting the cables to their final height.

8.0 SERVICE CONDUCTOR SIZES AND CONNECTIONS

Conductor Sizes	The Company will allow the use of any <i>NEC</i> approved service conductor as shown in Figure 7. No conductor size above 750 kcmil is allowed, including compressed and compact conductors.
Connectors Furnished	The Company will furnish and install all connectors necessary to connect service conductors to the source of power.
Customer Connections	All service conductor connections made by the customer ahead of the main disconnect, or connections to instrument transformers, must meet the following requirements: • All lugs must be UL listed and not modified. • Lugs may not be stacked unless specifically UL listed for the application. • For other than UL listed, factory-assembled connections, bolts must be Grade 5 or better, plated steel, assembled with a heavy flat washer and cupped spring washer (Belleville) and properly tightened. • Bolts must be the maximum diameter that the lug hole will accept, except as restricted by the terminal hole size of the instrument transformer. The instrument transformer terminal holes shall not be enlarged to accept larger bolts. An effort should be made to match the lug hole to the instrument transformer hole size. • Lugs must be attached with the maximum number of bolts possible. Two-hole lugs are required on each side of bar type CT connections.

9.0 METERING EQUIPMENT

Metering

The Company will supply meters for metering installations in accordance with the following:

Installation and Capacity of Load-Size Wiring	Metering	Refer To
Single-phase 400 amps or less	Self-contained socket-type	Figures 27-29
Three-phase 400 amps or less	Self-contained socket-type with manual clamping jaw bypass lever	Figures 30-32
Single-phase or Three-phase over 400 amps	Socket-type with instrument transformers	Figures 33-34

The following are prohibited:

- Splices in instrument transformer cabinets or meter sockets for the purpose of service entrance conductor extensions to additional metering points or customer equipment.
 - Use of meter sockets and other Company sealed enclosures as junction boxes and raceways for customer's circuits, including 480 volt PT supply wiring.
 - Meter sockets with automatic bypass.
-

Meter Socket Mounting

Meter sockets must be firmly attached to the structure.

- Mounting screws should be:
 - One-quarter inch diameter
 - At least two inches long
 - At least two screws should penetrate a wall stud.
 - If attachment is made between studs, molly bolts (or equivalent) are required to provide adequate holding strength.
 - If padmount metering with meter socket mounted adjacent to transformer, see Figure 14, or for instrument metering see Appendix F.
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9.0 METERING EQUIPMENT, Continued

Company Responsibility	The Company will be responsible for the following: • Furnish the instrument transformers • Furnish and install the meters • Furnish and install wiring leads from instrument transformers to meter socket
Customer Responsibility	The customer will have the following responsibilities: • Furnish, install, and maintain the related • Cabinets • Conduits • Meter sockets • Test switches (see Appendix D) • Cabinets and conduits shall be grounded per <i>NEC</i> Article 250 • Provide protective bushings on conduit ends • Make service entrance conductor connections to the instrument transformers • Install pull rope in conduit on instrument transformer installations
Padlocks or Seals	Meter and instrument transformer cabinets must be equipped with padlockable handle or other means to padlock or seal. Key locks will not be approved.
Current Transformer	For service sizes 1200 amps and below, current transformers required for metering shall be installed in a separate cabinet (reference Appendices C-3, C-4, C-5, C-6). With Company approval, current transformers may be installed in transformers for services above 1200 amps. See your local distribution engineering contact.
Potential Transformer	The potential transformers shall be installed in a separate cabinet (reference Appendix C-1, item 2). They will not be allowed in the secondary compartment of the padmount transformer.

Continued on next page

9.0 METERING EQUIPMENT, continued

**Demand
Monitoring**

If the customer desires the use of a Company meter signal for demand monitoring purposes, the Company will install, at the customer's expense, a pulse initiation relay external to the meter socket or cabinets.

These contacts will provide the customer with a real and/or reactive power pulse.

10.0 STANDBY GENERATOR SERVICE

General	The Company will allow a customer to have standby generators for temporary or emergency electric service.
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Parallel Operation	For the safety of Company personnel, as well as protection of the customer's equipment, there must be a positive means to guarantee that the standby generator cannot accidentally be connected in parallel to the Company's system.
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Transfer Switch	A manual or automatic transfer switch must meet the following requirements: • Must be installed at the customer's expense. • Must be designed so that under no conditions will the standby generator and the Company's electrical system operate in parallel without express written agreement between the customer and the Company. (For a positive break-before-make design, see Figure 17.) • Should incorporate a visual indication or some means of determining the physical position of the switch. • Shall be installed in compliance with this manual and the <i>NEC</i>. • Interlocking breakers with visible means of determining the open are acceptable. • Socket-mounted transfer switches are allowed. Before installing a system, please contact your Company representative to be sure the proposed standby transfer switch and meter socket installation meets the Company requirements. If a standby generator is connected without an approved transfer switch, service will be disconnected until such switch is installed. Safety of personnel demands this requirement.
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11.0 PARALLEL GENERATION OPERATION

General

Operation of any customer-owned generating equipment in parallel with the Company's system is prohibited without express written agreement between the customer and the Company.

For distributed generation installations (solar, wind, etc.), contact local distribution engineering personnel for information and requirements. For these installations, the meter must be located outside.

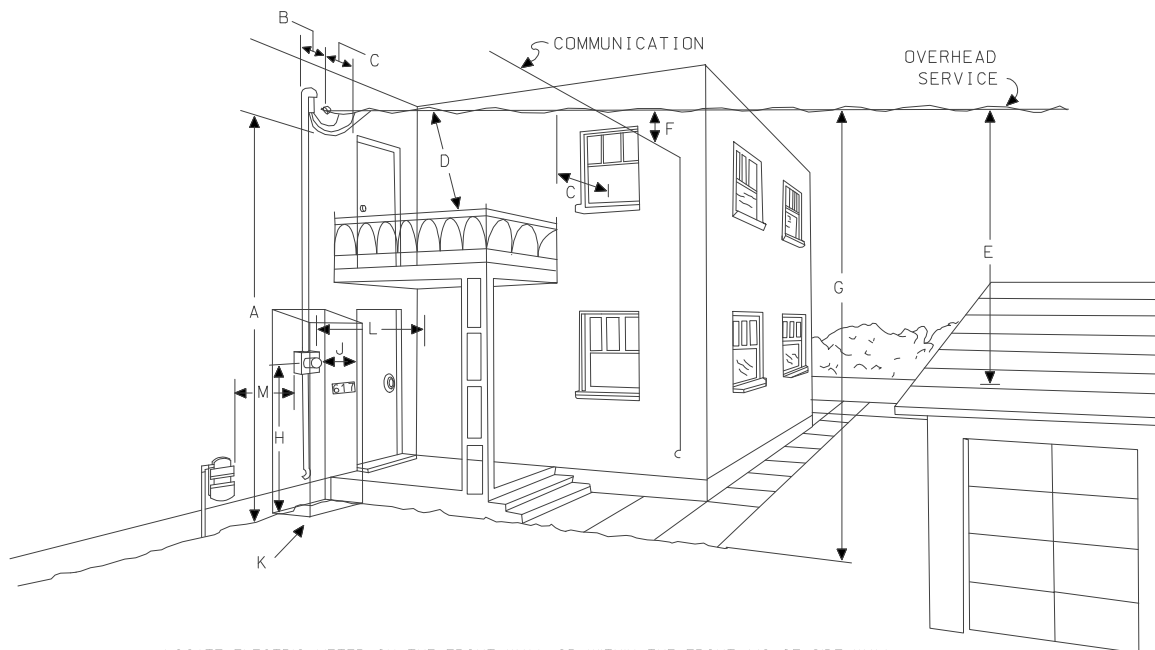
DIAGRAMS

MINIMUM CLEARANCES FOR SERVICES 480 V AND BELOW

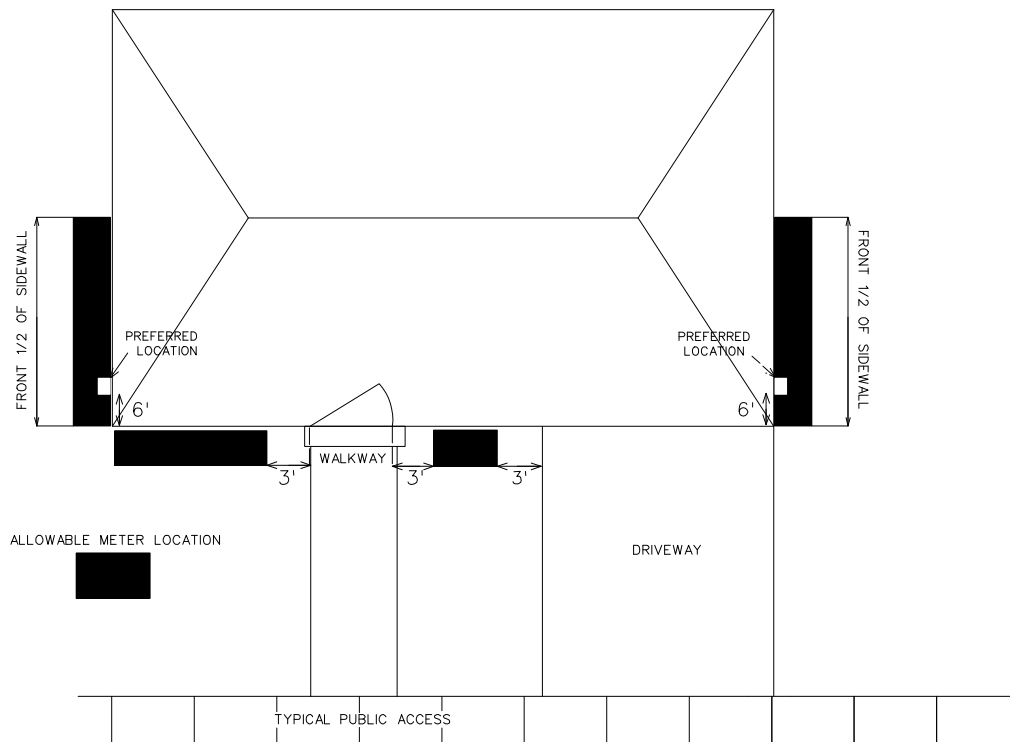
The following general clearances, under any and all conditions, include MidAmerican Energy Company's requirements and interpretations derived from the NESC Rule 234 and the *NEC* Section 230.24. Refer to these codes for specific conditions not shown in Figure 1. Clearances for utility-owned service drops and cables, beyond the perimeter of the customer's building, will be controlled by the NESC requirements. The following alphabetical designations and respective dimensions apply to Figure 1 on the opposite page. Clearances shown are for multiplex (duplex, triplex and quadruplex) service drop conductors. Open wire service conductors require greater clearances.

- A - The drip loop or service attachment fixture, whichever is the lowest point, shall have 12 feet minimum vertical clearance above final grade. Higher clearances may be required, reference "G" below.
- B - The clearance between the service attachment and weatherhead shall be 12 inches minimum and 24 inches maximum.
- C - Service conductors that are not protected by conduit or raceway shall have a minimum clearance of 3 feet from windows designed to be opened, doors, porches, fire escapes, signs, and similar construction. Conductors run above the top level of a window shall be permitted to be less than the 3 feet requirement.
- D - The diagonal distance from the nearest edge of a balcony or deck handrail that is readily accessible to the service conductor shall be 10 feet minimum.
- E - Refer to Figure 2D.
- F - Minimum vertical clearances between service drop and communication conductors shall be 2 feet at the conductor crossing and 12 inches at adjacent vertically spaced attachments to the building.
- G - The minimum vertical clearance shall be
 - 12 feet above sidewalk and ground
 - 16 feet above residential driveways
 - 18 feet above commercial areas, public driveways, alleys and streets, and other land traversed by vehicles
 - 20 feet above Department of Transportation right of way and others as required by local jurisdiction
- H - For individual settings, the clearance between the center of the meter and the finished grade is to be 6 feet maximum and 4 feet minimum.
- J - The dimension between the hinged side of a door and the nearest surface of the meter is to be door width plus 6 inches.
- K - A clear working space, as shown by the box in the diagram, of not less than 36 inches in front of the meter and 30 inches wide shall be maintained at all times. (*NEC* Section 110.26).
- L - The horizontal clearance from the nearest side of the meter socket enclosure to any structural protrusion shall be 3 inches minimum.
- M - Horizontal distance of electric meter to gas regulator vent is 3-feet minimum.

MINIMUM CLEARANCES FOR SERVICES 480 V AND BELOW



LOCATE ELECTRIC METER ON THE FRONT WALL, OR WITHIN THE FRONT 1/2 OF SIDE WALL.



GENERAL NOTES:

- (1) The house number must be clearly posted and readable from the street.
- (2) The service weatherhead is to be located no lower than the service attachment point to insure a positive drip loop.
- (3) Contact your Company representative for entrance and meter location. The Company will refuse connection to any service entrance not installed in an approved location.
- (4) The customer shall install a suitable service attachment point to obtain proper ground clearance. See Figure 3.
- (5) Service entrance conductors must be in conduit.

SERVICE CONDUCTOR CLEARANCES OVER ROOFS

Clearances shown are for multiplex (duplex, triplex, and quadruplex) service drop conductors. Open wire service conductors require greater clearances.

GENERAL REQUIREMENTS:

1. The customer shall install a suitable service attachment point. For proper ground clearance, see Figure 1. For adequate strength requirement, see Figures 3 and 4.
2. Eyebolts connected directly to the roof will not be approved.
3. The service weatherhead is to be located no lower than the service attachment point to insure a positive drip loop.
4. Service drop conductor shall not pass over or within 3.5 feet of furnace, chimney, antenna, fireplace, or sewer vents. See Figure (2A), NESC 234.C.1.b and NESC Table 234.1.

SPECIAL CONDITIONS REQUIRED FOR USING CLEARANCES SHOWN IN FIGURE 2(B):

5. Voltage between open conductors is 300 volts or less; and for multiplex conductors up to 750 volts.
6. The service entrance mast must not be more than 4 feet from the nearest edge of the roof. At a distance of 6 feet from the mast, the service conductors must have a vertical clearance of 3 feet over the roof. If the mast is more than 4 feet from the edge of roof, see Figure 2(C).
7. Roof must be classified as not readily accessible to pedestrians.

SPECIAL CONDITIONS REQUIRED FOR USING CLEARANCES SHOWN IN FIGURE 2(C):

8. Voltage between open conductors is 300 volts or less; and for multiplex conductors up to 750 volts.
9. Roof must be classified as not readily accessible to pedestrians.

SPECIAL CONDITIONS REQUIRED FOR USING CLEARANCES SHOWN IN FIGURE 2(D):

10. For multiplexed conductors up to 750 volts.
11. Special conditions required by Figure 2(B) and Figure 2(C) are not met. Service passes over, but is not attached to building.

SERVICE CONDUCTOR CLEARANCES OVER ROOFS

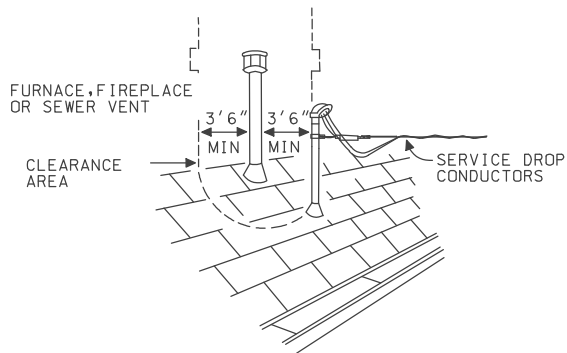


FIG. 2(A)

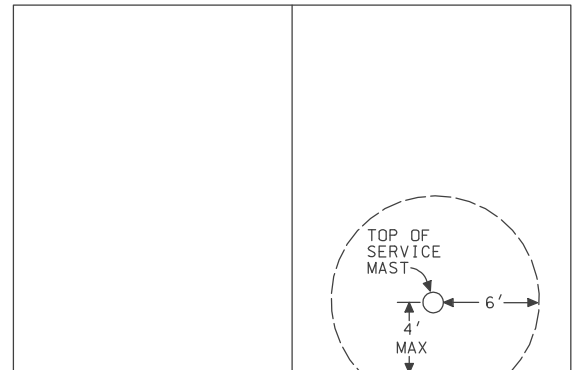


FIG. 2(B)
ROOF - TOP VIEW

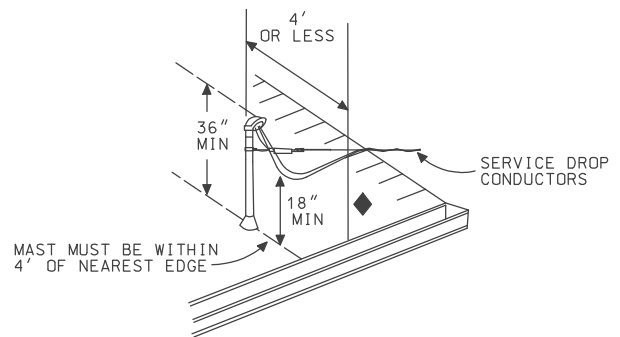


FIG. 2(B)

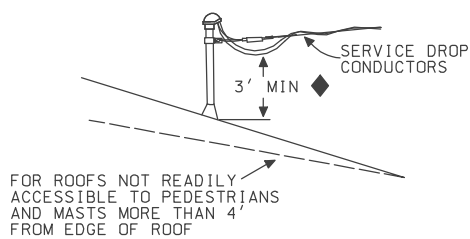


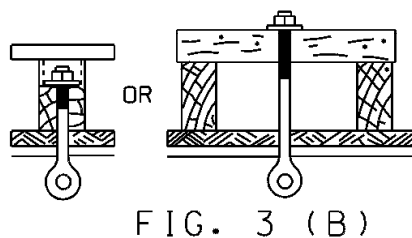
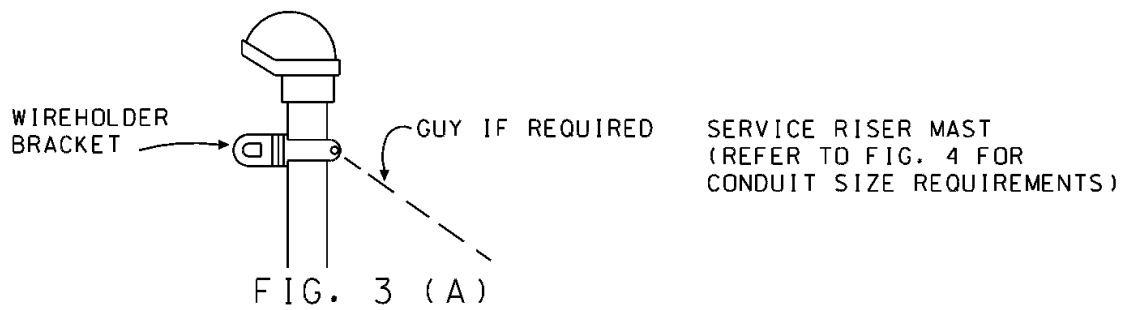
FIG. 2(C)

	SERVICE DROP CONDUCTORS
	D
CONDITION	D (MIN.)
ROOF SLOPE NOT READILY ACCESSIBLE TO PEDESTRIANS	3.5 FT.
ROOF SLOPE READILY ACCESSIBLE TO PEDESTRIANS	11 FT.

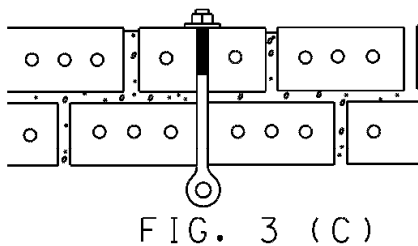
FIG. 2(D)

- ◆ THIS VERTICAL DIMENSION APPLIES TO ANY POINT ON THE ROOF SURFACE DIRECTLY UNDER THE CONDUCTORS.

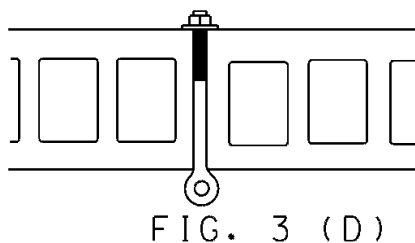
TYPICAL SERVICE ATTACHMENT PROVISIONS



BRICK VENEER, STUCCO, PLASTER,
SHEET METAL WALLS, OR ANY
FRAME BUILDING



SOLID MASONRY, BRICK, OR CEMENT:
EYE BOLTS MAY BE INSTALLED
THROUGH THE MORTAR JOINT



CONCRETE BLOCK OR HOLLOW TILE:
EYE BOLTS MAY BE INSTALLED
THROUGH THE MORTAR JOINT

1. The customer shall be responsible for all service attachment provisions.
2. Eye bolts, where required, shall be galvanized, 1/2 inch minimum diameter, and installed by the customer. Screw point or lag type attachments (4 inches of thread) are only permitted on rewires with Company approval.
3. Other types of service attachments may be required for larger services.
4. Service drop conductors shall not be attached to fire walls, parapet walls or chimneys.

TYPICAL OVERHEAD SERVICE MAST REQUIREMENTS

MAXIMUM SERVICE DROP LENGTHS						
ENTRANCE SIZE	RISER MAST CONDUIT SIZE FOR ABOVE THE ROOFLINE (Rigid or Intermediate)	SERVICE ATTACHMENT HEIGHT ABOVE SUPPORT (Ft.)				
		1.5	2	3	4	5
		MAXIMUM SERVICE DROP LENGTH (Ft.)				
100A	2"	125	100	75	75	50
	2-1/2" or 3"	150	150	100	100	75
	3-1/2" or 4"	150	150	150	125	100
200A	2"	100	75	50	50	50
	2-1/2" or 3"	150▲	100	75	75	75▲
	3-1/2" or 4"	150▲	150▲	125▲	100	75
400A	2-1/2" or 3"	100	100	75	50	50
	3-1/2" or 4"	125	100	100	75	75

APPLICATION AND CONDITIONS FOR ABOVE TABLE

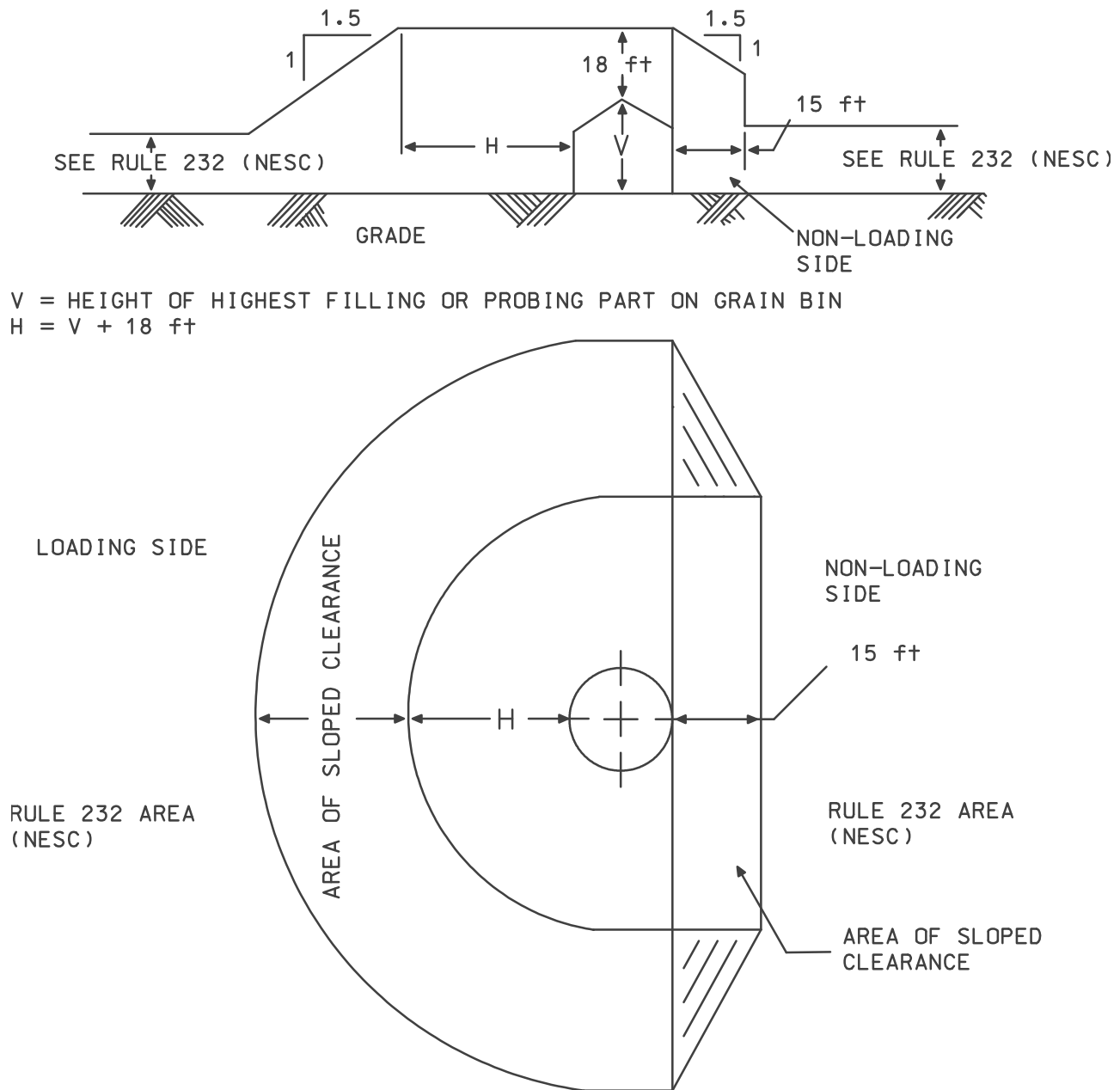
- The maximum service drop lengths shown are for triplex and quadruplex services attached to unguyed riser masts. ▲ Marked span lengths indicated that 25 ft. must be subtracted from the indicated span length if service is quadruplex.
- Conductor supports for spans longer than the maximum service drop lengths, for a given condition listed in the above table, must be guyed or braced to withstand the following maximum actual service drop tension:

<u>Entrance Size</u>	<u>Maximum Actual Tension</u>
100A	1500 Lbs.
200A	2000 Lbs.
400A	3500 Lbs.

The customer should consider providing additional strength as a "Safety Factor" (*NEC* Section 230.28).

- The service conductor type and span length will be selected by the Company representative as part of their inspection to determine the service entrance location. This information will be made available to the customer on request.
- EMT (thinwall conduit) is not acceptable for any portion of the service mast.
- Conduit couplings are not allowed above the roofline or less than 2 feet below the soffit line. Reducing down to a smaller conduit size must adhere to local jurisdictional requirements.

**CLEARANCE REQUIREMENTS
AROUND GRAIN BINS
NESC RULE 234F**



1. Overhead conductors should not be routed through the clearance envelope as shown above. For exceptions or for voltages exceeding 22 kV, see NESC Rule 234F.
2. The customer shall contact the Company representative to review clearances between grain bins and Company facilities.

CLEARANCE FOR CONDUCTORS INSTALLED OVER OR NEAR SWIMMING AREAS (REFERENCE NESC 234E)

Swimming Pools

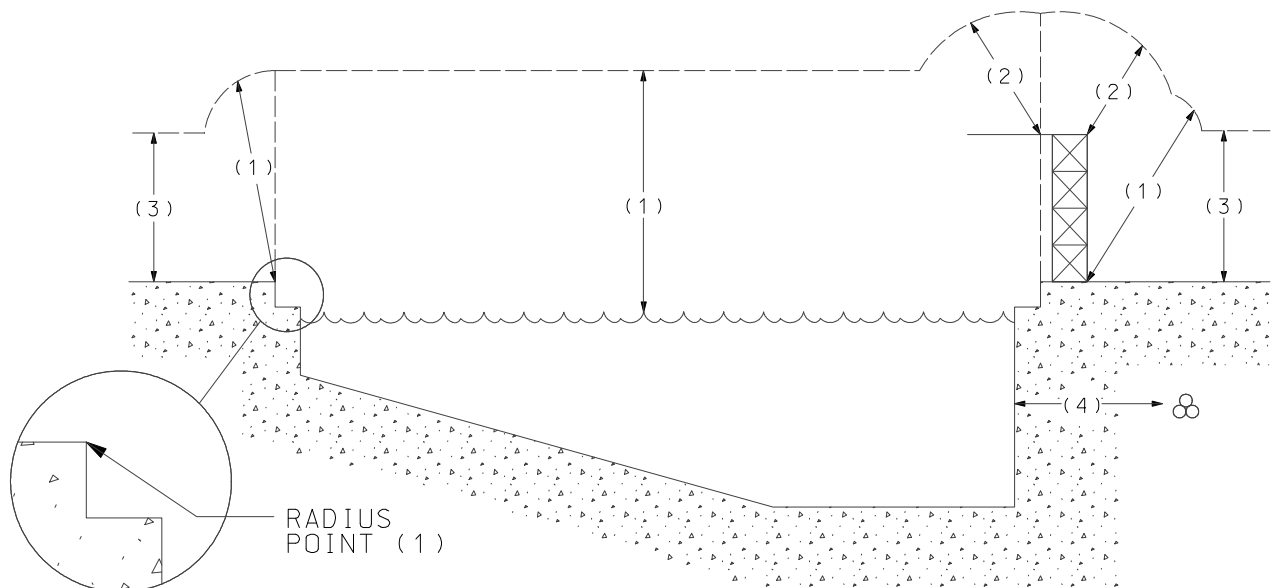
Conductors installed within 10' horizontally from the pool edge or diving platform must maintain basic vertical clearances as depicted in the following table.

This rule does not apply to a pool fully enclosed by a solid or screened permanent structure.

Beaches and Waterways Restricted to Swimming

Where rescue poles are used by lifeguards at supervised swimming beaches, the required basic vertical and horizontal clearances shall be as shown on the following table.

CLEARANCES TO SWIMMING AREAS	UNGUARDED RIGID LIVE PARTS, 0-750V; SECONDARY CABLE	GROUNDED OR INSULATED GUYS; NEUTRAL COND.	OPEN SUPPLY CONDUCTORS		
			0-750V	750V-15kV	ALL 34.5kV
(1) CLEARANCE IN ANY DIRECTION FROM THE EDGE OF POOL, BASE OF DIVING PLATFORM, OR ANCHORED RAFT	22'-6"	22'-0"	23'-0"	25'-0"	25'-6"
(2) CLEARANCE IN ANY DIRECTION TO THE DIVING PLATFORM OR TOWER	14'-6"	14'-0"	15'-0"	17'-0"	17'-6"
(3) VERTICAL CLEARANCE OVER ADJACENT LAND	AS REQUIRED IN CLEARANCES ABOVE GROUND OR ROADWAYS (REF. NESC 232)				
(4) UNDERGROUND DIRECT BURIED CABLE	5' FROM POOL OR AUXILIARY EQUIPMENT (REF. NESC 351C1)				



GROUNDING REQUIREMENTS

1. All grounding of electric installations shall meet the requirements of *NEC* Article 250, requirements of the Company as shown in these construction standards, adhere to local jurisdictional requirements, and all other applicable codes.
2. The grounding electrode system shall consist of the provisions specified in *NEC* Section 250.50, Section 250.52, and Section 250.56. The Company does not allow the use of gas piping for grounding of electrical services. However, interior metallic gas piping, upstream of equipment service shutoff valves which may become energized, shall be electrically continuous and bonded to any grounding common electrode as defined by the *NEC*.
3. Ground rods, when used, shall be at least 8 feet long and 1/2 inch in diameter if copper, copperclad, or stainless steel, or 5/8 inch in diameter if galvanized or steel. The top of the rod shall be 2 to 6 inches below ground level. In certain instances additional grounding electrodes may be required, see *NEC* Section 250.56. *NEC* Section 250.60 prohibits using a lighting rod grounding electrode as one of the electrodes listed above.
4. Concrete-encased electrode, when used, shall be encased by at least 2 inches of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 20 feet of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 1/2 inch in diameter, or consisting of at least 20 feet of bare copper conductor not smaller than 4 AWG. Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means.
5. If a metal underground water pipe is in direct contact with the earth for 10 feet or more, it must be bonded to the grounding electrode system. In addition, a copper bonding conductor, or equivalent, must be connected around the water meter. See the following *NEC* Table 250.66, reprinted with permission from NFPA 70-2002, the *National Electrical Code*, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association on the referenced Subject which is represented only by the standard in its entirety.
6. The service grounding electrode conductor shall be connected to the neutral bus in the service disconnect or overcurrent device.

TABLE 250.66 GROUNDING ELECTRODE CONDUCTOR FOR AC SYSTEMS			
SIZE OF LARGEST SERVICE-ENTRANCE CONDUCTOR OR EQUIVALENT AREA FOR PARALLEL CONDUCTORS		SIZE OF GROUNDING ELECTRODE CONDUCTOR	
COPPER	ALUMINUM OR COPPER CLAD ALUMINUM	COPPER	ALUMINUM OR COPPER CLAD ALUMINUM*
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 240 kcmil	4	2
Over 3/0 thru 350 kcmil	Over 250 kcmil thru 500 kcmil	2	1/0
Over 350 kcmil thru 600 kcmil	Over 500 kcmil thru 900 kcmil	1/0	3/0
Over 600 kcmil thru 1100 kcmil	Over 900 kcmil thru 1750 kcmil	2/0	4/0
Over 1100 kcmil	Over 1750 kcmil	3/0	250 kcmil

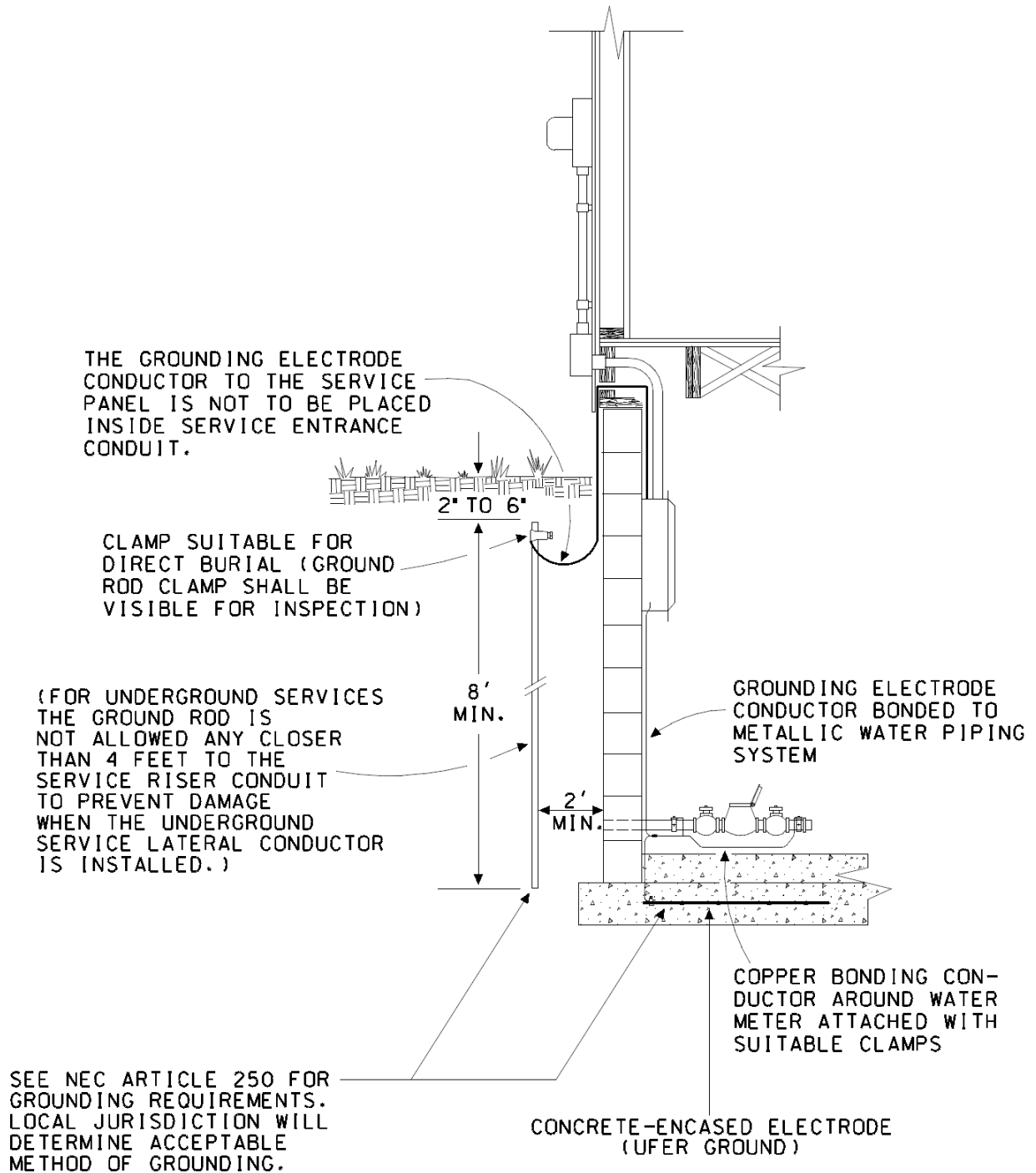
Where multiple sets of service-entrance conductors are used as permitted in *NEC* Section 230.40, Exception No. 2, the equivalent size of the largest service-entrance conductor shall be determined by the largest sum of the areas of the corresponding conductors of each set.

NOTE: Where the grounding electrode is a rod, pipe, or plate electrodes as permitted in *NEC* Sections 250.52(A)(5) or 250.52(A)(6), that portion of the grounding electrode conductor that is the sole connection to the grounding electrode shall not be required to be larger than No. 6 copper wire or No. 4 aluminum wire. Where the grounding electrode conductor is connected to a concrete-encased electrode as permitted in 250.52(A)(3), that portion of the conductor that is the sole connection to the grounding electrode shall not be required to be larger than No. 4 AWG copper wire.

* See installation restrictions in *NEC* Section 250-64.

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GROUNDING REQUIREMENTS



ALLOWABLE SERVICE CONDUCTOR SIZES

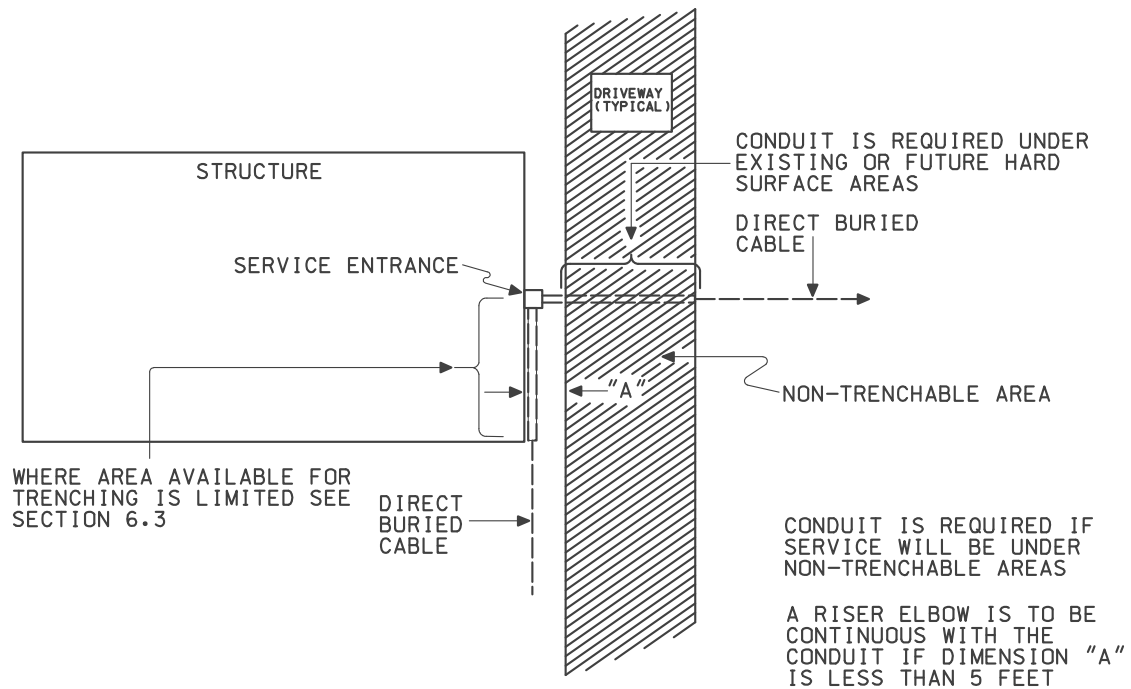
Allowable ampacities of insulated conductors rated 0-2000 Volts, 60° to 90°C (140° to 194°F) not more than three conductors in raceway or cable or earth (directly buried), based on ambient temperature of 30°C (86°F). No conductor sizes above 750 kcmil will be allowed, including compact and compressed conductors.

SIZE	TEMPERATURE RATING OF CONDUCTOR, SEE TABLE 310.13 OF THE NEC						SIZE
AWG kcmil	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 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-2, ZW-2	TYPES TW, UF	TYPES RHW THHW, THW THWN XHHW USE	TYPES TA, TBS SIS THHN, THHW THW-2, THWN-2 RHH, RHW-2 USE-2 XHH, XHHW XHHW-2, ZW-2	
	COPPER			ALUMINUM OR COPPER-CLAD ALUMI- NUM			
8	40	50	55	-	-	-	-
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

For residential applications, see NEC Section 310.15(B)(6).

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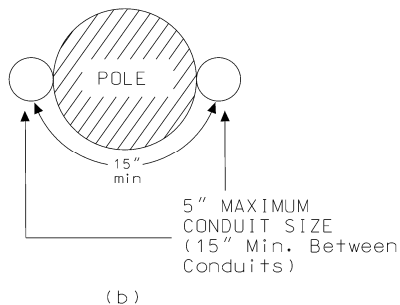
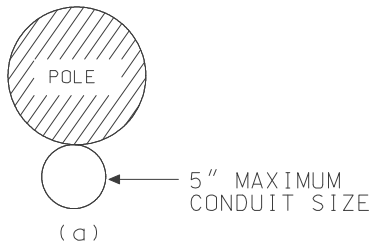
UNDERGROUND CONDUIT INSTALLATION



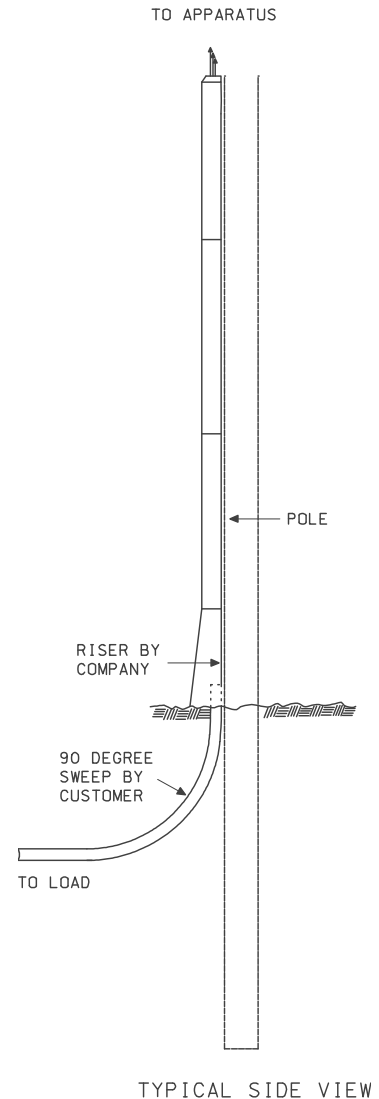
REFER TO SECTION 6.3 FOR CONDUIT
INSTALLATION REQUIREMENTS

UNDERGROUND CONDUIT INSTALLATIONS AT RISERS

NOTES:



1. Contact the Company for approved conduit position prior to each installation. Normally the riser should be mounted on the side of the pole that is opposite the direction of traffic.
2. Installations requiring larger conduit capacity or different conduit orientation than shown must be approved in advance by your Company representative.
3. Conduits are to be installed so that the top end is 4"- 6" above final grade.
4. PVC conduit is recommended. Sweeps are to be rigid steel or fiberglass. If rigid steel is used, it must be effectively grounded.
5. Contact the Company for recommended length of conductor to be coiled at base of pole so sufficient length is available to reach apparatus.
6. See Section 6.3 for conduit installation requirements.
7. Where conduit is to be extended to a location requiring a new or replacement pole, such extensions shall not be made until the pole work is completed by the Company.
8. Spare conduit to be capped with permanent cap.



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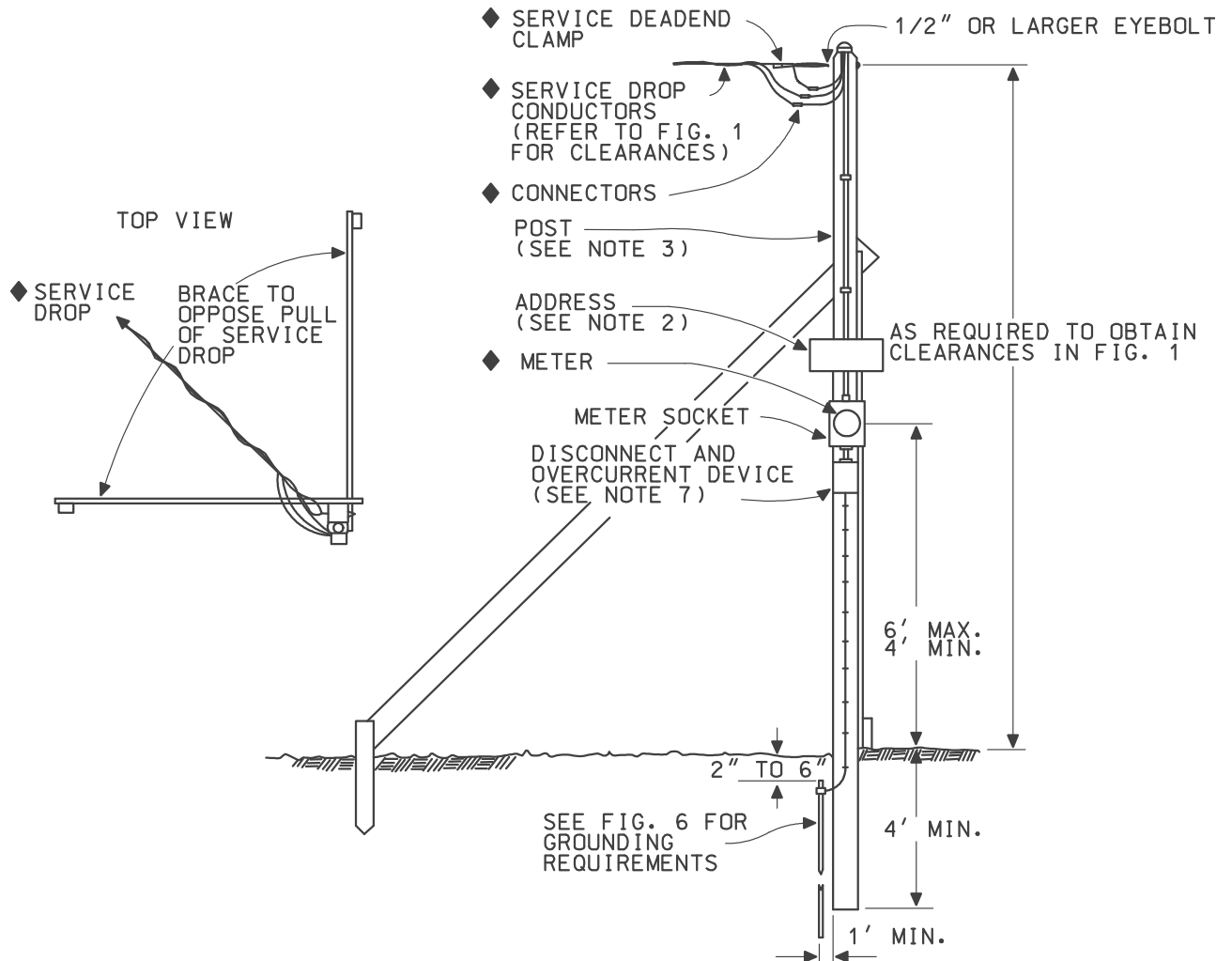
TYPICAL OVERHEAD TEMPORARY SERVICE

1. The Company will provide and install all ♦ marked items. The customer shall be responsible for all other items.
2. An address sign that is visible from the street shall be posted on the meter setting. It shall be made of materials that provide a clearly legible address for the duration of the setting.
3. With the exception of pedestal type settings, the support shall be a square or round treated timber post, 4 inch x 4 inch minimum or equivalent.
4. Meters shall not be installed on trailers, portable houses, or any buildings not on a permanent foundation.
5. The weatherhead is to be located above the level of the service attachment point.
6. The customer shall provide, install and connect all grounding equipment.
7. All 120 volt circuits shall have ground fault circuit interrupters (GFCI) (*NEC* Section 590.6).
8. All customer provided equipment shall be weatherproof.
9. The service drop conductors shall not cross adjoining property.

CUSTOMERS TO CALL 48 HOURS BEFORE DIGGING TO LOCATE UNDERGROUND FACILITIES

In Illinois call	(800) 892-0123
In Iowa call	(800) 292-8989
In South Dakota call	(800) 781-7474
In Nebraska call	(800) 331-5666
Universal Call	811

TYPICAL OVERHEAD TEMPORARY SERVICE



SERVICE CHARACTERISTICS		
VOLTAGE	SIZE	METER WIRING
1-PHASE 120 V 2-WIRE	60 A MAX.	FIG. 27
1-PHASE 120/240 V 3-WIRE	200 A MAX.	FIG. 27
1-PHASE 120/208 V 3-WIRE	See Note	FIG. 29
3-PHASE 120/240 V 4-WIRE	200 A MAX.	FIG. 30
3-PHASE 120/208 V 4-WIRE	200 A MAX.	FIG. 30
3-PHASE 277/480 V 4 -WIRE *	400 A MAX.	FIG. 31

Note: Contact your Company representative for service availability.

* Disconnect required for 480 V temporary service.

For other temporary service requirements, contact your Company representative.

TYPICAL UNDERGROUND TEMPORARY SERVICE

1. The Company will provide and install all ♦ marked items. The customer shall be responsible for all other items.
2. An address sign that is visible from the street shall be posted on the meter setting. It shall be made of materials that provide a clearly legible address for the duration of the setting.
3. The service lateral conductors shall be suitable for direct burial.
4. The customer shall provide and install the service lateral conductors in a manner that provides a sufficient length of conductor coiled at the transformer, secondary handhole or secondary pedestal, and end fittings (reference Detail “A”) for connection to the power source by the Company.
5. With the exception of pedestal type settings, the support shall be a square or round treated timber post, 4 inch x 4 inch minimum or equivalent.
6. The customer shall provide, install and connect all grounding equipment.
7. All temporary circuits shall have ground fault circuit interrupters (GFCI) (*NEC* Section 590.6).
8. All customer provided equipment shall be weatherproof.
9. If the temporary meter setting is located adjacent to a padmount transformer, secondary pedestal or secondary handhole, it shall be between 5 to 7 feet away from the enclosure.
10. Depending on local regulations, Figure 14 may be used for temporary services.

CUSTOMERS TO CALL 48 HOURS BEFORE DIGGING TO LOCATE UNDERGROUND FACILITIES

In Illinois call	(800) 892-0123
In Iowa call	(800) 292-8989
In South Dakota call	(800) 781-7474
In Nebraska call	(800) 331-5666
Universal Call	811

TYPICAL UNDERGROUND TEMPORARY SERVICE

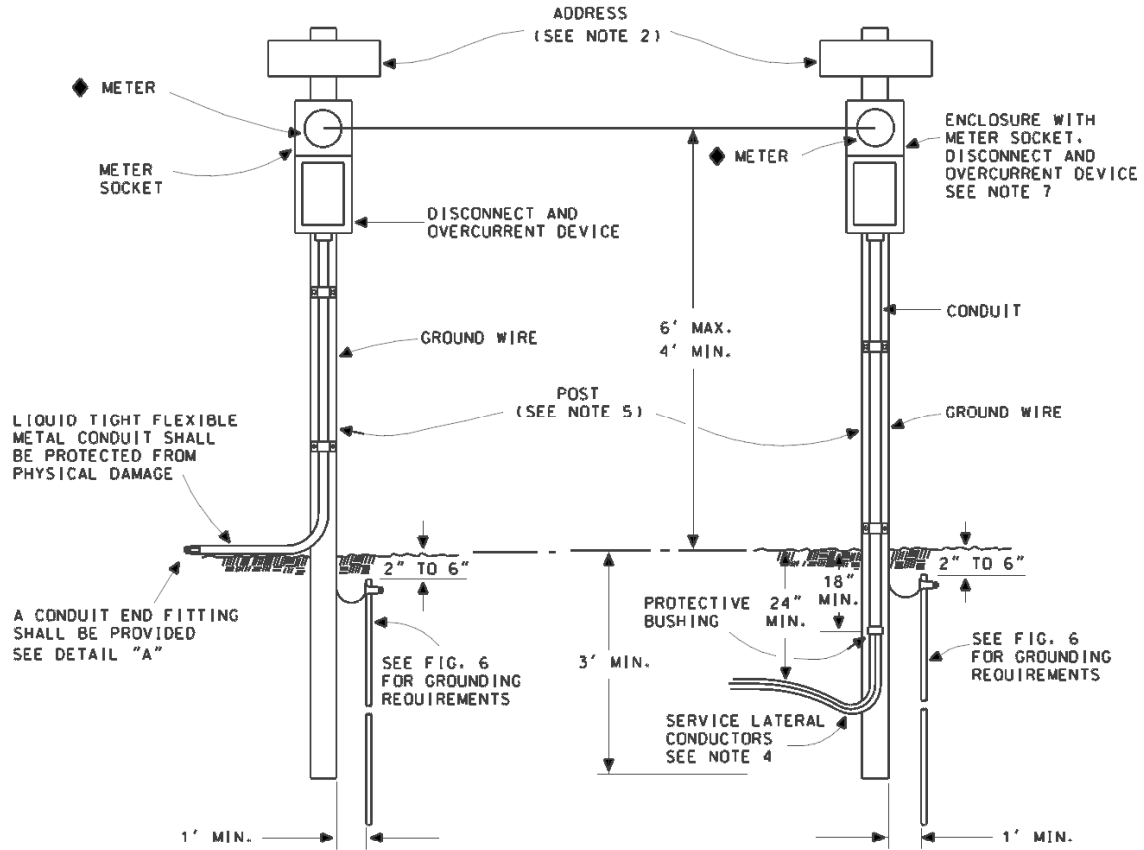
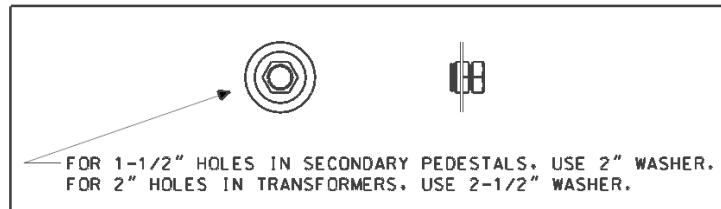


FIG. 11(A)
ABOVE GRADE SERVICE LATERALS

FIG. 11(B)
BELOW GRADE SERVICE LATERALS

DETAIL "A" - END FITTINGS WITH WASHERS

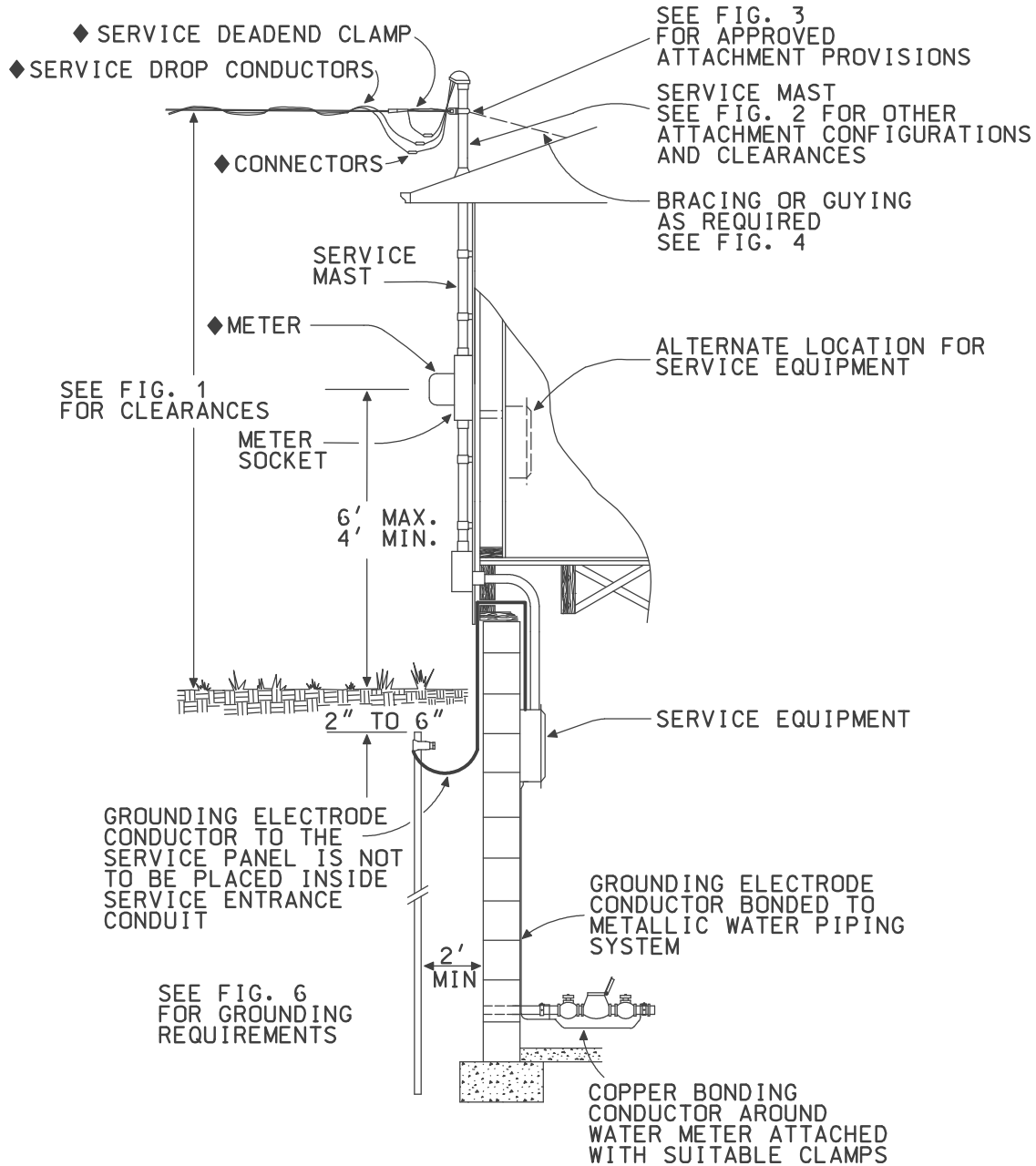


SERVICE CHARACTERISTICS		
VOLTAGE	SIZE	METER WIRING
1-PHASE 120 V 2-WIRE	60 A MAX.	FIG. 27
1-PHASE 120/240 V 3-WIRE	200 A MAX.	FIG. 27
1-PHASE 120/208 V 3-WIRE	See Note	FIG. 29
3-PHASE 120/208 V 4-WIRE	200 A MAX.	FIG. 30
3-PHASE 277/480 V 4-WIRE *	400 A MAX.	FIG. 31

Note: Contact your Company representative for service availability.

* Disconnect required for 480 V temporary service.

TYPICAL OVERHEAD RESIDENTIAL SERVICE

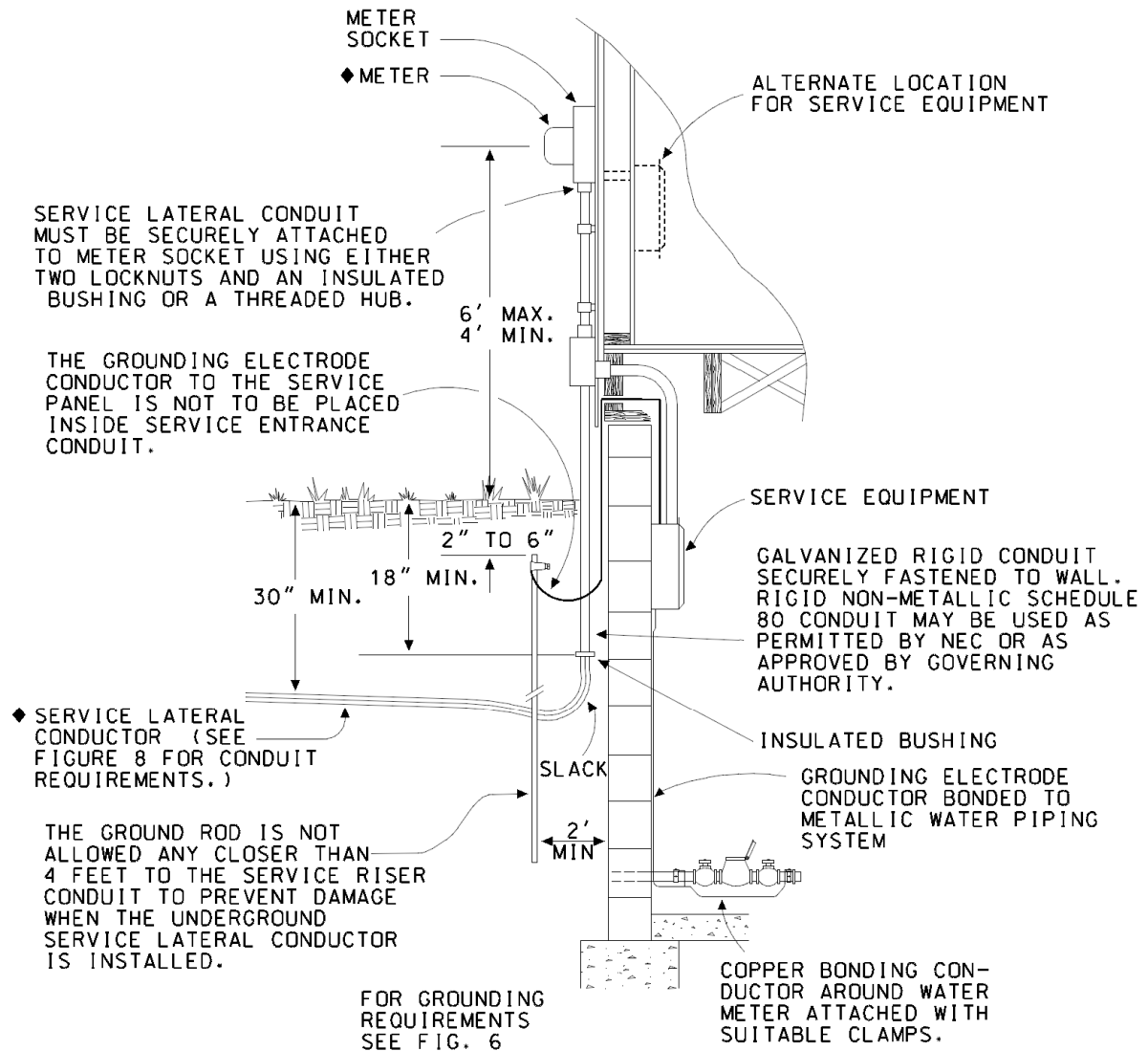


SERVICE CHARACTERISTICS

VOLTAGE	SIZE	METER WIRING
1-PHASE 120/240 V 3-WIRE	200 A MAX.	FIG. 27
1-PHASE 120/240 V 3-WIRE	400 A MAX.	FIG. 28

The Company will provide and install all ♦ marked items. The customer is responsible for all other items.

TYPICAL UNDERGROUND RESIDENTIAL SERVICE



SERVICE CHARACTERISTICS			
VOLTAGE	SIZE	METER WIRING	CONDUIT SIZE
1-PHASE 120/240 V 3-WIRE	200 A MAX.	FIG. 27	2 1/2" *
1-PHASE 120/240 V 3-WIRE	400 A MAX.	FIG. 28	3"

The Company will provide and install all ◆ marked items.

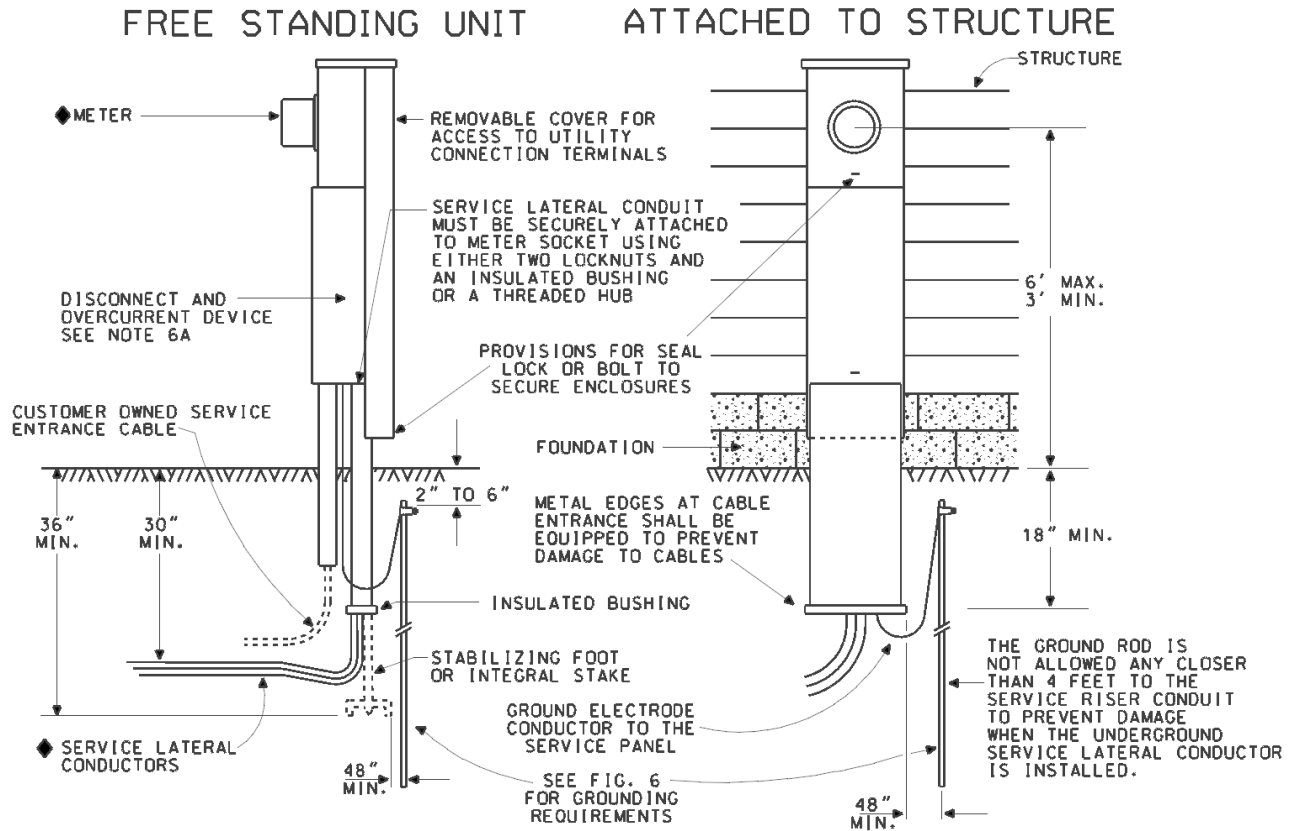
The customer is responsible for all other items.

* Services smaller than 200 amp are allowed, but a minimum 200 amp underground meter socket and 2-1/2" conduit are both required.

TYPICAL UNDERGROUND RESIDENTIAL SERVICE METER PEDESTAL

1. The company will provide and install all ♦ marked items. The customer shall be responsible for all other items.
2. An address, lot number or trailer number must be permanently posted on the outside of the cabinet, below the meter.
3. For free standing units, backfill around the pedestal shall be well tamped along the full 36 inch minimum length of the setting.
4. Any 120 volt outlet located on the pedestal shall have GFCI protection per *NEC* Section 210.8.
5. For pedestals attached to the masonry footings or basement walls, use three and one-half (3 1/2) inch length bolts (minimum) for secure mounting. Meter pedestal may be installed before house frame is constructed to eliminate the need for a temporary service.
6. Minimum specifications for meter pedestal are as follows:
 - A. Free standing meter pedestals shall have a disconnect and overcurrent device on the load side of the meter.
 - B. Meter pedestals shall have a removable cover for access to utility connection terminals.
 - C. Meter pedestal shall have one provision for a seal, lock or sealable bolt to secure the line-side enclosure. Key locks will not be approved.
 - D. All meter mounting equipment shall meet the requirements listed in Appendix A.
 - E. All pedestal materials shall be fiberglass, steel or wood. Steel shall have a minimum of 14 gauge and plated or galvanized. The finish shall be tough, non-fading and have a long service life. Wood shall be treated 6 inch by 6 inch post.
 - F. All meter pedestals shall be bonded to the neutral conductor. The neutral conductor shall be equipped with a lug for exclusive use of a copper ground wire.
 - G. Customer installed wire should not impede the installation of Company wires.

TYPICAL UNDERGROUND RESIDENTIAL SERVICE METER PEDESTAL



SERVICE CHARACTERISTICS		
VOLTAGE	SIZE	METER WIRING
1-PHASE 120/240 V 3-WIRE	400 A MAX.	FIG. 27 or FIG. 28

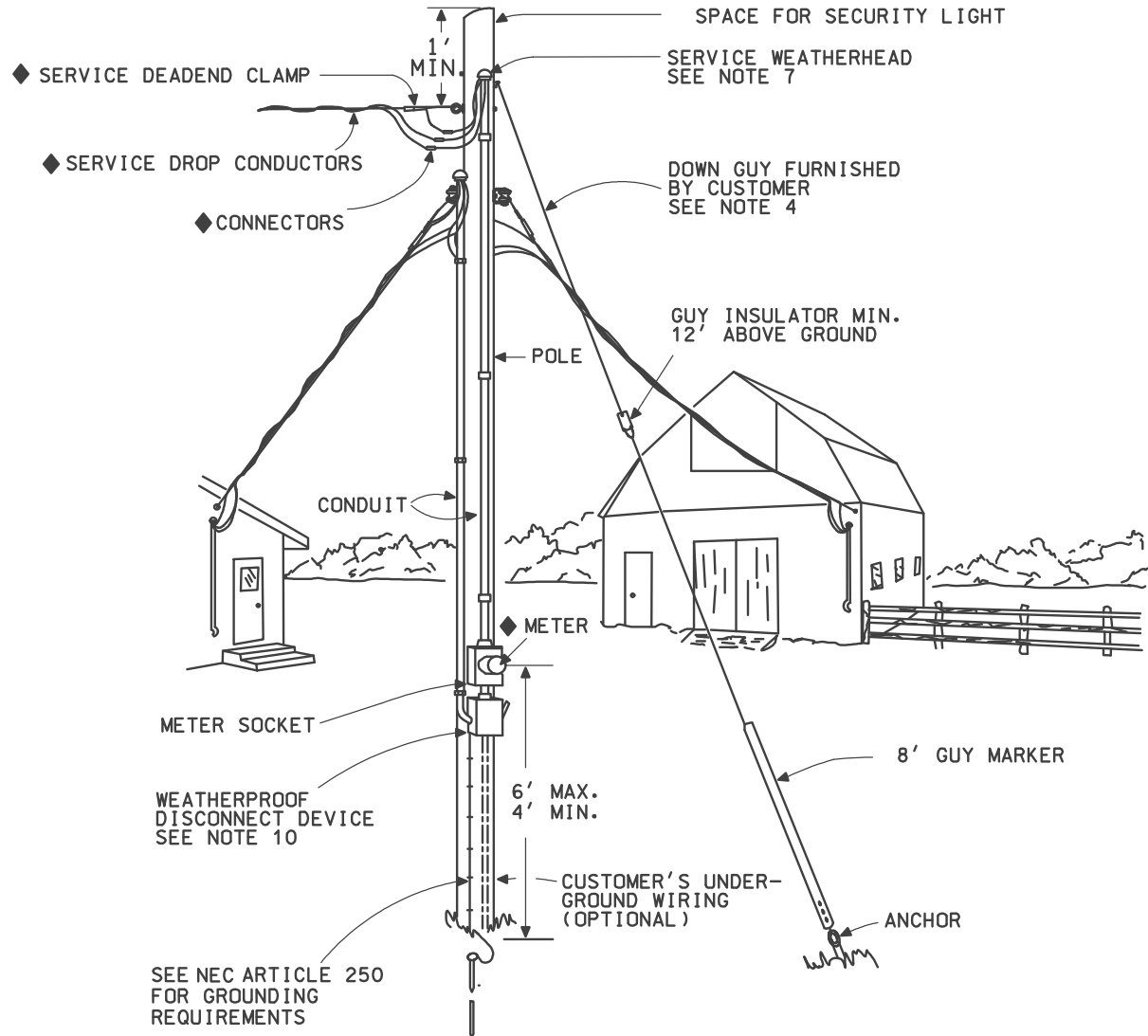
TYPICAL RURAL SERVICE METER POLE

1. The Company will provide and install all ♦ marked items. The customer shall be responsible for all other items.
2. The attachment of the customer's metering equipment and distribution wiring will not be allowed on Company poles.
3. The customer shall be responsible for providing and installing a pole that is in suitable condition for extended service life, to support the service drop conductors and equipment. The pole shall be in an accessible location out of the way of farm equipment traffic. The pole is to meet or exceed the following minimum requirements:

Length:	Sufficient to maintain proper clearances, see Figure 1.
Setting Depth:	5 feet
Top Diameter:	5.5 Inches
Treatment:	Pentachlorophenol or equivalent

4. Contact your Company representative to determine the need for an approved down guy.
5. The Company can provide and install, at the customer's expense, a pole and (if necessary) the down guy.
6. The customer's service riser, metering equipment and wiring shall conform to *NEC* requirements.
7. The service weatherhead is to be located above the service attachment point to insure a positive drip loop.
8. When facilities for a standby generator are installed refer to Figure 17.
9. Locations of fuel storage tanks and dispensing devices shall be in accordance with *NEC* Table 514-3(B)(1) and Table 514-3(B)(2).
10. The customer shall install a disconnecting means incorporating an overcurrent protection device on the load side of the meter. Reference *NEC* 230.90 (A).
11. The service conductors should not cross adjoining property or livestock areas.
12. Metered and unmetered conductors shall not be installed in the same conduit.
13. Reference Meter Clearances, page 21.

TYPICAL RURAL SERVICE METER POLE

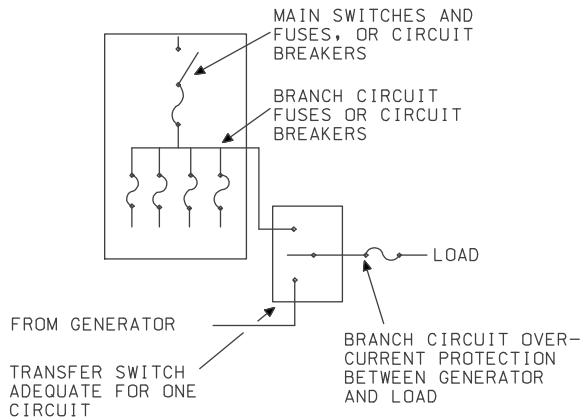


SERVICE CHARACTERISTICS		
VOLTAGE	SIZE	METER WIRING
1-PHASE 120 V 2-WIRE	60 A MAX.	FIG. 27
1-PHASE 120/240 V 3-WIRE	200 A MAX.	FIG. 27
1-PHASE 120/240 V 3-WIRE	400 A MAX.	FIG. 28

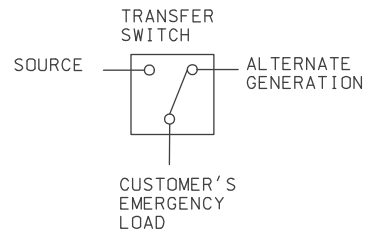
Other service voltages may be available. Contact your Company representative.

STANDBY GENERATOR PROVISIONS

IF A STANDBY GENERATOR IS CONNECTED WITHOUT AN APPROVED TRANSFER SWITCH, SERVICE WILL BE DISCONNECTED UNTIL SUCH SWITCH IS INSTALLED. SAFETY OF PERSONNEL DEMANDS THIS REQUIREMENT. SEE SECTION 10 OF THIS MANUAL FOR ADDITIONAL INFORMATION.



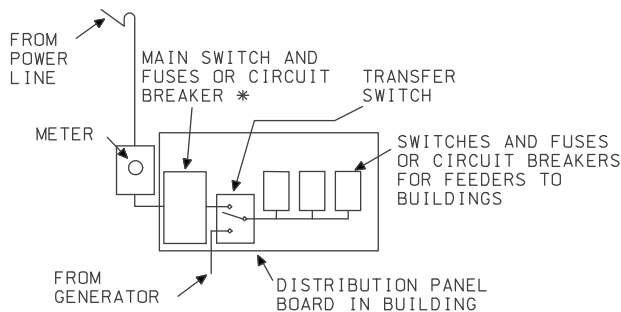
STANDBY GENERATOR CONNECTED
TO ONE CIRCUIT
FIGURE 17A



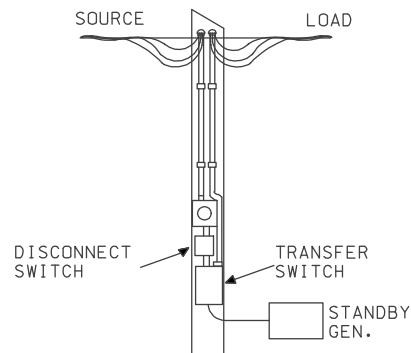
GENERAL REQUIREMENTS:

1. DOUBLE THROW SWITCH BREAK BEFORE MAKE ACTION.
2. IF LOCATED AT SERVICE ENTRANCE, MUST MEET ALL SERVICE ENTRANCE REQUIREMENTS.
3. ALL UNGROUNDED CONDUCTORS MUST BE SWITCHED SIMULTANEOUSLY (NEUTRAL NOT SWITCHED).

ONE LINE DIAGRAM
FIGURE 17B



STANDBY GENERATOR
CONNECTED AT SERVICE
ENTRANCE ON BUILDING
FIGURE 17D



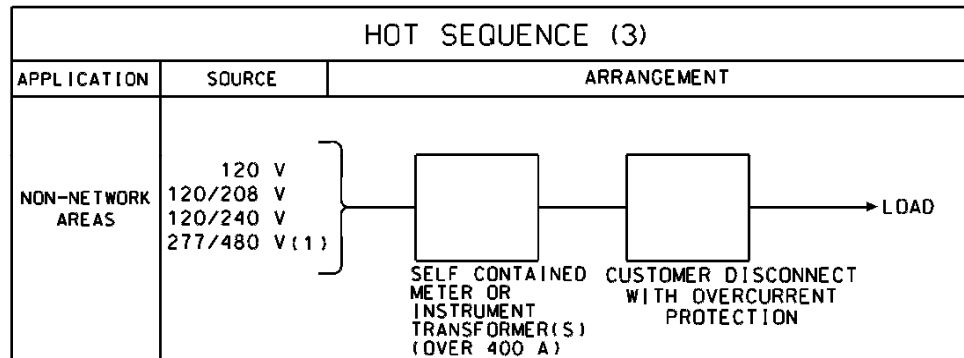
POLE MOUNTED
SERVICE ENTRANCE WITH
SELF-CONTAINED METER
FIGURE 17E

* If the transfer switch is located ahead of the main switch, the transfer switch shall be service entrance rated. The position of the transfer switch, with respect to the main switch, can vary from that shown. Contact your Company representative to be sure that the proposed transfer switch installation meets the Company requirements.

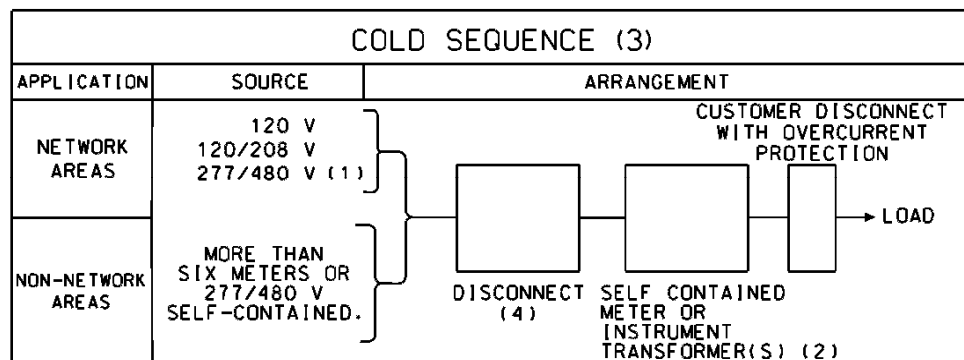
METERING SEQUENCE REQUIREMENTS NON-RESIDENTIAL INSTALLATIONS

NOTICE

CONTACT COMPANY TO DETERMINE THE
PROPER METERING SEQUENCE REQUIRED



(1) WITH INSTRUMENT TRANSFORMERS



(1) WITH INSTRUMENT TRANSFORMERS

(2) SEPARATE INSTRUMENT TRANSFORMERS ARE NOT REQUIRED WITH SELF-CONTAINED METERING

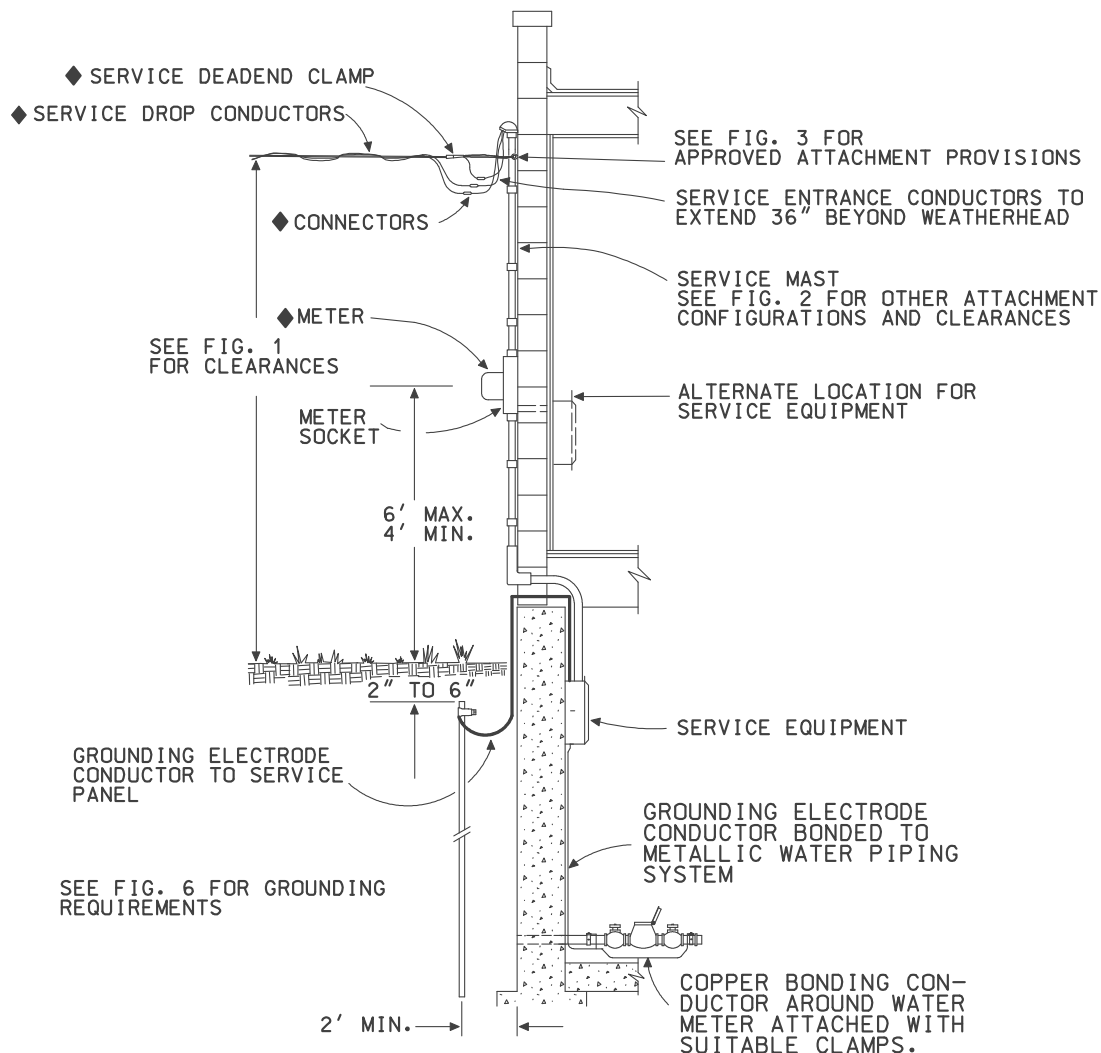
(3) EXIT LIGHTS, FIRE PUMPS, AND OTHER EMERGENCY SERVICES AHEAD OF THE MAIN MUST HAVE OVERCURRENT PROTECTION AND BE METERED

(4) DISCONNECT MAY BE FUSED OR UNFUSED DEPENDING ON WHAT IS NEEDED TO MEET MEC AND NEC FAULT CURRENT REQUIREMENTS FOR THE PARTICULAR APPLICATION.

NETWORK AREA DEFINITIONS:

Geographical areas exist in the downtown business districts of Carroll, Council Bluffs, Davenport, Des Moines, Moline, Rock Island, Sioux City, and Waterloo, in which service and related equipment must meet certain special requirements. Your Company representative must be contacted to determine if the service location is within this area.

TYPICAL OVERHEAD COMMERCIAL-INDUSTRIAL SERVICE WITH SELF-CONTAINED METER



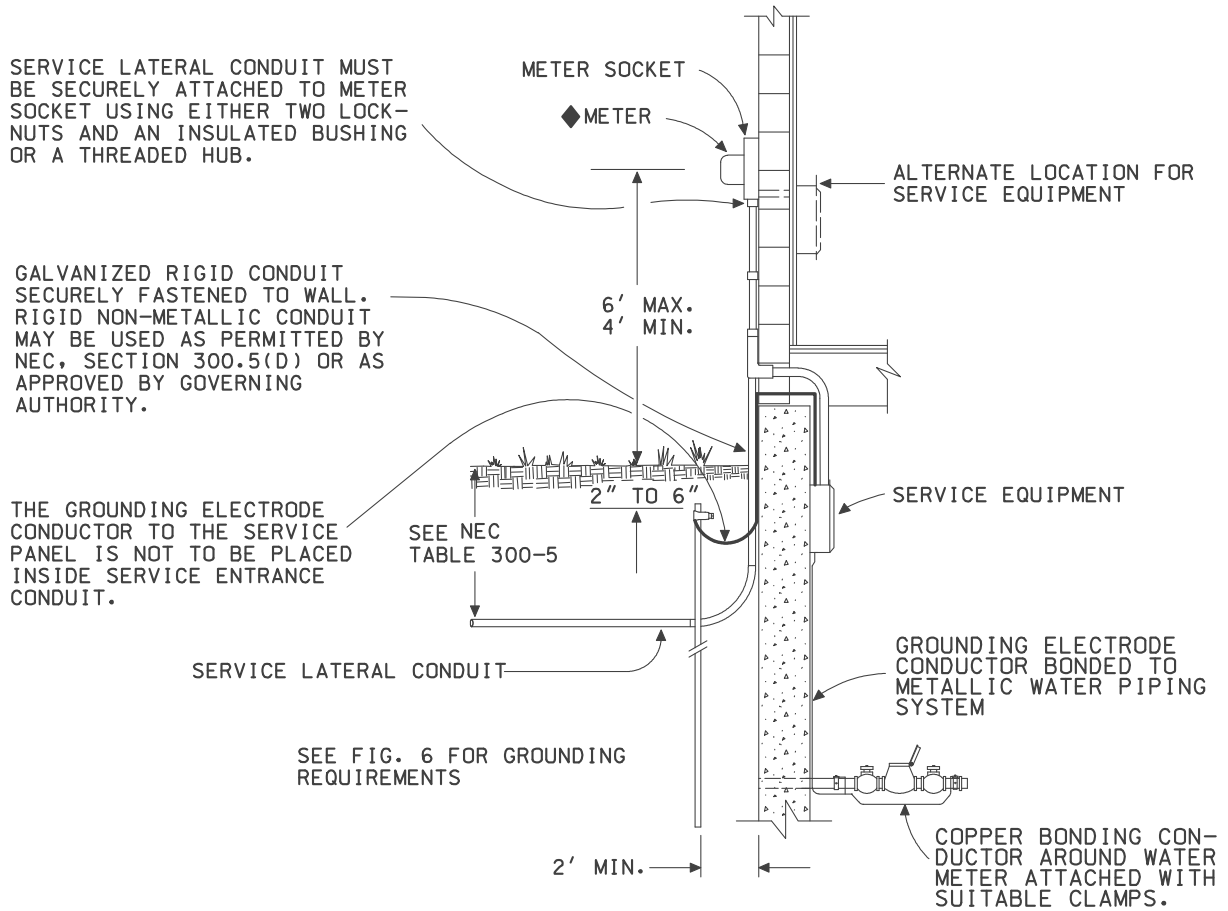
SERVICE CHARACTERISTICS

VOLTAGE	SIZE	METER WIRING
1-PHASE 120 V 2-WIRE	60 A MAX	FIG. 27
1-PHASE 120/240 V 3-WIRE	400 A MAX	FIG. 27 or FIG. 28
1-PHASE 120/208 V 3-WIRE	See Note	FIG. 29
3-PHASE 120/240 V 4-WIRE	400 A MAX	FIG. 30 or FIG. 32
3-PHASE 120/208 V 4-WIRE	400 A MAX	FIG. 30 or FIG. 32
3-PHASE 277/480 V 4-WIRE	400 A MAX	FIG. 31 or FIG. 32

Note: Contact your Company representative for service availability.

The Company will provide and install ♦ marked items. The customer is responsible for all other items.

TYPICAL UNDERGROUND COMMERCIAL-INDUSTRIAL SERVICE WITH SELF-CONTAINED METER



1. The Company will provide and install all ♦ marked items. The customer is responsible for all other items.
2. The conductor (and conduit when required) shall be furnished, installed and maintained by the customer. The Company will connect the service lateral conductors to the Company facilities.

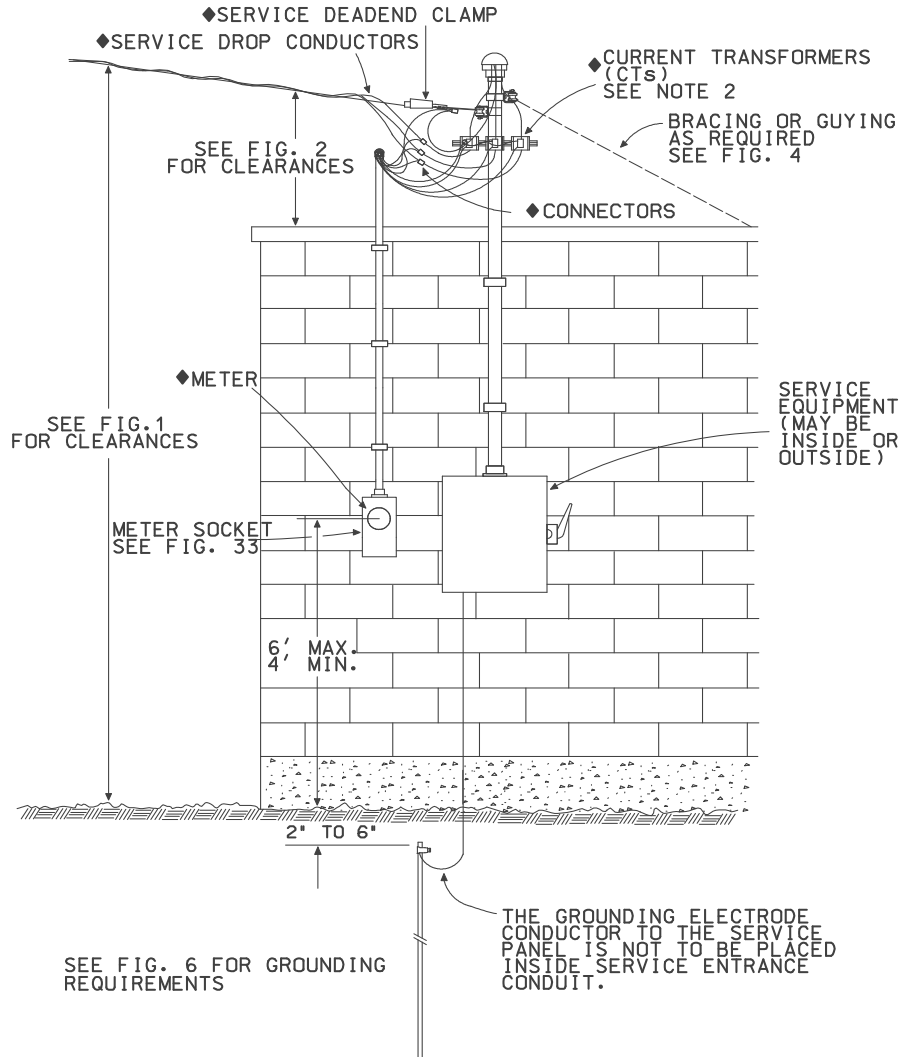
SERVICE CHARACTERISTICS		
VOLTAGE	SIZE	METER WIRING
1-PHASE 120/240 V 3-WIRE	200 A MAX.	FIG. 27
1-PHASE 120/240 V 3-WIRE	400 A MAX.	FIG. 28
1-PHASE 120/208 V 3-WIRE	See Note	FIG. 29
3-PHASE 120/208 V 4-WIRE	400 A MAX.	FIG. 30 or 32
3-PHASE 120/240 V 4-WIRE	400 A MAX.	FIG. 30 or 32
3-PHASE 277/480 V 4-WIRE	400 A MAX.	FIG. 31 or 32

Note: Contact your Company representative for service availability.
Other service voltages may be available. Contact your Company representative.

**TYPICAL COMMERCIAL-INDUSTRIAL SERVICE ENTRANCE
METERING WITH OVERHEAD-MOUNTED INSTRUMENT TRANSFORMERS
FOR MAINTENANCE ONLY**

1. The Company will provide and install all ♦ marked items. The customer shall be responsible for all other items.
2. Current transformers and potential transformers are furnished by the Company and installed by the customer.
3. Submit current transformer and potential transformer mounting details to the Company for approval.
4. Mount current transformers and potential transformers so that the polarity marks of each set are arranged in identical position.
5. Instrument transformer wiring on Figures 34 and 35 shows indoor mounting bar type current transformers. Wiring for outdoor installations is similar except that window type current transformers are used.
6. Bond all metal racks to the neutral wire.
7. Working space from electrical equipment shall be in accordance with *NEC* Section 110.26.
8. Service entrance conduit shall be mounted on an exterior wall accessible to Company personnel.

TYPICAL COMMERCIAL-INDUSTRIAL SERVICE ENTRANCE METERING WITH OVERHEAD-MOUNTED INSTRUMENT TRANSFORMERS FOR MAINTENANCE ONLY



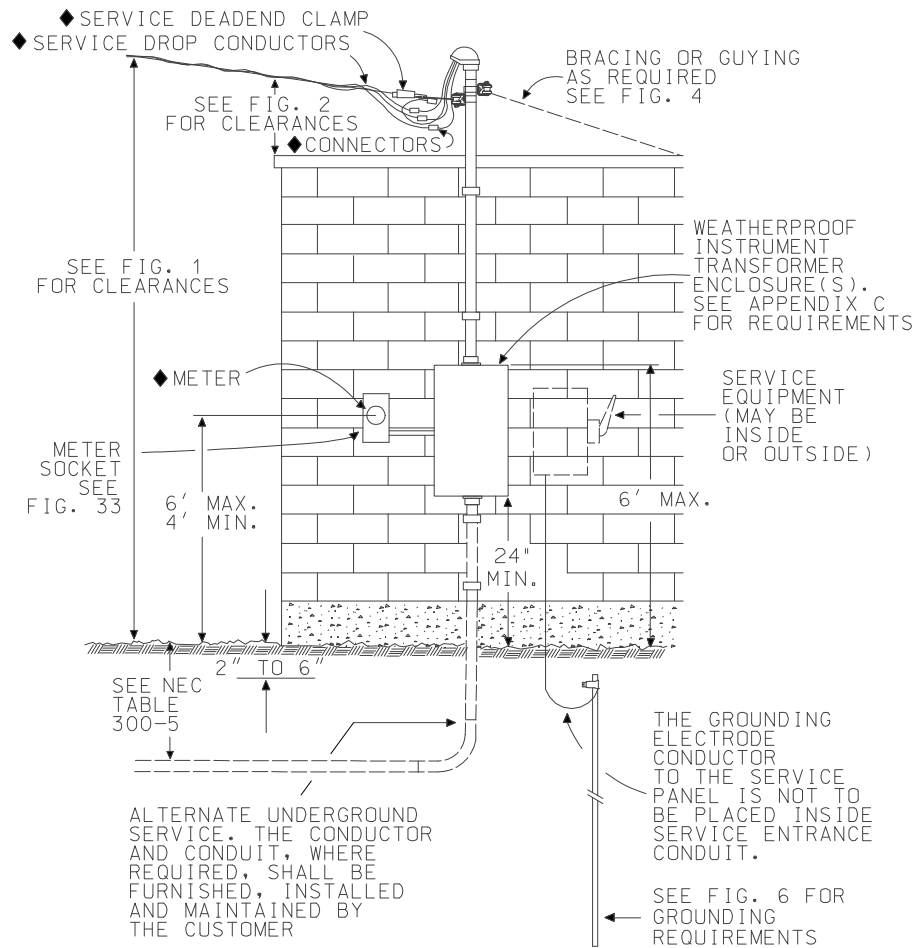
SERVICE CHARACTERISTICS				
VOLTAGE	SIZE	INSTRUMENT TRANSFORMER QUANTITY		INSTRUMENT TRANSFORMER WIRING
		CT's	PT's	
1-PHASE 120/240 V 3-WIRE	OVER 400 A THRU 800 A	2	-	FIG. 34
3-PHASE 120/240 V 4-WIRE	OVER 400 A THRU 800 A	3	-	FIG. 35
3-PHASE 120/208 V 4-WIRE	OVER 400 A THRU 1000 A	3	-	FIG. 35

* Refer to Fig. 35, Note 8.

**TYPICAL COMMERCIAL-INDUSTRIAL SERVICE ENTRANCE
METERING WITH CABINET-MOUNTED INSTRUMENT TRANSFORMERS
PREFERRED INSTALLATION**

1. The Company will provide and install all ♦ marked items. The customer shall be responsible for all other items.
2. Current transformers and potential transformers are furnished by the Company and installed by the customer.
3. The instrument transformer enclosure(s) shall be mounted outdoors. Consult your Company representative for an approved location.
4. Mount current transformers and potential transformers so that the polarity marks are orientated on the line side.
5. The instrument transformer enclosure(s) shall be bonded to the grounding electrode conductor, or neutral.
6. Working space from electrical equipment shall be in accordance with *NEC* Section 110.26.
7. When supplying size information from the SERVICE CHARACTERISTICS Table on Figure 22; “O.H. Max.” - refers to services supplied from the pole mounted transformers, and “U.G. Max.” - refers to services supplied from padmounted transformers.

TYPICAL COMMERCIAL-INDUSTRIAL SERVICE ENTRANCE METERING WITH CABINET-MOUNTED INSTRUMENT TRANSFORMERS PREFERRED INSTALLATION



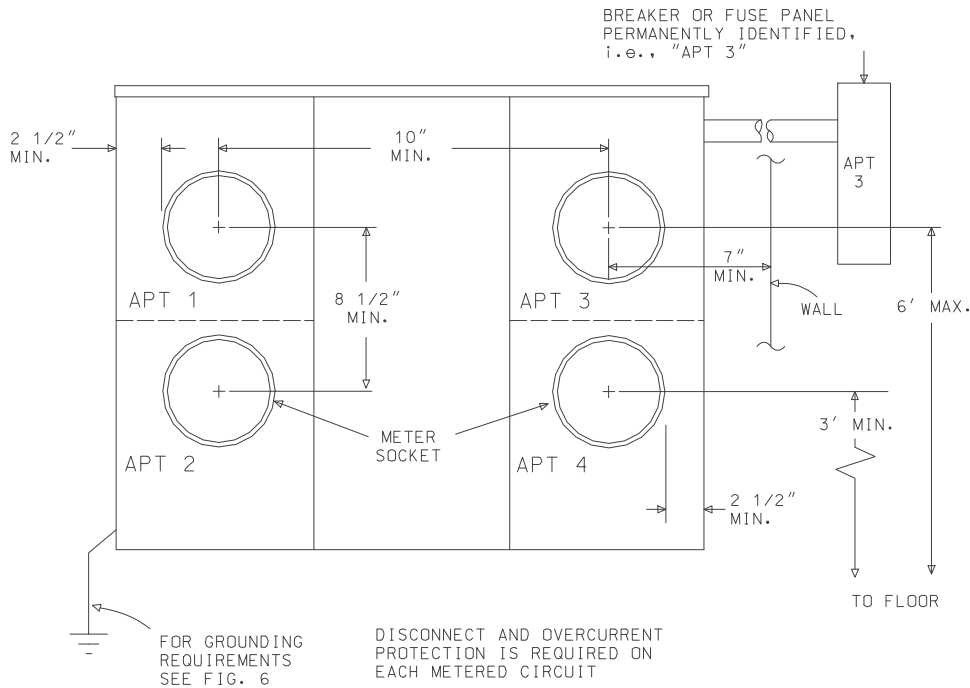
SERVICE CHARACTERISTICS						
VOLTAGE	SIZE (See Note 7)			INSTRUMENT TRANSFORMER QUANTITY		INSTRUMENT TRANSFORMER WIRING
	MINIMUM	O.H. MAX	U.G. MAX	CT's	PT's	
1-PHASE 120/240 V 3-WIRE	OVER 400 A	800 A **	1000 A	2	-	FIG. 34
3-PHASE 120/240 V 4-WIRE	OVER 400 A	800 A	N.A.	3	-	FIG. 35
3-PHASE 120/208 V 4-WIRE	OVER 400 A	1000 A	3000 A	3	-	FIG. 35
3 PHASE 277/480 V 4-WIRE	OVER 400 A	N/A	4000 A	3	3 *	FIG. 35

N.A. – NOT AVAILABLE

* Refer To Fig. 35, Note 8

** Contact your Company representative for availability.

TYPICAL GROUP METERING SIX OR LESS METERS FACTORY FABRICATED



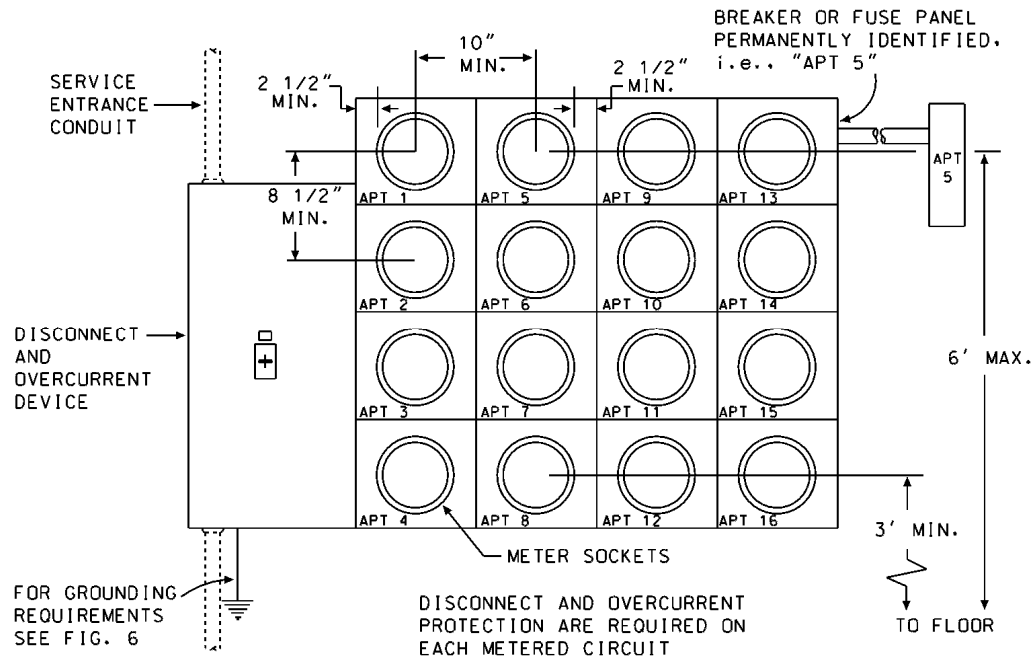
1. All service entrance equipment shall be UL listed.
2. All meter sockets shall meet Company specifications, see Appendix A.
3. Working space in front of service entrance equipment and meter sockets shall be in accordance with *NEC* Section 110.26. Refer to page 21 for Meter Clearances.
4. Apartments, rooms, or suites shall have identical markings on the entry door, meter socket, and fuse or breaker panel. A permanent/weatherproof label shall be used.
5. Group metering installed in network areas, as defined in Figure 18, shall be of type shown in Figures 25 and 26.
6. Metered and un-metered conductors shall not be installed in the same conduit or trough.
7. Spring, clip type add-on 5th terminals are not allowed.
8. Commercial (does not include residential apartments) installations require a manual clamping jaw lever bypass.
9. Open meter sockets shall have a plastic protective cover and shall be sealed.

SERVICE CHARACTERISTICS		
VOLTAGE	SIZE	METER WIRING
1-PHASE 120/240 V 3-WIRE	400 A MAX.	FIG. 27 or 28
1-PHASE 120/208 V 3-WIRE	See Note	FIG. 29
3-PHASE 120/240 V 4-WIRE	400 A MAX.	FIG. 30 or 32
3-PHASE 120/208 V 4-WIRE	400 A MAX.	FIG. 30 or 32

Note: Contact your Company representative for service availability.

Other service voltages may be available. Contact your Company representative.

**TYPICAL GROUP METERING FOR MORE THAN SIX METERS
OR ANY METERS IN NETWORK AREAS
FACTORY FABRICATED**



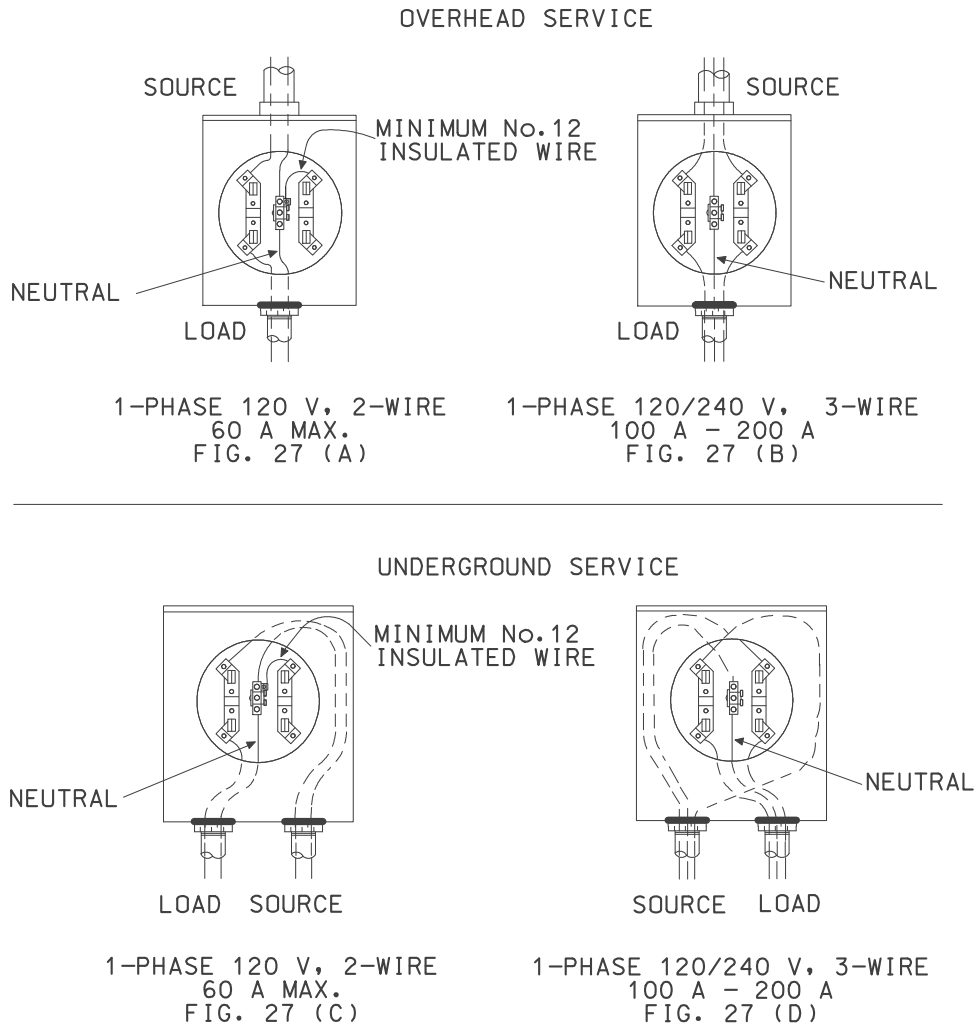
1. All service entrance equipment shall be UL listed.
2. All meter sockets shall meet Company specifications, see Appendix A.
3. Working space in front of service entrance equipment and meter sockets shall be in accordance with *NEC* Section 110.26. Refer to page 21 for Meter Clearances.
4. Apartments, rooms, or suites shall have identical markings on the entry door, meter socket, and fuse or breaker panel. A permanent/weatherproof label shall be used.
5. Spring, clip type add-on 5th terminals are not allowed.
6. Commercial (does not include residential apartments) installations require a manual clamping jaw lever bypass.
7. Metered and un-metered conductors shall not be installed in the same conduit or trough.
8. Open meter sockets shall have a plastic protective cover and shall be sealed.
9. Group metering banks shall meet 3' minimum and 6' maximum height requirements.

SERVICE CHARACTERISTICS		
VOLTAGE	SIZE	METER WIRING
1-PHASE 120/240 V 3-WIRE	400 A MAX.	FIG. 27 or 28
1-PHASE 120/208 V 3-WIRE	See Note	FIG. 29
3-PHASE 120/240 V 4-WIRE	400 A MAX.	FIG. 30 or 32
3-PHASE 120/208 V 4-WIRE	400 A MAX.	FIG. 30 or 32

Note: Contact your Company representative for service availability.

Other service voltages may be available. Contact your Company representative.

SELF-CONTAINED METER SOCKET WIRING
1-PHASE 120 V, 2-WIRE, 60 A MAX.
1-PHASE 120/240 V, 3-WIRE, 100 A – 200 A

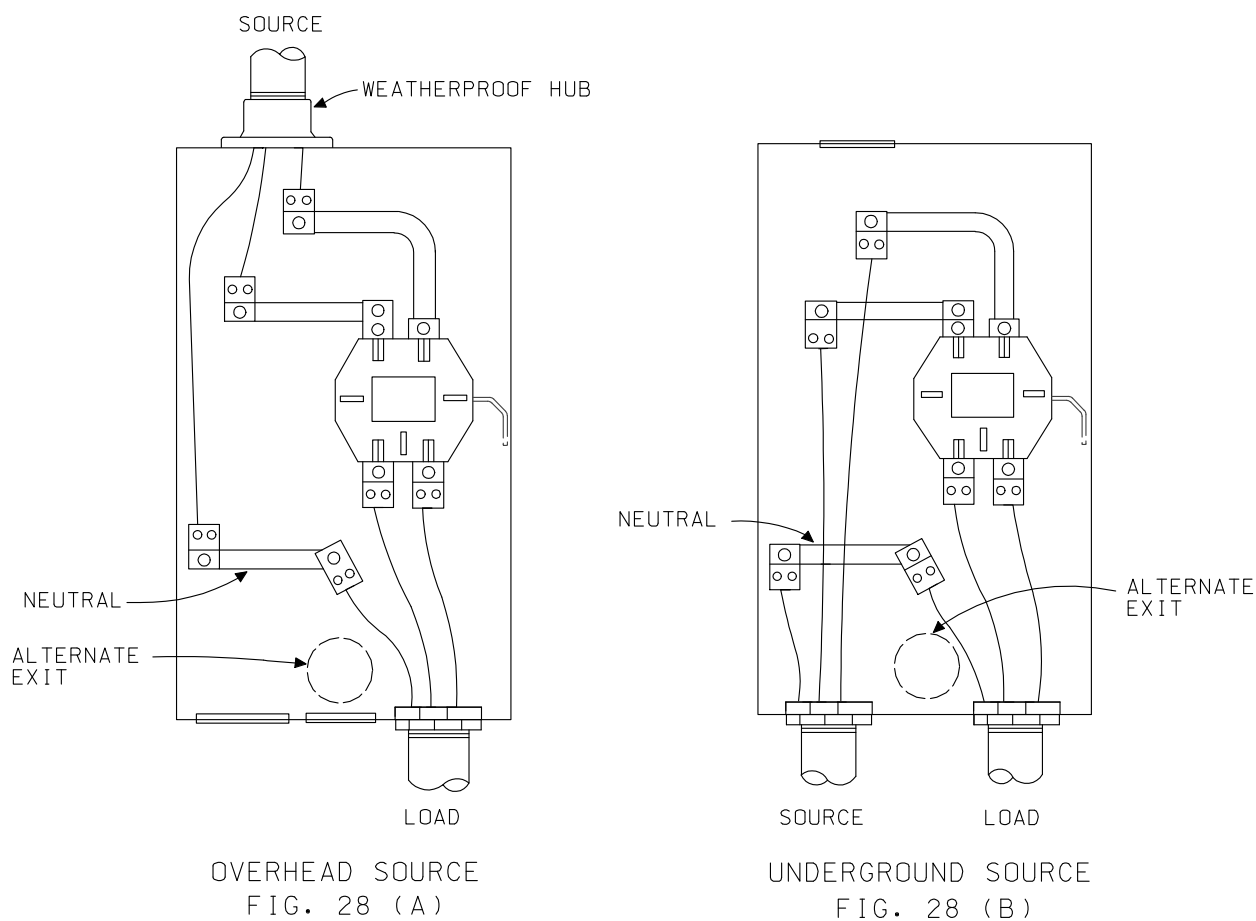


CAUTION

Source conductors shall be positioned along the sides of the meter socket, utilizing adequate bending radius, to provide maximum clearance from other socket terminals. Source conductors shall be looped to the top jaws shown in figures 27 (c) and (d).

1. The meter sockets shall meet Company specifications, see Appendix A.
2. Working space in front of service entrance equipment and meter sockets shall be in accordance with *NEC* Section 110.26. Refer to page 21 for Meter Clearances.
3. When using aluminum conductors, wire brush the conductors and apply oxide inhibitor on all connections.
4. When the neutral is not continuous through the meter socket, a dual lug neutral connector shall be used.
5. Use one of the two outside conduit knockouts for the underground service riser lateral.
6. Spring, clip type add-on 5th terminals are not allowed.
7. Commercial installations require a manual clamping jaw lever bypass.

SELF-CONTAINED METER SOCKET WIRING
1-PHASE 120/240 V, 3-WIRE, 320 A SOCKET
400 A ENTRANCE

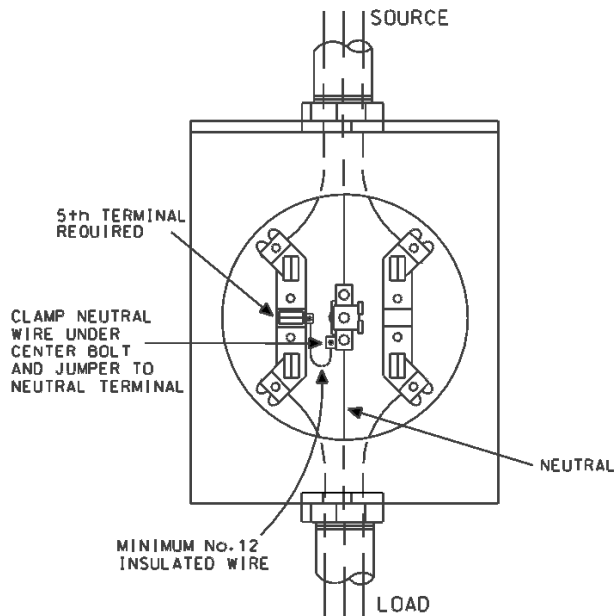


1. The meter sockets shall meet Company specifications, see Appendix A.
2. Working space in front of service entrance equipment and meter sockets shall be in accordance with *NEC* Section 110.26. Refer to page 21 for Meter Clearances.
3. When using aluminum conductors, wire brush the conductors and apply oxide inhibitor on all connections.
4. The neutral shall be grounded at the main disconnect in accordance with the *NEC*.
5. Please contact your Company representative if any questions arise concerning this installation.
6. Spring, clip type add-on 5th terminals are not allowed.
7. Commercial installations require a manual clamping jaw lever bypass.
8. Customer to provide all lugs.

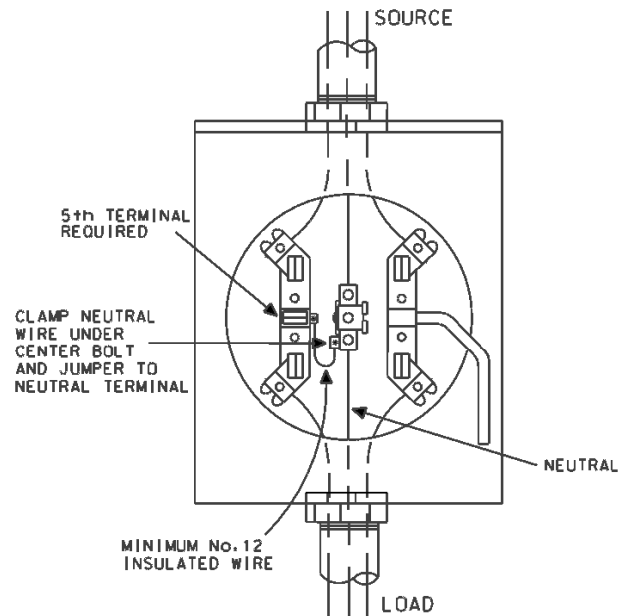
SELF-CONTAINED METER SOCKET WIRING

1-PHASE 120/208 V, 3-WIRE, 100 A

1-PHASE 120/208 V, 3-WIRE, 200 A



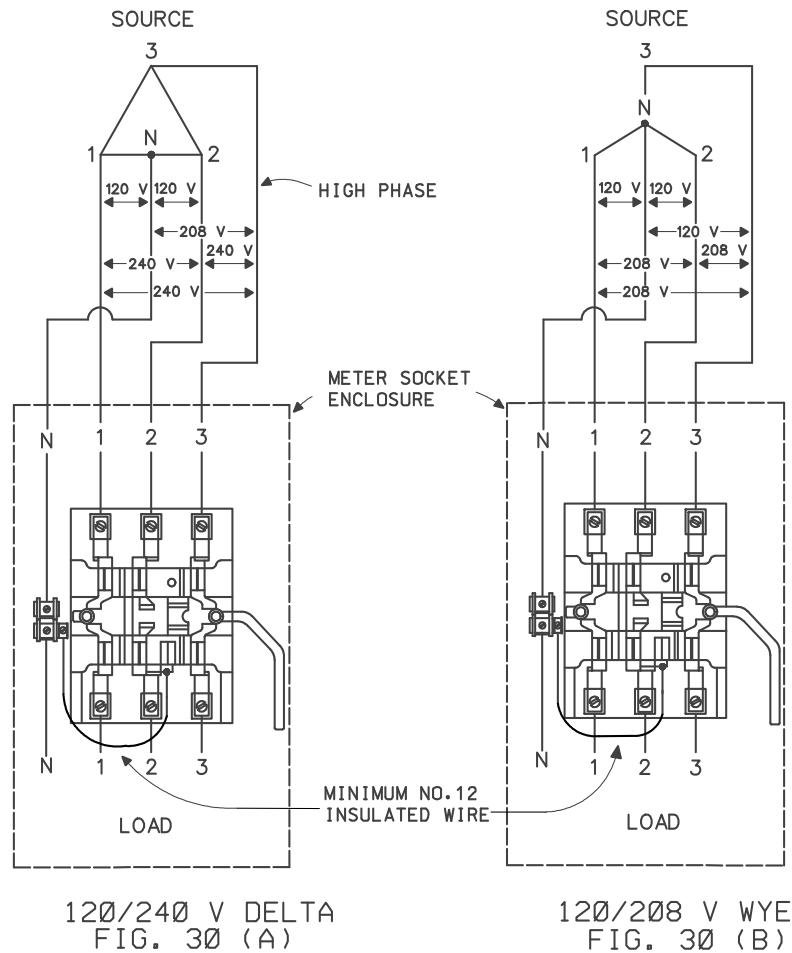
1-PHASE 120/208 V, 3-WIRE, 100 A



1-PHASE 120/208 V, 3-WIRE, 200 A
WITH LEVER BYPASS

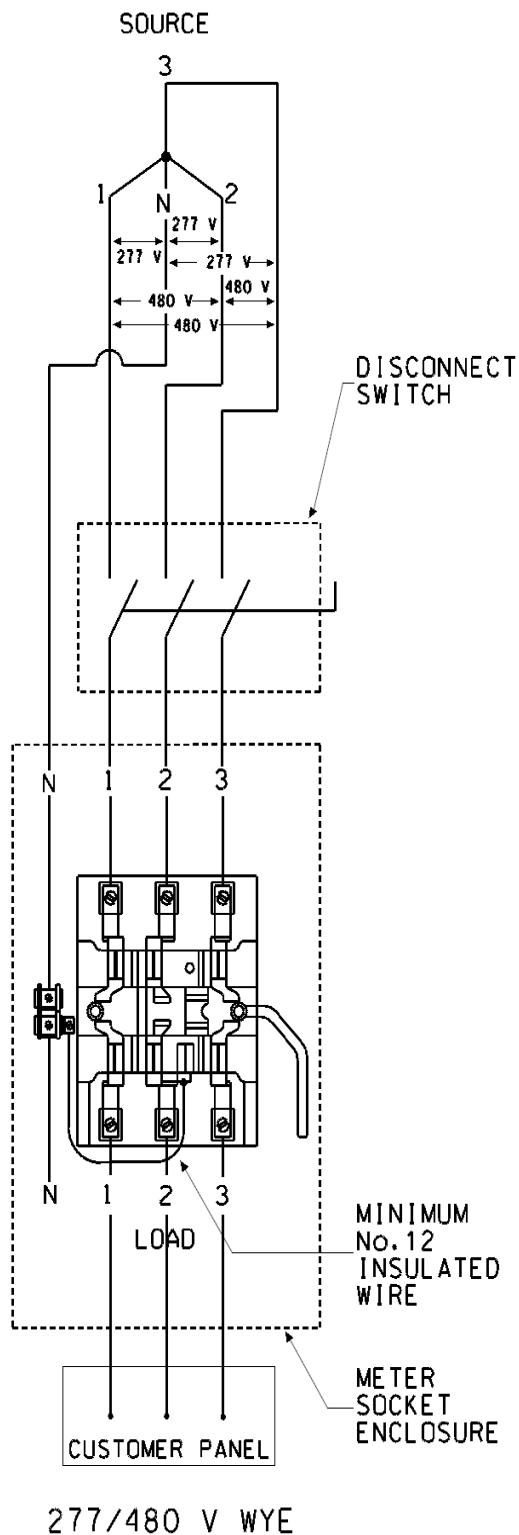
1. The meter sockets shall meet Company specifications, see Appendix A.
2. Working space in front of service entrance equipment and meter sockets shall be in accordance with *NEC* Section 110.26. Refer to page 21 for Meter Clearances.
3. When using aluminum conductors, wire brush the conductors and apply oxide inhibitor on all connections.
4. When the neutral is not continuous through the meter socket, a dual lug neutral connector shall be used.
5. 120/208 V 3-wire is normally available only from a 3-phase 120/208 V 4-wire service entrance. 200 ampere service may be available in certain areas. Consult your Company representative.
6. Spring, clip type add-on 5th terminals are not allowed.
7. Commercial installations require a manual clamping jaw lever bypass.

SELF-CONTAINED METER SOCKET WIRING
3-PHASE 120/240 V, 4-WIRE, 400 A MAX.
3-PHASE 120/208 V, 4-WIRE, 400 A MAX.



1. If the service size is 400 amps or less, self-contained metering will be used.
2. The meter sockets shall meet Company specifications, see Appendix A.
3. Working space of not less than 36 inches in front of service entrance equipment and meter sockets and 30 inches wide shall be maintained in accordance with *NEC* Section 110.26. (Reference page 21)
4. When using aluminum conductors, wire brush the conductors and apply oxide inhibitor on all connections.
5. The neutral, if insulated, shall be identified by a white or gray covering, or white paint or tape. (Reference page 30)
6. The high phase of a 120/240 V installation shall be identified by orange color, either insulation, paint, or tape, in accordance with *NEC* Section 110.15 and Section 230.56. (Reference page 30)
7. The high phase (wild leg) of a 120/240 V installation must be on the right hand terminals of the self-contained meter socket. (Reference page 30)
8. Commercial installations require a manual clamping jaw lever bypass.

SELF-CONTAINED METER SOCKET WIRING 3-PHASE 277/480 V, 4-WIRE, 400 A OR LESS



1. If the service size is 400 amps or less, self-contained metering will be used.
2. The meter sockets shall meet Company specifications, See Appendix A.
3. 277/480 V self-contained meter settings are limited to installations rated 400 A or less.
4. A disconnect switch shall be installed on the source side, immediately adjacent to each 277/480 V self-contained meter setting in a cold sequenced “switch-meter-load” configuration. The switch shall have provisions for padlocking in the open position and for installing a Company seal in the closed position. The disconnect may be fused or unfused depending on what is needed to meet MEC and *NEC* fault current requirements for the particular application. It is the customer’s responsibility to determine if the disconnect switch should be fused or unfused. (Reference page 63)
5. A “480 VOLTS” identification (decals or permanently painted orange or yellow letters) shall be applied in a conspicuous location on the front exterior surface of the meter socket enclosure. Lettering is to be legible and 3/4” minimum height.
6. The neutral, if insulated, shall be identified by a white or gray covering, or white paint or tape. (Reference page 30)
7. When using aluminum conductors, wire brush the conductors and apply an oxide inhibitor on all connections.
8. Working space of not less than 36 inches in front of service entrance equipment and meter sockets and 30 inches wide shall be maintained in accordance with *NEC* Section 110.26. (Reference page 21)
9. The neutral shall be installed from the source to the overcurrent device.
10. Commercial installations require a manual clamping jaw lever bypass.

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SELF-CONTAINED METER SOCKET WIRING

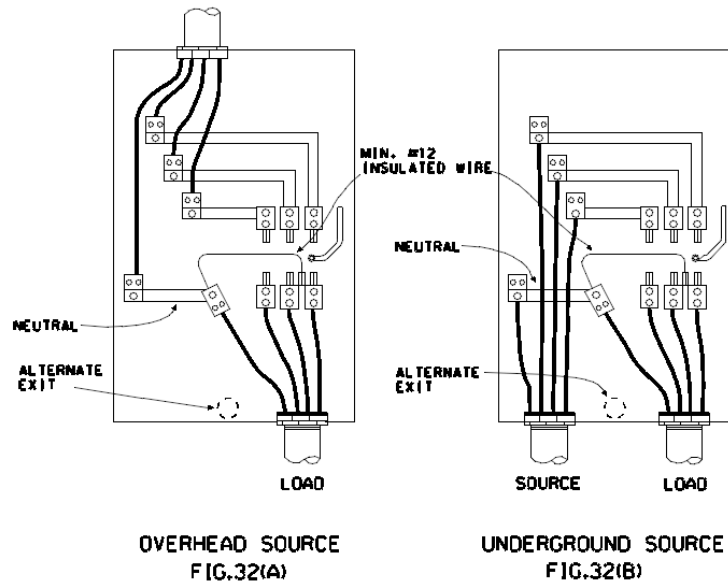
3-PHASE 120/240 V, 4-WIRE, 400 A MAX.

3-PHASE 120/208 V, 4-WIRE, 400 A MAX.

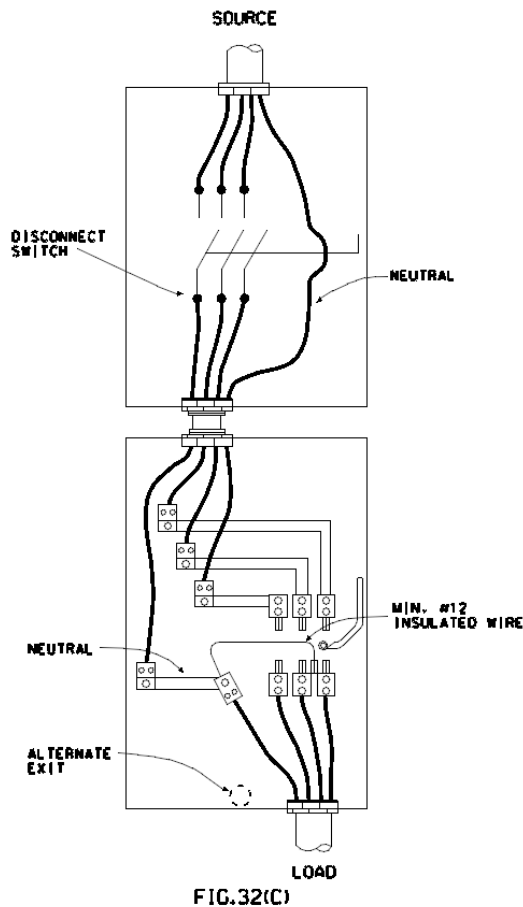
3-PHASE 277/480 V, 4-WIRE, 400 A MAX.

1. If the service size is 400 amps or less, self-contained metering will be used.
2. The meter sockets shall meet Company specifications, see Appendix A.
3. A disconnect switch shall be installed on the source side, immediately adjacent to each 277/480 V self-contained meter setting in a cold sequenced “switch-meter-load” configuration. The switch shall have provisions for padlocking in the open position and for installing a Company seal in the closed position. The disconnect may be fused or unfused depending on what is needed to meet MEC and *NEC* fault current requirements for the particular application.
4. Working space in front of service entrance equipment and meter sockets shall be in accordance with *NEC* Section 110.26.
5. When using aluminum conductors, wire brush the conductors and apply an oxide inhibitor on all connections.
6. The neutral, if insulated, shall be identified by a white or gray covering, or white paint or tape. (Reference page 30.)
7. The high phase (wild leg) of a 120/240 V installation shall be identified by orange color, either insulation, paint or tape. (Reference page 30.)
8. A “480 VOLTS” identification (decal or permanently painted orange or yellow letters) shall be applied in a conspicuous location on the front exterior surface of the meter socket enclosure. Lettering is to be legible and 3/4” minimum height.
9. Commercial installations require a manual clamping jaw lever bypass.

**SELF-CONTAINED METER SOCKET WIRING
3-PHASE 120/208, 120/240 V, 4-WIRE 320A SOCKET, 400A ENTRANCE**



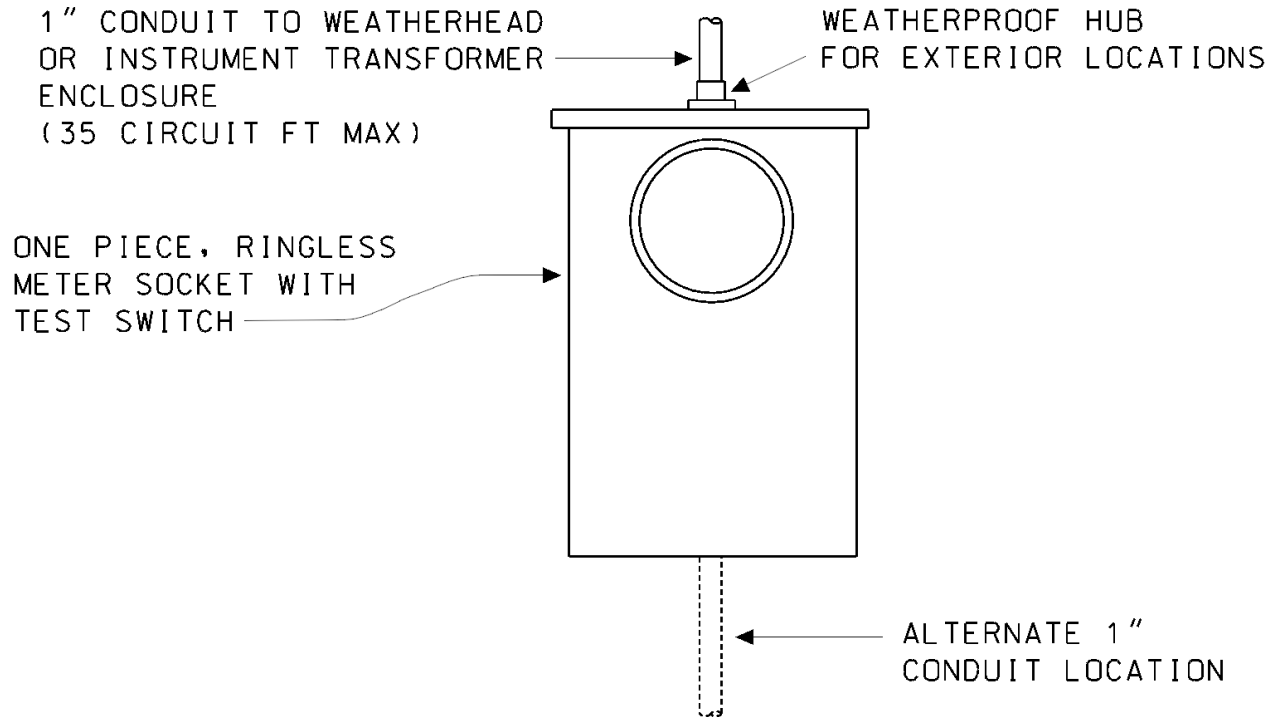
**SELF-CONTAINED METER SOCKET WIRING
3-PHASE 277/480 V, 4-WIRE 320A SOCKET, 400A ENTRANCE**



INSTRUMENT TRANSFORMER METERING GREATER THAN 400 A

1. Meter sockets shall not be mounted more than **35 circuit feet** from instrument transformers.
2. Meters will be furnished and installed by the Company.
3. Test switches shall be furnished by the customer. See Appendix D for specifications.
4. Meter sockets shall be bonded to the grounding electrode conductor.
5. Insulated bushings are required on all conduits.
6. Working space in front of service entrance equipment and meter sockets shall be in accordance with *NEC* Section 110.26.
7. Spring, clip-type add-on 5th terminals are not allowed.
8. Customer supplies and installs meter socket and test switch.
9. Meter sockets shall be weatherproof for exterior locations.
10. See Appendix C-1 for instrument transformer requirements.
11. All cabinet mounted CT's shall be bar type.
12. The instrument transformer enclosure(s) shall be mounted outdoors. Consult your Company representative for an approved location.
13. The 1" conduit from the meter socket enclosure to the instrument transformer enclosure must be continuous and contain less than three 90 degree bends. **The use of any conduit body fitting (LB, LL, LR, etc.) is prohibited.**

INSTRUMENT TRANSFORMER METERING GREATER THAN 400 A

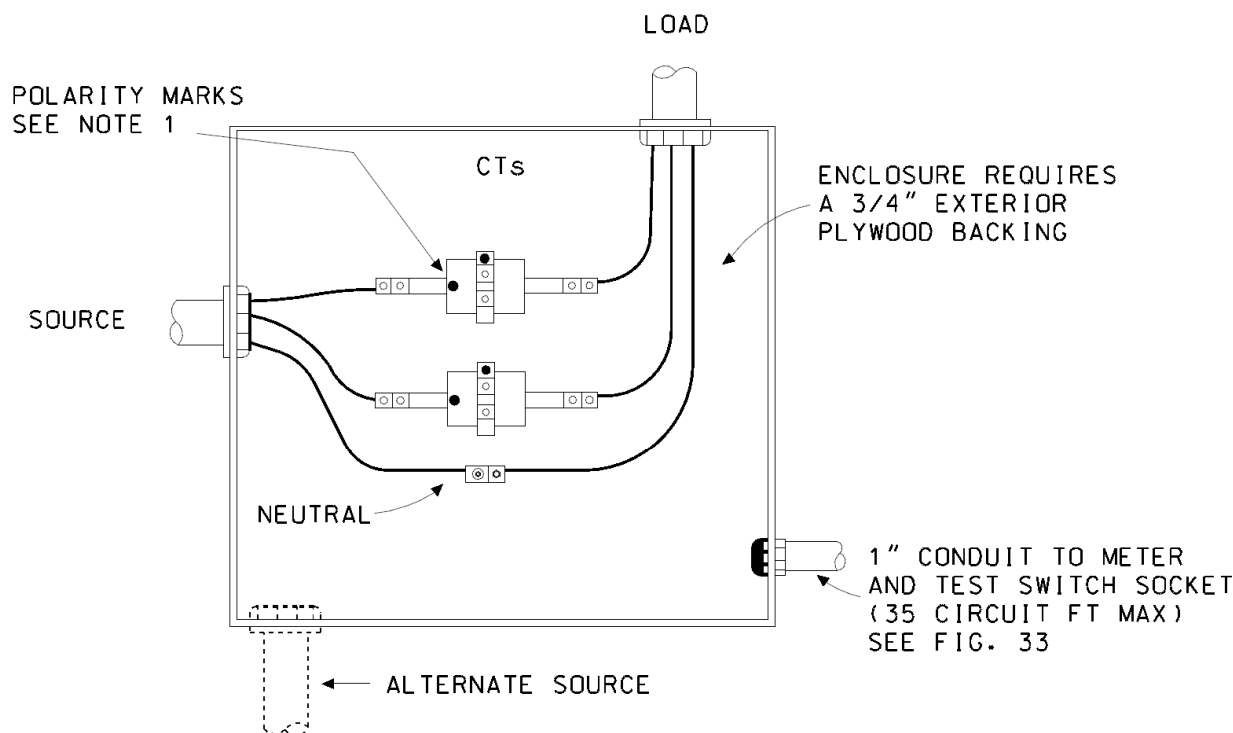


SERVICE	SOCKET
1-PHASE, 120/240 V, 3-WIRE, W/1 CT	5 TERMINAL, W/TEST SWITCH
1-PHASE, 120/240 V, 3-WIRE, W/2 CTs	6 TERMINAL, W/TEST SWITCH
3-PHASE, 4-WIRE, W/3 CTs	13 TERMINAL, W/TEST SWITCH

INSTRUMENT TRANSFORMER WIRING

1-PHASE 120/240 V, 3-WIRE

GREATER THAN 400 A

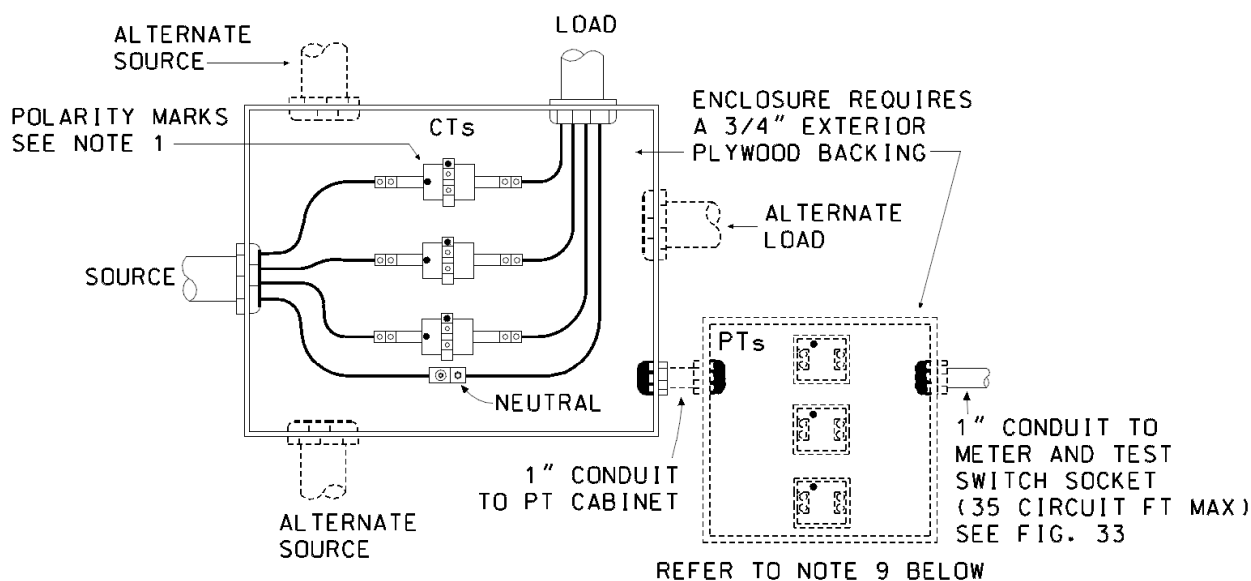


TRANSFORMER ENCLOSURE

REFER TO APPENDIX C FOR ALL INSTRUMENT TRANSFORMER ENCLOSURES
SEE FIG. 27 & 28 FOR SERVICES RATED 400 A OR LESS

1. The CTs shall be mounted so that the polarity marks are arranged facing source side.
2. Insulated bushings are required on all conduits.
3. Instrument transformer enclosures shall be grounded per *NEC* Article 250.
4. Covers on all instrument transformer cabinets shall be hinged on the side.
5. Bar type CTs will be used in instrument transformer enclosures and will be provided by the Company.
6. The neutral shall be available in the instrument transformer enclosure for connection of the meter potential leads.
7. In unusual conditions, contact your Company representative.
8. CT's shall be installed so they may be removed without access to the back of the cabinet.
9. See Appendix C-1 for instrument transformer requirements.

INSTRUMENT TRANSFORMER WIRING
3-PHASE 120/240 V, 4-WIRE DELTA
3-PHASE 120/208 V, 4-WIRE WYE
3-PHASE 277/480 V, 4-WIRE
GREATER THAN 400 A



TRANSFORMER ENCLOSURE

REFER TO APPENDIX C FOR ALL INSTRUMENT TRANSFORMER ENCLOSURES

1. The CTs and PTs, if required, shall be mounted so that the polarity marks are arranged facing source side.
2. Insulated bushings are required on all conduits.
3. Instrument transformer enclosures shall be grounded per *NEC* Article 250.
4. Covers on all instrument transformer cabinets shall be hinged on the side with heavy-duty hinges.
5. Bar type CTs will be used in instrument transformer enclosures and will be provided by the Company.
6. The high phase conductor of a 120/240 V Delta installation shall be identified by orange insulation, paint or tape at the weatherhead, CT connections, and all other terminations.
7. The neutral shall be available in the instrument transformer enclosure for connection of the meter potential leads. The neutral connector shall be UL listed and insulated from the instrument transformer cabinet.
8. In unusual conditions, contact your Company representatives.
9. PT cabinets required only for 277/480 V installations (See Appendix C-1 for dimensions). Contact a Company representative for details.
10. In a metering device, defined as a meter socket or CT cabinet, one conductor may be secured in a lug; multiple lugs, each with a single conductor, may be used to parallel conductor to a device or may run to other devices in the same area.
11. CT's shall be installed so they may be removed without access to the back of the cabinet.

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APPENDICES

REQUIREMENTS FOR METER MOUNTING EQUIPMENT

1. ENCLOSURE MATERIALS

- Meter sockets shall meet Company specifications and shall be UL Listed.
- Shall be steel (plated or made of galvanized steel) or aluminum.
- The finish shall be tough, non-fading and have a long service life.

2. INSULATING MATERIALS

- Bus Support – Shall be high strength and track-resistant.
- Sheet Insulation – High dielectric strength.
- Insulating materials meet UL requirements.

3. MOUNTING BASES

- Shall be high impact strength, track-resistant.

4. SAFETY SHIELD BARRIERS

- Shall be track-resistant.

5. CONNECTORS

- Shall have high strength tops.
- Single hex screw and floating pressure pad; shall be tin-plated, suitable for copper or aluminum wire; shall have a built-in, anti-turn provision.
- Shall meet UL requirements for electrical connectors.
- Only one conductor per lay in connector is allowed.

6. JAWS

- Shall be tin-plated electrolytic copper. Jaws rated at 100 A and above shall be spring reinforced.
- Spring, clip type add-on 5th terminals are not allowed.

7. COVERS

- Shall be one piece.
- Shall be lockable using a hasp-type lock.
- Shall be ringless type.

8. INSTALLATION EASE

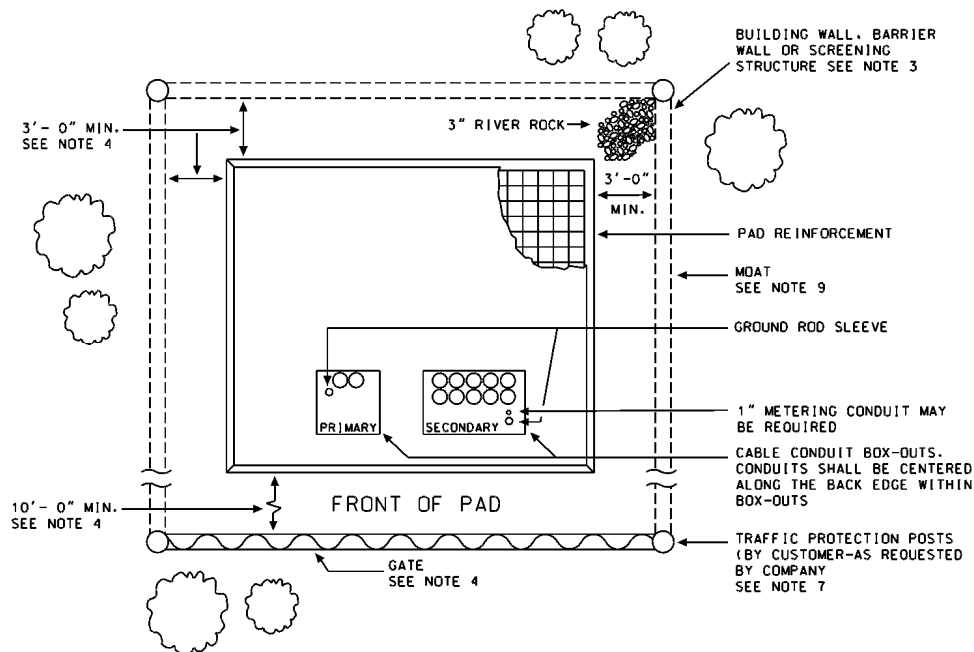
- Door shall be removable for installation ease.
- Terminals shall accept copper or aluminum wire for installation flexibility.
- Enclosure shall have a broad range of concentric knock-outs to accommodate varied wiring needs.
- Residential meter sockets rated greater than 200 amps require a manual clamping jaw bypass.
- Commercial installations require a manual clamping jaw lever bypass.

NOTE: METER MOUNTING EQUIPMENT IS NOT ACCEPTABLE IF:

- Designed for flush-mounting only.
- Equipped with automatic bypass or sliding bar bypass.
- Equipped with ring-type mounting cover.
- Used for UG application when specifically manufactured only for overhead application.
- Not UL approved.

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LOCATION OF CUSTOMER FURNISHED PADS FOR 3-PHASE PAD-MOUNTED TRANSFORMERS (ALL SIZES)



Three-phase transformer pads must be:

1. Installed by the customer at the customer's expense. Ongoing maintenance and repair to the pad are the responsibility of the customer.
2. Constructed in a manner satisfactory to the Company, in a mutually agreed upon location with hard surface access and unobstructed work space for large vehicles.
3. The installation of a screening or barrier structure may be required by your local governing authority. It is the customer's responsibility to determine if a barrier structure is required. If screening or a barrier structure is required, or installed as an optional feature, the clearance limitations of notes 2 and 3 must be maintained.
4. A 3'-0" minimum clearance is to be maintained from pad sides and back, to the nearest structure or plantings. A level graded, 10'-0" minimum clearance is to be maintained from the front of pad, to the nearest fixed structure or plantings. If a full length gate is installed, it shall be hinged and no closer than 3'-0" from pad front. Local government, fire protection, and building codes may require greater clearances. Customer will avoid plantings or construction that interferes with Company's required maintenance access to its equipment. If a fence or barrier is to be installed, it must be coordinated with the Company.
5. All conduits shall extend 5'-0" beyond the pad and screening structure (if used) and the locations of the ends of primary conduits shall be identified. Primary conduit shall be installed between 42" and 48" below final grade. Secondary conduit shall be installed between 30" and 42" below final grade.
6. When metallic conduit is utilized, customer shall install grounding bushings.
7. When necessary for traffic protection, set a 4" diameter concrete-filled galvanized steel post 3'-0" from pad corner. Post shall be 8' long with a 4' concrete embedment.
8. All Company transformers shall be located in mutually agreed upon location with hard surface access and unobstructed work space for large vehicles. If special equipment, such as a crane, is required for setting or replacing the transformer, the customer shall pay all expenses.
9. A trench 2'-0" deep and 3'-0" wide will be dug on all four sides. The trench will be lined with silt fence fabric and filled with 3" screened river rock to final grade. Contact local engineering representative if design needs modification.

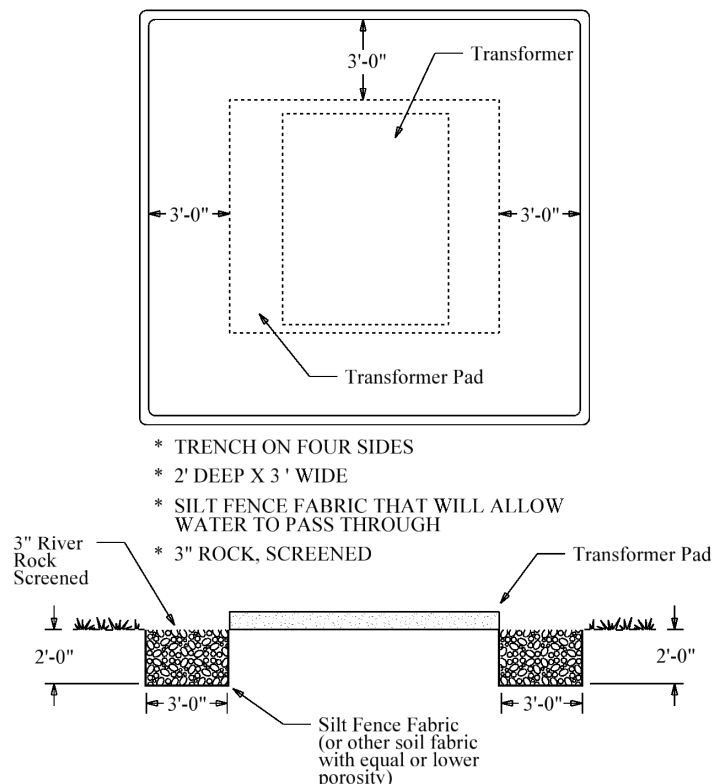
SPILL PREVENTION, CONTROL AND COUNTERMEASURE (SPCC) PLANS AND OIL CONTAINMENT FOR CUSTOMER FURNISHED PADS FOR 3-PHASE PAD-MOUNTED TRANSFORMERS (ALL SIZES)

Federal regulations prohibit the discharge of oil onto or into navigable waters of the United States or adjoining shorelines. A facility with aggregate above ground oil storage capacity of more than 1,320 gallons (counting only containers with oil storage capacity of 55 gallons or more) which could reasonably be expected to discharge oil to navigable waters of the United States, must prepare a Spill Prevention, Control and Countermeasure (SPCC) Plan. More specifically, whenever MidAmerican owned equipment at a customer facility exceeds this threshold (customer owned oil filled equipment at the site excluded), a plan must be prepared. This requirement affects bulk oil containers, oil-filled electrical equipment and oil-filled process equipment. Development of a site-specific SPCC Plan requires detailed knowledge of the facility and the potential effects of any oil release. Each SPCC Plan must include certain standard elements to ensure compliance with federal regulations. One of the elements is a description of appropriate containment and/or diversionary structures or equipment designed to prevent a discharge of oil to the environment.

Due to potential for oil release from oil-filled electrical equipment, any proposed facility that includes installation of 3-phase padmount transformers (any size) will incorporate secondary containment measures to minimize a potential oil release. The following secondary containment design is recommended. An alternate design may be used with approval by MidAmerican Energy.

For additional information on oil spill prevention or SPCC Plans, contact MidAmerican Energy Company, environmental services, at 515- 281-2951.

To discuss an alternative containment design, contact local MidAmerican Energy Company, distribution engineering personnel.



CONCRETE PAD SPECIFICATION

3-PHASE PAD-MOUNTED TRANSFORMERS

1.0 GENERAL

1.1 Scope of Work

The Contractor shall furnish all labor, materials, formwork, equipment, and services required to complete all concrete pad work shown on the drawings specified in this appendix.

1.2 Quality Assurance

1.2.1 Codes and Standards:

Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ACI 301 "Specifications for Structural Concrete for Buildings."

ACI 318 "Building Code Requirements for Reinforced Concrete" Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

1.2.2 Concrete Testing Service:

The Contractor may be required to employ a testing laboratory acceptable to the Company to perform material evaluation tests and to design concrete mixes.

2.0 MATERIALS

2.1 Form Materials

Forms for Exposed Finish Concrete: Unless otherwise indicated, construct framework for concrete surfaces with construction lumber, plywood, metal, metal framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without deflection.

2.2 Reinforcing Materials

2.2.1 Reinforcing Bars (ReBar):

ANSI/ASTM A 615 Grade 40, Deformed.

2.2.2 Welded Wire Fabric (WWF):

ANSI/ASTM A 185, Welded steel wire fabric.

2.2.3 Supports for Reinforcement:

Provide supports (including bolsters, chairs, and spacers) for positioning reinforcing bars and welded wire fabric in place.

2.3 Concrete Materials

2.3.1 Cement shall conform to the latest revised standard specification for Portland Cement, ASTM C 150, Type 1, or standard specification for blended hydraulic cements, ASTM C 595.

CONCRETE PAD SPECIFICATION

3-PHASE PAD-MOUNTED TRANSFORMERS

2.0 MATERIALS (Continued)

2.3 Concrete Materials (Continued)

- 2.3.2 Concrete aggregates shall conform to the latest revised standard specification for concrete aggregates, ASTM C 33. **Use crushed limestone for all aggregates.** Maximum coarse aggregate size shall be not more than 1-1/2 inches.
- 2.3.3 All mixing water shall be clean and free from deleterious amounts of acids, alkaline, or organic materials.
- 2.3.4 Air-entraining admixtures for concrete shall conform to the latest revised standard specifications for air-entraining admixtures for concrete, ASTM C260.
- 2.3.5 Calcium chloride is not permitted.
- 2.3.6 All other materials used in the concrete shall conform to current applicable ASTM specifications.

3.0 SUBGRADE PREPARATION

3.1 Material

- 3.1.1 All soft and yielding material and portions of the subgrade that will not compact readily when rolled or tamped shall be removed and replaced with suitable material.

3.2 Compaction

- 3.2.1 The subgrade shall be brought to a firm and unyielding condition.
- 3.2.2 Soil greater than/or equal to 95% Proctor density or 55 psi presumptive bearing value (pbv).
- 3.2.3 Soil should be compacted at or slightly above standard optimum moisture.

3.3 Moisture Barrier

- 3.3.1 A minimum 6 mil polyethylene film shall be placed on top of the sand leveling bed prior to pouring the concrete.

4.0 CONCRETE SPECIFICATIONS

4.1 General

- 4.1.1 All concrete shall have a minimum 28-day compressive strength of 3500 psi.
- 4.1.2 Concrete shall be produced with a minimum cement content of 520 lb per cubic yard and an entrained air content of 7% by volume.
- 4.1.3 Maximum allowable concrete slump shall be 4 inches.
- 4.1.4 Where it can be shown that adequate strength, surface finish, and durability can be obtained on a consistent basis with mix designs other than those specified above, such designs may be used upon written approval.

CONCRETE PAD SPECIFICATION

3-PHASE PAD-MOUNTED TRANSFORMERS

5.0 EXECUTION

5.1 Forms

- 5.1.1 Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work of finished structure.
- 5.1.2 Provide for openings, sinkages, chamfers and blocking in the structure.
- 5.1.3 Fabricate forms for easy removal without hammering or prying against concrete surfaces.

5.2 Placing Reinforcement

- 5.2.1 Clean reinforcement of loose rust, mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- 5.2.2 Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations.
- 5.2.3 Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers as required.
- 5.2.4 Place reinforcement to obtain adequate concrete protection.

5.3 Concrete Placement

- 5.3.1 Preplacement Inspections: **Before placing concrete, the Contractor shall give the Company 2 business days notification.** All items to be embedded will be exposed at the time of the inspection. The Company will not place a transformer on a concrete pad that has not been inspected. The Company has the right to request the Contractor to replace the pad due to failure to properly and timely request such inspection.

5.3.2 Temperature

- a. When air temperature is between 85°F and 90°F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes.
- b. When air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.
- c. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures.
- d. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.
- e. At any time the ambient temperature is expected to fall below 32°F, the concrete shall be immediately protected and maintained at a surface temperature of 40°F for a period of 7 days after placing.
- f. Use of frozen materials or materials containing ice or snow is not permitted. Concrete shall not be placed on frozen subgrade or subgrade containing frozen materials.

CONCRETE PAD SPECIFICATION

3-PHASE PAD-MOUNTED TRANSFORMERS

5.0 EXECUTION (Continued)

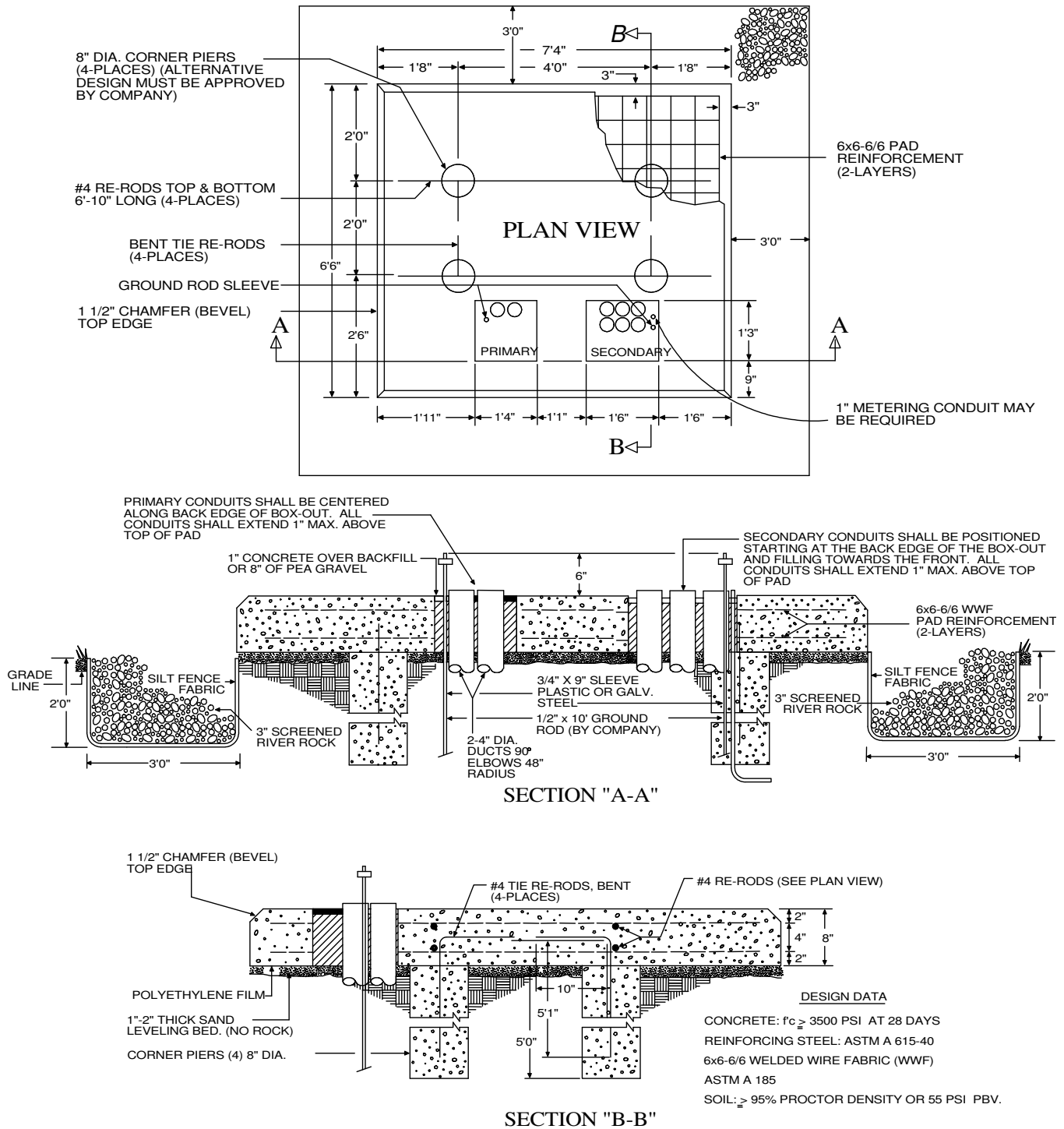
- 5.3.3 Deposit concrete continuously and as nearly as practicable to its final location to avoid segregation.
- 5.3.4 Consolidation
 - a. Consolidate placed concrete by mechanical vibrating equipment so that concrete is thoroughly worked around reinforcement and other embedded items.
 - b. Use equipment and procedures for consolidations of concrete in accordance with ACI recommended practices.
 - c. Excessive or over vibration will not be permitted.
- 5.3.5 Maintain reinforcing in proper position during concrete placement operation.
- 5.3.6 Bring slab surfaces to correct level with straight edge and strike-off. Use bull floats, darbies or hand floats to smooth surface free of humps or hollows. The finished slab shall be level.

6.0 FINAL INSPECTION

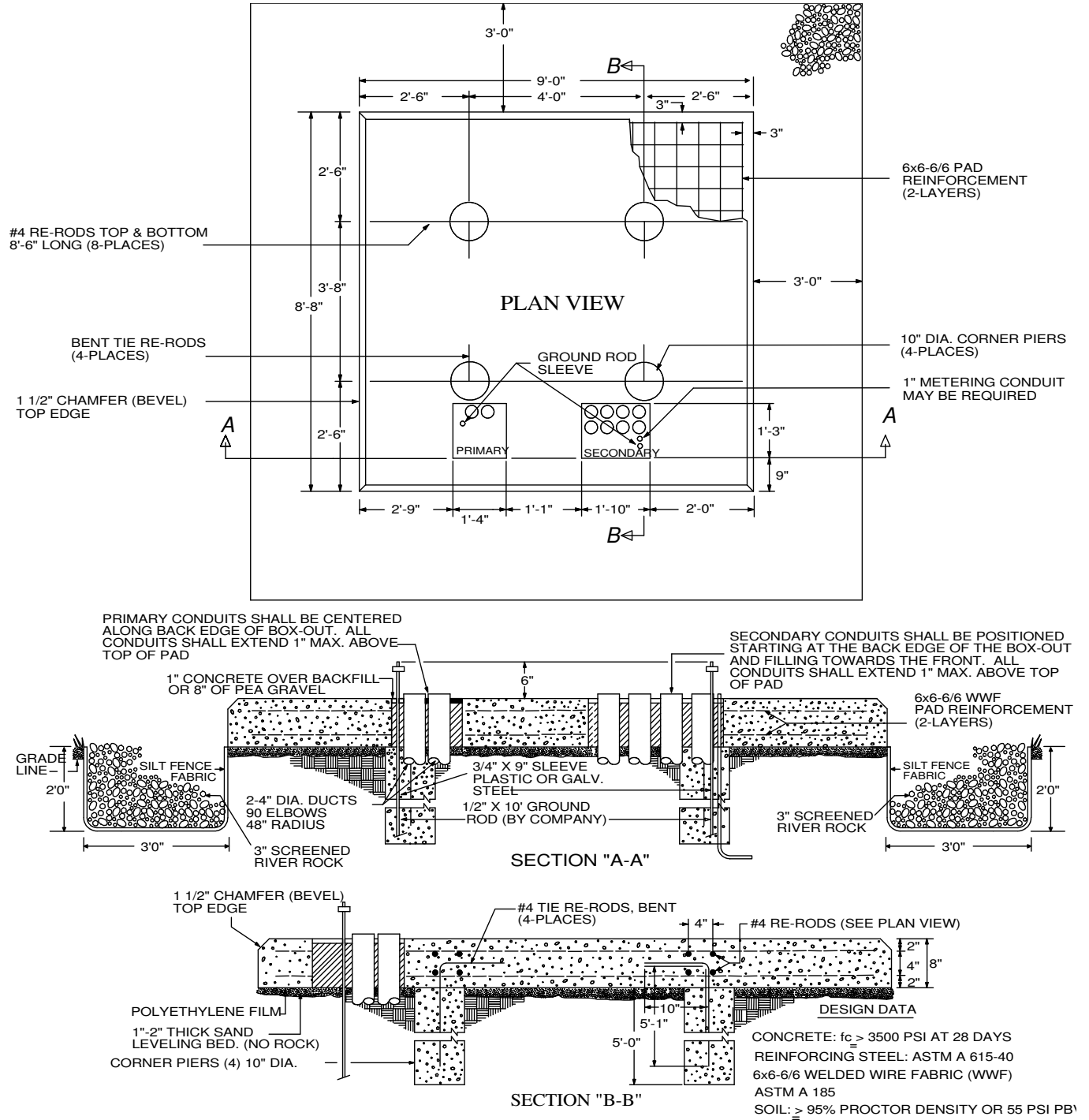
6.1 Finish Work

- 6.1.1 Apply non-slip broom-finish to exposed concrete.
- 6.1.2 Seal concrete with a standard concrete sealer. Apply sealing compound to concrete as soon as final finishing operations are complete (within two (2) hours). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions.
- 6.1.3 Let concrete cure for 24 hours before removing forms without putting undo pressure on concrete that may cause chipping or cracking.
- 6.1.4 Backfill and tamp around pad where applicable.
- 6.1.5 All edges are to be finished with an edger.
- 6.1.6 Contact the appropriate Company office for an inspection after the framework is placed. Two business days notice shall be given to the Company for this inspection.

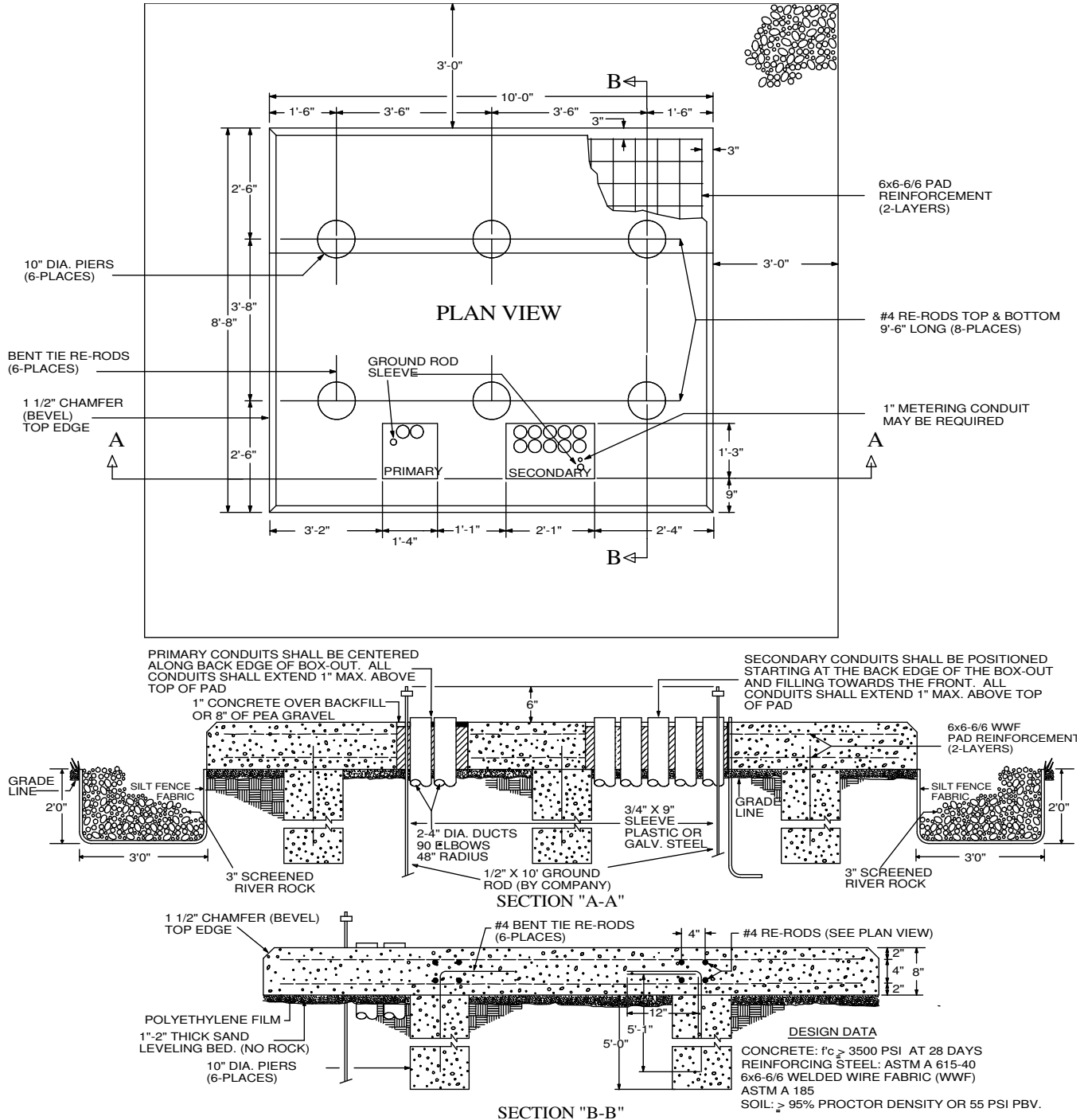
CONSTRUCTION DETAILS **CUSTOMER FURNISHED PADS FOR** **3-PHASE PAD-MOUNTED TRANSFORMERS** **75-500 kVA**



CONSTRUCTION DETAILS **CUSTOMER FURNISHED PADS FOR** **3-PHASE PAD-MOUNTED TRANSFORMERS** **750-1000 kVA**



CONSTRUCTION DETAILS CUSTOMER FURNISHED PADS FOR 3-PHASE PAD-MOUNTED TRANSFORMERS 1500-2500 kVA



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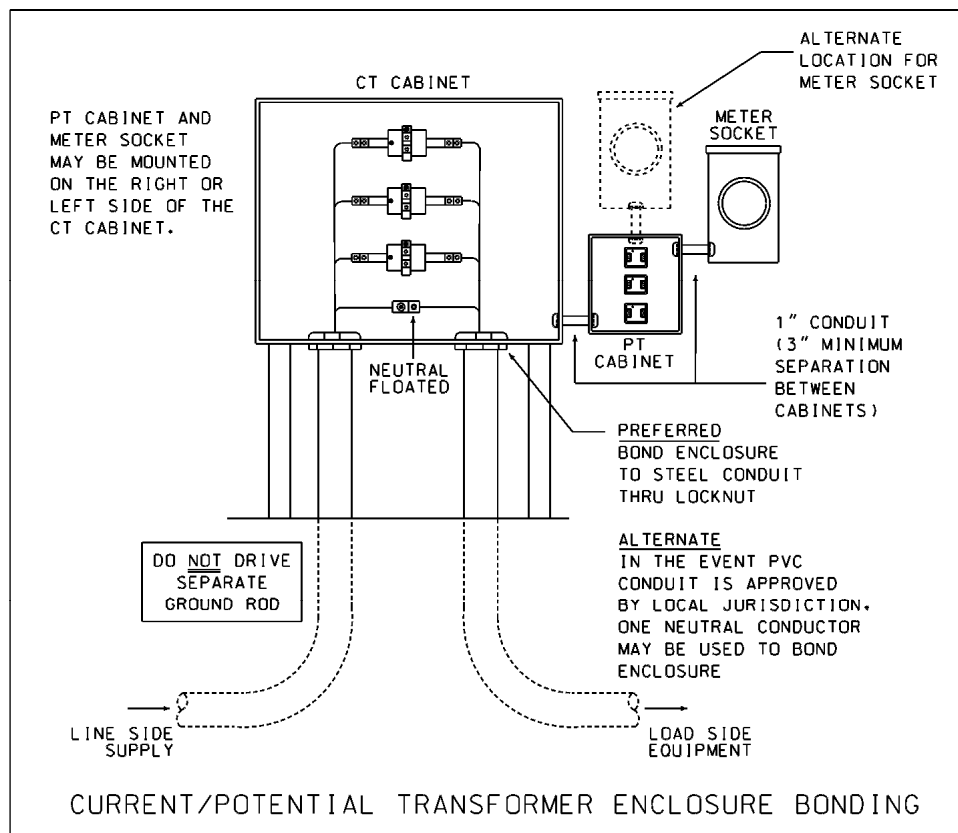
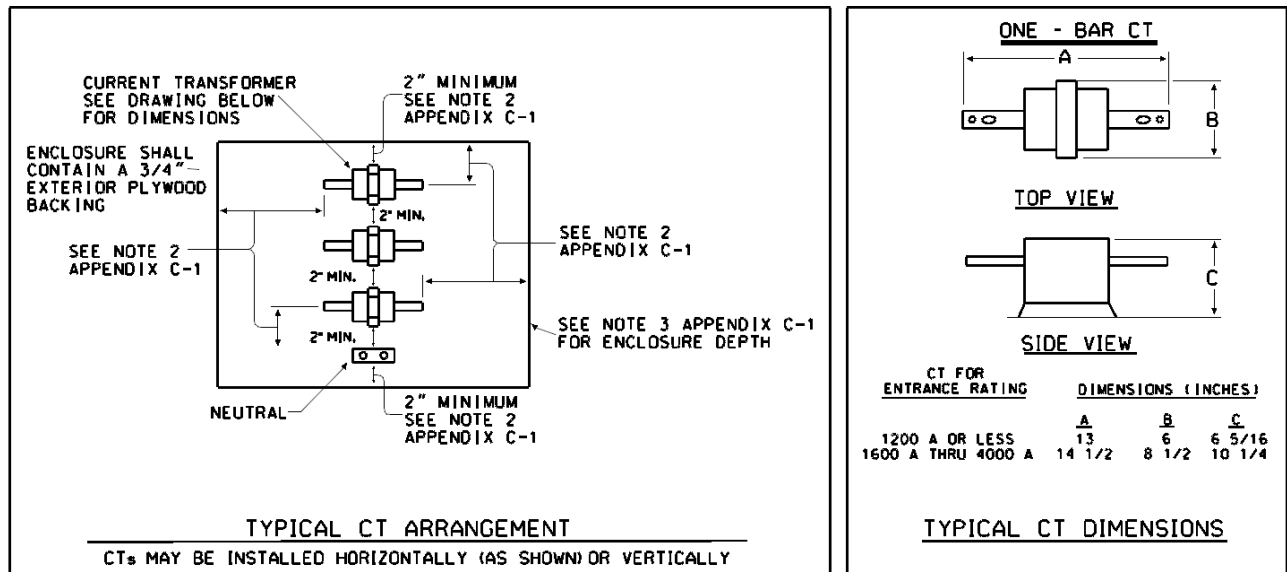
HINGED INSTRUMENT TRANSFORMER ENCLOSURES

1. The fabrication requirements and minimum sizes for enclosures shall conform to *NEC* Article 312. The size of separate potential transformer (PT) enclosures, when required, is indicated in Note 4 below. The remaining information applies to the minimum size for current transformer (CT) enclosures.
2. Space requirements for wire bends as specified in *NEC* Tables 312.6(A) and 312.6(B) will affect these dimensions, depending on the wire exit arrangement. The customer has the option to use the CT size and spacing information shown in Appendix C-2, along with the *NEC* tables, to determine the minimum size required as directed by the *NEC*, or to use the simplified enclosure size reference shown on Appendix C-3 through C-6. The customer shall contact a Company representative for approval of exceptions to these arrangements or when it is preferred to mount the CTs and PTs in the same enclosure.
3. The minimum CT enclosure depth will vary depending on entrance size as follows:

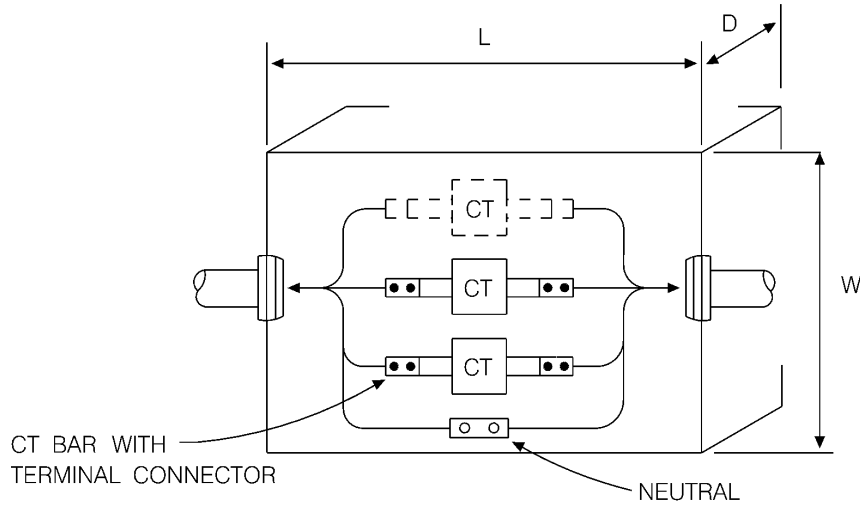
<u>Entrance</u>	<u>Depth</u>
1200 A or smaller	10"
Larger than 1200 A	12"

4. The minimum size of the PT enclosure shall be 22" wide x 22" high x 10" deep.
5. The top of instrument transformer enclosures shall be no more than 6 feet and the bottom no less than 2 feet above the final grade, centered as best as possible. Working space in front of enclosures shall be in accordance with *NEC* Section 110.26.
6. A hinged cover (with heavy-duty, pin type hinges on the side of the box) is required, with a latch no more than 5 feet above the floor. If the enclosure is 48 inches or wider, the cover shall be split, and hinged at each side. All hinged covers shall be installed with sufficient clearance to open at least 90 degrees. All enclosures shall have provisions for sealing and/or padlocking capabilities.
7. The enclosures shall be weatherproof. Aluminum or stainless steel is recommended.
8. Securing covers in place with multiple screws is not acceptable.
9. Company provided current transformers and potential transformers may be mounted by the manufacturer in a customer's factory fabricated switchgear. Contact your Company representative for details. Before fabrication, switchgear shop drawings shall be submitted to the appropriate Company representative for review and approval of instrument transformer mounting details.
10. Refer to Section 8.0 in this manual for connection requirements when using bar type CTs.
11. No customer equipment or other wiring shall be allowed in or to pass through the instrument transformer enclosure.
12. Enclosure requires a 3/4" exterior plywood backing.
13. Instrument transformer enclosures shall be grounded per *NEC* Article 250 and Company requirements as shown in Appendix C-2.

HINGED INSTRUMENT TRANSFORMER ENCLOSURES



CURRENT TRANSFORMER ENCLOSURE SIZE REQUIREMENTS GREATER THAN 400 A

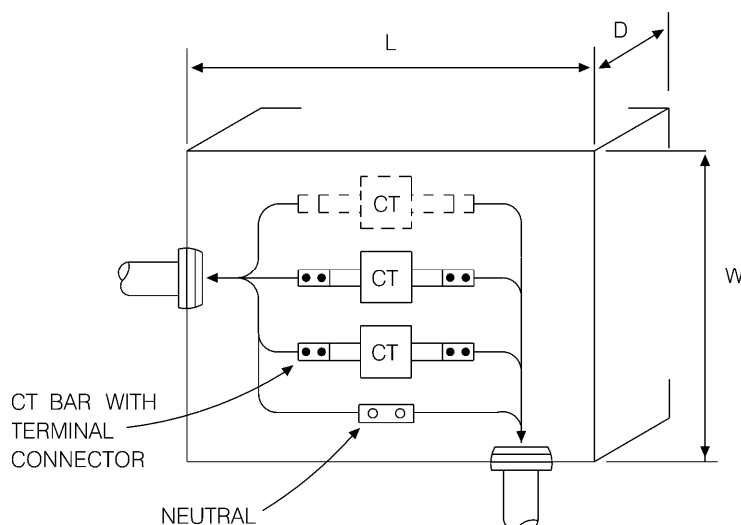


MINIMUM CT ENCLOSURE SIZE REQUIREMENTS (DIMENSIONS L, W, D)

WIRE SIZE	NUMBER OF WIRES PER TERMINAL CONNECTION				
	1	2	3	4	5
	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)
4/0	29-26-10	30-26-10	32-26-10	—————	—————
250	32-26-10	32-26-10	33-26-10	35-26-10	—————
300	35-26-10	35-26-10	37-26-10	39-26-10	—————
350	39-26-10	39-26-10	41-26-10	43-26-10	—————
400	41-26-10	41-26-10	43-26-10	45-26-10	47-35-12♦
500	43-26-10	43-26-10	45-26-10	49-35-12♦	49-35-12
600	45-26-10	47-26-10	51-26-10	55-35-12♦	55-35-12
700	47-26-10	51-26-10	55-26-10	61-35-12	61-35-12
750	49-26-10	53-26-10	61-35-12♦	65-35-12	65-35-12

1. The above W dimensions are for three CT installations. Subtract 8" to obtain the W dimensions for two CT installations.
2. Dimensions followed by a ♦ may be reduced as follows if aluminum wire is used: Reduce L by 2" and reduce W by 9". All other dimensions apply when aluminum or copper wire is used.
3. Refer to Appendix C-1 for general information.
4. Two or three CT versions of this arrangement may be installed horizontally (as shown), or vertically, or opposite hand. Rotate the page around until the diagram fits the preferred arrangement.

CURRENT TRANSFORMER ENCLOSURE SIZE REQUIREMENTS GREATER THAN 400 A

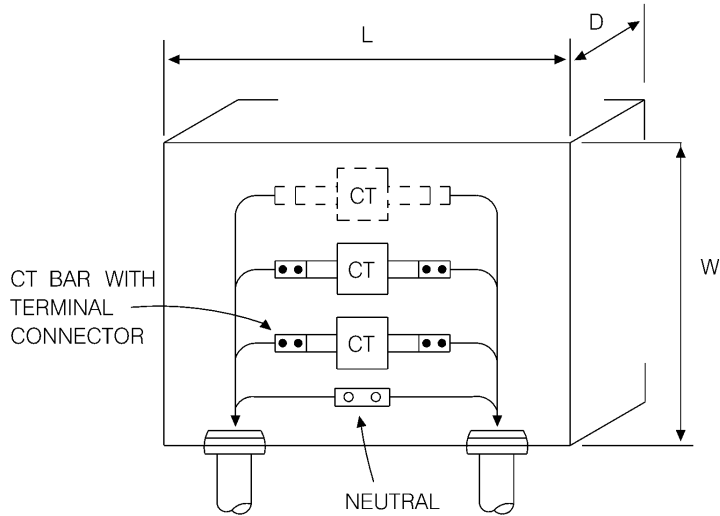


MINIMUM CT ENCLOSURE SIZE REQUIREMENTS (DIMENSIONS L, W, D)

WIRE SIZE	NUMBER OF WIRES PER TERMINAL CONNECTION				
	1	2	3	4	5
	L-W-D	L-W-D	L-W-D	L-W-D	L-W-D
	(INCHES)	(INCHES)	(INCHES)	(INCHES)	(INCHES)
4/0	26-26-10	29-27-10	32-29-10	_____	_____
250	28-26-10	30-27-10	32-29-10	35-31-10	_____
300	30-26-10	33-29-10	36-31-10	39-33-10	_____
350	32-26-10	35-29-10	38-31-10	41-33-10	_____
400	34-27-10	36-29-10	39-31-10	42-33-10	46-43-12♦
500	35-27-10	37-29-10	40-31-10	45-41-12♦	47-43-12
600	38-29-10	41-31-10	45-33-10	50-43-12♦	52-45-12
700	39-29-10	43-31-10	47-33-10	53-43-12	55-45-12
750	40-29-10	46-33-10	53-43-12♦	57-45-12	59-47-12

1. The above W dimensions are for three CT installations. Subtract 8" to obtain the W dimensions for two CT installations.
2. Dimensions followed by a ♦ may be reduced as follows if aluminum wire is used: Reduce L by 2" and reduce W by 7". All other dimensions apply when aluminum or copper wire is used.
3. Refer to Appendix C-1 for general information.
4. Two or three CT versions of this arrangement may be installed horizontally (as shown), or vertically, or opposite hand. Rotate the page around until the diagram fits the preferred arrangement.

CURRENT TRANSFORMER ENCLOSURE SIZE REQUIREMENTS GREATER THAN 400 A

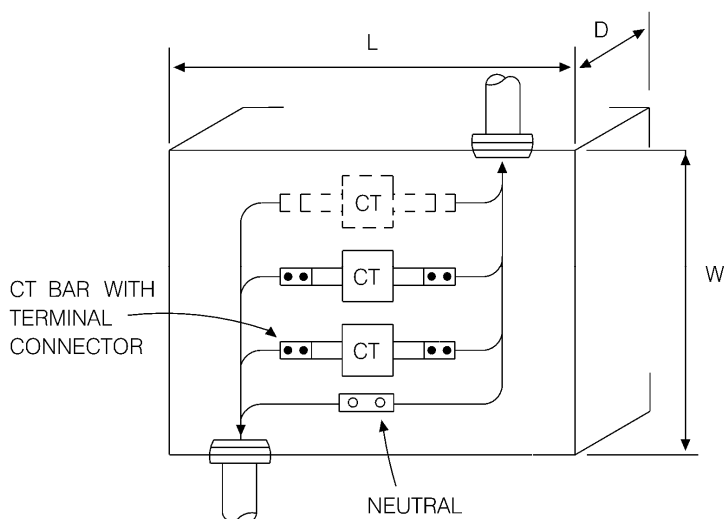


MINIMUM CT ENCLOSURE SIZE REQUIREMENTS (DIMENSIONS L, W, D)

WIRE SIZE	NUMBER OF WIRES PER TERMINAL CONNECTION				
	1	2	3	4	5
	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)
4/0	23-26-10	27-27-10	31-29-10	_____	_____
250	24-26-10	27-27-10	31-29-10	35-31-10	_____
300	25-26-10	31-29-10	35-31-10	39-33-10	_____
350	25-26-10	31-29-10	35-31-10	39-33-10	_____
400	27-27-10	31-29-10	35-31-10	39-33-10	45-43-12♦
500	27-27-10	31-29-10	35-31-10	41-41-12♦	45-43-12
600	31-29-10	35-31-10	39-33-10	45-43-12♦	49-45-12
700	31-29-10	35-31-10	39-33-10	45-43-12	49-45-12
750	31-29-10	39-33-10	45-43-12♦	49-45-12	53-47-12

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2. Dimensions followed by a ♦ may be reduced as follows if aluminum wire is used: Reduce L by 2" and reduce W by 8". All other dimensions apply when aluminum or copper wire is used.
3. Refer to Appendix C-1 for general information.
4. Two or three CT versions of this arrangement may be installed horizontally (as shown), or vertically, or opposite hand. Rotate the page around until the diagram fits the preferred arrangement.

CURRENT TRANSFORMER ENCLOSURE SIZE REQUIREMENTS GREATER THAN 400 A



MINIMUM CT ENCLOSURE SIZE REQUIREMENTS (DIMENSIONS L, W, D)

WIRE SIZE	NUMBER OF WIRES PER TERMINAL CONNECTION				
	1	2	3	4	5
	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)	L-W-D (INCHES)
4/0	23-26-10	27-28-10	31-32-10	_____	_____
250	24-26-10	27-28-10	31-32-10	35-36-10	_____
300	25-26-10	31-32-10	35-36-10	39-40-10	_____
350	25-26-10	31-32-10	35-36-10	39-40-10	_____
400	27-28-10	31-32-10	35-36-10	39-40-10	45-51-12♦
500	27-28-10	31-32-10	35-36-10	41-47-12♦	45-51-12
600	31-32-10	35-32-10	39-40-10	45-51-12♦	49-55-12
700	31-32-10	35-36-10	39-40-10	45-51-12	49-55-12
750	31-32-10	39-40-10	45-51-12♦	49-55-12	53-59-12

1. The above W dimensions are for three CT installations. Subtract 8" to obtain the W dimensions for two CT installations.
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3. Refer to Appendix C-1 for general information.
4. Two or three CT versions of this arrangement may be installed horizontally (as shown), or vertically, or opposite hand. Rotate the page around until the diagram fits the preferred arrangement.

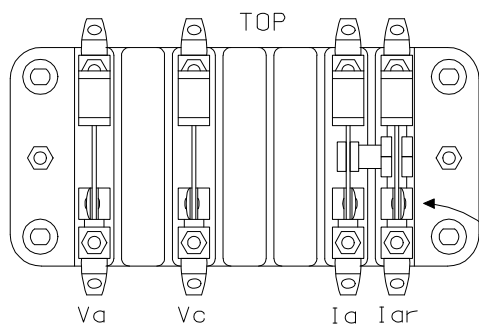
SPECIFICATIONS FOR METER TEST SWITCHES

Test switches are used with instrument transformer rated meter sockets and are mounted in the lower half of the enclosure. The test switches and meter sockets shall be furnished, installed, owned and maintained by the customer. Specifications for test switches are as follows:

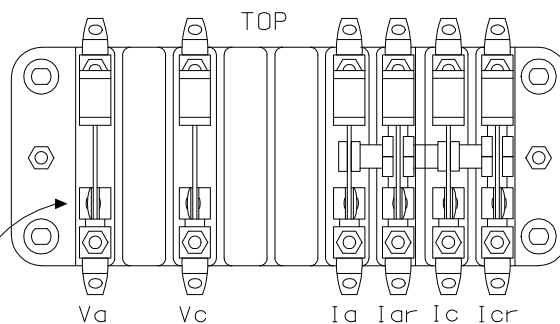
1. Test switches shall be tin corrosion resistant.
2. Test switches shall be blade type using front connections.
3. Test switches shall be mounted vertically with the hinge side on the bottom.
4. Connections for the metering leads shall be stud type connections, with nuts, for stranded copper conductors.
5. The connections shall have serrated “test ears” for test connections.
6. The neutral shall be a switch and not a solid bar.
7. The test switches shall be covered by the lockable cover of the meter socket.

SERVICE	NUMBER OF POLES
1-PHASE, 2-WIRE	4
1-PHASE, 3-WIRE	6
3-PHASE, 4-WIRE	10

4 – POLE METER TEST SWITCH

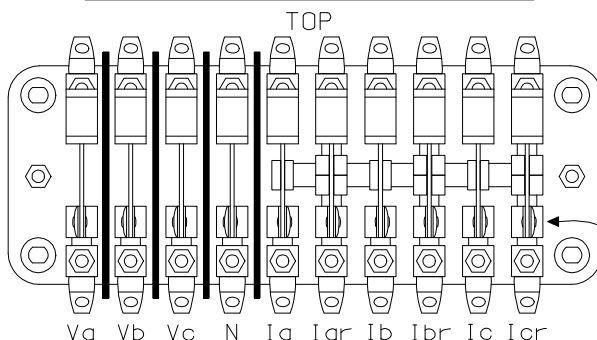


6 – POLE METER TEST SWITCH



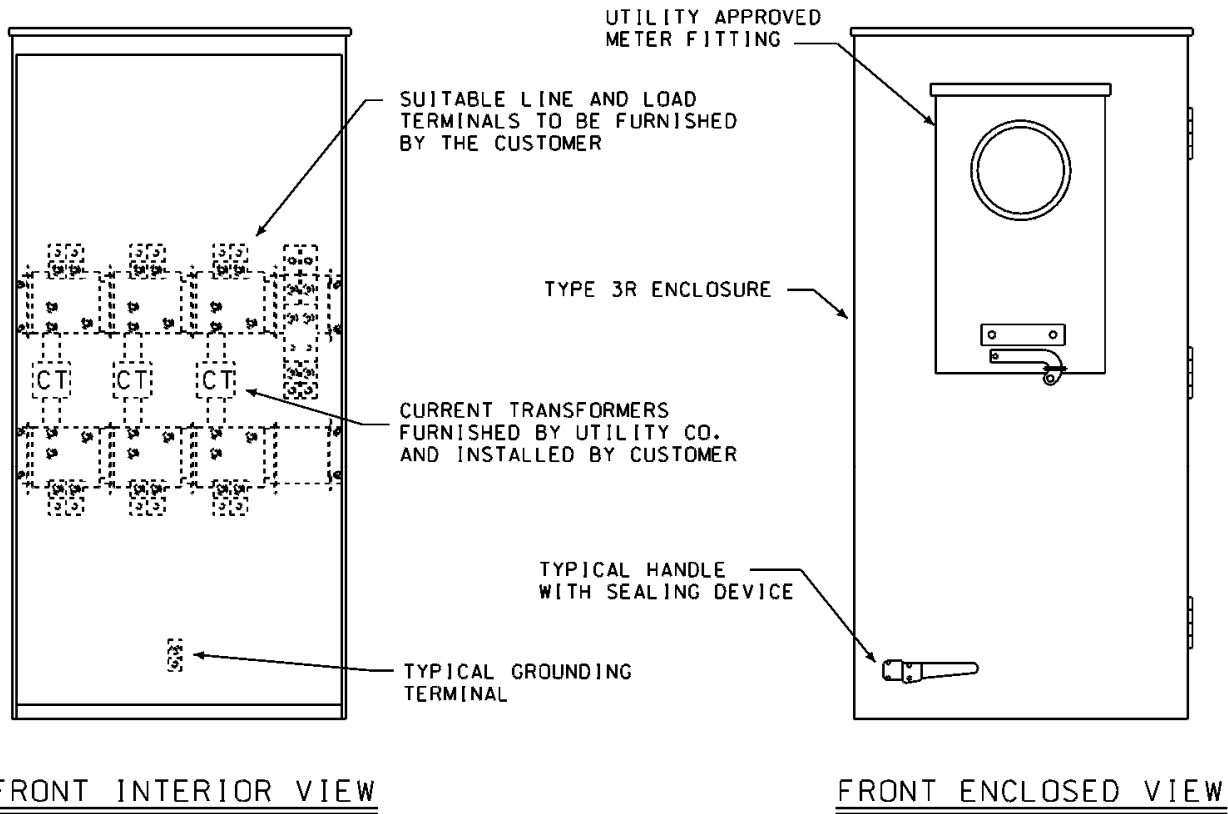
HINGE END
DOWN

10 – POLE METER TEST SWITCH



HINGE END
DOWN

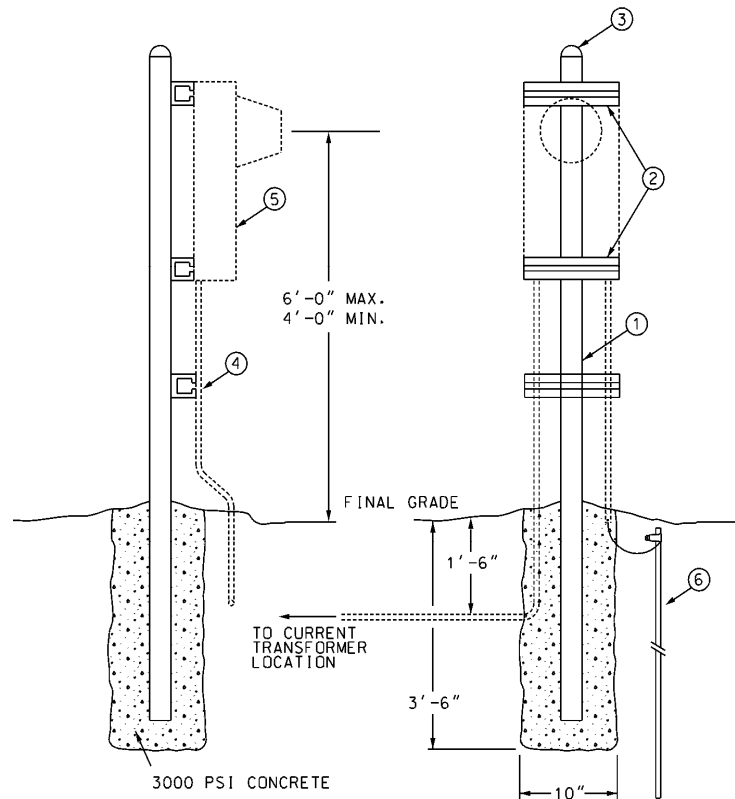
OPTIONAL COMBINATION CT METERING CABINET



THESE CABINETS MUST BE LISTED BY UNDERWRITERS LABORATORIES, INC. AS METERING TRANSFORMER CABINETS AND BEAR THEIR MARK.

SYSTEM	BUS POSITION	METER FITTING
1 PH 3W	A - N - C	6 JAW
3 PH 4 W	A - B - C - N	13 JAW

METER PEDESTAL INSTALLATION FOR INSTRUMENT TRANSFORMER METERING



Customer furnishes and installs the following equipment:

1. Pedestal support – 3 inch (minimum size) standard steel pipe or galvanized steel conduit, or 2 inch (minimum size) uni-strut, or 2 inch by 1/4 inch (minimum size) channel/angle iron.
2. Meter socket/conduit brackets – Weld or bolt uni-strut brackets to pedestal support. Length of brackets and vertical spacing will be determined by meter socket and conduit dimensions.
3. Cap – Pedestal support shall have either a welded or threaded cap or be filled with concrete and rounded on top.
4. Conduit – 1 inch rigid galvanized steel or schedule 80 PVC conduit shall be installed between meter socket and padmount transformer.
5. Meter socket meeting Company specifications with test switches (not shown).
 - Company approved location within **35 circuit feet** of transformer.
 - Finished pedestal to be either primed and painted or galvanized.
6. Driven ground rod.

Current transformers shall not be mounted in single phase transformers.

Current transformers (not shown) may be mounted on secondary spades of three phase transformer with prior Company approval.

Company furnishes and installs bushing mounted current transformers and metering wires from the instrument transformers to the test switches in the meter socket.

SPECIFICATIONS FOR INSTALLATION OF UNDERGROUND RESIDENTIAL SERVICES BY CUSTOMERS OR CONTRACTORS

1.0 SCOPE

- 1.1 This specification covers requirements for single phase, 120/240 Volt, three wire underground residential services rated 400 Amps or less and installed by customers or their contractors. The Company will assume responsibility for owning and maintaining these services only if the requirements listed below are satisfied.
- 1.2 These specifications supplement requirements contained in this manual. A copy of this booklet is available from a Company representative.

2.0 ENTRANCE LOCATE

- 2.1 Prior to installing a customer's underground residential service, the customer or their contractor must contact the Company to obtain permission to install the service, to reach agreement on the service entrance location, and to verify the service conductor size that will be required. Sources for underground services are determined when the distribution system is designed for a development. Location of the source for the underground service dictates the location of the meter socket and service entrance equipment. Service length determines the required conductor size. Please refer to Section 5.2 of this specification.

3.0 TRENCH

- 3.1 Customers and contractors must call the underground locate numbers, as presented on Page 54, at least 48 hours prior to digging so utilities can mark the locations of their facilities. Any damage to Company facilities that have been properly located will be repaired at customer or contractor expense.
- 3.2 Cable shall have at least 30 to 36 inches of cover below final grade.
- 3.3 The trench shall extend from the meter socket to a point within five feet of the nearest side lot line. From this point, the trench shall extend parallel to and within five feet of the side lot line to the Company-owned transformer, handhole, or pedestal. The trench shall be dug in straight lines parallel to lot lines. The trench shall not be dug on and shall not cross any lot lines.
- 3.4 Any trench route that does not conform to the requirements of Paragraph 3.3 must be approved by a Company representative prior to installation of the service.
- 3.5 Trenches may be mechanically dug no closer than 18 inches to the bases of Company-owned transformers, handholes, or pedestals. A 24" x 24" handhole immediately adjacent to the base of the enclosure must be hand dug all the way to the enclosure. Any damage to Company facilities will be repaired at customer or contractor expense.
- 3.6 Locations of conduit sweeps for riser installations on poles must be approved by the Company prior to installation. Please refer to Figure 9.

4.0 CONDUIT INSTALLATION

- 4.1 If the cable will be installed in contact with any rocks or other exposed obstructions by trenching, the service cable must be installed in a PVC conduit to protect the cable .
- 4.2 Where the service is to be located under a planned non-trenchable surface or future obstacle such as a driveway or sidewalk, the service cable must be installed in a PVC conduit of suitable size that extends past the non-trenchable or obstructed area. Please refer to Figure 8 and Section 6.3.

SPECIFICATIONS FOR INSTALLATION OF UNDERGROUND RESIDENTIAL SERVICES BY CUSTOMERS OR CONTRACTORS

5.0 CABLE INSTALLATION

- 5.1 Cable shall be 600 Volt, triplex, rated 90° C, with aluminum conductors and cross-linked polyethylene (XLPE) insulation. The following table provides minimum conductor size by entrance rating. Only those sizes shown in the table will be accepted by the Company.

ENTRANCE SIZE	PHASE CONDUCTORS	NEUTRAL CONDUCTOR
100 A or less	1/0	#2 or 1/0
200 A	4/0	2/0 or 4/0
400 A	350	4/0

- 5.2 If the underground service will be excessively long, service cable larger than specified in Paragraph 5.1 may be required to meet voltage drop or voltage flicker limitations. A Company representative will determine the proper service cable size when the customer calls for an entrance locate and permission to install the service as described in Paragraph 2.1.
- 5.3 The neutral conductor shall be clearly distinguishable from the phase conductors.
- 5.4 Cable ends shall be sealed against excessive moisture ingress with tape or protective caps.
- 5.5 Care must be taken to prevent damaging cable insulation or excessively bending the cable during installation.
- 5.6 Ten feet of cable shall be left outside Company-owned transformers, pedestals, or handholes. Forty feet of cable shall be left at the base of a riser pole. The Company will insert cable into the enclosure or install the riser on the pole.
- 5.7 The customer or contractor shall leave a small amount of slack cable at the bottom end of the service riser pipe to allow for expansion, contraction, and settling. The Company will not be responsible for any damage to customers' equipment due to settling. Please refer to Figure 13 and Figure 14.
- 5.8 The bottom end of the service riser pipe shall be installed at least 18 inches and at most 24 inches below final grade. The customer or contractor must install a bushing or terminal fitting with an integral bushed opening on the bottom end of the service riser pipe. The service riser pipe shall be securely fastened to the wall with two-hole conduit straps. Please refer to Figure 13.

6.0 BACKFILL

- 6.1 After the cable has been placed, the trench shall be backfilled using clean soil. Six feet of trench shall be left open immediately adjacent to a Company-owned enclosure. At the meter setting, the bottom end of the riser pipe must be left exposed. Backfill within four inches of cables must be clear of any rocks or debris. If backfill is not clear of rocks or debris, service conductors must be installed in conduit as described in Section 4.1. Red marking tape is to be laid in the cable trench 20 inches below final grade. Marking tape must be left exposed at both ends of the trench.
- 6.2 The customer or contractor is responsible for all backfill except six feet of trench immediately adjacent to Company-owned enclosures and the exposed end of the meter rise pipe. Three feet of trench immediately adjacent to the Company-owned enclosure and the exposed end of the meter riser pipe will be backfilled by the Company at the time the service is connected.

SPECIFICATIONS FOR INSTALLATION OF UNDERGROUND RESIDENTIAL SERVICES BY CUSTOMERS OR CONTRACTORS

- 6.3 The Company is not responsible for restoring sunken service trenches. The customer or contractor is encouraged to tamp backfill to minimize settling of trenches.

7.0 SITE REVIEW

- 7.1 The customer or contractor must call the Company and schedule a site review after the service cable is installed. Both ends of the trench, at the electric meter and at the Company's enclosure, must be left open for the review. Ends of the red marking tape must be exposed at both ends of the trench. The bottom end of the riser pipe must be visible at the meter end of the trench.

8.0 CONNECTIONS

- 8.1 The customer or contractor shall install and connect the service conductors in the customer's meter socket. Oxide inhibitor shall be used on aluminum conductor connections. Conductors shall be looped in the top of the meter socket as shown in Figure 27(D).
- 8.2 Meter socket terminals shall not be energized by any backfeed from the customer's main panel.
- 8.3 The Company will make connections at Company-owned equipment and install the electric meter in the customer's meter socket.

9.0 OWNERSHIP OF SERVICE CONDUCTORS

- 9.1 The customer or contractor shall own and maintain service conductors until such time as the Company approves the installation and connects and energizes the conductors. The Company will not connect or energize any service that does not meet the requirements of this specification. Any changes required to meet these specifications will be performed by the customer or contractor at their expense.
- 9.2 The Company will own and maintain the service conductors after they have been connected and energized.

10.0 QUESTIONS

- 10.1 Questions concerning these specifications should be directed to a Company representative.

ELECTRIC METERING INFORMATION

Availability and Characteristics of Service, Section 1.0, pg. 9

Diversion of Service or Tampering, Section 2.0, pg. 11

Equipment Specifications, Section 6.0, pg. 20

1. Meter Sockets shall meet Company specifications. See your Company representative for an approved socket list. (Section 6.0, pg.20, Equipment Specifications)
2. Spring, clip type add-on 5th terminals are not allowed.
3. Open meter sockets shall have a plastic protective cover and shall be sealed. (Section 6.0, pg.21, Multiple Meters)
4. If the service size is 400 amps or less, self-contained metering will be used. (New 2005)
5. Before service is connected, each meter socket cover, socket back plate and associated breaker of fuse panel must be plainly marked with a permanent marker such as a paint stick, etc. Magic Markers, tape, pencil or label makers are not considered permanent and are not acceptable. (Section 6.0, pg.21, Multiple Meters)

Meter Location See Section 6.0, pg. 21

Meter Poles See Section 6.0, pg. 21

Meter See Section 6.0, pg. 21

Overhead Primary Metering..... See Section 6.4, pg. 27

Underground Primary Metering See Section 6.5, pgs. 28 & 29

Metering Equipment, Section 9.0, pgs. 32, 33 & 34

1. Bar type current transformers will be used in a current transformer cabinet. See your Company representative for exceptions.

Grounding Requirements..... See Figure 6, pgs. 46 & 47

Metering Sequence..... See Figure 18, pg. 63

Typical Commercial - Industrial Overhead Service See Figure 21, pgs. 66 & 67

Typical Commercial - Industrial Underground Service..... See Figure 22, pgs. 68 & 69

Instrument Transformer Metering See Figure 33, pgs. 80 & 81

Requirements for Meter Mounting Equipment, Appendix A, pg. 86

1. Meter sockets shall be of a ringless type and have a one-piece cover.
2. Automatic bypasses are prohibited.

Instrument Transformer Enclosures, Appendix C-1 and C-2, pgs. 98 & 99

1. Potential transformers will not be allowed in the secondary compartment of the padmount transformer. They may be installed in the current transformer cabinet if the cabinet is sized appropriately.
2. All instrument transformer cabinets shall have 3/4" plywood backing installed. (Pgs. 82, 83, 99)
3. Instrument transformer cabinets shall be mounted so the top of the cabinet is not more than 6' above the final grade and the bottom is not less than 2' feet above the final grade. (App. C-1, #5)
4. Meter sockets shall not be mounted more than 35 circuit feet from the instrument transformers.
5. Covers on all instrument transformer cabinets shall be hinged with heavy duty, pin type hinges..

Specifications for Meter Test Switches See Appendix D, pg. 104

Optional Instrument Transformer Metering Cabinet..... See Appendix E, pg. 105

Meter Pedestal Installation.....See Appendix F, pg. 106

ELECTRIC SPACE HEATING DEVICE SPECIFICATIONS

General

Electric space heating devices shall:

- Meet all applicable local, state, and federal laws in regard to the installation and use of the electric space heating devices
 - Have UL approval or other comparable safety rating
-

Device Specifications

Electric space heating devices shall:

- Be specifically designed and engineered for the sole and primary purpose of providing heat to a space or building
 - Not be waste heat recovery systems that actively or passively capture byproduct heat that would otherwise be rejected into the environment
 - Be thermostatically controlled to cycle the heat source off when heating is not required
 - Be regularly used and relied upon for supplying the heating requirements to the customer's premises
 - Be solidly and permanently connected to its electrical source, i.e., not a plug in
 - Be energized in step stages of 7.5 kW or less for heating elements of electric furnaces and heat pumps
-

Capacity

The amount of installed heating capacity shall be determined in accordance with current recognized standard practices in the industry. Installed capacity shall not exceed the capacity determined by the standard practices by more than 15 percent.

REVISIONS MADE TO THE 2011 ELECTRIC SERVICE MANUAL

2014 MANUAL PAGE	SECTION	ITEM	REVISION
2	Introduction	Safety Codes and Regulations	Removed dates from: *The National Electric Safety Code (NESC) is a registered trademark of the Institute of Electrical and Electronic Engineers, Inc., New York, NY 10016. The NEC is a registered trademark of the National Fire Protection Association, Inc., Quincy, MA 02269.
2	Introduction	Additional Copies of the Electric Service Manual	Changed sentence to read: "For additional copies of the 2014 Electric Service Manual, contact your Company representative. An electronic version of the 2014 Electric Service Manual is also available online at www.midamericanenergy.com , under the "For Contractors" tab.
9	1.0 Availability and Characteristics of Service	Service Voltages	Added Wye to Service Voltages and Limitations chart
9	1.0 Availability and Characteristics of Service	Service Voltages	Added: "Contact your Company representative for service availability on 100% rated panels" after, "Calculations are based on 80% load level per <i>NEC overhead transformer sizes, based on a combined 300 kVA.</i> "
11	2.0 Diversion of Service or Tampering	Diversion and Tampering Prohibited	Added: "If access to Company equipment is needed, the Company requires a minimum of 24-hours notice."
11	2.0 Diversion of Service or Tampering	Disconnection	Changed sentence to read: "The Company <u>will</u> disconnect service to the customer and remove the meters and metering equipment in the event of such diversion or tampering."
14	4.0 Motors and Special Equipment	Introduction	Third paragraph, removed last sentence and corresponding bullet points. Replaced sentence with: "For all motor installations greater than five horsepower, customers are required to fill out the motor data form located at www.midamericanenergy.com under the "For Contractors" tab. Contact your local distribution engineering representative with the completed form."

REVISIONS MADE TO THE 2011 ELECTRIC SERVICE MANUAL

2014 MANUAL PAGE	SECTION	ITEM	REVISION
15	4.0 Motors and Special Equipment	Special Equipment	Added sentence to first paragraph, "The customer is responsible for any cost associated with alleviating adverse effects caused by the installation of special equipment."
17	5.0 Service Information	Company Contact	Changed first sentence to: "To avoid unnecessary expenses or delays, the customer is required to contact a Company representative before construction or remodeling begins."
17	5.0 Service Information	Customer Responsibility	Added residential service requirements - "For residential services, the customer must submit the following to a Company representative:"
20	6.0 Service and Service Entrances (General)	Equipment Specifications	Added sentence to fourth paragraph: "A minimum 200 amp meter socket is required for services smaller than 200 amps."
21	6.0 Service and Service Entrances (General)	Meter Location	Added bullet point: "provided with adequate traffic protection, if deemed necessary by the Company"
21	6.0 Service and Service Entrances (General)	Meter Location	Last bullet point, changed wording: "in compliance with Figure 1"
21	6.0 Service and Service Entrances (General)	Meter Location	Changed bullet point wording for grammar consistency
21	6.0 Service and Service Entrances (General)	Multiple Meters	Added page numbers for Figure 24 and 26
22	6.1 Overhead Service	Customer-Installed Services	Removed section
22	6.1 Overhead Service	Requirements	Second paragraph - changed "in a single" to "in" to allow more than one conduit
23	6.2 Underground Service	Customer-Installed, Residential Service	First bullet point, added "Company owned": "Customer-installed, <u>Company-owned</u> cable shall be approved by and installed in a manner satisfactory to the Company. All cable must be installed between 30" and 42" below final grade."
23	6.2 Underground Service	Commercial, Industrial and Other Services	Added sentence to paragraph: "The Company will terminate the cables in the transformer."

REVISIONS MADE TO THE 2011 ELECTRIC SERVICE MANUAL

2014 MANUAL PAGE	SECTION	ITEM	REVISION
23	6.2 Underground Service	Commercial, Industrial and Other Services	Added second paragraph: "Network services are typically furnished, installed, owned, and maintained by the Company. Contact local distribution engineering personnel to see if network service is available."
23	6.2 Underground Service	NEW - Mobile Home Park Services	NEW - Underground services for mobile home parks will be furnished, installed, owned, and maintained by the Customer.
23	6.2 Underground Service	Placement of Transformers	Removed last paragraph and replaced with: "When traffic protection is necessary, contact local distribution Engineering for requirements."
25	6.3 Underground Conduit	Single-phase Customers	Removed second bullet point "Primary and secondary cables for townhouses, condominiums and mobile home parks. Where area for trenching is limited by any of the following:" and subsequent related bullet points below it
26	6.3 Underground Conduit	Conduit Requirements (All Customers)	Added "Typical" to Item: " <u>Typical</u> Conduit Requirements (All Customers)
26	6.3 Underground Conduit	Conduit Requirements (All Customers)	Conduit Sizes are now: single phase primary - 2 inch; three phase primary 4/0 or smaller - 4 inch; three phase primary 500 kcmil or larger - 6 inch; single phase secondary 1/0, 4/0 and 350 - 4 inch; single phase services 1/0, 4/0 - 2.5 inch; single phase services 350 kcmil - 3 inch
26	6.3 Underground Conduit	Conduit Requirements (All Customers)	Number of conduits now: One for residential, local distribution engineering's discretion for commercial/industrial
26	6.3 Underground Conduit	Conduit Requirements (All Customers)	Added note: " Local engineering must be contacted before installation. "
26	6.3 Underground Conduit	Sweep Requirements (All Customers)	Material: Added sentence - "Sweeps must be burn-proof (exceeding burn resistant rating) and steel sweeps must include ground lugs and must be bonded where exposed, per <i>NEC</i> ."
26	6.3 Underground Conduit	Installation Requirements (All Customers)	Third bullet point now reads: "Conduit for secondary and streetlight cables shall have a minimum cover of 30 inches <u>and maximum of 42 inches</u> ."

REVISIONS MADE TO THE 2011 ELECTRIC SERVICE MANUAL

2014 MANUAL PAGE	SECTION	ITEM	REVISION
26	6.3 Underground Conduit	Address Requirements (All Customers)	Removed address requirements in this section, already addressed on page 17 under Customer Responsibilities.
27	6.4 Overhead Primary Metering (Over 600 volts)	Company Responsibility	Removed last three paragraphs in this section and replaced them with: "Location of primary metering shall be at the property line. Contact Company representative for metering design and review of customer's proposed primary system. Approval from the company is required before any installation."
29	6.5 Underground Primary Metering (Over 600 volts)	Transformers Beyond Primary Metering	Changed first sentence, now reads: "For any new primary metering, the customer must furnish, own, maintain, and operate all transformers located beyond the first point of attachment."
29	6.5 Underground Primary Metering (Over 600 volts)	Company-Owned Trans- formers	Changed first sentence, now reads: "For existing primary metered customers, the Company may provide standard distribution transformers located beyond the first point of attachment."
30	7.0 Conductor Identifica- tion	Multiple Conductors per Phase	Changed sentence, now reads: "When multiple conductors per phase are needed for a service, the phase wires must be identified with colored tape so the proper grouping can be determined. The tape must be installed below the termination height so the grouping remains identifiable after cutting the cables to their final height."
31	8.0 Service Conductor Sizes and Connections	Conductor Sizes	Added sentence: "No conductor size above 750 kcmil is allowed, including compressed and compact conductors."
32	9.0 Metering Equipment	Metering	Added "including 480 volt PT supply wiring" to second bullet point. Now reads: "Use of meter sockets and other Company sealed enclosures as junction boxes and raceways for customer's circuits, including 480 volt PT supply wiring."

REVISIONS MADE TO THE 2011 ELECTRIC SERVICE MANUAL

2014 MANUAL PAGE	SECTION	ITEM	REVISION
33	9.0 Metering Equipment	Current Transformer	Changed wording, now reads: "For service sizes 1200 amps and below, current transformers required for metering shall be installed in a separate cabinet (reference Appendices C-3, C-4, C-5 and C-6) With Company approval, current transformers may be installed in transformers for service above 1200 amps. See your local distribution engineering contact."
33	9.0 Metering Equipment	Potential Transformer	Removed last two sentences. Now reads: "The potential transformers shall be installed in a separate cabinet (reference Appendix C-1, item 2). They will not be allowed in the secondary compartment of the padmount transformer."
36	11.0 Parallel Generation Operation	General	Replaced second paragraph with: "For distributed generation installations (solar, wind, etc.), contact local distribution engineering personnel for information and requirements. For these installations, the meter must be located outside."
38	Minimum Clearances for Services 480 V and Below	Figure 1 Notes - Item E	Changed "Refer to Figure 2" to "Refer to Figure 2D."
44	Clearance Requirements Around Grain Bins NESC Rule 234F	Figure 5 - Item 1	Changed 22 kVA to 22 kV
46	Grounding Requirements	Figure 6 Notes - Item 1	Combined sentences - now reads: "All grounding of electric installations shall meet the requirements of <i>NEC Article 250, requirements of the Company as shown in these construction standards, adhere to the local jurisdictional requirements, and all applicable codes.</i> "
48	Allowable Service Conductor Sizes	Figure 7 - first paragraph	Added sentence: "No conductor sizes above 750 kcmil will be allowed, including compact and compressed conductors."
55	Typical Underground Temporary Service	Figure 11	Changed graphic notation to: "A conduit end fitting shall be provided. See Detail "A" Also changed Detail A to include specific secondary pedestal and transformer hole sizes and washer sizes needed for each.

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2014 MANUAL PAGE	SECTION	ITEM	REVISION
57	Typical Underground Residential Service	Figure 13 - Service Characteristics chart	Removed "Minimum" from the "Conduit Size" chart heading
57	Typical Underground Residential Service	Figure 13 - last sentence on page	Now reads: "* Services smaller than 200 amp are allowed, but a minimum 200 amp underground meter socket and 2-1/2" conduit are both required."
59	Typical Underground Residential Service Meter Pedestal	Figure 14	Added notation to graphics: "Service lateral conduit must be securely attached to meter socket using either two locknuts and an insulating bushing or a threaded hub." Also identified "insulated bushing" on graphics.
71	Typical Group Metering for More than Six Meters or Any Meters in Network Areas Factory Fabricated	Figure 26	Modified graphics to show 16-meter bank.
72	Self-Contained Meter Socket Wiring, 1-Phase 120V, 2-Wire, 60A Max., 1-Phase 120/240 V, 3-Wire, 100 A - 200 A	Figure 27 - Item 7	Added the following sentence: "Commercial sockets less than 200 amps require a horn bypass."
72	Self-Contained Meter Socket Wiring, 1-Phase 120V, 2-Wire, 60A Max., 1-Phase 120/240 V, 3-Wire, 100 A - 200 A	Figure 27 - Item 8	Removed Item 8
74	Self-Contained Meter Socket Wiring, 1-Phase 120/240 V, 3-Wire, 320 A Socket 400 A Entrance	Figure 28	Added new graphics for 200 A socket with bypass lever. Changed title of page to reflect addition.
74	Self-Contained Meter Socket Wiring, 1-Phase 120/240 V, 3-Wire, 320 A Socket 400 A Entrance	Figure 28 - Item 7	Reworded, now reads: "Commercial sockets of 200 amps require a manual clamping jaw lever bypass. Commercial sockets less than 200 amps require a horn bypass."
74	Self-Contained Meter Socket Wiring, 1-Phase 120/240 V, 3-Wire, 320 A Socket 400 A Entrance	Figure 28 - Item 8	Removed Item 8

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2014 MANUAL PAGE	SECTION	ITEM	REVISION
76	Self-Contained Meter Socket Wiring, 3-Phase 277/480 V, 4-Wire, 400 A or Less	Figure 31 - Item 4	Added sentence: "It is the customer's responsibility to determine if the disconnect switch should be fused or unfused."
80	Instrument Transformer Metering Greater than 400 A	Figure 33 Notes - Item 13	New Item 13: "The 1" conduit from the meter socket enclosure to the instrument transformer enclosure must be continuous and contain less than three 90 degree bends. <u>The use of any conduit body fitting (LB, LL, LR, etc.) is prohibited.</u> "
86	Requirements for Meter Mounting Equipment	Item 8 - Installation Ease	Fourth bullet point - removed first sentence: "Residential meter sockets rated at 200 amps or less require a horn bypass."
88	Location of Customer Furnished Pads for 3- Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1 - Graphics	Changed graphics - add ground rod sleeve to primary and secondary compartments.
88	Location of Customer Furnished Pads for 3- Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1 - Item 1	Added sentence: "Ongoing maintenance and repair to the pad are the responsibility of the customer."
88	Location of Customer Furnished Pads for 3- Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1 - Item 5	Changed wording of Item 5 to add maximum depths: "All conduits shall extend 5'-0" beyond the pad and screening structure (if used) and the locations of the ends of primary conduits shall be identified. Primary conduit shall be installed between 42" and 48" below final grade. Secondary conduit shall be installed between 30" and 42" below final grade."
88	Location of Customer Furnished Pads for 3- Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1 - Item 7	Removed "diagonally" from first sentence
88	Location of Customer Furnished Pads for 3- Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1 - Item 8	Changed 2" screened river rock to 3".

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2014 MANUAL PAGE	SECTION	ITEM	REVISION
89	Spill Prevention, Control and Countermeasures (SPCC) Plans and Oil Containment for Customer Furnished Pads for 3-Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1	Changed Appendix B-1 to Appendix B-2
89	Spill Prevention, Control and Countermeasures (SPCC) Plans and Oil Containment for Customer Furnished Pads for 3-Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1	Last sentence: "To discuss an alternative containment design, contact local MidAmerican Energy Company, distribution engineering personnel."
89	Spill Prevention, Control and Countermeasures (SPCC) Plans and Oil Containment for Customer Furnished Pads for 3-Phase Pad-Mounted Transformers (All Sizes)	Appendix B-1	Graphic changes: 3" River Rock Screened
90-93	Concrete Pad Specification 3-Phase Pad-Mounted Transformer	Appendix B-2	Change Appendix B-2 to Appendix B-3
94	Construction Details, Customer Furnished Pads for 3-Phase Pad-Mounted Transformers 75-500 kVA	Appendix B-3	Change Appendix B-3 to Appendix B-4

REVISIONS MADE TO THE 2011 ELECTRIC SERVICE MANUAL

2014 MANUAL PAGE	SECTION	ITEM	REVISION
94	Construction Details, Customer Furnished Pads for 3-Phase Pad-Mounted Transformers 75-500 kVA	Appendix B-3	Graphic changes: Widened primary box to 16" to accommodate larger conduits or more conduits. Centered conduits and moved to the back of the box out, not stacked back to front. Rebar is specified #4 for all re-rods. Removed grass and dirt that was shown over the rock and made the rock larger.
95	Construction Details, Customer Furnished Pads for 3-Phase Pad-Mounted Transformers 750-1000 kVA	Appendix B-4	Change Appendix B-4 to Appendix B-5
95	Construction Details, Customer Furnished Pads for 3-Phase Pad-Mounted Transformers 750-1000 kVA	Appendix B-4	Graphic changes: Widened primary box to 16" to accommodate larger conduits or more conduits. Centered conduits and moved to the back of the box out, not stacked back to front. Rebar is specified #4 for all re-rods. Rebar is now specified #5 for the pad. Removed grass and dirt that was shown over the rock and made the rock larger.
96	Construction Details, Customer Furnished Pads for 3-Phase Pad-Mounted Transformers 1500-2500 kVA	Appendix B-5	Change Appendix B-5 to Appendix B-6
96	Construction Details, Customer Furnished Pads for 3-Phase Pad-Mounted Transformers 1500-2500 kVA	Appendix B-5	Graphic changes: Widened primary box to 16" to accommodate larger conduits or more conduits. Centered conduits and moved to the back of the box out, not stacked back to front. Rebar is specified #4 for all re-rods. Removed grass and dirt that was shown over the rock and made the rock larger.
97	Construction Details, Pad for 1-Phase Pad-Mounted Transformer	Appendix B-6	Removed page from manual
98	Hinged Instrument Trans- former Enclosures	Appendix C-1 - Item 5	Added "centered as best as possible" to first sentence.

REVISIONS MADE TO THE 2011 ELECTRIC SERVICE MANUAL

2014 MANUAL PAGE	SECTION	ITEM	REVISION
98	Hinged Instrument Transformer Enclosures	Appendix C-1 - Item 7	Added "Aluminum or stainless steel is recommended."
98	Hinged Instrument Transformer Enclosures	Appendix C-1 - Item 13	Changed Item 13 to read: "Instrument transformer enclosures shall be grounded per <i>NEC Article 250 and Company requirements as shown in Appendix C-2.</i> "
99	Hinged Instrument Transformer Enclosures	Appendix C-2	Added graphics for "Current/Potential Transformer Enclosure Bonding"
106	Meter Pedestal Installation for Instrument Transformer Metering	Appendix F - Item 1	Removed "or treated 6 inch by 6 inch wood post." No wood posts are allowed.
106	Meter Pedestal Installation for Instrument Transformer Metering	Appendix F	Removed last sentence "Potential transformers are required only for 277/480 V in certain services areas. Contact A Company representative for details."
112	Revisions Made to the 2011 Electric Service Manual	Appendix J	Inserted new revision log

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2014 MANUAL PAGE	SECTION	ITEM	REVISION
20	6.0 Service and Service Entrances (General)	Equipment Specifications	Changed last sentence to read: " A minimum 200 amp meter socket is required for all underground residential services smaller than 200 amps. "
43	Typical Overhead Service Mast Requirements	Maximum Service Drop Lengths Table	Changed column heading from "Riser Mast Conduit Size (Rigid or Intermediate) to " Riser Mast Conduit Size For Above the Roofline (Rigid or Intermediate). "
43	Typical Overhead Service Mast Requirements	Application and Conditions for Above Table - Item 5	Added sentence to #5: " Reducing down to a smaller conduit size must adhere to local jurisdictional requirements. "
50	Underground Conduit Installations at Risers	Figure (b)	Changed Figure (b) to show conduits on opposite sides of the pole and changed the 5" minimum to 15" .
72	Self-Contained Meter Socket Wiring, 1-Phase 120V, 2-Wire, 60A Max., 1-Phase 120/240 V, 3-Wire, 100 A - 200 A	Figure 27 - Item 7	Changed sentence #7 to read: " Commercial installations require a manual clamping jaw lever bypass. "
74	Self-Contained Meter Socket Wiring, 1-Phase 120/240 V, 3-Wire, 320 A Socket 400 A Entrance	Figure 28 - Item 7	Changed sentence #7 to read: " Commercial installations require a manual clamping jaw lever bypass. "
75	Self Contained Meter Socket Wiring, 3-Phase 120/240V, 4-Wire, 400 A Max.; 3-Phase 120/208 V, 4-Wire, 400 A Max.	Figure 30 - Item 8	Changed sentence #8 to read: " Commercial installations require a manual clamping jaw lever bypass. "
76	Self-Contained Meter Socket Wiring, 3-Phase 277/480 V, 4-Wire, 400 A or Less	Figure 31 - Item 10	Changed sentence #10 to read: " Commercial installations require a manual clamping jaw lever bypass. "
78	Self Contained Meter Socket Wiring, 3-Phase 120/240V, 4-Wire, 400 A Max.; 3-Phase 120/208 V, 4-Wire, 400 A Max.; 3-Phase 277/480 V, 4-Wire, 400 A Max.	Figure 32 Notes - Item 9	Changed sentence #9 to read: " Commercial installations require a manual clamping jaw lever bypass. "

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2014 MANUAL PAGE	SECTION	ITEM	REVISION
83	Instrument Transformer Wiring, 3-Phase 120/240 V, 4-Wire Delta; 3-Phase 120/208 V, 4-Wire Wye; 3-Phase 277/480 V, 4-Wire; Greater Than 400 A	Figure 35 - Transformer Enclosure Graphic	Moved the 1" conduit to meter and test switch to the right side of the PT cabinet.
86	Requirements for Meter Mounting Equipment	8. Installation East - last bullet point	Changed sentence last bullet point to read: "Commercial installations require a manual clamping jaw lever bypass."
99	Hinged Instrument Transformer Enclosures	Current/Potential Transformer Enclosure Bonding graphics	Relocated the meter socket to the right side of the PT cabinet and added 3" minimum separation between the cabinets. Added note "PT cabinet and meter socket may be mounted on the right or left side of the CT cabinet." Also added an alternate location for meter socket mounting to graphics.