



First Electric
Cooperative

Improving quality of life

Your Touchstone Energy® Cooperative



Member Installation Standards for Electric Service

December 2010 Edition

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Section 1: Foreword, General Information, and Terms

1.1 Purpose

The information contained in this document is presented for use in planning electrical wiring and equipment installations intended for connection to First Electric Cooperative power lines. Current procedures, practices and requirements, adopted by First Electric Cooperative (hereinafter referred to as the Cooperative) are intended to assure economical and satisfactory service to Members, consistent with the most recent version of the National Electrical Safety Code (NESC), are set forth and discussed herein. (Note: Any statements concerning the National Electrical Code (NEC) refer only to Member owned facilities.) Any mention of the NESC or the NEC indicates the basic provisions that are considered necessary for safety. In the event that the Cooperative's standards are more stringent than provisions of the NESC or NEC, the Cooperative's standards shall be followed. This document is limited to information considered essential in planning installations which are adequate and satisfactory for the many uses and conveniences of electric service.

The Member or the Member's Representative is encouraged to contact the Cooperative before any planning or construction takes place regarding the need for new electrical service, or changes to existing service. For all work on the Member's electrical facilities, the Cooperative strongly recommends that the Member use a qualified, licensed electrical contractor.

1.2 Service Contracts, Terms and Conditions

The following documents are not included in the Service Standards:

- (1) Service Regulations (or Terms and Conditions) which prescribe the rules, obligations, and liabilities of the Cooperative in providing service and the Member in receiving electric service;
- (2) Rate Schedules (or tariffs) which set forth the price, periods of taking, and payment terms for electric service;
- (3) Service Agreements wherein the Member and the Cooperative agree to specific quantities and type of service.

The Cooperative's currently approved Service Regulations, Rate Schedules, Service Agreements, and other forms are available by contacting the Cooperative. The Member should contact the Cooperative early in the design phase of a project for information concerning the terms and conditions of service.

1.3 Service Standards Availability and Revisions

These Service Standards are issued in PDF format on the Cooperative's website at www.firstelectric.coop. These Service Standards may be revised from time to time as needed, and new editions will be posted to the Cooperative's website. Revisions to the Standards will go into effect when approved by Cooperative Management. It is the Member's responsibility to make sure that the latest Standards are followed for construction of electric service. Contact the Cooperative or go to our website to determine if the Standards you possess are the latest edition.

1.4 How to Interpret and Apply the Standards

When reading the Service Standard, note the following key words:

Shall: Any rule using the word "shall" is strictly enforced. If the rule or drawing shows a reference to the NEC or the NESC, then the rule is a requirement of that particular code. If the rule or drawing doesn't have a code reference, then it is a Cooperative rule that exceeds the minimum requirements of the NEC or NESC.

Should: Any rule using “should” carries the idea that options exist, but that the rule follows the best engineering advice as written. This rule could be less strictly enforced than the “shall” rule.

Recommend: Any rule using “recommend” has several options, but the Cooperative would like for the Member to use the one given. “Recommend” is never used where safety is an issue.

May: Any rule using “may” is allowed by the Cooperative; it’s the Member’s option.

1.5 General Terms Used in Service Standards

Agreement for Service: See "Application".

Application (or Agreement for Service or Contract): The agreement between the Cooperative and the Member under which service is taken. Until a written agreement for service has been signed, service rendered by the Cooperative is subject to the provisions of the Cooperative's Service Regulations and applicable rate schedule. The provisions of the Cooperative's standard application for service will be presumed to apply. The supplying and taking of such service shall constitute an Agreement for Service.

Authorities (having jurisdiction) (AHJ): The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure. The basic role of an AHJ is to verify that an installation complies with the National Electric Code.

Cooperative: First Electric Corporation, its operating subsidiaries, officers, agents or employees.

Cooperative Designated Underground Areas: Those portions of the Cooperative's service area, defined by the Cooperative, where overhead service is not available. This includes many residential subdivisions, and areas of concentrations of commercial buildings with large loads that are not practical to serve with overhead facilities.

Cooperative's Installation: In general, all the wires, devices, or apparatus on the Cooperative's side of the point of delivery. Some equipment, such as devices installed for metering electric consumption or for demand side management, may belong to the Cooperative, yet be installed on Member's side of the point of delivery.

Cooperative Pole: Includes Cooperative owned poles, and poles occupied by the Cooperative under joint use agreements.

Cooperative Specifications: The particular details developed by the Cooperative as its standard, which may include specifications of manufacturers and regulatory bodies having jurisdiction.

Conduit System: Any combination of duct, conduit, conduits, manholes, handholds, and vaults joined to form an integrated whole.

Contract: See "Application".

Demand: The kW or kVA, as shown or computed from the readings of the Cooperative's demand meter installation, for the interval of the Member's greatest use between readings. (This is also known as maximum demand.)

Disconnect: An approved switching device that enables the disconnection of the electric service from the supply conductors or equipment.

Easement: An interest in land owned by another that entitles its holder to a specific limited use (The Cooperative’s right-of-way is an easement.)

Electric Service: See "Service".

Emergency Service: An additional, separate service, when required by regulatory authorities, for exit or emergency lighting, fire pumps, or to satisfy other safety regulations.

Inaccessible Area: Any area, as designated by Cooperative, which would be difficult to enter for the purpose of conducting normal or emergency operations or maintenance.

Load: The amount of electric power delivered or required at any specified point or points on a system.

Mandatory Rules: The rules of the Service Standards which are characterized by the use of the word "shall."

Member: An individual, firm, partnership, association, corporation, organization, or governmental agency who is a member of the Cooperative and taking service as defined by Cooperative's Bylaws and regulatory authorities.

Member's Installation: In general, all the wires, appliances, devices or apparatus of any kind or character on the Member's side of the point of delivery except the meters, metering devices and facilities of the Cooperative that may be located on the Member's side of the point of delivery. The Member's wiring and electrical equipment within or on the premises shall be installed and maintained in accordance with all effective building and wiring codes, and local laws and ordinances.

Meter: A device or devices together with auxiliary equipment used for measuring any of the following: apparent, real, and reactive power and/or energy, which are supplied to any Member at a single point of delivery.

Mobile Home or Trailer Park: A continuous parcel of land that is used for the accommodation of five or more occupied mobile homes or trailers with individually metered service and its accessory buildings or structures for the exclusive use of its occupants or owners. A parcel is a unit of land under unified ownership (with or without buildings).

National Electrical Code (NEC): The code adopted by the National Fire Protection Association, Inc (NFPA) and American National Standards Institute (ANSI) as advisory information on the installation of electric facilities on private property. It is offered for the use in law and regulatory purposes in the interest of life and property protection.

National Electrical Safety Code (NESC): The code published by the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and the American National Standards Institute (ANSI) in order to bring consistency and safety to the design, construction, operation and use of electric supply and communications installations. The NES C is adopted as state law in Arkansas.

Point of Delivery: (also called "Point of Common Coupling) the physical location where the Member's service terminals or wires are joined to the Cooperative's facilities or such other point specifically designated by written agreement.

Public Property: Property dedicated to public use such as streets, alleys, canals, roadways, and highways. This does not include schools, parks, public housing, gyms, playgrounds, public buildings, etc., which are considered Member premises.

Rigid Metal Conduit: A raceway specially constructed for the purpose of the pulling in or the withdrawing of wire or cable after the conduit is in place and made of metal pipe of standard weight and thickness permitting the cutting of standard threads.

Rigid Non-metallic Conduit: Gray polyvinyl chloride (PVC), schedule 80 or schedule 40, tube for enclosure of electrical wires and cables which includes associated equipment such as adapters, cable enclosures, couplings, junction boxes, pull boxes, etc., as required for a complete enclosure system. (Schedule 80 PVC shall be manufactured per NEMA TC-2 standard.)

Service (or Electric Service): The availability of electric power and energy to the Member, regardless of whether any power and energy is actually used. Supplying of service by the Cooperative consists of its maintaining at the point of delivery the approximate nominal voltage and frequency by means of facilities adequate for supplying the Member's contracted load.

Service Conductors: The supply conductors that extend from the pedestal or from transformers to the service equipment of the premises supplied.

Service Drop: The overhead service conductors from the last pole or other aerial support to and including the splices, if any, connecting to the service-entrance conductors at the building or other structure.

Service Entrance: The Member owned equipment for connecting to the service conductors or the service entrance conductors.

Service Entrance Conductors:

1. Overhead System: The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where it is joined by tap or splice to the service drop.
2. Underground System: The service conductors between the terminals of the service equipment and the point of connection to the service lateral.

Shall: The highest degree of requirement, no other options exist when shall is used. (Also see 1.4)

Type of Service: The electrical or physical attributes of the service such as voltage, phase, frequency, transformer connection, number of wires, overhead or underground installation, etc.

Underground Service: The underground cable installation which connects the Cooperative's distribution system to the Member's service entrance conductors, or to the supply side lugs of the meter socket.

1.6 Electrical Terms Used in Service Standards

Ampere: A unit of measurement of electric current (abbreviated A or amp).

Btu (British Thermal Unit): The quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit. Capacity of air conditioning, heating, or heat content of fuel, etc. is measured in Btu. Btu per hour is the rate of heat change (Btu/h).

Current: The flow of electricity usually measured in amperes.

Energy: The total work done as distinguished from the rate of doing work (power), usually measured in kilowatt-hours (kWh). Its amount depends upon the power and the time that the power is taken. For instance, a 100 watt light bulb burned for one hour uses 100 watt-hours of energy; if burned for 10 hours the bulb uses 1000 watt-hours, or 1 kilowatt-hour of energy.

Hertz: Unit of alternating current frequency in cycles per second (abbreviated Hz). The U.S. electric system furnishes 60 Hz alternating current.

Horsepower: A unit of mechanical power, equal to a rate of lifting 550 pounds one foot in one second (abbreviated hp). Motors are normally rated in horsepower to indicate the mechanical power they are designed to produce.

Kilovolt-ampere (kVA): 1,000 volt amperes, the unit of apparent power, volts multiplied by amperes, which is comprised of both real and reactive power.

Kilowatt: (kW) 1,000 watts.

Kilowatt-hour: (kWh) A quantity of electrical energy - equal to 1000 watts used continuously for one hour, or 100 watts used continuously for ten hours, or some other equivalent.

Number of Phases: See "Phase".

Ohm: The unit of measurement of electrical resistance or impedance. It is that resistance through which one volt will produce a current of one ampere.

Phase (or Number of Phases): Term which designates characteristics of alternating current. It is a term used in the electric industry relating to the characteristics of the electrical service available or supplied at a given location or required for the operation of a given electrical device. Single-phase is normally supplied for residences and small power Members, and three-phase is supplied for Members with higher power requirements.

Power: The time rate of doing work, generating, transferring, or using electric energy, commonly expressed in kilowatts (kW).

Power Factor: The ratio of real power (kW) to apparent power (kVA) for any given load and time. Normally, power factor is expressed as a ratio and stated as a percentage. When the power factor is less than 100%, the power system is not operating efficiently. For this reason, capacitors or other power factor correction equipment must be used to correct the power factor to as near 100% as practicable.

Reactive-kilovolt-amperes: (kVAR) (rkVA) (kilovar) Reactive power that is the product of the applied voltage and the magnetizing or charging current, divided by 1,000. Reactive power does not provide heat, light, or mechanical power, but must be supplied by the power system to magnetic equipment, such as motors and fluorescent lights to enable their operation. Excessive reactive power flow causes low power factor conditions on the power system (see power factor definition above).

Sag (Voltage sag): A decrease in RMS voltage at the power frequency for duration of 0.5 cycles to 1 minute. Typical values are 0.1 to 0.9 per unit.

Volt / Voltage: A unit of electrical pressure or potential or electromotive force which if applied to a load of one ohm resistance will cause a current of one ampere to flow. Primary distribution and transmission voltages are usually designated in kilovolts (kV). One kilovolt is equal to 1,000 volts.

Watt: An electrical unit of power. Electrical appliances and lamps are rated in watts to indicate their capacity or rate of using power for doing work. A 100 watt lamp used 10 hours will use one kilowatt-hour (kWh) of energy (1,000 watt-hours). Likewise a household iron rated at 1,000 watts will use one kilowatt-hour in one hour.

Section 2: Safety, Member's Service Obligations, and Protection

2.1 Safety

Safety is paramount. If the Cooperative believes, based upon observation, information or experience that danger to the public or to an individual exists, work shall stop and service may be disconnected until such danger is remedied.

2.2 Code Requirements

The data contained herein is intended to conform with and be supplementary to recognized codes or rules and regulations of the authority having jurisdiction over the installation. In all cases, those codes or rules and regulations shall govern, regardless of possible conflict in the expressed or implied meaning of the contents of this document. The contents are intended to be consistent with the principles of the NEC on the Member's side of service and generally consistent with the NESC on the Cooperative side. Compliance with the minimum requirements of the NEC will provide the Member with what is considered a minimum standard for appropriate use of electricity. **Any difference from the NEC is intended to provide better service than required by the standards of the NEC.**

2.3 Distance Requirements for Member Structures

The construction of any structure near, under or over electrical facilities may cause a code and / or safety violation and be an encroachment on Cooperative right of way. Consult the Cooperative concerning all clearances. Permanent or temporary structures shall never be located within 10 feet (measured horizontally) of the Cooperative's aboveground electrical facilities. The Cooperative will not allow the placement of electrical service nearby, over, or under a pool, nor permit the construction of a pool nearby, over or under electrical facilities (also see Drawings 7.2.1 (Overhead) and 8.6.5 (Underground) and Consult the Cooperative).

2.4 Working in Close Proximity to the Cooperative's Facilities

Members should use extreme caution to avoid contact when working in the proximity of the Cooperative's overhead or underground conductors or other electric facilities to prevent injury and to prevent damage to either the Cooperative's or the Member's equipment. Arkansas state law (High Voltage Act, Title 11, Chapter 5, Subchapter 3 of the AR State Code) prohibits unauthorized persons from working, including moving tools or equipment, within ten feet of any high voltage overhead electric utility line. If any unauthorized person intends to work within 10 feet of any high voltage overhead line, the person responsible for the work to be done must notify the owner or operator of the high voltage overhead electric utility line not less than forty-eight hours prior to commencing work. Please note transmission level voltage requires greater clearance.

Work shall be performed only after satisfactory mutual arrangements have been completed between the owner or operator of the high voltage overhead electric utility line and the person responsible for the work to be done. To notify the Cooperative that you intend to work within ten feet of a high voltage overhead electric utility line owned or operated by it, please call 1-800-489-7405 not less than two business days prior to commencing work.

The Cooperative shall be consulted for location of the Cooperative's conductors and electrical facilities before operating equipment near the Cooperative's facilities. In locations where excavation is planned, the Member shall notify ONECALL by dialing 811 not less than 48 hours prior to commencing work and shall have ONECALL locate all underground facilities before digging. It shall be the responsibility of the Member to stay clear of all electric facilities.

2.5 OSHA Working Requirements

OSHA (Title 29 of the Code of Federal Regulations, Section 1926.550 (a) (15)) requires that all operators of equipment maintain a minimum of 10 feet of radial clearance from energized electrical facilities. Please note transmission level voltage requires greater clearance.

2.6 Lightning and Other Surge Protection

Surge arrester protection by the Member is not required for services under 480 Volts. With the proliferation of electronic home entertainment equipment and appliances, however, the Cooperative suggests that the Member consider installing surge protection. It shall be installed on the load side of the meter, and shall not be connected to the service drop conductors or to the service entrance conductors. The surge protection should be installed as closely as possible to the device to be protected. Members with services above 480 Volts should install surge arrestors. Consult the NEC Article 280, a licensed, professional engineer, or the manufacturer of protective equipment.

2.7 Clearance to Buildings, Signs, and Other Installations

Clearances of buildings, signs, and other structures to the Cooperative's facilities shall meet or exceed the clearance requirements set forth in the National Electrical Safety Code Article 234. The Member shall be responsible for the cost of relocating lines or structures, or otherwise correcting any violations caused by the Member's actions.

2.8 Attachments to Cooperative Poles

The Cooperative will provide, install, and maintain meter poles as required. Other than the Member's service equipment, no other attachments (i.e. Member owned lighting, antennas, basketball goals, bird houses) may be made to the meter pole. Attachments to any other Cooperative poles are normally not allowed. Attachments may be made only with approval of the Cooperative. Unauthorized attachments may be removed upon discovery. If an attachment is allowed, an attachment agreement shall be signed, and the agreement will set forth any charges. All permitted attachments are to be made under the supervision and to the satisfaction of the Cooperative. All allowed attachments shall be made in accordance with the specifications of authorities having jurisdiction, where applicable. Consult the Cooperative for details.

Section 3: Information for Providing Electric Service

3.1 Application for Service

A Member may apply for service by contacting the Cooperative by phone at 1-800-489-7405.

(Note: Service rendered by the Cooperative is subject to the provisions of the Cooperative's Bylaws, Service Regulations, and applicable rate schedule. The supplying and taking of such service shall constitute an Agreement for Service if no written agreement for service or application for service has been executed.)

3.2 Pre-Installation Information

The Cooperative can expedite service connection and minimize cost to both the Member and the Cooperative if the Member consults the Cooperative before the design phase of the installation has begun. Architects, Builders, Contractors, Developers, Engineers, Electricians, or Owners are urged to consult the Cooperative for information regarding the availability and type of service, and location of the service drop, service entrance, and meter. The Cooperative is not responsible for the cost of replacing any of the Member's facilities that do not meet the requirements for service. Connection to the Cooperative's electric system is not available prior to approval by the Cooperative. The approval process may include the acquisition of permits and/or inspections by the authorities having jurisdiction.

3.3 Alterations to Existing Service

The Cooperative's facilities, including meters, transformers, and other equipment, are sized and installed by the Cooperative to satisfy the Member's requirements at the time the service is initiated and is based on information supplied by the Member. Consulting with the Cooperative regarding any change in the Member's requirements is recommended. It is essential that the Member give notice to the Cooperative of any substantial additional load (e.g., a large motor) that is to be connected to the electric system. The Member should not proceed to make these additions until after the Cooperative has notified them that it can either supply the increased load or the conditions under which the increased load can be served. The Cooperative is not liable for any damages incurred by the Member connecting additional equipment without notice to the Cooperative. Under no circumstances shall any service drop wire, meter or metering equipment belonging to the Cooperative be disconnected, removed, or relocated unless authorized by the Cooperative (see also Section 11.2). This authorization requires advance notification. The Cooperative may require the replacement of the Member's obsolete equipment at the service entrance or relocation of the service entrance to a more accessible area prior to providing the requested service.

The construction of pools, decks, fences or any structure near, under or over electrical facilities may cause a code and / or safety violation and be an encroachment on the Cooperative's right of way. Consult the Cooperative concerning all clearances.

3.4 Required Information for New Service or Alteration to Service

The Member shall furnish the following information to the Cooperative for any new service, or alterations to existing service, desired by the Member:

1. Exact location(s) of premises, including street address if available, where service is desired.
2. 911 address if different than street address [Note: 911 address or other address if no 911 address is available shall be posted near the location where the meter is to be installed.]
3. If location is new, with no established address, have street or road name and good directions to service location.

4. Name of city if service location is within an incorporated city limits.
5. Billing address and name.
6. Home phone, work phone and mobile phone if applicable.
7. Permitting requirements, if any
8. Type of service (including service voltage), equipment rating, and amount of electrical load to be installed.
9. Total motor load (to include size(s) of largest motor(s), starting current(s), NEMA letter or code) and rated voltage.
10. General characteristics of equipment to be driven by motors.
11. Date new electric service or alterations to existing service are needed.
12. Desired point of delivery or service entrance location. (Sketch may be required.)

(Note: For residential applications the Member will be asked to provide both his or her social security number and the place of employment, as well as the social security number and place of employment of their spouse or roommate.)

Upon receipt of the above information, the Cooperative will advise the Member as promptly as possible concerning installation or modification of the Member's electric service.

The Member shall install and maintain the Member's wiring and electrical equipment within or on the premises, in accordance with building and wiring codes, laws and local ordinances that are in effect.

The Cooperative reserves the right to refuse to connect its service if the Member's installation does not meet either:

1. The Cooperative's requirements,
2. Electrical Codes or,
3. Rules and regulations of the authority having jurisdiction over the installation. The Cooperative will not be responsible, in any way, for any defect in the Member's wiring, equipment, or for damages that may result from such defects. (Note: The Cooperative may refuse service for other than technical reasons.)

The Cooperative (or the Cooperative's contractor) shall make the connection at the point of delivery. In special cases the Cooperative may authorize the Member's contractor to make this connection. This authorization shall be obtained before any connections are made directly to the electric system. This requirement does not preclude the Member's contractor or electrician from installing meter sockets, metering transformers, or other equipment when furnished by the Cooperative.

3.5 Connection of Service

3.5.1 General Comments

The Cooperative desires to provide connection of service in conformation with the Member's request. Timeliness of connection may depend on the Member being present when the Cooperative representative is at the site. The procedures for energizing the service are explained in the following paragraphs.

3.5.2 Residential Self-Contained Meters

The Member should contact the Cooperative to schedule an appointment for the connection of the service and be on the premises if possible. If the Member is not on the premises, the service may not be energized. If an outside main breaker or disconnect switch is available, the switch shall be placed in the "off" position and the meter installed. The switch shall be left in the "off" position and the Member would then be responsible for putting the switch in the "on" position.

3.5.3 Commercial and Industrial Self-Contained Meters and All Three-phase Services & Single-phase Transformer Rated Services

It is recommended that the Member or the Member's representative be present for energizing commercial and industrial self-contained meters and all three-phase services and single-phase transformer rated services. If the Member is not on the premises and if an outside main breaker or disconnect switch is available, the switch will be placed in the "off" position and the meter installed. The switch will be left in the "off" position and the Member shall be responsible for putting the switch in the "on" position. For self-contained metered service, if no breaker or disconnect is available, the meter will not be installed. For transformer rated metered service, if no breaker or disconnect is available, the Cooperative will not energize the service drop. The Member should then contact the Cooperative to schedule an appointment for the connection of the service.

Section 4: Types of Service

4.1 General Characteristics

The electric service furnished by the Cooperative is 60 Hertz alternating current, single and three-phase.

4.2 Generally Available Types of Service

The type of service (number of wires, phase, and voltage) furnished by the Cooperative depends on two factors

1. The voltage available near the service location.
2. The type of service which in the Cooperative's judgment can most economically be made available to serve the nature, size, and location of the Member's requirements.

The voltages and number of phases generally furnished are listed in Table 4.2-1 by nominal service voltages. However, a particular type of service may or may not be available at a given location. Therefore, during the Member's design phase, the Cooperative shall be consulted for availability and terms and conditions regarding the type of service desired.

	Types of Service	Typical Loads Served
1.	1 phase - 120/240 volts – 3 wire	Residential and other small loads
2.	3 phase delta - 120/240 volts - 4 wire (Consult Cooperative for availability on 25 kV systems.)	Loads with both single and three-phase requirements not exceeding 1,000 kVA: Open delta - For small three-phase loads normally 40-60Hp max; Closed delta - Single-phase load shall be 20% or less of total for loads between 300 and 1,000 kVA. Delta service not available from pad mounted transformers.
3	3 phase delta 240/480 volts – 4 wire (Consult Cooperative for availability on 25 kV systems.)	Loads between 10 kVA and 2,500 kVA. Delta service not available from pad mounted transformers.
4.	3 phase wye 120/208 volts - 4 wire	Loads with both single and three-phase requirements not exceeding 1,000 kVA
5.	3 phase wye 277/480 volts - 4 wire	Loads with both single and three-phase requirements not exceeding 2,500 kVA
Notes:		
<ol style="list-style-type: none"> 1. For specific information on voltage transformations, consult the Cooperative or the rate schedules. Refer to Table 5.4-2 for allowable motor sizes for various voltages. 2. Items 1-4 are further described in NEC250.20B 3. Table 4.2-1 does not include all types of service available. The Cooperative also offers electric service at primary distribution voltages. Normally, the voltages offered at a given location are restricted to readily available voltages. Contact the Cooperative for further information on the availability of all distribution voltages not listed in Table 4.2-1. 		

4.3 Availability of Three-phase Service

It is the Cooperative's policy to allow the Member the widest selection of service types consistent with sound operation and with the type of service desired to best suit the electrical requirements. However, there are locations in the Cooperative's service area where, for practical considerations, the selection must be limited. The Cooperative has many areas in which three-phase facilities are not available. In these areas, the Member may be required to pay the incremental cost of providing three-phase service. The cost of providing such facilities may be prohibitive in relation to the value of three-phase service to

the Member. Therefore, the Member should contact the Cooperative to determine if any charges are associated with the desired service prior to making any decision concerning the purchase of electrical equipment.

4.4 Facilities for Highly Fluctuating or Special Loads

The Cooperative normally provides facilities adequate to serve reasonably stable loads. Highly fluctuating loads such as welders, X-ray machines, and motors with unusual or frequent starting requirements, may cause the facilities normally provided to be inadequate. Highly fluctuating loads may interfere with other Members' electric service. In some instances, the most practical solution to these problems may be the installation of additional facilities to serve the Member. Should the Cooperative need to install such additional facilities, the Member will be required to pay for them.

4.5 Temporary Service

Temporary services are usually defined as locations that will be utilized for less than 5 years. The Cooperative provides many types and classes of temporary service that may be available at the location for construction work, traveling shows, etc. The Member shall provide adequate protective devices for all temporary services. Member installed poles to be used for temporary service shall be treated. Overhead temporary service poles are typically set no more than 75 feet from the nearest Cooperative pole. See Drawing 4.5-1 for a typical structure for temporary service from an overhead source. See Drawing 4.5-2 for a typical structure for temporary service from an underground source. The Cooperative will specify the temporary service pole location for either overhead or underground service. Specific terms and conditions under which temporary service will be provided may be obtained from the Cooperative. When air conditioned or electrically heated construction trailers are to be served please see Section 4.6 below or consult the Cooperative.

4.6 Services for Individually Located Mobile Homes and Travel Trailers

Requirements for electrical service for individually located mobile homes and travel trailers differ from other types of service. Provisions shall be made for connecting a mobile home feeder assembly by a permanent wiring method. Member feeder conductors shall consist of either a factory-installed listed cord or a permanently installed feeder consisting of four, insulated, color coded conductors (NEC 550-33). For information on the location of meter service, see Drawing 4.6-2 and Drawing 4.6-4. For mobile homes installed in locations other than in a mobile home park, see Drawing 4.6-1 and Drawing 4.6-2 for a typical meter service installation from an overhead source and Drawing 4.6-3 and Drawing 4.6-4 for a typical meter service installation from an underground source.

4.7 Services for Mobile Home Parks

Mobile Home Parks are defined as five or more mobile homes or trailers and accessory buildings on a continuous parcel of land used by its occupants or owners. These parks shall be served at a common point as shown in Drawings 4.7-1, 11.6-1 and 11.6-3. The park management shall be responsible for running service from the disconnect at the Cooperative meter location to the individual trailers.

On overhead service from Cooperative, the Cooperative shall have exclusive use of the pole where the point of common connection is located. Cooperative recommends that the Park use underground feeders to individual trailers to avoid the hazards of trailers, antennas, etc. contacting overhead electric lines. If the Park wishes to distribute the electricity overhead it must use a separate pole(s) from the Cooperative's poles. Consult the NEC for overhead clearances and underground construction on Member owned lines.

4.8 Meter-On-Pole Locations

For farms and other permanent service locations that have two or more points of utilization on the premises, or where it is more practicable to deliver service at a central meter pole on the Member's property than at a building, the Cooperative will provide a meter pole for service under the following conditions:

1. The meter pole will be installed, owned, and maintained by the Cooperative. Refer to Drawing 4.8-1.
2. Member shall install a service entrance (or meter loop) and fused switch or circuit breaker (all to be owned by the Member) on the meter pole. The Cooperative will hang the service assembly at the Member's request.
3. No other attachments such as Member-owned lighting, basketball goals, satellite dishes, etc. will be allowed on the meter pole.
4. The Cooperative will connect its service wires to the Member's service entrance conductors on the meter pole, this point of connection being the point of delivery of service.
5. The wires extending from the meter pole to the Member's buildings or points of utilization will be a part of the Member's installation and will be installed and maintained by the Member.

4.9 Apartment and Commercial Building Service

Where apartment buildings are contemplated, the Cooperative should be contacted before plans are drawn, in order that adequate service can be made available to the prospective tenants.

4.10 In-building Distribution System

The Cooperative will not install, own, or maintain a distribution system within any buildings. Consult the Cooperative.

4.11 Service to Marinas and Boat Docks

The Cooperative will provide electric service to marinas and boat docks. These electric services shall terminate at a point above the expected high water level on land designated by the Cooperative or the authorities having jurisdiction. Consult the Cooperative for the exact location and other details. A disconnect switch shall be installed at the point of delivery. All underground served installations will have a junction box before the disconnect as the point of delivery (see Section 8.7.1). With the exception of the meters, the Member shall own, install, and maintain all facilities beginning at the point of delivery. Meters will be owned by the Cooperative but may be installed near each boat slip. The Member's facilities shall meet all requirements in NEC Article 555 and any other referenced code.

4.12 Buildings Built over Water

The Cooperative will provide electric service to buildings built over water. These electric services shall terminate at a point above the expected high water level on land designated by the Cooperative or the authorities having jurisdiction. Consult the Cooperative for the exact location and other details. As a minimum, the point will be located above the 100-year flood plain elevation. A disconnect switch shall be installed at the point of delivery. All underground served installations will have a junction box before the disconnect as the point of delivery (see Section 8.7.1). With the exception of the meters, the Member shall own, install, and maintain all facilities beginning at the point of delivery. The Cooperative will own the meters. The Member's facilities shall meet all requirements in NEC and any other referenced code.

Section 5: Voltage Categories and Member Equipment

5.1 General Comments

Sections 4 and 5 describe the types of service generally furnished for specific uses. General descriptions of available voltages for different size loads are also given. When a Member wants a type of service from the Cooperative that would not normally be made available, the Member shall consult with the Cooperative prior to planning the installation. If providing the type of service desired is possible, the Cooperative will inform the Member of the terms and conditions. Any type of service or voltage not defined as the Cooperative's standard voltage may be supplied only after specific written approval is obtained from the Cooperative.

5.2 Voltages for Lighting

The recommended service voltage for lighting is 120 volts. Members served by higher voltages may use 208, 240, 277, or 480 volts for lighting. Where the lighting voltage is different from the voltage supplied by the Cooperative, the Member will install and maintain suitable transformers on the Member's side of the point of delivery.

5.3 Voltages for Heating

The recommended voltage for space and water heating is either 208 or 240 volts, depending on the service voltage. Heating equipment operated at the Member's service voltage should be designed for operation at that voltage. Higher voltages, as available, may be used for larger loads. Resistance furnaces or ovens rated 30 kVA or larger should be three-phase. Consult the Cooperative for service to arc furnaces. Consult the Cooperative for service to residential furnaces or ovens rated 30 kVA or higher prior to purchase of equipment.

5.4 Voltages for Motors

Consult the Cooperative for availability of voltages for motors over 7½ horsepower. Motors may be connected to a 240-volt single-phase service when they are no larger than 7½ horsepower. Motors over 7½ horsepower should be connected to 208 volts three-phase (or other available voltage of 240 volts or higher) where the Member has a three-phase service. The Cooperative may require that a motor over 7½ horsepower be served by single-phase service where three-phase service is not available unless the Member is willing to pay for installing three-phase service.

Three-phase service will not normally be furnished for individual motors less than 7½ horsepower. Any exceptions will result in the Member paying for the additionally required facilities. Table 5.4-2 offers a general guide for selection of motor voltages for various horsepower ratings, except as may be otherwise determined in consultation with the Cooperative.

Total Connected Motor Load (hp)	Size of Largest Individual Motor (hp)	Minimum Voltage and Phase
Up to 5	1	120 volts 1 phase
5 – 50	5	240 volts 1 phase
7.5 – 150	30	208 or 240 volts 3 phase
50 – 2,500	30	480 volts 3 phase

Consult the Cooperative before commitments are made for any three-phase motor over 30 hp., and for any motor that may have requirements not suited for the available service type. Motors larger than

these sizes may be allowed under certain conditions. The use of larger motors will usually require the use of auxiliary starting devices and other special equipment. Refer to Section 14.5, Motor Starting, for allowable starting currents for motors, and Section 14.5.4, Motor Starting and Control Equipment, for the requirements for auxiliary starting devices. Consult the Cooperative before designing any use of motors which exceed the sizes listed above.

5.5 Voltages for Welders, Elevators, Hoists, Electronic Transmitters, X-Ray Machines, and Other Miscellaneous or Special Equipment

Various voltages may be available for welders, elevators, hoists, electronic transmitters, x-ray machines, and other miscellaneous or special equipment. The Cooperative shall be consulted before the Member purchases welding equipment, elevator, or any apparatus with highly fluctuating load characteristics. In some instances, the most practical solution to problems associated with fluctuating loads may be the installation of additional facilities to serve the Member. Should the Cooperative install such additional facilities; the Member will be required to pay for them.

5.6 Voltages for Overhead or Underground Residential Areas Including Manufactured Homes, Mobile Home Parks, Trailer Parks, and Individually Located Mobile Homes

Members in residential areas, including manufactured homes, mobile home parks, trailer parks, and individually located mobile homes, with either overhead or underground facilities will be served at 120/240 volts, single-phase. Should three-phase service be required for a specific Member, consult the Cooperative for availability and added cost of providing three-phase service before commitments are made.

Section 6: Service Requirements

6.1 General Comments

The Cooperative will designate the location of the point of delivery or attachment of the service to the Member's premises, taking into consideration the shortest distance to the Cooperative's distribution facilities, crossing adjacent property of others, and location of meter for reading and servicing. See Table 6.1-1 for the typical location of the point of delivery.

The cost to the Member for electric facilities will be minimized for the Member by contacting the Cooperative to determine the point of delivery location during the Member's project design phase. The service may be installed overhead or underground depending on the Member's preference and/or the facilities available in the area of the premises to be served. Consult the Cooperative for the cost and conditions for underground service.

All electric service required on the Member's premises shall be delivered and metered by the Cooperative at one point of delivery, except where a second separated service is required for exit or emergency lighting, fire pumps, or other safety regulations.

The Cooperative's service will not be energized until the Member's installation has been inspected and approved by the authorities having jurisdiction and all obligations due the Cooperative have been satisfied.

Service for loads over 200 amperes may require individual attention. Consult the Cooperative for information and specifications.

Table 6.1-1 – Typical Point of Delivery Locations		
Service Rating	Overhead Service	Underground Service
Single or Three-phase Up To 320 amps	Member provides and installs the meter socket, outside disconnect switch, and riser conduit with service entrance conductors. Cooperative provides, installs, and connects the service drop conductors to the service entrance conductors at the weatherhead. POD is the connection at the weatherhead.	Member provides and installs the meter socket and outside disconnect switch (or meter pedestal) on the building or structure, and all conduits from the meter location to the Cooperative's secondary pedestal or transformer. Cooperative installs the conduit into its pedestal or transformer, and provides and installs the service conductors to the meter. POD is the supply side of the meter terminals.
Single or Three-phase Over 320 amps	Member provides and installs the support structure, meter socket and service equipment, mast conduits with service entrance conductors, and service drop attachment hardware on the mast. Cooperative provides, installs, and connects the CT's and service drop conductors to the service entrance conductors at the weatherhead. POD is the connection at the weatherhead.	Member provides and installs a CT cabinet on the building or structure, and provides and installs all conduits and service conductor from the CT cabinet to the Cooperative's secondary pedestal, junction box, or transformer. Cooperative provides and installs the CT metering equipment on the building or structure. POD is the at the secondary pedestal, junction box, or transformer terminals.
Note: See the applicable service drawing for details on materials and construction requirements.		

6.2 Right-of-Way for Service Facilities

The property owner(s) will grant, at no cost to the Cooperative, right-of-way suitable to the Cooperative for the installation of the Cooperative's facilities. The Cooperative may require a written right-of-way permit document for execution by the property owner(s). The Cooperative may require the Member's assistance in obtaining right(s)-of-way from adjacent property owner(s).

The Cooperative shall also be provided, at no cost, written agreements covering proper easements if:

1. Primary facilities are installed on private property;
2. secondary facilities are to be installed on the Member's premises that could serve one or more Members on adjoining properties;
3. facilities cross over or under private property, such as, cross country, adjoining highways and roadways, within subdivisions, etc., and
4. facilities are constructed within the confines of a highway or roadway that exists by virtue of servitude only.

All parties, i.e., in-fee land owner(s), grantee(s), shall give their consent.

6.3 Initial Clearing of Property for Right-of-Way

The Cooperative is responsible for the cost of preparing the initial right-of-way for overhead service installations up to the meter pole location. If agreeable to both parties, the Member may perform the clearing as instructed by the Cooperative on all property owned by the Member. In either case, the Member will be responsible for removal of all debris on the Member's property. For underground service routes, the Member is responsible for clearing and maintaining the right-of-way from the Cooperative's source location to the meter location.

6.4 Relocation of Cooperative's Facilities

The Cooperative will move or relocate the Cooperative's facilities, where practical to do so, at the request of the Member. The Member may be required to provide consideration (i.e., payment, furnishing of installed facilities, etc.) in exchange for the relocation.

Section 7: Overhead Service

7.1 General Comments

Consult the Cooperative for the closest and most reasonable location for the service drop attachment. Ordinarily, only one type of service and one service drop is permitted to the Member's premises. The Cooperative will normally make connection to the Member's service entrance conductors. Connection shall be made only after the Member's wiring has passed inspection and has been approved by the authorities having jurisdiction. From the point where the Cooperative's overhead service drop terminates, the Member shall install service entrance wires to the meter socket and service entrance switch or circuit breaker panel in accordance with the requirements of the NEC, NESC, or other authorities having jurisdiction.

Not less than three feet of each conductor of the service entrance cable or wires shall be left extending beyond the weather head for connection to Cooperative's service drop. For polyphase services, like phases shall be appropriately identified and marked on both ends. High-legs in four-wire delta services shall be marked with orange tape on both ends. Neutrals shall be marked with white tape on both ends. Neutrals may be bare wire. The Cooperative will make the connection(s). Refer to Drawing 7.1-1 and Drawing 7.1-2 for overhead residential installations.

It is the Member's responsibility to ensure that like phases are appropriately marked and connected together on the supply side and the load side of the metering equipment.

7.2 Point of Attachment

The point of attachment

1. shall be provided and installed by the Member for the Cooperative's service drop to the Member's premises,
2. shall be of sufficient height to permit the Cooperative's service drop to conform to the requirements of the National Electrical Safety Code and any other controlling codes, ordinances, or orders of authorities having jurisdiction,
3. shall not exceed 21 feet in height from final grade to attachment point for residential services, and shall be either accessible to Cooperative's bucket truck or have enough surface (such as a wall or building structure) and sufficient ground space on same Member's property to safely support a ladder,
4. shall have a clear line of sight to the pole from which the service wire is or will be attached,
5. shall not have any other attachments (such as telephone, cable, Internet) as per NEC 230.28.

Also see Section 11.5 Location of Meter Installations.

The Member may be required to install a service extension or a metal riser pole. When a service extension or metal riser extends above the roof, the point of attachment and clearances above the roof shall conform to the National Electrical Code or other controlling codes. Where a service mast is used for the support of service drop conductors it shall be of adequate strength and supported by braces or guy wire to withstand safely the strain imposed by these drops and be no higher than 60" higher than the roof. Where the raceway type service mast is used, all raceway fittings shall be identified for use with service mast. Rain type service head shall be used at the point of connection to service drop conductors.

For temporary overhead service refer to Section 4.5, Temporary Service, and Drawing 4.5-1. For permanent service, see Drawing 7.1-1 and Drawing 7.1-2.

7.3 Clearances

The point of attachment of the service drop (150 volts line to ground or less) shall be high enough to allow for the service drop conductors to have the following minimum clearances at their lowest point (To allow for typical cable sag, point of attachment is usually 1 1/2 -2 ft higher than minimum clearance below-consult the Cooperative):

- 12 feet over areas of pedestrian traffic, residential driveways, and commercial areas not subject to truck traffic
- 16 feet over roads, streets, alleys, non-residential driveways, and other areas subject to truck traffic.

Where the height of a residential building does not permit service drops to meet these values, the clearances may be reduced to the following (see NESC Table 232-1):

150V or less to ground	For residential driveways only	Spaces accessible to pedestrian traffic only
Insulated Service drops	12	10
Insulated drip loops	10	10

The point of attachment shall never be installed so the service drop would extend over a swimming pool or any other permanent or temporary structure. See section 2.3 Distance Requirements for Member Structures for swimming pool clearances.

The construction of any structure near, under, or over Cooperative lines may cause a code and / or safety violation. Consult the Cooperative concerning all clearances.

7.4 Length of Service Drop

The clearance of the unsupported length of the service drop from the Cooperative's facilities to the first point of attachment will in no case violate the clearances given in previous Section. The allowable unsupported length of a service drop shall depend on wire sizes as shown in the table on Drawing 4.6-1, Drawing 4.6-2, Drawing 7.1-1, Drawing 7.1-2 and Drawing 7.7-1. Other significant factors and conditions at the Member's property may affect these standard lengths. Consult the Cooperative for length limitations.

7.5 Method of Attachment

The service drop will be attached to the building or approved extension by suitable means supplied by the Member. The Member shall provide suitable reinforcement or backing for secure mounting of attachment fittings and adequate anchorage of the service drop as well as at the appropriate height with the appropriate separation. Refer to Drawing 7.1-1 or Drawing 7.1-2 for residential installations.

7.6 Extension of Overhead Distribution Facilities

The Cooperative standard for overhead distribution facilities is installation on front lot easement. Consult the Cooperative early in the design phase for more information on other options.

A Member's service location may require the Cooperative to incur expense greater than normally allowed in providing the service. Extension of primary overhead distribution lines, relocation of Cooperative facilities or removal of Cooperative facilities are examples of situations which occur. When such a situation exists, the Cooperative may require payment from the Member in addition to the amount normally charged. For complete details on payment options, consult the Cooperative's policy for extension of overhead electric distribution facilities.

7.7 480 Volt Metered Service

A 480 Volt service with a self-contained meter shall have a disconnect switch on the supply side of the meter. Refer to Section 13.8.1, Disconnecting Means for Services Less Than 600 Volts. Also refer to Drawing 7.7-1 and Drawing 11.6-5.

Section 8: Underground Service and Installations

8.1 General Comments

Economic, physical and technical considerations normally dictate the use of overhead distribution facilities in the Cooperative's operating area. The Member may either elect or be required to take underground electric service. The Member will be required to pay the additional cost, if any, in excess of the cost of an overhead system. Consult the Cooperative.

Single-phase underground service will normally be 120/240 volts, three-wire. The service from three-phase pad mount or vault type transformers should be restricted to 120/208Y or 277/480Y volts, four-wire. The Cooperative's typical installation includes a pad mount transformer. Occasionally, other type transformers may be required. Consult the Cooperative for details.

In general, the Member will be responsible for replacing any landscaping, shrubs, trees, or paved areas that are removed or disturbed to accommodate the installation of new, or the repair of existing, Cooperative owned underground facilities on the Member's premises.

8.2 Ownership of Facilities

The Cooperative will generally own and operate all facilities on the Cooperative side of the point of delivery. The Cooperative will own metering equipment and selected equipment located in vaults. Specific ownership requirements for residential and non-residential installations can be found in Section 8.6, Requirements for Obtaining Underground Residential Service, and Section 8.7, Requirements for Commercial, Industrial, and Other Non-Residential Underground Service.

8.3 Initial Clearing of Property for Underground Service

The Member:

1. Requesting a new service is responsible for preparing the initial right of way.
2. Shall notify ONECALL 48 hours before digging and shall have ONECALL locate all underground facilities before digging. Dial 811 to contact ONECALL.
3. Shall be responsible for performing all grubbing and clearing as instructed by the Cooperative on all property owned by the Member
4. Will be responsible for removal of all debris and shall bring the easement to final grade prior to any installation of facilities by the Cooperative
5. Shall be responsible for costs associated with raising, lowering or relocating facilities due to changes in the surface grade after installation of the Cooperative's facilities.

At the Cooperative's option, the Cooperative may prepare the right-of-way and will be reimbursed by the Member.

8.4 Agreement for Underground Service

The Member may be required to execute an agreement that will set forth ownership and maintenance responsibilities, characteristics of the services covered, and any financial arrangements. An agreement may also be required with the individual Member in order for the Cooperative to provide underground service.

8.5 Specification Requirements

All facilities, which the Cooperative will own and operate, shall be installed either by the Cooperative or to the Cooperative's specifications. The Cooperative will not accept ownership of any underground facilities that do not meet the Cooperative's specifications.

8.6 Requirements for Obtaining Underground Residential Service

8.6.1 General Comments

Underground residential service may be available from either overhead or underground facilities. The Member shall provide, install, own and maintain the conduit from the meter socket to the service transformer or pedestal. The Cooperative shall provide, install, and maintain the underground conductors in the conduit system for services rated 320 amps or less. The Member will provide, install, and maintain the service conductors for services rated above 320 amps. Typically, the Member pays for all costs above the value of an overhead service installation.

8.6.2 Underground Electric Service for New Residential Subdivisions

Contact the Cooperative at the earliest date possible so that,

1. the Cooperative can plan the distribution system, design any applicable street lighting feed points or other lighting systems, determine the meter and service locations, and
2. Agreement can be reached on the manner of paying the additional cost, if any, in excess of the cost of any overhead system.

Underground facilities will be installed on the front lot easement with pad mount transformers and pedestals where needed. Water or natural gas lines are not allowed to share the trench with electric lines and must be separated from the Cooperative's lines by a minimum of 18"; CATV and telephone may share trench with electric lines only if the Cooperative and the CATV or telephone company have an agreement for such shared trench already in place. Easements for underground facilities shall be described on Cooperative's right-of-way agreement forms and furnished to the Cooperative as outlined by Cooperative policy and/or on dedicated recorded plat. Refer to Section 6.2, Right-of-Way for Service Facilities.



Typical pad mounted residential transformer



Typical secondary service pedestal

Members within an underground subdivision adjacent to an overhead distribution system may be served with an underground service from the overhead system.

8.6.3 Underground Service from an Underground Distribution System.

A Member may elect or be required to take electric service through an underground service from an underground distribution system and may be required to pay in some manner the additional

cost, if any, in excess of the cost of an overhead system. The Member shall provide, install, own and maintain the conduit from the meter socket to the service transformer or pedestal. The Cooperative shall provide, install, own, and maintain the underground conductors in the conduit system for services rated 320 amps or less. For services rated above 320 amps, the Member will provide, install, own, and maintain the service conductors.

8.6.4 Underground Service from Overhead Distribution System

The Member may elect or be required to take service through an underground service from an overhead distribution system and may be required to pay in some manner the additional cost, if any, in excess of the cost of an overhead service. The Member shall provide, install, own and maintain the conduit from the meter socket to the Cooperative’s pole. The Cooperative shall provide, install, own, and maintain the pole riser conduit and the underground conductors in the conduit system for services rated 320 amps or less. For services rated above 320 amps, the Member will provide, install, and maintain the service conductors from the meter to the pole riser, including sufficient conductor to reach up the pole to the transformer; the Cooperative shall install the conductors into the pole riser and connect to the transformer.

8.6.5 Underground Service Replacing Existing Overhead Service

An existing Member served with an overhead service may request the removal of the overhead service and installation of a new underground service. If the existing service is of adequate size to serve the load, the Member is responsible for paying the total estimated cost of the job plus the removal cost less salvage. Where the existing service is not adequate to serve the increased load, the Member shall pay the difference between the estimated cost of an underground service and a new overhead service. Consult the Cooperative for information and specifications.

8.7 Requirements for Commercial, Industrial, and Other Non-Residential Underground Service

8.7.1 Junction Box Requirements

When the Member provides, owns, installs and maintains the secondary wire to the Cooperative’s transformer, a junction box is not required. If the Cooperative owns the service conductors from the transformer to the Member’s premises, the Member shall supply a UL listed Cooperative approved junction box or a UL listed Cooperative approved alternative with a locking mechanism to secure it suitable for a Cooperative padlock. Junction boxes used for various situations are shown in Drawing 11.6-3, Drawing 11.6-4, Drawing 11.6-5, Drawing 11.8-3, and Drawing 11.8-4.

Table 8.7.1-1: Guideline for Junction Box Use with Multiple Circuits				
No. of conductors allowed per phase		Box dimensions		
Member	Cooperative	Depth	Width	Height
(2) 250-500 CU or less	(2) 336-500 AL or less	12"	30"	36"
(3) 500 CU	(3) 500-750 AL	15"	48"	48"
For larger sizes consult the Cooperative				

The Member shall supply UL listed connectors inside, which will be the point of common coupling between Cooperative and Member. These connectors shall be sized no less that 125% of continuous load, plus 100% of the non-continuous load. Any ampacity adjustment shall be made in accordance with the terminal rating requirements of Section 110.14 of the 2002 NEC. Connectors shall be suitable for both copper and aluminum. Insulated multi connector block or bus bar type shall be used. Bus bar type shall be fastened to the back of junction box. A

durable marking for color or word coding shall be installed. The neutral conductor shall have a white marking or a suitable identifying mark. The next section of the terminals shall have color suitable for applicable voltage. Plastic anchors are not allowed. Consult the Cooperative for the requirements in your area.

8.7.2 Underground Service from Underground Systems

Underground secondary service from an underground distribution system may be provided to non-residential Members under the following conditions:

1. For three-phase services, it is the responsibility of the Member to install, own, and maintain the transformer pad. The Cooperative will provide, own, and maintain the pad for single-phase services.
2. The Member will open and close all primary and secondary trenches required for conduit installation.
3. The Member will provide and install all secondary conduit from the Cooperative's source to the meter or service entrance location. The Cooperative will provide and install all primary conduit.
4. The Member will provide, install, and maintain secondary conductors for services rated over 320 amps. The Cooperative will provide, install, and maintain secondary conductors rated 320 amps and less.

The Member shall pay the difference between the cost of the Cooperative's underground facilities and the cost of the Cooperative's overhead facilities, if any, to serve the load. For installation details, refer to Section 8.10.2.3, Conduit Used in Commercial, Industrial, and Other Non-Residential Underground Installations, to Section 8.11.3, Conductors Used in Underground Non-Residential Installations, to Section 8.14, Transformers Used In Underground Installations, and to Section 10.5, Transformer Vaults. Consult the Cooperative for additional information, specifications, and contract forms for underground installations.

8.7.3 Underground Secondary Service from Overhead Systems

Underground secondary service from an overhead distribution system may be provided to non-residential Members under the following conditions:

1. The Cooperative will provide and install any riser conduits to be attached to its poles.
2. The member will provide and install secondary conduit from the riser pole to the meter or service entrance location.
3. The Cooperative will provide and install the conductors from the transformer to the meter for services rated up to 320 amps.
4. For services rated over 320 amps, the Member will provide and install the conductors from the meter to the base of the pole, leaving enough conductor to reach up the pole to the transformer terminals.

Refer to Section 8.10, Conduit, and Section 8.11.3, Conductors Used in Underground Non-Residential Installations. Consult the Cooperative for additional information, specifications, and contract forms for underground installations.

8.8 Section not used in this edition

8.9 Underground Electric Service for Mobile Home Parks

The Cooperative will provide underground electric service to approved Mobile Home Parks. The Member shall pay the difference between the overhead and the underground systems. (Approved

Mobile Home Park shall mean one that is permanent, rather than temporary, and shall have permanent central water and sewage systems.)

Other than in a mobile home park, service to individual mobile homes will be made at individually installed meter pedestals. The Member shall supply the pedestal. Consult the Cooperative for information. See Drawing 4.6-3 and Drawing 4.6-4 for details.

Also see Section 4.6 Services for Individually Located Mobile Homes and Travel Trailers and Section 4.7 Services for Mobile Home Parks.

8.10 Conduit

8.10.1 General Comments

Conduit is normally required for all underground installations. Some rural or agricultural areas that are less subject to dig-in activity, and free of surface obstructions, may be served using direct-buried cable if soil and local use conditions permit. Consult the Cooperative for details. The conduit may be rigid steel or Schedule 40 PVC (below ground) or Schedule 80 PVC (above ground) in appropriate applications. All PVC conduit and fittings shall be gray electrical grade conduit. All conduits shall be of such size and type to meet the requirements of the Cooperative and the Cooperative specifications for the selected cable to serve the Member. All bends and elbows shall be a minimum 36" radius. The Member's anticipated future load requirements should also be considered when sizing cable and conduit to serve the Member's present requirements.

8.10.2 Installation

8.10.2.1 General Comments

All conduits shall be installed according to Cooperative requirements. Due to the quality of the soil in some portions of the Cooperative's service area, concrete around the conduit may be required. All ditch bottoms shall be level and free of debris or rocks larger than 1" in diameter. Where ditch depth varies, the ditch bottom shall be gradually graded to support the conduit along its entire length, leaving no voids between the conduit and the bottom of the trench.

8.10.2.2 Conduits Used in Residential Underground Installations

Services installed in conduits for residential Members shall conform to Drawing 8.6-2 or Drawing 8.6-3. Also see Drawing 8.6-1. The Member shall install the conduit at a minimum cover depth of 30 inches to finished grade (trench depth shall be 36 inches), with the end of the elbow coming up at the base of the pole for service from an overhead source. The Member shall install the conduit to a point 12 inches from the side of the transformer pad or pedestal for service from an underground source. The Member shall mark the end of the cable or conduit by a stake or other agreed upon method.

In general, the conduits shall be installed such that when the conduit run has more than three 90-degree bends, including riser bends (riser bends shall be 36 inches in radius), the Member shall install a pull box. The pull box shall be of a design that conforms to Cooperative specifications. It shall be installed as advised by the Cooperative. Also consult the Cooperative when conduit or cable length runs exceed 200 feet. A pull box may be needed when conduit runs exceed 200 feet. Long cable runs may also require bigger cable and conduit to compensate for voltage drops.

When the source is an overhead system, the Cooperative shall provide and install the conduit riser. The Cooperative will pull the conductors in the conduit system for services rated up to 320 amps. When two or more services originate from one Cooperative pole having overhead

facilities, means of accommodating multiple services will be installed by the Cooperative. Refer to Section 8.6.4.

8.10.2.3 Conduit Used in Commercial, Industrial, and Other Non-Residential Underground Installations

- Primary Conductors: The Cooperative shall provide, install, and maintain all primary conduit runs to be installed. The member shall open and close all primary conduit trenches. See Drawing 8.7-1 for primary trench specifications.
- Secondary Conduit and Conductors: The Member normally provides and installs all secondary conduits from the transformer or pedestal to the service entrance location. Consult the Cooperative for specific conduit sizes. The following table may be used as a general guide for conduit sizing.

#2 Al Triplex	2"	#2 Al Quad.	3"
1/0 Al Triplex	2"	1/0 Al Quad.	3"
4/0 Al Triplex	2"	4/0 Al Quad.	3"
350 Al Triplex	3"	350 Al Quad.	4"
500 Al Triplex	3"	500 Al Quad.	4"
750 Al Triplex	5"	750 Al Quad.	5"
1000 Al Triplex	5"	1000 Al Quad.	5"

8.11 Conductors

8.11.1 General Comments

The Cooperative will generally own and operate all conductors on the Cooperative side of the point of delivery. See Table 6.1-1 for typical point of delivery locations. If the Cooperative’s facilities do not exist to serve the Member’s load, the Member shall be required to pay for the difference between the cost to extend the line as an overhead distribution facility and the actual cost to install underground facilities. Specific requirements are defined in the Cooperative's line extension policy. Consult the Cooperative for details.

8.11.2 Conductors Used in Underground Residential Installations

Normally conductors installed for permanent service to single residences shall be 4/0 aluminum. Installations shall conform to Section 8.10, Conduits Used in Residential Underground Installations.

8.11.3 Conductors Used in Underground Non-Residential Installations

The maximum size conductor inside a single-phase transformer cabinet is 500 kcmil. The maximum size conductor inside a three-phase transformer cabinet is 750 kcmil. Consult the Cooperative in advance for consideration of requirements that exceed these limitations or where parallel of Conductors are required. More information is available in Section 13.4, Service Entrance Conductors.

8.12 Termination of Members’ Conductors in Cooperative’s Transformers

The Cooperative will furnish and install terminals for copper or aluminum secondary conductors in sizes 1/0, 2/0, 4/0, 350 kcmil, 500 kcmil, and 750 kcmil. Consult the Cooperative early in the design phase if other size conductors are to be used. The Cooperative will normally install all conductor terminals and bolt to the terminals of the transformer. The phasing and proper conductor length will be the responsibility of the Member regardless of who installs the terminals or bolts the terminals to the transformer terminals. More information is available in Section 13.4, Service Entrance Conductors.

8.13 Metering for Underground Service

The meter installation shall be located outside of a building or structure. Refer to Section 11.5, Location of Meter Installations. Outside disconnect switches are required for all self-contained meters rated up to 320A, and shall be mounted outside the building within 2 feet of the side of the meter socket. Outside disconnects are not required for CT-rated meters. Prior approval shall be obtained from the Cooperative for the installation of any service equipment directly below the meter sockets. Also see NEC 230.70.

If a single transformer-rated metering installation is to be used in connection with a three-phase pad mount transformer installation, the meter will typically be installed on the pad mount transformer. Special metering options may be available with approval of the Cooperative. The Member shall bear the additional cost made necessary by the special metering options.

8.14 Transformers Used in Underground Installations

8.14.1 General Comments

The Cooperative will generally own and operate all transformers on the Cooperative side of the point of delivery. Pad mount transformers shall be installed in accordance with Cooperative specifications. Vaults, enclosures, etc. (when used) will be at Member's expense and shall conform to Cooperative specifications. See Section 10, Transformers. Consult Cooperative for specific details.

8.14.2 Transformer Pads, Slabs, and Retaining Walls

The Cooperative will generally furnish single-phase transformer pads. Three-phase transformer pads or slabs shall be provided by the Member, and shall conform to Cooperative specifications. See Drawing 8.14-1 for details. When supporting walls or foundations are needed for the transformer installation the Member will be responsible for the design and installation of the supporting foundation and for obtaining approval of the design by the Cooperative. Consult the Cooperative.

Section 9: Not used in this edition

Section reserved for future use.

Section 10: Transformers

10.1 General Comments

When large concentrated loads or long distances are encountered, it is frequently necessary to install transformers on or in the Member's property. In such cases, high voltage conductors are taken directly to the transformer. Whether transformers are to be installed outside, on, or in the Member's property, the Member shall provide a suitable location. The Member shall consult the Cooperative regarding the location, size, and construction of the facilities during the design and planning phase. Installations will vary so widely that the Member shall consult with the Cooperative so that arrangements can be worked out to the benefit of both parties.

In the interest of public safety, it is imperative that all transformers be readily accessible to the Cooperative at any time of the day or night. In all but the most unusual cases, the Member shall equip each gate (or other barrier) between the transformer and the nearest public access with locks that can be opened by the Cooperative. These locks will be provided by the Cooperative and installed by the Member.

For ready access to unenclosed pad mount transformers, a minimum clearance of three feet from the side and back edges of the pad and twelve feet from the front of the transformer shall be maintained at all times. See Drawing 10.1-1 for other restrictions on transformer placement. The Cooperative, at its option, may require a barricade to be installed to prevent damage to the meters or encroachment on the clearances (driveways, parking lots, etc.)

The Cooperative will not energize its facilities until the installation meets all of the following requirements:

1. Made in accordance with manufacturer recommendations and engineering standards.
2. Approved by authorities having jurisdiction.
3. Acceptable to the Cooperative.

Adequate access and support to accommodate line trucks or other necessary lifting and hauling equipment shall be provided and maintained by the Member to allow for maintenance, operation or replacement of equipment at all hours.

10.2 Fences, Screen Walls, Decorative Walls

The Cooperative will not construct, reimburse the Member, or accept ownership and maintenance responsibility of any fences, screen walls, or decorative walls around pad mount transformer installations or vaults. Prior written approval shall be obtained from the Cooperative before the Member constructs such walls or fences. Adequate space and means of ingress and egress (such as wide removable panels) shall be provided to operate, maintain, remove and replace transformer, metering or other equipment located behind the fence or wall. See Drawing 10.1-1.

10.3 Types of Transformer Installations

The Cooperative provides electric service from one of the following general transformer installations:

1. Pole mounted transformers, one or cluster of two or three transformers
2. Two pole transformer platform
3. Pad mounted transformers,

10.4 Pad Mount Transformers

Pad mount transformers are generally provided, owned and maintained by the Cooperative for underground service to residential subdivisions, mobile home parks, shopping centers, and commercial and industrial Members. Consult the Cooperative for requirements and availability in totally underground systems.

For pad-mount transformer applications, the Member will provide, install, and maintain the conduit(s) from the Member's premises or meter location to the transformer location.

10.5 Termination of Secondary Conductors to Transformers for Non-Residential Services

Terminals for secondary conductors shall be installed as provided in Section 8.12, Termination of Member's Conductors in Cooperative's Pad-Mounted Transformers.

The phasing, sizing and proper length of conductors is the sole responsibility of the Member. The Member shall also be responsible for properly marking the phases. The Cooperative will generally make connection of the terminals to the connectors of the transformer.

Section 11: Metering Installations and Equipment

11.1 General Comments

11.1.1 Responsible Parties

The metering equipment is usually installed on the Member's premises (on Member owned building; pole or structure also see NEC 314.23 Supports) as part of the service entrance equipment, therefore provisions shall be made for it in the Member's installation. The Cooperative will provide, as required, meters, metering transformers, relays, color-coded cable and transformer-rated meter sockets. The type of equipment supplied will depend on the requirements of the applicable rate schedule and the Cooperative's standard practices.

The Member will be required to provide the Cooperative with information regarding the total connected load. The Member may be required to provide and / or install the meter socket, metering transformer enclosure and adequate attachments or devices for attaching Cooperative's metering facilities to the building. (This may require running conduit through eaves of roof and other similar necessities that could alter the Member's building.)

11.1.2 Meter Socket Specifications

1. All meter sockets have a UL label which signifies they meet ANSI C12.7 and UL 414.
2. All meter sockets shall be sealable and in serviceable condition. (The Cooperative recommends socket pans that provide a knockout in the front cover and flange inside for barrel-locking.)
3. On combination meter/ breaker boxes, the wires behind the breakers and the Cooperative wires shall be secured behind separate barriers. Cooperative personnel shall have access to Cooperative wires without exposing the wires behind the breakers.
4. All sockets except residential single-phase less than 320 Amps shall have a manual mechanical gang operated bypass switch. Horn bypasses and similar devices are not allowed. Service entrance wires shall enter and stay opposite of the by-pass switch. (Any commercial 100 amp service such as billboards and other non-critical small commercial services should consult with the Cooperative.)
5. The lugs in 320 Amp meter sockets shall accept up to 500 MCM conductors.
6. For 5 terminal meter sockets, the 5th terminal shall be physically secured to the meter socket. It should be relocatable but shall be securely attached to the socket in the proposed operating position.
7. In accordance with all applicable codes, a socket shall be properly installed and used in the application for which it is designed. Load and supply wires shall not cross in the meter socket. Overhead sockets are required in overhead installations and underground sockets are required in underground installations. (Example of an inappropriate application: A three-gang meter socket installed on a duplex apartment building is not acceptable.) Meter pan socket shall be large enough to accommodate conductor size see NEC 300.34 Conductor Bending Radius. For meter sockets in underground installations, minimum size shall be D 4 1/8" X W 11" X H 15 1/2 ". Member shall properly seal all unused openings on the meter socket assembly.
8. If ring-type sockets are used, Member shall supply a meter ring to secure the meter in the socket. The ring should be stainless steel.

11.1.3 Meter Transformer (CT) Enclosure Specifications

The Cooperative specifies instrument transformer enclosures that accommodate the Cooperative's equipment standards. These standards may differ from manufacturer's specifications if determined only by ampere ratings. Therefore, Members or their agents should determine the enclosure size based upon the size and number of service conductors as well as ampere ratings. Instrument transformers shall be bolted to the back-plate and each shall be capable of being removed individually. The back plate is in

addition to the back wall of the enclosure and shall be metal or $\frac{3}{4}$ " plywood. All enclosures should be rain-tight (NEMA 3R).

- For 600 amps or below or single conductors of 750 MCM or greater and parallel conductors up to and including 500 MCM, the minimum requirements are: Aluminum or 14 gauge G90 steel enclosure, 14"D x 32" W. X 40" H., with a back-plate, front cover that is hinged and sealing latches.
- For 600 –800 amps or parallel conductors greater than 500 MCM, the minimum requirements are: Aluminum or 14 gauge G90 steel enclosure, 14" D. X 32" W. x 54" H., with a back-plate, front cover that is hinged and sealing latches.
- For 800 amps or parallel conductors greater than 750 MCM contact Cooperative for requirements.
- Service connections cannot be made in an instrument transformer enclosure. A suitable junction box must be provided adjacent to the CT enclosure.

11.2 Meter Connections and Seals

The Cooperative shall install the meters, seal all meters, and seal all instrument transformer enclosures. Except as noted below, only the Cooperative and its authorized agents are permitted to break or replace a seal, or to remove or change a meter. Under certain conditions, and with specific approval of the Cooperative, authorization may be obtained by a licensed electrical contractor to remove a Cooperative meter seal. The contractor shall obtain approval prior to removing the meter seal, or notify the Cooperative after doing so under unusual circumstances. Any infringement or violation shall be dealt with in accordance with the Cooperative procedure for dealing with meter tampering.

Also see Section 7.7, 480-Volt Metered Service.

11.3 Meter Clearance

Meters and metering equipment enclosures shall be mounted in locations that will provide at least 15 inches clearance on all sides and at least three feet in front. Exceptions to this section must be approved by the Cooperative. Equipment and clearances shall be within Member's property. See Drawing 8.6-5.

The additional requirements for distance between a gas meter and an electric meter are as follows:

- National Gas Code 2.7.2 Gas Meter Locations (c), Gas meters shall be located at least 3 feet (0.9 m) from sources of ignition.
- Office of Pipeline Safety, Part 192 Minimum Federal Safety Standard. #192.353 Member meters and regulators: Location (c), which states that each meter installed within a building must be located in a ventilated space and not less than 3 feet (0.9 m) from any source of ignition or any source of heat that may damage the meter.

An electric meter is a possible source of ignition whether located inside or outside of a building.

11.4 Outdoor Meters

An outdoor meter installation is the Cooperative's standard for all new installations and where practicable on rewired installations. (For example, locations inside porches or beneath carports are not considered as being outdoors.) To facilitate reading by both the Member and the Cooperative and to provide accessibility for testing, the Cooperative requires that outdoor meters be mounted between four and six feet above finished grade.

11.5 Location of Meter Installations

In all cases, the Cooperative designates the meter location. The Cooperative should always be consulted to determine the meter location on any new building or renovation. For residential service, the meter is to be located on the outside of the building on the side of residences, and outside of fences on the side most economical to reach the Cooperative's facilities. This location minimizes the Cooperative's required access to the Member's premises. The Cooperative will endeavor to select a meter location that will be satisfactory and economical for the Member and at the same time convenient to the Cooperative in providing the necessary connections as part of the service entrance installation. **Prior written approval of the Cooperative is required to locate the meter other than in the preferred location** and the Member shall pay any and all appropriate charges. Approval of the Cooperative to locate the meter elsewhere will not be given unless the meter is, and will remain, readily accessible. Construction of pools, decks, fences or any structure near, under or over electrical facilities may cause a code and / or safety violation and may require relocation of the meter, connection point and/or electrical facility at Member expense. Consult the Cooperative concerning all clearances.

The meter shall not be installed above or behind any piece of apparatus or machinery. The location should be such as to minimize the possibility of damage from moisture, vibration, dirt, mechanical damage and corrosive or dangerous fumes. The meter shall be in a safe location accessible to the Cooperative at all hours.

11.6 Grouping of Meters

When more than one meter is involved, the meters shall be grouped at one location. Therefore, it is important that a meter location be selected which will provide ample space for the meters required. In-group installations, the Member shall permanently mark both meter loops and service switches. Permanently attached tags are required. The lettering on each tag shall be 3/16 inch or larger and be either raised or incised on each tag. Each tag shall be riveted or glued to the meter loop or switch. The tags shall identify the space served by each meter and service switch; and will be for future reference when servicing or repairs are required.

Where the Member furnishes Ganged Factory Bussed Meter Sockets, the Member shall check with the Cooperative for approval before purchasing. These shall have provisions for locking each individual meter space. These shall also allow for any one meter to be removed or serviced without disturbing the other meters. The metering installation should be as tamper-proof as possible. It is important that the equipment be of good quality and strength so that corrosion and deterioration will not present security problems.

Where the Cooperative provides underground service, all non-residential underground services for multiple meter arrangements shall terminate in a junction box. See section 8.7 Requirements for Commercial, Industrial and Other Non-Residential Underground Service for details of required junction box. Diagrams of typical meter installations and layout are shown in the Drawings listed below.

Drawing No.	Description
11.6-1	Typical Multiple Meter (Field Assembled), OH Service.
11.6-2	Typical Multiple Meter (Pre-assembled), OH Service.
11.6-3	Typical Multiple Meter (Field Assembled), UG Service.
11.6-4	Typical Multiple Meter (Pre-assembled), UG Service
11.6-5	Typical Multiple Meter 480 Volt Three-phase Service

11.7 Meter Mounting Height

To facilitate reading, resetting and servicing, the preferred mounting height of a single meter or a single row of meters is 5 1/2 feet above the ground to center of the meter(s). It shall not be less than 4 feet and no more than 6 feet above ground to center of the meter(s).

The height of the meter may be increased to accommodate flood plains (see Drawings 11.7-1 & 11.7-2). At all times Member shall furnish a permanent four foot by four foot (4' X 4') platform, five to six feet below the center of the meter with permanent rails around the platform and steps. Consult Cooperative for details.

Where two meters are mounted vertically on a wall as a gang installation, the upper meter shall be mounted at least 5 1/2 feet to center above ground, and not more than 6 feet to center above ground. The lower meter shall be mounted so as to allow three inches clearance between meter sockets. Where more than two meters are to be installed as a gang installation, they shall be mounted in horizontal rows.

Individually metered apartment complexes may have meters installed in manufactured combination meter enclosure and switchgear assemblies. Such assemblies shall not have more than six horizontal rows of meters. When such assemblies are installed indoors or in enclosures, the center of the highest meter shall not be more than 6 1/2 feet above the floor and the center of the lowest meter shall not be less than 18 inches above the floor or bottom of enclosure. When such assemblies are mounted on the exterior walls of a building, the center of the highest meter shall not be more than 6 1/2 feet above finished grade and the center of the lowest meter shall not be less than 34 inches above finished grade. Assemblies mounted on the exterior walls of a building shall be rain tight. Where more than one meter shall of necessity be mounted vertically on a pole, the top meter shall be mounted no more than 6 feet to center above final grade. Additional sockets shall be mounted to allow three inches clearance between sockets and the center of the lowest meter shall not be less than 34 inches above final grade. The Cooperative, at its option, may require a barricade to be installed to prevent damage to the meters or encroachment on the clearances (driveways, parking lots, etc.)

11.8 Types of Meter Installations

11.8.1 Self-Contained Metering Installations

Normally, residential and small non-residential loads are metered with self-contained meters rated for 320 amps or less. All self-contained meter installations rated for 208 Volts or less shall have an outdoor mounted load side disconnecting switch or main breaker installed adjacent to the meter enclosure by the Member (see Section 13.8.2). All three-phase self-contained meters shall have a meter socket containing a by-pass switch. All 480 Volt self contained meters shall have an outdoor mounted supply side disconnect switch or main breaker installed adjacent to the meter enclosure by the Member (see Section 13.8.3). All disconnecting switches or main breakers shall be provided, installed, and maintained by the Member. All three-phase, four-wire, 120 V / 240 V self-contained meter installations shall have the high voltage (wild) leg clearly and properly identified with orange tape at the service entrance and connected to the right-hand supply side of the meter socket. See Drawing 11.8-1 and 11.8-2 for wiring diagrams of the most common types of self-contained meters.

11.8.2 Instrument Transformer Installation

When in the Cooperative's judgment the load exceeds the capacity of a self-contained meter (320 Amps), the Cooperative shall provide instrument transformers and a transformer-rated socket. The Cooperative will determine the type of metering to be used.

Unless specified by the Cooperative, an instrument transformer enclosure (as described in Section 11.1.3) is required for all transformer-rated installations. The center of the enclosure shall not be less than

eighteen inches above final grade and not more than six feet above grade. All transformer-rated sockets should be no more than 25 feet from the instrument transformer enclosure.

As the requirements involving this installation vary so much, it is not practical to describe requirements covering all installations. The Member or contractor contemplating an installation of this nature shall consult with the Cooperative as to the number, size, location of and provisions for mounting instrument transformers and metering enclosures. Upon request, the Cooperative will furnish information regarding the type, dimensions and connections of metering equipment to be used. For larger installations it is essential that such information be obtained before wiring plans are completed.

All three-phase, four-wire 120V/240V transformer-rated installations shall have the high voltage leg clearly and properly identified at the service entrance. If the transformers are mounted horizontally, the high voltage leg should pass through the right-most transformer. If mounted vertically, the high voltage leg should pass through the bottom transformer.

11.9 Primary Metering Installations

Certain installations involve the use of large quantities of power where the Member intends to use electricity without transformation or finds it convenient to own a distribution system and provide the transformers. In these cases the Cooperative may provide service under one of the three options. For any primary metered installation, the Member shall consult with the Cooperative during the design phase of the proposed service. The three options for furnishing service involving primary voltage delivery or metering are as follows:

1. Primary voltage delivery and metering: All service is delivered and metered at primary line voltage and the Member owns and maintains all of the service transformers and substation installation, except for the metering equipment.
2. Primary voltage metering and secondary voltage delivery: All service is metered at primary line voltage and the Cooperative owns some or all of the service transformers or substation installation. The Member takes delivery at the secondary voltage level.
3. Primary voltage delivery and secondary voltage metering: All service is delivered at primary line voltage and the Member owns and maintains all of the service installation on the Member's premises, except for the metering installation. The meters are part of the service installation on the Member's premises, but they are owned and maintained by the Cooperative. Service is metered at the secondary voltage level.

Regardless of the option desired, when the metering installation is located on the Member's premises, the Member shall provide a suitable location without cost to the Cooperative. The Member shall also provide the Cooperative suitable right-of-way over the premises for the Cooperative's overhead primary circuit to the substation or in lieu thereof an underground service for primary voltage may be provided.

11.10 Meter Grounding

Grounding the metering installation is a safety consideration both for the Cooperative and the Member. The grounding connection shall be made in accordance with NEC Article 250 and any other referenced code and preferably in the meter socket. If the grounding connection is made anywhere other than the meter socket, the Member shall be responsible for grounding continuity between the point where the grounding is made and the meter socket. (Also see Section 13.5, Grounding of Service Equipment.)

Section 12: Consumer Owned Generation

12.1 Electrical Emergency or Standby Systems

For most residential Members, the easiest method for using a standby or emergency generator is to simply plug the desired appliances, tools, or devices directly into the electric outlets on the generator. Consult with the generator manufacturer or vendor to insure that the generator is adequate for the intended purpose.

For emergency or standby generators that are to be connected into the wiring of a home or any other building or premises, the use of a generator transfer switch is required. The transfer switch will insure that the generator cannot energize the Cooperative's service equipment or transformer, which would cause a serious safety hazard for line workers.

12.2 Generators Interconnected to and Operating in Parallel with the Electric Utility Grid

For cogeneration systems, or parallel operation of an electrical generator, the Member shall consult the Cooperative early in the design phase. Generation facilities other than the Cooperative's may be permitted to interconnect and operate in parallel with the Cooperative's distribution system provided that all of the following are met throughout the life of the interconnection:

1. The safety of the general public and the personnel and equipment of the Cooperative shall in no way be reduced or impaired as a result of the interconnection.
2. The quality, reliability, and the availability of service to the Cooperative's other Members shall not be diminished or impaired as a result of the interconnection.
3. The generator is connected through a double-pole, double-throw transfer switch which has an open and visible break verifiable by Cooperative personnel. The Member shall supply a disconnect method acceptable to the Cooperative. The location shall be on the outside of the facility accessible to Cooperative personnel at all hours.
4. A written interconnection agreement between the Cooperative and Member covering parallel operation of Member generation and the proper coordination of protective devices has been executed and is in force.

12.3 Interconnection of Wind, Solar, or other Renewable Generation for Net Metering

In order to qualify as a net metering facility, a generation system must use solar, wind, hydroelectric, geothermal, or biomass resources to generate electricity, as defined in the Arkansas Public Service Commission's Net metering Rules. The facility must have a generating capacity of not more than 25-kW for residential use or 300-kW for any other use, and be interconnected to a residential or commercial service billed under any of the Cooperative's rates. The net metering facility must be located on the Member's premises and intended primarily to offset some or all of the energy usage at that location.

Installation requirements for net metered facilities are:

1. The renewable system is required to meet all local and national electrical codes including National Electrical Code (NEC), the Institute of Electrical and Electronics Engineers (IEEE), the National Electrical Safety Code (NESC), and Underwriters Laboratory (UL). The Cooperative assumes no liability or responsibility for the installation or operation of the net metering system, and does not inspect the equipment, wiring, or installation beyond the interconnection to the meter.
2. The Member shall submit a design drawing and product literature to the Cooperative's engineering department for approval prior to the installation. The Member shall complete and

submit a copy of the standard interconnection agreement at least 30 days prior to the planned interconnection.

3. After the equipment is installed, the member shall contact the Cooperative to schedule a site visit to commission the installation. The Cooperative will verify that the net metering equipment disconnects from the electric meter during a power outage, and that the electric meter indicates reverse power flow when the Member's system is feeding back to the Cooperative. The interconnection agreement will be signed at the time the system is commissioned by the Cooperative.

The net metering equipment must remain disconnected from the electric meter until the system is commissioned by the Cooperative.

Section 13: Member's Service Installation

13.1 General Comments

Information regarding characteristics and availability of service, exact points of delivery and service entrance and location and type of service equipment shall be determined by consultation with the Cooperative in planning any electrical work for new installations, for changes brought about by rewiring, for building reconstruction, or for increased load.

The Member shall normally provide, install, own, and maintain all service cables, raceways, conduits, fittings, wires, fuses, main entrance and meter service switches or breakers, wire troughs, etc., on the Member's premises beyond the point of termination of the Cooperative's overhead service drop, or at the secondary terminals of the Cooperative's transformer. (Exception: For Members with underground service rated 320 amps or less, the Cooperative will own the service conductors; see Section 8.6, Requirements for Obtaining Underground Residential Service.) The meters and metering apparatus including metering transformers will be furnished by the Cooperative to adequately measure the Member's load. The Member shall pay for any additional metering requirements.

It is important that the Cooperative be notified in advance of any substantial change in the Member's equipment or wiring. Consultation with the Cooperative is necessary to guard against the purchase of unsuitable equipment by the Member, and possible damage to the Cooperative's service equipment.

The construction of pools, decks, fences or any structure, near under or over electrical facilities may cause a code and / or safety violation. See Section 7.3 Clearances and Drawings 7.1-1, 7.1-2 and 7.2-1. Consult the Cooperative concerning all clearances.

13.2 Inspection and Approvals

The Cooperative strongly recommends that all work on the Member's electrical facilities be performed by a qualified licensed electrical contractor. The wiring, electrical equipment and appliances of the Member should be installed in accordance with the requirements of the latest NEC and of authorities having jurisdiction. **The Cooperative does not inspect Member premise wiring.** Where inspection is available, the Cooperative requires the Member to have the premise wiring inspected and approved by the authorities having jurisdiction before requesting connection to the Cooperative's service. Where inspection is required, the Cooperative is not allowed to connect to the Member's installation until it has been inspected and approved by the authorities having jurisdiction.

The Cooperative reserves the right to refuse connection to any new installation and/or to disconnect from any existing service, should the Cooperative learn that the wiring is unsafe or that it has not been approved. The authorities having jurisdiction also have the right to require the Cooperative by written notification to discontinue service to an installation which has been found unsafe. The Cooperative is not liable for any damages incurred when electrical service is discontinued under order of the authorities having jurisdiction. The Cooperative accepts no responsibility for injury or damage to the Member's premises or to persons on the Member's premises resulting from defective wiring or equipment.

13.3 Meter Requirements

Refer to Section 11, Metering Installations and Equipment.

13.4 Service Entrance Conductors

The class and type of service being rendered determine the number and size of service entrance conductors. The service entrance conductors shall be sized as prescribed by the NEC and / or the authorities having jurisdiction.

Meter sockets shall not be used as junction boxes see Section 8.7.1. Only one conductor per phase or neutral shall be connected to the terminals in meter sockets unless the terminals are designed for more than one.

For loads where parallel phase and neutral service entrance conductors are installed, the **Member shall consult with the Cooperative early in the design phase to determine the type and quantity of conductors that may be brought out for their system.**

1. For overhead transformer banks, the Cooperative shall connect its service drop to a maximum of four conductors per phase using Member furnished terminal pads. Cooperative approved, Member furnished connectors shall be required for loads that exceed four conductors per phase for overhead service.
2. Pad mount transformers
 - a. 500 kVA or smaller can accept six conductors per phase
 - b. 750kva and larger can accept ten conductors per phase.
3. For underground service, bus duct or a Member furnished Cooperative approved junction box may be required for loads that exceed the number of conductors the Cooperative can accept.

13.5 Grounding of Service Equipment

The neutral conductor and metallic parts of the service equipment, including all meter sockets, and instrument transformer enclosures, shall be effectively grounded and all grounding shall be bonded together according to NEC250.4

Typical grounding of service equipment:

1. Single-phase 120 Volt, two-wire system: The identified neutral conductor.
2. Single-phase three-wire system: The identified neutral conductor.
3. Multiphase systems having one wire common to all phases: The identified common conductor.
4. Multiphase systems in which one phase is used to supply 120/240 Volt, single-phase service: The identified neutral conductor.

The National Electrical Code requires grounding to a 'grounding electrode' (NEC article 250.52). A driven ground rod is preferred by Cooperative and is shown in Drawings in Section 7 (Overhead Services) and Section 8 (Underground Services). The Cooperative reserves the right to refuse installation of service contingent upon inspection of Member's grounding connections.

Grounding requirements are shown on many of the Drawings in the Member Installation Standards. A grounding conductor (#6 CU minimum – refer to NEC for correct sizing) that is free from exposure to physical damage shall be permitted to be run along the surface of the building construction without metal covering or protection where it is securely fastened to the construction; otherwise, it shall be in conduit, electrical metallic tubing, or cable armor (installed in accordance with the NEC).

All metal buildings, metal structures, and metal siding on buildings to which electric service is to be supplied shall be permanently bonded to the service entrance ground before service is connected.

13.6 Service Entrance from Overhead System

13.6.1 General Comments

The service entrance meter loop shall meet the requirements of all applicable codes and the Cooperative's Service Standard requirements. It shall be installed, owned, and maintained by the Member. In general, the service mast shall be extended above the service drop attachment. See Drawing 7.1-1. The service drop attachment shall be high enough to provide the required clearances in Section 7.3, Clearances. The Member shall provide the required conductors in the meter loop and leave three feet of wire outside the top of the service entrance mast for connection to Cooperative's service drop.

13.6.2 Service Entrance Masts

When a building is not tall enough to attach the service drop at a point to provide for the necessary line clearances above the ground, a "service mast" or other approved extension to support the service drop conductors shall be furnished and installed by the Member. The extension shall permit the point of attachment to be located at a proper height above ground as defined in Section 7.3, Clearances and Section 7.2 Point of Attachment. The service mast shall not exceed 21' above the ground or be more than 60" from its base. Refer to Drawing 7.1-2 for typical installation of service mast above the eaves.

If a service mast is used to support the service drop conductors, it shall be rigid/intermediate metal steel. Service drop conductors shall be the only attachment to the service mast per NEC 230.28. Metallic conduits or brackets used as a service mast or extension shall be electrically bonded and grounded to the ground wire terminal in the meter socket.

Service masts or other types of extensions shall be able to withstand the maximum loading requirements placed on them by the service line attached. Mast supports may be used to support loading. Mast supports shall be painted or otherwise treated to provide protection against corrosion and rotting. The Cooperative reserves the right to refuse to attach its service drop to any service mast or extension considered a hazard to public safety.

Consult the Cooperative for service entrance mast requirements for three-phase installations designed for 200 Amps and above.

The Cooperative assumes no responsibility of any kind or in any manner for any failure of the Member owned service mast or extension.

13.7 Service Entrance from Underground Distribution System

The service entrance riser conduit shall be rigid/intermediate metal steel, rigid aluminum, or Schedule 80 PVC securely fastened, made rain tight, installed, owned, and maintained by the Member. Refer to Section 8, Underground Service and Installations. Consult the Cooperative for additional information and specifications.

13.8 Service Disconnecting Means

13.8.1 General Comments

The Member is required to provide each set of service entrance conductors with a means of disconnecting all energized wires from the source of supply. The disconnecting means may consist of not more than six switches with over current protection or six manually operable circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in a switchboard. All equipment must be U. L. approved and be installed in enclosures suitable for prevailing conditions, such as weather extremes or corrosive environments. For more details, refer to NEC Articles 230 VI and VII and any other referenced code.

13.8.2 Self-contained Meter Service Disconnects Less Than 480 Volts

For worker safety, all self-contained meter installations rated 320 amps or less require a disconnecting means on the load-side of the meter located in a readily accessible location outside of the building or structure. If the load-side disconnect does not provide overcurrent protection per NEC requirements, an overcurrent device shall be installed on the load side of the meter per NEC requirements. For wall-mounted meters, the main breaker or disconnect shall be a maximum of 2 feet horizontal from the meter. For pole-mounted meters, the main breaker or disconnect shall be immediately below the meter enclosure.

13.8.3 480 Volt Self-contained Meters

480 volt electric services can present an increased arcing hazard to workers. To allow for the safe installation and maintenance of 480 volt service metering, the Member shall supply a readily accessible disconnecting means on the supply side of the Cooperative meter. If the supply-side disconnect does not provide overcurrent protection per NEC requirements, an overcurrent device shall be installed on the load side of the meter per NEC requirements. See drawings 7.7-1 and 11.6-5.

Section 14: Member's Electrical Equipment

14.1 General Comments

The Cooperative offers the following suggestions as an aid in maintaining reasonably uniform voltage and continuous service. The type, size and mode of operation of equipment frequently affect the voltage and the quality of service received. Three-wire, single-phase and all multiphase circuits should be arranged to maintain load balance on the individual circuits and the main service within 10%. Many of these details can be best resolved when the wiring is in the design stage.

The Cooperative recommends that the Member's wiring be designed so that the voltage drop between the disconnecting means or service entrance switch, and the farthest outlet is limited to not more than 2% at full load.

The Cooperative's distribution system contains protective devices that are designed to momentarily interrupt power flow (causing a blink), or to lock open (causing a power outage), during storms, lightning strikes, trees contacting the line, or other system damage or disturbance. Although the Cooperative strives to keep blinks, outages, and other voltage variations to a minimum, they are a normal part of electric system operations. Sensitive equipment such as computers and other electronic devices may be adversely affected by these occurrences. It is the Member's responsibility to provide any uninterruptible power supplies, voltage regulating equipment or other protective apparatus for these sensitive devices and equipment.

14.2 Radio and Television Interference

Some types of utilization equipment, including certain types of motors, equipment depending for its operation upon frequent making and breaking of the circuit, X-ray machines and other devices, may cause unsatisfactory operation of television, radios and other electronic equipment unless especially designed or equipped to prevent such interference. In purchasing utilization equipment, the Member should inquire regarding such interference characteristics and select non-interfering types. Where interference is experienced from utilization equipment, it can often be eliminated or minimized by equipping the interfering device with an U.L. approved interference suppresser. These suppressers are available through many retail stores.

14.3 Electric Heating

Large heating appliances should be connected to 120/240, 120/208, or 277/480 volt circuits. Also see Section 5.3 Voltages for Heating.

14.4 Motor - Voltage Rating

Single-phase motors manufactured under American National Standard Institute (ANSI) Standard C84.1-1970 have 115 or 230 Volt nameplates and, if three-phase, have 208, 230, 460, 2,300, 4,000, or 13,200 Volt nameplates. These are nominal voltage ratings and do not imply that the motors shall be operated at the exact voltages supplied. Motors may be supplied with nominal voltages as listed below: All motors should have a manufacturer's nameplate indicating the voltage, current rating, speed and horsepower rating for continuous or intermittent use as the case may be. This nameplate should also carry the NEMA "code letter" designation of the motor (See NEC Table 430.7B.). When a motor is rewound to produce a change in its original design, a new nameplate should be attached indicating the new characteristics and the name of the firm or person making the change.

Type of Service	Motor Voltage Rating (Nameplate)	Nominal Supply Voltage
Single-phase	115	120
Single-phase	230	240
Three-phase	208	208
Three-phase	230	240
Three-phase	460	480
Three-phase	2,300	2,400
Three-phase	4,000	4160
Three-phase	13,200	13,800

14.5 Motor Starting

14.5.1 General Comments

Most motors draw current much in excess of full load running current when starting at rated voltage. Also, the power factor of this starting current is usually low. This causes, for a brief period, a voltage drop or lighting flicker. It is essential that the Member's equipment have good starting characteristics to assure against objectionable effects to the Member's equipment and to service to other Members. The Cooperative finds it necessary to establish certain limitations for the maximum allowable starting currents of motors to be connected to its lines. Frequency of starting is also a factor. Considerable latitude in the amount of starting current is permissible under certain conditions, especially where the motors are started not more than two or three times per day. It is necessary that the Member consult with the Cooperative as to the acceptability of the proposed installation in this respect.

14.5.2 Single-phase Motors

14.5.2.1 Horsepower Rated

Single-phase motors rated in horsepower may be started "across the line", that is, at full rated voltage by merely closing a switch. It is recommended that single-phase motors larger than 1/2 hp be operated at 240 volts. Locked rotor current specified in Table 14.5-5, will be permitted under the following conditions only:

- When such motors are provided with proper current limiting starting equipment; or
- When the total locked rotor currents of two or more smaller motors, which may be started simultaneously, are less than the allowable locked rotor current of the largest motor in said installation.

Equipment Rated	Locked Rotor Current
115 volts	
All Sizes	50 amps
230 volts	
2 hp. or less	60 amps
3 hp.	80 amps
5 hp.	120 amps
6-1/2 hp.	150 amps
Over 6 1/2 hp.	Consult the NEC for specific characteristics

14.5.2.2 Btu/h Rated Motors

Years of development have resulted in single-phase, hermetically sealed air conditioning and heat pump units that, from the Member's standpoint, are as efficient and trouble-free as three-phase units up through units sized with a nominal 60,000 Btu/h (5 ton) rating. All hermetically sealed motors in this category will be served single-phase provided they do not exceed the locked rotor current values of Table 14.5-6.

Equipment Voltage	Btu/h Rating	Locked Rotor Current
115 volts	All sizes	50 amps
230 volts	Less than 20,000 Btu/h	60 amps
	20,000 to 60,000 Btu/h	60 amps plus 3 amps per 1,000 Btu/h in excess of 20,000 Btu/h (150 amps max)
	Over 60,000 Btu/h	Consult the Cooperative

For larger homes requiring heating and cooling capacity in excess of a nominal 60,000 Btu/h, (5 tons), the Member should consult the Cooperative to determine the type of service that will be supplied. The Member should not overlook the possibility of using two or more independent units that can provide better zone control.

14.5.3 Three-phase Motors

14.5.3.1 Horsepower Rated

Because conditions vary widely at different points on the system, no specific rule can be written as to the size of polyphase motors which may be connected, either for "across-the-line" starting or with starting equipment to limit the starting current. Therefore, it will be necessary to consult the Cooperative for motors of 10 hp size and larger to determine the maximum value of starting current permissible at a given location. Refer to Section 15.8, Converters - Operation of Three-phase Motors from Single-phase Electric Supply, for phase converter operations.

14.5.3.2 Btu/h Rated Motors

Where it has been determined that three-phase service will be rendered, motor starting currents shall not exceed the following values: 159 amps if the service voltage is 208V, 150 amps if the service voltage is 230 V, or 75 amps if the service voltage is 460 V. For motors exceeding these values and for units greater than 120,000 Btu/h, (10 tons), it will be necessary to provide facilities to limit the starting current to values specified by the Cooperative for the location involved.

14.5.4 Motor Starting and Control Equipment

All motors and motor control equipment shall be installed in accordance with the NEC Article 430 and any other referenced code. Auxiliary starting devices shall be used on all motors that cannot be safely subjected to full voltage while starting. They shall also be used on all motors which, if started at 100% voltage, would draw currents in excess of those discussed in 14.5.2.1 (Single-phase Motors) Horsepower Rated, 14.5.2.2 (Single-phase Motors) Btu/h Rated, and 14.5.3.2 (Three-phase Motors) Btu/h Rated. The auxiliary starting device should be designed in such a way that the motor can be thrown into the running position before the motor has reached rated running speed in the starting position. Typically, electric irrigation motors above 60 hp served at three-phase, 480 Volts will be started with reduced voltage starting equipment. The Cooperative may specify the particular voltage tap setting to be used.

Motor Starters/Controllers of the Silicon Controlled Rectifier (SCR) type as well as other similar devices can create harmonic disturbances that may have detrimental effects on the Cooperative's electric system and/or service to the Members. Disturbances of this nature attributable to the use of these type devices shall be corrected without undue delay, at the Member's expense, to the satisfaction of the Cooperative. Consult the Cooperative for information.

14.6 Critical Service Motor Operation

Where continuous operation of a motor is essential, the no-voltage release should have a time delay relay, which will prevent the opening of the circuit in the event of momentary voltage fluctuation. The Cooperative will assist the Member in selection of an automatic starting device and any other device to hold motors on line during voltage disturbances.

14.7 Motor Protection

14.7.1 Phase Reversal Protection

Reverse phase relays are required on three-phase elevator services (NEC Article 620) and it is strongly recommended that the Member install them where accidental reversal of motor rotation would cause serious inconvenience, damage, or delay. The Cooperative shall not be responsible for any damages caused by phase reversal.

14.7.2 Over Current Protection

The NEC requires that adequate over current protection be provided in each phase on all motor installations. The Member shall ensure complete protection against "single-phasing" on all three-phase motors. Over current protection in two phases is not adequate protection for this condition. Single phasing on the distribution system is necessary at times for fault clearing and switching and occurs occasionally due to unforeseen circumstances. Motor protection is the responsibility of the Member.

14.7.3 Partial or Complete Loss of One or More Phases

The Cooperative operates the three-phase distribution system with single-phase devices. These single-phase devices may open from time to time as a part of their normal operating function, which will cause a partial or complete loss of voltage on one or more phases. **The Cooperative shall not be held responsible or liable for damage to the Member's installation due to such causes as they are an inherent operation of the distribution system.** Partial or complete loss of one or more phases may also be caused by failure of the Member's equipment serving the motor. For these reasons, it is recommended that all three-phase Members follow the NEC (National Electric Code) Article 430 III pertaining to motor protection. The Code requires motors to be provided with three current (i) overload units, one in each phase. In addition, it is also recommended that all polyphase motor installations be equipped with an automatic disconnecting device (sensing voltage loss) as added protection for 'single phasing conditions' (partial or complete loss of one or more phases).

Section 15: Member's Special Equipment

15.1 General Comments

So that the Cooperative may provide adequate electric service to all its Members and avoid unnecessary delays in supplying electric service, it is recommended that the Member, prior to purchase, submit to the Cooperative information and specifications of any special equipment that might cause interference with the service to the Member or to others. This prior information is especially important if the special

equipment requires additional electric facilities for its satisfactory operation. The Cooperative will not connect electric service until all problems caused by utilization equipment that may cause interference with other Members has been remedied by the Member providing the necessary corrective equipment. The Cooperative reserves the right to inspect and test any equipment connected to its lines and to require that such equipment be provided with nameplates showing the voltage, phase, full-load amperes, maximum current, maximum kVA and such other information as may be necessary to determine the operating characteristics of the equipment.

15.2 Additional Electric Facilities

A Member may desire or require additional facilities (such as emergency service, oversized transformer, separate transformer, dual service, etc.) to minimize voltage fluctuations or interference with other Members, or to provide satisfactory operation of the Member's electric equipment. The Cooperative in cases, where practicable, will furnish such facilities, when the Member agrees to pay in some manner the additional cost of such facilities. Consult the Cooperative for details.

15.3 Radio, Satellite, and Television Antennas

Antennas for radio, satellite, and/or television sets shall never be erected over, under, or in close proximity of either side of the Cooperative's power lines or other wires carrying electric current. Nor should they be constructed in such a place where they may accidentally fall into energized wires. Antenna lead in and other wires shall not cross over and should not cross under Cooperative's electric conductors. Such location of the Member's apparatus may result in serious accidents, damage to the equipment, or poor reception. Where proximity to electric power service conductors cannot be avoided, a ten-foot minimum clearance is required. The attachment of antenna systems to poles or service masts carrying the Cooperative's conductors is strictly prohibited. The Cooperative will remove such attachments upon discovery, and the responsible party will be billed for all removal costs.

15.4 CATV and Carrier Installations

Service for the operation of radio and television transmitting apparatus will be furnished under conditions specified by the Cooperative and conditions of use of such service shall not cause undue disturbance of electric service to other Members. Where necessary, the Member shall install suitable filters or other devices to prevent radio, telephone, and television interference by the electrical power supply. Consult the Cooperative for installation of community antenna television (CATV) systems on Cooperative poles. The Member shall sign a Service Agreement and the Cooperative will designate the service locations and specifications for attachment and operation on Cooperative poles.

15.5 Electric Welders and Furnaces

Electric welders and arc furnaces usually have such severe load characteristics that special attention shall be given to the service installation to prevent interference and impairment of service to the Member and others. The Cooperative is prepared to assist the Member in planning installations of electric welders and industrial type furnaces. It is essential in every case that the Cooperative be consulted when such installations are being planned and before commitment to purchase equipment, so that there will be ample time to determine the electrical supply requirements.

15.6 Radio and Television Transmitters, X-Ray, Diathermy, and High Frequency Heating Equipment

Members using radio and television transmitters, x-ray, diathermy, and high frequency heating equipment shall install and maintain devices approved by the Cooperative for protection of transformers, meters, and other service equipment. Should the operation of the Member's equipment impair their own or other

Members' service, then a separate transformer and service entrance connection or other appropriate corrective measures shall be required. The Cooperative shall not be required to furnish or continue service to radio installations, X-ray apparatus, or other apparatus, the operation of which causes disturbances on the Cooperative's distribution circuits.

It is recommended that X-ray and similar imaging devices be connected to dedicated circuit run directly to the service entrance.

Wired-radio, or any related means of transmitting information, shall not be connected or coupled to the Cooperative's lines except by special arrangement with the Cooperative.

Consult the Cooperative for service to commercial radio and television facilities.

15.7 Member's Capacitors and Other Reactive Power Equipment

It is desirable and important to maintain the power factor of any load as near unity as possible. Maintaining a high power factor may allow a reduction of conductor sizes and equipment capacities. This may suggest the installation of capacitors. Capacitors shall be applied more carefully than most types of electrical equipment in order that satisfactory operation and maintenance will result. When a Member installs capacitors to improve the power factor, the Member should provide, or at the request of Cooperative, the Member shall provide automatic disconnecting of capacitors when the equipment causing the low power factor is not operating. Where large capacity motors are to be installed, consideration should be given to the use of synchronous type equipment.

15.8 Phase Converters: Operation of Three-phase Motors from Single-phase Electric Supply

The phase converter is used to provide a three-phase voltage from a single-phase source. Phase converters can provide a reliable and economical alternative for Members requiring three-phase power at locations away from the Cooperative's three-phase system. For reliable operation, the phase converter should be matched with both the motor horsepower and the motor application. Because there are several different types of phase converters, the Cooperative recommends that the Member consult with the phase converter manufacturer or a knowledgeable salesperson to determine the proper converter for the application. The Cooperative shall be consulted prior to the installation of a phase converter supplying load greater than 10 horsepower.

Section 16: Power Quality Parameters for Member Equipment Specifications

16.1 General Comments

The best time to address power quality issues is during the design stage of a new facility or plant expansion. This is to ensure that the Cooperative's and other Members' equipment will not be adversely impacted by a new Member's facilities or an existing Member's planned expansion.

The Cooperative should be consulted early in the design phase for new installations and load additions to address specific installation requirements for new facilities and planned expansions.

Applicable Standards are:

- ANSI C84.1 Electric Power Systems and Equipment
- ANSI MG-1 Motors and Generators
- ANSI C62.92.4 IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems, Part IV-Distribution
- IEEE Std 141 - Recommended Practices For Electric Power Distribution For Industrial Plant Systems
- IEEE Std 519 - Recommended Practices And Requirements For Harmonic Control In Electrical Power Systems
- IEEE Std 1159 - Recommended Practice For Monitoring Electric Power Quality

16.2 Steady State Voltage to Member

The steady state voltage is the voltage a Member can expect to receive under normal operating conditions. Since the loads on a utility system are constantly changing, it is impossible to maintain a completely constant voltage. Thus the Cooperative will provide voltage regulation to keep the steady state voltage within the ranges shown in Tables 16.2-1 as indicated by ANSI standard C84.1.

Service voltage is measured at the point of common coupling between Member and Cooperative (usually the meter location). Utilization Voltage is measured at the equipment using the electricity.

Nominal Voltage	Range A		Range B	
	Minimum	Maximum	Minimum	Maximum
120	114	126	110	127
208Y/120	197Y/114	218Y/126	191Y/110	220Y/127
240/120	228/114	252/126	220/110	254/127
208	197	218	191	220
480/240	456/228	504/252	440/220	508/254
480Y/277	456Y/263	504/Y291	440Y/254	508Y/293
480	456	504	440	508

Range A applies to normal operating conditions.
Range B is permitted under temporary or abnormal operating conditions.

When abnormal conditions occur (such as the loss of a transmission line, substation, etc.), corrective measures shall be taken by the Cooperative within a reasonable time to improve voltages to meet Range A guidelines. The Cooperative will follow these guidelines for service voltages.

It is the responsibility of the Member to design their electrical system to ensure the utilization voltage guidelines in ANSI standard C84.1 are met. Table 16.2-2 lists the guidelines for the Member's utilization equipment.

The Cooperative's transmission grid (above 25 kV) is designed to operate at steady state voltage levels between 95% and 105% during normal conditions and between 92% and 106% during contingency situations. Accordingly, Members fed from the transmission grid should have a means of regulating the step-down transformer(s) low-side voltage to ensure the appropriate voltage levels are maintained at the Member's utilization equipment.

16.3 Voltage Unbalance

16.3.1 Voltage Unbalance at Service Entrance

The voltage unbalance at the service entrance under no-load conditions should be limited to 3% or less per ANSI standard C84.1. The Cooperative's facilities will be designed to meet this guideline.

$$\text{Percent voltage unbalance} = (V_{\text{maxD}} - V_{\text{avg } 3\phi}) / V_{\text{avg } 3\phi}$$

Where:

V_{maxD} = the phase voltage most different from the average of three-phases.

$V_{\text{avg } 3\phi}$ = the average voltage of three-phases.

For voltage unbalance greater than 1% at a Member's motor terminals, the motor should be derated; ANSI Standard MG-1 provides guidelines for motor derating to avoid excessive motor heating. Additionally, excessive current unbalance due to supply voltage unbalance can cause nuisance tripping of motor protective devices. The Member is responsible for balancing the loads in their facility to ensure adequate levels of balance are maintained during all loading conditions.

16.3.2 Single-phasing

An extreme case of phase unbalance is single phasing, which can occur on both the utility side and the Member side of the point of common coupling. It is the responsibility of the Member to protect utilization equipment from single-phasing events on the power system. Compliance with the NEC does not always insure adequate protection from single phasing, and additional protection may be required. The Cooperative recommends that all three-phase motor installations be equipped with an automatic disconnecting device (sensing voltage loss) as added protection for 'single phasing conditions' (partial or complete loss of one or more phases). Also see Section 14.7.3 and NEC 430.

Section 17: Drawings

The Drawing Number corresponds to the related narrative section in these Standards. For example, Drawings 4.5-1 and 4.5-2 correspond with Section 4.5 in the narrative section of the Standards.

Each drawing is a separate PDF file that can be printed or downloaded from www.firstelectric.coop. Each drawing is listed under Section 17 in the Bookmarks pane on the left side of the viewing window. Use these Bookmarks to open the drawings for viewing, printing, or downloading.

Drawing Number	Drawing Description
4.5-1	Temporary Service Pole from Overhead Source
4.5-2	Temporary Service Pedestal from Underground Source
4.6-1	Underground Service to a Permanent Location from an Overhead Source
4.6-2	Overhead Service Details for Single Mobile Home Installation
4.6-3	Single Phase Meter Pedestal for Underground Service
4.6-4	Underground Meter Pedestal Installation Details
4.7-1	Typical Layout for Mobile Home Park with Multiple Meter Installations
4.8-1	Typical Overhead Meter Service Pole
7.1-1	Overhead Residential Meter On House Service (Wall or Fascia Attachment)
7.1-2	Overhead Residential Meter On House Service (Mast Attachment)
7.2-1	Overhead Meter On House Installation Details
7.7-1	Self Contained 480V Meter On Pole
8.6-1	Single Phase Service Underground Conduit System Details
8.6-2	Pad Mounted Transformer or Secondary Pedestal Serving a Member
8.6-3	Single Phase Underground Service from Overhead Source
8.6-4	Details of Conduit Encased in Concrete
8.6-5	Underground Service Installation Details and Clearances
8.6-7	Installation Requirements for Mixed Siding Finishes on Buildings
8.7-1	Primary Underground Trench Specifications
8.14-1	Three-phase Transformer Pad Details
10.1-1	Location of Transformers and Other Oil Filled Equipment
11.6-1	Multiple Meter Installation from Overhead Source (Field Assembled)
11.6-2	Multiple Meter Installation from Overhead Source (Pre-assembled)
11.6-3	Multiple Meter Installation from Underground Source (Field Assembled)
11.6-4	Multiple Meter Installation From Underground Source (Pre-assembled)
11.6-5	Multiple Meter 480V Installation
11.7-1	Flood Plain Raised Foundation Meter Access Requirements from Overhead Source
11.7-2	Flood Plain Raised Foundation Meter Access Requirements from Underground Source
11.8-1	Wiring Diagram for Overhead Self Contained Meters
11.8-2	Wiring Diagram for Underground Self Contained Meters
11.8-3	CT Cabinet Installation for Overhead Service
11.8-4	CT Cabinet Installation for Underground Service