

# Brainerd Public Utilities



**Electrical  
Service  
Requirements**

# ELECTRICAL SERVICE REQUIREMENTS

Adopted 02/23/2021

## Introduction

Brainerd Public Utilities (BPU) has assembled this booklet to assist customers to plan for and obtain prompt and satisfactory electric service.

Information in this booklet is intended to supplement the requirements of the current edition of the National Electric Code (NEC) and any other state and municipal codes, regulations, laws, and ordinances. Any questions regarding this information should be brought to the attention of BPU for interpretation.

Contact BPU for special considerations and if there are any questions regarding rates, services, equipment requirements, etc. Such requests should be directed to the Customer Service Representative at 8027 Highland Scenic Rd, Baxter MN 56425 at 218-825-3216 or by e-mailing [repair@bpu.org](mailto:repair@bpu.org).

The Electric Service Requirements are also available on the BPU website at [www.bpu/construction/electricrequirements.org](http://www.bpu/construction/electricrequirements.org).

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## Definitions

**Application for Service:** The agreement or contract between the customer and BPU under which electric service is supplied and consumed.

**Access:** Allowing BPU entry to their equipment and not be guarded by locked doors, elevation, or other effective means including temporary or permanent structures.

**Approved:** Acceptable to the authority having jurisdiction

**BPU:** Brainerd Public Utilities

**Customer:** Any individual, partnership, corporation, or other legal entity being served or to be served, using the electric service of BPU at any specified location.

**Customer's Service Equipment:** The necessary equipment and accessories, owned by the customer, to provide electrical service to the premises.

**Demand:** The max load on a circuit at a given point in time (referred as Instant Kilowatts-IKW). Demand is used as a measured value in billing. BPU bills demand on a 15-minute rolling average in 1-minute blocks to customers at a rate code that has been determined by BPU. Demand is measured in Kilowatts (KW) and Kilovolt-Amps (KVA).

**Disconnecting Means:** A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

**Distribution Lines:** BPU power lines located along streets, alleys, highways, or easements when used or intended for use for general distribution of electric service to customers of BPU.

**Easements:** An easement is the right to use part of a property without owning it, which allows BPU access to the customer's property for the purpose of installing, repairing, and maintaining both overhead and underground utility lines. A utility easement is attached to the property deed so that it passes on even when the property is transferred or sold.

**Electric Service:** The availability of electric power and energy, regardless of whether any electric power and energy is used. The supplying of electric service by BPU consists of maintaining, at any point of the delivery, approximately the agreed voltage, phase, and frequency by means of facilities adequate for carrying the load that BPU is thereby obligated to supply by reason of the known requirements.

**Fault Current:** The current that will flow through the system to a point where a piece of equipment or conductor has failed, such as bare conductors touching together or touching a ground point.

**Kilowatt-hours(kWh):** The measure of electrical energy equivalent to a power consumption of 1,000 watts for 1 hour. The customer is billed for each kWh used at a rate that is determined by BPU.

**Meter Base:** Any enclosure containing an electric watt-hour meter, the device that measures how much electric power and energy a customer consumes during each utility-service billing period.

**Meter Cabinet:** Also referred to as a transition cabinet or CT cabinet.

- **Secondary** - Any equipment, enclosure (wall mount or self-standing) 600 volts or less containing metering equipment (CT's and/or PT's) used to measure electric power and energy used by the customer.
- **Primary** - Any equipment, enclosure (wall mount or self-standing) 600 volts or more containing metering equipment (CT's and/or PT's) used to measure electric power and energy used by the customer.

**Meter Set:** An instrument or instruments, together with auxiliary equipment, for measuring the electric power and energy supplied to a customer.

**National Electric Code (NEC):** The current edition of the National Electric Code as issued by the National Fire Protection Association (NFPA No. 70).

**National Electric Safety Code:** The current edition of the National Electric Safety Code as issued by the American National Standards Institute (ANSI C2).

**Overhead Distribution Area:** The area or areas served by BPU's overhead distribution system as differentiated from the underground systems.

**Point of Attachment:** The anchor or bracket used to support the overhead line supplying electric service to the customer.

**Point of Connection:** The point where the electric energy first leaves the line or equipment owned by BPU and enters the line or equipment owned by the customer unless specified in the Customer's Agreement for Service. (Overhead - typically located where overhead lines connect to the point of attachment. Underground - typically located at the secondary terminal.)

**Secondary Terminal:** The secondary side of a pad mount transformer, a secondary terminal box at the base of a riser pole, meter cabinet, or a secondary junction box, whichever is designated by BPU.

**Service:** The conductors and equipment for delivering energy from BPU's system to the wiring system of the customer.

**Service Drop:** The overhead service conductors from BPU's system connecting to the service entrance conductors at the building or structure.

**Service Entrance Conductors:**

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

**Service Equipment:** The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means of cutoff of the supply.

**Service Lateral:** The underground service conductors from BPU's distribution system to the first point of connection with the service conductors in a terminal box or meter or other enclosures with adequate space, inside or outside the building wall.

**Types of Service:** The characteristics of electric service described in terms of frequency, phase, nominal voltage, and number of wires which are discussed below.

- **Primary Service:** Any type of service with a nominal voltage greater than 600 volts.
- **Secondary Service:** Any type of service with a nominal voltage less than or equal to 600 volts.

**Underground Distribution:** Those subdivisions or other specified areas within which all customers are served by underground distribution lines.

**Utility:** For the purpose of this document, any public, city, or city-franchised organization that furnishes electric service.

**Utility Rate Code:** An applicable electric service rate per kilowatt hour and or kilowatt charged to customer by the electric utility. The utility rate includes a monthly service charge, all electricity commodity charges, peak demand charges, and power cost adjustment charges.

**Voltage, Nominal:** The value, expressed in volts, which is assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240, 120/208Y, 480Y/277). The actual voltage, at which a circuit operates, can vary from the nominal within a range established by ANSI C84.1. The customer is responsible for making sure that their systems can operate within range B of ANSI C84.1.

**Voltage to Ground:** For grounded circuits, the voltage between the given conductor and that point or conductor of the circuit that is ground.

## Ownership

### BPU Owned Equipment

The meter and associated metering equipment furnished or installed by BPU is the property of BPU.

1. Overhead Service – In addition to the metering equipment, the overhead service drop installed by BPU is the property of BPU.
2. Underground Service – In addition to the metering equipment, all equipment up to and including the designated secondary terminal installed by BPU, is the property of BPU. (The secondary terminal could be the secondary terminal of a pad mounted transformer, or a secondary junction box.) Unless service is taken at primary voltage or otherwise specified by a written agreement, all conductors and equipment operating at nominal voltages in excess of 600V are the property of BPU.

### Customer Owned Equipment

The following are deemed to be the property of the customer:

- meter base
  - metering cabinet (if required)
  - service conductors after the point of connection
  - service conductors and conduit from the meter socket to the service entrance disconnect
  - service switch or circuit breaker
  - service ground equipment
  - concrete transformer pad, as required
1. Overhead Service – In addition to the equipment on the customer side of the meter base, the following is the property of the customer.
    - Service drop wire from the point of attachment (wire holder or bracket) to the meter base
    - Weather head and either the service mast and conduit with entrance wires or the service cable with watertight connections to the meter base
  2. Underground Service – In addition to the equipment on the customer side of the meter base, the following is the property of the customer.
    - All conduit and cable required to extend the secondary service lateral from BPU'S secondary terminals to the meter.

The customer and BPU are responsible for the installation, maintenance, repair, and replacement of the electric service which each owns.

## Service Types

### Availability of Service

Although the types of services listed below are generally available through the area served by BPU, the type of service requested by a customer may not be available at the location where such service is desired, and in certain cases, may be available only through special contractual arrangements at the expense of the customer.

Generally speaking, each customer will only be allowed one type of service, at one point of connection at each location, which also includes dual fuel, off peak or other approved NEC services. Redundant facilities can be allowed with special permission from BPU in a written agreement.

### Secondary Service Voltages

The following types of secondary services are generally available to customers served within BPU's service area. Other services may be available with special permission from BPU.

Single-Phase Service – 120/240 Volt, 3 wire, grounded neutral, generally available where total load is 50 kVA or less.

Three-Phase Service – The following describes the different types of three-phase services available:

- 120/208Y Volt, 4 wire, grounded neutral. Generally available where the facility of adequate capacity is adjacent to the premises to be served. For loads where the service desired by the customer is not adjacent to the premises to be served, special contract arrangements may be required prior to service being furnished.
- 480Y/277 Volt, 4 wire, grounded neutral. Generally available where total load is 75 kVA or greater. Other services are available with special permission from BPU.

### Primary Service Voltages

The following types of primary services are generally available to customers served within BPU's service area:

- Three-phase, 34,500Y/19,900 Volt, 4 wire, grounded neutral
- Three-phase, 4,160Y/2,400 Volt, 4 wire, grounded neutral, only available with special permission from BPU

BPU reserves the right to deny a request for a primary voltage service.

BPU will retain ownership of primary voltage equipment and conductors unless specifically agreed upon between BPU and the customer.



## Approved Equipment and Installation

All types of electric self-contained metering, single socket, multiple sockets, for both residential and commercial will be an approved heavy duty, ringless type socket with a lever by-pass, clamping jaw, 200 Amp service minimum.

Exceptions:

- Apartment type or stacked multiple type metering will meet all the requirements above, except for the 200 Amp minimum.
- 100 Amp service minimum is acceptable for multi-unit buildings.
- Temporary services that will be removed and replaced with an approved meter socket, will not be required to have a by-pass lever. The temporary services will have to be removed within a reasonable amount of time.

All metering equipment will be of the approved type, mounted outside, and be readily accessible.

All load management equipment will be outside and wired adjacent to the metering. Power for controls is derived from the load side of the load management meter.

All metering and load management equipment will be readily accessible and mounted at a height of not less than 3 feet to the bottom and 6 feet to the top of the meter base.

All CT/PT metering will be installed by BPU.

Only existing three-phase delta self-contained services are required to have the conductor with the higher voltage to ground (wild leg) connected to the right-side meter terminal.

Service equipment is not allowed to be attached to a utility pole.

BPU must receive a completed Service Application Agreement, an Electrical Wiring Affidavit that has been filed with the State of MN, and a site plan prior to any meter installation, unless all requirements are signed off by a master electrician.

Any electrical service not meeting these requirements and standards will not be energized.

Services energized, not meeting the requirements, will be subject to disconnection until the requirements have been corrected.

All metering and load management equipment that becomes enclosed or inaccessible will be moved to an outside location at the owner's expense.

BPU has the right to disconnect any unsafe electric service.

All wiring must be in accordance with the current NEC.

BPU will maintain an inventory of approved type meter bases (see page 28 for list, prices are available upon request) at their service center. Please contact BPU for any specialty type metering that may not be covered in these standards.

For other special services types contact BPU for special permission.

## **RESIDENTIAL**

All residential services will be required to have a disconnect located outside at a readily accessible location and within 10 feet of the meter.

### **100-200 Amp Service**

- BPU requires a minimum 100 Amp service to the top of the meter base for all services.
- 200 Amp meter base with jaw release lever by-pass that is approved by BPU.
- Milbank U4801-XL-5T9 is pre-approved by BPU. Other meter bases maintaining same standards must be approved by BPU.
- Milbank U5871-XL-200-5T9 is pre-approved by BPU. This has the required disconnect and meter base all in one. Other enclosures must be approved by BPU.
- Durham 200 Amp, single-phase, pre-made meter pedestal with a GFCI is available at BPU.

### **400 Amp Service**

- 320 Amp meter base with jaw release lever by-pass that is approved by BPU.
- Meter base has 3/8" studs and the customer supplies the lugs.
- Milbank U2448-X-5T9 is pre-approved by BPU. Other meter bases maintaining same standards must be approved by BPU.

## **MULTI-UNIT DWELLINGS**

- BPU approved 200 Amp two-position meter base.
- Multiple position meter banks shall be supplied by the customer and must be approved by BPU before installation.

If service size exceeds 400 Amps, a three-phase service is required.

- Service 120/208 Voltage.
- Metering is required to have 5<sup>th</sup> meter terminal at 9 o'clock position.

## **COMMERCIAL**

### **100-200 Amp Service**

- 200 Amp single-phase or three-phase meter base with jaw release lever by-pass that is approved by BPU.
- Milbank U4801-XL-5T9 is pre-approved by BPU for single-phase installation. Other meter bases maintaining same standards must be approved by BPU.
- Milbank U4701-XL is pre-approved by BPU for three-phase installation. Other meter bases maintaining same standards must be approved by BPU.

- Durham 200 Amp, single-phase, pre-made meter pedestal with a GFCI are available at BPU.

### **400 Amp Service**

- 320 Amp single-phase or three-phase meter base with jaw release lever by-pass that is approved by BPU.
- Meter base has 3/8" studs and the customer supplies the lugs.
- Service larger than 400 Amps will be three-phase.
- Milbank U2448-X-5T9 is pre-approved by BPU for single-phase installation. Other meter bases maintaining same standards must be approved by BPU.
- Milbank U2594-X is pre-approved by BPU for three-phase installation. Other meter bases maintaining same standards must be approved by BPU.

### **600 Amp Service**

- Three phase WYE service only.
- 600 Amp meter cabinet that BPU has approved, with customer supplied bars and hinged door, will be installed at service entrance.

### **Wall Mount Enclosure**

- American Midwest Power (AMP) CT46-4I is pre-approved by BPU. Other meter cabinets maintaining same standards must be approved by BPU.

### **Self-Standing Enclosure (800 Amp is the minimum)**

- American Midwest Power (AMP) SCC8-CT4A is pre-approved by BPU. Other meter cabinets maintaining same standards must be approved by BPU.
- BPU will supply CT's and any other required meter equipment.

### **800 Amp Service**

- Three-phase WYE service only.
- Meter cabinet, that BPU has approved, with customer supplied bars and hinged door, will be installed at service entrance.

### **Wall Mount Enclosure**

- American Midwest Power (AMP) CT8-4I is pre-approved by BPU. Other meter cabinets maintaining same standards must be approved by BPU.

### **Self-Standing Enclosure**

- American Midwest Power (AMP) SCC8-CT4A is pre-approved by BPU. Other meter cabinets maintaining same standards must be approved by BPU.
- BPU will supply CT's and any other required meter equipment.

### **Larger than 800 Amp Services and Primary Installations**

- Contact BPU for service requirements.

## CUSTOMER UTILIZATION EQUIPMENT

The customer's service entrance and utilization equipment shall be installed in accordance with all local, state, and NEC requirements. It is the intent of this section to provide the customer with recommendations concerning factors that can affect both BPU and the customer in the selection, installation, maintenance, and operation of the customer's utilization equipment. If concerns arise that are not covered in this section, please contact a BPU Customer Service Representative for assistance.

### Protection of Customer Equipment

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

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

- motors
- computers
- electronic equipment
- equipment in which computers or electronics form an integral operating part.

Equipment should be protected under all conditions, including:

- overload
- voltage loss
- high or low voltage
- phase loss (e.g., single phasing on polyphase motors)
- re-establishment of service after any of the foregoing
- phase reversal
- motors that cannot be subjected to full voltage on starting
- harmonics or wave form irregularities

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

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

Before any microprocessor-based electronics are installed:

- Wiring practices that meet manufacturer specifications need to be assured (e.g., proper grounding and dedicated circuits are important)
- Consideration should be given to installation of transient voltage surge suppression
  - at the main service entrance
  - at the point of use
- An uninterrupted power supply (battery backup) should be considered if a momentary voltage dip or outage would cause loss of data.

## **Motor Starting Currents**

Generally, all motors require a starting current substantially greater than their normal running current. Where starting currents are excessive, an abnormal drop in supply voltage will result. In order to minimize the unfavorable effects of such voltage drops, it is essential that the customer's motors do not exceed the allowable starting characteristics as shown in Table 430-251(A and B) of the NEC.

NOTE: Customers planning to install any motor larger than 5 hp single-phase or 25 hp three-phase, must contact BPU. Motor installations that cause power quality problems for other customers shall be corrected at the owner's expense.

## **Power Factor**

In order to improve the efficiency of BPU's distribution system, the customer's utilization equipment shall maintain an average power factor as close to unity as possible.

Some of BPU's rate schedules include a demand charge and a penalty for an average power factor that is less than 85%. Details of the method of billing for such customers can be obtained from a BPU Customer Service Representative. For new services, it is suggested that the customer's utilization equipment be designed for operation at high power factor or with capacitors that are switched on and off with the equipment.

BPU will calculate the power factor of customers in designed rate classes by installing a varhour meter.

## **Fault Currents**

The customer's service equipment and other devices shall be adequate to withstand and interrupt the maximum available fault current. For single-family residences with service equipment rated 200 amperes maximum and 120/240 volts, single-phase, equipment shall have a minimum interrupting rate of 10,000 amperes symmetrical and other equipment shall be braced to withstand that minimum value.

## **Wiring Adequacy**

The NEC (NFPA No. 70) specifies the adequacy of wiring with respect to safety; however, such installations may not be efficient, convenient, or adequate for future expansion of electrical use. In many instances, the installation of wiring capacity greater than minimum code requirements is strongly recommended.

## **Customer Owned Generating Equipment**

Unless authorized by written agreement, electric generating equipment installed by the customer shall not be interconnected or operated in parallel with BPU's system. The customer shall own, install, operate, and maintain electrical interlocking equipment which will prevent parallel operation and such equipment shall be approved by BPU prior to installation. Please contact BPU for specific requirements relating to generation installations designed to operate in parallel with BPU's distribution system (e.g., solar, wind, etc.)

## Customer's Obligations

Increased Load – In the event the customer desires to increase load materially, such as additional electric heat, increased motor loads, etc., they shall give BPU sufficient advance notice, so that BPU may provide added facilities if necessary. If the customer fails to notify BPU and BPU's equipment is damaged because of such increased load, the customer shall reimburse and make payment to BPU for all such damages.

Balancing of Load – Except in the case of three-phase, four-wire delta services, the current unbalance in three-phase services shall not exceed 10 percent of the current that would be required at maximum load under balanced conditions.

### Total Harmonic Distortion (THD)

1. The application of any nonlinear load by the customer (e.g., static power converters, arc furnaces, adjustable speed drive systems, etc.) shall not cause voltage and/or current Total Harmonic Distortion (THD) levels greater than industry accepted levels on BPU's electric system at the point of power delivery to the customer's facility.
2. The customer shall disclose to BPU all nonlinear loads prior to connection. BPU may test the customer's load to determine the THD levels.
3. It shall be the responsibility of the customer to assure that the THD requirements are met, including the purchase of necessary filtering equipment. Any load found not in compliance with this policy shall be corrected immediately by the customer at the customer's expense. If not corrected, BPU may disconnect service to the customer's facility.
4. The customer shall be liable for all damages, losses, claims, costs, expenses and liabilities of any kind or nature arising out of, caused by, or in any way connected with the application by the customer of any nonlinear load operating with maximum THD levels in excess of the values stated in Section 1 above. The customer shall hold harmless and indemnify BPU from and against any claims, losses, costs of investigation, expenses, reasonable attorney's fees, damages and liabilities of any kind or nature arising out of, caused by, or in any way connected with the application by the customer of any nonlinear load operating with maximum THD levels in excess of the values stated in Section 1 above.

## **UNDERGROUND SERVICE**

### **Undergrounding in New Residential Developments**

BPU requires the complete underground installation of primary and secondary distribution service laterals to new structures in all residential zones, except in those cases where it is determined that such underground installations are either technically or economically undesirable.

BPU will designate a junction point for the connection of the customer's secondary underground service lateral. The junction point will be a service pedestal or junction box, the terminals of a pad-mounted transformer, or a meter enclosure to the point of the overhead point of connection. In general, BPU will install, own, operate, paint Munsell green, and maintain all facilities on the source side of the junction point, including the junction enclosure and connections; and the customer will install, own operate, and maintain all secondary cables, conduit, and related service equipment specified in other sections of this publication on the load side of the junction point. However, the developer of a new subdivision is responsible, during general development, for coordinating road crossing conduits per BPU specifications.

Junction points will be located within BPU's easement area along or near a front or a rear property line unless it is necessary or desirable to designate locations which are closer to the metering point(s). In such cases, the customer will be charged for the installed cost of any additional lengths of underground distribution cable and conduit from the property line to the junction point. Such charges shall be in addition to any other charges specified herein.

BPU's primary and/or secondary distribution laterals will normally be installed within lot line utility easements provided by the customer as a part of the recorded property plat. All utility easements required by BPU are to be granted by the customer at no cost to BPU.

### **Residential Undergrounding in Overhead Areas**

Customers residing in residential zones served by overhead lines may request underground electric service. Customers intending to relocate, upgrade or replace an existing overhead service may request underground service. In either case, the customer shall install, own, operate, and maintain the facilities specified in paragraph 2 of Undergrounding in New Residential Developments. In addition, the customer will be charged an amount which reflects any additional cost incurred by BPU in providing service to the junction point. All such charges must be paid by the customer before BPU will commence installation of the necessary facilities.

### **Underground Service to Commercial and Industrial Customers**

BPU will designate a junction point for the connection of the customer's secondary underground service lateral. The junction point will normally be the secondary terminals of a pad-mounted transformer placed at a mutually agreeable location on the customer's property, as close as practicable to the metering point.

BPU will install, own, operate, and maintain the primary underground cable, the distribution transformer, and the secondary connections.

If underground primary distribution facilities are located on the customer's property, the customer or their electrical contractor shall provide the conduit from a designated point of interconnection to the distribution transformer. If underground main distribution facilities are located on the customer's property, the customer shall provide the conduit from a designated tap point to the distribution transformer. If overhead main distribution facilities are located on the customer's property, the customer shall provide conduit to be coordinated with BPU on the riser pole and the customer shall provide and install the conduit including the elbow, from the riser pole to the pad mounted distribution transformer.

The customer shall install, own, and maintain a concrete transformer pad to BPU specifications. If the transformer is located in an area where it may be subject to physical damage (e.g., from vehicular traffic) BPU may require the customer to furnish and install an approved means of protection.

The customer shall install, own and maintain all secondary cables, conduits, and cabinets from the transformer to the building service entrance; the cables and conduit shall be buried 24 inches minimum below final grade. If service is such that a secondary lateral is to be installed directly from BPU's main secondary distribution system, the secondary cables and conduit shall be installed, owned, and maintained by the customer. (Conduit for the riser pole, if required, shall be furnished by the customer.) BPU must approve the design of all secondary bus duct and cable bus designs. The installation will be inspected by BPU and the secondary connections to the transformer and the transformer side of the connection cabinet will be made by BPU. It is the customer's responsibility to coordinate with and provide the necessary information to BPU to assure that adequate connections are made at the secondary terminals of the transformer.

BPU will furnish and install the meter set in accordance with the requirements listed in the section of Approved Equipment and Installation, Page 8.

The maximum number of secondary connections available shall be:

- Single Phase  
Six (6) 350 MCM conductors per phase

- Three Phase

Transformer Size	# of Conductors per Phase
45 kVA	3
75 kVA to 500 kVA	6
750 kVA to 2500 kVA	10

- The maximum size secondary conductor to be installed in a three-phase transformer is 750 MCM.
- Any service requiring more conductors per phase than listed above must utilize a customer provided secondary connection cabinet.



## **Secondary Connection Cabinets**

Where secondary connection cabinets are necessary, the following requirements apply:

- Cabinet assemblies will be suitable for the installation and comply with all BPU and NEC requirements.
- Cabinets shall be constructed with provisions for bar-type or donut-type current transformers.
- Conduits from service equipment to the connection cabinet and from the transformer to the connection cabinet will be furnished and installed by electrical contractor as concrete pads are being formed and poured. Conduit systems shall meet BPU requirements. Above-grade raceway from the transformer to the connection cabinet is not allowed. During the required transformer pad inspection, if the secondary connection cabinet is found to be in violation of the minimum required pad-mount transformer clearances, the inspection will be marked as 'FAILED'. The contractor will need to correct the observed deficiencies and have another inspection before the service will be energized.
- All secondary cabinets shall be free standing and located within 10 feet of transformer.
- BPU is responsible for installing the transformer to the line side of the cabinet. The customer is responsible for the installation for the load side of the cabinet.
- Other installations are allowed with prior approval from BPU (e.g., wall meter cabinet).

## **Transformer Clearances**

Where pad-mounted transformers and equipment in pad-mounted enclosures are installed, the minimum clearances specified must be maintained. (Refer to: Location of Pad-Mounted Transformers Near Buildings on page 18.) Fences, shrubbery, manholes, junction boxes, and trees may be installed by the customer if the specified clearances are maintained, the grade is not altered, and the underground cable is not endangered.

## **Winter Installation**

Underground cable installation at the customer's request between November 1 and April 30 will be subject to a winter installation charge. The amount of the frost fee depends on the depth of the frost. BPU may require that the estimated frost charges be paid in advance of performing work.

## **Installation in Unsuitable Soils**

The customer shall be required to pay an additional fee if unsuitable backfill material is encountered during the installation of BPU's facilities. The fee will be based on the cubic feet of unsuitable backfill material encountered by BPU or our contractor during installation.

## **Total Undergrounding**

BPU does not install underground vaults, manholes, or submersible transformers on customer property. If the presence of permanent structures up to the property lines, or other conditions, precludes the installation of pad-mounted equipment on the customer's property, primary service will normally be provided.

## LOCATION OF PAD-MOUNTED TRANSFORMERS NEAR BUILDINGS

### Non-Combustible Walls

(Included in this class would be wood framed brick veneered buildings, metal clad steel framed buildings, asbestos-cement-board walled metal framed buildings and masonry buildings.)

Pad-mounted oil insulated transformers may be located a minimum distance of 24 inches from non-combustible walls if all the following clearances are maintained from doors, windows, and other building openings. A sump shall be installed for transformers if the immediate terrain is not pitched away from the building. Contact BPU for sump specifications. If a combustible first floor overhang exists, a 10-ft distance from the edge of the transformer to the edge of the overhang (combination of vertical and horizontal distance) shall be required in addition to the other clearance as shown.

- **Doors**

Pad-mounted oil insulated transformers shall not be located within a zone extending 20-ft. outward and 10-ft. to either side of a building door.

- **Air Intake Openings**

Pad-mounted oil transformers shall not be located within a zone extending 10-ft. outward and 10-ft. to either side of an air intake opening located at the level of the transformer. If the air intake opening is located above the transformer level, the distance from the transformer to the opening shall be a minimum of 25-ft.

The above term "level of the transformer" is to be interpreted as within 10-ft. of the ground.

- **Windows or Openings other than Air Intake**

1. **First Story**

Pad-mounted oil insulated transformers shall not be located within a zone extending 10-ft. outward and 3-ft. to either side of a building window or opening other than an air intake.

2. **Second Story**

Pad-mounted oil insulated transformers shall not be located less than 5-ft. from any part of a second story window or opening other than an air intake.

### Combustible Walls

(Included in this class would be wood buildings and metal clad buildings with wood frame construction.)

Pad-mounted oil insulated transformers shall be located at a minimum of 10-ft. from the building wall, in addition to the clearance from building doors, windows and other openings set forth for non-combustible walls. A sump shall be installed for transformers if the immediate terrain is not pitched away from the building. Contact BPU for sump specifications. If a combustible first floor overhang exists, a 10-ft distance from the edge of

the transformer to the edge of the overhang (combination of vertical and horizontal distance) shall be required in addition to the other clearances as shown.

**Barriers** (Included in this class are reinforced concrete, brick, or concrete block barrier walls.)

If the clearance specified above cannot be obtained, a fire resistance barrier shall be constructed in lieu of the separation. The barrier when required is provided by the customer. The following methods of construction are acceptable.

**1. Non-Combustible Walls**

The barrier shall extend to a projection line from the corner of the pad-mount to the furthest corner of the window, door, or opening in question. The height of the barrier shall be 1-ft. above the top of the pad-mounted transformer.

**2. Combustible Walls**

The barrier shall extend 3-ft. beyond each side of the pad-mounted transformer. The height of the barrier shall be 3-ft. above the top of the pad-mounted transformer. If a combustible first floor overhang exists, the 24-in. specified shall be measured from the edge of the overhang rather than from the building wall.

**Fire Escapes**

Pad-mounted oil insulated transformers shall be located such that a minimum clearance of 20-ft. is always maintained from fire escapes.

Exception: Pad-mounted transformers may be located closer to a fire escape than the 20-ft. minimum when a fire-resistant barrier is constructed around the transformer (side walls and roof). The barrier shall extend a minimum of 1-ft. beyond the pad-mount. The pad-mount and barrier shall not in any way obstruct the fire escape exit. A 10-ft. clearance is required in front of pad-mounted transformer doors. Adequate transformer accessibility and ventilation must be provided.

**Decorative Combustible Enclosure**

Decorative combustible enclosures (fence) installed by the customer around pad-mounted transformers adjacent to a combustible building wall shall not extend more than 24-in. beyond transformer towards the combustible wall. A 10-ft clearance is required in front of pad-mounted transformer doors. Adequate transformer accessibility and ventilation must be provided.

**Non-Combustible and Combustible Walls – Fire Resistant Barriers**

For definitions of combustible and non-combustible walls and fire-resistant barriers, refer to the State Minnesota Building Code. This information can be obtained from the City Engineer's Office, 501 Laurel St, Brainerd MN or call them at 828-2309.

# **BPU AND CUSTOMER RESPONSIBILITIES ASSOCIATED WITH UNDERGROUND THREE-PHASE INSTALLATIONS**

## **BPU RESPONSIBILITIES**

- Designate service location and/or transformer location.
- Supply and install pad-mounted transformer.
- Make all primary terminations and connections.
- Connect the customer's secondary cable to the secondary terminals of the transformer only after customer's wiring has been approved by the inspecting authority.
- Energize the service only when authorized to do so by the inspecting authority.
- Furnish and install all cables, cabinets, and conduits to the point of connection.
- Supply and install one meter set for each customer, including all meters required for billing purposes and any accessories such as totalizers, current and potential transformers, phase-shifting transformers, test switches, and color code meter wiring.
- Inspect customer furnished equipment required by BPU. Installations not in compliance with BPU regulations will be rejected.

## **CUSTOMER RESPONSIBILITIES**

- Contact BPU to obtain the location and routing of BPU's facilities and to fill out an "Electric Service Agreement", and any other forms or statements required by BPU.
- Provide necessary easements and clear area of all construction obstructions.
- Bring area to final grade before installation of cable and transformers. Grade changes requiring cable adjustments will result in charges to the party requiring the changes.
- Compaction along conduit route after installation of conduit is customer's responsibility.
- Furnish and install a transformer pad and ground rod to BPU specifications. Contact BPU to obtain the pad specifications and transformer location for the specific service being installed. Notify BPU to inspect formed pad prior to pouring concrete.
- Provide the following minimum clearances around the transformer: front-10 feet; sides and back-24 inches. These clearances must be at the same grade as the transformer.
- Provide easy accessibility to area 24 hours a day.
- Furnish and install all cables, cabinets, and conduits from the point of connection to the building service.
- Install protective posts if transformer pad is to be installed in parking area or area of vehicular traffic.
- Protect BPU facilities from damage during construction period.
- Have wiring approved by inspecting authority and then request service connection by BPU.
- Notify BPU prior to any proposed building or grade changes within 10 feet of the electrical service or the cable route.
- Supply and install BPU approved meter socket on outside wall or approved location and install conduit for service cable.

- Notify BPU as far in advance as possible when any unusual loads are anticipated, such as special medical equipment, arc welders, elevators, or any other equipment that could affect BPU's system or any other customer.
- Supply all secondary cable extending from the meter to the BPU designated secondary terminal.
- Contact BPU 24 hours in advance when a service is to be installed so that BPU can unlock the power source and the contractor can install the service into the power source.

## **ROCK AND WINTER INSTALLATION GUIDELINES**

BPU will bill the developer for any surcharge we receive from our contractor for rock excavated or unsuitable backfill.

BPU will install underground electric services through October 31 at the standard charge, on a first come – first served basis. For jobs started before November 1 per a mutually agreed upon schedule, installation will continue until complete with no surcharge applied for frost. Customer may be responsible for frost protection.

Developments not ready for installation by the day scheduled will be rescheduled to last. If rescheduling will result in installation on or after November 1, a trenching surcharge may be applied.

Installations scheduled on or after November 1, and completed before April 30, may receive a per foot trenching surcharge.

Where conditions do not permit the completion of a scheduled installation, or where a development cannot be completely brought to grade in time, partial installation will be made at no added cost under the following conditions:

- Partial installation must conform to final design layout, including placement of one (minimum) permanent transformer.
- Partial installations must be contiguous with existing facilities.
- Total project fees must be paid before partial installation will be approved.
- All standard pre-and post-installation site conditions must be met for a partial installation.

## **ACCESS AND APPROVAL**

Employees of BPU shall have the right of access to the customer's premises at all reasonable times for the purpose of installing, reading, inspecting, maintaining, or removing any of its meters, devices, or other equipment which is used in connection with the customer's electric service.

At a minimum, wiring and electrical equipment of the customer shall be installed in accordance with the latest edition of the NEC.

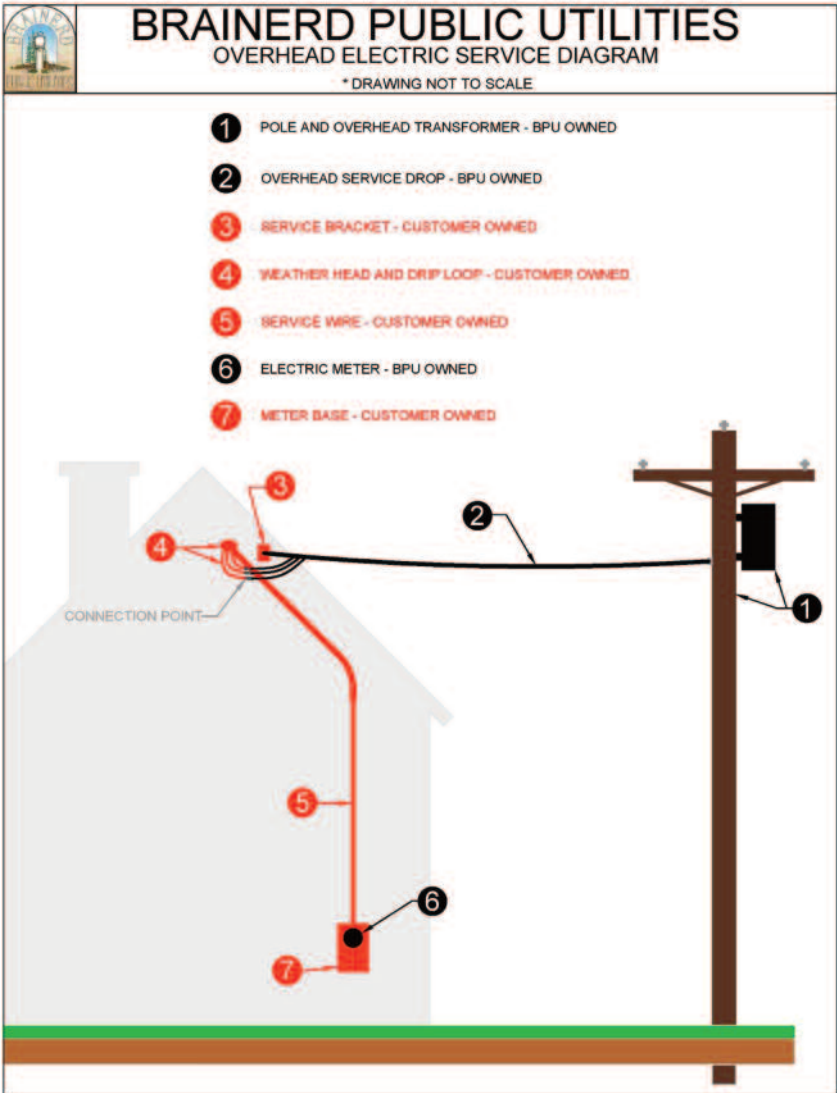
Wiring installations, including temporary installations, must be inspected before BPU will make connection and set the meter.

After the customer's installation has been inspected and approved by the proper authority, a meter will be installed by BPU and the electric service made available provided that all applications, agreements, and deposits have been submitted by the customer and approved by BPU. Inspection notices must be received by BPU no later than 3:00 PM of the day proceeding the date that connection is desired (weekends and holidays excluded).

Customer requests for disconnection or reconnection of existing services must be received by BPU at least 24 hours in advance of the desired time of disconnection or reconnection (weekends and holidays excluded). For protection of the customer and BPU, only employees of BPU are permitted to install and remove meters, or to make and energize or break and de-energize the connection between BPU and the customer's electric service.



# OVERHEAD SERVICE DIAGRAM



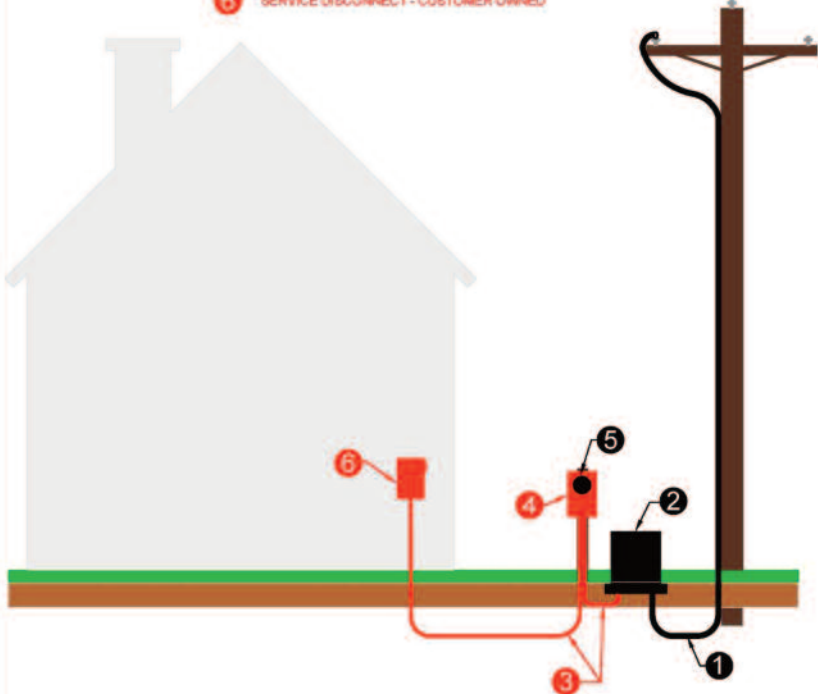
## UNDERGROUND SERVICE DIAGRAM



### BRAINERD PUBLIC UTILITIES UNDERGROUND ELECTRIC SERVICE DIAGRAM

\* DRAWING NOT TO SCALE

- ① BPU OWNED CONDUCTOR (PRIMARY CONDUCTOR TO TRANSFORMER OR SECONDARY CONDUCTOR TO SECONDARY PEDESTAL FOR POINT OF CONNECTION TYPICALLY AT PROPERTY CORNER) - BPU OWNED
- ② TRANSFORMER OR SECONDARY PEDESTAL - BPU OWNED
- ③ UNDERGROUND SERVICE CONDUCTOR - CUSTOMER OWNED
- ④ METER BASE (TYPICALLY LOCATED ON HOUSE OR ON METER PEDESTAL NEAR PROPERTY LINE) - CUSTOMER OWNED
- ⑤ ELECTRIC METER - BPU OWNED
- ⑥ SERVICE DISCONNECT - CUSTOMER OWNED



## METER BASE/PEDESTAL/CT CABINET INVENTORY

<u>BPU PART</u>	<u>DESCRIPTION</u>
M0870	SP-200 AMP - 5T- BYPASS METER
M0880	SP-320 Amp Meter Socket-5 Term
M0915	3P-200 Amp Meter Socket-7 Term
M0917	3P-320 Amp Meter Socket-7 Term
M0930	3P-20 Amp Meter Socket-13 Term
M0960	SP-200A TWO POSITION-5 TERM
M0970	SP-200A - 5T BYPASS W/DISCONNECT
M0980	SP 200A DISCONNECT
M8CTSCAB	800A CT CABINET STANDING
M10CTSCAB	1000A CT CABINET STANDING
M12CTSCAB	1200A CT CABINET STANDING
M16CTSCAB	1600A CT CABINET STANDING
M0700	SP-200A METER PEDESTAL - GRAY



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(218) 829-8726

Repair Office and 24 Hour Emergency

(218) 829-2193

[www.bpu.org](http://www.bpu.org)

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