

## APPENDIX C

### BOARD OF PUBLIC UTILITIES REQUIREMENTS ELECTRIC SERVICE & METER INSTALLATIONS

**SECTION 1. INTRODUCTION.** This booklet is issued as a convenient reference for architects, engineers, and electrical contractors planning or constructing buildings, or installing, repairing or renewing apparatus or equipment to be connected to the company's distribution system and to facilitate the company in giving more prompt and satisfactory service to its customers and the public.

While this booklet is issued as a matter of general information, it should not be considered a complete book of requirements covering all installations. It is essential that the company be consulted in those specific cases not covered by the requirements of this booklet or where application of these requirements may be impractical.

These requirements are supplementary to the requirements of the National Board of Fire Underwriters and State and Municipal Authorities.

The company does not install wiring or electrical apparatus in buildings and will not assume any responsibility for the condition of the wires or other installations within buildings, or for damage arising because of the condition of same.

The company is eager to maintain a high standard of service and to that end asks that all person cooperate in the proper interpretation of he requirements contained in this booklet.

#### **SECTION II. GENERAL INFORMATION.**

A. **Definitions.** Company: The word "company" as used throughout this booklet refers to the Board of Public Utilities.

Customer: The word "customer" is used to designate either the present prospective use or the Company's electric service.

Service: As previously used here refers to the supply of the Company's product electricity to the customer. The wire connection between the Company's lines and the customer's wiring is a service connection and is sometimes called a "service". This is composed of two parts as follows:

Service Drop: That portion of the service between the pole and the point of attachment to the building.

Service Entrance: Wire and enclosures, connecting the customer's service equipment and the service drop or source of supply.

Inspector: As referred to herein is to be considered an agency authorized to inspect and pass on electrical installations in the territory under its jurisdiction.

b. **Availability of Service.** Information should be obtained at company office as to whether service is available in the location where it is desired to utilize the service. If it is not, the company will make such extensions to its existing facilities as may be required by one or more consumers, provided the revenues therefrom shall be sufficient to afford a fair and reasonable return on the cost of providing and rendering the required service. However, the company may require minimum guarantees or other arrangements with the consumer whereby the company will be insured a fair and reasonable return on the cost of providing and rendering the required service.

c. Type and Character of Service. Alternating current service at a normal frequency of sixty (60) cycles.

As the voltage and number of phases which will be supplied depends upon the character of the load, its size and location, it is necessary that this customer consult the company office regarding the type of service which can be furnished before proceeding with the purchase of equipment or installation of wiring.

The Company establishes 120 volt, 2 wire, and 12-240 volt, three wire, single phase; and 120-240 volt, 4 wire, and 240 volt, 3 wire, three phase, as its nominal secondary voltage for supply to customers.

The Customer shall pay the cost of any special installation necessary to meet his peculiar requirements for service at other than standard voltages, or for the supply of closer voltage regulation than required by standard practice.

Service is usually available at a high voltage, generally known as primary voltage, and information may be obtained from the company regarding this class of service.

c. Application for Service: Application for original or added service shall be made at the company office. Application shall show street and number, or other means to assist in locating customer's premises.

In order to facilitate obtaining service at the desired time, application should be made as early as possible in order that details for furnishing service may be worked out, and the necessary materials assembled.

No application for regular or temporary service will be accepted until the applicant has exhibited proof that a proper building permit, or certificate of occupancy has been obtained from the building inspector. Temporary service authorized by Section (g) is exempt from this provision and service may be authorized with the exception of trailers homes or mobile homes (Ord. #431, 10/04/71).

e. Inspection: The wiring and appliances of the customer should be installed and maintained in accordance with the latest edition of the National Electric Code and such local requirements as may be in force at the time the installation is made.

The company does not inspect wiring but requires that any wiring installation be inspected and approved by an authorized electrical inspector having jurisdiction in the territory served before the installation is connected to its distribution system.

The company reserves the right to refuse service to any new installation or to disconnect service to any existing installation should it come to the attention of the company that such installation is unsafe. The company will not be responsible, in any way, for any defect in the wiring or equipment of the customer or for damage that may result from such defect.

f. Alterations and Additions: Connection to the customer's premise is made with service wires, transformers, meters, and equipment supplied by the company to properly supply adequate electric service for the operation of the customer's installation in accordance with the application. Therefore, no material additions shall be made to the customer's installation without first notifying and receiving permission from the company to add additional equipment. Failure to give notice of additions or changes in the customer's installation, and to obtain company's consent for same, shall render the customer liable for any damage to any of the company's equipment caused by the additional or changed installation.

The customer should realize that this rule must be enforced since violation of same may materially affect not only the quality of his own service but also that of customers supplied from the same facilities.

To safeguard both the property of the customer and that of the company, the customer is warned against overloading or overfusing any service branch circuit.

The company, upon request, will promptly remove all disconnected services and meters. When alterations require the relocation of service drop wires, or metering equipment, the company will promptly do this when the necessary wiring changes have been completed by the customer, at a cost fixed by the company.

Under no circumstances shall any service drop wire, meter, or metering equipment be removed or relocated except by employees of the company authorized to do such work.

g. Temporary Service: It is necessary that the company be consulted for detailed plans for each installation where temporary service is to be supplied. Temporary installations requiring special service, meter or other work such as for construction purposes, exhibits of short duration, trailer homes, etc., are generally made at the expense of the customer.

Service entrance, meter and other wiring on temporary installations shall be made in the same manner as for permanent installations.

### SECTION III. Service Entrance.

a. Overhead Service: The location of the service outlet is an important consideration to both the customer and the company. It is essential, in order to avoid errors, that the customer, architect, or contractor ascertain from the company to what point on the building the company's service wires will be attached. In all cases the company will designate the point of service entrance and meter location.

In general, only one service shall be installed to serve a building. The customer's wiring shall be extended on the outside of the building wall to a point high enough to allow proper clearance of service wires across alleys, streets, driveways, telephone cables, windows or buildings, or to a point not less than 12 feet about the ground line and at a point on the building nearest to the pole from which the company specifies service will be taken.

The contractor should install the necessary facilities for mounting the service drop wire attachments on all buildings, and on buildings constructed of tile, stucco, concrete, concrete block, asbestos shingle, plastered metal lath, brick veneer, rock, or sheet iron the contractor shall mount the necessary facilities for attaching the service drop wires. For convenience, the company will supply the service attachments for the contract to install at the time the building is being constructed.

b. Underground Service: When an underground service is desired, such service must be installed and maintained by the company. The difference in cost of underground and overhead shall be paid by the customer.

c. Customers Service Entrance: Service entrance wires between the company's service drop terminal and the customer's service equipment shall be enclosed in a metallic tubing or conduit, or an approved type service entrance cable. The service entrance must be grounded.

The neutral conductor of each service entrance wiring shall be plainly marked at the service outlet and at the meter location.

At least three feet of the service entrance wires shall be left projecting from the service outlet fitting for connection to the service drop or source of supply.

Where conduit or metallic tubing is used, fittings with removable covers in the service entrance run should be avoided if possible. If they are necessary, they shall not be concealed and shall be of a capped elbow type, or similar.

The service entrance wires between the company's service drop terminal and the meter location shall be run on the outside of the building wall and shall not be concealed.

d. High Voltage Services: When the customer's service requirements are such as to make necessary the installation of a high voltage service (over 250 volts), plans and specifications should be submitted to the company for approval on each individual case.

SECTION IV. TRANSFORMER VAULTS. When conditions are such that it is necessary to install transformers within a building on the customer's premises, the customer will provide a suitable vault to house the transformer and accessories.

Customers should in all cases consult the company regarding the location and construction of transformer vaults before plans are made.

The vault or room should be so located that it will be easily accessible for installation, maintenance and removal of apparatus and, if possible, should have the entrance outside the building in a street or other public highway.

The vault should comply with the National Electric Code and such local requirements as may be in force at the time installation is made. The vault should be free of gas, oil, steam or other pipes and building ventilation ducts.

Transformer vaults should contain on the transformers and auxiliary equipment. The customer's secondary fuses, switches or meters should not be installed in the vault.

The transformer vault and its contents will be under the supervision of the company and the customer should not permit unauthorized persons to enter.

SECTION V. METERS. a. Meter Location: The location of meters is an important consideration to both the company and the customer. The company should always be consulted and will endeavor to select a location that will be the most suitable to both parties.

All meters, service connections, and other equipment furnished by the company shall be, and remain, the property of the company. The customer shall provide a space for, and exercise the proper care to protect the property of the company on its premises; and in the event of loss or damage to the company's property arising from neglect of a customer to care for same, the cost of the necessary repairs or replacements shall be paid by customer.

Meters for residences and apartments shall be located outdoors.

Poles will be provided for central meter location at the cost set by the company. All service drops from this central meter location to buildings shall be the property of the customer and shall be maintained by the customer. When meter poles are desired by the customer, application should be made at the company office.

Meters for office and commercial buildings shall be located outdoors.

A clear space of at least three feet shall be maintained in front of all meters for reading and testing. A clear space of not less than three inches horizontally and six inches vertically shall be provided adjoining all meters to allow for changing and testing. On gang installations where socket type meters are used, this distance may be decreased to that obtained by using a 4-inch nipple between meter sockets horizontally or a 6-inch for vertical mounting.

Meter sockets or enclosures shall be mounted in a plumb and level position on the surface of a solid wall or structure. The top of the meter shall be not more than 6 feet or less than 4 feet from the ground.

On multiple meter installations, the meter location for each office or apartment shall be permanently marked or identified by the customer or contractor.

The company furnishes the customer without cost meter sockets, boxes, and other equipment directly connected with the housing and protection of meters. Those materials forming portions of the wiring installation shall be installed by the customer as part of his wiring job. All device supplied by the company remains its property.

b. Single Phase Meter Installation: 1. Less than 200 amperes: On installations where the connected load does not exceed 200 amperes, the company will furnish a meter socket for outdoor installation.

2. Over 200 amperes: Installations of this size usually require the use of instrument transformers. The company should be consulted on all installations of this character before any work is done.

c. Three Phase Installations: 1. Less than 200 amperes:

The company will furnish a meter socket or metal box for mounting the meter outside when the connected load does not exceed 200 amperes.

2. Over 200 amperes: Installations of this size usually require the use of instrument transformers. The company should be consulted on all installations of this size before any work is done.

d. Instrument Transformer Installations: Where the installation of instrument transformers is necessary, the company will furnish a metal cabinet for the transformers, and a metal box for the meter for outdoor installations. This cabinet and box shall be mounted in a location approved by the company and connected by a one-inch conduit.

All service wires from the instrument transformer location to the building shall be completed by the company. The wiring from the instrument transformer secondaries will be completed when the meter is installed by the company.

e. Demand Meters: Generally, only one meter will be required for each customer's requirements. Where demand metering is necessary, a combination KWH and KW meter will be installed. Where it comes to the attention of the company that industrial or commercial customers are operating their equipment below 85 percent power factor, the customer shall provide the necessary space, in an approved location, for mounting the KVA demand meter. The company will install the necessary wiring for demand meters when other meters are installed.

#### SECTION VI. CUSTOMERS UTILIZATION EQUIPMENT. a. General.

The Company builds and maintains adequate lines to supply proper service to all customers using normal equipment. However, since equipment installed by one customer may very materially affect the adequate service to other customers and because the misuse of some equipment would constitute a life or fire hazard, the company has prepared the following regulations covering the more common installations of utilization equipment. The company proposes to specify only such requirements as are necessary to safe guard both its customer and the company to the end that service may be rendered with a maximum of safety and a minimum of liability of interruption or disturbance. The customer should consult the company for additional details on special equipment not covered in the following paragraphs.

The company furnishes free engineering advice on air conditioning, heating, lighting, wiring plans, and other utilizations equipment to its customers, and urges all customers, who do not employ an engineer or architect to make plans and specifications for the installation and use of their utilization equipment, to avail themselves of this free service.

b. Motors: In order to insure a good quality of service, the company deems it advisable to establish certain limits for the maximum allowable starting currents of motors to be connected to their lines. In order to save time and possible inconvenience, the customer or his electrical contractor should consult the company before purchasing motors for use on the company's lines.

On account of voltage disturbance, it is not advisable to connect motors to lighting circuits. It is recommended that separate circuits be installed in houses, apartments and offices for such equipment.

A motor rated above ½ h. p. and not exceeding 5 h. p., or a group of motors not exceeding 5 h. p., will be served single phase at 240 volts.

A motor or group of motors in excess of 5 h. p., and not exceeding 15 h. p., may be served single phase or three phase at the option of the company. In order to facilitate obtaining service at a future location, on individual motors 5 h. p. and smaller, it is recommended that consideration be given to the purchase of single phase motors, even when served by three phase service.

Motors in excess of 15 h. p. and not exceeding 50 h. p. will be served three phase at 240 volts.

The company should be consulted on all installations of motors in excess of 50 h. p.

All motors shall be provided with devices that will protect the motor and motor circuit against under voltage, overload, phase failure, phase reversal, and short circuit.

All motors that cannot be safely subjected to full voltage at starting should be provided with a device to insure that, on the failure of the supply voltage, the motor will be disconnected from the line or the starting device returned to the "OFF" position, unless the motor is equipped with automatic restarting means. To prevent unnecessary shutdown, it is recommended that this device be equipped with a time relay feature so that it will not function until the motor speed drops to a point where it will not pick up.

Elevator and hoist motors and other motors which are to be started frequently may not draw line starting currents exceeding 100 amperes. In order to comply with these requirements, it will usually be necessary with the larger motors to use a wound rotor motor with a variable resistance starter in the rotor circuit, or a squirrel cage motor with a variable resistance starter in the line. The starter should not open the circuit during the entire starting period and should limit successive steps of current values given later at not less than ½ intervals, or the equivalent thereof.

The starting current drawn from the line by an individual motor must not generally exceed the values given in the following table for the rated horsepower of the motor.

### INSTANTANEOUS AMPERES STARTING CURRENTS

<u>H. P. of Motor</u>	<u>120V-1 Ph.</u>	<u>240V-1 Ph.</u>	<u>240V-3 Ph.</u>
1-4	20	15	15
1-3	20	15	15
1-2	30	15	15
3-4		20	15

<u>H. P. of Motor</u>	<u>120V-1 Ph.</u>	<u>240V-1 Ph.</u>	<u>240V-3 Ph.</u>
1		25	15
1-1/2		35	20
3		60	40
5		95	60
7-1/2		140	90
10		175	110
15		225	160
20			200
25			260
30			300
40			400
50			500

Over 50 not to exceed 8 amp. per phase per h. p.

The instantaneous current may be measured with a starting current ammeter, an oscillograph or with an ordinary ammeter by blocking the rotor.

The blocked rotor current of 40 amperes for infrequently started 120 volt single phase motors such as on residential air conditioners and home freeze units is permissible.

The values given in the above table for 240 volt motors shall be reduced by 1-2 for 440 volt motors and 1-10 for 2400 volt motors.

The starting currents for motor sizes not given may be obtained by interpolation.

c. Ranges: All residential type ranges will normally be served by three wire 120-240 volts. The same service entrance shall supply all of the customer's electrical requirements. Where the existing service entrance is not adequate for servicing an added load, a new service entrance shall be substituted. Installation of the range service device shall provide for combination with existing or future water heater service device.

The service entrance should terminate in an approved type combination entrance switch or set or circuit breakers. The range circuit should be protected by a current limiting device having a rating not exceeding 40 amperes. The minimum size copper conductor used for range circuit shall be No. 8 AWG.

d. Water Heaters: All continuous service type water heaters as normally used for residential service will be served two wire 240 volts.

To adequately protect the customer's property, water heaters of all types should be equipped with a reliable type pressure-temperature relief valve. This valve should be installed in the cold water line at the heater and property drainage facilities provided.

All heaters should be installed so that all thermostatic controls and heat elements are readily accessible.

e. Gaseous Tube Lighting: All gaseous tube lighting, such as neon and fluorescent having inherent operating characteristics of extremely low power factor shall have installed by the customer corrective devices, either incorporated in the equipment or as an additional device, so as to maintain a power factor of not less than ninety (90) percent.

f. Space Heating: When considered on a yearly basis, space heating probably imposes the lowest load factor on the company's lines that any of the customer's other utilization equipment. The characteristics of hearing loads are such that as excess installed capacity is increased, load factors are decreases. It is important, therefore, from the standpoint of the customer, that installed excess capacity be avoided. Under certain conditions an extra 10 KW installed in a househeating installation, will without a demand charge, mean the difference between a profit and a loss to the Company. Its is not unreasonable to expect the extra demand to annually cost the company a large sum of money in increases operating expenses and fixed costs.

The company should be consulted, and detailed plans and specifications submitted for approval, on all heating installations before any work is done. The company will be glad to assist the customer in the design of hearing installations, without cost to the customer.

All unit heaters in excess of 1 ½ KW shall be served at 240 volts. Each individual heater shall be on a separate circuit and controlled by a separate thermostat.

Furnaces rated 20 KW or above may be served single phase 240 volt or three phase 240 volt at the option of the company. If served three phase, the furnace shall be so connected that the loading on any phase shall not exceed 1-3 the rated capacity of the furnace.

The company may require the installation of load regulators and outdoor thermostats, when it its opinion, such regulation is necessary to supply proper and adequate service to all customers.

g. Special Equipment: The customer is cautioned against the purchase and use of any type of equipment or machine to be connected to any source of supply, which is not of standard manufacturer and approved by a competent authority (such as Underwriter Laboratories) for use under the designated conditions.

All flashing signs or lights served by the company shall be provided with the necessary type of switching equipment to eliminate undesirable flicker and radio trouble to other customers.

Due to the very severe operation characteristics of such equipment as electric welders, x-ray, wireless stations, and furnaces, the customer shall apply to the company for approval to use such equipment before installation is made. When the operation of any equipment is detrimental to satisfactory operation of the company's distribution system, the company may require the installation of special equipment such as lines and transformers, at the expense of the customer.