

## CUSTOMER EQUIPMENT

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### 400. General

The Company will make permanent connections between the customer's electric service wiring and the Company's system. Unauthorized connections are not permitted. (See drawings in section 6)

Unless authorized by the Company, metering equipment will not be used as connection points for circuits or services added to the installation after the original service has been approved and energized.

Except for installations outlined in Article 312D, no customer owned equipment will be permitted on any Duke Energy owned pole without prior approval from Power Delivery.

### Metered And Unmetered Wiring

- A. Unmetered conductors will not be permitted in any wiring raceway, pullbox, or distribution cabinet containing metered conductors.
- B. No pullbox, distribution cabinet, wire trough, etc., will be permitted in raceways containing unmetered conductors unless provisions are made by the customer for sealing by the Company. Provisions for padlocking will be required on some installations.

### 402. Service Entrance Disconnecting Device

- A. Service ampacities will be limited to 3000 amps per transformer. Contact Power Delivery for installations over this limit.
- B. All service equipment must be rated for the available fault current on the Company's system. Information regarding the available fault current can be obtained from Power Delivery.

### **403. Standby Generators / Uninterruptible Power Supply**

No other source of electricity can be connected to the customer's wiring system without transfer equipment to prevent feedback into the Company's system. Power Delivery must be contacted a minimum of 90 days in advance to allow time for engineering review and approval.

### **404. Parallel Operation Of Customer Generation / Cogeneration**

No other source of electricity can be connected to the customer's wiring system that results in parallel operation with the Company's system unless prior written authorization has been received from the Company. The Company provides technical requirement booklets to assist customers and their representatives in planning and operating customer generation on the Company system. Power Delivery must be contacted a minimum of 90 days in advance to allow for engineering review and approval.

## **MISCELLANEOUS CONNECTED EQUIPMENT**

### **405. General**

The Company will not be responsible for any customer equipment that causes objectionable voltage fluctuations. The operations of any customer equipment causing objectionable voltage fluctuations on the Company's system will not be permitted and may be disconnected.

### **406. Radio And Television Interference**

Electrical-contacting devices (i.e., thermostatic flashers, X-ray machines, multi-phase rectifiers, or other similar equipment) which radiate high-frequency waves on the Company's electric distribution systems must be equipped, at the customers cost, with filters or other means to prevent radio or television interference.

### **407. Computers And Other Sensitive Electronic Equipment**

Minor voltage fluctuations and momentary outages on utility or customer distribution systems are normal and might adversely affect the operation of sensitive electrical loads. Installation of supplementary equipment, at the customer's expense, may be necessary to assure satisfactory operation.

### **408. Auto-Transformers**

If an auto-transformer is required, its use must be authorized by Power Delivery.

## 409. Step-Bus Installation

When an unusually large number of service lateral conductors are being installed, a customer supplied step-bus installation may be required at the service point for connection to the Company's system. Contact Power Delivery prior to installation.

## **MOTORS AND CONTROLS**

### 410. Customer Equipment Considerations

- A. Certain restrictions are necessary on motor starting currents in order to limit instantaneous demands on the Company's system. Motor-starting current is defined as locked rotor current when rated voltage is applied to the motor terminals.
- B. If a current reducing starter is used, the motor-starting current is measured on the line side of the starter.
- C. Motor-starters should be designed in such a manner that:
  - 1. It cannot rest freely in a starting position that will cause the overload protective devices to be inoperative
  - 2. In the event of loss of the supply voltage, the motor will automatically be disconnected from the line, or the starting device will be returned to the starting position
- D. The use of a time-limit under-voltage release for motors on important applications should be considered because of the rapid reclosure of the Company's circuit breakers.
- E. All motors should be protected by the customer from damage caused by continued operation at under-voltage and/or single phasing of three phase motors.
- F. Protection should be installed if phase reversal or single-phase operation may cause damage to three-phase motors.

## 411. 120/240 Volts Single-Phase Service Voltage

- A. Motor starting currents should not exceed the values shown in Table I. These starting current limitations apply to the sum of the starting currents of all motors on the appliances that are started at the same time.

**TABLE I**  
*Permissible Starting Current for Single Phase Motors*

MOTOR RATING			MAXIMUM STARTING AMPERES	
Volts	HP	BTUH*	3 Starts or Less Per Hour	More Than 3 Starts Per Hour
120	2 or less	12,000	50	30
230	2	20,000	60	60
230	3	27,000	80	70
230	4	33,000	95	80
230	5	40,000	110	90

\* The BTUH applies to air conditioners rated in British Thermal Units Per Hour

- B. Single-phase motors larger than 5 horsepower require approval from Power Delivery.

## 412. Three-Phase Service Voltages (Other Than Downtown Cincinnati Network System)

- A. Motor installations of 7.5 horsepower and larger are normally supplied by a three-phase service. No motor installation will be permitted that causes disturbances on the Company's system.
- B. Three-phase motor-starting currents drawn from the Company's system should not exceed the values shown in Table II or III. At locations where there is a large service ampacity in proportion to the individual motor proposed, these table values might be exceeded.
- C. Table values may be exceeded on an individual motor for group motor installations if the starting current does not exceed the maximum listed current for the largest motor of the group. Written approval for such installations must be obtained from Power Delivery.
- D. When motors of 50 horsepower and larger are proposed, inquiry must be made to Power Delivery regarding the Company's capacity to serve the motor, the starting current permitted, and possible starting restrictions.

**TABLE II***Permissible Starting Currents (Three-Phase Motors)*

Nominal Service Voltage	208Y / 120		240/120		480Y / 277	
Rated Motor Voltage	200 (208)*		230		460	
Rated H.P.	Approx. Full Load Amp. Per Terminal	Maximum Amps Locked Rotor	Approx. Full Load Amp. Per Terminal	Maximum Amps Locked Rotor	Approx. Full Load Amp. Per Terminal	Maximum Amps Locked Rotor
5	17.5	103	15.2	90	7.6	45
7 ½	25	152	22	132	11	66
10	32	186	28	162	14	84
15	48	276	42	240	21	120
20	62	359	54	312	27	156
25	78	442			34	192
30	92	538			40	234
40	120	718			52	312
50	150	862			65	378
60	177	1035			77	450
75	221	1276			96	558

\* Parenthetical value is former design

**TABLE III***Maximum Ratio of Starting Current to Full Load Current for Hermetic Equipment with Three-Phase Motors*

Full Load Current at 240 Volts	3 Starts or Less Per Hour	More Than 3 Starts Per Hour
20 Amps or Less	6:1	4.5:1
More Than 20 Amps	5:1	3.5:1

### **413. Three-Phase, Four-Wire Voltage (Downtown Cincinnati Network)**

- A. Motors connected to the Company's three-phase, four-wire, 208Y/120 volt network distribution system are subject to the following requirements:
- Single-phase motors may be operated on 120-volt circuits providing the starting currents do not exceed the values given in Article 411(A)
  - Single-phase motors having starting currents in excess of the value given in Article 411(A) must be operated on 208-volt circuits (the starting current of 2 horsepower and smaller motors must not exceed 60 amps)
  - All motors of 3 horsepower or larger must be three-phase, suitable for operation on 208 volt three-phase circuits
- B. Permissible Starting Current:
- Where total motor and other loads create an estimated 15 minute maximum demand of 100 kilowatts or less, the maximum permissible locked-rotor current of any motor should not exceed 100 amps
  - Where total motor and other loads create an estimated 15 minute maximum demand greater than 100 kilowatts but less than 300 kilowatts, the maximum permissible locked-rotor current of any motor should not exceed a value of 1 amp per kilowatt of demand
  - Where total motor and other loads create an estimated 15 minute maximum demand greater than 300 kilowatts, the allowable locked-rotor value must be obtained from Power Delivery
- C. The customer must install a starting device if the locked-rotor current exceeds maximum permissible values.
- D. Starting devices having only two steps should be designed and operated so that the inrush currents do not exceed allowable values on either the starting or running tap.
- E. Starting devices having more than two steps must not open the starting circuit at any time during the starting period.
- F. For motors operated through transformers, other than 208 volts, the starting current is measured on the 208-volt side of the transformer.
- G. Questions concerning group starting of motors must be referred to Power Delivery.

## **414. Harmonic Current and Power Factor**

Harmonic currents and Power Factor can cause damage to Company equipment or reduce the quality of service provided by the Company to other customers. The customer is required to limit harmonic currents and power factor to acceptable levels.

For additional information please contact the Power Quality Department of Duke Energy at 1-800-262-3000



