



## ELECTRICAL INFORMATION

### 1. Convert Watts to AMPS:

- Watts divided by Voltage  
Example:  
 $2,300 \text{ WATTS} = 2300\text{w divided by } 120\text{v} = 19.1 \text{ AMPS}$   
(for 3 Phase divide by 1.73)

### 2. Convert AMPS to Watts:

- AMPS multiplied by Voltage  
Example:  
 $19.1 \text{ AMPS multiplied by } 120\text{v} = 2300 \text{ Watts}$   
(for 3 phase multiply by 1.73)

### 3. Convert Horse Power to AMPS:

- Multiply Horse Power by 746w (1 HP = 746 Watts)  
Find Circuit Voltage and Phase  
Example:  
 $30 \text{ HP at } 480 \text{ (3 Phase) - } 746 \text{ multiplied by } 30 = 22380$   
 $22380 \text{ divided by } 480 \text{ (3 Phase) } = 46.5$   
 $46.5 \text{ divided by } 1.73 = 29.5\text{AMPS}$   
Multiply all the motor loads by 1.50% and go to the next circuit size.

### 4. Convert KVA to AMPS:

- Multiply KVA by 1000/voltage  
Example:  
 $30 \text{ KVA multiplied by } 1000\text{v} = 30,000 \text{ Watts}$   
 $30,000 \text{ Watts divided by } 480 = 62.5 \text{ AMPS}$   
(for 3 phase divide by 1.73)

### 5. Convert KW to AMPS:

- Multiply KW by 1000/voltage and then by power factor  
Example:  
 $30\text{KW multiplied by } 1000\text{v} = 30,000$   
 $30,000 \text{ divided by } 480 = 62.5 \times .90 = 56.25\text{amps}$   
(for 3 phase divide by 1.73)

### 6. Building Supply Power:

- Large buildings generally have 277/480v.3ph.4w incoming power to a main disconnect. This is fed by the power company. Most lighting, air conditioning and equipment are fed by this voltage. To feed general receptacles a step-down transformer is installed (480v 3PH. Input and 120/208V/.3PH Output).

## 7. Panelboard Capacity

- 100A panelboard will handle 100A per phase
- Find the existing loads from each circuit
- Add them and multiply by the Circuit Voltage
- Divide by panel voltage and (1.73 for 3 Phase)
- The total should not exceed 80% of the 100A
- **Remember Circuit Voltage is not the same as Panelboard Voltage.**
- Panelboard Voltage 208v or 480v
- Circuit Voltage might be 120v or 277v

## 8. Portable Equipment:

- Portable equipment cannot be hardwired (this includes benches that are not fastened to the floor)
- Typical solution is to install a cord drop or a cord with a plug

## 9. Safety Disconnect:

- A circuit disconnect must be installed within sight or not more than 50ft. from the piece of equipment

## 10. Breaker Style and Brand:

- When a new breaker is installed in an existing panelboard, verify that the proposed breaker style is listed on the panelboard manufacturer's name card (information posted on the panelboard cover)
- The AIC Rating of the breaker must be equal or greater than the panelboard's AIC rating (located on the information card)

## 11. Clearances:

- All electrical panelboards, transformers, switchboards, disconnects, etc., must have the following working clearances:
- 42" for 480v equipment
- 36" for 240v equipment

## 12. Circuit Identification:

- Even though it is not a code issue, it still is a good practice to –
- Require that all receptacles, light switches, and electrical equipment be labeled with the circuit information, including the panelboard designation and circuit number

## 13. Amount of Devices Per Circuit:

- Receptacles (*Rule of Thumb*):  
Not more than (6) per circuit
- Copiers and appliances (coffee pots, microwaves, refrigerators, water coolers, etc.) should be on a dedicated circuit
- Dedicated means no other load or device should be connected to this circuit

#### **14. Light Fixtures Per Circuit:**

- Multiply ballast AMPS by the amount of ballast or lamp watts
- The total should not exceed 80% of the Circuit AMPS

#### **Example**

A 20AMP 120v circuit could only be loaded to 16 AMPS which equals 57 fluorescent lamps-34 Watt or 19 2 x 4 Fluorescent Fixtures-3lamp.

#### **15. Device Mounting Heights:**

- Receptacles 15"
- Receptacle in bathroom 44"
- Receptacle above counter 4" above back splash
- All heights are the center line of the device and above finished floor or surface.
- Light switches 46"
- Restroom light switches 42"
- Disconnects and panelboards should not be more than 6' from the finished floor to the top of it

#### **16. Required GFI Protection:**

- All receptacles within 6' of any water source
- Receptacles on the roof
- Receptacles exposed to the outside weather and in wet locations must be GFCI protected

This can be accomplished by installing an approved GFI breaker or a receptacle with built-in GFI protection.

#### **17. New Building Electrical Services Protected by Main GFI Breaker:**

- All electrical services 1000AMPS at 480v or greater must be protected by a GFI (Ground Fault Interrupter) main breaker
- Ground fault testing must be performed by an approved testing agent. A ground neutral could cause the main GFI breaker to trip
- A short circuit on a lighting circuit could cause the main circuit breaker to trip which would result in the entire building being shutdown until the breaker is restored to the ON position

#### **18. Isolated Ground Receptacle:**

- All critical computer equipment and some copiers should be connected to an isolated ground receptacle (commonly orange color)

#### **19. Server, Telephone and Data Rooms:**

- All circuits feeding these rooms should not be shared with other devices that are not part of these rooms
- An overload on a circuit caused by someone plugging in a piece of equipment into a receptacle that is connected to the same circuit as these rooms will trip the breaker and data loss or hardware damage could occur

## **20. Energy management Systems:**

- Typical Energy Management System controls the light fixtures per title 24, automatic lighting control should be in 5,000sf increments (maximum) in a building on the following schedules:
- Lights on at 6:00 a.m.
- Lights off at 6:00 p.m.
- Off every 2 hours thereafter during week days if overridden
  - Saturday, Sunday and Holidays - off all day
  - Saturday, Sunday and Holidays - off every 2 hours thereafter if overridden

## **21. Outside Lighting Controls:**

- Outside lighting is normally controlled by a timer and a photo cell.
- The timer is typically located in the main electrical room or electrical closet
- The photo cell is typically located on the roof
- Some building outside lights are controlled by a photo cell. If lights remain on during the day, the photo cell is not functioning and requires replacement.