

Overview

CLM Entertainment is pleased to be able to create this White Paper as a guide to clarify electrical safety issues associated with the IAAPA expositions.

Within the body of this paper we hope to define the following:

- What is an Inductive Load?
- What is the proper usage of power strips?
- What is the proper usage of extension cords?

Inductive load

An inductor is a device that produces a magnetic field while an electrical current is passed through it.

1) Inductive loads use magnetic fields. Examples - Motors, solenoids, and relays. If it moves, it's probably an inductive load.

2) Inductive loads can cause blowback voltage. Circuits should be protected from this by diodes.(GFCI)

3) Blowback is caused by a surge of voltage created by the collapsing magnetic field in an inductor.

It is CLM's position that any inductive load should have a GFCI circuit in place for protection. This is a relatively inexpensive requirement with extraordinary capability to defend against any possible over voltage/current condition that could pose a fire risk. Any motor; blower motors, drive motors, compressors, refrigeration systems, should all be using GFCI outlets, not only to protect from fire but to also protect the exhibitors device.

Power Strips

The standard office model power strip that 99% of all exhibitors use are typically 15 amp models and run the risk of being overloaded. Power strips are not designed for high inductive loads, which can easily exceed the recommended ampere ratings.

Most standard power strips or surge suppressors have a limited useful lifetime. Inside the units are Metal Oxide Suppressors (MOV's) which slowly degrade over time as they absorb excess energy from the power source. Most will continue to operate as a power strip, even though the MOV may have been destroyed by a power spike. This presents two possible dangers:

- 1) If another power surge should occur, it can damage the equipment that are plugged into it.
- 2) If sufficient voltage passes through the unit due to a second power spike, a resistant short may have been formed allowing heating to occur, and fire to ignite.

Any power strip or surge suppressor manufactured before 1998 should be removed from service.

Another concern is the practice of "Daisy Chaining". To meet power supply needs, power strips are often interconnected, or "Daisy Chained" to provide more outlets and extend distances. Then there is also the problem of a "Mixed Daisy Chain", with the improper interconnecting of power strips and extension cords, which is a direct OSHA and NEC violation because doing so can cause them to become overloaded, leading to failure and possible fire.

OSHA regulations (29 CFR 1910.303(a)) require that all conductors and electrical equipment be used in accordance with the conditions under which they are approved by a recognized testing organization. (UL CE etc.) Most standard power strips are approved for providing power to a maximum of six, often four, individual items; however when multiple strips are interconnected, the one directly connected to the power source is supplying power to far more than the approved number. This electrical current overload can result in fire, at best it will trip a circuit breaker. Should the breaker de-energize, we also run the risk of knocking out multiple exhibitors' devices.

EXTENSION CORDS

Quick questions:

- Will I use the cord indoors or outdoors?
- What is the total wattage rating of the appliances I will use with the cord?
- How far is the nearest outlet from where I will be working?

Extension cords are labeled with valuable information as to the use, size and wattage rating of the cord. Cords are offered in many lengths and are marked with a size or "gauge." The gauge is based on the American Wire Gauge (AWG) System, in which the larger the wire, the smaller the AWG number. For example, a 12 gauge wire would be larger and can power larger wattage appliances than a 14 gauge wire.

To determine what size, or gauge, cord is needed, you will also have to determine the cord's length. A cord, based on its gauge, can power an appliance of a certain wattage only at specific distances. As the cord gets longer, the current carrying capacity of the cord gets lower. For example, a 16 gauge extension cord less than 50 feet in length can power a 1625 watt (W) appliance. A 16 gauge cord that is longer than 50 feet in length can only power an appliance up to 1250W.

Quick tip: if your appliance indicates that it uses 5 amps at 125 volts, then its wattage rating is 625W (5x125).

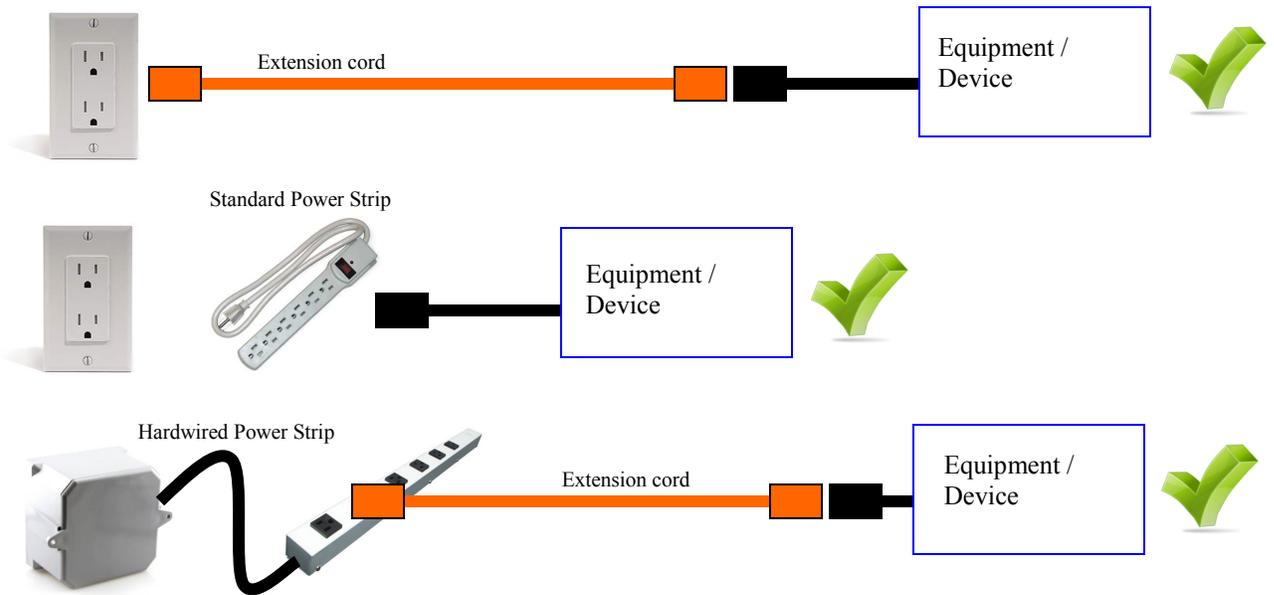
In summary it is CLM's position that more diligence needs to be paid in addressing the proper use of both power strips and extension cords. We strongly recommend the use of GFCI outlets wherever and whenever possible.

The following two charts are for reference, and general education for the exhibitors, the first is a chart of extension cord ampere ratings, the second is the three allowable configurations for the use of extension cords and power strips.

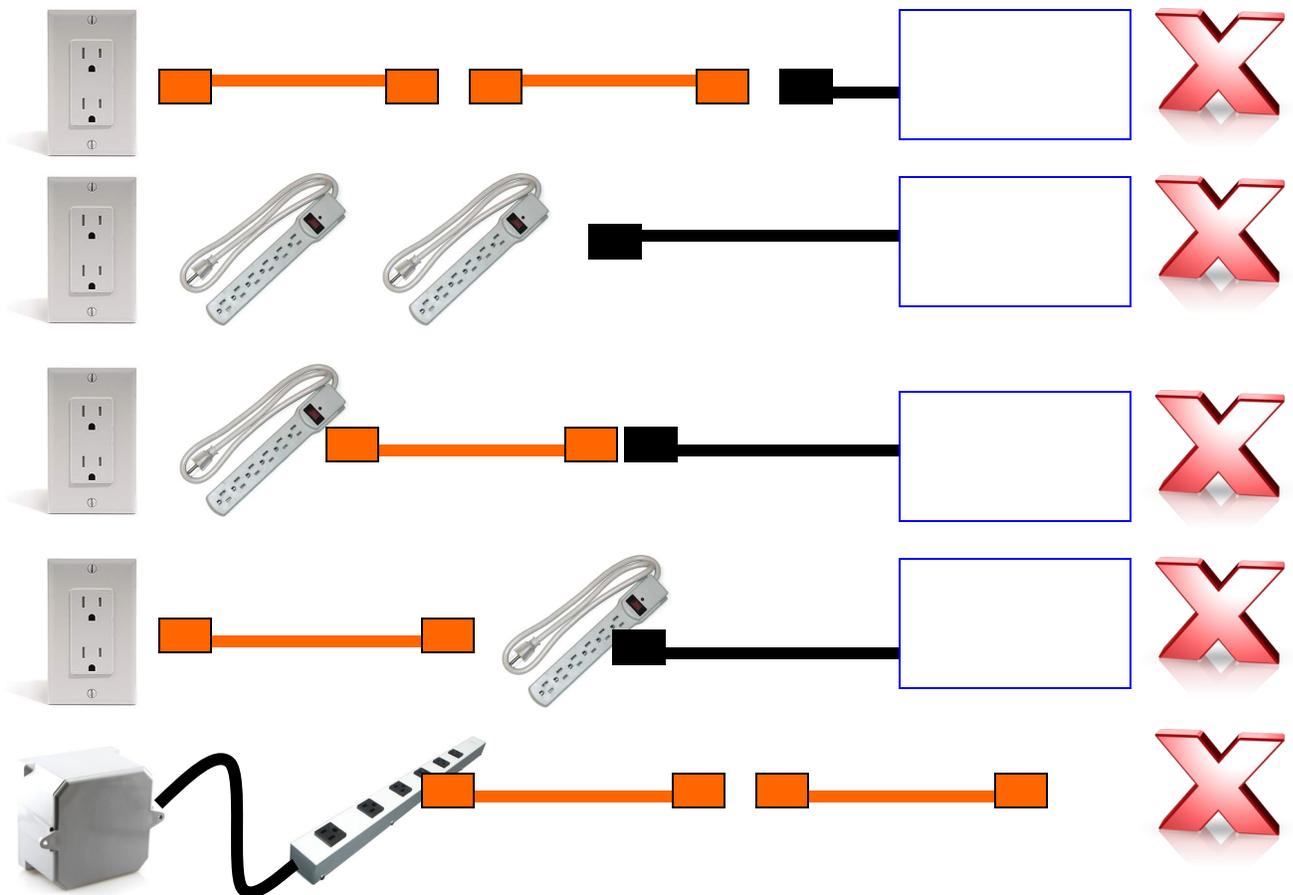
Extension Cord Ampere Rating Chart

WIRE SIZE (Copper)	Single Phase Two & Three Conductor Cords	Three Phase Cords
16 AWG	13 Amps	10 Amps
14 AWG	18 Amps	15 Amps
12 AWG	25 Amps	20 Amps
10 AWG	30 Amps	25 Amps
8 AWG	40 Amps	35 Amps
6 AWG	55 Amps	45 Amps
4 AWG	70 Amps	60 Amps
2 AWG	95 Amps	80 Amps

Acceptable combinations of extension cords and power strips.



Un-acceptable combinations of extension cords and power strips.



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