

Safety Guidelines for Flexible Electrical Cords

Note: For the purposes of this document, a **power strip** is defined as a multi-outlet adapter with a flexible cord-and-plug attachment and an over-current device (breaker). Some power strips also have a master on/off switch and some have a surge suppressor.

OSHA, the National Electrical Code (NFPA-70) have specific requirements for the use of flexible cords and cables. No exception is made for the use of a flexible cord that contains an over-current protection device (such as a power strip or surge protector) instead of a traditional plain extension cord. Any flexible cord or cable, whether it is the actual power cord from the electronic device, an extension cord, or the cord of a power strip, can NOT be used:

1. As a substitute for the fixed wiring of the structure
2. Where run through holes in walls ceilings or floors
3. Where run through doorways, windows or similar openings
4. Where attached to building surfaces
5. Where concealed behind building walls, ceilings, or floors.

Except for temporary wiring (as provided for in the National Electrical Code, NFPA-70/NEC-305, not to exceed 90 days) cord-and-plug connection of equipment is not permitted to be energized from extension cords.

Extension cords are not legal substitutes for the NEC-compliant fixed wiring of a structure such as a receptacle outlet. Power strips are classified as temporary devices and, as such, should never be permanently mounted to any facility surface. Notice the fine print on the package where it explains that the keyholes on the back are for temporary hanging of the power strip.

Safety Guidelines for Use of Power Strips and Extension Cords

1. Laboratory instrumentation and fixed equipment that you cannot lift yourself should be plugged directly into the wall outlet. Exceptions will only be made for equipment that needs a surge suppressor. In this case, the surge suppressor should be mounted to the outlet with the protected device directly plugged in.

2. Power strips must meet the following criteria:

- a. Use only surge protectors or power strips that have an internal circuit breaker. These units will trip the breaker if the power strip is overloaded or shorted to prevent overheating.
- b. Power strips should have a plastic external case rather than a metal one. Homemade extension cords employing metal outlet boxes (example shown below) are NOT acceptable.
- c. Frayed or strained cords are NOT permitted.
- d. The surge protector or power strip should always have either a polarized plug with one of the blades being larger than the other one, or a three-prong grounded plug. Never use a three-to-two prong adapter to power the unit. Never cut off the grounding prong of a 3-prong plug.
- e. Only UL 1363, 1449 2nd edition, or 46D0 approved power strips (those with over-current testing) should be used. Just because it is UL rated does not mean that it is approved.

f. "Flexible" use power strips should have a cord of no more than 6 feet in length. Power strips with cord longer than 6 feet are classified by code as power strip with extension cord. Longer length extension cords are only for "temporary" use only.

3. All Uses:

a. There should only be one surge protector or power strip plugged into a single duplex electrical outlet.

b. Do NOT plug a surge protector or power strip into an existing surge protector or power strip. This practice is called "daisy-chaining" or "piggy-backing" and can create a serious hazard.

c. Power strips should not be overloaded. Most are rated for 15A. This equates to approximately 1500 watts of power connected to the device.

d. Surge protectors, power strips, and/or extension cords are NOT a substitute for permanent wiring.

e. Do NOT locate a surge protector or power strip in any area where the unit would be covered with carpet, furniture, or any other item that will limit or prevent air circulation.

f. Do NOT staple, tack, or tape a surge protector or power strip.

4. **Personal computer use:** Personal computers and their accessories can be plugged into a power strip. It is recommended for the protection of the equipment that the power strip have surge protection. If possible, the approved power strip should be elevated off the ground. It should never be permanently mounted to a building surface.

5. Bench top use of power strips on "wet" laboratory benches will be permitted only under the following conditions:

a. There must be GFCI protection via 1 of the following 3 methods:

i. Install GFCI rated breakers for a laboratory bench area and use a UL rated surge protector.

ii. Install a GFCI rated outlet and use a surge protector.

ii. Use a GFCI rated surge protector for laboratory use operations

b. The power strip should be hung on mounting screws above the bench top.

6. Power strips are never acceptable for the following uses unless GFCI equipped:

a. Aquariums

b. To power any water pumping equipment

c. Use in a damp location

d. Use in a cold room

- e. Use near a sink or other source of water.
7. Use of extension cords and/or power strips in an area that may contain flammable vapors (e.g. solvent storage room, paint cabinet) is never permitted even with GFCI. These environments require specially rated, intrinsically safe power equipment to prevent explosions.
8. Equipment with a heating element should not be connected to a power strip. This includes:
- a. Hot plate
 - b. Water bath
 - c. Heat gun
 - d. Coffee pot
 - e. Toaster oven

Extension Cord Construction

Multiple outlet adapters (“octopus adapters”) are not permitted.

Multiple strip outlets that are fused for the wire size of the connecting cord, are allowed when needed to power electronic devices.

Flexible extension cords shall contain a ground wire and shall be constructed from type S, hard usage material. When cords are used with heating appliances, a type HS cord is required.

At least 14-gauge wire is required in a flexible cord servicing a current draw of more than 7 amps.

Extension Cord Use and Maintenance

Extension cords shall not be used as a substitute for permanent wiring.

Extension cords shall not be used on stationary equipment or equipment drawing more than 15 amps, such as refrigerators, centrifuges, or power tools.

Extension cords shall not run through, behind or in walls, ceilings or floors or other concealed space. Nor shall they be run in or through ventilation ducts.

Do not place extension cords under carpets, under doors, or other locations that subject the cord to abrasion or other damage.

Avoid creating a tripping hazard; do not place extension cords across walkways or doorways.

Discard extension cords with broken wires or damaged insulation; splicing or taping is not allowed.

Where hazardous atmospheres may exist, due to the presence of flammable gases or vapors or explosive dusts, extension cords shall not be used.

The combined length of the appliance cord and extension cord that is used on very portable equipment, such as a floor scrubber, projectors and hand tools, shall not exceed 105 feet.

General Safety Considerations

Uncoil long cords when in use, to avoid overheating.

Replace a short appliance cord with a longer one when appropriate.

Consider the proximity of electrical outlets when locating furniture. For example, move the furniture closer to the outlet, rather than using a 50-foot extension cord to bridge a 2-foot gap.

Select a cord with proper insulating materials if there will be exposure to moisture, oil or other chemicals.

At each use, visually check the cord insulation, plug and connector for damage.

For further information on electrical safety, refer to:

NEC National Electric Code (NFPA-70)