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## Power Strips and Dangerous Daisy Chains

The supply of readily available electrical outlets is inadequate in some older buildings. Extension cords or surge protected power strips are often interconnected, or “daisy chained,” to readily provide more outlets and/or to reach greater distances. Another common solution that is often used is to create a “mixed daisy chain,” by interconnecting several extension cords and surge protectors or power strips in series. However, interconnecting these devices is a violation of Occupational Safety and Health Administration (OSHA) regulations and the National Electrical Code because doing so can cause them to become overloaded, which could lead to their failure and a possible fire. (See the Office of Compliance “Extension Cords” Fast Facts for more information)

### Daisy Chaining Found Frequently

Daisy chains and mixed daisy chains constitute some of the most common violations identified during recent Office of Compliance health and safety inspections. During the biennial inspection conducted during the 114th Congress, instances of daisy chains and mixed daisy chains were observed in many office settings, accounting for numerous recorded violations.

### Problems

OSHA regulations require that conductors and electrical equipment be used in accordance with the conditions under which they are approved by a recognized testing organization (29 CFR 1910.303(a)). Most power strips or surge protectors are approved for providing power to a maximum of four or six individual items. When multiple power strips are interconnected, the one directly connected to the building wall outlet is often supplying power to far more outlets than the approved number. This electrical current overload can result in a fire or can cause a circuit breaker to trip, de-energizing computers and other equipment throughout the area that are connected to the surge protector.

Extension cords are sometimes used to energize power strips in locations far from outlets. Because electrical resistance increases with increased power cord length, interconnecting cords increases the total resistance and result in heat generation. This creates an additional risk of equipment failure and fire, particularly when paper and other combustible materials are in contact with the wires. Additionally, OSHA’s regulations only allow extension cords to be used as temporary wiring for up to 90 days. Any cords in place over



**Figure 1:** Daisy Chain—Interconnected extension cords



**Figure 2:** Mixed daisy chain—Powerstrip energized by an extension cord

90 days are considered permanent wiring. Unfortunately, once in place, extension cords tend to become permanent wiring and a fire hazard.

### Solutions

Several safe solutions exist. In many cases, a power strip energized by an

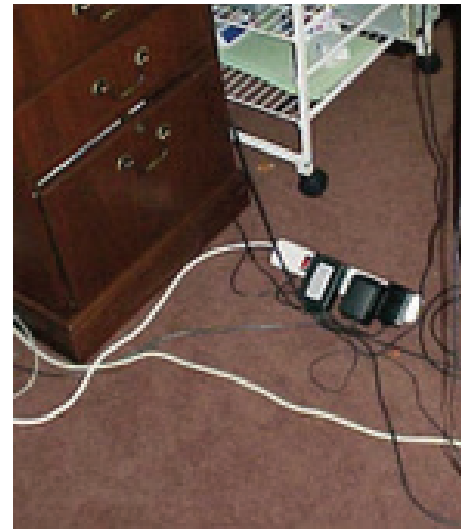
extension cord or another power strip can simply be replaced by a power strip with a power cord of adequate length to reach an outlet. Alternatively, desks and associated equipment may be moved so they are closer to existing outlets. Other times, use of a power strip that is better able to accommodate bulkier transformer plugs solves the problem.

Several factors should be considered when selecting an appropriate surge protector. Since models vary in the amount of current that they are rated to safely carry, it is important to consider the amperage requirements of the devices to be energized. Models vary in length of power cord, typically ranging from three to 15 feet. Choose one whose length is most appropriate for reaching the intended room outlet. Avoid having excess cord that could get in the way and cause a hazard. Ensure that the surge protector is set on its' base. Some have swivel plugs which make them easier to connect

to the outlet, and helps to protect the plug and cord from damage. Check each surge protector to make sure it is in good condition for use.

Only power strips equipped with internal fuses are acceptable as permanent wiring. Those lacking these fuses are equivalent to extension cords, and therefore may not be used as permanent wiring. When a power strip is installed, care must be taken to ensure that it is not suspended in mid-air by its power cord or cords plugged into it, resulting in excessive stress on electrical connections.

When there are not enough outlets to supply occupants' needs, one solution is to request the installation of additional wall or floor outlets. Their placement should avoid any need to run any wires across walkways, where they can create tripping hazards (See the Office of Compliance's "Slips, Trips and Falls" Fast Facts). Consideration can also be given to the



**Figure 3:** Daisy chain of power strips— One power strip is being used to energize two other power strips

merits of installing modular furniture that provides multiple outlets at each workstation. Interconnected modular furniture units are energized by the building's electrical supply through a single, large power cord, or "whip," providing ample power to all served workstations.

## Fast Stats

- All conductors and equipment must be approved by an OSHA Nationally Recognized Testing Laboratory (NRTL) (29 CFR §1910.303(a)).
- OSHA's electrical standards require that listed or labeled equipment be used or installed in accordance with any instructions included in the listing or labeling by the manufacturer (29 CFR §1910.303(b)(2)).
- OSHA's electrical standards require that outlet devices have an ampere current rating not less than the current load to be served (29 CFR §1910.304(b)(2)).
- The National Electrical Code and OSHA does not permit extension cords to be used for permanent wiring.



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