



W H I T E P A P E R



Power Strip Safety and Regulatory Compliance: A Comprehensive Guide to Utilizing Power Strips in Healthcare Facilities

Executive Summary

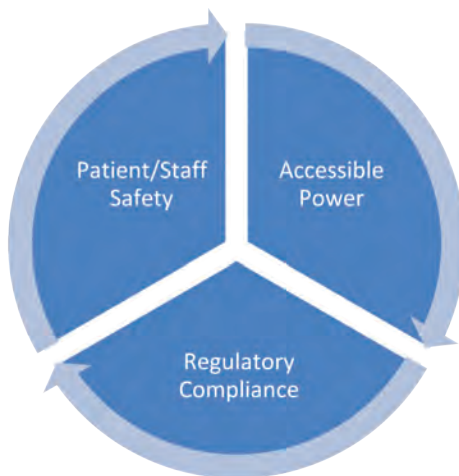
As the use of power strips in hospitals has become more widespread, their misapplication has also become increasingly prevalent. Incorrect use of power strips in healthcare facilities can result in citations, fines, or event patient injuries. This White Paper discusses the common mistakes made in using power strips in healthcare applications and introduces a methodology to promote safety and compliance. Moreover, this White Paper examines the most current codes and standards governing power strips in healthcare applications and the ways those codes and standards may impact your healthcare facility.



Introduction

The convenience of power strips is undeniable, but the hazards they present in hospitals and other healthcare facilities are less well-known. Because of the ways misused power strips can endanger patients and staff, strict regulations have been developed to govern how and where they are used. Failure to follow regulations can lead to code violations, citations, fines and accreditation issues, but perhaps most important, violating regulations can increase the risk of inflicting injury upon patients, staff and visitors. By understanding the basics of healthcare power strip technology and the various codes and standards that govern power strips in healthcare environments, you can benefit from their cost-effective convenience while at the same time encouraging optimal safety and regulatory compliance.

Power Strip Policy Goals



Power Strip Policy – Where to Start?

Before you begin to develop your power strip policy, first determine what you aim to accomplish:

- **Patient/Staff Safety:** The safety of patients and staff is paramount. As such, it is of utmost importance that the correct technology is used for the intended purpose as well as installed and maintained in a correct manner.
- **Accessible Power:** Accessible power is a necessity in modern healthcare. In many applications, power strips provide the most effective way to obtain accessible power. Therefore, you want to be able to use power strips throughout the facility.
- **Regulatory Compliance:** Meeting regulators' requirements promotes safety and minimizes the possibility that your facility gets cited, fined or jeopardizes its good standing. Regulatory compliance is accomplished through due diligence and risk management, which should be enshrined in your policy.



Remember: **S-T-R-I-P** for a Successful Power Strip Policy



S-T-R-I-P Method

Although there is a learning curve associated with devising and implementing a power strip policy, following the five-step S-T-R-I-P method will put you on the right path to better promote safety and compliance for your healthcare facility. Your policy-making **S**trategy will be informed by understanding the **T**echnology available, understanding the **R**egulations that apply to power strips and your facility, understanding the proper **I**nstallation of power strips, and understanding the correct **P**urpose (i.e. application) for each type of strip within your facility.

STRATEGY

Combine your knowledge and resources to develop a policy that makes sense for your facility and the regulators involved (regulators include The Joint Commission, OSHA, CMS, and federal, state and local authorities having jurisdiction). It is up to you to conduct a risk assessment and develop an appropriate policy. Get to know the regular surveyors that make appearances at your facility. Ultimately, the interpretation of code is up to them. Understanding their interpretations will help you tremendously when developing your policy.

Policy Tips:

- If you don't have a policy for addressing power strips, you'll find that a de facto policy will form in place of a real policy, and that de facto policy will leave your facility open to code violations, fines and loss of standing.
- If your policy simply prohibits all power strips, it will be like having no policy at all. Power strips are convenient and they will be used. It is up to you to make sure that the appropriate power strips are being used in the right way.
- Your policy should address installation. Many code violations come from the way a power strip is installed, even if it is the right kind of strip in the right place.
- Your policy should cover preventative maintenance. Treating power strips as you would any other medical device is best practice.
- You need to take the steps required to make sure your staff actually follows your facility's policies and procedures, including publicity, training, verification and enforcement.
- You should revisit and update your policy periodically. Technology, standards, regulations and interpretations are changing all the time, and your policy has to keep pace if it is going to stay relevant.



Hospital-grade plugs and receptacles include a green dot to distinguish them from other types of plugs and receptacles used in commercial or residential applications.

TECHNOLOGY

There is a big difference between the technology used in a generic power strip from the local big box store and specialized power strips with fault protection that are designed for healthcare applications. Reviewing the progression of power strip technology provides a useful overview of some of the different technologies you'll be dealing with.

Power strips consist of several components, such as multiple electrical receptacles, an on/off switch, a circuit breaker, a power cord and a grounded plug. UL refers to power strips as "Relocatable Power Taps (RPT)," defined and listed in UL 1363. They must be removable without the use of a tool.¹ UL defines and lists surge protectors (also known as surge suppressors) in UL 1449, "Transient Voltage Surge Suppressors (TVSS)." Surge protectors are dual-listed by UL and also meet the requirements of UL 1363. UL 1363 power strips can be plastic or metal, with long cords or short, and they're found anywhere and everywhere.

1. In 1990, manufacturers introduced RPTs with "hospital-grade" plugs and receptacles. In addition to complying with the general-use plug and receptacle requirements, hospital-grade plugs and receptacles have additional features and performance requirements for improved grounding reliability, assembly integrity, strength and durability.
2. Around 2000, UL introduced new labeling and marketing requirements for hospital-grade strips. Power strips approved under UL 1363 could no longer be referenced as appropriate for medical applications, even if they included hospital-grade receptacles.¹ UL 1363-approved power strips were also required to carry a warning: "CAUTION: Not for use where NEC requires hospital-grade receptacles." Under the new guidelines, power strips needed to meet the medical electrical equipment requirements of UL/IEC 60601-1 or the equivalent international standards to be referenced as appropriate for medical applications.



Relocatable Power Tap with Ground-Neutral Fault Detector (Patented)



3. In 2010, UL adopted UL 1363A, a new standard for “Special Purpose Relocatable Power Taps,” power strips intended for use with rack-, table- or pedestal-mounted medical equipment.² The power strips must be permanently attached to the medical equipment assembly and require a tool for removal. They also require dual circuit breakers and hospital-grade plugs and receptacles.

In several cases, technology has advanced beyond the adopted standards, which can make it difficult to coordinate providing the best protection and following regulations. For example, a patented fault-sensing technology exists for products that meet UL 60601-1.³ The technology detects hot, neutral and ground for a wiring fault before passing power to the receptacles, which provides a higher standard of protection. Regulators should recognize this technology and incorporate it in the standards, but recognition and adoption of new technology can be very slow.



REGULATIONS

Regulations, standards and codes are not laws, but rather, criteria that certifying bodies such as CMS and The Joint Commission use to benchmark electrical safety for patients and staff. Understanding regulations, and especially how regulations are interpreted and applied, is a complex and confusing task for anyone who isn't experienced in dealing with them. For example, the usage of power strips in some cities is subject to the interpretation of the regulatory authority, like the local department of buildings. Adding to the confusion, the regulating body has not necessarily adopted the most recent version of the codes and standards, or they may have made changes to them. Regardless of the complexities, the first step in understanding and successfully interpreting the regulations is familiarizing yourself with the relevant codes and standards. Ultimately, you need to make sure you follow the code. Once you become familiar with the code, you can work with your regulators and experienced partners to ensure your compliance strategy is successful.

NFPA® 70 / National Electrical Code® (NEC®)

- NEC is a standardized electrical safety code for the installation of wiring and equipment.^{4,5} Although not itself a law, it is designed to be adopted by state and local authorities, and compliance with NEC is required by law in most jurisdictions. In some cases, NEC has been altered or amended by the state or local authority, and they may not have adopted the most recent version of NEC.
- NEC Article 517 defines requirements for all equipment that will supply electrical power within patient care areas. 517.18(B) requires hospital-grade receptacles in patient care areas.



NFPA 99: Healthcare Facilities Code / Standard for Healthcare Facilities

- NFPA 99 defines requirements for facilities, material, equipment and appliances.⁶ It addresses installation, safe practices, performance, testing, maintenance and inspection. It is designed to minimize risks to patients, staff and visitors from hazards such as electricity.
- NFPA 99 functions as the benchmark for electrical design safety of facilities, while UL standards function as the benchmark for electrical design safety of products.

NFPA 99-2005

- Chapter 8 – Electrical Equipment (Paragraphs 8.4.1.2.5 and 8.5.2.1.7)
- Chapter 10 – Manufacturer Requirements (Paragraph 10.2.2.2)

NFPA 99-2012

- Chapter 6 – Electrical Systems
- Chapter 10 – Electrical Equipment (Paragraphs 10.2.2.2, 10.2.4.2.1, 10.2.4.2.2, 10.2.4.2.3, 10.2.3.6, 10.2.4.1 and 10.5.2.3)

29 CFR §1910.303(b)(2)

- Occupational Safety and Health Administration (OSHA) regulations governing the installation and use of electrical equipment. “Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.”^{7,8}

You will also need to consider the AHJ, which is the federal, state or local Authority Having Jurisdiction (i.e. power to enforce the law). Examples: Agency for Healthcare Administration (AHCA) in Florida and the Department of Health and Environmental Control (DHEC) in South Carolina.

Certain localities also have codes that amend or completely replace the national/model codes. Examples: California Fire Code in California amends NEC and Chicago Building Code in Chicago, Illinois, replaces NEC.

INSTALLATION

Many regulatory violations are for improper installation of power strips, even when the right kind of strip is being used in the right location for the right application. **Improper installation will render all your other efforts useless**, so it's crucial to make installation part of your power strip policy and to understand what regulators are looking for when they inspect your facility.

OSHA requires that "listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling." Manufacturers and nationally recognized testing laboratories determine the proper uses for power strips.⁸



Common Installation-Related Code Violations

(See **APPENDIX A** for more information.)

- Daisy-Chaining
- Improper Routing
- Overloading
- Improper Labeling
- Improper Mounting
- Improper Plug Connection
- Signs of Thermal Distress
- Signs of Damage or Neglect
- Improper Environmental Conditions
- Improper Grounding
- Tripping Hazards
- Improper Application



Patient Care Vicinity



Medical-Grade (UL 60601-1 or UL 1363A)
Power Strips Required

PURPOSE

It is important to understand that there is not a single type of healthcare power strip that is suitable for every application in your facility. Each category of healthcare power strip has a specific purpose and should not be used for a different purpose that it is not designed and approved for. Healthcare power strips (including surge protectors) can be divided into four primary application groups that use different technologies and meet varying UL standards. They can also be divided into medical-grade power strips, i.e. power strips that meet the requirements of medical equipment, and those that do not. Medical-grade power strips meet UL 60601-1 or UL 1363A and they can be used in the "Patient Care Vicinity." Power strips that do not meet UL 60601-1 or UL 1363A cannot be used in the Patient Care Vicinity. The Patient Care Vicinity is a "space, within a location intended for the examination and treatment of patients, extending 1.8 m (6 ft) beyond the normal location of the bed, chair, table, treadmill, or other device that supports the patient during examination and treatment and extending vertically to 2.3 m (7 ft 6 in.) above the floor."⁶

Medical-Grade Power Strips

(Approved for Use in the Patient Care Vicinity)

- Tested to comply with UL 60601-1.
- Can be used inside or outside the Patient Care Vicinity.
- Protect patients and staff in the event of a **single fault**.
- Include splash-resistant receptacle covers that require a tool for access to prevent use of receptacles by unqualified personnel.
- Include hospital-grade plug and receptacles.
- Typically power medical or computer equipment.





Medical-Grade Power Strips for Mobile Applications

(Approved for Use in the Patient Care Vicinity)

- Tested to comply with UL 1363A.
- Can be used inside or outside the Patient Care Vicinity.
- Require permanent mounting (not removable without a tool) to mobile medical equipment platforms, such as IV poles and crash carts.
- Require dual breakers.
- Include hospital-grade plug and receptacles.



Power Strips for Administrative Areas and Operating Rooms with Isolation

(NOT Approved for Use in the Patient Care Vicinity)

- Tested to comply with UL 1363.
- Cannot be used in the Patient Care Vicinity.
- Include hospital-grade plug and receptacles.



Surge Protectors for Administrative Areas

(NOT Approved for Use in the Patient Care Vicinity)

- Tested to comply with UL 1449.
- Cannot be used in the Patient Care Vicinity.
- Provide surge protection for connected equipment.
- Include hospital-grade plug and receptacles.

Developing Your Policy

Once you have a better understanding of the technology, regulations, installation and purpose of healthcare power strips, try to incorporate everything you've learned into your facility's power strip risk management policy. Once you devise an appropriate policy, you'll find that when properly used, hospital-grade power strips are valuable, cost-saving tools that help keep a facility up to code. If possible, work with your regulators so that your policy meets their approval. Also consider working with an experienced partner who can review your policy to identify any vulnerabilities as well as make recommendations to facilitate your success.

Policy Tips:

- Develop your policy with regulatory standards as a guideline.
- Mandate the use of hospital-grade plugs and receptacles throughout the entire facility.
- Provide clear guidelines for proper installation.
- Schedule regular preventative maintenance.
- Tag and catalog power strips (and surge protectors) for accurate replacement and highlight power strips that may require extra attention during inspections.
- Arrange for regular inspections by your facility's Safety / Environment of Care Committee.



Conclusion

Whether you consider power strips indispensable cost-saving devices or a necessary nuisance, it is all but certain that they are or will be used within your healthcare facility. By designing and implementing a power strip policy, the need for accessible power can be achieved without losing sight of a healthcare administration's mission to protect patients. You can moderate your learning curve by following the S-T-R-I-P method and taking advantage of the expertise and experience of Tripp Lite's healthcare power specialists.

For more information, including professional consultation, helpful documentation and compliance walkthrough requests, contact Tripp Lite's healthcare power specialists at 773.869.1282 or medical@tripplite.com.

About Tripp Lite

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APPENDIX A

Common Installation-Related Code Violations

- **Daisy-Chaining:** Interconnecting power strips violates Occupational Safety and Health Administration (OSHA) regulations and the National Electrical Code (NEC) because it can cause overloads and fires. Extension cords also fall under this category. There is no provision for using an extension cord in a healthcare environment.
- **Improper Routing:** Routing cords through walls, ceilings, floors, windows or similar openings is prohibited.
- **Overloading:** Power strips are designed to be used with several low-amperage loads, such as desktop computers and peripherals. Power strips must not be connected to high-amperage loads, such as refrigerators, space heaters, microwave ovens or air conditioners that are likely to overload the strip.
- **Improper Labeling:** Power strips without the proper agency certification sticker are unacceptable.
- **Improper Mounting:** Power strips must not be mounted with Velcro®, double-sided tape, duct tape, zip ties, etc.
- **Improper Plug Connection:** The power strip cord and device cords must not be hanging out of receptacles. Power strips and devices must not be suspended from the power cord.
- **Signs of Thermal Distress:** Power strips, plugs or cords that are hot to the touch, melted, burned, frayed, scorched or discolored are unacceptable.
- **Signs of Damage or Neglect:** Power strips, cords and components should not be dirty, stained, crushed, cut, broken, kinked, warped, knotted, twisted, loose, frayed or otherwise damaged.
- **Improper Environmental Conditions:** The power strip must not be installed in a moist environment or a location with excessive heat or limited air circulation.
- **Improper Grounding:** The power strip must not have its grounding pin/wire removed or connected to an adapter that defeats grounding.
- **Tripping Hazards:** The power strip must not be installed in a location where it may impede the safe movement of patients and staff.
- **Improper Application:** Power strips must be used for the applications they are designed and approved for. For example, a power strip with a UL 1363 rating and hospital-grade plug and receptacles can be used in some areas of a healthcare facility, but it cannot be used in the Patient Care Vicinity. (See **Purpose**.)

APPENDIX B

References

1. *Relocatable Power Taps UL 1363*.
Retrieved from <http://ulstandardsinfontet.ul.com/scopes/1363.html>
 2. *Special Purpose Relocatable Power Taps 1363A*.
Retrieved from <http://ulstandardsinfontet.ul.com/outscope/outscope.asp?fn=1363A.html>
 3. *Medical Electrical Equipment, Part 1: General Requirements for Safety UL 60601-1*.
Retrieved from <http://ulstandardsinfontet.ul.com/scopes/scopes.asp?fn=60601-1.html>
 4. *NFPA 70 National Electrical Code (NEC) 2008 and 2011*. Articles 400.7, 400.8, 517.
 5. *NFPA 70 National Electrical Code, 2011 Edition (International Electrical Code Series)*.
National Fire Protection Association. 2010.
 6. *NFPA 99 Health Care Facilities Code 2005*. 8.4.1.2.4.2, 8.5.1.2.2.
 7. Fairfax, Richard. *What is the current compliance status on the use of "power strips?"* (November 18, 2002).
Retrieved from https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=24631
 8. *Occupational Safety and Health Standards*. OSHA 29 CFR Part 1910 Subpart S – Electrical.
Retrieved from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10135
- Bates, Brian. *Power Strips and Extension Cords Use In Commercial Buildings*. (2012, May 1).
Retrieved from <http://dwginc.com/wp-content/uploads/Power-Strips-White-Paper1.pdf>
 - Centers of Medicare and Medicaid (CMS) Document (Publication 100-07, Transmittal 27, Dated August 17, 2007, Titled *Revisions to Appendix PP – Guidance to Surveyors for Long Term Care Facilities*.)
 - *Healthcare Electrical Safety*. Coastal Training Technologies Corp., 2003.
 - Coté, Ron and Harrington, Gregory. *NFPA 101: Life Safety Code Handbook, 2009 Edition*. National Fire Protection Association, 2009.
 - DiVarco, Sandra. "Surprise! CMS-2567 Statement Of Deficiencies Forms For Hospital Surveys Now Available Online." *The National Law Review*, March 21, 2013. Retrieved from <http://www.natlawreview.com/article/surprise-cms-2567-statement-deficiencies-forms-hospital-surveys-now-available-online>
 - *Comprehensive Accreditation Manual for Hospitals (CAMH)*. The Joint Commission Accreditation. 2009.
 - *Fast Facts on US Hospitals*. American Hospital Association, 2011.
Retrieved from <http://www.aha.org/research/rc/stat-studies/fast-facts.shtml>