

<b>ICP CORD-AND-PLUG ELECTRICAL EQUIPMENT POWER SUPPLY POLICY</b>	Identifier: POL-121 Revision*: 1 Page: 1 of 16
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Idaho Cleanup Project

Policy

For Additional Info:  
<http://EDMS>

Effective Date: 02/23/11

Manual: 14A-Safety and Health – Occupational Safety and Fire Protection

Change Number: 332307

\*The current revision can be verified on EDMS.

**1. VISION**

Electrical incidents are preventable, and electrical safety and health is a top priority for the Idaho Cleanup Project (ICP).

**2. PURPOSE**

This document establishes CWI management policy for the use of *approved* (see def.)/Nationally Recognized Testing Laboratory (*NRTL*; see def.)-listed extension cords, relocatable power taps (RPTs), surge protective devices (SPDs), and cord-and-plug electrical equipment.

**3. APPLICABILITY**

This policy applies to all CWI employees and CWI subcontractor employees and their associated cord-and-plug electrical equipment.

**4. POLICY**

Cord-and-plug electrical equipment shall be plugged directly into an approved *outlet* (see def.) or *panelboard* (see def.) unless surge suppression is recommended by the equipment manufacturer. If this is not possible, the use of approved/NRTL-listed extension cords, RPTs, or SPDs is acceptable (see Appendix A, Illustration B) unless specifically prohibited by the manufacturer of the cord-and-plug equipment [NFPA 70 - 110.3(B)]

**NOTE:** *If the safety of the cord and plug equipment or extension cord configuration is in question or if compliance to the codes is in question, contact a Safety professional or a member of the CWI Electrical Safety Committee.*

DO NOT connect NRTL-listed extension cords, relocatable power taps, or surge protective devices in *series* (see def.) unless explicitly allowed by its listing. This is commonly called “daisy chaining” (see Appendix A, Illustration C for examples and Appendix B for description). [NFPA 70 110.3(B)]

**Exception 1:** *NRTL-listed extension cords (not including RPTs or SPDs) may be plugged in series to other extension cords ONLY if it is for temporary installations (see def.) and must be verified and approved by designated and authorized personnel acceptable to the authority having jurisdiction (AHJ) based on conditions of use and any special requirements of the temporary installation. [NFPA 70 590.2(B)]*

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**Exception 2:** *Only approved field assembled cord sets (see def.) may be connected in series provided they have been engineered and/or analyzed so that they do not exceed their rated capacity.*

Cord-and-plug electrical equipment shall be NRTL listed and must be operated in accordance with the manufacturer's instructions and in accordance with manufacturer's listed safety requirements. [NFPA 70 110.3(B)]

**NOTE:** *Where material and equipment is not labeled, listed, or recognized by any NRTL; provide a manufacturers Certificate of Compliance indicating compliance with applicable standards of National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), or other recognized commercial standard. In addition, an AHJ record must be approved for non-NRTL labeled or listed equipment.*

*Ground-fault protection* (see def.) shall be provided for personnel using cord-and-plug portable hand tools during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment; or similar activities. [NFPA 70 590.6]

Users of cord-and-plug connected electrical equipment shall verify that the *combined continuous electrical equipment load* (see def.) DOES NOT exceed the rated capacity of the extension cord, RPT, SPD, or intended outlet on a panelboard (see a sample of job aid Form 440.45, "ICP Cord Plug Electrical Equipment and Power Supply Worksheet," in Appendix C for assistance). Installations may use configuration conforming to Appendix A, Illustration B, and if the configuration is verified by a safety professional. Before use on any shift, portable cord-and-plug connected equipment shall be visually inspected for external defects (such as loose parts, deformed and missing pins) and for evidence of possible internal damage (such a pinched or crushed outer jacket). Cord-and-plug sets and extension cords that remain connected once they are put in place and are not exposed to damage shall not be required to be visually inspected until they are relocated. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damage items shall be removed from service, and no employee shall use it until repairs and tests necessary to render the equipment safe have been made. [NFPA 70E 110.9 (B)(3)(a)]

Grounded (three-prong) cord-and-plug electrical equipment shall not be plugged into ungrounded (two-prong) outlet receptacles or adapters. [NFPA 70 110.3(B)]

When *protective devices* (see def.) actuate, a single attempt to reset the device will be permitted only after an attempt has been made to understand the cause of the trip. If the protective device fails to reset after a single try, contact a *qualified electrical worker* (see def.) and your supervision for further assistance. DO NOT attempt any further action. [DOE O 5480.19 CH 2 C.7]

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Extension cords shall not be attached to the structure of a building nor be run through walls, windows, doorways or similar openings. In addition, extension cords shall not be used as a substitute for fixed wiring of a structure and shall not be used where subjected to physical damage [NFPA 70 400.8]

**NOTE:** *Flexible cords and cables are allowed to be run through doors and windows for temporary installations (see def.) such as decontamination and decommissioning (D&D)/Voluntary Consent Order (VCO)/construction activities. Where passing through doorways, windows, or other pinch points; protection shall be provided to avoid damage and sharp corners and projections shall be avoided. [NFPA 70 590.4 (H)]*

## 5. DEFINITIONS

*Approved.* Reviewed by designated and authorized personnel acceptable to the AHJ and found to be in compliance with company policies and standards.

*Combined continuous electrical equipment load.* A sum total of the amperage of each electrical cord-and-plug device.

Example: Computer tower requiring 3 amps + computer monitor requiring 2 amps + printer requiring 5 amps + clock requiring 1 amp = 11 amps.

**NOTE:** *Many appliances are rated in watts—to convert watts to amps: watts/voltage = amperage or amps. Also, extension cords are usually rated in watts—to convert amps to watts: watts = voltage × amps.*

*Commons areas.* Areas not designated for individual personal use but designated for use by multiple employees.

Examples of commons areas: Break room, cafeterias, conference rooms, assembly areas, etc.

*Field-assembled cord sets.* Approved CWI manufactured extension cords that are not listed as a NRTL assembly.

*Joule.* One watt-second.

*Ground fault protection* or ground fault circuit interrupter (GFCI). A device intended for the protection of personnel that functions to deenergize a circuit or portion thereof within an established period of time when a difference in current exists between or among wires being monitored that exceeds values established for a Class A device.

**NOTE:** *Class A ground-fault circuit interrupters trip when the current to ground has a value in the range of 4 mA to 6 mA.*

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*NRTL*. Nationally Recognized Testing Laboratory.

Examples of NRTL: See Appendix B.

*Outlet*. A point on the wiring system at which current is taken to supply utilization equipment, including portable generator receptacles and approved panelboards.

*Panelboard*. A single panel or group of panels units designed for assembly in the form a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall, partition, or other support; and accessible only from the front. This includes bangboards.

*Protective devices*. Circuit breakers on RPTs, surge protectors, GFCIs, etc.

*Qualified electrical worker*. One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid electrical hazards. A person may be qualified with respect to certain equipment and methods, but still unqualified for others.

*RPT* (relocatable power tap). Commonly known as “power strips” or “plug strips,” these consists of a block with a number of sockets, usually three or more, on the end of a power cable. They were developed as a way to plug in several electronic devices such as computer peripherals (monitor, printer, central processing unit [CPU], etc.).

*Series*. A number of things of the same class coming one after another in succession.

Examples of electrical devices in series: Plugging one extension cord into another extension cord, plugging a RPT into an extension cord, or plugging a SPD into an RPT, etc.

*Temporary installations*. Temporary electrical power and lighting installations permitted during the period of construction, remodeling, maintenance, repair, or demolition of structures, equipment, or similar activities in accordance with Article 590 of NFPA 70.

*Watt*. A unit used to measure power consumption and is equal to 1 joule/second.

## 6. REFERENCES

NFPA 70, “National Electric Code,” 2005 Edition

NFPA 70E, “Standard for Electrical Safety in the Workplace,” 2004 Edition

DOE O 422.1, “Conduct of Operations,” June 29, 2010

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**7. APPENDIXES**

Appendix A, Illustrated Examples

Appendix B, Electrical Equipment Information/Discussion

Appendix C, Job Aid Sample

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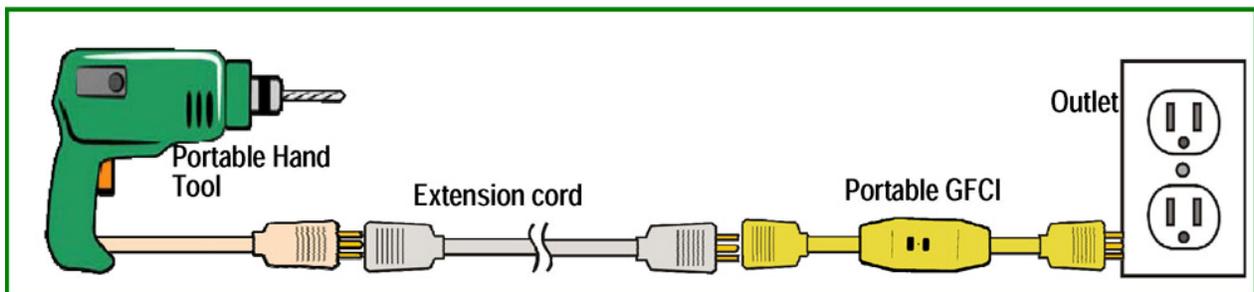
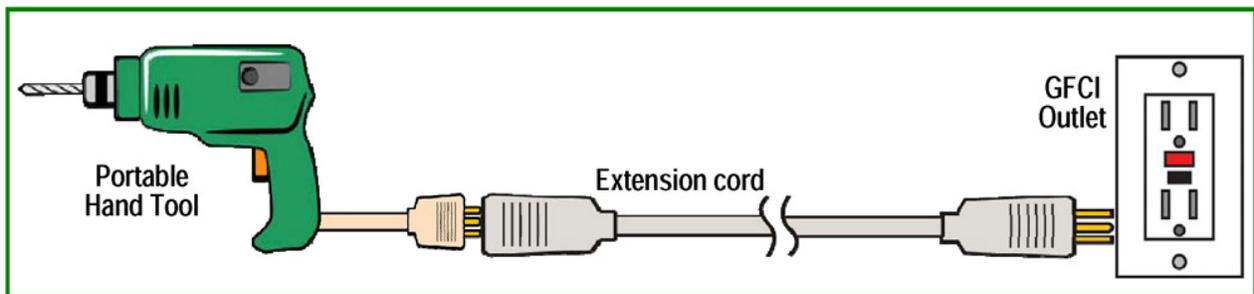
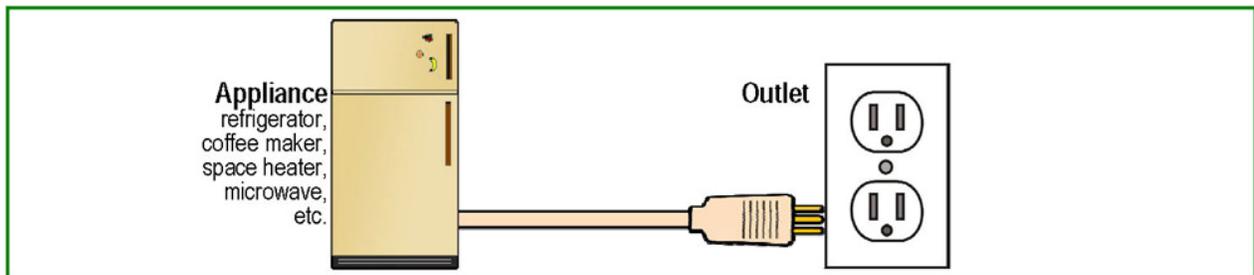
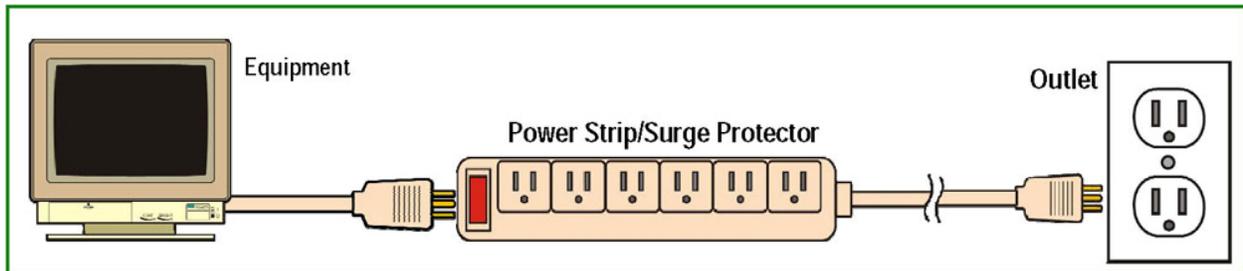
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**Appendix A**

**Illustrated Examples**

**PREFERRED/APPROVED ONLY IF VERIFIED/UNACCEPTABLE**

**Illustration A – PREFERRED**



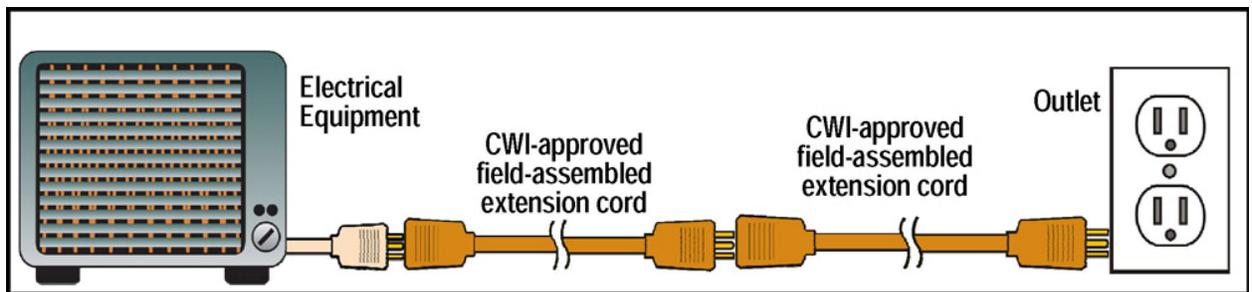
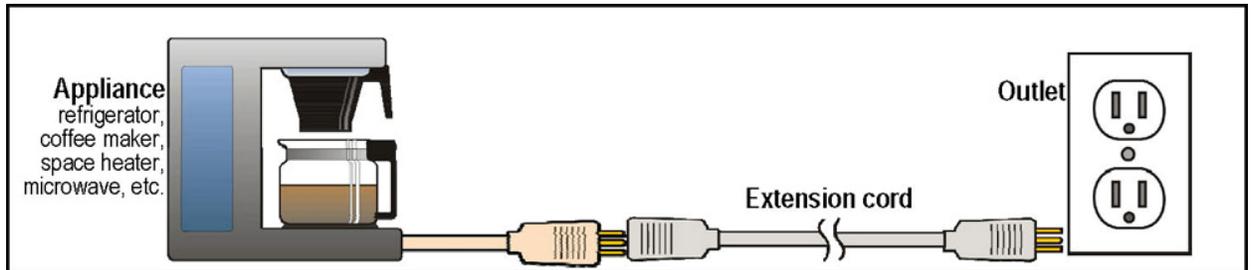
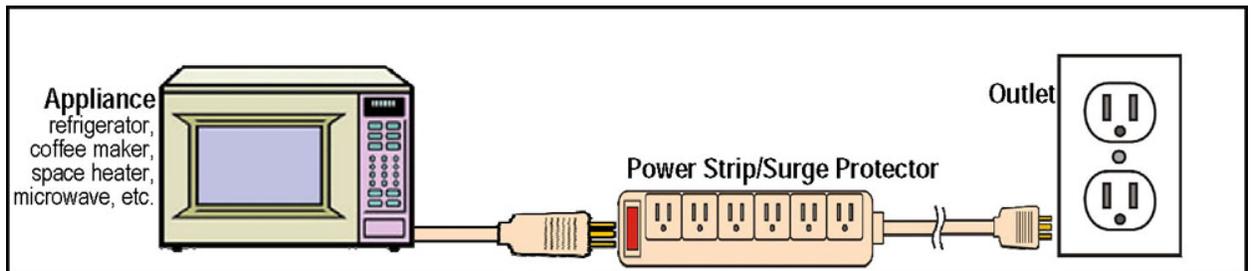
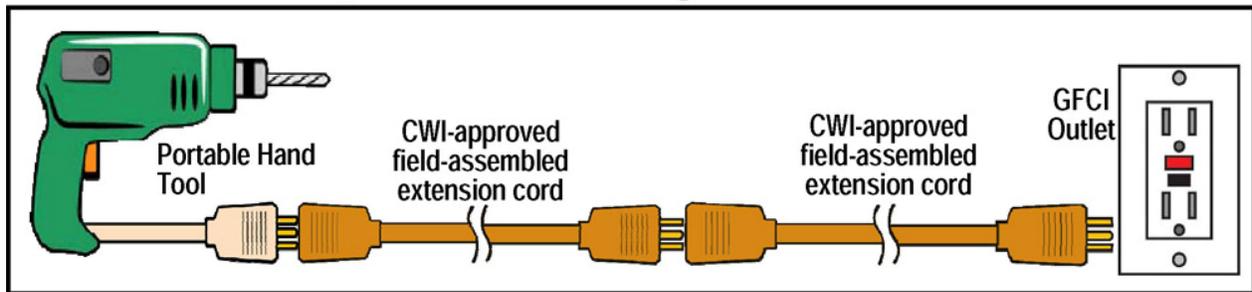
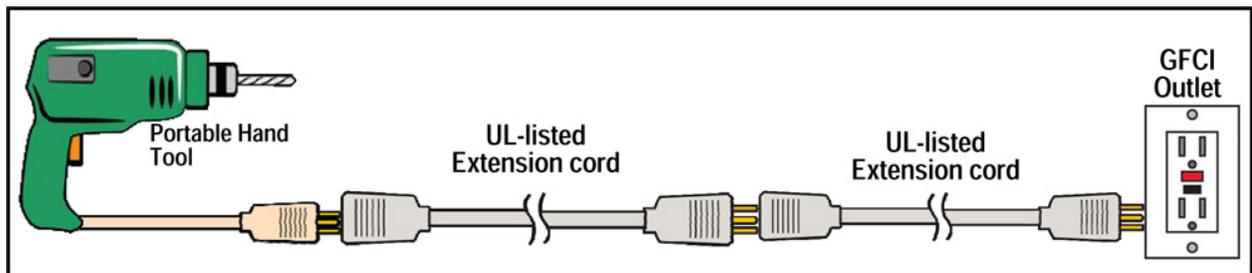
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**Illustration B – APPROVED ONLY IF VERIFIED**



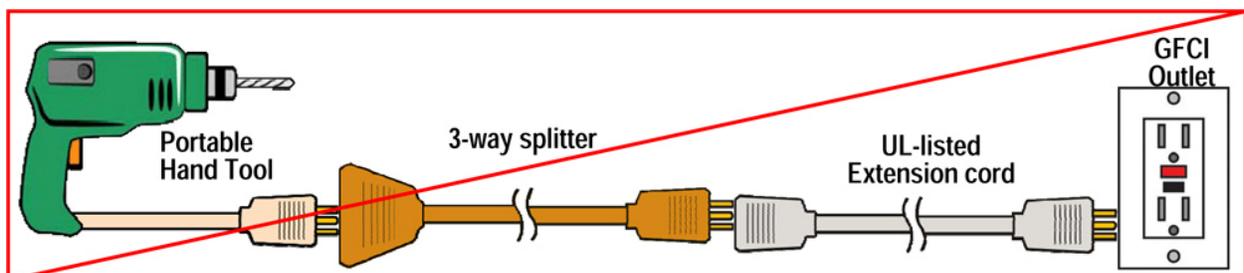
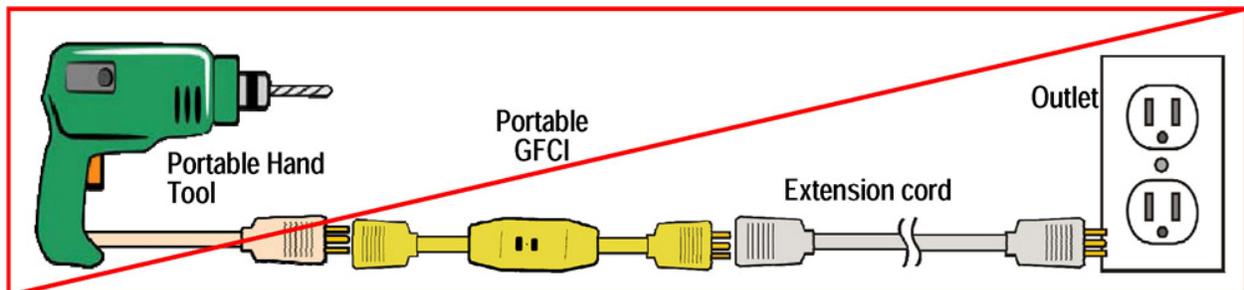
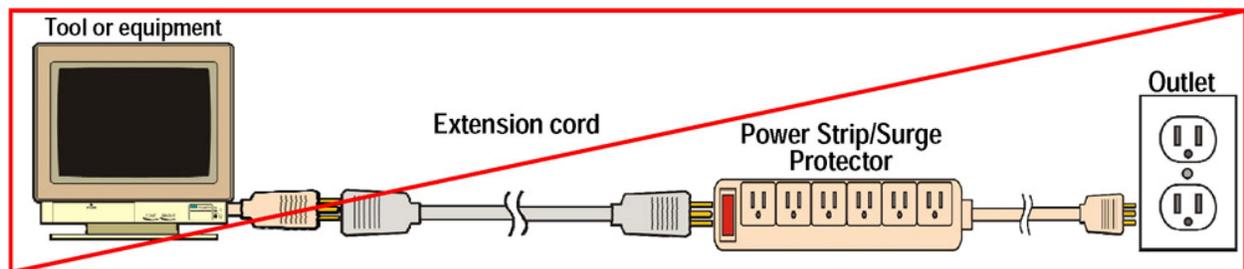
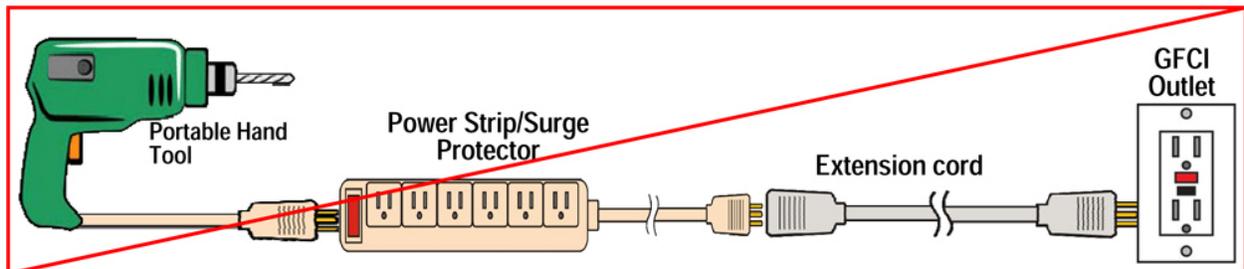
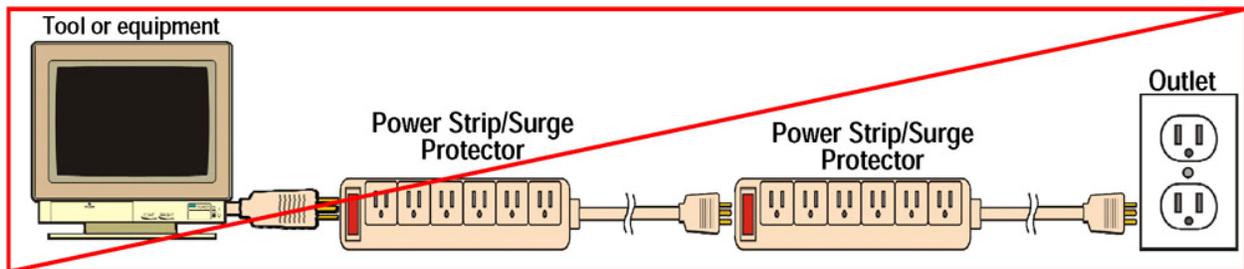
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**Illustration C – UNACCEPTABLE**



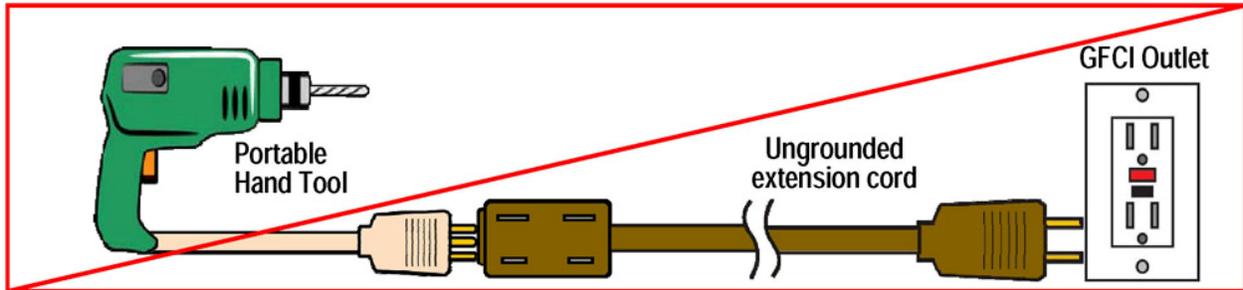
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**Illustration C – UNACCEPTABLE  
(continued)**



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**Appendix B****Electrical Equipment Information/Discussion**

Improper use of easily overloaded, unapproved extension cords can present a serious fire safety hazard in the workplace. According to the National Fire Protection Association, electrical distribution equipment, such as extension cords, was the second leading cause of fire deaths (6,900) in the U.S. between 1994 and 1998 resulting in over \$115.9 million in direct property damage. The most common cause of fires from extension cords is due to improper use and/or overloading, especially when cords have multiple outlets. Most extension cords are only rated for a maximum of 10 amps or 1,200 watts. Overloading can occur when multiple devices are plugged into one cord or when cords are “daisy chained” (plugging multiple extension cords together).

Relocatable power taps (commonly called power strips), extension cords, and surge protective devices are commonly used in the workplace and at home to provide a convenient power source to power our equipment, appliances and electronic devices. Although they are similar in function, these devices have specific uses and capacities, which are not always easily understood by the user, and therefore can be used inappropriately. Inappropriate use of power taps, extension cords, and surge protectors can result in overheating and pose a serious fire threat.

In the past, CWI has experienced a number of examples of inappropriate use of power taps, extension cords and surge protectors in various locations across the ICP (operations, office and break rooms). To help address this issue, the following explanatory information is provided to help the user better understand this policy.

**Extension cords**

Extension cords provide a convenient method of bringing power to a device not located near a power source. Extension cords come in various lengths and gauges.

It is important to understand that an extension cord can only carry a certain amount of power a certain distance without overheating. The amount of current (measured in amps) an extension cord can safely handle depends on two things: **length** and **gauge** (thickness). As the cord gets longer, the more the voltage drops. The thicker the wire (indicated by a lower gauge number), the more current the wire can safely carry. The use of an undersized extension cord can result in an overheated cord, insufficient power delivered to the device, and potential device or cord failure as well as a fire hazard. Improper use of extension cords can also lead to shock hazards.

Electrical equipment or electrical distribution equipment are often rated in watts. In order to verify if the distribution equipment can handle the load in amperage use the formula:

watt = amperage × voltage, or watt/voltage = amperage.

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Extension cords are commonly used to supply power to tools under certain limited conditions. These include situations in which permanent rigid wiring is inappropriate because equipment is moved frequently and situations where power tools or other portable appliances are used on a transient basis.

Extension cords should always be:

- Sufficiently sized (gauge) to handle the device's power needs. Before deciding which cord to use, first carefully read the manufacturer's instructions or manual for the device(s) you are plugging in, to find out how much power (in watts) it requires. Wattage capacity of the cord should always be matched to the load.
- Approved by a NRTL and carry their label (typically Underwriters laboratories, Inc. [UL])— unless they are approved field assembled extension cords.
- Equipped with three-prong plugs (one blade can be slightly wider than the other, with the third ground plug above and between the other two).
- Properly maintained with no exposed conductors (metal) parts, no damage to cord jacket, and no splices.

Adaptors should not be used to attach a grounded extension cord to ungrounded power sources or a grounded electrically powered item to an ungrounded extension cord.

Extension cords should always be inspected prior to each use for missing grounding pins, pinched sections, damaged insulation, insulation that has pulled away from the plug ends, and other damage. **WARNING: Do not touch or inspect damaged cords while they are plugged in.**

Damaged extension cords should be discarded since a damaged extension cord that has been repaired negates the NRTL listing. Never use a damaged extension cord. Store all extension cords indoors, free of kinks and twists.

Misused and damaged extension cords (see Figures 1–5 below) have caused painful injuries, fires, equipment damage, and regulatory citations and penalties.



Figure 1. Gouged cord (unacceptable for use).



Figure 2. Worn cord (unacceptable for use).

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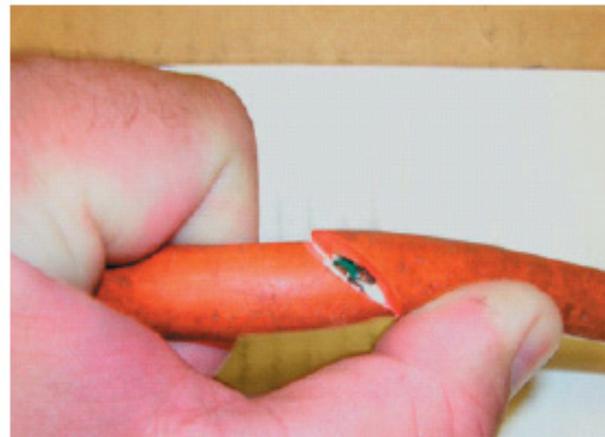
Figure 3. Burned cord (unacceptable for use).



Figure 4. Split cord (unacceptable for use).



Figure 5. Extension cord damage not visible at first glance (unacceptable for use).



It is very important to protect extension cords from physical damage. DO NOT put extension cords through doorways or windows, or under carpets or rugs; avoid pinching extension cords between or under heavy items or driving over them (see Figures 6–8 below), DO NOT hang them over abrasive or sharp edges, and never use them as rope to tie or lift objects.

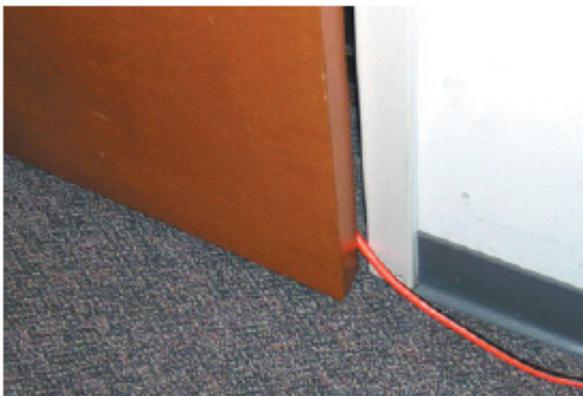


Figure 6. Cord through doorway (unacceptable).



Figure 7. Cord through window (unacceptable).

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Figure 8. Cord in path of vehicle (unacceptable).

Cords exclusively designed for indoor use are lightweight and intended for low wattage use. DO NOT use indoor-rated cords outdoors. Outdoor extension cords are marked continuously along their length with several items of information. Most important is the marking that tells the size (gauge) of the wires in the cord; it is usually something like “16/3.” This indicates a three-conductor (grounded) #16 American Wire Gauge (AWG) cord. Other markings tell the type or physical construction of the extension cord. The two most common types of construction are “S” (extra hard service) and “SJ” (hard service). Additional letters indicate other performance characteristics. The following are some examples:

Letter	Indication
S	Extra hard service
SJ	Hard service
T	Thermoplastic insulation (less flexible)
E	Thermoplastic elastomer insulation (more flexible)
O	Oil resistant
W	Moisture and sunlight resistant

### Relocatable Power Taps

Commonly known as “power strips” or “plug strips,” these consists of a block with a number of sockets, usually three or more, on the end of a power cable. They were developed as a way to plug in several electronic devices such as computer peripherals (monitor, printer, CPU, etc.).

Many people make two major mistakes using power strips—they try to use them as extension cords or they plug in appliances that require more current than the RPT can safely provide. Most power strips are rated for 15 amps and cannot safely handle higher power loads or combined loads that exceed the rated amperage.

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Although many RPTs have built-in surge suppression capabilities, they differ slightly from surge protectors (see below). RPTs that have built-in surge protection can malfunction and the RTP can still operate even if the indicator lights no longer signals that the devices' surge suppression is active. If this occurs and protection against transient voltage is needed, the RPT should be replaced.

**Surge Protection Devices**

SPDs are used to protect sensitive electronic equipment such as computers, monitors, scanners and printers, from transient over-voltages. Many surge protectors look nearly identical to relocatable power taps, but some have only one plug-in location.

SPDs will be listed as a Transient Voltage Surge Suppressor or Surge Protector.

Multiple-receptacle SPDs should only be purchased with a minimum energy suppression rating of 1,200 *joules* (see def.). Single-receptacle SPDs should only be purchased with a minimum suppression rating of 750 joules (the larger the minimum energy suppression rating, the better the protection against damaging sensitive electronic equipment from transient voltage surges).

Surge protectors must be replaced once the indicator lights indicate that they can no longer provide protection. SPDs should be replaced if manufactured prior to February 1998 or if the manufacture date is unknown.

**Daisy Chaining**

Plugging one cord into another is what many refer to as “daisy chaining” (see Figure 9). Daisy chaining increases the likelihood of misuse, excessive voltage drop and overloading the extension cord and may create a fire or shock hazard. Therefore, UL 817 requires that cord sets be provided with a tag label that identified the dos and do nots of using an extension cord to avoid dangerous hazards. One of the markings required on the tag states, “Do not plug one extension cord into another.” Accordingly, if one extension cords is plugged into another, it is a violation of NEC 110.3(b) because the cord set would not be installed in accordance with the Listing installation markings. This also applies to RPTs and SPDs.



Figure 9. Daisy chaining (unacceptable).

<p align="center"><b>ICP CORD-AND-PLUG ELECTRICAL EQUIPMENT POWER SUPPLY POLICY</b></p>	<p>Identifier: POL-121 Revision*: 1 Page: 15 of 16</p>
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**Nationally Recognized Testing Laboratories' Labels  
(Examples)**



Applied Research  
Laboratory



Canadian Standards  
Association



Communication  
Certification Laboratory



FM Global  
Technologies, LLC



Intertek Testing  
Services NA, Inc.



MET Laboratories, Inc.



NSF International



National Technical Sys-  
tems, Inc.



SGS US Testing Company, Inc.



Wyle Laboratories



TUV America, Inc.



Underwriters Laboratories, Inc.

These labels can be found at the following web sites:

<http://www.osha.gov/dts/otpc/nrtl/index.html#nrtls>

<http://www.osha.gov/dts/otpc/nrtl/nrtllist.html>

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**Appendix C**

**Job Aid Sample**

440.45  
12/16/08  
Rev. 00  
Use with POL-121

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AND POWER SUPPLY WORKSHEET**

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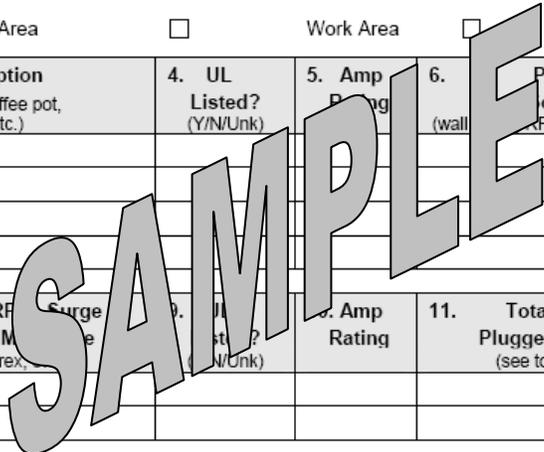
1. Location: \_\_\_\_\_

2. Area Type:      Office Area            Work Area            Commons Area     

3. Equipment Description <small>(portable space heater, coffee pot, microwave, toaster, etc.)</small>	4. UL Listed? <small>(Y/N/Unk)</small>	5. Amp Rating	6. Power Source <small>(wall, RPT, extension cord)</small>	7. Equipment Condition <small>(good/poor)</small>

8. Relocatable Power Tap (RPT), Surge Protector, or Power Strip Module <small>(Tripp Lite, Wiremold, Sentrex, etc.)</small>	9. UL Listed? <small>(Y/N/Unk)</small>	10. Amp Rating	11. Total Amps Plugged into RPT <small>(see total above)</small>	12. Acceptable? <small>(Y/N)</small>



13. Completed by: \_\_\_\_\_  
Print Name
Signature
Date

14. Verified by: \_\_\_\_\_  
Print Name
Signature
Date

**NOTE:** *This form is to be used in conjunction with NFPA 70E Article 110.0(3), "Visual Inspection of Portable Cord-and Plug-Connected Equipment and Flexible Cord Sets."*

The following are instructions for using this worksheet (Form 440.45) to assist you in performing an electrical evaluation of your workspace (or designated work area). This worksheet is to be used in conjunction with POL-121. Remember: **DO NOT DAISY CHAIN.**