

**ENVIRONMENTAL, SAFETY, AND HEALTH
WORK PRACTICES**

525: PORTABLE ELECTRICAL EQUIPMENT

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ABSTRACT

Overview of Practice 525

Environmental, Safety, and Health Work Practice 525: **Portable Electrical Equipment** describes types of portable electrical equipment and the requirements for its safe use and maintenance.

Contents

This Practice covers the following information:

- Relevant definitions
 - General requirements for portable electrical equipment
 - Electric cords
 - Portable lights
 - Portable electric tools
 - Adapters
 - Portable ground fault circuit interrupters (GFCIs)
 - Equipment ground testing program
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Appendices

This Practice contains no appendices.

SECTION 1 – PURPOSE

Purpose of Practice 525

Environmental, Safety, and Health Work Practice 525: **Portable Electrical Equipment** is intended as a guide for the purchase, use, and inspection of portable electrical equipment.

SECTION 2 – REFERENCES

References

For more information on portable electrical equipment, refer to the following documents:

Document Number	Title
ESH-508	Hot Work
ESH-511	Personal Protective Equipment
ESH-513	Confined Space Entry
ESH-534	Tank Cleaning, Repairs, and Dismantling

SECTION 3 – DEFINITIONS

Adapter

These are used so standard plugs on portable tools and lights do not have to be replaced with “Arc-tite” plugs. Adapters have a NEMA standard female plug on one end and an “Arc-tite” male plug on the other end. Adapters are also called “pigtailed.”

Class I area

A hazardous area in which flammable gases or vapors are, or may be, present in quantities sufficient to produce explosive or ignitable mixtures.

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SECTION 3 – DEFINITIONS, Continued

GFCI	See “ground fault circuit interrupter.”
Ground fault circuit interrupter	A device that trips and disconnects a circuit when the current leakage to ground exceeds 5 milli-amps. This is well below any level that could be hazardous to personnel.
Low-voltage lighting	Portable lighting that has its 120-volt power supply reduced to 12 volts, which essentially eliminates the hazard of electric shock.
Pigtail	See “adapter.”
Portable communications equipment	Includes all battery-powered handheld radios, cellular telephone equipment, and telephone pagers.
Portable electrical equipment	<p>The portable electrical equipment covered in this ESH includes multiple outlet strips, extension cords, drills, saws, grinders, portable lights, vacuum cleaners, soldering irons, etc.</p> <ul style="list-style-type: none">• This ESH does not cover office equipment, such as printers, pencil sharpeners, computer terminals, or calculators.• Battery operated power tools are exempt from this procedure.

SECTION 4 – GENERAL INFORMATION AND REQUIREMENTS FOR PORTABLE ELECTRIC EQUIPMENT

Introduction This section covers:

- General information about electric shock hazards
- Approval and permit requirements for portable electrical equipment
- Inspection and repair of portable electrical equipment

4.1 – Shock Hazard

Electric shock Electric shock involves the flow of current from an energized conductor or part through a person to a ground.

Damaged cord insulation Contact with an energized conductor may occur when insulation on a portable cord is worn or damaged and the conductor is exposed.

Faulty internal insulation Internal insulation in portable electrical lights and tools can break down and cause the shell or frame to become energized. Persons using the equipment can receive an electric shock if they are also in contact with a grounded surface.

Significant shock hazard A significant shock hazard from portable electrical equipment exists if a person is grounded.

Maximum shock hazard The maximum shock hazard from portable electrical equipment exists inside a confined space in the presence of moisture.

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4.1 – Shock Hazard, Continued

Reducing shock hazards You can reduce electric shock hazards by inspecting and taking proper care of portable electrical equipment. You can also reduce shock hazard by using:

- Low-voltage lighting
- Ground fault circuit interrupters
- Battery-powered tools
- Air-powered tools

4.2 – Approvals and Permits

NEMA or UL label All portable electrical equipment must be in good condition and have the NEMA or UL label.

Requisition approval The Terminal Manager or designate must approve all requisitions for purchase of portable electrical equipment. This ensures the standardization and safety of the equipment.

Approved portable communications equipment All portable communications equipment must be:

- Of an intrinsically safe design
- Labeled by the manufacturer as approved for use in Class I areas

Unapproved portable communications equipment Devices not labeled as approved can ONLY be:

- In non-hazardous areas
- In conjunction with a Hot Work Permit

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4.2 – Approvals and Permits, Continued

Hot Work Permit requirements

You must have a Hot Work Permit before using portable electrical equipment in either of the following situations:

- In an area where flammable vapors are likely to be present
 - Inside a confined space
-

4.3 – Inspection and Repair

Visual inspection

Visually inspect portable electrical equipment each day before using it for the following:

- External defects
 - Damaged or missing insulation
 - Missing parts
 - Any indication of possible internal damage
-

Damaged or defective equipment

Immediately remove damaged or defective equipment from service. Tag it with the appropriate “**Danger – Do Not Operate**” tag until it is repaired. If you know the reason the equipment is defective, write it on the tag.

Repairs

Repairs or modifications to portable electrical equipment must be made only by a qualified person.

SECTION 5 – ELECTRICAL CORDS

Introduction

This section applies to extension cords and portable electrical power cords for tools and lights.

5.1 – General Requirements for Electrical Cords

Use as intended Use electric cords only for the type of service for which they are designed and intended.

Light-duty cords Light-duty domestic cords must be used only in offices.

Temporary use of extension cords, etc. Do not use any of the following as permanent installations:

- Extension cords
- Electrical adapters
- Multiple outlet strips

If an extension cord will be used for the same service for more than five days, you must replace it with a hard-wired installation.

Extension cord size An extension cord must be of the proper size to avoid excessive power loss and damage to the portable electric tool

Extension cord installation Extension cords must not be:

- Run through walls, ceilings, or floors
- Permanently attached to building surfaces
- Concealed behind walls, in ceilings, or under floors

Permanent wiring Permanently installed equipment must have the power supply wired in accordance with National Electric Code standards, preferably in conduit.

5.2 – Inspection of Electrical Cords

Visual inspection	Visually inspect extension cords and cords on power tools before each day's use for: <ul style="list-style-type: none">• Cuts• Damage• Cleanliness
Ground plug	When a ground plug is required, check to be sure it is present and not damaged.
Knotted cords	Do <u>not</u> use a cord that is knotted or tangled.
Removing cords from service	If you have doubts about the condition of a cord, remove it from service, tag it, and have it repaired or replaced.

5.3 – Proper Use of Electrical Cords

Use as intended	Use cords only for the purpose intended.
Not as rope	Do <u>not</u> use an electrical cord as a rope for tying, securing, or supporting objects.

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5.3 – Proper Use of Electrical Cords, Continued

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- Heat, corrosion** Do not lay cords on:
- Hot objects
 - Water
 - Asphalt
 - Oil
 - Grease
 - Acid or other corrosive substances
-

Crimping Do not crimp, kink, or bend cords over sharp edges or corners.

- Placement** Do not place cords where they can be:
- Run over by vehicles
 - Stepped on
 - Tripped over
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Walkways If a cord must cross a walkway, run it overhead or tape it down.

Pinch points Do not run cords through doorways, windows, cabinets, or other pinch points without protecting them from damage at the nip point.

Don't tie to tool Do not tie cords to the tool or equipment to prevent them from coming unplugged.

Storing Disconnect extension and light cords at the end of the workday and store them properly.

SECTION 6 – PORTABLE LIGHTS

- Introduction** This section covers:
- General requirements for portable lights
 - Low-voltage lighting
 - Inspection and proper use of portable lights
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6.1 – General Requirements for Portable Lights

Battery-powered lights Battery-powered lights can be used in place of electric lights to eliminate shock hazard.

GFCIs When 120-volt portable lighting is used in any of the following situations, it must be equipped with a ground fault circuit interrupter (GFCI):

- In a wet location
- Inside a confined space
- On a metal platform

For more information about GFCIs, see Section 9 of this Practice.

Confined spaces Use explosion-proof and intrinsically safe lighting in any enclosed or confined space.

Extension light bulbs When using an extension light, make sure that the bulb is a heavy-duty safety type and is protected with a guard to reduce the chance of breakage.

6.2 – Low-Voltage Lighting

Eliminates shock hazard	Low-voltage lighting supplied by a step-down transformer essentially eliminates shock hazard. Voltage is reduced to 12 volts, which is considered safe if actually contacted by a worker.
Transformers	Transformers must <u>not</u> be located inside a confined space.
Limited power	A major disadvantage of low-voltage lighting is that power is limited to about 100 watts. This limitation makes these lamps suitable for inspection purposes, but not for illuminating a general area.

6.3 – Inspection and Proper Use of Low-Voltage Lighting

Inspection	Inspect extension lights before each use to ensure that the: <ul style="list-style-type: none">• Outer globe and guard are in place.• Handle is not cracked or broken.
Hanging light	Do <u>not</u> use the cord to support or hang the light.
Wet locations	In damp or wet locations: <ul style="list-style-type: none">• Use only lights with approved cords and molded rubber sockets.• Attach the lights to a GFCI.

SECTION 7 – PORTABLE ELECTRIC TOOLS

Introduction This section covers the following considerations for portable electric tools:

- General requirements
- Inspection
- Proper use

7.1 – General Requirements for Portable Electric Tools

Right tool for job Make sure the tool is the right one for the job and that it is big enough to do the work.

Hot Work Permit Do not use portable electric tools in areas where flammable vapors are likely until both of the following conditions are met:

- Gas testing has been done.
- A Hot Work Permit has been approved.

7.2 – Inspection of Portable Electric Tools

Required inspection Inspect all portable electric tools before each use. Do not use a defective or damaged tool.

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7.2 – Inspection of Portable Electric Tools, Continued

Safety devices If the tool has a guard or safety device on it, make sure that the device is:

- In place
- Working properly

Grinders and saws Make sure that the guards on grinders and saws are:

- Attached
- Set properly
- Operating freely

Ground wire Do not use the tool if the ground wire has been broken or removed.

7.3 – Proper Use of Portable Electric Tools

Use as intended Do not use power tools for anything other than their intended use.

Don't overload Do not overload the tool. Overloading is caused by bearing down too heavily on the tool or using dull cutting accessories.

Don't leave overhead Do not leave tools overhead, where someone could pull the cord and cause the tool to fall.

Don't jerk cord Do not jerk the power cord.

Don't suspend tool Do not use the power cord to suspend the tool.

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7.3 – Proper Use of Portable Electric Tools, Continued

Clamp small items When you work on small items, clamp or anchor them to prevent them from whipping or slipping.

Use proper adapters Do not bypass ground connections by using an improper adapter.

Protect eyes Wear appropriate eye protection when using electric power tools.

- For more information on eye protection, see ESH-511.

GFCIs Use a GFCI:

- In wet or damp locations
- Inside a confined space

SECTION 8 – ADAPTERS

Introduction This section covers requirements for using adapters.

“Arc-tite” receptacles The terminal should have “Arc-tite” receptacles wherever a hazardous atmosphere could exist. These receptacles isolate any arc (spark) that may occur when a portable electric tool or light is plugged in or unplugged.

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SECTION 8 – ADAPTERS, Continued

Conditions for permitted use

Adapters may be used provided all of the following conditions are met:

- The adapter will be used only on a temporary basis.
 - The adapter will be removed from the area when the job is completed or when the General Work Permit expires.
 - A Hot Work Permit is obtained if the adapter is used in an area where flammable vapors are likely to be present.
 - All electrical equipment has been shut down before the adapter is disconnected from the “Arc-tite” receptacle.
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SECTION 9 – PORTABLE GROUND FAULT CIRCUIT INTERRUPTERS (GFCIs)

Introduction

This section covers the following information about GFCIs:

- General information and requirements
 - Double-pole GFCI units
 - Location of GFCIs
-

9.1 – General GFCI Information and Requirements

Where required

All 120-volt single-phase 15 and 20 amp receptacle outlets on a construction site which are being used by workers but are not part of the permanent wiring of a building or structure must have an approved GFCI.

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9.1 – General GFCI Information and Requirements, Continued

Contact with grounded surface	GFCI units must also be used with 120-volt equipment where contact with a grounded surface is possible. Such conditions include: <ul style="list-style-type: none">• Confined spaces• Steel platforms• Wet locations
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GFCI types	Several types of GFCIs are available which may be used for shutdowns where the area is safe for general work.
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Prohibited near flammable vapors	DO NOT USE GFCIs IN AREAS WHERE FLAMMABLE VAPORS ABOVE <u>10 PERCENT LFL</u> ARE DETECTED.
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9.2 – Double-Pole GFCI Units

Preferred	A double-pole GFCI unit is preferred to a single-pole unit.
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Disadvantage of single-pole GFCIs	If the energized and neutral wires in the cord, plug, or receptacle supplying a single-pole GFCI are reversed, the device will open the neutral instead of the energized conductor. If this happens, the GFCI will not protect against shock.
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Advantage of double-pole	Reversed wires are not a problem with double-pole GFCIs, because the double-pole GFCI unit disconnects both wires.
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9.3 – Location of GFCIs

Best location It is generally desirable to locate a GFCI in the circuit breaker panel.

Alternate location If the GFCI cannot be located in the circuit breaker panel, locate it close to the work site. In this location, minimize tripping by using the shortest possible power cord to attach the tool or portable lighting.

Prohibited location Do not locate a GFCI inside a confined space.

SECTION 10 – EQUIPMENT GROUND-TESTING PROGRAM

Introduction This section covers general requirements for ground-testing equipment.

Equipment The following portable electrical equipment must be checked to ensure that the grounding conductor is intact and electrically continuous:

- Portable receptacles
- Flexible cord sets
- Electric power tools

Visual inspection Visually inspect portable electrical equipment before each day's use to ensure:

- The equipment has no external defects or damage.
- There is no indication of internal damage.
- There are no missing or defective pins.
- The ground plug is intact.
