



NATIONAL HIGH MAGNETIC FIELD LABORATORY

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Extension Cord Safety Policy

Introduction

Extension cords provide a convenient method of bringing temporary AC power to a device that is not located near a power outlet. Extension cords are widely used at The National High Magnetic Field Laboratory but, if not used properly, can be the cause of electrical shock, equipment damage, and fire hazards.

The U.S. Consumer Product Safety Commission (CPSC) estimates that each year, about 4,000 injuries with electric extension cords are treated in the hospital emergency rooms. About half the injuries involve fractures, lacerations, contusions, or sprains from people tripping over extension cords.

CPSC also estimates that about 3,300 residential fires originate in extension cords each year, killing 50 people and injuring about 270 other. The most frequent causes of such fires are short circuits, overloading, damage and/or misuse of extension cords.

Besides the conventional 3-wire 120 VAC extension cords, special-purpose extension cords (“shop-made”), carrying up to a maximum of 480 VAC are in use at the NHMFL.

Unless otherwise specified, the following policies relate to all types of extension cords in use at the Lab.



Quick Tips To Avoid Hazards

- Look for the UL® Mark or equivalent safety standard listing on extension cords you purchase. This means that representative samples of the cord have been tested for foreseeable safety hazards for their intended purpose.
- Store all cords indoors when not in use. Outdoor conditions--especially sunlight--can deteriorate a cord over time.
- Unplug an extension cord when not in use.
- Some indoor cords with more than one outlet have covers for the unused openings. Use them; they prevent debris and moisture from entering the unused outlets.
- Do not use extension cords that are cut or damaged. Touching even a single, exposed strand of wire can give you an electric shock or burn.



Damaged Cord (exposed wire)

- As a safety feature, extension cords and most appliances have polarized plugs (one blade wider than the other). These special plugs are designed to prevent electric shock by properly aligning circuit conductors. If a plug does not fit, have a qualified electrician install a new outlet.
- Never file or cut the plug blades or grounding pin of an extension cord or appliance to plug it into an ungrounded outlet.



Grounding Pin Removed

- Keep cords out of work areas. If this situation is unavoidable, secure the cord to the floor with tape or use cord molding. Position cones or other attention-getting warnings to alert passersby.

General Policy

- Extension cords may be used for temporary applications only. “Temporary” generally means it is associated with a one-time job or with a transient condition. Install permanent wiring for long-term or repetitive needs. An extension cord may be used while awaiting permanent wiring.
- All extension cords shall be clean and properly maintained with no exposed live parts or conductors, exposed underground metal parts, splices, substantial abrasion, or other damage that might compromise its safe usage.

- Extension cords must be rated “HEAVY DUTY” or “EXTRA-HEAVY DUTY” and must be a continuous length. Cords classified as SO, ST, and SJ meet this requirement.
- Extension cords must be of sufficient current-carrying capacity to power the device(s) it will be used with (See ampacity table below). Long extension cords require increased conductor size to compensate for voltage drop. A good rule of thumb is one gauge heavier for every 100 feet of additional cord length. Minimum conductor size for cords used at the NHMFL shall be #16AWG.

Cord Length	Load Ampere (Current) Rating					
	0-2	2-5	5-7	7-10	10-12	12-15
25 ft	16 ga	16 ga	16 ga	16 ga	14 ga	14 ga
50 ft	16 ga	16 ga	16 ga	14 ga	14 ga	12 ga
100 ft	16 ga	16 ga	14 ga	12 ga	12 ga	
150 ft	16 ga	14 ga	12 ga	12 ga		
200 ft	14 ga	14 ga	12 ga	10 ga		

- Extension cords may not be daisy-chained (one extension cord plugged into another extension cord) except as described in this Appendix. Cords with molded multiple receptacles are acceptable if the total load does not exceed the cord ampacity. Avoid plug-in multi adapters.
- Never use two-conductor extension cords. All 120 VAC extension cords used at the NHMFL must be three-conductor (grounded) - even if the device it serves uses a two-prong plug. Do not attempt to modify plug prongs to fit an existing outlet. Have an electrician install a new outlet with proper polarized connections.
- Around construction sites, in damp areas, or in an area where a person may be in direct contact with a solidly grounded conductive object, such as working in a vacuum tank, extension cords must be protected by a ground-fault circuit interrupter (GFCI).



- Extension cords should not be used for heat-producing appliances such as coffee pots, toasters, and space heaters. The load from these devices often approaches the circuit capacity, and the added cord length increases the chance of overheating. In addition, the appliance cord to extension cord connection is subject to wear and tear, causing localized heating.
- Submit a work request to Facilities for installation of a receptacle for the appliance. If an extension cord must be used temporarily, choose the shortest one that will work, and at least one size larger than the appliance cord.

Allowable Types Of Extension Cords

- Extension cords must be of the proper type, size, and voltage and current rating for the intended application. The cord shall not be substantially longer than required for the application.
- For 120 VAC single-phase service, only unmodified, commercially manufactured extension cords equipped with three-wire plugs and receptacles may be used. In general, these cords shall have molded plugs and receptacles. Multi-tap (“3-way”) extension cords are acceptable.



- The jackets of commercially manufactured extension cords must indicate approval by Underwriter Laboratories® or another Nationally Recognized Testing Laboratory (NRTL).
- Extension cords for special applications, such as 208 VAC or 480 VAC three-phase service, may be shop-made as required. Only qualified persons may fabricate or repair shop-made extension cords, including the installation of connectors or plugs to the cord. All components of shop-made cords must be of a type approved by an NRTL. For purposes of meeting this requirement, “qualified persons” means NHMFL electricians: staff or subcontracted.
- At the time of fabrication or repair, shop-made extension cords shall be tested by qualified persons for proper wiring and grounding. On 480 VAC cords, a tamper-resistant safety-inspection seal installed on the plug and receptacle to indicate the cord is properly constructed and to prevent unauthorized modification. Shop-made cords without intact safety inspection seals on both plug and receptacle may not be used.

Disallowed Uses Of Extension Cords

The following uses of extension cords are not permitted at the NHMFL:

- Extension cords may not be used in place of permanent facility wiring. Cords shall not be attached to building surfaces or structural members. They shall not be permanently concealed in walls, ceilings, or under floors - including raised computer floors.

- Do not run cords through moisture, tied to over-head pipes, across traveled roads, under carpets, or across areas of high foot traffic.
- Extension cords may not be run through doors, ceilings, windows, holes in walls, or through hinged door openings in enclosures. This is to prevent “pinch” damage to the cord. If it is absolutely necessary to run an extension cord through a doorway or open window for short-term use, the cord must be protected from damage should the door or window slam shut; it must be removed immediately when no longer in use; and must not be a trip hazard.
- Do not use extension cords that are frayed, cut, or damaged such that inner conductors show, or that have outer sheaths which have pulled loose from their molded plugs exposing the inner conductors. In particular, do not use a cord that has a bare conductor exposed.
- Detachable multi-tap adapters may not be used on extension cords nor on receptacles.
- Cords may not be repaired with electrical tape, nor may tape be used for other purposes on a cord. It may conceal damage, and it does not provide the integrity of the original jacket.



- Do not use extension cords in which the third prong (grounding prong) has been removed from the plug.

Power Strips

A power strip is a variation of an extension cord, where the cord terminates in a row or group of receptacles. Power strips are commonly used in offices to provide multiple receptacles to office equipment. This use is permissible so long as the load does not exceed the current rating for the strip. Other policies pertaining to extension cords also apply to power strips. Additional power strip requirements are:

- Multiple-outlet power strips must be equipped with an integral circuit breaker; have a cord no longer than 10 feet; and bear the approval marking of UL or other NRTL.
- Power strips shall not be permanently mounted to any facility surface (wall, floor, etc...).
- For equipment racks, test benches, test carts, and similar apparatus, the preferred method of supplying 120 VAC utility power to rack-mounted instruments is with a special raceway power strip specifically designed for permanent installation.



Acceptable Combinations Of Extension Cords And Power Strips

There are very few acceptable combinations of extension cords and devices (electrical equipment). These include:

- Receptacle to surge protector (or UPS) to extension cord to device
- Receptacle to power strip to UPS to device (electrical equipment)
- Receptacle to surge protector (or UPS with cord) to device
- Receptacle to surge protector (or UPS) to power strip to device

Other Considerations For Extension Cord Use

Cord overload and overheating:

In addition to the total electrical load, the conditions of use affect extension cord safety. Rated capacity for an extension cord assumes it will be used in an open-air and straight configuration.

As electric current passes through a wire, electrical resistance causes some voltage drop and heating of the wire. Coiling or winding excess cord length can concentrate this heat and overheat the cord. Similarly, covering a cord with a rug or rag can trap heat and overheat the cord. This trapped heat can damage the cord and lead to a fire. Tying a knot in a cord can have a similar outcome.