



HUBBELL® SAFETY EVALUATION



A step-by-step checklist to help identify potential safety problems, from the wiring device experts... Hubbell.

**think SAFETY...
think HUBBELLSAFE**





Identify and Correct Safety Hazards for Reduced Downtime and Expense

Workplace safety has a significant impact on your business. Employee safety and productivity, machine downtime and production throughput are all impacted by the condition of the workplace environment. Hubbell Wiring Systems is committed to helping our customers maintain the safest possible workplace through the proper selection, use and installation of wiring devices.

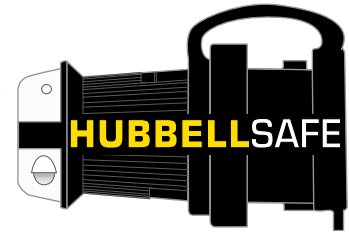


Potential safety hazards exist in almost every workplace environment—from open office areas and factory floors, to construction sites and retail spaces. That's why all employers are required to comply with strict safety codes and regulations. Many businesses today pride themselves on the number of accident-free days, which can be supported through the implementation of formal safety programs that include periodic visual safety evaluations. Conducting a safety evaluation to identify and correct safety hazards now can help avoid accidents later.

Hubbell has designed the Hubbell Safety Evaluation to help our customers increase awareness of safety codes and potentially avoid accidents.



For a variety of applications and environments, the Safety Evaluation poses key inspection questions aimed at reviewing the condition of existing wiring devices to help identify potential safety hazards. With a wide range of products designed to provide maximum safety while complying with the latest codes, Hubbell offers possible product solutions



for each safety hazard and details the related NEC, NEMA or OSHA requirement. The Hubbell Safety Evaluation is not all-inclusive, but may help point to trouble areas in the installation of wiring devices.

Hubbell understands the importance of making safety a core value in every business and the cost of not. Upgrading to the most current wiring device technology with Hubbell products can help customers maintain workplace safety, comply with codes and regulations, and ultimately reduce risk. The Hubbell safety evaluation is one element of an overall company safety program.



Hubbell Recommends...

- ✓ Always adhering to the manufacturer's installation instructions when installing and using wiring devices.
- ✓ Using a certified, qualified electrician to perform all electrical work.
- ✓ Being aware of all related NEC, NEMA and OSHA regulations.
- ✓ Always disconnecting power and using lock-out/tag-out procedures during inspection and maintenance.
- ✓ Conducting periodic inspections and maintenance to ensure personal safety and day-to-day product performance.
- ✓ The following check list is not inclusive but may point to trouble areas in the installation of wiring devices.



Plugs and Connectors, 15 - 30 Amp

Problem



Problem: Devices are burning out from coming in contact with water and debris.

Solution: Safety-Shroud® Twist-Lock® products that are UL Type 4X rated for use in harsh environments.

NEC Information: Refer to 110.11 Deteriorating Agent, and Table 430.91 for environmental type ratings.

Solution



Application

Are there visible cuts and defects on cords? Are flexible cords and cables free of splices or taps?

Is the cable securely captured by the cord grip?

Is the cable within the recommended diameter range of the cord grip?

Does the application require additional cable strain relief to control stress or arc of bend at the cord grip?

Are there any visible signs of damage or wear to the devices?

Are plug blades bent or distorted from being dropped or hit?

When inserting the plug, does the engagement with the receptacle or connector feel loose?

Are the devices being used in wet locations, wash down areas or corrosive environments?

Are closure caps installed on the devices when they are not in use?

Is accidental contact with plug blades a concern?

Are clamps or other securing means provided on flexible cords or cables at plugs, receptacles, tools, equipment, etc., and is the cord jacket securely held in place?

Applies



Notes:

High Amperage Devices 50 - 200 Amp Plugs and Connectors

Problem



Problem: Machinery or equipment connected with conventional straight blade NEMA devices may become unplugged unintentionally due to strain on the cord or vibration.

Solution: The use of Hubbell Twist-Lock devices prevent nuisance disconnections from occurring that could cause unwanted downtime or a possible injury to personnel.

UL Information: Twist-Lock devices are recommended as an industry best practice to prevent accidental unplugging of equipment, such as Article 513.7 that calls for locking type devices that will not readily disconnect. Twist-Lock devices should also be standards for overhead connections as recommended in Article 525.23(B)

Solution



Application

Are devices not mated securely or do they disconnect unintentionally?

Is exposure to weather (rain) expected?

Are all energized parts of electrical circuits and equipment guarded against accidental contact by approved cabinets or enclosures? 1910.303(g)(2)(i)

Is the correct wire gauge being used for the application or length of run?

Is exposure to arcing when connecting/disconnecting possible?

Are installed products rated for make or break under load?

Has the added safety of non-metallic devices been considered?

Are the devices designed to prevent unintentional mis-mating of different ratings?

Applies



Notes:



Wet and Damp Locations

Problem



Problem: Non GFCI devices are installed indoors in wet and damp locations.

Solution: GFCI receptacles with Self-Test technology provide continually monitored protection.

NEC Information: For non-residential installations all 125 volt 15 and 20 amp receptacles installed in locations specified in Article 210.8(B)(1) shall have ground fault circuit interrupter protection for personnel.

Solution



Application

- Do your requirements include power in a bathroom or sink area (within 6 ft.)?
- Is your application for temporary power in an outdoor construction location?
- Is power required in a garage or service bay?
- Do you have considerations for spa/whirlpool or pool installations?
- Are you providing power in a kitchen area?
- Is this a medical or hospital application?
- Do you have a demanding industrial application?
- Is the application outdoors, including rooftops?
- Do you have a high current application in an Industrial area?
- Will you be using power tools or equipment?
- Does your application include 3 phase power?
- Are there requirements for convenience power in bathrooms, kitchens, roof tops, outdoors, sink areas, wet locations, locker rooms, shower facilities, garages or service bays?

Applies

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Notes:

Portable GFCI

Problem



Problem: A standard GFCI receptacle installed in a 4" square box for temporary power.

Solution: Portable GFCI products with the required open neutral protection.

OSHA Information: Meets OSHA 29 CFR 1926.404(b)(1)(ii) and 29 CFR 1926.405(a)(2)(ii)(G) requirements for portable power/lighting in confined space.

Solution



Problem: Portable power tools can be used on circuits without GFCI protection.

Solution: GFCI plugs and line cords have built in protection for portable tools and include the required open neutral protection.

UL Information: The GFCI standard, UL 943, section 6.7.2.1 requires open neutral protection for portable GFCI. The open neutral protection feature allows the GFCI to trip if a neutral wire is broken, and will not reset until the wire is fixed.



Application

- Are ground fault circuit interrupters installed on each temporary 15 or 20 ampere, 120 volt AC circuit at locations?
- Are there outlets required for temporary power on construction sites?
- Do you require 3 phase power with GFCI protection?
- In wet or damp locations, are electrical tools and equipment appropriate for the use or location or otherwise protected?
- Is power required in a locker room or shower facility?
- Is the GFCI installed in a readily accessible location?

Applies

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Notes:

Temporary Power

Problem



Problem: Temporary power distribution systems without required personnel protection.

Solution: Factory defined assemblies that can be easily installed as a cost effective alternative to conventional wiring methods.

NEC Information: Article 590.6 requires GFCI protection for personnel on all temporary receptacles installed at construction sites and receptacles existing or installed as part of the permanent wiring in a building and used for temporary electric power.

Solution



Application

Are all temporary circuits protected by suitable disconnecting means at the junction with permanent wiring?

Is the work site potentially abusive to equipment?

Is the entire distribution panel/box suitably rated for outdoor use?

Are all 125 volt devices adequately protected with ground fault circuit interrupting devices that include open neutral detection?

Will the application require multiple cables run to the points of use?

Is there individual overload protection at each connection point?

Applies

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Notes:



Modular Power

Problem



Problem: There is a need to quickly reconfigure work spaces for product change-overs and continuous improvement activities.

Solution: Factory defined assemblies that can be easily installed as a cost effective alternative to conventional wiring methods.

NEC Information: Article 336.10(7) permits types TC-ER cable when secured at intervals of not more than 6 feet without continuous support.

Solution



Application

How frequently are workbenches and equipment moved?

Are work cells reconfigured for product change-overs or continuous improvement activities?

Is electrical maintenance support readily available to facilitate moves, adds and changes?

Are connections exposed to wet environments?

Are any of the wiring devices or connections subject to damage?

Applies

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Notes:



Portable Outlet Box

Problem



Problem: Using a box that is not listed for pendant application. Open knockouts and inadequate strain relief could potentially harm equipment or personnel.

Solution: Portable non-metallic outlet boxes provide a safe rugged portable enclosure with integral sealed cord connector fittings.

NEC Information: Article 110.12 prohibits unused cable openings in metallic boxes.

Solution



Application

Are there extension cords with metallic outlet boxes installed on the ends?

Are metallic boxes with unused knockouts in use for convenience power drops?

Applies

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Notes:





Disconnect Switches

Problem



Problem: Switch controls equipment that is exposed to frequent washdowns and cleaning chemicals.

Solution: Circuit-Lock Switched Enclosure with a UL Type 4X (Washdown, Corrosion Resistant) rating and a lockable handle to meet OSHA Lockout/Tagout regulations.

NEC Information: 430.91 – Refers to enclosure type ratings, and 430.102 (B) – Refers to Lock-out, Tag-out requirements.

Solution



Application

- Are motor controllers being used as motor disconnect switches?
- Are Variable Frequency Drives being used?
- Do the disconnect enclosures have a rating suitable to the environment?
- Are all disconnecting switches and circuit breakers labeled to indicate their use or equipment served?
- Are disconnecting switches for electrical motors in excess of two horsepower, capable of opening the circuit when the motor is in a stalled condition? (Switches must be horsepower rated equal to or in excess of the motor hp rating.)

Applies

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Notes:

Manual Motor Control

Problem



Problem: Disconnect switches that have been placed near power feeds may not be close enough to the equipment to comply with line of sight requirements.

Solution: Install a listed motor disconnect switch between the final motor branch-circuit short-circuit and ground fault protective device and adjacent to the controller.

NEC Information: Article 430.102(A) for circuits under 600 volts requires a disconnecting means be located within sight from the motor location or the driven machinery location (50 feet).

Solution



Problem: Space available near equipment to comply with line of sight disconnect requirements may not provide enough room to fit along side of the motor controller.

Solution: Install a motor controller that is additionally listed as “suitable as a motor disconnect” between the final motor branch-circuit protective device and the motor.

NEC Information: Article 430.109(A)(6) permits the use of a motor controller that is additionally listed as “suitable as a motor disconnect” to function as both and may include supplementary fuses.



Application

- Is each motor disconnecting switch or circuit breaker located within sight of the motor control device?
- Is each motor located within sight of its controller or the controller disconnecting means capable of being locked in the open position or is a separate disconnecting means installed in the circuit within sight of the motor?
- Is the controller for each motor in excess of two horsepower, rated in horsepower equal to or in excess of the rating of the motor it serves?

Applies

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Notes:

Mechanical Interlocks

Problem



Problem: Potential for dangerous arcing when equipment is unintentionally connected / disconnected under load.

Solution: Circuit-Lock® Switched Mechanical Interlock Enclosure virtually eliminates the possibility of making or breaking the circuit under load or making a casual or “lazy” connection.

NEC Information: 430.103 – The disconnecting means shall open all ungrounded conductors and be designed so that no pole can be operated independently.

Solution



Application

Are all energized parts of electrical circuits and equipment guarded against accidental contact by approved cabinets or enclosures?

Are there Arc Flash calculation labels, safe separation distance, identified/installed?

Is there any physical damage to electrical boxes creating openings into electrical circuit from bent metal?

Is sufficient access and working space provided and maintained around all electrical equipment to permit ready and safe operations and maintenance? OSHA

Will personnel make or break equipment connections under load?

Do your disconnect switches offer built in Lockout/Tagout capability?

Applies

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Notes:



PANEL-SAFE®

Problem



Problem: Access is required to programmable controllers located inside energized cabinets requiring necessary arc flash protection.

Solution: Install an external interface that is isolated from live control cabinet components.

NFPA Information: The Electrical Standard in NFPA 79 calls for all utility receptacles to be GFCI protected, external utility receptacles must be covered and covers must maintain the rating of the enclosures.

Solution



Application

Is maintenance being performed on active electrical cabinets?

Is GFCI and over current protection needed at point of use?

Will the equipment encounter weather or hose down?

Is “tool entry” or lockout desirable?

Is “finger safe” contacts for wiring desirable?

Are electrical cabinets left open while energized or when equipment is operating?

Do you open cabinet enclosures to access data ports from inside?

Are all panel utility receptacles adequately protected for the environment, such as NEMA 4 or 4X?

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Notes:





Wire Management

Problem



Problem: Cable connections and cord drops can pull out or become damaged from being overstressed by motion or vibration in use.

Solution: Kellems® Wire Mesh is designed to prevent strain from being transmitted to connection points. This provides greater security than using a fitting alone, making the electrical system safer by preventing cable pull-out and controlling arc-of-bend.

NEC Information: Article 400.10 pull at joints and terminations states flexible cords and cables shall be connected to devices and to fittings so that tension is not transmitted to joints or terminals.

Solution



Application

Do the current cable supports provide a positive action that distributes loads equally over the cable jacket?

Are cable drops from overhead properly supported over the entire run?

Will cable drops potentially be subject to pull, vibration or movement?

Are flexible cords and cables protected where passing through holes in covers, outlet boxes, or similar enclosures?

Will equipment feed cables be subject to offset strain at the entrance to fittings?

Is the application in a highly corrosive environment?

Does the application require a cable strain relief be installed on the middle of the run?

Applies

Notes:

Strain Relief

Problem



Problem: Standard clamp style cable entrance clamps may not provide adequate strain relief and bend control to prevent damage and down-time.

Solution: Mesh grip strain relief for cable drops and connections to portable equipment or stationary machinery for an additional level of protection.

NEC Information: Article 638.56 states cord and cable be provided with strain cable grips at the busway plug-in device and the equipment terminations.

Solution



Notes:

Liquidtight Protection

Problem



Problem: Unprotected equipment cables can easily become damaged during use if not properly protected.

Solution: PolyTuff® Non-Metallic Liquidtight conduit protects electrical wiring improving safety for both people and equipment by preventing mechanical and moisture damage.

NEC Information: Article 356.10 Liquidtight Flexible Non-Metallic Conduit shall be permitted to be used in exposed or concealed locations for the following purposes; (1) Where flexibility is required for installation, operation, or maintenance. (2) Where protection of the contained conductors is required. (3) For outdoor locations. (4) For direct burial. (5) Type LFNC-B shall be permitted to be installed in lengths longer than 6 feet where secured per 356.30. (6) For encasement in concrete and installed per 356.42.

Solution



Application

Is the application in a wet, damp or corrosive environment?

Is there a need to accommodate movement or vibration for the installation?

Has metal fatigue or separation been an issue with existing Liquidtight conduit?

Applies

Notes:



Cable Management

Problem



Problem: Cables on floors and work surfaces creates electrical safety and trip hazards.

Solution: The use of cord reels positions potentially hazardous cables above the work space and allows them to be easily retracted when not in use, improving safety and extending cord life.

OSHA Information: 1926,416(e)(1) Requires that worn or frayed electrical cables shall not be used. Precautions be taken to mitigate wear including protection from damage and pinch points.

Solution



Application

Is there unmanaged cords or hoses that may cause trips or risk of electrical shock?

Is exposure to weather or hose down likely?

Do drop lights need to be stored when not in use?

Do extension cords have open neutral ground fault circuit interrupter protection?

Is the application automotive repair that requires switches to be located safely above the work area?

Will the application require cords to be pulled in multiple directions?

Is temporary static discharge connections required for portable equipment or processes?

Applies

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Notes:

GFCI Cord Reels

Problem



Problem: Standard GFCI duplex receptacles are installed in outlet boxes on the end of cords fed by overhead reels.

Solution: Installed portable GFCI protective device that includes the necessary open neutral protection at the end of the cord reels and other temporary power cords.

New UL Information: "Retractable electrical cord reel with Ground Fault Protection (GFCI) need to conform with UL 355." The GFCI cord reel must incorporate UL listed open neutral protection in the end effector.

Solution



Notes:

Hose and Cable Protection Systems

Problem



Problem: Electrical cables, pneumatic and hydraulic hoses are being damaged when driven over and create a trip hazard.

Solution: Protect your cables and hoses with TrukTrak®, TredTrak® and AccessTrak® non-metallic cable protectors designed to safeguard electrical cables and cords from vehicle and pedestrian traffic.

NEC Information: 527.4(H) – Protection from accidental damage indicates that cords shall be protected from sharp corners and projections.

Solution



Application

Do cables or hoses run unprotected across the floor?

Do you need to comply with Americans with Disabilities Act Accessibility guidelines?

Are unprotected machine connection cables run to peripheral equipment across the floor?

Is there any vehicle traffic present in the application?

Is compliance with NEC Article 525 for insulating cables at public areas required?

Applies

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Notes:



Lockout, Tagout

Problem



Problem: During machine repair, set-up or change over, employees must be protected from unintentional energizing of equipment.

Solution: Plugout® devices in a full range of sizes, enclose the equipment plug and secure with a keyed padlock.

NEC Information: Article 430.102 – Explains lock-out tag-out procedure.

Solution



Application

Is all machinery or equipment capable of movement, required to be de-energized or disengaged and locked-out during cleaning, servicing, adjusting or setting up operations, whenever required?

Is a lock and tag placed on each disconnecting means used to de-energize circuits and equipment? [29 CFR 1910.333(b)(2)(iii)(A)]

What type of power source is being locked out and tagged? i.e. plug end, switched interlock, motor starting switch, main breaker etc.

Are there Power Disconnect Switches in OFF position without lockout/tagout installed?

When electrical equipment or lines are to be serviced, maintained or adjusted, are necessary switches opened, locked-out and tagged whenever possible?

Are appropriate employees provided with individually keyed personal safety locks?

Are employees required to keep personal control of their key(s) while they have safety locks in use?

Are employees instructed to always push the control circuit stop button immediately after checking the safety of the lock-out?

Is there a means provided to identify any or all employees who are working on locked-out equipment by their locks or accompanying tags?

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Notes:

Recommendations

The standards have establish requirements that employers must follow when employees are exposed to energy while servicing and maintaining equipment and machinery. Some of the most critical requirements from the standards as outlined in the OSHA's Fact Sheet are:

- Develop, implement and enforce an energy control program.
- Use lockout devices for equipment that can be locked out. Tagout devices may be used in place of lockout devices only if the tagout program provides employee protection equivalent to that provided through a lockout.
- Ensure that new or overhauled equipment has the capability of being locked out.
- Develop, implement and enforce an effective tagout program if machines or equipment are not capable of being locked out.
- Develop, document, implement and enforce energy control procedures. [See the note to 29 CFR 1910.147(c)(4)(i) for an exception to the documentation requirements.]
- Use only lockout/tagout devices authorized for the particular equipment or machinery and ensure that they are durable, standardized and substantial.
- Ensure that lockout/tagout devices identify the individual users.
- Establish a policy that permits only the employee who applied a lockout/tagout device to remove it. [See 29 CFR 1910.147(e)(3) for exception.]
- Review all energy control procedures annually at a minimum.
- Provide effective training as mandated for all employees covered by the standard.
- Comply with the additional energy control provision in OSHA standards when machines or equipment must be tested or repositioned, when outside contractors work at the site, in group lockout situations, and during shift or personnel changes.

Weather Resistant Receptacles

Problem



Problem: Receptacles mounted outdoors, in damp locations, or subject to routine spray washing can develop corrosion on metal components. UV exposure may also degrade the device face leading to damage and a potentially unsafe condition.

Solution: Use of receptacles specifically intended for use in wet, damp and outdoor installations with corrosion and UV resistant construction.

NEC Information: Article 406.9 requires all 15 and 20 amp 125 and 250 volt non-locking type receptacles shall be listed weather resistant type. It also states receptacles installed in wet locations shall have an enclosure that is weatherproof whether or not the attachment plug is inserted.

Solution



Application

Is strain relief needed in liquid-tight conduit applications?

Do all interior wiring systems include provisions for grounding metal parts of electrical raceways, equipment and enclosures?

Do the receptacles feature a WR marking for quick identification?

Applies

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Notes:



Heavy Duty Receptacles

Problem



Problem: Misapplied receptacle grades installed in demanding applications such as production floors and maintenance shops.

Solution: Industrial receptacles with impact resistant faces to minimize damage from impact and abrupt plug removal. Stainless steel plates provide excellent strength and protection.

NEC Information: Article 110.3 and 110.12(C) indicates the requirements for the structural integrity of devices.

Solution



Application

Is the receptacle face cracked or broken?

Is the receptacle grade adequate to withstand the abuse level for the application?

Are the wall plates installed impact resistant?

Applies

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Notes:



Corrosion Resistant Devices

Problem



Problem: Devices are installed and used in demanding environments that can cause contacts and fasteners to develop corrosion.

Solution: Use corrosion resistant devices in applications where water and chemicals are likely to attack components.

NEC Information: Article 110.11 equipment and conductors shall not be installed, unless identified for use, in the operating environment with exposure to deteriorating effects.

Solution



Application

Are connections that are used mainly outdoors rated for the applications?

Are corrosive chemicals employed near by within the facility?

Has corrosion been an issue on electrical contacts or metal fasteners?

Is the application considered NEMA 3R, 4 or 4X rated?

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Notes:





SAFETY EVALUATION

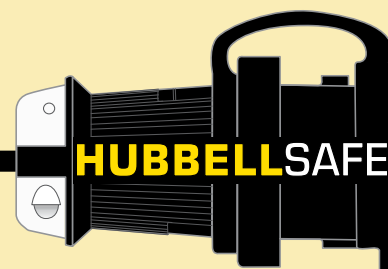
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Available Literature

Hubbell offers an extensive literature library for product support. Downloadable PDFs are available online at www.hubbell-wiring.com under the media tab.

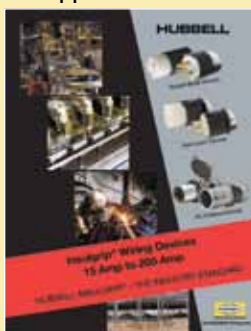
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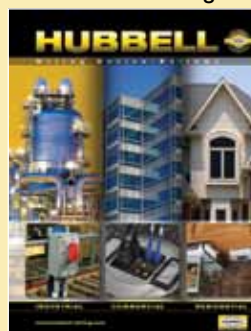
Hubbell Watertight Wiring Devices



Insulgrip® Wiring Devices Application Guide



Hubbell Wiring Device-Kellems Catalog



Hubbell Slide Charts



Twist-Lock® Devices



Kellems® Mesh Grips

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