Document Name: Protection of Conductors

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Purpose: The purpose of this document is to provide direction and consistency with respect to how we protect conductors over moving assemblies, and sharp edges.

Definitions:

Sharp Edge: Any edge that a conductor or cable passes over or has risk of coming into contact with that can be determined to provide risk of abrasion and laceration of the conductor sheath or the conductor/cable assembly.

Moving assembly: Any mechanical action in or on a machine or electrical installation where the cable or conductors will move, either through regular machine operation, or occasional maintenance action (such as opening a panel door)

Clearance: A distance that is determined to be safe in proximity to a sharp edge, or moving assembly

Spiral Wrap: Spiral type wrap designed to be wrapped around a cable assembly or group of conductors, in order to create a singular assembly that will move uniformly throughout the movement and provide a degree of protection.

Braided Cable sleeve (Snake Skin): Braided cable sleeve designed to slide over a cable assembly or group of conductors, in order to create a singular assembly that will move uniformly throughout the movement and provide a high level of abrasion protection.

Conduit: Any approved tubing or pipe assembly designed to pass cables or conductors through in order to organize, route or provide mechanical protection to cables and conductors.

Definitions continued:

Grommet: A mechanical protection device, either in strip form, or hole form, that is designed to protect the cable or conductor from mechanical damage when passing over or near a sharp edge.

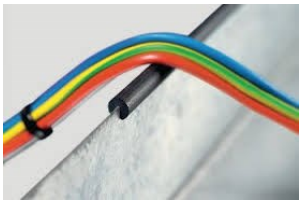
Cable / Conductor: A cable is defined as an assembly of conductors within a sheathed assembly, a conductor is defined as a singular conductor not grouped in an assembly.

Scope / Process:

Fixed Sharp Edges:

When passing a stationary cable or conductor over or near a fixed (non moving) edge, do your best to grind or file that edge so that it is smooth and not sharp. Examples include but not limited to, ladder tray, duct dividers, internal panel components, internal transformer edges, machine edges, etc. The test is typically that if you can pass your finger over it without any perception of sharpness, that it is safe for a cable (take care when doing this). If the edge cannot be filed or ground to a smooth edge, do you best to route the cable or conductors away from the edge. If that cannot be accomplished, utilize the below techniques:

Edge grommet: Install edge grommeting to the sharp edge. Ensure the grommeting will stay stationary and not fall off, either with adhesive or mechanical means (zip ties or fasteners).



Cable Wrap: Utilize Braided Cable Sleeve to protect the cable/conductors from the sharp edge. Note, avoid spiral wrap in this case as it has gaps that may become exposed.

Conduit: Utilize a conduit system to pass cables or conductors through the area with sharp edges. This technique would mainly be used when there is a longer than normal hazard area that cables or conductors would have to be pulled through the area with sharp edges during installation, not a singular edge.

Holes:

When passing cables through a hole through a material that creates a sharp edge, regardless of the sharpness of the hole, always employ the below methods to protect cables and conductors.

Hole Grommet: Use a purpose built hole grommet. Always be sure the hole size is correct and that the grommet fits properly without risk if falling out. Grommets cab be the snap in plastic type or rubberized type

Edge Grommet: If the hole is larger or a differing size, edge grommet can be used to 'wrap' around the holes internal diameter. Be sure to affix this with adhesive or zip ties (through small drilled holes along the grommet edge, in order to prevent it from falling off.

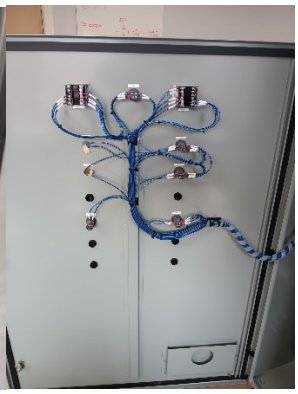
Moving Areas:

When routing cables or conductors through a moving plane, be sure the cables can move safely without putting strain on the assembly and exposing it to abrasion from nearby edges. Examples of this are:

Panel doors: When routing cables and conductors to panel doors for device wiring, be sure to observe the following.

-If it is a cable assembly or group of cables that has a large degree of mechanical protection built in, such as LF, Provo, Industrial Ethernet cable, then cable wrap is not required.

-If it is a group of individual conductors, always employ a cable wrap system, such as braided snake skin or spiral wrap.



Machine movements: When routing cables through a machine movement area such as tooling or robot End of Arm Tooling, always be aware of risk of abrasion, and also be aware of bundling the cables, conductors together, so they are moving together. Nowhere in the movement should it put undue stress on the cable/conductors. *This is a very specialized skill and the lead electrician, should always be part of the conversation when determining these methods.

*Snake Skin – Do not install zip ties on the snake skin in the middle of its run, as cables/conductors are meant to move freely through the braid.

*NOTE: The scope of this document does not specifically cover flexing cable requirements, only protection against mechanical damage.

Supporting Documents / Rules:

CEC Rule 12-3034

CEC Rule 12-3010

CEC Rule 12-3022

CEC Rule 2-024

Specialized Equipment Needed:

N/A

PPE Needed:

Standard worksite PPE per the requirements of the worksite

Face shield when grinding or cutting

Safety Precautions

Take Precautions when grinding down sharp edges as to not spray grinding dust onto sensitive equipment. Always wear your face shield when performing any grinding or cutting with a power tool.

Comments

We realize that every job will present challenges when it comes to protecting cables, that may go beyond the scope of this document. Be sure to discuss with team members to ensure consistency is achieved across the job when it comes to cable protection.