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Recommended Citation

Goergen, Joel; Potterf, Jason; Jones, Chad; and Zimmerman, George, "RAPID CABLE BUNDLE SIZE INSPECTION OF POWER OVER ETHERNET BASED COMMUNICATIONS CABLING", Technical Disclosure Commons, (April 19, 2019)
https://www.tdcommons.org/dpubs_series/2149



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RAPID CABLE BUNDLE SIZE INSPECTION OF POWER OVER ETHERNET BASED COMMUNICATIONS CABLING

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ABSTRACT

Techniques are described herein to allow a user (e.g., installer, electrician, inspector, etc.) to use a tie for a particular gauge wire system to tie the bundle together. A set of markers on the tie may indicate the number of wires that are in the bundle. If the viewing window exceeds the marked bundle size, then the bundle grouping is too large and the wire count must be reduced.

DETAILED DESCRIPTION

Recent National Electrical Code (NEC) regulations have impacted traditional category cable deployments used for Power over Ethernet (PoE), including altering the rules for bundle sizing. For example, table 725.144, published in NEC 70, defines the allowable ampacity as a function of bundle size. An example cable is a 24 American Wire Gauge (AWG) Category (Cat) 5 wire.

Inspectors and installers do not want to count cables inside a given bundle. Instead, they want a simple method to determine the maximum bundle size for a gauge of wire. Accordingly, techniques are described herein which solve this problem with simple modifications to already-available commodity devices, thereby ensuring a low-cost solution. These techniques enable easy identification of the current number of cables allowed in cabling a bundle of a specific cable wire gauge. They may, for example, allow for accurate determination of the bundle size required by table 725.144.

Figure 1 below illustrates an example cable diameter and bundle measurement scale presented herein. The scale may use any flexible resin with marking on both sides for left- and right-handed inspectors. The markings may be adjusted based on the available cable diameters.

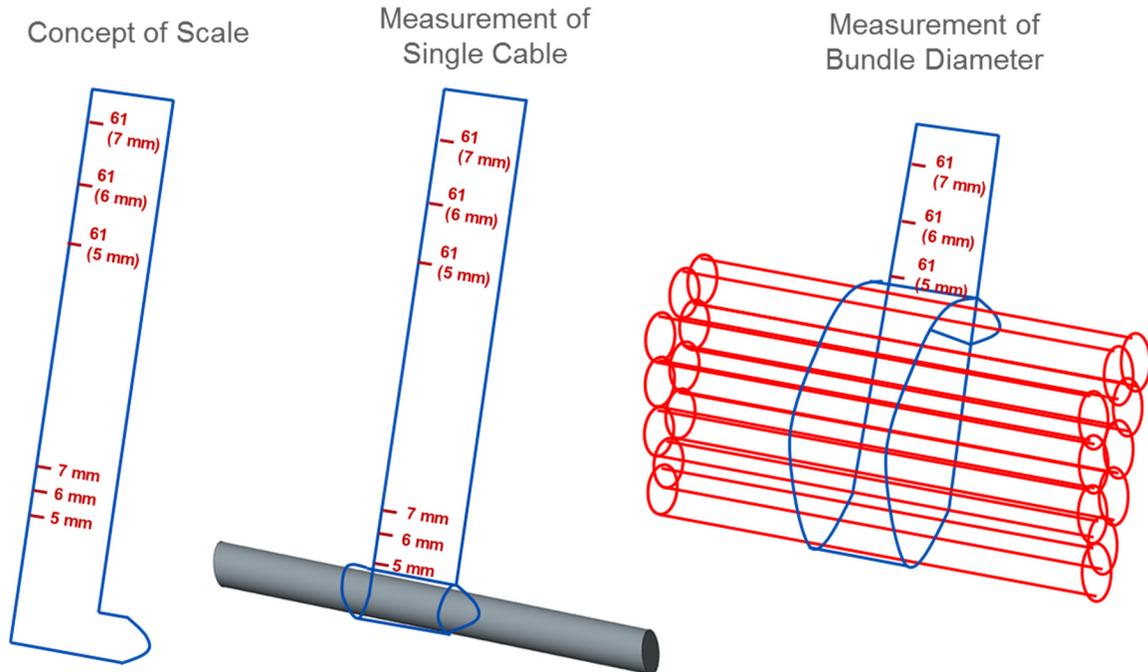


Figure 1

At least two mechanisms are further provided for determining the maximum bundle size for a gauge of wire. The first mechanism involves permanently attaching a cable tie or hook-and-loop strap with marker points thereon such that when the tie is wrapped around the cable bundle, there are several marking points that indicate the bundle count. The markings may be based on pre-devised marker points corresponding to the radius of required bundle sizes as specified in table 725.144.

An installer or electrician may use the tie, strap, or other device to tie the bundle together. A set of markers on the tie or device indicates the number of wires in the bundle. If the viewing window or device indicator exceeds the marked bundle size, the bundle grouping is too large and the wire count must be reduced to meet the requirements of NEC 70.

One example of the first mechanism is a tie which serves to restrain cabling into a bundle. The tie may correspond to only a single gauge type or to multiple gauge types, with markings at each critical circumference to indicate the number of cables in a given bundle. The tie/label may be color coded and/or use a uniform symbol(s) to provide information to the inspector.

Figure 2 below illustrates example cable ties for multiple bundle sizes. In this example, each mark is labeled with a given bundle range. The different bundle size markings are based on cable diameter. The cable ties have the same color but may have different part numbers based on cable diameter. The markings may be visible to an inspector after locking the cable tie in position to help verify the bundle size after the cable diameter is measured.

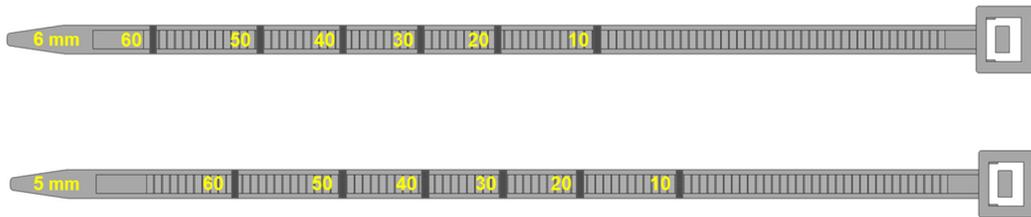


Figure 2

Figure 3 below illustrates alternative example cable ties for multiple bundle sizes. Here, the cable ties have the different colors, which may be standardized based on cable diameter. The markings may be visible to an inspector after locking the cable tie in position to help verify the color and bundle size.

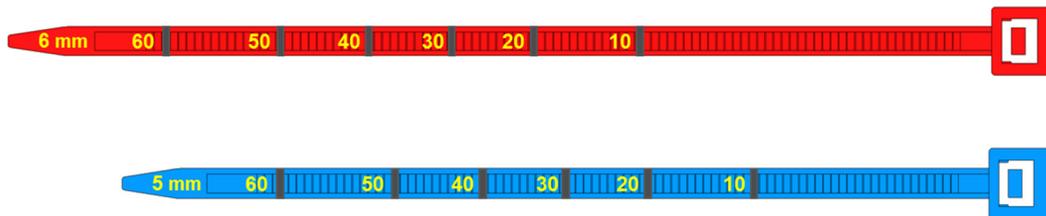


Figure 3

The second mechanism for determining the maximum bundle size for a gauge of wire is an inspection tool carried by a user. Examples include full circumference and diameter gauges. In either case, there may be multiple sizes per gauge type with markings at each critical circumference. There may also be multiple gauges per size, with each gauge color coded and using uniform symbols. The cables may be designed to be held together as a set. In another example, a single cable diameter measurement device may have the same structure, but scaled down to a single cable.

Figure 4 below illustrates example hand tools for inspection. As shown, different attachments may be provided for various diameters.

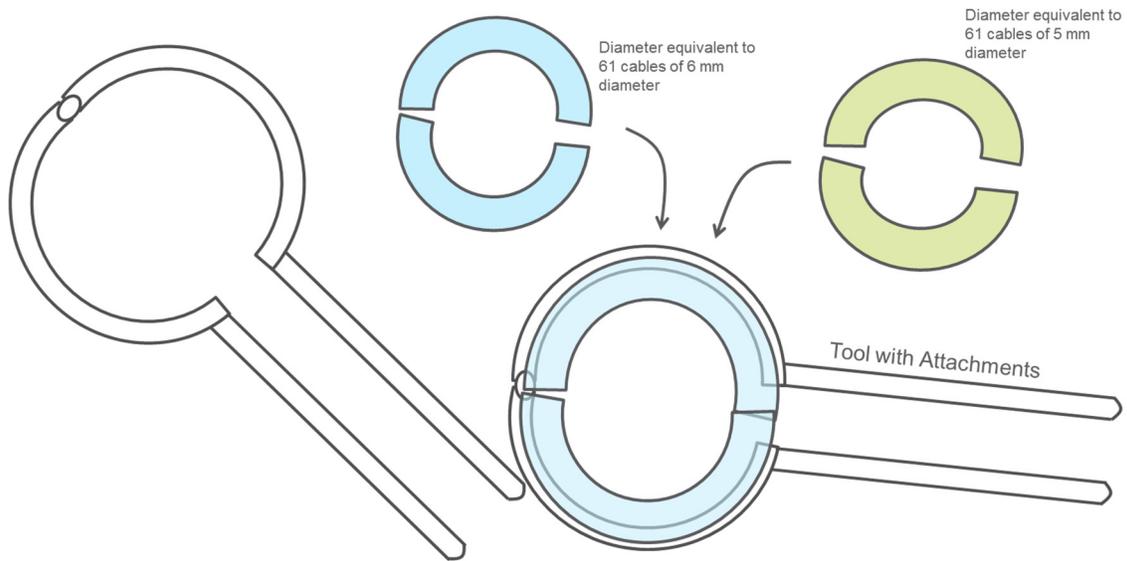


Figure 4

Figure 5 below illustrates an example foldable bundle diameter tool. The foldable nature of the tool may improve its convenience of transportation. Furthermore, various diameter attachments may be designed to adjust the tool for multiple diameter options. The attachments may also be foldable.

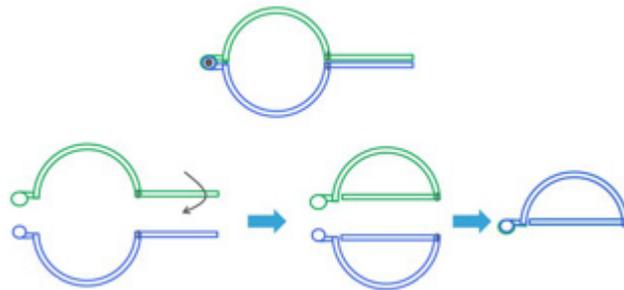


Figure 5

Figure 6 below illustrates an example tamper-proof label which serves as an indicator that the bundle has been certified. Cables cannot be added to the bundle without tampering with the label, once applied on the bundle. The inspector may apply the tamper-proof label on the cable bundle after verification and hence may avoid measurements every time a subsequent inspection is performed. The inspector may inspect the label for evidence of tampering, and if there is none, the bundle may be approved. Label dimensions may be customized for different bundle sizes.

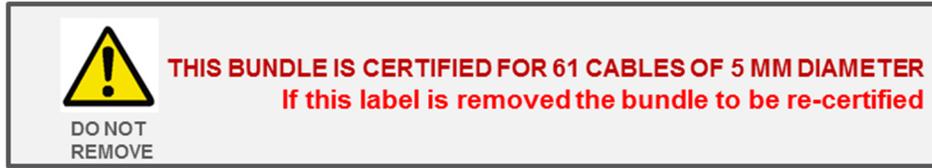


Figure 6

In one example, a table may be provided to indicate a conversion between a bundle size for common cable types and cable bundle diameter. There may be several examples for a permanent cable diameter indicator. In one example, existing cable ties (e.g., plastic, hook-and-loop, etc.) may be re-used with measurement indicators. In another example, self-adhesive labels with diameter markers may be employed. There may be one label/tie per diameter, or a single tie with multiple indicators. There may also be various implementations of the cable bundle diameter measurement tool for quickly measuring cable bundles.

Techniques described herein may enable an inspector to locate labels or cable ties on cable bundles and quickly approve the bundle sizing. Furthermore, an inspector may carry a set of tools including a first tool for determining a single cable size range and a second tool that corresponds to that single cable diameter and shows the allowable bundle size(s) for that cable.

In summary, techniques are described herein to allow a user to use a tie for a particular gauge wire system to tie the bundle together. A set of markers on the tie may indicate the number of wires that are in the bundle. If the viewing window exceeds the marked bundle size, then the bundle grouping is too large and the wire count must be reduced.