Three Things To Look for When Purchasing Wire

Cerro Wire

Just as two cars may be of vastly different quality even though both have one steering wheel and four tires, not all wire is exactly the same, even though it appears to be on the outside. Those purchasing building wire should be aware that wire manufactured “on the cheap” may come in the same sizes as high quality wire, and may nominally meet the same UL standards, but that does not mean it will perform as well as better quality wire. To ensure that wire you buy can be easily installed and get the job done, look for three key factors that signal high quality wire: the wire is produced using length control techniques to make sure you get what you paid for; insulation is applied using co-extrusion; and wire is inspected with quality control equipment that measures dimensional control, detects defects, and tests for PVC insulation integrity.

Length control

The first factor to look for begins with asking this question – are you getting exactly what you are paying for in your building wire? If wire you purchase is manufactured using length control, this is a question you can actually answer. When wire contains an accurate footage mark, it allows for quick identification of the re-order point, guaranteeing the full purchased wire length and reducing random lengths. This better controls end-of-reel scrap, prevents the need to carry excess cable inventory, providing precision length, accurate footage, and cost control.

For example, Cerrowire’s True Sequential Footage™ uses a footage mark to document remaining wire, beginning with zero at the bottom of the reel and ending with the finished length at the top. The accurate footage mark allows for quick identification of the re-order point, guaranteeing the full purchased wire length and reducing random lengths. This better controls end-of-reel scrap.

Cerrowire is the only wire manufacturer with a footage guarantee; footages on Cerrowire’s standard reels are guaranteed to be within +/-0.5 percent of the tagged footage. If the footage falls below that range, Cerrowire credits the customer for the amount of the product that is short or replaces the length of wire that is short. In addition, Cerrowire also reimburses the customer for reasonable, direct, out-of-pocket labor costs incurred as a result of the shortage,

Tandem extrusion versus co-extrusion

One of the key features of quality wire is insulation/jacketing that is smooth and consistent. There are two main methods for applying multiple layers of insulation/jacketingto wire: tandem extrusion and co-extrusion. With tandem extrusion, insulation/jacketing layers (for example, PVC/nylon) are put on one at a time and the finished product is placed in a cooling bath. With co-extrusion, the two layers are applied simultaneously. This gives an advantage in diameter control. The

PVC and nylon layers adhere to each other much better and when the product is cooled and finished, as it bends, the two layers bend together better.

With tandem extrusion, the PVC and nylon layers tend to separate from each other, especially in colder weather. The nylon can crack and fall off, so the wire might lose the resistance to gasoline and oil added by nylon. The product is said to “horse-collar,” a term that refers to the ripples that form along the inside of the tight circle when wire is bent. When wire horse-collars, the ripples may rip right off as the wire goes around a corner if it is tight in a conduit, exposing copper. In the process of installation, you lose the physical protection of the nylon layer and the insulation function of the PVC layer.

Use of co-extrusion rather than tandem extrusion to apply the PVC insulation and nylon jacket ensures a tight, yet flexible, nylon jacket that will not horse-collar or wrinkle and hang up or tear during installation. Even as the wire is cornering, the cable remains smooth and the two layers stay together. The method results in more consistent properties and a more durable product, far less susceptible to brittleness at low temperatures and stress cracking, which is prevalent with tandem extrusion. Although the end product may look similar, the co-extruded insulation will have better abrasion resistance, and the nylon jacket will be more likely to remain intact. The co-extruded jacket will be tighter, and the nylon will adhere better to the PVC.

Issues associated with faulty installation can lead to aborted installation if severe. The wire may have to be pulled out, causing loss of time and delay to construction schedules. If installed, it might be rejected by the owner on a job. If really acute, it could lead to damage to the PVC layer, failure of dielectric and a wire shorting out. In most cases, installers spot torn away nylon at the leading end, where the wire comes out of the conduit during installation, and the job is stopped while the wire is pulled out.

The need to eliminate horse-collaring, wrinkling, and its attendant installation problems, along with elimination of low temperature brittleness, were of sufficient gravity that Cerrowire began converting line by line to co-extrusion a few years ago. While a significant expense, the process has resulted in a better product, as well as eliminated a leading cause of customer service call and returns. This in turn has reduced labor costs and the need to reimburse customers when installation is affected. Issues with torn nylon have dwindled tremendously, and low-temperature cracking is virtually non-existent.

Equipment and testing – watch out for dimensional control, spot defect detection, and high voltage testing for PVC insulation integrity

The third tip centers on ensuring that wire you buy makes use of quality control and inspection technology. First up is ensuring dimensional control of PVC and nylon wall thickness. If the wire does not have adequate wall thickness, it may be subject to the chance of insulation penetration, which could cause a failure. Also, the wire’s dialectic strength is automatically reduced by reducing the thickness; there is more protection with adequate wall thickness.

To ensure dimensional control, the wire should be manufactured using a laser micrometer to monitor the wall thickness of the PVC insulation and nylon jacket as it is being extruded onto the wire and microprocessors control the process to insure that every foot of wire has the correct thickness of PVC and nylon. Laser micrometers are extremely effective in maintaining a consistent wall thickness.

A variation of the laser micrometer can also be used to include spot defect detection. The same sensors, processing the information differently, can spot defects and eliminate them before they could become a problem during installation.The sensors are like multiple curtains of light,crisscrossing the wire from different angles, taking thousands of samples per second over many feet of wire. Measuring the average wall thickness by how much light is blocked out, the computer microprocessor processes this data to calculate and compare with pre-set wall thicknesses. It also uses information from the same sensors to locate any instantaneous change in wall thickness, using other software to spot defects like high or low spots, or bumps.

The wire machine can be programmed to reject the spot. (In fact, the defect may or may not cause a failure, but installers pulling wire who see a deformity have to assume the wire would result in a probable failure, stop the installation, pull out all the wire and reinstall, leading to a great deal of lost installation time.)

When the laser results in a lot of rejections, operators can stop and take action to prevent further defects and correct the problem. The laser micrometer therefore prevents bad wire from going out, helps diagnose and correct problems, and results in an extremely high quality level.

Another manufacturing step that improves wire quality is conducting a high voltage test to ensure there are no defects in the insulation.Copper conductor being insulated is grounded at the beginning of the process coming off a reel or coil. After the insulation is applied, it goes through a “bead chain” curtain, which is energized to test a voltage, from 7.5 kilovolts for smaller sizes to 15000 volts for larger sizes. If there is a hole or weak spot in the insulation, as that section goes through the bead chain, the potential on the bead chain will arc out to the grounded wire inside. When this occurs, it sets off a visible and audible alarm and also ejects the package to one side as having a defect. In some cases, the operator manually rejects the section and sends it off to be reworked (the defect area is cut out) or scrapped.

Quality manufacturing techniques will lead to quality wire

In short, within the general category of wire that complies with UL specifications, there is wire that barely meets the specification and wire that is well above it. And this definitely relates back to the performance of the cable in field.

The key is to have excellent control of manufacturing processes so there is not a great deal of variation. When selecting wire for your next building project, look for some of the extra product benefits and quality measures taken during the manufacturing process. Asking questions on the three key factors that establish that wire was manufactured correctly will prevent problems from happening during

installation and end up saving you money.

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