Networks accept shearbolt connectors

With old imperial network cables having to be repaired or connected to new metric cables, getting compression joints right has been fraught with risk and prone to failure.

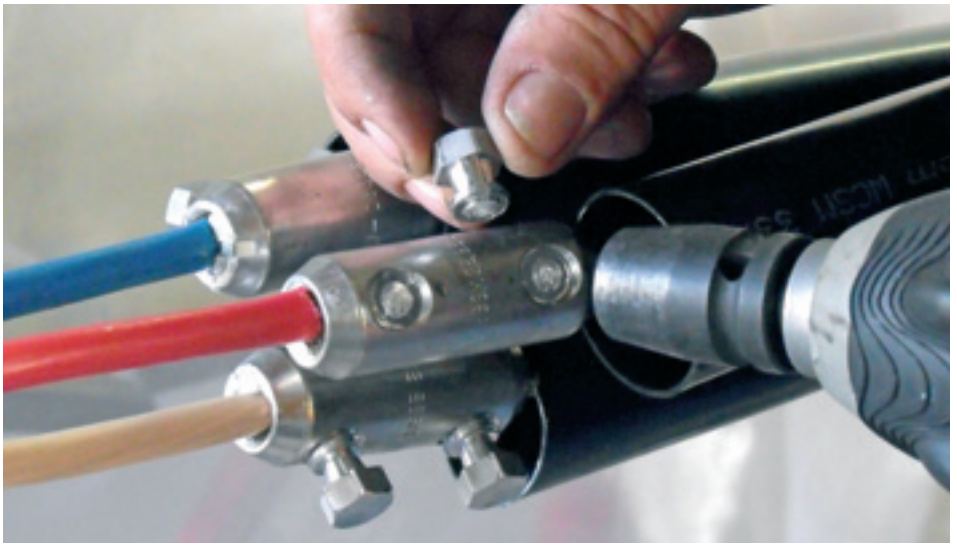
When shearbolt mechanical connectors debuted on the New Zealand power scene back in late 90's they offered a promising new alternative to the traditional compression jointing method but had yet to be accepted by the industry.

"Now, after several years of successful use in the field, Tyco Electronics' shearbolt mechanical connectors have established themselves as a more reliable way to address conductor compatibility and joint quality issues," says Leslie Oelofse, general manager for distributor Cuthbert Stewart's electrical utilities and transmission division.

"Electrical distribution is a risk averse business and when it fails or goes wrong there is no place to hide," says Oelofse. "With any new technology comes risk, but in the case of the Tyco Electronics' shearbolt technology the change was simple: it reduces the risk of incorrect installation, removes the product selection error element and provides an automatic quality assurance program by delivering a consistent result every time."

The key is the product's flexibility to accommodate a range of cables. Each Tyco Electronics shearbolt connector can take a range of conductor sizes and composition so you can always have the 'best fit' connector in your kit, says Oelofse. Their design and construction also makes them suitable for bi-metal applications eliminating the need for custom machined bi-metal connectors and lugs which vastly reduces lead-times.

CSL's Leslie Oelofse (left) and Orion Networks technical engineer Anthony O'Donnell discuss the finer details of a shearbolt connector Tyco Electronics designed specifically for Orion



Made of a high-tensile, tin-plated aluminium alloy Tyco Electronics shearbolts are engineered to shear at the correct torque regardless of the cable size or composition

Consistency

It was this feature, in particular, that drove lines company Powerco to be an early adopter of the shearbolt technology on its high voltage lines.

"We found it difficult to get consistent results with conventional compression joints," says Powerco asset specialist Peter Chappell. "It is the shearbolt's 'range taking' ability that sets it apart, and many of our contractors have now developed a preference for the technology."

Oelofse says that Tyco shearbolt connectors, lugs and repair sleeves have been engineered to remove the risks associated with conventional compression connectors. The result is simpler decisions and a lot easier, quicker and safer jointing. The pressure is off when it comes to getting it right because the Tyco Electronics design makes it virtually impossible to get cable jointing wrong.

"The biggest problem shearbolts have overcome on our networks," says Chappell, "is the guesswork associated with replacing imperial with metric cables. Shearbolt connectors simplify this process because you needn't measure the cross section."

Whatever the cable size, metal, insulation type or cross section, says Oelofse, Cuthbert Stewart (CSL) has a Tyco Electronics patented shearbolt solution that will centre any conductor and connect it to any other conductor type within the connector's size range.

Reliability

Tyco Electronics' shearbolt connectors provide superior electrical performance when compared with a compression connector, says Oelofse, particularly under fault conditions.

"They've been tested to the highest mechanical and electrical level (class A) under

IEC 61238-1. Traditional HEX connectors used in New Zealand will not perform to this standard."

Canterbury-based Orion Networks first implemented shearbolt connectors over eight years ago to boost reliability. All of Orion's 33kV joints are now made with shearbolts and they are implementing their use on 11kV conductors, says technical engineer Anthony O'Donnell.

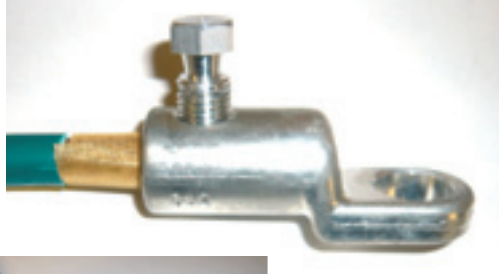
"Shearbolts provide the best termination and eliminate human error from the process. It's notoriously difficult to judge whether a cable is metric or imperial, but because shearbolts operate within a size range you can't get it wrong.

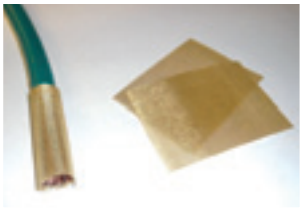
"And our contractors love the reduced inventory. You can cover all conductor sizes from 25mm² to 400mm² with as few as three connectors."

As well as removing the risk and stress from the decision making process, Orion was attracted to numerous other benefits shearbolts offer, says O'Donnell.

"You can't over-tighten them; retrofitting times are shorter; and smaller equipment makes the job easier – you can actually hold the tool in your hand, as opposed to the large presses necessary with compression joints. As well as the handy holding tool, Orion contractors use the CSL-supplied cordless impact wrenches for even faster terminations.

"There is also no growth in the cable length when you fit shearbolt lugs, unlike with compression lugs. This is particularly important when terminating to switchgear as it reduces mechanical stresses applied to bushings and terminal plates."





Brass gauze ensures the integrity of conductors by protecting the fine copper strands used in flexible and multi stranded cables

CSL's universal holding tool (IT 000020) grips the shear bolt connector making jointing easy and safe

Engineered solution

To complete a perfect compression joint requires the right combination of cable assessment, equipment and crimping technique – all providing plenty of opportunity for something to go wrong.

Tyco Electronics' shearbolt connectors overcome these risks by removing them from the equation, says Oelofse. The range taking capability along with the precise predetermined shearing of the bolts guarantee an optimal mechanical joint at the correct compression.

"The bolt heads are engineered to shear below flush with the connector when tightened to the correct torque, so the contact force is always correct regardless of how much muscle you have applied."

The bolt is designed with a single hexagonal double shear head, not a combination hexagonal head and allen-key socket which means only one tool is required. This simplifies the installation and eliminates another potential area for error.

Made of a high-tensile, tin-plated aluminium alloy, these mechanical connectors have internal surfaces which are grooved to penetrate the oxide film on the conductor and achieve a high electrical performance. Alloy inserts are used to position smaller conductors in the centre of the connector. This centring minimises electrical stresses over the ends of the connectors and the chamfered edges allow good adhesive bonding.

Also made of a special aluminium alloy are the contact bolts. These bolts are treated with a lubricating agent, which reduces friction during tightening and converts torque into contact force for maximum effect. A special contact ring tip is provided to ensure a more effective connection.

The unique design of the connectors also makes them a perfect solution for general electrical contractors, says Oelofse.

"They eliminate the need for specialist compression tooling as well as custom machined bi-metals which saves time and money. Many leading electrical wholesalers are now stocking the range which provides an off-the-shelf solution to most jointing and cable connection applications."

Back up and training

CSL has led the charge in distributing shearbolt connectors in New Zealand and offers strong technical support and on-site training, says Oelofse.

"Our team of experienced technical advisors provide one-on-one on-site training fully supported by Tyco Electronics, a world leader in manufacturing cable jointing and termination products and equipment.

"The successful uptake of Tyco Electronics shearbolt connectors is now having a positive impact on what we put into the Raychem low voltage jointing kits. The package now includes the shearbolt product complete with instruction sheets and a built in quality assurance check sheet to assist network managers with their ongoing program to strengthen their networks and to provide contractors with a hassle-free installation." ■

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