Product BULLETIN
Wire Rope Corporation of America

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XLT^4 – Design Factor on Mobile Cranes

XLT^4 is designed to be used with a design factor as low as 3.5 on mobile cranes. ASME B30.5, *Mobile and Locomotive Cranes*, has a required design factor for live or running ropes on mobile or locomotive cranes of 3.5 and a more restrictive design factor of 5.0 for rotation-resistant ropes used in the same application. Parts of sections 5-1.7.1(a)(1), 5-1.7.1(c) and 5-0.2.2 are shown below for reference:

> 5-1.7.1(a)(1) the design factor for live or running ropes that wind on drums or travel over sheaves shall not be less than 3.5…
>
> 5-1.7.1(c) Rotation resistant ropes shall have a design factor of 5 or greater…
>
> 5-0.2.2 …*rotation resistant rope*: a wire rope consisting of an inner layer of strand laid in one direction covered by a layer of strand laid in the opposite direction…

One reason that XLT^4 can be used with design factors of 3.5 is that it is not a rotation-resistant rope per the definition given in ASME B30.5 5-0.2.2. It does not have multiple layers of strands laid in opposite directions. It is also important to understand why rotation-resistant ropes have different design factor requirements and even different broken wire removal criteria.

Tests were conducted by the industry years ago to evaluate rope removal criteria. These tests had some rotation-resistant ropes failing before the then existing removal criteria was met. As a result, standards were changed to require rotation-resistant ropes to have a higher minimum design factor and more restrictive broken wire removal criteria.

A rotation-resistant rope uses the opposite lay direction of outer and inner strands to reduce torque in the rope. The opposite lay direction of the strand layers produces a different contact pattern between the strand layers than is found in a standard rope. Also, if the rotation-resistant rope rotates under load, the inner strands take more of the load and the outer strands less. This reduces the ultimate strength of the rope and causes internal wear. Both of these can result in internal rope deterioration that is more difficult to detect in a visual inspection. These are factors that contributed to the change in the design factor and removal criteria for rotation-resistant rope. These factors are the result of two layers of strands closed in the opposite direction – and XLT^4 does not have this.

The low-torque characteristic of XLT^4 is more than just being a 4-strand rope. It is the result of a designed balance between rope lay and strand lay. There are not layers of strands creating opposing torque. All 4 strands are on the outside of the rope and visible for inspection. XLT^4 does not have the disadvantages created by multiple strand layers laid in opposite directions.