



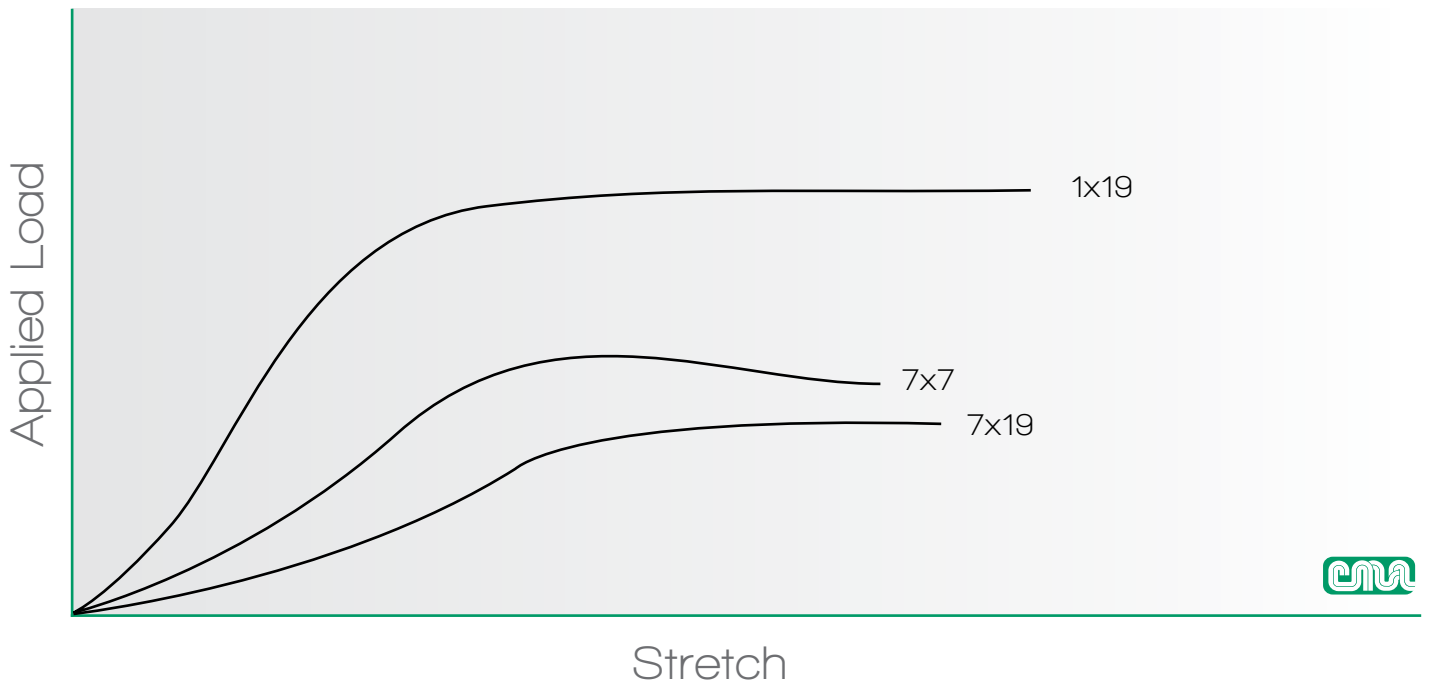
CONSTRUCTIONAL STRETCH AND ELASTIC STRETCH: DO THEY ALTER YOUR CABLE DESIGN?

Cable/Wire Rope

Wire rope stretches or elongates under load. As the tension increases, the stretch in the wire rope increases as well.

Two types of stretch occur in wire rope:

- Constructional Stretch
- Elastic Stretch



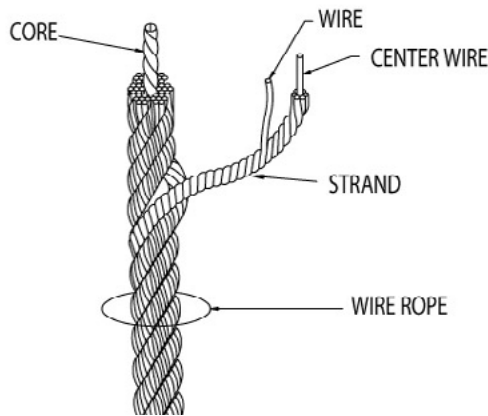


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What is Constructional Stretch?

Wire rope is comprised of various constructions, each containing a unique configuration of strands helically-laid around a core.

Cable/Wire Rope Construction



Cross-Sections for 7x19 Construction



Cable cross-sections, the gaps between individual wires and strands, are compressed when tension is applied. The constriction causes the core and rope elements to move closer together, which elongates the cable to a certain extent. As load is applied and the space between wires and strands closes, constructional stretch of the rope lay occurs.

The degree of constructional stretch depends on multiple factors, such as the lay length, rope construction, diameter and cable bends. In an application where the same amount of tension is applied, cables with more wires typically experience greater stretch than constructions with less wires.

After the initial load is applied and stretch occurs, the wire rope has a slightly decreased diameter and an increase in length. The change in the wire rope is permanent.



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What is Elastic Stretch?

Unlike constructional stretch, elastic stretch is quantifiable. It is the stretching of the actual wire material when load is applied.

$$\text{Elastic stretch (mm)} = \frac{W \times L}{E \times A}$$

where:

W = Applied load (kN)

L = Cable length (mm)

E = Strand modulus (kN/mm²)

$$A = \text{Area of cable} = \frac{D^2 \times \pi}{4}$$

where D = Nominal diameter of cable (mm)

The individual wires of a cable construction are physically elongated under tension, with the total stretch proportionate to the load applied. Elastic stretch is accurately calculated using the formula above, unless the yield point of the cable is exceeded. Once the load is released, the wire material recovers its original length.





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Constructional Stretch vs. Elastic Stretch: Can It Be Removed?

Designers must consider if the inherent stretching nature of wire rope under tension is of concern for their specific application. In the majority of applications, constructional stretch and elastic stretch are not an issue.

Cable/Wire Rope Construction

- Shrinking of space between wires and strands in cable wire when load is applied
- Rope lay is lengthened
- Permanently elongated
- Can it be removed? Yes

Cross-Sections for 7x19 Construction

- Wire material itself is elongated under tension
- Rope returns to original length once the load is released
- Temporarily stretched
- Can it be removed? No

While elastic stretch cannot be removed, options exist to minimize or remove constructional stretch. As wire rope adjusts under load, constructional stretch is typically a very small percentage of the total length of the rope. Cable elongation may only equal .0025 up to .01 times the length of the rope under load. If the load is light, for example, the total constructional stretch will be closer to one-quarter percent or less.

If close tolerances are required for a specific application, constructional stretch of wire rope can be addressed with:

- preloading (also known as pre-stretching)
- changing the wire rope diameter
- increasing the safety factor

If the appropriate cable construction and diameter have been selected, the majority of applications are not negatively impacted by stretch. Many cables are also designed with a safety factor greater than the working load. For example, a wire rope with a strength of 5,000 pounds may be used with a total working load of 2,500 pounds, which means that the cable is operating with a safety factor of 2. If constructional stretch in the wire rope is of concern, safety factors can be increased.



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To achieve uniform elasticity, wire rope can also be pre-stretched. The process applies load to the wire rope prior to installation. Preloading removes some of the constructional stretch for greater predictability once the wire is in use.

Contact CMA With Questions

Starting with the right cable design is imperative to a successful application. If cable stretching is a concern for your project, we can help. The experts at CMA determine the appropriate cable design for your application-specific requirements.

[Contact us](#) to speak with an expert on choosing the best cable for your project.

