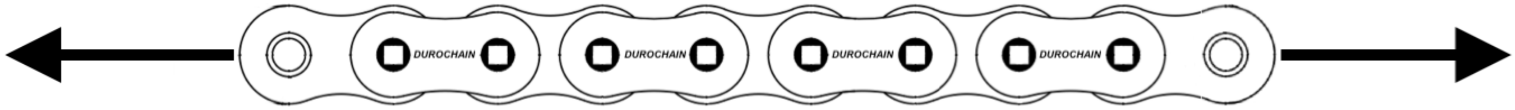
Roller Chain Strengths Explained



When it comes down to engineering an application, the strength of a roller chain is an essential factor when determining the correct size to use. However, there are several important terms when referring to how strong a roller chain is, and it is imperative to distinguish the two.

Roller Chain Strength Terms:

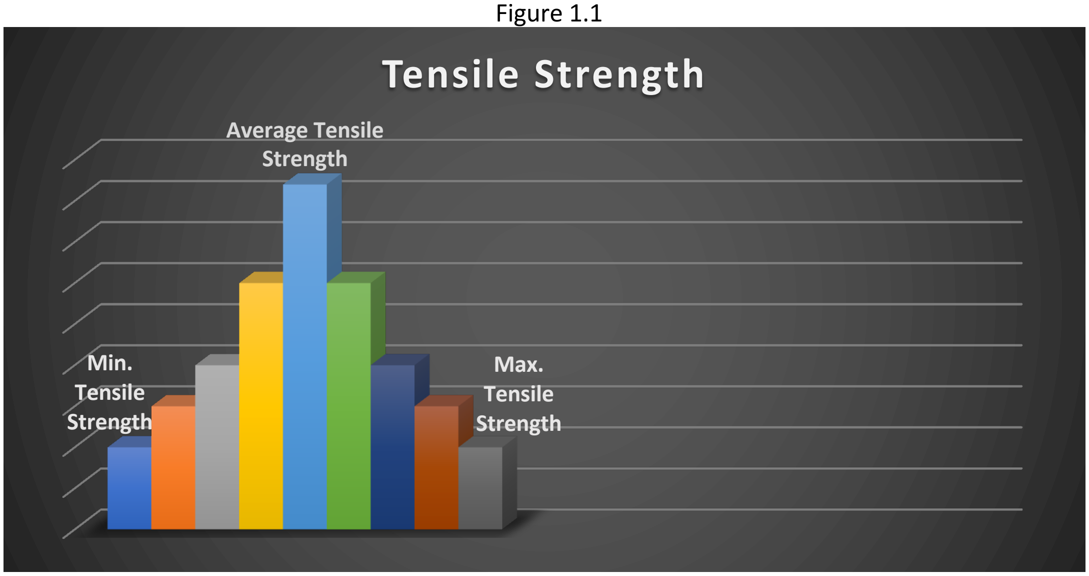
- Tensile Strength
- Working Load

Tensile Strength:

Tensile strength is defined by the amount of force required for a chain to fail. However, three different sub-terms/ measurements are taken when testing for tensile strength. The below chart shows a visual figure of the three different benchmark measurements.

- **Minimum Tensile Strength** – This is the lowest amount of force taken to break a given chain out of a series of tensile tests conducted on a particular size of roller chain, there are typically multiple amounts of tests done per run on each size to ensure this measurement is applicable.
- **Average Tensile Strength –** This is the median amount of force taken to break a given chain out of a series of tensile tests conducted on a particular size of roller chain.
- **Maximum Tensile Strength –** This is the highest amount of force taken to break a given chain out of a series of tensile tests conducted on a particular size of roller chain.

Figure 1.1



Working Load:

The definition of a roller chain working load is the amount of linear pull exerted on a chain by a drive. This load measurement is calculated using different formulas and with a safety factor of 70% of the tensile strength. Since a working load is what the specific chain size is designed to operate under through a range of applications, it is imperative to use this load rating when creating a drive.

Working Load / Chain Pull Equations

$$\text{Load / Chain Pull} = \frac{\text{Horsepower to be Transmitted X 33000}}{\text{Speed of Chain (feet/minute)}}$$

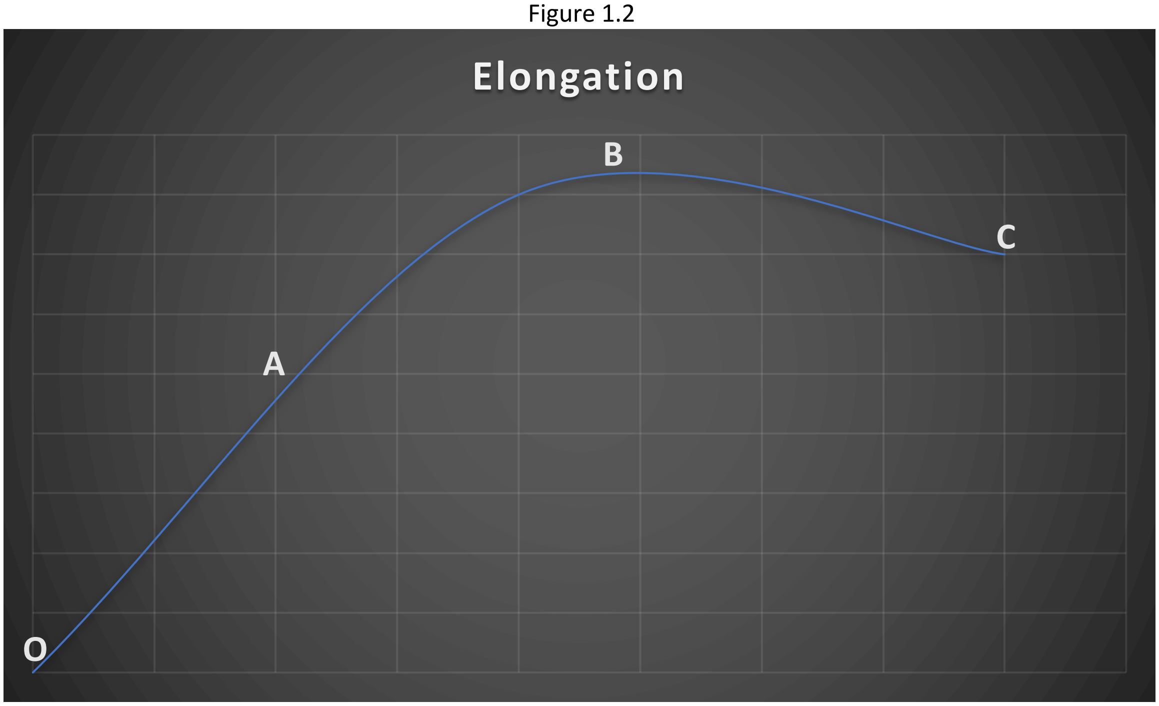
$$\text{Load / Chain Pull} = \frac{\text{Horsepower to be Transmitted X 39600}}{\text{Pitch of chains (inches) X Number of Teeth on Sprocket X Speed of Sprocket (rev/min)}}$$

$$\text{Load / Chain Pull} = \frac{\text{Horsepower to be Transmitted X 126050}}{\text{Pitch Diameter of Sprocket (inches) X Speed of sprocket (rev/min)}}$$

Elongation Chart:

- **Points O – A:** Elastic region
- **Point A:** Limit of proportionality for chains; there is not an obvious declining point, as in mild steel
- **Points A – C:** Plastic deformation
- **Point B:** Maximum tension point
- **Point C:** Actual breakage

Figure 1.2



The above elongation chart visualizes how a roller chain strength is mapped. Point B is the maximum tension point, which is the maximum tensile strength. In some circumstances, point B will happen simultaneously with point C. After several chain breakings, a tensile strength graph can be formed to show normal distribution (figure 1.1).

Something important to note about tensile strengths is that most manufacturers, from a marketing standpoint, will showcase their maximum tensile strength; here at DUROCHAIN, we only publish our minimum breaking load (min. tensile strength).

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