



Rod Elongation

Rod elongation is a critical performance criteria.

Rod stretch is calculated per [AC391 3.2.1.1](#) which states:

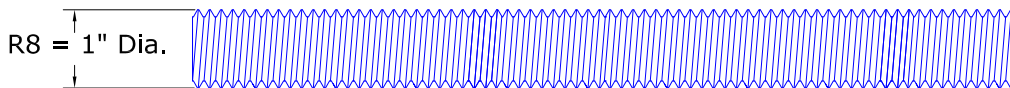
$$\Delta Rod = PL/AnE \quad (Eq. 1)$$

$$An \text{ (Area net)} = 0.7854 (D-0.9743/n)^2 \quad (Eq.2)$$

where: P=Load, L=length (between reaction points) ,
D = rod dia, n = threads per inch, E = elastic modulus = 29,000,000.

Example 1: A 120" length of R8A307 (1" dia., A307) at 17,671 lbs. stretches (elongates) 0.121"
Note: the area of continuous threaded (or reduced diameter) rod is significantly less than full diameter (FD) rod.

Example 2: A 120" length of R8C1045 (1" dia., ASTM A108-C1045) at 32,700 lbs. stretches 0.200" Rod Strength limit is 35,340 pounds)



Reducing Rod Stretch can be done by: 1. upsizing the rod diameter (Best), or 2. changing to a full diameter rod, or 3. by inserting "stretch rod" into the system.

Increasing rod diameter is the most common method of reducing elongation. **Example:** if we upsize the rod from 1" to 1-1/8" rod, elongation drops from 0.121 to 0.096". Increasing rod diameter by one size reduces elongation by 0.025".

Full Diameter Rod

Rod stretch for full diameter rod may use $An = \pi * (\varnothing^2/4)$. If full diameter rod is used equation 2 results are changed to:



A 120" length of R8A307 at 17,671 lbs load stretches 0.093" or an elongation reduction of 0.027

Stretch Rod is larger rod inserted into the system to reduce stretch. Sometimes 1-3/4" rod is inserted into the tensile system to reduce system stretch. We do this often with tall floor heights. Consult Factory.

Automatic Calculations

Rod elongation is one of many calculations used in system design. This work can be tedious and subject to error. To assist you we offer the AutoTight Auto Design package. This package designs the system floor-by-floor and calculates either rod or system elongation in seconds. The program allows you to change rod or bearing plates to reduce elongation. Download the software and instructions for a fast-accurate experience. For some changes, such as adding full diameter rod and "stretch" rod, please call factory.