

# Fatigue-Proof® Steel Bars

## Specifications

Fatigue-Proof® has the high strength properties usually associated only with heat treated steels. It also has excellent machining characteristics, resistance to fatigue and wear, and it minimizes distortion. Fatigue-Proof® is produced from a high manganese, resulfurized, silicon killed steel. The chemical specification for Fatigue-Proof® corresponds to AISI Grade 1144. From this special quality hot roll grade Fatigue-Proof® is made by various combinations of mechanical working and thermal treatment which can include Niagara LaSalle's e.t.d.® (elevated temperature drawn) process. This is a high strength steel bar that eliminates heat treating and secondary operations such as cleaning, straightening, secondary machining and inspections. All this, in combination with free machining and high strength, operates to lower end costs. Fatigue-Proof® can also be induction hardened but should be watched for quench cracks, and, being a resulfurized steel, a magnetic particle inspection operation should be performed after heat treating. Fatigue-Proof® is also electro-magnetically tested using eddy currents and pre-tested for machinability through Niagara LaSalle's unique testing procedure.

### Chemistry\*

Carbon	0.40/0.48%
Manganese	1.35/1.65%
Phosphorus	0.040 Max%
Sulfur	0.24/0.33%
Silicon	0.15/0.35%

\*AISI 1144 heats to be used for Fatigue-Proof® are usually nitrogen treated and contain nitrogen in quantities normally associated with steel produced by the electric furnace process.

### Mechanical Properties

Tensile Strength	140,000 psi (Min)
Yield Strength	125,000 psi (Min)
Machining Characteristics	80% of 1212
Elongation	5% (Min)
Reduction of Area	15% (Min)
Rockwell C Hardness	*30 (Min)
Brinell Hardness	*285 (Min)

\*In the event of disagreement between hardness and tensile strength, the tensile strength will govern.

### Size Range

Rounds	1/4" through 3-1/2"
Hexagons	1/4" through 1-1/2"

### Tolerances\*

Rounds	
1/4" to less than 7/16"	0.004"
7/16" to 1-1/2" incl	0.005"
Over 1-1/2" to 3-1/2" incl	0.006"

\*Tolerances provide for undersize variation only.

### Finish

1. Standard "as-drawn" finish is smooth, accurate, and dark in color.
2. Ground and polished finish provides close tolerances, high accuracies and bright surface. Rounds only.

Hexagons	
1/4" to less than 3/8"	0.004"
3/8" to less than 7/16"	0.005"
7/16" to 1-1/2" incl.	0.006"

**Example of Use** Parts you are now heat treating from Rc 30 to Rc 36.

## Machining

Fatigue-Proof® is definitely a free machining steel. Although it has high tensile strength and hardness properties usually associated only with heat treated steels, it is an excellent machining material. For example, Fatigue-Proof® is rated at 80% of 1212 and will machine about 25% faster than annealed alloy steels and 50% to 100% faster than heat treated steels. With this futuristic bar steel faster speeds, heavier feeds and better tool life are possible compared with materials heat treated to the same strength level. Fatigue-Proof's® fine machining characteristics often have a positive effect on machining costs, product quality, and service life. It turns, forms, broaches, drills, reams, splines, and threads with minimum warpage. Surface finish is excellent.

Normally, this material machines best with as heavy feeds as possible. Fatigue-Proof® will glaze and work harden if the tool is not cutting. Any fortified cutting oil works, although, when threading and tapping is involved, a heavily fortified sulfur-chlorinated oil is suggested. For complete machining specifications, please call and request a copy of Niagara LaSalle's Machining Data Book.

## The Importance of Fatigue Strength in High Strength Parts

Fatigue is one of the most common causes of mechanical failures for metals in service. Since these failures normally originate at points of high stress concentration, perhaps a large percentage could be eliminated by improved design. Unfortunately, it is not possible to design useful parts and at the same time eliminate all points of stress concentration such as notches, holes, threads, change of section and tool marks. It should be noted that the fatigue life of a part is more complex than that of endurance limit. Fatigue-Proof® and e.t.d.® 150® parts, since they rarely require final straightening, normally do not have the unfavorable residual stresses resulting from straightening operations. Fatigue-Proof® and e.t.d.® 150® machine clean and smooth to minimize deep tool marks and tears in fillets and spline roots. Also, Fatigue-Proof® and e.t.d.® 150®'s uniform properties across the bar mean that their strength is maintained even when severe step downs in the finished part are involved.



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