

## **ENGINEERING SPECIFICATION**

Eng. Spec 220010: High-Strength, High Toughness parts from 300-M

Revision: D

DATE: 10/26/14

1. Raw material: 300-M (AMS-6419) round bar, hot-rolled and normalized condition. Metal must be delivered with material certification paperwork.
2. Cut sample coupon from delivered material. Send to certified metal testing lab for chemical certification. Verify compliance with AMS-6419-F. File the documentation.
3. Perform semi-finish machining of part in accordance with part drawings.
4. HEAT TREATMENT PROCESSING:
  - a) Vacuum-austenitize at 1595°F. Stack part in oven so as to minimize distortion. **For long, thin shafts**, hang in oven vertically using wire through small hole at one end of shaft, or by means of hanging fixture provided with parts.
  - b) Pressure-gas quench.
  - c) For splined shafts, check straightness while hot; straighten to 0.002 TIR max on shaft side of splines to at least 1.00" away from splines; 0.010 TIR allowable in areas not closer than 1.00" to splines.
  - d) Snap temper at 300°F for 2 hours, then air-cool to room temperature.
  - e) Temper at 600°F for 2 hours, then air-cool to room temperature.
  - f) Temper AGAIN at 600°F for 2 hours, then air-cool to room temperature.
  - g) Stress-relieve at 350°F for 1 hour; air-cool to room temperature.
  - h) TARGET HARDNESS for optimal strength, ductility and toughness properties is 53 HRc. Inspect all parts to verify final hardness of 52-53 HRc. Hardness checks may be done only on non-critical (low stress) areas of the part.
  - i) Provide certifications which verify processing and testing.
5. After heat treating, finish-machine part to drawing dimensions.
6. After finish-machining, 100% MPI per ASTM-E-1444.

7. If additional fatigue resistance is required, shotpeen according to the following steps:
  - (a) Mask any area of the part to which shotpeening should not be applied (eg. spline teeth, etc.). Masking may be done with metal fixturing or with appropriate high strength tape.
  - (b) Shotpeen part per MIL-S-13165-B with S330 cast steel shot at 0.018-0.020 Allmen-A intensity, 200% coverage.
  
8. If any coatings are applied to the part, the post-coating bake temperature **MUST NOT EXCEED 275°F**.
  
9. Spray parts (inside and outside) with LPS-3 or similar corrosion protectant (**DO NOT use WD-40**); wrap parts in sealed plastic bag for corrosion protection.

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REVISION HISTORY

<u>ID</u>	<u>Date</u>	<u>Description</u>
A	05/23/11	<i>Initial Release.</i>
B	03/31/12	<i>Added snap-temper step from Stack procedure document</i>
C	06/11/13	<i>Added vacuum-austenitize and pressure-gas quench steps per recommendations from Stack Metallurgical. Added straightening instructions.</i>
D	10/26/14	<i>Removed "hold at 350 after quench" instruction; clarified hanging instructions for long shafts; Updated and reworded shotpeening step; Changed coating step to remove specific coating requirement.</i>
E	03/14/15	<i>Changed tempering temp from 585 to 600; Changed allowable runout after straightening from 0.020 to 0.010</i>