

Thanks to to Jan Kochansky for this set of data.

Heat-Treating Data for Selected Tool Steels

(All temperatures are in °F)

Steel	Forging Temperature (start/stop)	Anneal From	Harden From ¹	Quench In	Temper Temperature ²	Notes
W-1, W-2	1900-1825/1500-1450	1425-1400	1450-1410	water/brine	300-600	3
O-1	1900/1500	1450	1475	oil	300-600	5,8
O-6	1950/1500	1500	1450-1480	oil	300-1000	4,8
L-6	1900/1650	1375	1500-1550	oil	200-700	
A-2	2050/1700	1650	1775	air	300-1300	4,5,8
A-6	2025/	1375	1525-1600	air	200-1000	5,8
D-2	2050/1700	1650	1850	air	900-1200 (900-960 Rc 59)	4,5,6,7,8
D-3	1900/1700	1600	1740	warm oil	400-1300	5,8
D-5	2000/1750	1650	1850-1875	air	300-1000	4,5,7,8
S-1	2100/1660	1475	1750	oil	300-1200	4,9
S-3	1900/1700	1375-1525	1600 (1450)	oil (water)	300-400	10
S-5	1950/1650	1450	1600	oil	300-1300	9
S-7	2050/1700	1550	1725	air <2½inch	300-1300	4,5,6
H-13	2150/1650	1600	1850	air	1050-1150	4,5
6150	2250/1950	1550	1550-1600	oil	400-900	

Notes:

- Variations in temperature may depend on size, and higher temperatures may give greater hardness at the expense of increased grain size.
- Higher temperatures give higher toughness and lower hardness. Generally the lowest temperature gives about Rc 60 and the highest about Rc 30.
- W-1 and W-2 come in different carbon contents. The higher the carbon, the lower the forging, annealing, and hardening temperatures. This also applies to the SAE 10xx carbon steels.
- Steel needs an intermediate temperature (about 1200°) soak before heating to final hardening temperature.
- Controlled atmosphere furnace preferred, but packing in a neutral medium like cast iron chips is also possible to prevent decarburization. Air hardening steels may be wrapped in stainless steel foil during heating to prevent decarburization and scaling.
- Large sizes (generally >2½ inches) are quenched in oil
- Draw temper twice, with the second draw about 50° lower than the first.
- Furnace cooling required for annealing (20 °F/hour maximum). It is not realistically possible to anneal these steels properly in a blacksmith shop.
- May be quenched in water for simple sections.
- There are different heat-treating procedures (oil/water/case harden/temperature) available for different purposes.