



NESSteel Inc

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L-6 Special Tough Jewelry Die Steel - (205 BHN max)

Typical Analysis

C	Si	Mn	Cr	Ni	Mo
.70	.25	.55	.70	1.50	.25

L-6 Special Tough is an oil hardening steel specially formulated and manufactured to meet the needs of the jewelry manufacturing industry. It has a low Brinell hardness and consistent structure for improved machineability, especially where fine high speed steel engraving tools are used. The relatively high percentage of nickel in this grade produces an alloy with greater toughness than the standard oil hardening types while retaining desirable hardness and wear resistance.

In addition to jewelry dies L-6 Special Tough is well suited to use in tools where the combination of hardness and toughness is desirable.

Applications -Punches

Forming Rolls

Blanking

Trimmer Dies

Clutch Parts

Pawls

Stamps

Swage Dies

Slitting Cutters

Fingers

Index Pins

Clutch Pins

Forming Dies

Shear Blades

Spindles

Machine Parts

Knuckle Pins

Machineability- L-6 Special Tough at a 217 Brinell maximum has a machineability rating of 85, when compared to 1% carbon tool steel which has a rating of 100.

Annealing - To anneal pack in a sealed container containing clean cast iron chips to prevent scaling and/or decarburization. Heat slowly to 1400-1450° F and hold for one hour per inch of greatest thickness. Then cool at 20° F per hour to 900° F and then air cool. Proper annealing should result in a hardness of 217 Brinell or less.

Dimensional Stability-L-6 Special Tough has good non-deforming properties in heat treatment, similar to other oil hardening tool steels. Tools small enough in section to be air hardened should show movement of less than 0.0001 in/in. When properly oil quenched, expansion of 0.0015 in/in can be expected.

Hardening-For large or intricately shaped sections or where deformation may be a problem, preheating is advisable. Preheat slowly to 1100-1200° F before transferring to the hardening furnace. L-6 Special Tough should be heated slowly to 1450-1550°F, held at this temperature until uniformly and thoroughly heated (about one hour per inch of greatest cross section), then oil quenched to a temperature of 150°F. In order to avoid stress cracking, temper immediately after the pieces have reached room temperature. It is advisable to insure against excessive scaling and decarburization during the heat treatment by hardening in a controlled atmosphere furnace or by pack hardening. Either gray cast iron chops or one of the proprietary commercial compounds are recommended for the packing media. Salt

bath hardening is also satisfactory providing the molten bath has been properly rectified with respect to dissolved oxides. Sections of less than 1 in. Thickness are often air-quenched from 1500°F. Air quenching provides safer hardening of intricate sections, and results in less distortion than oil quenching.

Salt bath hardening is also satisfactory providing the molten bath has been properly rectified with respect to dissolved oxides. Sections of less than 1 in. Thickness are often air-quenched from 1500°F. Air quenching provides safer hardening of intricate sections, and results in less distortion than oil quenching. A series of 1 in. diameter by 5 in. long specimens listed to the right, were hardened in an air blast furnace and in oil. The hardening temperatures ranged from 1400°F to 1800°F at intervals indicated below. The hardened samples were fractured, giving fracture ratings and tested for Rockwell hardness.

Quench Temp. °F	Air-Fracture Rating	Air-Rc	Oil-Fracture Rating	Oil Rc
1400	9 3/4	61	9 3/4	63
1450	9 3/4	63	9 3/4	64
1500	9 1/2	63	9 3/4	64.5
1525	9 1/2	63	9 3/4	64.5
1550	8 3/4	63	9 1/4	64
1600	8 1/2	63	8 1/2	63
1650	8 1/4	63	7 1/2	63
1700	8	62.5	7 1/4	62
1750	8	62.5	7 1/4	61.5
1800	7	62	7	61

Tempering- L-6 Special Tough should be tempered at 400°F. However, where increased toughness is desired, at a sacrifice of some hardness, higher tempering temperatures are often used. L-6 Special Tough does not become brittle, as many other die steels do, when tempered in the range of 450° to 800°F. A minimum holding time of one hour soak time at temperature per inch of thickness should be used when tempering at 400°F. Remove from the furnace and allow to cool in thin air. To minimize the possibility of cracking, the steel should be tempered immediately after hardening and should be heated slowly to the desired tempering temperature. Double tempering is recommended for best results. A tempering temperature of 300°F is most common for a good combination of hardness and toughness.

Tempering Temp °F	Rc
None	61/62
200	61/62
300	60/61
400	56/57
500	53/54
600	51/52
700	48/49
800	45/46

Properties

Specific Gravity	7.86
Density	0.283 lbs/in ³
Modulus of Elasticity	30.0 X 10 ⁶ psi

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