

WORKSHOP DATA

Cutting Speeds For Machines

Material worked	Metres per minute	Feet per minute
Tool Steel	13-20	45-65
Mild Steel	25-35	90
Cast Iron	13-20	45-65
Brass	50-80	150-240
Copper	50-80	150-240
Aluminum Alloy	65-140	180-400
Bronze	13-23	40-70
Zinc Alloys	30-50	90-150
Stainless Steel	13-30	40-90
Plastic	35-60	100-180

Cutting Lubricants

Tool Steel	Soluble Oil
Mild Steel	Soluble Oil
Stainless Steel	Soluble Oil
Cast Iron	Dry
Brass	Dry. Soluble Oil or Paraffin
Copper	Dry, Soluble Oil or Paraffin
Aluminum Alloy	Dry, Soluble Oil or Paraffin
Bronze	Dry, Soluble Oil or Paraffin
Zinc Alloy	Dry. Soluble Oil or Paraffin
Plastics	Dry

Flame Temperatures

Combustible	Diluent	% Combustible	Flame Temperature (°C)
Methane	Air	10.0	1875
Propane	Air	4.15	1925
Butane	Air	3.2	1895
Iso-butane	Air	3.2	1900
Acetylene	Oxygen	9.0	2325
		18.0	2927
		33.0	3007
		44.0	3137
		50.00	2927

Tempering Colours on Steel

Type of Tool	Colour	Temperature (°C)
Scrapers; tools for use on brass	Pale Straw	220
Drills; small lathe tools	Straw	230
Drills; hammers; reamers	Dark Straw	240
Shears; scissors; dies and tapes; punches	Brown	255
Axes; woodworking tools	Brown/Purple	265
Knives; sets; cold chisels	Purple	280
Smiths tools; circular saws; screwdrivers	Blue	295
Springs; handsaws	Dark Blue	305
Rules	Pale Blue	340

WORKSHOP DATA (cont'd)

Solders and Fluxes							
Material	Flux	Solder	Alloy	(% Composition)			
				Sn	Pb	Zn	Al
Aluminum	Stearin	85		10	5		
Brass of Copper	Zinc chloride	65	35				
Electrical work	Resin in solder core	60	39.5				0.5
Galvanised sheet or zinc	Dilute Hydrochloric acid	50	50				
Lead	Tallow	30	70				
Brittania metal or Pewter	Tallow or Gallipoli oil	25	25			50	
Tinplate	Zinc chloride	50	50				

Melting Points of Metals and Alloys (°C)	
Cast Iron	1200 - 1400
Wrought Iron	1600 - 1700
Tool Steel	1200 - 1400
Mild Steel	1200 - 1350
Aluminum	700
Copper	1083
Brass (including gilding metal)	930 - 1010
Tin	231
Zinc	419
Lead	327
Silver	800 - 910

Grinding Wheel Speeds (Peripheral)	
Metal Tool Grinder	850 – 1250 metres per minute
Woodwork Tool Grinder	125 – 200 metres per minute
Horizontal Grindstone	125 - 175 metres per minute
Sandstone	125 – 150 metres per minute

Heat Treatment of Carbon Steels

Normalising

Process used to refine the grain structure and relieve internal stress.

Heat above the upper critical temperature and allow cooling in air.

Annealing

Process used to soften steel for machining.

Heat above the upper critical temperature and allow cooling very slowly in the furnace.

Hardening

Makes the steel very hard and brittle

Heat above the upper critical temperature and quench in water or oil.

Case Hardening

A method of hardening the outer skin of the steel by increasing carbon content.

Heat to red heat and plunge in to charcoal dust. Repeat the process several times before bringing to hardening temperature and quenching in water.

Tempering

Hardened tool steels are inclined to be brittle.

Tempering is a process which reduces the brittleness without losing too much of the hardness. The compromise between hardness and toughness varies for different tools.