VANGUARD STEEL LTD.

PRODUCT MANUAL

HOT ROLLED CARBON STEELS - 1020

AISI/SAE 1020 **ASTM A576 UNS G 10200**

TYPICAL ANALYSIS

C.	Mn.	P.	S.
.17/.24	.25/.60	.04 MAX.	.05 MAX.

A GENERAL PURPOSE MILD STEEL, LOW-CARBON MACHINERY STEEL, HAVING GOOD OVER-ALL MECHANICAL PROPERTIES. EASILY MACHINABLE AND WELDABLE. SUITABLE FOR HEAT TREATMENT AND IDEAL FOR CARBURIZING

TYPICAL APPLICATIONS

GENERAL PURPOSE STRUCTURAL AND MISCELLANEOUS NON-CRITICAL APPLICATIONS, GENERAL ENGINEERING PARTS, SHAFTS, AGRICULTURAL IMPLEMENTS, HUBS, ETC.

MECHANICAL PROPERTIES - AS SUPPLIED

THE FOLLOWING ARE AVERAGE VALUES AND MAY BE CONSIDERED AS REPRESENTATIVE:

TENSILE STRENGTH, PSI	**58,000**	
YIELD STRENGTH, PSI	**36,000**	**MIN.**
ELONGATION, %	**36**	
REDUCTION IN AREA, %	**59**	
BRINELL HARDNESS	**120**	

MACHINABILITY

1020 IN THE AS SUPPLIED CONDITION HAS A MACHINABILITY RATING OF 72%,.
BASED ON AISI 1212 AS 100%.
AVERAGE SURFACE CUTTING SPEED IS 120 FEET PER MINUTE.

WELDABILITY

THIS GRADE IS EASILY WELDED BY ALL WELDING PROCESSES.
THE RESULTANT WELDS AND JOINTS ARE OF EXTREMELY HIGH QUALITY.
WELDING ROD TO BE USED DEPENDS UPON THE THICKNESS OF SECTION, DESIGN, SERVICE REQUIREMENTS, ETC.

HOT ROLLED CARBON STEELS - 1040-1045

AISI/SAE 1040-1045 **ASTM A576 UNS G 10400-G 10450**

TYPICAL ANALYSIS

	C.	Mn.	P. MAX.	S. MAX.
1040	0.37/0.44	0.60/0.90	0.040	0.050
1045	0.43/0.50	0.60/0.90	0.040	0.050

A GENERAL PURPOSE MILD STEEL, MEDIUM-CARBON FINE GRAIN MACHINERY STEEL. IN THE PRODUCTION OF THIS GRADE, SPECIAL CONTROLS ARE USED FOR CHEMICAL COMPOSITION, HEATING, ROLLING AND SURFACE PREPARATION. THESE BARS ARE SUITABLE FOR APPLICATIONS OF FORGING, COLD DRAWING, MACHINING, HEAT TREATING (INCLUDING FLAME HARDENING). GOOD WEAR RESISTANCE CAN BE OBTAINED BY FLAME OR INDUCTION HARDENING.

TYPICAL APPLICATIONS

AXLES, BOLTS, SHAFTS, MACHINERY PARTS, LIGHTLY STRESSED GEARS, PINIONS FORMING DIES.

MECHANICAL PROPERTIES - AS SUPPLIED.

THE FOLLOWING ARE AVERAGE VALUES AND MAY BE CONSIDERED AS REPRESENTATIVE:

TENSILE STRENGTH, PSI	**87,000**
YIELD STRENGTH, PSI	**52,500**
ELONGATION, %	**25**
REDUCTION IN AREA, %	**49**
BRINELL HARDNESS	**180**

(CONTINUED)

HOT ROLLED CARBON STEELS - 1040-1045

AISI/SAE 1040-1045 **ASTM A576 UNS G 10400-G 10450**

THERMAL TREATMENTS	DEGREES IN CELSIUS
FORGING	COMMENCE AT 1150° MAX. FINISH AT 950°
ANNEALING	800/830° SURFACE COOL
NORMALIZING	870/920° COOL IN AIR
HARDENING	840/870° WATER QUENCH 855/885° OIL QUENCH
TEMPERING	430/700° ACCORDING TO PROPERTIES REQUIRED

MACHINABILITY

1040 IN THE AS ROLLED BAR HAS A MACHINABILITY RATING OF 62% OF AISI B-1112.
AVERAGE SURFACE CUTTING SPEED IS 105 FEET PER MINUTE.

SHEAR STRENGTH

THE ULTIMATE SHEAR STRENGTH IS APPROXIMATELY 66% OF THE ULTIMATE TENSILE STRENGTH.

WELDABILITY

DUE TO HIGH CARBON CONTENT, THIS MATERIAL IS NOT READILY WELDED. WITH THIN SECTIONS AND FLEXIBLE DESIGN, GAS OR ARC WELDING MAY BE USED WITHOUT PREHEATING, BUT IN JOINTS OVER 1/2" TO 3/4" THICK, PREHEATING IS NECESSARY. TO DEVELOP EQUIVALENT STRENGTH IN A WELD, A LOW ALLOY FILLER IS RECOMMENDED. THE GRADE OF WELDING ROD TO BE USED DEPENDS ON THICKNESS OF SECTION, DESIGN, SERVICE REQUIREMENTS, ETC.