Rails

Bhilai Steel Plant

Profile	Sectional Wt kg/m	Standard Length (metres)	Mill
R – 45	44.61	13	Rail & Structural Mill, Bhilai
R – 52	51.89	13, 26, 130, 260	Rail & Structural Mill, Bhilai
R – 60	60.34	13, 26, 130, 260	Rail & Structural Mill, Bhilai

Product nomenclature for 13 m & 26 m is "RAIL" and for 130 m & 260 m is "LONG RAIL PANEL".

Specifications

Grades	UTS (MPa), min	Application (Speed of train in km/hr)
A) Prime Quality Rails		
880	880	>50
Head Hardened (1080 HH)	1080	>50
Chromium (1080 Cr)	1080	>50
B) Special Rail Steel		
Niobium (NB)	880	>50
Vanidium (VN)	880	>50
C) Corrosion Resistant Rail Steel		
Copper-Molybdenum (CM)	880	>50
Nickel, Chromium, Copper (NC)	880	>50
D) Industrial use		
IRS-T-12-IU	880	<50
Commercial Rail*	880	NA

Note:

1. Hydrogen content 1.6 ppm Max & Aluminium – 0.015 max.
2. Bhilai Steel Plant has taken up project to produce rail sections 68 kg & Zu-1-60 (Assymetric RAIL).
3. Bhilai Steel Plant can also produce rails as per specifications of the union of international railways and other foreign specifications, like British standard or Japanese industrial standards if sufficient orders are available.
4. BSP can also produce end forged assymetric rail which can be used for manufacture of track switches for Railways.

* Can be used as electrical poles.

	Chemical Composition (Percentage)												Mechanical Properties			
Grade	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	V (max)	Nb (max)	10^{-4}% (ppm) max by mass	Hydrogen content in liquid steel (max)	UTS (MPa) (min)	Yield Strength (MPa) (min)	Elongation% on gauge Length – $5.65\sqrt{So}$ (min)	Running Surface Hardness (BHN)
880	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	–	–	–		–	1.6 ppm	880	460	10.0	Min 260**
1080 Cr	0.60-0.80	0.80-1.20	0.50-1.10	0.025	0.025	0.004	0.20	0.80-1.20	0.20		20	1.6 ppm	1080	560	9.0	320-360
1080 HH	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	–	–	–		–	1.6 ppm	1080	460	10.0	340-390
Special Rail Steel																
NIOBIUM (NB)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	–	–	–	0.04	–	1.6 ppm	880	540	10.0	Min 260**
VANADIUM (V)	0.60-0.80	0.80-1.30	0.10-0.50	0.025*	0.030*	0.015	–	–	0.20	–	20	1.6 ppm	880	630	9.0	Min 260
Corrosion Resistant Rail Steel																
Copper-Molybdenum (CM)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.2-0.3	–	0.25-0.35	–	–	1.6 ppm	880	460	10.0	260
Nickel Chromium Copper (NC)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.25	0.50-0.65	0.3-0.4	0.25-0.40	–	1.6 ppm	880	520	10.0	260

So = Cross sectional area of tensile test piece in mm^2

* 0.035 maximum for finished rail

The chemical compositions specified as above are applicable to Ladle analysis and Product Analysis. Manufacture shall ensure that chemcial composition at ladle analysis should be such that product analysis also satisfies the requirement of chemical composition as above.

** Desirable Value.

Wheels, Axles & Wheel Sets

Durgapur Steel Plant : Details of Wheels, Axles and Wheel Sets

Item	Weight per piece, kg	Wheel tread dia, mm	Axle load, t
16.25T AC Coaching Wheel Set	1092	915	16.25
16.25T BG Coach Wheel	384	920	
16.25T Loose Axle	378		16.25
Diesel Loco Wheel	528	1097	
Loco Wheel 'S' Shaped	528	1097	
MG Loco Wheel	421	970	16.25

All the above items are as per the relevant drawings.
Chemical Composition

Specification	C% max	Mn % max	P % max	S % max	Si %
IRS: R-16/ 95*	0.37	1.12	0.040	0.040	0.15-0.46 - BG Coaching Axles
IRS: R-19/ 93**	0.52	0.60-	0.030	0.030	0.15-0.40 - BG Coaching Wheels
IRS: R-34/ 03***	0.57-0.67	0.60-0.85	0.030	0.030	0.15 min - Loco Wheel

* P+S = 0.07 max

** For IRS: R-19/93 Hydrogen content < 3 ppm (Liquid steel)

*** For IRS: R-34/03 Hydrogen content < 2.5 ppm

Applications

Specification	Application
IRS : R-34/03	Diesel Loco Wheels
IRS : R-19/93	BG Coaching and other wheels
IRS : R-16/95	BG Coaching Axles

Mechanical Properties

Specification		Yield Strength (Min) MPa	Tensile Strength MPa	% Elongation	V-Notch Impact Toughness at +20°C J/cm^2
IRS: R-16/ 95	Normalised Quenched & Tempered	320 350	550-650 550-700	22 min 24 min	25 min 40 min
IRS: R-19/ 93		50% of UTS	820-940	14 min	15 min
IRS: R-34/ 03		50% of UTS	775-900 (at web)	13-11 min	10 min

For IRS : R-19/93 : Hardness range- 241 to 277 BHN.

For IRS : R-34/03 : Hardness range on outside face of rim : 300-341 BHN. On web face of the wheel, hardness shall not exceed 293 BHN.

Wheels are 100% rim-sprayed, tempered and hardness tested along with ultrasonic testing in IRS : R-19/93 and IRS : R-34/03 specifications.

1. DSP is developing Micro alloyed coaching Wheel & Axels for supply to Railways.
2. DSP has the capability to produce 22.9T Axle load Box-N Type Wheels, Axles and wheel sets depending on order size.
3. DSP is also producing EMU coach wheel and WHG 9 electric locomotive wheel.