

WORLD'S BEST PURE AND CLEAN **GPH QUANTUM** CONSTRUCTION STEEL

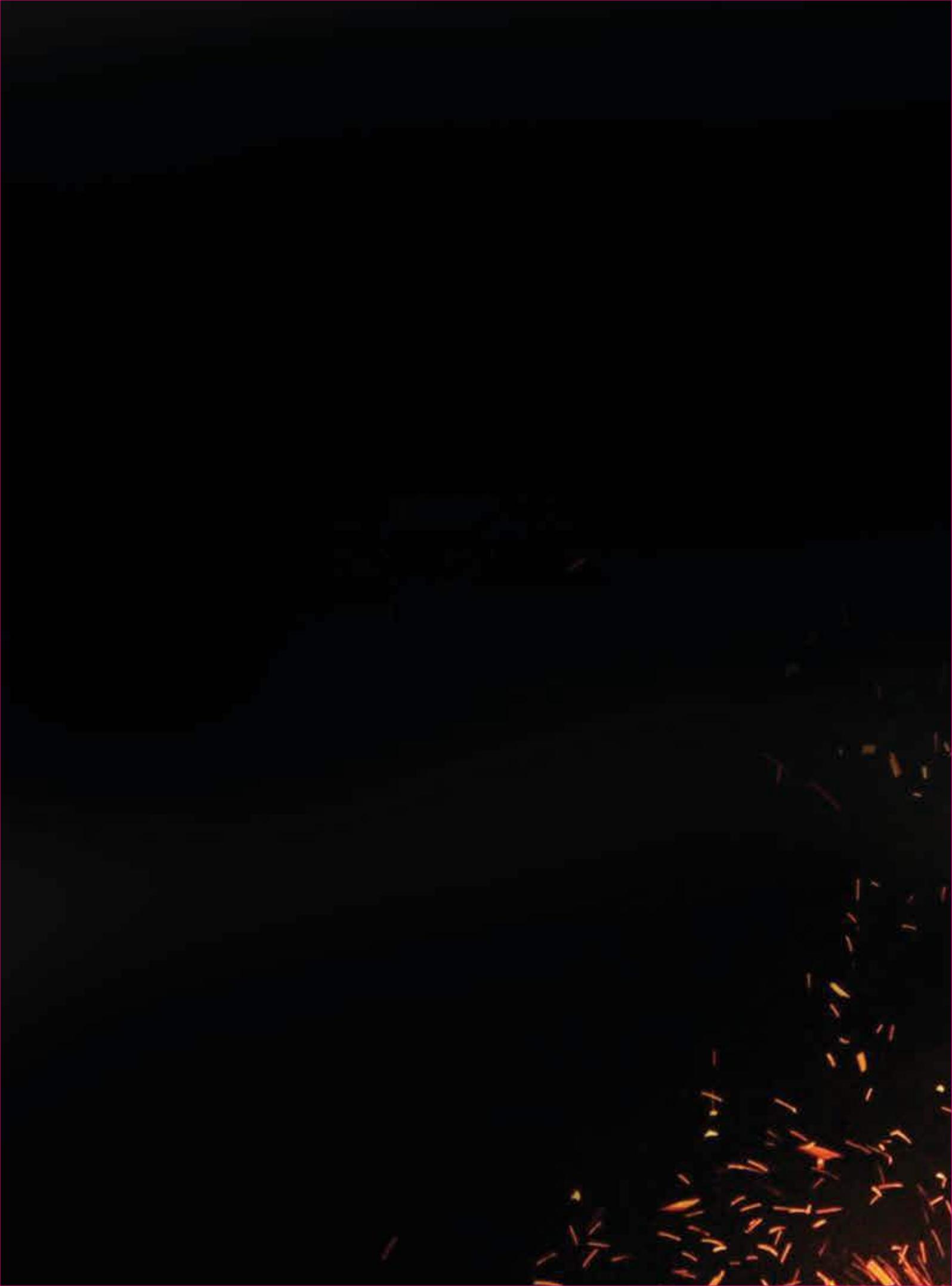


With historically world's most innovative and Asia's first Quantum Technology at GPH ispat we are producing and marketing world's best GPH Quantum construction steel. We have reached new horizons of prosperity in the domestic construction industry while also taking Bangladesh to new heights of pride across the world.

GPH QUANTUM B500CWR



www.gphispac.com.bd



GPH ISPAT

With Quantum Technology

GPH Ispat has embarked on a new journey with the cutting-edge innovation in history of steel making and has proudly introduced Asia's first Quantum Electric Arc Furnace and Winlink Technology. A completely green, world class factory is the continuation of our enduring commitment to build the future Bangladesh.



World's Best Pure and Clean GPH QUANTUM Construction Steel



The story of GPH Ispat is not an ordinary one. It all began with a vision. A vision for development.

Having belief in sustainable development GPH Ispat is continuously working for the development and people's welfare of the country. GPH Ispat has established the Asia's first Quantum EAF Technology based factory to enrich the steel sector in Bangladesh. GPH Ispat is one of the leading steel manufacturing company in Bangladesh that ensures the best quality of steel complying the national and international standards.

GPH Ispat has introduced first in Bangladesh the level 4 automation in steel manufacturing industry and ERP-enriched state-of-the-art technology with fully computerized integrated digital industry known as Industry 4.0. This makes it possible to produce the highest quality products using comparatively less energy. The main purpose of all our efforts are to bring you the world class construction Re-bar through advanced technology.

We have a big dream, a dream of building a new Bangladesh, and you are the companions in this dream.

Vision

To provide the foundation for building the infrastructure of Bangladesh towards High-Income-Country (HIC) with the true GPH philosophy.

Mission

The trusted brand of Bangladesh leading the steel sector with innovative products leveraging cutting edge technology.

GPH QUANTUM Green Factory:

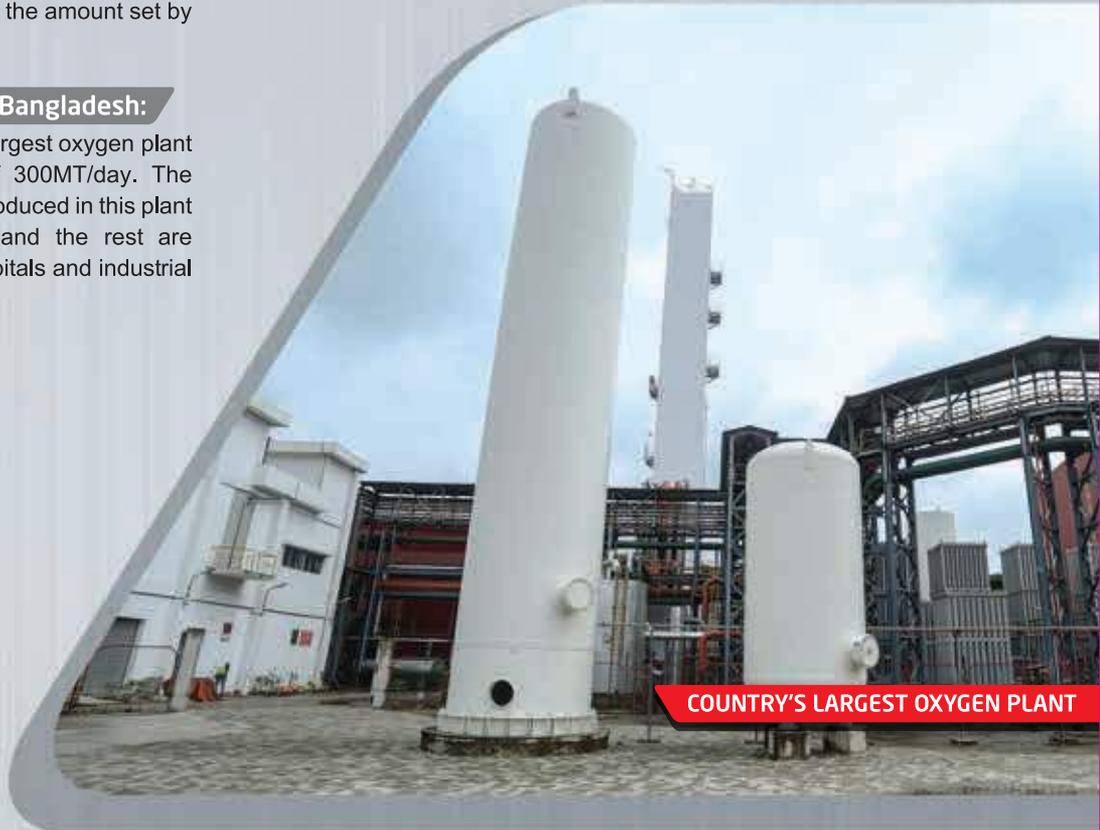
GPH Ispat established Asia's first Quantum EAF Technology based factory in Bangladesh with the following features to avoid any harm to the environment.

1. Exhaust Gas Purification Unit:

GPH QUANTUM green factory has highly sophisticated and advanced exhaust gas purification system to keep the environment clean and safe. The amount of carbon and dust emissions from the GPH QUANTUM factory is less than the amount set by the World Bank.

2. The largest Oxygen Plant of Bangladesh:

GPH Ispat's green factory has the largest oxygen plant in Bangladesh having capacity of 300MT/day. The liquid oxygen, nitrogen and argon produced in this plant meet the factory's own demand and the rest are marketed for the use in various hospitals and industrial establishments in the country.



COUNTRY'S LARGEST OXYGEN PLANT



EXHAUST GAS PURIFICATION UNIT

3. Water Treatment Plant with Zero Discharge Technology:

Only GPH Ispat factory in Bangladesh has its own water harvesting system and water treatment plant with zero discharge technology, so no water is wasted.

4. Own Substation:

The factory has a 230/33 KV GIS substation for uninterrupted power supply. The amount of electricity saved in this green factory, can be utilized in 1 lakh 92 thousand households per year.

5. Natural Gas Savings:

The amount of natural gas saved in the GPH QUANTUM factory can meet the gas demands of 35,000 households per year.



WATER TREATMENT PLANT



230/33 KV GIS SUBSTATION

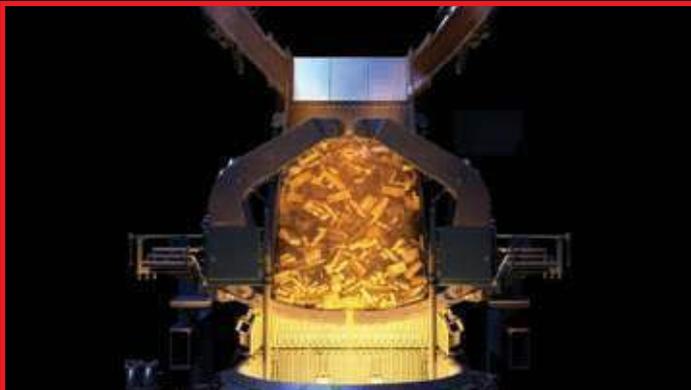
Why GPH QUANTUM technology is the best in making construction steel?

1. Completely Pure Steel:

GPH QUANTUM Re-bar is completely inclusion free because it contains-

- **Scrap pre-heating process:** The GPH QUANTUM pre-heating chamber of the arc furnace heats the scrap to a temperature of 600-degree C. During this process, it removes the paint, rust, moisture and primary impurities present in the scrap.
- **Oxygen lancing and argon bottom purging:** GPH QUANTUM removes unnecessary carbon and phosphorus by oxygen lancing and bottom purging in the arc furnace, turning the heated mixture into a homogenized mixture.
- **Flat bath operation and bottom tapping:** PURE FLAT BATH OPERATION is done by preparing 70 MT HOT HEEL in GPH QUANTUM arc furnace having holding capacity of 150 MT, where the chemical reaction of carbon and oxygen creates FOAMY SLAG, and removes phosphorus and other impurities. 80 MT 100% slag free metal is collected into the ladle by tilting the furnace at a 4-degree angle through bottom tapping in a siphonic process.

The GPH QUANTUM Re-bar is much more earthquake resistant than other Re-bars in the market for its 100% refinement. So the engineers rely on GPH QUANTUM Re-bar for any mega structure.



PREHEATING CHAMBER



OXYGEN LANCING

FLAT BATH OPERATION &
FAST BOTTOM TAPPING



2. Homogenized Chemical Mixture:

The chemical composition of GPH QUANTUM Re-bar is homogenized because-

- **Ladle Refining Furnace (LRF):** Harmful sulfur and other inclusions are removed by secondary refinement in LRF from the liquid metal coming from the QUANTUM arc furnace. The perfect homogenized chemical composition in GPH QUANTUM Re-bar is ensured by mixing the required chemical ingredients in LRF.
- **High Speed Continuous Casting Machine (CCM):** Closed casting is maintained at each level which protects the liquid steel from oxidizing and adding impurities (from the surrounding atmosphere) and maintains the quality of the steel.

So, the homogenized chemical properties are achieved in the Re-bar and the construction becomes stronger and safer.



3. Steel with High Ductility and Firm Bonding Strength:

- Billets made in CCM are directly rolled in the most advanced and latest high-speed rolling mill with Winlink technology. The GPH QUANTUM Re-bar is more ductile than any other Re-bar in the market due to Quantum and Winlink technology.
- The new generation housing-less free-floating rolling stands and Tungsten Carbide Rolls ensure the uniform diameter of the Re-bar, the relative rib area and proper transverse rib height that makes the construction more secure by establishing a strong bond between the concrete and the Re-bar.



CONTINUOUS CASTING MACHINE



HOUSING-LESS FREE FLOATING ROLLING STAND

4. Uniform Strength, Corrosion Resistant and Superior Weldability:

- Fully automatic computerized Quenching Method ensures a uniform Martensite Ring in the Re-bar; that is why there is no strength variations from start to end.
- The right level of carbon equivalent ensures GPH QUANTUM re-bar's superior weldability (improved welding ability).
- 100% refining and automatic computerized quenching system creates a light anti-corrosive scale layer on the Re-bar surface which makes the Re-bar more corrosion resistant.



TMT QUENCHING BOX



HIGH SPEED TWIN CHANNEL



TUNGSTEN CARBIDE ROLL

5. Shiny Surface:

- The use of more tungsten carbide rolls in the rolling process makes the surface of the GPH QUANTUM Re-bar shinier.

6. Quality Consistency:

- For quality control we have 2000 KN Automatic Universal Testing Machine, Universal Hardness Testing Machine, Profilometer, Bend-rebend Testing Machine, X-ray Fluorescence Spectrometer (XRF), Microscope, Impact Testing Machine, Bond Testing, Ring Testing, Macro Etching and Wet Chemical Lab. Moreover, we have advanced M12 Spectrometer from Germany. At each stage of production, the state-of-the-art GPH lab is rigorously controlled by these testing machines to maintain the quality of the Re-bar.

**XRF MACHINE****BEND & REBEND TESTING MACHINE****M12 SPECTROMETER****PROFILOMETER**

Every stage of GPH QUANTUM Re-bar production such as scrap processing and charging, melting, refining, casting and rolling processes are integrated and uninterrupted.

The use of world class technology ensures perfect homogenized chemical properties, uniform strength, superior ductility and bendability.

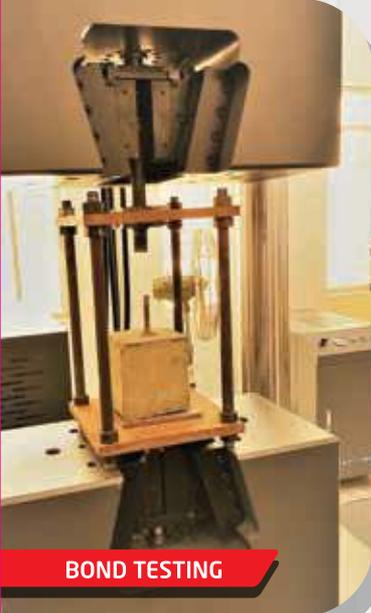
That is why GPH QUANTUM Re-bar guarantees safe and strong structure.



RING TESTING



RING TESTING MICROSCOPE



BOND TESTING

UNIVERSAL HARDNESS TESTING MACHINE



MICROSCOPE



AUTOMATIC FINE POLISHING MACHINE



CHARPY IMPACT TESTING MACHINE



MACRO ETCHING SETUP



UNIVERSAL TESTING MACHINE

Nominal Weight, Dimension and Dimensional Tolerances of GPH QUANTUM B500CWR Re-bar as per BDS ISO 6935-2:2016:

Nominal Diameter	Nominal Weight	Permissible Tolerance	Cross-sectional Area	Length (Per ton)		Ton and Piece Count (1 pc=12 meter approx.)
				m	ft	no of re-bar
8	0.395	±8	50.3	2534.31	8314.66	211 (1 ton)
10	0.617	±6	78.5	1621.96	5321.38	135 (1 ton)
12	0.888	±6	113	1126.36	3695.40	94 (1 ton)
16	1.58	±5	201	633.58	2078.67	53 (1 ton)
20	2.47	±5	314	405.49	1330.35	34 (1 ton)
25	3.85	±4	491	259.51	851.42	22 (1 ton)
28	4.84	±4	616	206.88	678.75	18 (1 ton 45 kg)
32	6.31	±4	804	158.39	519.67	14 (1 ton 60 kg)
40	9.86	±4	1257	101.37	332.59	9 (1 ton 65 kg)
50	15.42	±4	1964	64.88	212.86	6 (1 ton 110 kg)



Mechanical Properties of GPH QUANTUM B500CWR Re-bar as per BDS ISO 6935-2:2016:

Steel Grade	Ductility Class	International Standard	Yield Strength	Tensile Strength	Elongation at Max force, EMF Gauge Length=200 mm	TS/YS	Elongation after Fracture Gauge Length=5D mm	Bend Test Mandrel Diameter (mm)	Re-Bend Test Mandrel Diameter (mm)	Rib Geometry			
										Transverse Rib Height, (mm)	Longitudinal Rib Height, (mm)	Rib Spacing, (mm)	Relative Rib Area*
B500 CWR	C	BDS ISO 6935-2:2016	72500 Psi (Min)	83375 Psi (Min)	7% (Min)	1.15 (min.)	1.4% (Min)	≤16mm: 3D 16mm<D≤32mm: 6D 32mm<D≤50mm: 7D	≤16mm: 5D 16mm<D≤25mm: 8D 25mm<D≤50mm: 10D	0.065D (min.)	0.15D (max.)	D<10: 0.5D-1.0D D≥10: 0.5D-0.8D	6 < D ≤ 12 f _R ≥ 0.040 D > 12 f _R ≥ 0.056
			500 MPa (Min)	575 MPa (Min)									

*Note: Relative rib area as per BS 4449-2005+A3:2016

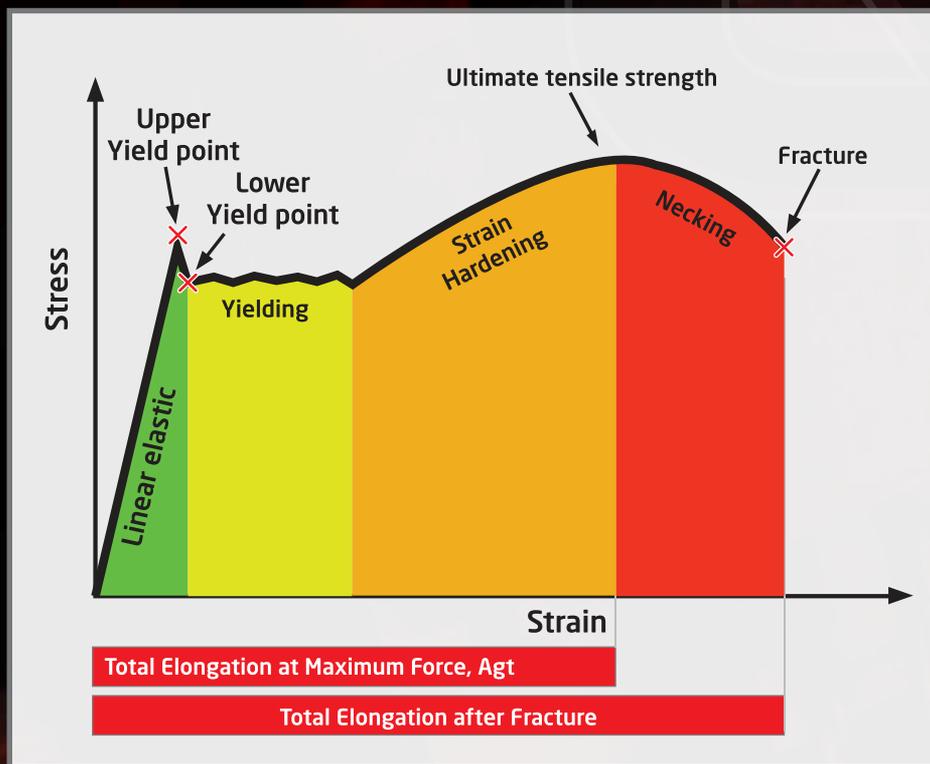
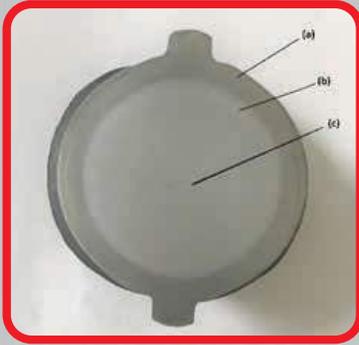


Figure: Typical Stress -Strain Curve of Low Carbon Steel

GPH QUANTUM B500CWR follows these standards:

- BDS ISO 6935-2:2016 (Bangladesh Standard)
- BS 4449:2005 + Amendment 3:2016 (British Standard)
- ASTM A706 / A706M -14 (USA Standards)
- JIS G 3112:1987 (Japanese Standard)
- DIN 488-1:1984 (German Standard)
- NF A 35 016-1:2007 (France Standard)
- AS/NZS 4671 :2001 (Australia NewZealand Standard)
- IS 1786:2008 (Indian Standard)
- GOST R52544-2006 (Russian Standard)
- GB/T 1499.2-2018 (Chinese standard)

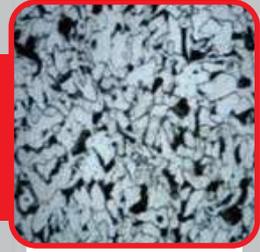
Martensite Ring & Microstructure of different zone:



(A)
TEMPERED MARTENSITE



(B)
MIXED BAINITE

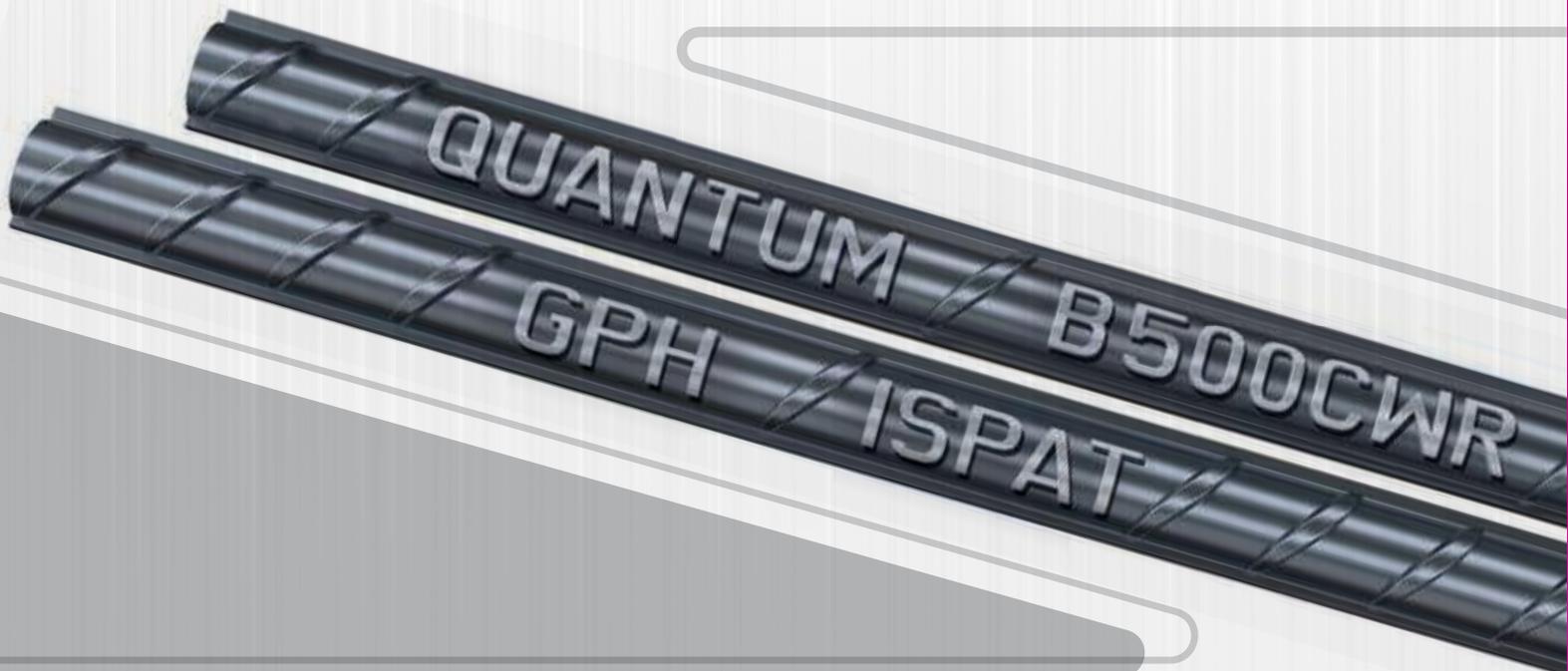


(C)
FINE FERRITE & PEARLITE

Martensite Ring Performance Report:

Rebar Nominal Diameter (mm):	20	Grade:	B500CWR
Heat No.:	Q20E100192	Sample No.:	1

Nominal Dia. (mm)	Nominal Cross sectional Area (mm ²)	Position	Martensite Ring Thickness	Avg. Martensite Ring Thickness	Avg. Martensite Ring Area	%Martensite Ring Area
			(mm)	(mm)	(mm ²)	
20	314.16	Q0	1.90	1.90	10780	34.32%
		Q1	1.78			
		Q2	1.86			
		Q3	2.04			



Bond Performance:

As per BS 4449:2005 Grade B500C, defined by characteristic relative rib area (f_R) is as follows:

$$6 < d \leq 12 \quad f_R \geq 0.040$$

$$d > 12 \quad f_R \geq 0.056$$

Results are obtained from fully automatic Re-bar surface geometry measurement device (Profilometer)

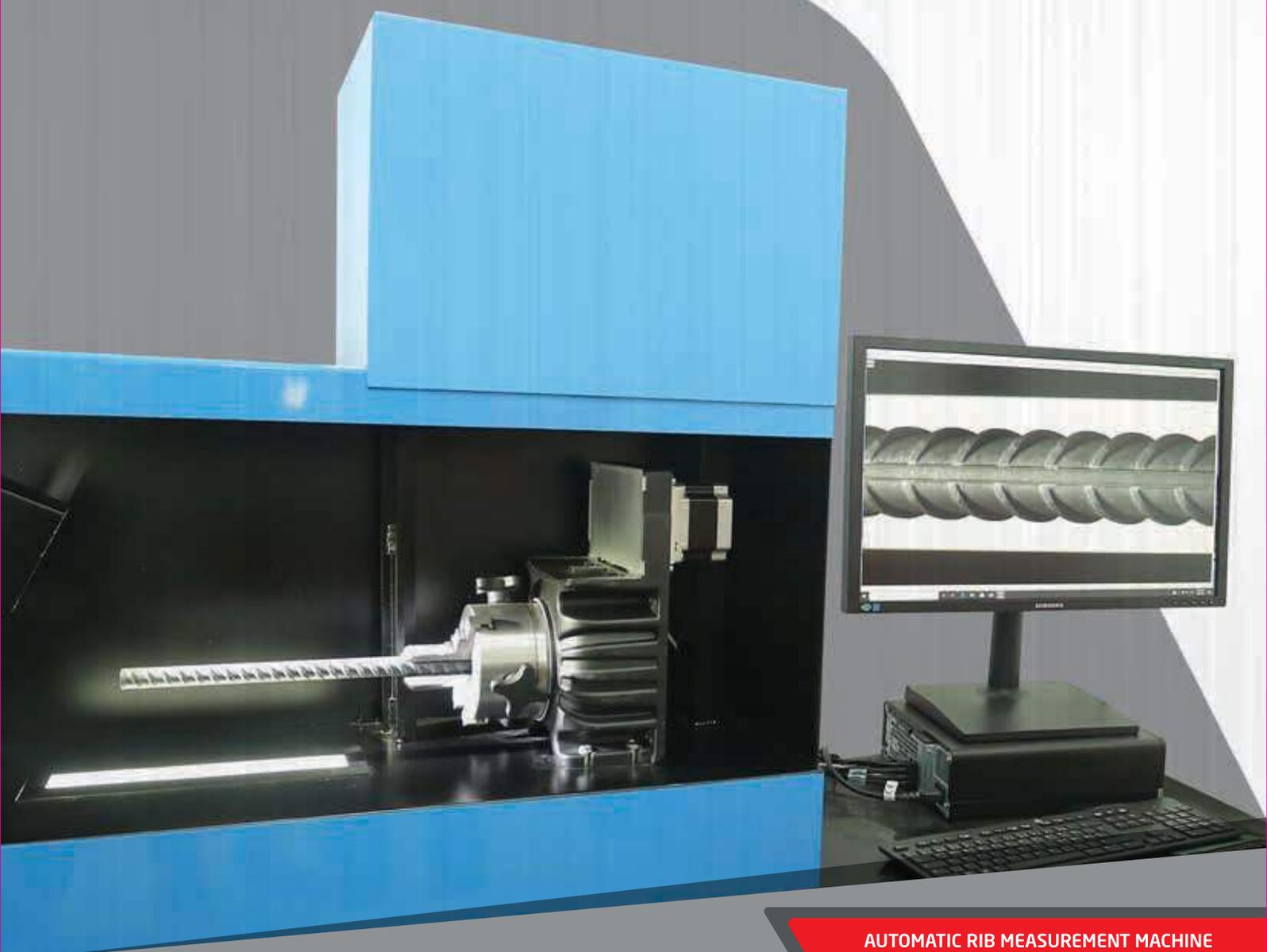
ECM Datensysteme RM-303

Made: Germany

Heat No. Q20E100187
Sample No. 1

Testing date: 06/01/2020
EN ISO 15630-1:2019 / Simpson formula

Row	Diameter		Rib Height			Rib dist.c (mm)	Inclination		Row dist.e (mm)	Head width (mm)	Rib. length (mm)	Long.rib. Height (mm)	Relative rib area f_R
	Nom. (mm)	Real (mm)	Center (mm)	1/4 Pnts (mm)	3/4 Pnts (mm)		Alpha (°)	Beta (°)					
1	20.0	19.95	1.50	1.34	1.24	13.7	46	63	3.60	2.00	31.1	1.39	0.071 +26.8%
2			1.55	1.13	1.30	13.5	47	62	3.79	1.80	31.4	1.39	
Mean			1.53	1.24	1.27	13.6	46.5	63	Σ:7.39	1.90	RLW	1.39	



Fatigue Performance:

According to BS 4449:2005+A3:2016 Fatigue test is carried out on full section bars using a sinusoidal tensile load as follows:

Diameter, mm	Max. Stress (MPa)	Min. Stress (MPa)	No. of Cycles
≤16	250	50	5.0 million
20	231	46	5.0 million
25	212	42	5.0 million
32	200	40	5.0 million
40	187.5	37.5	5.0 million
50	187.5	37.5	5.0 million

All tests are required to survive for 5 million stress cycles under these loading conditions. The procedure is carried out at room temperature with a frequency of up to 200Hz.

The test is continued until 5 million stress cycles have been reached or until the fracture of the test sample.

Chemical Composition of Product Analysis as per International Standard:

Element	BDS ISO 6935-2:2016 (Max)	BS 4449:2005+ A3:2016 (Max)	GOST R52544-2006 (Max)	DIN 488-1:2009 (Max)
% C	0.24	0.24	0.24	0.24
% Si	0.65	-	0.95	-
% Mn	1.66	-	1.70	-
% P	0.058	0.055	0.055	0.055
% S	0.058	0.055	0.055	0.055
% Cu	-	0.85	0.55	0.65
% N	0.014	0.014	0.013	0.014
% CEV	0.55	0.52	0.52	0.52

Weldability:

Because of carefully controlled chemical composition, GPH QUANTUM B500CWR has a carbon equivalent below 0.50%, when calculated according to the following formula:

$$CEV = C + \frac{Mn}{6} + \frac{(Cr + V + Mo)}{5} + \frac{(Cu + Ni)}{15}$$

This meets the requirements of BS 4449:2005 and BS EN 10080 for the definition of weldable steel. GPH QUANTUM B500CWR steels can be welded using all common welding processes.



The Bangladesh We Want to Build

GPH's journey is based on its determination to build Bangladesh on a strong and solid foundation. Our country will be witnessing world class factories, huge buildings, international standard roads, highways, flyovers, bridges, tunnels and many other facilities. An outstanding installation will be made in this country, which will attract tourists from home and abroad. A stadium will be built where the Olympic or World Cup will be held. We want to build this better Bangladesh with you.





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