Since : 1965

সুপার এনামেল কপার ওয়্যার উৎপাদনকারী একমাত্র সরকারি প্রতিষ্ঠান

গাজী ওয়্যারস্ লিমিটেড
GAZI WIRES LIMITED

(বাংলাদেশ ইস্পাত ও প্রকৌশল করপোরেশন, শিল্প মন্ত্রণালয়)

BDS 1034

ISO 9001-2015
BUREAU VERITAS Certification

NPO

INTRODUCTION

Gazi Wires Limited (GWL), a leading enterprise of **Bangladesh Steel & Engineering Corporation (BSEC)** under the **Ministry of Industries, Government of Bangladesh,** is the **pioneer and largest manufacturer of Enamelled Round Copper Winding Wire** (formerly known as Super Enamelled Copper Wire) in the country. Established in **1965** as a private-sector venture in technical collaboration with the globally renowned **Furukawa Electric Company, Tokyo, Japan,** GWL has set the benchmark for quality in wire manufacturing. Today, the company produces:

- **Super Enamelled Copper Wire:** SWG 12 to 46
- **Annealed Copper Wire:** SWG 12 to 46
- **Hard Drawn Bare Copper Wire:** SWG 1 to 46

In **July 1972,** GWL joined the public sector under **Bangladesh Engineering & Shipbuilding Corporation (BESC)** and later transitioned to **'BSEC,** where it continues to thrive as a key industrial unit.

GWL manufactures its entire product range in strict accordance with both **British Standard Specifications (BSS)** and **Bangladesh Standard Specifications (BDS**). Our ability to consistently deliver Premium-quality **Super Enamelled Copper Wire (SECW)** products is supported by state-of-the-art manufacturing technology, ongoing R&D, and continued collaboration with international partners.

Our flagship product, **Super Enamelled Copper Wire (SECW)**-commonly known as **Magnet Wire**-is a critical component in electric machinery, communications systems, and electronic equipment. Unlike ordinary electric wires used for transmission, SECWs are essential for forming coils that convert electrical energy into magnetic energy and vice versa-making them vital to a wide array of modern technologies.

GWL's performance has shown consistent growth across all areas of operation, earning recognition as one of the **top-performing enterprises under BSEC** during the **1979-1980 fiscal year.**

Initially commissioned with a production capacity of **280 metric tons per year (SWG 12 to SWG 34),** GWL successfully completed a BMRE **(Balancing, Modernization, Rehabilitation & Expansion)** initiative between **1981-1983,** boosting capacity to **500 metric tons annually** and extending the product range up to **SWG 46**-all funded through internal resources. In **2019**, the Government of Bangladesh invested 69 cores taka in Gazi Wires Limited to establish a new state-of-the-art manufacturing facility, aimed at meeting the growing demand from government-owned companies within the electricity sector. Now, Gazi Wires has the production capacity 2,020 MT per year.

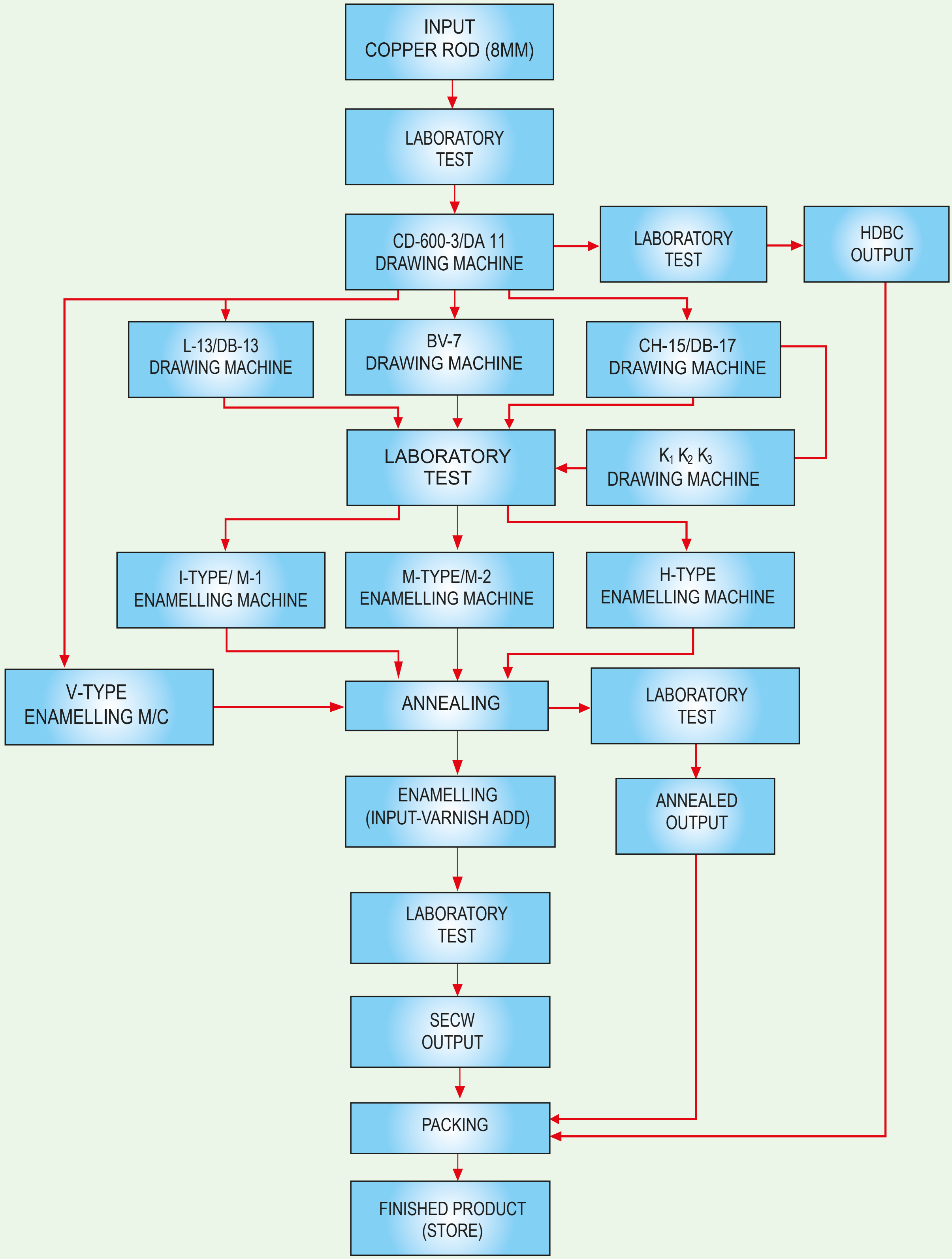
Comparison of GWL Product with BSS and BDS Standared.

Gazi Wires Limited's Super Enamelled Copper Wire is engineered to exceed expectation consistently outperforming both British Standard Specification (BSS) and Bangladesh Standard Specification (BDS 1034 Part 1 & 5), as highlighted in the comparison table as given below:

Test	Standard Value	Result of Products	Remarks
Unidirectional Scrap Resistance	12.5 N	14.7 N	More Than The Required Quality is Available
Break down Voltage Unit-Volt	5500	10,000	Almost Double
Conductivity Unit-%IACS	100%	Above 100%	Very much effective for electrical purpose
Continuity of Covering (Pinhole) Unit-No.	5 Faults (Maximum) (30 Meter)	Almost Zero	No fault at all

Raw Materials

PRODUCTION FLOW PROCESS CHART WITH LAB



4. THE PRODUCTION PROCESS:

4.1 Drawing:

Imported Premium quality wax-coated electrolytic copper Rod (8mm diameter) is precisely processed through advanced drawing machines equipped with diamond dies and polished tungsten carbide dies. The wire undergoes multiple reduction stages to achieve the exact required dimensions with exceptional surface finish and consistency.

8 m.m Dia Electrolytic Copper Rod (Raw Material)

Drawing Machine (DA-11)

Drawn Copper Wire

Drawn Copper Wire

4.2 Annealing:

As the copper wire undergoes the drawing process, it naturally hardens-a condition that must be corrected to ensure optimal ductility. To restore flexibility and mechanical integrity, the wire is continuously annealed through electrically heated, thermostatically controlled overhead furnaces, precisely maintained at temperatures ranging from 500°C to 800°C, tailored to the specific wire size.

4.3 Enamelling:

After undergoing precise annealing and thorough cleaning, the copper wires are transferred to the state-of-the-art enamelling plant. They are uniformly coated with high-quality enamel varnish using advanced solid enamelling dies or vanish applicators. The enamel-coated wires are then cured in electrically heated, thermostatically controlled furnaces-either vertical or horizontal-ensuring optimal insulation and durability. Once cured, the wires are carefully wound onto plastic bobbins, with each bobbin undergoing individual quality testing. This entire enamelling process is fully automated, ensuring consistency, efficiency and superior product quality.


Enamelling Machine


Enamelling Machine

5. Product Range and Applications:

5.1 PRODUCTS:

At Gazi Wires Limited, we specialize in the production of high-performance copper wire solutions, engineered to meet stringent national and international standards. Our current product lineup includes:

Enamelled Round Copper Winding Wire (Polyvinyl Acetal Varnish):
Manufactured in sizes SWG 12 to SWG 25, this wire meets the requirements of BSS 4516 and BDS 1034 (Part 1 & 5): 2006, offering excellent thermal stability and insulation performance.

Enamelled Round Copper Winding Wire (Polyester Varnish):
Produced in sizes SWG 26 to SWG 46, conforming to BSS 4665 and BDS 1034 (Part 1 & 5): 2006, these wires are ideal for applications requiring high dielectric strength and long-term durability.

Enamelled Round Copper Winding Wire (Polyestrimide):
Produced in sizes SWG 12 to SWG 46, conforming to BSS 4665 and BDS 1034 (Part 1 & 5): 2006, these wires are ideal for applications requiring high dielectric strength and long-term durability.

Hard Drawn Bare Copper Wire:
Available in a wide range of sizes from SWG 1 to SWG 46, this wire is known for its mechanical strength and conductivity, suitable for general-purpose industrial use.

Annealed Copper Wire:
Offered in sizes SWG 12 to SWG 46, this wire provides superior flexibility and softness, making it ideal for precision winding and electrical applications.


Finished Goods


Finished Goods

5.2 MAIN USES AND PROPERTIES OF OUR PRODUCTS

USES	POLYVINYL ACETAL ENAMELLED WIRE	POLYESTER ENAMELLED WIRE	POLISTERIMIDE ENAMELLED WIRE
Varnish	**PVF-(22%)**	**PEW-(34%)**	**PEI-(40%)**
Thermal class Generators	A(105°C)	B(180°C) Small type non-utility generation	C(180°C)
Motors	Standard Motors. Small type motors for electric household appliances, Toys.	Standard motors, Motor for electric tools, Grinders, Drill, Saw, Planner etc. Small type motors for electric household appliances, Toys, other special motors.	Standard or Big Size motors, Motor for electric tools, Grinders, Drill, Saw, Planner etc. and High Heat aenerate electric device.
Transformer	Oil immersed transformer, Transformer for measuring instruments, Pole-transformer for sub-station, current transformer, Transformer for test use.	Transformer for measuring instruments, Current transformer for test use.	Transformer for measuring instruments, Current transformer for test use.
Coil for Equipment	For communication equipment, high frequency coil, for power source transformer, for power gerneration, Coil for electro magnetic switch, Solenoid coil. Coil for lighting fixture etc.	For communication equipment High frequency coil, Transformer Coil for power source, Transformer for power generation, coil for electro magnetic switch, Solenoid coil for lighting Fixture.	For communication equipment High frequency coil, Transformer Coil for power source, Transformer for power generation, coil for electro magnetic switch, Solenoid coil for lighting Fixture.
Merits	Excellent flexibility, abrasion resistance, Excellent overload proofness, good thermal stability Resistance heatshock to mechanical abuse, windability, good resistance to R-12 Refrigerant.	Excellent thermal stability. Good mechanical properties, Excelent dielectric Strength, good cut-through resistance to withstand burn-out conditions of temporary overload.	Excellent thermal stability. Good mechanical properties, Excelent dielectric Strength, good cut-through resistance to withstand burn-out conditions of temporary overload.
Demerits	Poor solvent resistance (phenol, alcohol) Tends to craze during winding when soaked in water or solvent which may be removed by heating the wire for 30 min at 120°C-130°C under stress.	Poor heatshock resistance, Poor moisture resistance, Tends to hydrolise in humid condition	Poor heatshock resistance, Poor moisture resistance, Tends to hydrolise in humid condition

6. Advanced Quality Assurance & Inspection Excellence:

At Gazi Wires Limited, quality is more than a commitment-it's a system built into every stage of production. Our advanced quality control laboratory is equipped with state-of-the-art instruments, precision testing machinery, and a team of highly trained professionals dedicated to ensuring excellence. We believe exceptional products start with premium raw materials, which is why we source only from globally trusted suppliers.

Every incoming batch of raw material undergoes stringent testing for physical, chemical, electrical, and mechanical properties. For instance, copper is rigorously evaluated for elongation, breaking load, electrical resistance and chemical purity. Likewise, our enamel varnishes are tested for solid content, viscosity, specific gravity, flash point and other performance-critical parameters.

Throughout the manufacturing process, our production engineers, laboratory chemists and quality control specialists work in close coordination-monitoring in-process materials and refining conditions to deliver consistent, high-performance wires that meet and exceed industry standards.

CHARACTERISTICS

Key Features of GWL Brand Super Enameled Copper Wires (SECW):

A. The insulation coating is thin, uniform, and has superior electrical properties.
B. The insulation coating has superior mechanical and heat resistance.
C. GWL wires are flexible and have a smooth surface, making them ideal for various winding processes.
D. Our wires maintain stable properties over extended periods.
E. Wires are very competitively priced.

"Super Enamelled Copper Wires (SECW) from Gazi Wires Limited are engineered to meet the evolving needs of modern electronics, where compact design and high efficiency are paramount. Known for their space-saving design, superior insulation and mechanical performance, SECWs play a vital role in the miniaturization and technological advancement of today's electronic equipment.

As demand grows for premium-quality wires compatible with high-speed automatic winding machines, flexibility and durability become essential. Our SECWs are specifically designed to maintain critical electrical, mechanical, and thermal properties-even after enduring the stress of precision coil winding operations.

To ensure unmatched product reliability, each production line is subject to continuous quality verification. Samples from every reel are thoroughly tested in our in-house laboratory, in full compliance with the relevant Bangladesh Standard Specifications (BDS). We also conduct extensive evaluations on both the inner and outer ends of each reel, performing a comprehensive suite of tests including, but not limited to:

6.1 PHYSICAL TESTS:

Conductor and Overall Diameter Precision You Can Trust To ensure dimensional accuracy and consistent performance, both the conductor diameter and overall diameter are measured using high-precision instruments. Each measurement is meticulously verified against the standards outlined in Tables 1 and 2, guaranteeing full compliance with specified tolerances and product specifications.

Table - 1: Diameter, area, weight and resistance of Hard Drawn Bare Copper Wire.

SWG	Diameter of conductor			Area of conductor (Nom)mm	Copper weight (bare) kg/km	Standard resistance of HDBC at 20°C (68°F) Ohm/Km
	Nominal mm	Maximum mm	Minimum mm			
1	2	3	4	5	6	7
1	7.620	7.648	7.590	45.600	405.400	0.387
2	7.012	7.028	6.970	38.600	343.200	0.458
3	6.403	6.428	6.370	32.180	286.100	0.549
4	5.893	5.918	5.860	27.270	242.400	0.649
5	5.386	5.408	5.349	22.770	202.400	0.777
6	4.880	4.908	4.849	18.680	166.060	0.948
7	4.472	4.498	4.439	15.700	139.530	1.129
8	4.065	4.088	4.029	12.970	115.320	1.366
9	3.660	3.688	3.629	10.510	93.430	1.686
10	3.252	3.278	3.219	8.302	73.790	2.136
11	2.946	2.974	2.915	6.816	60.560	2.601
12	2.642	2.668	2.616	5.481	48.720	3.238
13	2.337	2.360	2.314	4.289	38.130	4.137
14	2.032	2.052	2.012	3.243	28.830	5.471
15	1.829	1.847	1.811	2.627	23.350	6.756
16	1.626	1.641	1.610	2.075	18.430	8.552
17	1.422	1.438	1.407	1.589	14.130	11.180
18	1.219	1.232	1.207	1.163	10.380	15.210
19	1.016	1.026	1.006	0.811	7.207	21.910
20	0.914	0.924	0.904	0.657	5.838	27.040
21	0.812	0.820	0.805	0.519	4.613	34.220
22	0.711	0.718	0.704	0.397	3.532	44.700
23	0.610	0.615	0.605	0.292	2.595	60.850
24	0.558	0.563	0.554	0.245	2.181	72.420
25	0.508	0.513	0.503	0.202	1.797	87.630
26	0.457	0.462	0.452	0.164	1.460	108.200
27	0.416	0.421	0.412	0.136	1.212	130.400
28	0.375	0.378	0.372	0.111	0.987	160.100
29	0.345	0.348	0.342	0.093	0.833	189.500
30	0.315	0.318	0.312	0.079	0.703	227.900
31	0.294	0.297	0.291	0.068	0.606	260.400
32	0.274	0.277	0.271	0.059	0.525	300.600
33	0.254	0.257	0.251	0.051	0.451	350.600
34	0.233	0.236	0.230	0.043	0.381	414.300
35	0.213	0.216	0.210	0.036	0.317	484.161
36	0.193	0.195	0.190	0.029	0.260	589.631
37	0.173	0.175	0.170	0.023	0.209	735.530
38	0.152	0.155	0.150	0.018	0.161	950.960
39	0.132	0.135	0.129	0.012	0.122	1261.220
40	0.122	0.125	0.119	0.010	0.104	1476.110
41	0.112	0.115	0.110	0.009	0.088	1752.130
42	0.102	0.104	0.099	0.008	0.073	2112.860
43	0.091	0.094	0.088	0.007	0.058	2652.460
44	0.081	0.084	0.079	0.005	0.046	3347.770
45	0.071	0.074	0.068	0.004	0.035	4364.810
46	0.061	0.063	0.059	0.003	0.026	5904.450

Table 2: Diameter, area, weight and resistance of Annealed Copper Wire

SWG	Diameter of conductor			Area of conductor (Nom)mm	Copper weight (bare) kg/km	Resistance at 20°C (68°F) Ohm/Km
	Nominal mm	Maximum mm	Minimum mm			
12	2.642	2.668	2.616	5.481	48.720	3.238
13	2.337	2.360	2.314	4.289	38.130	4.137
14	2.032	2.052	2.012	3.243	28.830	5.471
15	1.829	1.847	1.811	2.627	23.350	6.756
16	1.626	1.641	1.610	2.075	18.430	8.552
17	1.422	1.438	1.407	1.589	14.130	11.180
18	1.219	1.232	1.207	1.163	10.380	15.210
19	1.016	1.026	1.006	0.811	7.207	21.910
20	0.914	0.924	0.904	0.657	5.838	27.040
21	0.812	0.820	0.805	0.519	4.613	34.220
22	0.711	0.718	0.704	0.397	3.532	44.700
23	0.610	0.615	0.605	0.292	2.595	60.850
24	0.558	0.563	0.554	0.245	2.181	72.420
25	0.508	0.513	0.503	0.202	1.797	87.630
26	0.457	0.462	0.452	0.164	1.460	108.200
27	0.416	0.421	0.412	0.136	1.212	130.400
28	0.375	0.378	0.372	0.111	0.987	160.100
29	0.345	0.348	0.342	0.093	0.833	189.500
30	0.315	0.318	0.312	0.079	0.703	227.900
31	0.294	0.297	0.291	0.068	0.606	260.400
32	0.274	0.277	0.271	0.059	0.525	300.600
33	0.254	0.257	0.251	0.051	0.451	350.600
34	0.233	0.236	0.230	0.043	0.381 4	14.300
36	0.193	0.195	0.190	0.029	0.260	589.631
35	0.213	0.216	0.210	0.036	0.317	484.161
37	0.173	0.175	0.170	0.023	0.209	735.530
38	0.152	0.155	0.150	0.018	0.161	950.960
39	0.132	0.135	0.129	0.012	0.122	1261.220
40	0.122	0.125	0.119	0.010	0.104	1476.110
41	0.112	0.115	0.110	0.009	0.088	1752.130
42	0.102	0.104	0.099	0.008	0.073	2112.860
43	0.091	0.094	0.088	0.007	0.058	2652.460
44	0.081	0.084	0.079	0.005	0.046	3347.770
45	0.071	0.074	0.068	0.004	0.035	4364.810
46	0.061	0.063	0.059	0.003	0.026	5904.450

Table - 3: Type and thickness of Super Enamelled Round Copper Wires and resistance of conductor.

SWG	Diameter of conductor			Fine covering		Medium Covering		Thick Covering		Resistance
	Nominal mm	Maximum mm	Minimum mm	Overall dia	Increase in dia	Overall dia	Increase in dia	Overall dia	Increase in dia	at 20°c Ohm/km
1	2	3	4	5	6	7	8	9	10	11
12	2.642	2.668	2.616	2.749	0.052	2.781	0.077	2.816	0.107	3.146
13	2.337	2.360	2.314	2.433	0.051	2.468	0.075	2.502	0.104	4.019
14	2.032	2.052	2.012	2.125	0.050	2.153	0.073	2.186	0.101	5.317
15	1.829	1.847	1.811	1.918	0.048	1.946	0.071	1.978	0.099	6.564
16	1.626	1.641	1.610	1.710	0.046	1.738	0.068	1.769	0.096	8.307
17	1.422	1.438	1.407	1.502	0.044	1.529	0.066	1.599	0.093	10.850
18	1.219	1.232	1.207	1.295	0.042	1.320	0.062	1.351	0.088	14.768
19	1.016	1.026	1.006	1.085	0.039	1.110	0.059	1.203	0.085	21.270
20	0.914	0.924	0.904	0.980	0.038	1.005	0.057	1.033	0.081	26.260
21	0.812	0.820	0.805	0.874	0.036	0.898	0.054	0.925	0.078	33.230
22	0.711	0.718	0.704	0.769	0.034	0.791	0.051	0.816	0.074	43.400
23	0.610	0.615	0.605	0.663	0.032	0.685	0.049	0.710	0.071	59.070
24	0.558	0.563	0.554	0.610	0.030	0.633	0.046	0.691	0.068	70.300
25	0.508	0.513	0.503	0.557	0.029	0.578	0.044	0.600	0.065	85.070
26	0.457	0.462	0.452	0.503	0.027	0.525	0.042	0.546	0.062	105.020
27	0.416	0.421	0.412	0.460	0.025	0.481	0.039	0.502	0.058	126.510
28	0.375	0.378	0.372	0.417	0.024	0.435	0.037	0.456	0.057	155.340
29	0.345	0.348	0.342	0.386	0.023	0.405	0.035	0.425	0.055	185.960
30	0.315	0.318	0.312	0.353	0.022	0.371	0.034	0.391	0.053	221.300
31	0.294	0.297	0.291	0.331	0.021	0.350	0.032	0.371	0.051	252.900
32	0.274	0.277	0.271	0.310	0.020	0.327	0.031	0.347	0.048	291.700
33	0.254	0.257	0.251	0.288	0.020	0.305	0.031	0.325	0.048	340.300
34	0.233	0.236	0.230	0.266	0.019	0.282	0.030	0.302	0.046	402.000
35	0.213	0.216	0.210	0.244	0.018	0.259	0.029	0.276	0.046	483.870
36	0.193	0.196	0.190	0.223	0.017	0.237	0.027	0.253	0.041	589.300
37	0.173	0.175	0.170	0.201	0.016	0.214	0.026	0.229	0.038	733.500
38	0.152	0.155	0.150	0.179	0.015	0.189	0.024	0.204	0.036	950.200
39	0.132	0.135	0.129	0.157	0.014	0.167	0.023	0.180	0.033	1259.900
40	0.122	0.124	0.119	0.146	0.012	0.155	0.021	0.169	0.031	1474.900
41	0.112	0.115	0.109	0.134	0.012	0.142	0.020	0.155	0.029	1750.000
42	0.102	0.104	0.099	0.123	0.011	0.130	0.019	0.144	0.028	2110.000
43	0.091	0.094	0.088	0.111	0.010	0.117	0.017	0.129	0.026	2651.000
44	0.081	0.084	0.079	0.099	0.009	0.106	0.016	0.117	0.024	3345.900
45	0.071	0.074	0.068	0.088	0.008	0.093	0.015			4355.000
46	0.061	0.063	0.059	0.076	0.008	0.081	0.012			5099.700

6.2 Abrasion Resistance of Enamel Coating - Proven Durability Under Stress:

We ensure that our Super Enamelled Copper Wires (SECWs) meet the highest durability standards through rigorous abrasion resistance testing. This critical evaluation applies to wires with a bare diameter of 0.230 mm and above, assessing the enamel's ability to withstand mechanical stress during high-speed operations.

The test is performed using an automated abrasion testing apparatus, where a 0.4 mm diameter steel sewing needle, held at a right angle, repeatedly scrapes the enamel surface. The needle is part of an electrical circuit energized with 12V DC; once the enamel layer is breached and contact is made with the conductor, a current of approximately 5mA completes the circuit- automatically stopping the test.

Each wire sample undergoes three abrasion cycles, spaced 25 mm apart longitudinally and 120° apart angularly. As per Bangladesh Standard Specification (BDS), the average number of abrasion strokes must be 30 or higher, with no single test below 15. Gazi Wires consistently exceeds these benchmarks, with our wires typically achieving average values above 45 and individual test results above 30-a testament to the superior quality and resilience of our enamel coatings.

6.3 Flexibility & Enamel Adhesion:

Our Super Enamelled Copper Wires (SECWs) are rigorously tested to ensure exceptional flexibility and enamel adhesion critical qualities for high-speed winding applications and long-term reliability.

Our wires are tested in accordance with industry standards, with specific methods tailored to wire diameter:

1. For wires under 0.250 mm (bare diameter):
A 25 cm wire specimen is stretched by 3.1 cm at a controlled speed of 30 cm/min, or until it breaks. The specimen is then tightly wound around a polished metal mandrel, three times the diameter of the bare wire. The enamel must show no visible cracks, ensuring resilience under mechanical stress.
2. For wires between 0.250 mm and 2.00 mm (inclusive):
The enamelled wire is coiled into ten tight turns around itself, and the enamel surface is inspected for cracking or flaking-none is permitted.
3. For wires above 2.00 mm (bare diameter):

The wire is wound into ten contiguous turns around a polished mandrel, with a diameter three times greater than the wire. Again, the enamel must remain intact and crack-free.

All test specimens are examined under a microscope to ensure microscopic integrity of the enamel layer, confirming outstanding adhesion and mechanical durability-hallmarks of GWL's manufacturing excellence.

6.4 Heat Shock Resistance:

Our Super Enamelled Copper Wires (SECWs) are engineered to deliver consistent performance under extreme thermal conditions. Our Heat Shock Test is designed to validate the enamel's ability to resist cracking when exposed to elevated temperatures-ensuring long-term reliability in demanding electrical applications.

(A) SECW with Polyvinyl Acetal Varnish (PVF- 22%):

A wire sample, prepared according to the relevant standard procedure based on its size, is placed in a precision-controlled oven at 155°C to 160°C for 30 minutes. Upon removal and inspection, the enamel coating remains completely crack-free, confirming its excellent thermal endurance.

(B) SECW with Polyester Varnish (PEW- 34%):
A wire sample, prepared according to the relevant standard procedure based on its size, is placed in a precision-controlled oven at 200°C to 205°C for 30 minutes Upon removal and inspection, the enamel coating remains completely crack-free, confirming its excellent thermal endurance.

(C) SECW with Polyeslrimide Varnish (PEI -40%):
A wire sample, prepared according to the relevant standard procedure based on its size, is placed in a precision-controlled oven at 200°C to 205°C for 30 minutes. Upon removal and inspection, the enamel coating remains completely crack-free, confirming its excellent thermal endurance.

All results are visually inspected under magnification, reaffirming GWL's commitment to enamel durability, thermal reliability and insulation integrity across its entire product range.

6.5 Heat Ageing Test:

(A) For SECW Based on Polyester Varnish PEW-34%:
An unstretched and unbent enamelled wire specimen is subjected to heating in free air at 180 ± 2°C for 120 hours in an oven. After cooling to room temperature, the specimen is wound into ten continuous turns around a polished metal mandrel with a diameter three times that of the bare wire. The enamel coating should show no signs of cracking.

(B) For SECW Based on Polyvinyl Acetal Varnish PVF-22%:
An unstretched and unbent enamelled wire specimen is heated in free air at 130 ± 2°C for 96 hours. After cooling to room temperature, the specimen is tested based on its size:

(C) SECW with Polyestrimide Varnish (PEI -40%)
An unstretched and unbent enamelled wire specimen is subjected to heating in free air at 180 ± 2°C for 120 hours in an oven. After cooling to room temperature, the specimen is wound into ten continuous turns around a polished metal mandrel with a diameter three times that of the bare wire. The enamel coating should show no signs of cracking.

(i) For wires with a bare diameter of 0.900mm or less:
The aged specimen is wound into ten continuous turns around a polished metal mandrel with a diameter three times that of the bare wire. The enamel coating should remain crack-free.

(ii) For wires with a bare diameter greater than 0.900mm:
The aged specimen is wound into ten continuous turns around a polished metal mandrel with a diameter four times that of the bare wire. The enamel coating should show no cracks.

(iii) For wires with a bare diameter greater than 0.900mm:
The aged specimen is wound into ten continuous turns around a polished metal mandrel with a diameter three times that of the bare wire. The enamel coating should remain crack-free.

6.6 Elongation of SECW:

A 25 cm long specimen of enamelled wire is clamped between the grips of a tensile testing machine and gradually stretched at a rate of 30 cm/min until it breaks. The minimum percentage of elongation at break, as specified in the BDS, along with the typical values for our wires are provided in Table 3 below.

Table: 4 MINIMUM ELONGATION OF SECW

NOMINAL DIAMETER OF BARE WIRE IN MM		MINIMUM ELONGATION AT BREAK	
Over	Upto & including	As per B.D.S	Our Wires
0.060	0.090	15%	16%
0.090	0.190	17%	20%
0.190	0.750	20%	25%
0.750	2.500	25%	30%
2.500	4.000	30%	35%

6.7 Electrical Test:

Two equal-length samples of enamelled wire are twisted together using a machine with jaws set 125 mm apart. The wires are twisted to achieve the specified number of twists per 12.5 cm, as outlined in the table below.

Table : 5 NUMBER OF TWISTS OF SPECIMENS FOR ELECTRIC STRENGTH

NOMINAL DIAMETER OF BARE WIRE IN MM		NUMBER OF TWISTS PER 12.5 CM
Over	Upto & including	
0.061	0.112	40
0.112	0.250	33
0.250	0.350	23
0.350	0.500	16
0.500	0.750	12
0.750	1.050	8
1.050	1.500	6
1.500	2.150	4
1.150	2.500	3
2.500	2.950	2

Approximately 5 cm of each end of the twisted specimen is untwisted, and the enamel is stripped from one pair of ends to enable voltage application between the wires. The test voltage is alternating current (AC) with a nominal frequency of 50 Hz, a sine-wave form, and a peak factor within the range of 1.34 to 1.48 (±5%).

Table : 6 Specification Of Breakdown Voltage Tests Under BDS 1034 (Part 1 & 5) : 2006 for grade-2 enamel covering.

SI NO.	SWG	DIA IN mm	TENSTION	TWIST	TURN	VOLTS (BDS)
01.	11	2.903				3,400v
02.	12	2.642				3,400v
03.	13	2.337	54. 00 (N) or 5.508 (kg)	4	1	7,000v
04.	14	2.032	-Do-	4	1	7,000v
05.	15	1.829	-Do-	4	1	6,500v
06.	16	1.626	-Do-	4	1	6,500v
07.	17	1.422	27.00 (N) or 2.754 (kg)	6	$1\frac{1}{2}$	6,000v
08.	18	1.219	-Do-	6	$1\frac{1}{2}$	6,000v
09.	19	1.016	13.500 (N) or 1.377 (kg)	8	2	5,500v
10.	20	0.914	-Do-	8	2	5,500v
11	21	0.812	-Do-	8	2	5,500v
12.	22	0.711	7.00(N) Or 0.714 (kg)	12	3	5,500v
13.	23	0.609	-Do-	12	3	5,000v
14.	24	0.558	-Do-	12	3	5,000v
15.	25	0.508	-Do-	12	3	5,000v
16.	26	0.457	3.40 (N) or 0.340 (kg)	16	4	4,600v
17.	27	0.416	-Do-	16	4	4,600v
18.	28	0.375	-Do-	16	4	4,400v
19.	29	0.345	1.709 (N) or 0.173 (kg)	23	$5\frac{3}{4}$	4,400v
20.	30	0.315	-Do-	23	$5\frac{3}{4}$	4,400v
21	31	0.295	-Do-	23	$5\frac{3}{4}$	4,200v
22.	32	0.274	-Do-	23	$5\frac{3}{4}$	4,200v
23.	33	0.254	-Do-	23	$5\frac{3}{4}$	4,200v
24.	34	0.233	0.85 (N) or 0.086 (kg)	33	$8\frac{3}{4}$	3,900v
25.	35	0.213	0.85 (N) or 0.086 (kg)	33	$8\frac{3}{4}$	3,700v
26.	36	0.193	0.086 (kg)	33	$8\frac{3}{4}$	3,500v
27.	37	0.173	-Do-	33	$8\frac{3}{4}$	3,300v
28.	38	0.153	-Do-	33	$8\frac{3}{4}$	3,000v
29.	39	0.132	-Do-	33	$8\frac{3}{4}$	3,000v
30.	40	0.122	-Do-	33	$8\frac{3}{4}$	2,800v
31.	41	0.112	-Do-	33	$8\frac{3}{4}$	2,700v
32.	42	0.102	0.40 (N) or 0.040 (kg)	40	10	2,700v
33.	43	0.091	-Do-	40	10	1,000v
34.	44	0.081	-Do-	40	10	1,000v
35.	45	0.071	-Do-	40	10	900v
36.	46	0.061	0.20 (N) or o.20 (kg)	40	10	800v

6.8 Continuity of Covering:

This test is designed for wires with a bare diameter of 0.500 mm or smaller. A sample of enamelled wire, at least 30 meters long, is passed through a bath of clean mercury to detect any insulation faults.

According to BDS specifications for Grade-2 enamel covering, up to 5 faults are allowed within a 30-meter length. However, our medium-covered wires typically exhibit no faults, showcasing their exceptional quality.

CHEMICAL TEST

6.9 Cure Test:

A sample of enamelled wire is initially conditioned by baking at 130 ± 2°C for 10 minutes, then allowed to cool to room temperature. Next, approximately 10 cm of the wire is immersed-without bending-for 5 minutes in a boiling solvent mixture, as specified below:

(a) For wires enamelled with polyvinyl acetal varnish: a mixture of 30% commercial-grade toluene and 70% denatured Ethanol alcohol by volume.

(b) For wires enamelled with polyester varnish: a mixture of 30% commercial-grade toluene and 70% methanol by volume.

(C) For Wire Enamelled Polyestrimide Varnish a mixture 30% commereial grade toluene and 70% Ethanol

6.10 Resistance of Enamel to Varnish Solvents:

(A) The surface of our Super Enamelled Copper Wire (SECW) with polyester varnish exhibits excellent resistance to common solvents. Four wire specimens, conditioned as per the previous test, are immersed in the following solvents for 24 hours:

Methylated spirit

Xylene/Butanol mixture (90/10 by volume)

Xylene

White spirit

After immersion, the specimens are dried at room temperature for 30 minutes. Following this, the enamel coating cannot be removed by a single scrape of a thumbnail along the wire, demonstrating strong solvent resistance.

(B) When tested with the same procedure, wires enamelled with polyvinyl acetal also show resistance to the following solvents:

Denatured ethyl alcohol

Xylene/n-butanol mixture (80/20 by volume)

Xylene

White spirit

Additionally, the wire displays excellent resistance to transformer oil.

Completeness of cure (5 min. in a boiling mixture of 30% toluole and 70% methylated sprite)	Pass	No swelling or blister.
Resistance to Solvents		24 hours
(a) Methylated spirit	Pass	,,
(b) Xylole/butanol (90:10)	Pass	,,
(c) Xylole	Pass	,,
(d) White spirit	Pass	,,
Resistance to insulating oil (transformer oil)	Pass	Pass 6 hours at 110+2°C

Thermal Test

6.11 Cut-through:

(Applicable to all sizes)

Two wire specimens are placed in a test apparatus (preheated to the specified temperature) so that they cross at right angles. Once the sample reaches the apparatus temperature, a load is applied at the crossing point based on the wire diameter. An alternating voltage is then applied between the wires to detect any cut-through of the enamel and contact with the conductors. Throughout the test, no enamel cut-through should occur, as the thermoplasticity of the enamel is designed to prevent this at the specified temperature.

Wire Drawing Machine

Injection Moulding Machine

Table 7: Times for Cut-Through Test:

NOMINAL DIAMETER		TIME FROM INSERTING UNTIL LOADING
Over	Upto and including	
mm	mm	Min. (minutes)
-	1.000	1
1.000	2.000	2
2.000	3.000	3
3.000	-	5

Table 8: Loads for Cut-Through Test:

NOMINAL DIAMETER		LOAD
Over	Upto and including	
mm	mm	N
-	0.050	0.40
0.050	0.080	0.70
0.080	0.125	1.25
0.125	0.315	2.20
0.315	0.500	4.50
0.500	0.800	9.00
0.800	1.250	18.00
1.250	2.000	36.00
2.000	-	70.00

Finished Goods

Finished Goods

6.12 Peel Test:

(Applicable to wire sizes greater than 1.0mm)

A 600 mm long sample of wire is placed in a tester with two fixing devices positioned 500 mm apart along the same axis. One device is fixed and can be displaced axially, while the other is rotatable. The fixed device is loaded based on the wire diameter to apply tension. Using a scraper, the enamel is removed from opposite sides of the wire, exposing the bare conductor. The applied pressure is sufficient to cleanly remove the enamel without damaging the copper beneath. The enamel removal does not extend beyond the fixing device.

The rotating fixing device is then operated at a speed of 60-100 RPM until the specified number of revolutions is completed. After twisting, the specimen is examined for flexibility and enamel adhesion. If the enamel can be easily removed, it is considered to have lost its adhesion, even if it is not fully detached from the wire during the test. The number of revolutions of the rotating device is calculated using the following formula:

$$R = \frac{175}{d} \quad \text{(for PVF Enamel)}$$

$$R = \frac{110}{d} \quad \text{(for PEW Enamel)}$$

$$R = \frac{110}{d} \quad \text{(for PEI Enamel)}$$

Where R is the number of revolutions, and d is the nominal dianeter of the conductor in mm.

NOMINAL DIAMETER		LOAD
Over	Upto and including	
mm	mm	N
1.00	1.40	25
1.40	1.80	40
1.80	1.24	60
1.24	2.80	100
2.80	3.55	160
3.55	4.50	250
4.50	-	400

MECHANICAL TEST

6.13 Jerk test:

(Applicable to sizes upto and including 1.0mm)

1. A 250 mm long wire specimen is secured between the clamps of a testing machine and rapidly stretched until it breaks. Afterward, the specimen is examined under 6x to 10x magnification for any cracks or loss of enamel adhesion. Cracks occurring within 2 mm of the fractured end are excluded from the analysis.

7. TYPICAL PROPERTIES AND TECHNICAL DATA:

7.1 Typical Properties of Round SECW Based On Polyester Varnish (PEW-34%):

Diameter of the bare wire	: 0.315 mm (SWG-30)
Overall diameter	: 0.371 mm
Thickness of the film	: 0.0381 mm

Table 10 :

NAME OF TEST	UNIT	TYPICAL PROPERTIES	BDS. SPECIFICATION VALUE (MINIMUM)
Flexibility and adhesion	-	Pass	No crack.
Elongation (Min)	%	28	26
Unidirectional Scrap Resistance	N	8.50	6.40
Break-down Voltage (min)	KV	5.0	4.2
Heat shock Resistance (30 minutes at 200°C to 205°C)	-	No Cracks	Should not crack after heating.
Jerk	-	Pass	Should not crack
Completeness of cure (5 minutes in a boiling mixure of 30% toluen and 70% Methanol)	-	Pass	No swelling and Blister.
Continuity of Covering DC V/30 meter	Faults	No Faults	5 Faults (Maximum)

7.2 TYPICAL PROPERTIES OF ROUND SECW BASED ON POLYVINYL ACETAL VARNISH (PVF-22%):

Diameter of Bare Wire 0.914 mm (SWG-20)
Overall Diameter 0.966 mm to 1.004 mm
Increax In Diameter 0.061 mm

Table 11 :

NAME OF TEST	UNIT	TYPICAL PROPERTIES	BDS. SPECIFICATION VALUE (MINIMUM)
Flexibility and adhesion	-	Pass	No crack.
Elongation (Min)	%	34	31
Unidirectional Scrap Resistance	N	14.7	12.5
Break-down Voltage (min)	KV	9.5	5.5
Heat shock Resistance (30 minutes at 155°C to 160°C)	-	No Cracks	Should not crack after heating.
Jerk	-	Pass	Should not crack
Completeness of cure (5 minutes in a boiling mixure of 30% toluen and 70% Ethylacohol)	-	Pass	No swelling and Blister.
Continuity of Covering DC V/30 meter	Faults	No Faults	5 Faults (Maximum)

7.3 TYPICAL PROPERTIES OF ROUND SECW BASED ON Polyesterimide Varnish (PEI-40%):

Diameter of Bare Wire 0.914 mm (SWG-20)
Overall Diameter 0.966 mm to 1.004 mm
Increas In Diameter 0.061 mm

Table 12 :

NAME OF TXST	UNIT	TYPICAL PROPERTIES	BDS
Flexibility and adhesion	-	Pass	No crack.
Elongation (Min)	%	34	31
Unidirectional Scrap Resistance	N	14.7	12.5
Break-down Voltage (min)	KV	9.5	5.5
Heat shock Resistance (30 minutes at 200°C to 205°C)	-	No Cracks	Should not crack after heating.
Jerk	-	Pass	Should not crack
Completeness of cure (5 minutes in a boiling mixure of 30% toluen and 70% Methanol)	-	Pass	No swelling and Blister.
Continuity of Covering DC V/30 meter	Faults	No Faults	5 Faults (Maximum)

8. Tension Control in Winding Operation:

Maintaining proper tension during the winding of Super Enamelled Copper (SEC) Wires into coils is essential for ensuring quality. Excessive tension can cause wire elongation, leading to uneven conductor resistance. In more severe cases, it may result in surface cracks or even wire breakage. To ensure optimal performance and prevent damage, winding tension should not exceed the recommended limits. The table below outlines the acceptable tension levels for winding thinner-sized SEC wires.

Table 13 :

Conductor Diameter mm	Standard Tension Gm.	Conductor Diameter mm	Standard Tension Gm.
.06	27	.10	72
.07	36	.12	96
.08	48	.15	150
.09	60	.17	192

9. Premium Packaging & Global Shipping Assurance:

Our Super Enamelled Copper Wires are expertly wound onto durable plastic spools and securely packed in high-quality corrugated cardboard boxes. Each spool is clearly labeled on the top and sides with essential details, including wire size, gross and net weight, and compliance with British Standard Specification (BSS) and Bangladesh Standard Specification (BDS). Every spool contains a single, uninterrupted length of wire to ensure seamless performance.

For international shipments, we take extra measures to safeguard quality. Our export packaging features waterproof polyethylene wrapping for each spool, all of which are housed in strong, seaworthy wooden crates-ensuring safe and damage-free delivery across the globe.

এক ইউনিট বিদ্যুৎ উৎপাদনের চেয়ে
এক ইউনিট সাশ্রয় করাই শ্রেয়

একমাত্র গাজী ওয়্যারস্ এর নির্ভেজাল কপার ওয়্যার দিতে পারে বিদ্যুৎ সাশ্রয়ের সুযোগ। আপনিও এ সুযোগ গ্রহণ করুন এবং ১০০% ঝুঁকিমুক্ত থাকুন

উৎপাদিত পণ্যঃ

ক) সুপার এনামেল কপার ওয়্যার : এসডব্লিউজি ১২-৪৬
খ) এ্যানিল্ড কপার ওয়্যার : এসডব্লিউজি ১২-৪৬
গ) হার্ড ড্রন বেয়ার কপার ওয়্যার : এসডব্লিউজি ০১-৪৬

ব্যবহারঃ

আন্তর্জাতিক মানের গাজী ওয়্যারস্ এর কপার ওয়্যার দিয়ে বৈদ্যুতিক ট্রান্সফরমার, ফ্যান, মোটর, জেনারেটর ইত্যাদি তৈরি/মেরামত করে আপনার যাবতীয় বৈদ্যুতিক সামগ্রীর স্থায়ীত্ব ও সুরক্ষা নিশ্চিত করুন।

অতি মূল্যবান বিদ্যুৎ অপচয় রোধে গাজী ওয়্যারস্ লিমিটেড এর কপার ওয়্যার ব্যবহার করুন।

গাজী ওয়্যারস্ লিমিটেড
GAZI WIRES LIMITED

(বাংলাদেশ ইস্পাত ও প্রকৌশল করপোরেশন , শিল্প মন্ত্রণালয়)

BSTI
BDS 1034

NPO

ISO 9001-2015
BUREAU VERITAS
Certification

প্রধান কার্যালয় ও কারখানা :
২৮-বিএফআইডিসি সড়ক, কালুরঘাট ভারী শিল্প এলাকা, চট্টগ্রাম-৪২১২।
ফোন : ০২-৪১৩৮৮১২৩, মোবাইল : ০১৭১৩-১১৪৩৩৬
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বিদেশ থেকে আমদানীকৃত আন্তর্জাতিক মানসম্পন্ন ৯৯.৯৯% খাঁটি কন্টিনিউয়াস কাস্ট হট রোল্ড ওয়াক্স কোটেড ইলেকট্রোলাইটিক কপার রড ও উন্নতমানের ভার্নিশ দ্বারা উৎপাদিত গাজী ওয়্যারস্ লিঃ-এর সুপার এনামেল কপার ওয়্যার নিরাপদ, বিদ্যুৎ সাশ্রয়ী ও দীর্ঘস্থায়ী।

- মান সম্পন্ন পণ্য উৎপাদন।
- সময়মত সরবরাহ।
- ক্রেতার সন্তুষ্টি অর্জন।
- সকল বৈদ্যুতিক ট্রান্সফরমার, মোটর, ফ্যান ও অন্যান্য বৈদ্যুতিক যন্ত্রপাতি তৈরি ও মেরামতে দীর্ঘস্থায়ী সেবা পেতে ব্যবহার করুন ১০০% আই,এ, সি, এস মানে প্রস্তুতকৃত গাজী ওয়্যারস্ লিমিটেড এর কপার ওয়্যার।
- সাশ্রয়ী মূল্যে অধিক কিনুন অধিক ব্যবহার করুন দেশের তৈরি সরকার নিয়ন্ত্রিত একমাত্র গাজী ওয়্যারস্ লিমিটেড এর কপার ওয়্যার।

গাজী ওয়্যারস্ লিমিটেড

GAZI WIRES LIMITED

(বাংলাদেশ ইস্পাত ও প্রকৌশল করপোরেশন , শিল্প মন্ত্রণালয়)

ISO 9001-2015 BUREAU VERITAS Certification

BDS 1034

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