LONG PRODUCTS

REBAR AND WIRE ROD
MANUFACTURED TO EXACTING STANDARDS



ezzsteel
The Middle East Steel Professionals

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LEADERS IN STEEL

RAISING THE BAR FOR QUALITY, RELIABILITY AND SERVICE

Ezz Steel is one of the world's fastest growing and most technically advanced steel producers. At our purpose-built steelmaking plants across Egypt, we have a production capacity of 7 million tons of steel per year, comprising 4.7 million tons of long products and 2.3 million tons of hot rolled flat steel (HRC).

We produce more than 450 grades of steel to provide the properties required for a huge range of applications, from concrete reinforcement to high-tensile cables, from nuclear projects infrastructure to fasteners and fixings.

Our dedication to investing in the latest technology and in the skills of our people, coupled with a commitment to continuous improvement and unparalleled customer service, have established Ezz Steel as a major player in the global steel marketplace.

Led by a clear vision, Ezz Steel is a name synonymous with quality, reliability and service excellence.



$4BN TOTAL INVESTMENTS

7M TPY

TOTAL ANNUAL CAPACITY (LONG PRODUCTS & HRC)

8,000+ STEEL PROFESSIONALS

MORE THAN 450 GRADES OF STEEL



LONG PRODUCTS

REBAR AND WIRE ROD PRODUCED TO EXACTING STANDARDS

Rebar and wire rod products are produced in sizes and grades designed to meet the needs of demanding applications worldwide.

LARGE-SCALE STEEL PRODUCTION

At four state-of-the-art plants in Egypt, Ezz Steel has the capacity to produce 4.7 million tons of long products per year.

These products provide essential components for everything from major construction projects to household objects, from long-span bridges to cars, from infrastructure for nuclear projects to nails and bolts.

MULTIPLE STEEL GRADES FOR DIVERSE APPLICATIONS

Ezz Steel produces more than 130 grades of long products, which comply with challenging international standards and customer specifications. The properties of these steel grades have been carefully developed to meet the demands of applications that require varying degrees of tensile strength, ductility, machinability, formability and other properties.

METALLURGICAL INNOVATION TO MEET CHANGING DEMAND

Our metallurgists are constantly innovating with steel properties and developing new steel compositions to meet changing market demands. This has resulted in diverse products, including low, medium and high-carbon steel grades with exceptional mechanical properties and welding characteristics, through to high-quality steel grades with enhanced drawing performance.

WHERE OUR LONG PRODUCTS GO

REBAR APPLICATIONS

- Concrete reinforcement.
- Pre-cast concrete units.
- Tunnel form, box form and table form concrete systems.
- Traditional construction systems.
- Concrete roads, airport runways and highways.
- Coverings for steel beams, columns and false ceilings.
- Canal linings.
- Concrete tunnels and pipes.

WIRE ROD APPLICATIONS

- Drawn and galvanized wire.
- Nails, bolts and tacks.
- Sling wire rope.
- Electrical components and household goods.
- Welding electrodes.
- Electric cable armouring.
- Furniture springs.
- Automotive components.
- Fasteners and fixings.
- Wire mesh.

4.7M TPY

LONG PRODUCTS ANNUAL CAPACITY

WHY CHOOSE EZZ STEEL?

INTEGRATED STEELMAKING FOR QUALITY, ACCURACY AND EFFICIENCY

Ezz Steel produces rebar and wire rod at fully integrated plants employing state-of-the-art technology. Intelligent plant design facilitates a continuous, automated process from raw material intake through to finished product dispatch – delivering exceptional steel quality, accuracy, process efficiency and productivity.

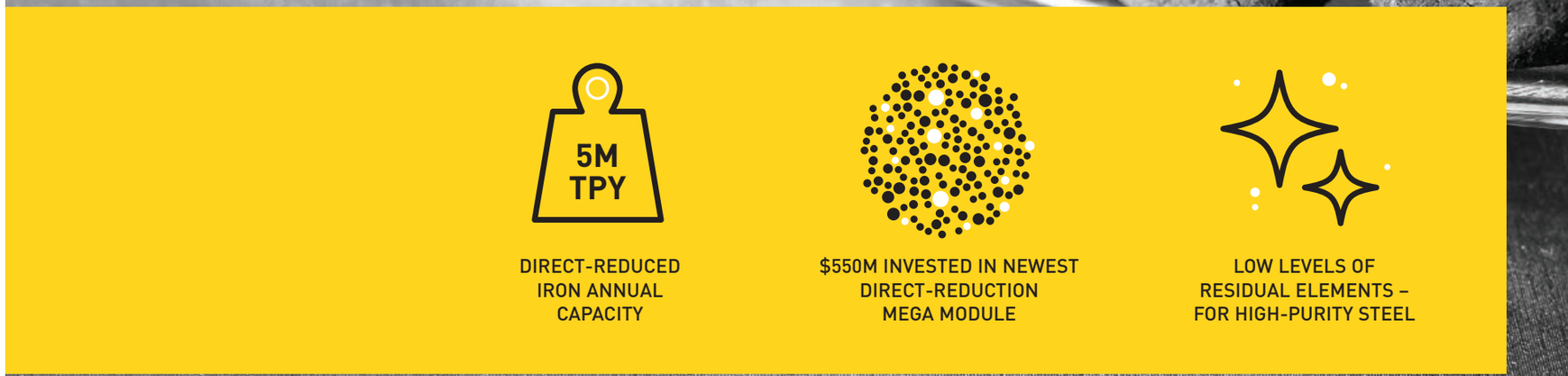
QUALITY IN...

80% DIRECT REDUCED IRON (DRI) + HIGH-GRADE STEEL SCRAP

Ezz Steel converts iron ore into high-purity iron in four advanced direct reduction plants (DRP). Using the Midrex technology and the HYL technology by Danieli, these plants have an output capacity of 5 million tons of DRI per year, which is fed directly into electric arc furnaces in a continuous process.

Ezz Steel electric arc furnaces use 80% DRI in the steelmaking process, with high-grade steel scrap making up the remainder. This enables us to maintain precise control over the metallurgical properties of our steel and ensure a consistently high-quality end product.





DIRECT-REDUCED IRON ANNUAL CAPACITY

$550M INVESTED IN NEWEST DIRECT-REDUCTION MEGA MODULE

LOW LEVELS OF RESIDUAL ELEMENTS – FOR HIGH-PURITY STEEL

QUALITY OUT...

ACCURATE ROLLING, CAREFUL HANDLING, RIGOROUS CONTROLS

Careful handling and monitoring maintains steel cleanness throughout the steelmaking process. The addition of alloying elements, gas stirring and heating in the ladle furnace produces the precise chemical composition required for each steel grade, ensuring low levels of inclusions.

Multi-stand rolling mills produce consistent-quality rebar and wire rod. Rebar is produced in diameters ranging from 10 mm to 40 mm, and wire rod in diameters from 5.5 mm to 16 mm. Surface quality and dimensional accuracy are maintained through controlled cooling systems and continuous monitoring.

A strict regime of quality inspections along the entire process route, from raw materials to finished product, guarantees the quality of Ezz Steel long products. Only material that meets the required standards at each stage is passed for further processing.

WELL PLACED FOR WORLDWIDE DELIVERY

Ezz Steel plants are located either adjacent to major ports or with direct access to them. Long products can be sent to the docks for shipment within minutes, providing cost and efficiency benefits for customers worldwide. The development of Ain Sokhna port to accommodate ships up to 150,000 dwt has further increased our export capacity.

Customers within the region also benefit from efficient deliveries, with each Ezz Steel plant having direct access to major road, rail and water transport routes.

"FEW OTHER STEELMAKERS HAVE SUCH DIRECT ACCESS TO PORTS FOR EFFICIENTLY IMPORTING RAW MATERIALS AND EXPORTING FINISHED GOODS. THE ADVANTAGEOUS LOCATION OF EZZ STEEL PLANTS OFFERS CUSTOMERS COST-EFFECTIVE, RESPONSIVE DELIVERIES, WHEREVER THEY ARE."

George Matta,
CHIEF MARKETING OFFICER – EZZ STEEL



INVESTMENT IN EXCELLENCE

CONTINUOUS GROWTH STRATEGY PUTS QUALITY FIRST

To lead the way in world steel markets, Ezz Steel recognizes the need to invest in the most advanced technology and the most talented and skilled people.

IMPRESSIVE GROWTH FUELED BY INVESTMENT

Investment in improved plant and equipment is an ongoing process. Our investment strategy ensures continued growth, enabling Ezz Steel to increase capacity and capabilities in line with ambitious targets and growing demand for our highly regarded steel products.

ADVANCED DRI PLANTS – INVESTING IN RAW MATERIAL PURITY

Our major investment in a new, state-of-the-art direct reduction plant at Suez means we now have in-house direct reduction capabilities at two of our four steelmaking facilities. Integrating these plants with our steelmaking facilities creates process and operational efficiencies, improves quality control and optimizes energy use.

With four direct reduction plants now operational, Ezz Steel has an output capacity of 5 million tons of DRI per year. That made Ezz Steel the second largest producer of DRI in the world (2017).

INVESTING IN TALENTED PEOPLE

The high caliber of Ezz Steel's skilled and enthusiastic workforce is your guarantee of exceptional service and product quality. We invest heavily in training our people to the highest standards, as well as recruiting the most promising graduates to nurture the next generation of pioneering steel professionals.

"EZZ STEEL IS A LEAN, EFFICIENT ORGANIZATION, EMPLOYING SKILLED PEOPLE TO PRODUCE LARGE VOLUMES OF STEEL, AND INVESTING IN THE VERY BEST TECHNOLOGY TO MAINTAIN OUR IMPRESSIVE QUALITY STANDARDS AND PRODUCTIVITY LEVELS."

Hassan Nouh, MANAGING DIRECTOR – EZZ STEEL





"PRODUCING IRON BY DIRECT REDUCTION GIVES US A HIGH-PURITY INGREDIENT FOR STEELMAKING, WITH LOW LEVELS OF RESIDUAL ELEMENTS."

Fouad Emam,
CORPORATE CHIEF TECHNICAL OFFICER – EZZ STEEL



QUALITY ASSURANCE

"FROM THE CEO TO MANAGERS, FROM THE CHAIRMAN TO STEEL PLANT WORKERS, A SPIRIT OF EXCELLENCE AND CONTINUOUS IMPROVEMENT PERVADES THE BUSINESS."

Raed El-Beblawy,
MANAGING DIRECTOR – EZDK

EXCELLENCE THROUGH RIGOROUS TESTING, MONITORING AND CONTROL

Ezz Steel is renowned for the consistent quality of its products. Such high standards are achieved through rigorous quality inspections, a policy of continuous improvement and a quality-management system developed in line with ISO 9001, combined with the skill and expertise of our people and significant investments in the latest iron and steelmaking technologies.

HIGH-PURITY INGREDIENTS FOR STEELMAKING

Quality assurance begins with the selection of raw materials. Only high-grade iron ore is chosen for our advanced direct-reduction plants, which provide up to 80% of the feedstock for steelmaking. The remainder is high-grade steel scrap. This assures customers of very low levels of impurities in the finished product.

EXHAUSTIVE TESTING AND QUALITY CONTROL

Steel is quality tested throughout the steelmaking, rolling and finishing processes. Samples are taken for testing in our ISO/IEC 17025-certified laboratories. Sophisticated analytical equipment and techniques are used to verify the precise chemical content. Test results are relayed immediately to the plant so that fine adjustments can be made to maintain accurate steel composition.

CLEARED FOR DISPATCH

The finished rebar and wire rod undergoes demanding mechanical tests to confirm compliance with relevant standards. Final quality checks are conducted in the dispatch yard before the products are cleared for delivery to customers.

CUSTOMER SUPPORT

LONG-TERM PARTNERSHIPS BUILT ON TRUST

The steel professionals at Ezz Steel understand the needs of customers across the region and worldwide. Our dedicated people are united by a shared determination to maintain Ezz Steel at the forefront of the global steel industry by forging supportive relationships with our customers.

UNDERSTANDING OUR CUSTOMERS – SHARING OUR EXPERTISE

We use our knowledge and experience to understand individual business requirements and to advise customers on the optimum steel products for their needs. Strong customer relationships are essential to the way we work. Customers know they can rely on the quality of our steel and the ability of our people to advise and support them in their most ambitious ventures.

RESPONSIVE, FLEXIBLE SERVICE TO FULFIL URGENT REQUIREMENTS

Our efficient production processes mean we can offer excellent stock availability and short lead times – to fulfil the most urgent requirements. We are able to respond quickly to changing demand, and to produce steel to order to meet challenging customer specifications and timings.

Such a responsive service has made Ezz Steel the partner of choice for major infrastructure projects across the region. By working alongside our customers we ensure that our products, service and delivery performance always live up to expectations.



"OUR RESPONSIVE SERVICE HAS MADE EZZ STEEL THE PARTNER OF CHOICE FOR MAJOR INFRASTRUCTURE PROJECTS ACROSS THE REGION."

GLOBAL REACH

EXPORTING HIGH-QUALITY LONG PRODUCTS TO THE WORLD

Ezz Steel long products are distributed to customers on four continents where the quality, integrity and reliability of our steel makes a significant contribution to major construction and engineering projects.

SERVING OUR INTERNATIONAL NEIGHBORS

One of the principal markets for Ezz Steel products is the wider Middle East and North Africa region. Rapid growth and development over recent decades has produced an escalation of demand from these countries for reliable supplies of high-quality rebar and wire rod.

MEETING DEMAND FROM EUROPE, ASIA AND THE USA

A significant proportion of Ezz Steel exports are destined for Europe, Asia and the USA, where our product quality is seen as a match for steel from many local steel producers. As well as our product quality, overseas customers value our reliable deliveries, flexible production capabilities and competitive prices.

RAPID DISPATCH AND DELIVERY – ANYWHERE IN THE WORLD

Efficient deliveries worldwide are supported by the strategic location of our steel plants close to major ports and other arterial transport routes.

As part of the continuous integrated steel production process, our extensive storage facilities are located at the end of the steel rolling and cooling line, enabling fast, efficient transfer with minimal handling. That not only helps to maintain product quality by minimizing the risk of mechanical damage, but also facilitates rapid loading onto transport for onward delivery by road, rail or ship.



"OUR FLEXIBLE BUSINESS MODEL ALLOWS EZZ STEEL TO FOLLOW DEMAND ANYWHERE IN THE WORLD, AIDED BY THE PROXIMITY OF OUR PLANTS TO THE PORTS. THIS FLEXIBILITY HAD ENABLED US TO PLAY A KEY ROLE IN THE RAPID DEVELOPMENT OF EMERGING MARKETS IN THE REGION AND FURTHER AFIELD."

Hassan Nouh,
MANAGING DIRECTOR
– EZZ STEEL



ENVIRONMENTAL CHAMPIONS

"WE RESPECT AND VALUE THE COMMUNITIES AROUND US AND WE HAVE BEEN VERY CAREFUL TO MINIMIZE OUR IMPACT ON NEIGHBORS AND THE ENVIRONMENT. THE MEASURES WE TAKE RANGE FROM MAINTAINING GOOD HOUSEKEEPING STANDARDS TO INVESTING IN ADVANCED PURIFICATION AND RECYCLING TECHNOLOGY."

Fouad Emam,
CORPORATE CHIEF TECHNICAL OFFICER – EZZ STEEL

TAKING A RESPONSIBLE APPROACH TO BUSINESS GROWTH

Protecting our environment and our people is a commitment that influences everything we do at Ezz Steel.

PROTECTING OUR PLANET

Our investments in efficient steel production technology have been matched by investments in environmental protection systems. These range from water purification and recycling technologies to advanced filters to purify our emissions.

Ezz Steel is the first steel producer in Egypt to have its energy-management system certified in compliance with ISO 50001. Our trained energy specialists ensure that we reduce our energy consumption through operational, technical and behavioural improvements – and that we continuously maintain and enhance our environmental performance.

We maintain the strictest controls over dust, gas and other airborne emissions, as well as liquid effluents, noise levels and even electrical pollution, which could affect the national electricity grid and other consumers.

All of our plants comply with internationally recognized environmental and occupational health and safety standards, and we meet international guidelines for CO_2 emissions.

PROTECTING OUR PEOPLE

Health and safety standards are never compromised at Ezz Steel. Our skilled and diligent people are our most valuable asset and we work hard to keep them safe and healthy. Strict, internationally verified safety procedures are in place and we are ever vigilant for opportunities to enhance our safety performance.

Every member of staff goes through rigorous safety training, which is regularly updated and refreshed. We give all our people the knowledge, tools and resources they need to work in the safest possible way and to keep the safety and wellbeing their colleagues and visitors at the heart of everything we do.

ISO 14001 ISO 45001 ISO 50001

$100M INVESTED IN CSR PROJECTS



TECHNICAL SPECIFICATIONS

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SYMBOLS AND TERMS

Symbol/Term	Unit	Description
CEV	%	Carbon equivalent value.
El.	%	Percentage elongation after fracture.
A_{gt}	%	Percentage total elongation at maximum force.
YS	MPa	Yield strength: the maximum stress that can be applied along axis before material begins to change shape (plastic deformation).
TS	MPa	Tensile strength: the maximum stress that can be applied to a material before breaking.
TS/YS	–	Ratio of tensile strength to yield strength.
Ductility Class	–	Classification of the ductility properties of rebar based on the value of TS/YS, as well as the elongation measured either as A_{gt} or El.
ISO	–	International Organization for Standardization.
ASTM	–	ASTM International Standard (formerly American Society for Testing and Materials).
EN	–	European Standard.
BS	–	British Standard.
JIS	–	Japanese Industrial Standard.

SECTION 1: REBAR

1. REBAR IN BUNDLE

1.1 Produced Sizes

Ezz Steel produces plain and deformed reinforcing steel bars in bundle form from size Ø 10 mm to Ø 40 mm as follows:

Diameter (mm)	10	12	14	16	18	20	22	25	28	30	32	40

Any special size from Ø 10 mm to Ø 40 mm can be produced with 0.5 mm increment in diameter according to customer request.

1.2 Rebar Length

Rebar is produced with length of 6 m up to 24 m according to customer request. Standard produced bar length is 12 m.

1.3 Bundle Weight

Ezz Steel produces bundles with uniform number of bars per bundle size-wise. Weight of each bundle is about 2.0 tons for standard bar length of 12 m. Bundle weight varies between 1.0 and 4.0 ton according to bundle length.

1.4 Bundle Packaging

Compact packaging with six double ties of 7 mm wire for standard length of 12 m. For other bar lengths, number of ties ranges from 4 to 9 according to bar length.

2. REBAR IN COIL

2.1 Produced Sizes

Plain and deformed reinforcing steel bars in coil form are available as follows:

Plain rebar in coil:

Diameter (mm)	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0
	13.5	14.0	14.5	15.0	15.5	16.0		

Deformed rebar in coil:

Diameter (mm)	6.0	8.0	10.0	12.0	14.0	16.0

Any special size from Ø 6.0 mm to Ø 16.0 mm can be produced with 0.5 mm increment in diameter according to customer request.

2.2 Coil Weight

About 2.0 tons.

2.3 Coil Dimensions

Inner diameter: 800–850 mm.
Outer diameter: 1,200–1,250 mm.
Coil height: 2,000 mm maximum (varies with produced size).

2.4 Coil Packaging

Compact packaging with 4 ties of 7 mm wire. Ties are either single or double according to size, destination and customer request. Bellyband is applied for export shipments.

3. PRODUCIBLE STANDARDS

Ezz Steel produces rebar according to the national and international standards:

3.1 Egyptian Standards
ES 262-1/2015, ES 262-2/2015

3.2 International Standards
ISO 6935-1:2007, ISO 6935-2:2019

3.3 American Standards
ASTM A615M -16, ASTM A615M -18[e1]
ASTM A706M -16, ASTM A510M -18

3.4 British Standard
BS 4449:2005 + A3:2016

3.5 French Standards
NF A 35-016:1996, NF A 35-080-1:2013

3.6 Canadian Standard
CSA G30.18-09 (R2019)

3.7 Ukrainian Standard
DSTU 3760:2006

Other standards can be produced upon customer request. Please contact sales team for more details.

3.1 Egyptian Standards

Standard	ES: 262 – 1/2015, ISO: 6935 – 1:2007	Issuing Country	Egypt

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B240A-P	–	–	–	0.060	0.060	–	–	240	–	1.02	20	2
B240B-P										1.08		5
B240C-P										1.15		7
B240D-P	–	–	–	0.050	0.050	–	–	240	520 max.	1.25	22	8
B300A-P	–	–	–	0.060	0.060	–	–	300	–	1.02	16	2
B300B-P										1.08		5
B300C-P										1.15		7
B300D-P	–	–	–	0.050	0.050	–	–	300	600 max.	1.25	19	8
B420D-P	0.30	0.55	1.50	0.040	0.040	0.012	0.56	420–540	–	1.25	16	8
B420DWP												

[1] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

Standard	ES: 262 – 2/2015, ISO: 6935 – 2:2007	Issuing Country	Egypt

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B300A-R	–	–	–	0.060	0.060	–	–	300	–	1.02	16	2
B300B-R										1.08		5
B300C-R										1.15		7
B300D-R	–	–	–	0.050	0.050	–	–	300	–	1.25	17	8
B300DWR	0.27	0.55	1.50	0.040	0.040	0.012	0.49	300–390				
B350DWR	0.27	0.55	1.60	0.040	0.040	0.012	0.51	350–455	–	1.25	17	8
B400A-R	–	–	–	0.060	0.060	–	–	400	–	1.02	14	2
B400B-R										1.08		5
B400C-R										1.15		7
B400AWR	0.22	0.60	1.60	0.050	0.050	0.012	0.50	400	–	1.02	14	2
B400BWR										1.08		5
B400CWR										1.15		7
B400DWR	0.29	0.55	1.80	0.040	0.040	0.012	0.56	400–520	–	1.25	17	8
B420DWR	0.30	0.55	1.50	0.040	0.040	0.012	0.56	420–546	–	1.25	16	8
B500A-R	–	–	–	0.060	0.060	–	–	500	–	1.02	14	2
B500B-R										1.08		5
B500C-R										1.15		7
B500AWR	0.22	0.60	1.60	0.050	0.050	0.012	0.50	500	–	1.02	14	2
B500BWR										1.08		5
B500CWR										1.15		7
B500DWR	0.32	0.55	1.80	0.040	0.040	0.012	0.61	500–650	–	1.25	13[2]	8

[1] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$ [2] Ezz Steel standard elongation ≥ 14%.

3.1.1 New Steel Grade B500DWR Produced by Ezz Steel

Ezz Steel pioneers the Egyptian market by introducing high strength rebar "steel grade B500DWR" according to ES 262-2 /2015 as a common product for local market.

TABLE 1 – COMPARISON OF MECHANICAL PROPERTIES OF STEEL GRADES B500DWR AND B400B-R

Property		Steel Grade	
		B400B-R (Ordinary Rebar)	B500DWR (New Ezz Steel Product)
Yield strength (YS, MPa)		≥ 400	500–650
Tensile strength to yield strength ratio (TS/YS)		≥ 1.08	≥ 1.25
Elongation (%)	after fracture	≥ 14	≥ 13[1]
	at max. force (A_{gt})	≥ 5	≥ 8
Earthquake-resistance		Non earthquake-resistant (non-seismic)	Earthquake-resistant (seismic)
Weldability		Non-weldable	Weldable

[1] Ezz Steel standard elongation ≥ 14%.

ADVANTAGES OF STEEL GRADE B500DWR:

- Highest yield strength and tensile strength in the Egyptian standard ES 262-2/2015.
- Highest ductility class in the Egyptian standard ES 262-2/2015.
  Ductility class = tensile strength to yield strength ratio ≥ 1.25.
- The combination of high strength and ductility provides proofing against excessive loads such as earthquakes, as follows:
  a) When the applied stress (load) reaches the yield point, the steel still can absorb more energy before failure.
  b) Thus, the period from yielding till failure allows enough time to evacuate the building in case of any earthquake.
- Weldable.

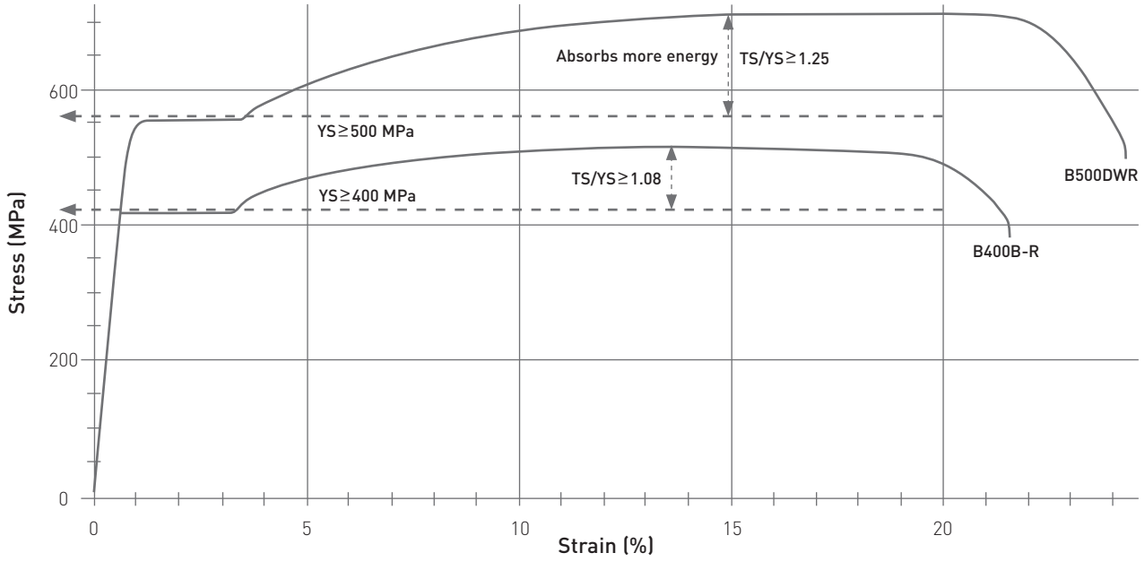


Figure 1: Comparison of Stress-Strain Curve of Steel Grades B500DWR and B400B-R

Figure 1 shows that:

- B500DWR has higher yield strength than that of B400B-R by 25%.
- B500DWR has higher tensile strength to yield strength ratio of 1.25 while the same ratio of B400B-R is 1.08.
- If the applied stress on the rebar exceeds its yield strength, such as through excessive loads generated by earthquakes, the rebar deforms plastically to a much larger extent without exceeding its ultimate tensile strength – this is due to its higher yield strength and TS/YS ratio. Thus, grade B500DWR is earthquake-resistant.

3.2 International Standards

Standard	ISO 6935 – 1:2007	Issuing Country	International

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B240A-P	–	–	–	0.060	0.060	–	–	240	–	1.02	20	2
B240B-P										1.08		5
B240C-P										1.15		7
B240D-P	–	–	–	0.050	0.050	–	–	240	520 max.	1.25	22	8
B300A-P	–	–	–	0.060	0.060	–	–	300	–	1.02	16	2
B300B-P										1.08		5
B300C-P										1.15		7
B300D-P	–	–	–	0.050	0.050	–	–	300	600 max.	1.25	19	8
B420D-P	0.30	0.55	1.50	0.040	0.040	0.012	0.56	420–540	–	1.25	16	8
B420DWP												

[1] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

Standard	ISO 6935 – 2:2019	Issuing Country	International

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B300A-R	–	–	–	0.060	0.060	–	–	300	–	1.02	16	2
B300B-R										1.08		5
B300C-R										1.15		7
B300D-R	–	–	–	0.050	0.050	–	–	300	–	1.25	17	8
B300DWR	0.27	0.55	1.50	0.040	0.040	0.012	0.49	300–390				
B350DWR	0.27	0.55	1.60	0.040	0.040	0.012	0.51	350–455	–	1.25	17	8
B400A-R	–	–	–	0.060	0.060	–	–	400	–	1.02	14	2
B400B-R										1.08		5
B400C-R										1.15		7
B400D-R	0.29	0.55	1.60	0.040	0.040	–	0.55	400–520	–	1.25	17	8
B400AWR	0.22	0.60	1.60	0.050	0.050	0.012	0.50	400	–	1.02	14	2
B400BWR										1.08		5
B400CWR										1.15		7
B400DWR	0.29	0.55	1.80	0.040	0.040	0.012	0.56	400–520	–	1.25	17	8
B420DWR	0.30	0.55	1.50	0.040	0.040	0.012	0.56	420–546	–	1.25	16	8
B450AWR	0.22	–	–	0.050	0.050	0.012	0.50	450-562	–	1.05	–	2.5
B450CWR										1.15		7.5
B500A-R	–	–	–	0.060	0.060	–	–	500	–	1.02	14	2
B500B-R										1.08		5
B500C-R										1.15		7
B500D-R	0.32	0.55	1.80	0.040	0.040	–	0.60	500–625	–	1.25	13	8
B500AWR	0.22	0.60	1.60	0.050	0.050	0.012	0.50	500	–	1.02	14	2
B500BWR										1.08		5
B500CWR										1.15		7
B500DWR	0.32	0.55	1.80	0.040	0.040	0.012	0.61	500–650	–	1.25	13 [2]	8

[1] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

[2] Ezz Steel standard elongation ≥ 14%.

3.3 American Standards

Standard	ASTM A615M -16	Issuing Country	United States of America

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%) [1]	A_{gt} (%)
Grade 40	–	–	–	0.06	–	–	–	280	420	–	11–12	–
Grade 60								420	620		7–9	
Grade 75								520	690			
Grade 80								550	725		6–7	
Grade 100								690	790			

[1] Minimum elongation values depend on produced size.

Standard	ASTM A615M -18$^{\varepsilon 1}$	Issuing Country	United States of America

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%) [1]	A_{gt} (%)
Grade 40	–	–	–	0.06	–	–	–	280	420	–	11–12	–
Grade 60								420	620		7–9	
Grade 80								550	725		6–7	
Grade 100								690	790			

[1] Minimum elongation values depend on produced size.

Standard	ASTM A706M -16	Issuing Country	United States of America

Grade [1]	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [2]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%) [3]	A_{gt} (%)
Grade 60	0.30	0.50	1.50	0.035	0.045	–	0.55	420–540	550	1.25	10–14	–
Grade 80								550–675	690		10–12	

[1] For concrete reinforcement intended for applications where restrictive mechanical properties and chemical composition are required for compatibility with controlled tensile property applications or to enhance weldability.

[2] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cu}{40} + \frac{\%Ni}{20} + \frac{\%Cr}{10} + \frac{\%Mo}{50} + \frac{\%V}{10}$

[3] Minimum elongation values depend on produced size.

Ezz Steel produces plain bars of AISI steel grades according to ASTM A510M – 18 for industrial applications. Mechanical properties are to be agreed upon with the customer.

Standard	ASTM A510M -18	Issuing Country	United States of America

Grade	Chemical Composition (%) [1]				
	C	Si [2]	Mn	P Max.	S Max.
AISI 1006	0.08 max.		0.25–0.45	0.040	0.050
AISI 1008	0.10 max.		0.30–0.50	0.040	0.050
AISI 1010	0.08–0.13		0.30–0.60	0.040	0.050
AISI 1012	0.10–0.15		0.30–0.60	0.040	0.050
AISI 1013	0.11–0.16		0.50–0.80	0.040	0.050
AISI 1015	0.13–0.18		0.30–0.60	0.040	0.050
AISI 1018	0.15–0.20		0.60–0.90	0.040	0.050
AISI 1022	0.18–0.23		0.70–1.00	0.040	0.050
AISI 1023	0.20–0.25		0.30–0.60	0.040	0.050
AISI 1025	0.22–0.28		0.30–0.60	0.040	0.050
AISI 1030	0.28–0.34		0.60–0.90	0.040	0.050
AISI 1037	0.32–0.38		0.70–1.00	0.040	0.050
AISI 1042	0.40–0.47		0.60–0.90	0.040	0.050
AISI 1045	0.43–0.50		0.60–0.90	0.040	0.050
AISI 1050	0.48–0.55		0.60–0.90	0.040	0.050
AISI 1055	0.50–0.60		0.60–0.90	0.040	0.050
AISI 1059	0.55–0.65		0.50–0.80	0.040	0.050
AISI 1060	0.55–0.65		0.60–0.90	0.040	0.050
AISI 1064	0.60–0.70		0.50–0.80	0.040	0.050
AISI 1065	0.60–0.70		0.60–0.90	0.040	0.050
AISI 1070	0.65–0.75		0.60–0.90	0.040	0.050

[1] If required, copper can be specified as 0.20% minimum.

[2] Where silicon is required, one of the following ranges and limits are commonly specified: (max 0.10%), (0.10–0.20%), (0.15–0.35%), (0.15–0.40%), or (0.20–0.40%).

3.4 British Standard

Standard	BS: 4449/2005 + A3:2016	Issuing Country	United Kingdom

Grade	Chemical Composition (Maximum %) [1]							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [2]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.05	0.05	0.012	0.50	500–650	–	1.05[3]	–	2.5[4]
B500B										1.08	–	5.0
B500C										≥1.15, <1.35	–	7.5

[1] Maximum copper content = 0.80%.

[2] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

[3] For sizes below 8 mm, the tensile strength to yield strength ratio is 1.02.

[4] For sizes below 8 mm, A_{gt} is 1.0%.

3.5 French Standards

Standard	NF A 35-016: 1996	Issuing Country	France

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
FeE500-2	0.22	–	–	0.050	0.050	0.012	0.50	500	–	1.03	–	2.5
FeE500-3										1.08	–	5.0

[1] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

Standard	NF A 35-080-1: 2013	Issuing Country	France

Grade	Chemical Composition (Maximum %) [1]							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [2]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.050	0.050	0.012	0.50	500–650	–	1.05	–	2.5
B500B										1.08		5.0
B450B								450–585	–	1.08	–	5.0
B450C								450–562	–	1.15–1.35	–	7.5

[1] Maximum copper content = 0.80%.

[2] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

3.6 Canadian Standard

Standard	CSA G30.18-09 (R2019)	Issuing Country	Canada

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%) [2]	A_{gt} (%)
400R	–	–	–	0.05	–	–	–	400	540	1.15	7–10	–
500R								500	675	1.15	6–9	–
400W	0.30	0.50	1.60	0.035	0.045	–	0.55	400–525	540	1.15	12–13	–
500W								500–625	625	1.15	10–12	–

[1] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cu}{40} + \frac{\%Ni}{20} + \frac{\%Cr}{10} - \frac{\%Mo}{50} - \frac{\%V}{10}$

[2] Minimum elongation values depend on produced size.

3.7 Ukrainian Standard

Standard	DSTU 3760:2006	Issuing Country	Ukraine

Grade	Chemical Composition (Maximum %) [1]							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N	CEV [2]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
A400S	0.25	–	–	0.045	0.050	0.012	0.25–0.52	400	500	1.05	16	5
A500S							0.30–0.52	500	600	1.05	14	5

[1] Maximum arsenic content = 0.08%.

[2] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$ or $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Si}{10}$

4. PHYSICAL CHARACTERISTICS OF BUNDLES

4.1 Bar Weight per Unit Length

TABLE 2 – DIMENSIONS, WEIGHT PER UNIT LENGTH AND UNIT WEIGHT TOLERANCE

Diameter (mm) [1]	Nominal Unit Weight (kg/m) [2]	Ezz Steel Standard		
		Unit Weight Tolerance (%) [3]	Number of Bars/ Bundle	Maximum Bundle Weight (kg) [4]
10	0.617	94.5–97.5	270	1,949
12	0.888	94.5–97.5	188	1,953
14	1.210	95.5–98.0	138	1,964
16	1.580	95.5–98.0	105	1,951
18	2.000	95.5–98.0	83	1,952
20	2.470	95.5–98.0	67	1,946
22	2.980	95.5–98.0	56	1,963
25	3.850	96.5–98.5	43	1,957
28	4.840	96.5–98.5	34	1,945
32	6.310	96.5–98.5	26	1,939
40	9.860	96.5–98.5	17	1,981

[1] Any special size from Ø 10 mm to Ø 40 mm can be produced according to customer request.

[2] Unit weights are according to Egyptian and international standards.

[3] For more customer satisfaction; Ezz Steel typical unit weight for the local market is on the negative side of the Egyptian standard acceptable limits.

[4] Maximum Bundle Weight in case of standard bar length of 12 m.

4.2 Length, Weight and Packaging

Bar lengths from 6 m up to 24 m are producible. Bundle weight varies with the bar length as shown in Table 3.

TABLE 3 – PRODUCIBLE LENGTHS, BUNDLE WEIGHT AND PACKAGING

Ser.	Bundle Length (m) [1]	Maximum Bundle Weight (kg)	No. of Double Ties
1	6	991	4
2	10	1,651	5
3	12[2]	1,981	6
4	14	2,311	6
5	16	2,641	7
6	18	2,972	8
7	24	3,962	9

[1] Any special lengths from 6 up to 24 meter can be produced upon request.

[2] Standard length in the local Egyptian market.

SECTION 2: WIRE ROD

1. PRODUCED SIZES

Ezz Steel produces wire rod from size Ø 5.5 mm to size Ø 16 mm as follows:

Diameter (mm)	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0
	13.5	14.0	14.5	15.0	15.5	16.0		

2. COIL WEIGHT

About 2.0 tons.

3. COIL DIMENSIONS

Inner diameter: 800–850 mm.
Outer diameter: 1,200–1,250 mm.
Coil height: 2,000 mm maximum (varies with produced size).

4. COIL PACKAGING

Compact packaging with 4 ties of 7 mm wire. Ties are single or double according to size, destination, and customer request. Bellyband is applied for export shipments.

5. APPLICATIONS

Ezz Steel produces a range of low, medium and high carbon steel wire rod for industrial applications according to international standards.

5.1 Wire Rod for Welded Steel Fabric

Wire rod to be used for making cold-drawn concrete reinforcement bars and welded steel fabric.

5.2 Wire Rod for Welding Electrodes

Wire rod for producing welding electrodes according to DIN 8557 S2 or AISI 1008 with special silicon and manganese levels.

5.3 Wire Rod for Cable Armouring

Wire rod for cable armouring which is used in underground projects in order to protect the electric cables from mechanical damage.

5.4 Drawing-Grade Wire Rod

Wire rod to be used for drawing wires for various applications. Typical exemplary applications are listed in Table 1.

TABLE 1 – TYPICAL EXEMPLARY APPLICATIONS OF PRODUCED DRAWING-GRADE WIRE ROD

Grades	Representative Grades	Application
Low carbon	AISI (1006, 1008, 1010, 1012, 1013, 1015, 1018, 1020, 1022)	Barbed wire, nails, refrigerator condenser, refrigerator shelves, coated wires for fences, steel wool, galvanized drawn wire, cooker's pots holders.
Medium carbon	AISI (1025, 1030, 1037,1038, 1042, 1045)	Nails, bolts, galvanized drawn wire, spring fastening (mattress component).
High carbon	AISI (1050, 1055, 1059, 1060, 1064, 1065, 1070)	Mattress spring (upholstery), sling wire rope, galvanized drawn wire, electric cables reinforcing.

6. PRODUCIBLE STANDARDS

Ezz Steel produces steel wire rod according to the international standards:

6.1 American Standard

ASTM A510M - 18

6.2 International/European Standard

EN ISO 16120-2:2017

6.3 Japanese Standard

JIS G 3507-1:2010

Other standards can be produced upon customer request. Please contact sales team for details.

6.1 American Standard

Standard	ASTM A510M -18	**Issuing Country**	United States of America

Grade [1, 2]	**Chemical Composition (%)** [3, 4]				
	C	**Si** [5]	**Mn**	**P Max.**	**S Max.**
AISI 1006	0.08 max.		0.25–0.45	0.040	0.050
AISI 1008	0.10 max.		0.30–0.50	0.040	0.050
AISI 1010	0.08–0.13		0.30–0.60	0.040	0.050
AISI 1012	0.10–0.15		0.30–0.60	0.040	0.050
AISI 1013	0.11–0.16		0.50–0.80	0.040	0.050
AISI 1015	0.13–0.18		0.30–0.60	0.040	0.050
AISI 1018	0.15–0.20		0.60–0.90	0.040	0.050
AISI 1022	0.18–0.23		0.70–1.00	0.040	0.050
AISI 1023	0.20–0.25		0.30–0.60	0.040	0.050
AISI 1025	0.22–0.28		0.30–0.60	0.040	0.050
AISI 1030	0.28–0.34		0.60–0.90	0.040	0.050
AISI 1037	0.32–0.38		0.70–1.00	0.040	0.050
AISI 1042	0.40–0.47		0.60–0.90	0.040	0.050
AISI 1045	0.43–0.50		0.60–0.90	0.040	0.050
AISI 1050	0.48–0.55		0.60–0.90	0.040	0.050
AISI 1055	0.50–0.60		0.60–0.90	0.040	0.050
AISI 1059	0.55–0.65		0.50–0.80	0.040	0.050
AISI 1060	0.55–0.65		0.60–0.90	0.040	0.050
AISI 1064	0.60–0.70		0.50–0.80	0.040	0.050
AISI 1065	0.60–0.70		0.60–0.90	0.040	0.050
AISI 1070	0.65–0.75		0.60–0.90	0.040	0.050

[1] AISI steel grades are used for industrial applications. Mechanical properties are to be agreed upon with the customer.
[2] Wire rod for producing welding electrodes can be produced according to DIN 8557 S2 or AISI 1008 with special silicon and manganese levels.
[3] If required, copper can be specified as 0.20% minimum.
[4] The chemical composition can be modified according to customers' needs and Ezz Steel capabilities.
[5] Where silicon is required, one of the following ranges and limits are commonly specified: (max 0.10%), (0.10–0.20%), (0.15–0.35%), (0.15–0.40%) or (0.20–0.40%).

6.2 International/European Standard

Standard	EN ISO 16120-2:2017	Issuing Country	International/European

Grade	European Material No.	Chemical Composition (%) [1, 2, 3]							
		C	Si [4]	Mn	P max.	S max.	Cr max.	Ni max.	Cu [5] max.
C4D	1.0300	≤0.06	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C7D	1.0313	0.05–0.09	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C9D	1.0304	≤0.10	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C10D	1.0310	0.08–0.13	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C12D	1.0311	0.10–0.15	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C15D	1.0413	0.12–0.17	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C18D	1.0416	0.15–0.20	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C20D	1.0414	0.18–0.23	≤0.30	0.30–0.60	0.035	0.035	0.20	0.25	0.30
C26D	1.0415	0.24–0.29	0.10–0.30	0.50–0.80	0.030	0.030	0.20	0.25	0.30
C32D	1.0530	0.30–0.35	0.10–0.30	0.50–0.80	0.030	0.030	0.20	0.25	0.30
C38D	1.0516	0.35–0.40	0.10–0.30	0.50–0.80	0.030	0.030	0.20	0.25	0.30
C42D	1.0541	0.40–0.45	0.10–0.30	0.50–0.80	0.030	0.030	0.20	0.25	0.30
C48D	1.0517	0.45–0.50	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C50D	1.0586	0.48–0.53	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C52D	1.0588	0.50–0.55	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C56D	1.0518	0.53–0.58	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C58D	1.0609	0.55–0.60	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C60D	1.0610	0.58–0.63	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C62D	1.0611	0.60–0.65	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C66D	1.0612	0.63–0.68	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C68D	1.0613	0.65–0.70	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C70D	1.0615	0.68–0.73	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25
C72D	1.0617	0.70–0.75	0.10–0.30	0.50–0.80	0.030	0.030	0.15	0.20	0.25

[1] Elements not included in this table may not be added intentionally to the steel without the agreement of the purchaser, except those intended for finishing the heat. By agreement at the time of ordering, the grades can contain additions (commonly termed micro-alloying additions) of Cr and V. The content of Cr is up to 0.30% and the content of V is 0.05% to 0.10%.

[2] %Mo (max.) = 0.05

[3] %Al (max.) = 0.01. By agreement at the time of ordering, the value for aluminium can be fixed at 0.01% to 0.06%. In such cases, the value of silicon can be fixed at ≤0.10% on request.

[4] For wire rod intended for galvanization, the required lower limit of silicon content should be specified at the time of ordering. By agreement at the time of ordering, the maximum silicon level for grades C4D to C20D may be further restricted.

[5] A maximum copper content of 0.20% may be agreed at the time of ordering. For steel grades C48D to C92D, Cu + Sn shall be ≤0.25%.

6.3 Japanese Standard

Standard	JIS G 3507-1:2010	Issuing Country	Japan

Grade	Chemical Composition (%)							
	C	Si	Mn	P max.	S max.	Cr max.	Ni max.	Cu max.
SWRCH6R	≤0.08	–	≤0.6	0.040	0.040	0.20	0.20	0.30
SWRCH8R	≤0.10		≤0.6	0.040	0.040	0.20	0.20	0.30
SWRCH12R	0.10–0.15		0.30–0.60	0.040	0.040	0.20	0.20	0.30

SECTION 3: COLD-DRAWN WIRE FOR THE REINFORCEMENT OF CONCRETE

Cold-drawn wire is manufactured from low carbon wire rod through a cold drawing process that increases yield strength, tensile strength and hardness.

The steel wire is drawn to be used for the reinforcement of concrete and the manufacture of welded fabric.

Ezz Steel produces cold-drawn wire in the form of both bundles and coils.

1. COLD-DRAWN WIRE IN BUNDLE

1.1 Produced Sizes

Ezz Steel produces plain and deformed cold-drawn wire in bundle form from size Ø 5.0 mm to size Ø 12.0 mm as follows:

Size (mm)	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
	9.0	9.5	10.0	10.5	11.0	11.5	12.0	

1.2 Wire Length

Cold-drawn wire is produced with lengths of 1 m up to 12 m according to customer request.

1.3 Bundle Weight

Bundle weight varies between 1.5 and 3.0 ton according to customer request.

2. COLD-DRAWN WIRE IN COIL

2.1 Produced Sizes

Plain and deformed cold-drawn wire is produced in coil form from size Ø 5.0 mm to size Ø 12.0 mm as follows:

Size (mm)	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
	9.0	9.5	10.0	10.5	11.0	11.5	12.0	

2.2 Coil Weight

From 1.7 to 2.0 tons.

2.3 Coil Dimensions

Inner diameter: 500 mm ± 10 mm.
Outer diameter: 1025 mm ± 25 mm.
Length: 720 mm ± 10 mm.

3. PRODUCIBLE STANDARDS

3.1 International Standard

ISO 10544:1992
ISO 10544:1992 is complying with the requirement of ES: 262-3/2015 and ISO: 6935-3/1992 "Steel for the reinforcement of concrete – Part: 3 Welded Fabric".

3.2 British Standards

BS 4449:2005 + A3:2016, BS 4482:2005

3.3 American Standard

ASTM A1064M-18a

Other standards can be produced upon customer request. Please contact sales team for more details.

3.1 International Standard

Standard	ISO 10544:1992 [1]	Issuing Country	International

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N [2]	CEV [3]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. $A_{5.65}$ (%)	A_{gt} (%) [4]
500	0.22	0.60	1.60	0.05	0.05	0.012	0.50	500	550	1.03	12	–

[1] ISO 10544:1992 is complying with the requirement of ES: 262-3/2015 and ISO: 6935-3/1992 "Steel for the reinforcement of concrete – Part: 3 Welded Fabric".

[2] Higher nitrogen content may be used if sufficient quantities of nitrogen binding elements are present.

[3] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

[4] By agreement between purchaser and supplier, a total elongation at maximum force (A_{gt}) of 2.0% shall be used instead of $A_{5.65}$

3.2 British Standards

Standard	BS 4482:2005	Issuing Country	United Kingdom

Grade	Chemical Composition (Maximum %) [1]							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N [2]	CEV [3]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
250	0.22	–	–	0.05	0.05	0.012	0.42	250	–	1.15	–	5.0
500								500	–	1.05 [4]	–	2.5 [5]

[1] Maximum copper content = 0.80%.

[2] Higher nitrogen content may be used if sufficient quantities of nitrogen binding elements are present.

[3] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

[4] For sizes below 8 mm, the tensile strength to yield strength ratio is 1.02.

[5] For sizes below 8 mm, A_{gt} is 1.0%.

Standard	BS 4449:2005 + A3:2016	Issuing Country	United Kingdom

Grade	Chemical Composition (Maximum %) [1]							Mechanical Properties (Minimum)				
	C	Si	Mn	P	S	N [2]	CEV [3]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.05	0.05	0.012	0.50	500–650	–	1.05 [4]	–	2.5 [5]
B500B								500–650	–	1.08	–	5

[1] Maximum copper content = 0.80%.

[2] Higher nitrogen contents are permissable if sufficient quantities of nitrogen binding elements are present.

[3] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

[4] For sizes below 8 mm, the tensile to yield ratio is 1.02.

[5] For sizes below 8 mm, A_{gt} is 1.0%.

3.3 American Standard

Standard	ASTM A1064M-18a	Issuing Country	United States of America

Grade	Chemical Composition (Maximum %)							Mechanical Properties (Minimum)			
	C	Si	Mn	P	S	N	CEV	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	Reduction of Area [2]
GR. 65 [1]	–	–	–	–	–	–	–	450	515	–	30
GR. 70	–	–	–	–	–	–	–	485	550	–	30
GR. 72.5	–	–	–	–	–	–	–	500	568	–	30
GR. 75	–	–	–	–	–	–	–	515	585	–	30
GR. 77.5	–	–	–	–	–	–	–	533	603	–	30
GR. 80	–	–	–	–	–	–	–	550	620	–	30

[1] Grade 65 is specified for plain wire of welded wire reinforcement only.

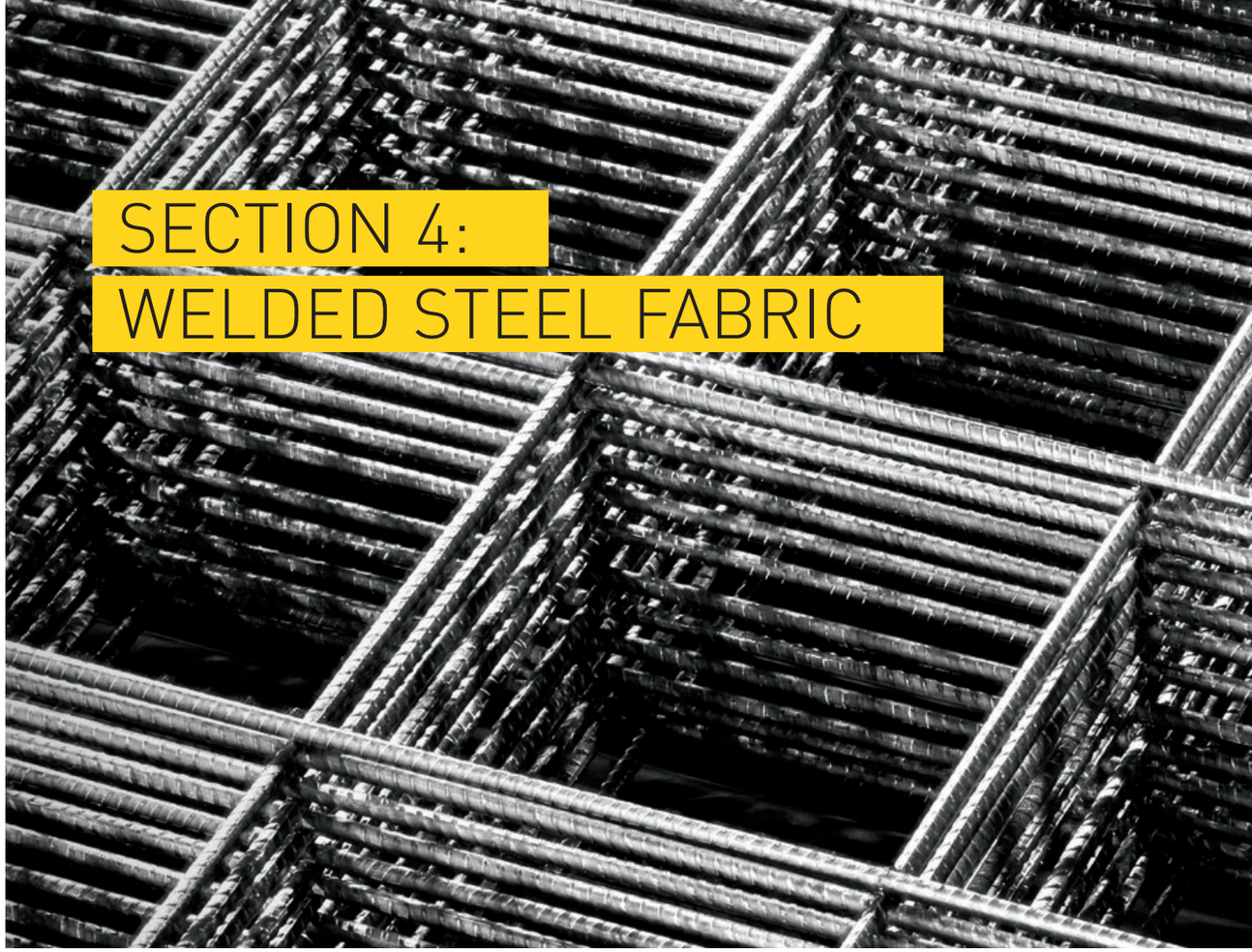
[2] For material testing over 690 MPa tensile strength, the reduction of area shall be not less than 25%.

4. PHYSICAL CHARACTERISTICS OF COLD-DRAWN WIRES

4.1 Weight per Unit Length

Size (mm)	Nominal Unit Weight (kg/m)	Unit Weight Tolerance (%)			
		ISO 10544:1992 [1]	BS 4482:2005	BS 4449:2005 + A3:2016	ASTM A1064M-18a
5.0	0.154	± 9%	± 6.0%	± 6.0%	± 6.0%
5.5	0.186	± 8%			
6.0	0.222				
6.5	0.260				
7.0	0.302				
7.5	0.347				
8.0	0.395				
8.5	0.445	± 5%	± 4.5%	± 4.5%	
9.0	0.499				
9.5	0.556				
10.0	0.617				
10.5	0.679				
11.0	0.746				
11.5	0.815				
12.0	0.888				

[1] ISO 10544:1992 is complying with the requirement of ES: 262-3/2015 and ISO: 6935-3/1992 "Steel for the reinforcement of concrete – Part:3 Welded Fabric".



SECTION 4: WELDED STEEL FABRIC

Welded steel fabric is an arrangement of longitudinal and transverse wires or bars of the same or different nominal diameter and length, that are arranged substantially at right angles to each other, and to be welded together at all points of intersections by electrical resistance automatic machines.

The welded steel fabric is made from plain or deformed wire or bar, or a combination of plain and deformed wire or bar.

1. APPLICATIONS

Welded steel fabric is used in a wide range of demanding construction applications including:

- Pre-cast concrete units.
- Concrete tunnels and pipes.
- Traditional construction system.
- Concrete roads, airports runways and highways.
- Canal lining.
- Concrete slab on grade, floor slab, and walls.
- Road pavements.

2. PRODUCT FEATURES

- Using welded fabric drastically speeds up the construction process due to avoiding the use of manual tying.
- Welded fabric is available in wide range of wire diameters each suited for a particular reinforcing design application.
- Where there is a significant amount of repetition, conventional bar reinforcement can be substituted with pre-manufactured designed mesh resulting in easier controls, speed of installation, reducing offcuts and wastage.

3. DEFINITIONS – ACCORDING TO ES 262-3:2015 AND ISO 6935-3:1992

3.1 Length of the Welded Fabric Sheet

Longest side of a sheet of welded fabric, irrespective of the manufacturing direction.

3.2 Width of the Welded Fabric Sheet

Shortest side of a sheet of welded fabric, irrespective of the manufacturing direction.

3.3 Longitudinal Wire

Reinforcing steel in the manufacturing direction of the welded fabric.

3.4 Transverse Wire

Reinforcing steel perpendicular to the manufacturing direction of the welded fabric.

3.5 Pitch of Welded Fabric

The distance between center to center of wires in a sheet of welded fabric. For twin wire fabric, the pitch is measured between the tangents of the adjacent wires (See Figure 2).

3.6 Overhang of Welded Fabric

Length of longitudinal or transverse wires beyond the center of the outer crossing wire in a sheet of welded fabric. For twin wire fabric, the overhang is measured from the tangent line of the adjacent wires (See Figure 2).

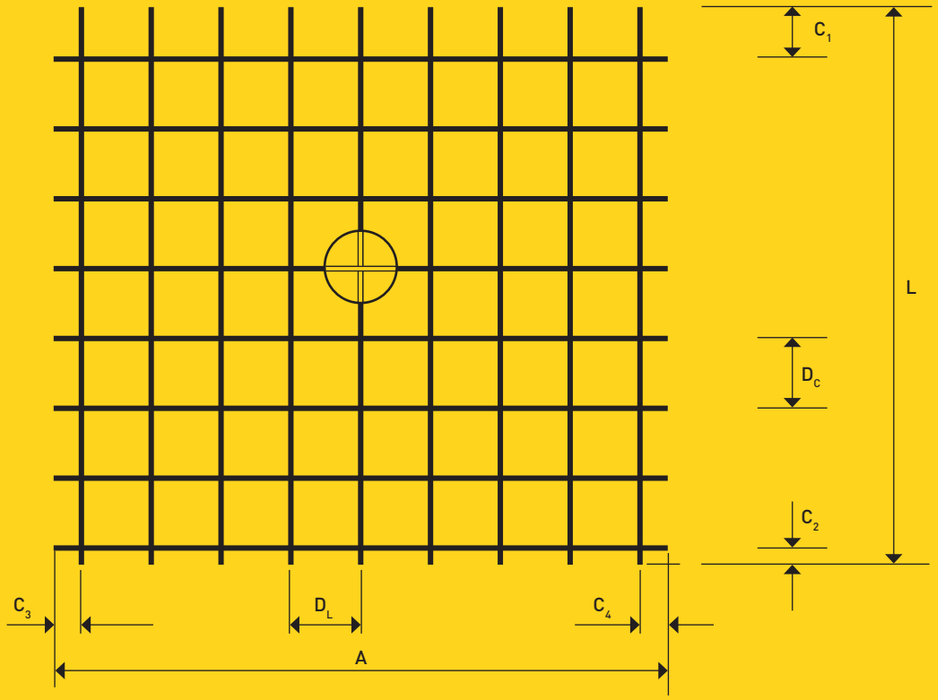


Figure 1: Geometric Characteristic of Welded Fabric.

L: Length of the longitudinal wires. | **A:** Length of the transverse wires. | **C_1 and C_2:** Overhangs of the longitudinal wires. **C_3 and C_4:** Side overhangs of the transverse wires. | **D_L:** Pitch of the longitudinal wires. | **D_C:** Pitch of the transverse wires.

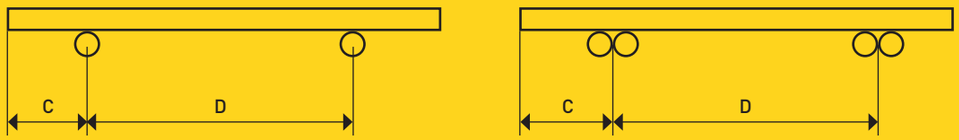


Figure 2: Pitch of the Wires (D) and Overhangs of the Wires (C).

4. WELDED STEEL FABRIC PRODUCTS DIMENSIONS

4.1 Sizes

From 5 mm to 12 mm diameter, in 0.5 mm increments.

4.2 Maximum Dimensions

Length: 12 m, Width: 2.80 m.

4.3 Pitches

Between longitudinal wires: multiples of 50 mm.
Between transverse wires: multiples of 50 mm.

4.4 Overhangs

Minimum longitudinal: 50 mm.
Minimum transverse: 25 mm.

5. PRODUCIBLE STANDARDS

5.1 Egyptian Standard

ES 262-3/2015

5.2 International Standard

ISO 6935-3/1992

5.3 British Standard

BS 4483:2005

5.4 American Standard

ASTM A1064M-18a

Other standards can be produced upon customer request. Please contact sales team for more details.

5.1 Egyptian Standard

Standard	ES: 262 – 3/2015, ISO 6935-3/1992	Issuing Country	Egypt

The welded steel fabric for the reinforcement of concrete is manufactured from one of the following:

1: Cold-drawn steel wire for the reinforcement of concrete according to the International Standard ISO 10544:1992.

2: Deformed bars according to the Egyptian Standard ES: 262 – 2/2015.

3: Plain bars according to the Egyptian Standard ES: 262 – 1/2015.

5.2 International Standard

Standard	ISO 6935 – 3/1992	Issuing Country	International

The welded steel fabric for the reinforcement of concrete is manufactured from one of the following:

1: Cold-drawn steel wire for the reinforcement of concrete according to the International Standard ISO 10544:1992.

2: Deformed bars according to the International Standard ISO 6935-2:2019.

3: Plain bars according to the International Standard ISO 6935-1:2007.

5.3 British Standard

Standard	BS: 4483:2005	Issuing Country	United Kingdom

The welded steel fabric for the reinforcement of concrete is manufactured from one of the following:

1: Ribbed bars according to BS 4449:2005.

2: Cold-drawn steel wire according to BS 4482 for wrapping fabrics D98 [*] only.

[*] D98 is a standard wrapping mesh according to BS 4483:2005 with nominal bar size 5 mm and standard pitch 200 mm for both longitudinal and transverse bars. Sheet size 4.8 m X 2.4 m.

5.4 American Standard

Standard	ASTM A1064M-18a	Issuing Country	United States of America

The welded steel fabric for the reinforcement of concrete is manufactured from plain or deformed wire or combination of them according to ASTM A1064M-18a

6. MECHANICAL PROPERTIES OF WELDED FABRIC

6.1 Welded Joint Shear Force

Nominal Diameter (mm)	Nominal Cross Section Area (mm²)	Welded Joint Shear Force (kN), Min.			
		ES 262-3/2015 ISO 6935-3/1992	BS: 4483:2005		ASTM A1064M-18a
		Grade 500	Grade 250	Grade 500A Grade 500B Grade 500C	Gr. 65, Gr. 70, Gr. 72.5, Gr. 75, Gr. 77.5, Gr. 80
5.0	19.6	2.940	1.191	2.377	4.724
5.5	23.7	3.555	1.440	2.874	5.712
6.0	28.3	4.245	1.719	3.431	6.820
6.5	33.2	4.980	2.017	4.026	8.001
7.0	38.5	5.775	2.339	4.668	9.279
7.5	44.2	6.630	2.685	5.359	10.652
8.0	50.2	7.530	3.050	6.087	12.098
8.5	56.7	8.505	3.445	6.875	13.665
9.0	63.6	9.540	3.864	7.712	15.328
9.5	70.8	10.620	4.301	8.585	17.063
10.0	78.5	11.775	4.769	9.518	18.919
10.5	86.5	12.975	5.255	10.488	20.847
11.0	95	14.250	5.771	11.519	22.895
11.5	103.8	15.570	6.306	12.586	25.016
12.0	113	16.950	6.865	13.701	27.233

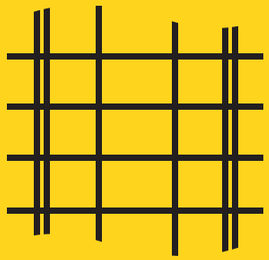
7. WELDED FABRIC DIMENSIONS TOLERANCE

Dimensions Tolerance		ES 262-3/2015 ISO 6935-3/1992	BS: 4483:2005 [1]	ASTM A1064M-18a
Overall Welded Fabric Tolerance	Longitudinal Wire	± 25 mm or ± 0.5% of wire length [2]		± 25 mm Or ± 1% of wire length [2]
	Transverse Wire	± 25 mm or ± 0.5% of wire length [2]		± 25 mm
	Overhangs	≥25 mm (Recommended)	To be agreed at the time of inquiry and order	Transverse wires: ≤25 mm, unless otherwise specified
Welded Fabric Pitch Tolerance	Longitudinal Pitch	± 10 mm or ± 7.5% of wire pitch [2]	± 10 mm or ± 5% of wire pitch [2]	+ 6.30 mm
	Transverse Pitch	± 10 mm or ± 7.5% of wire pitch [2]	± 10 mm or ± 5% of wire pitch [2]	+ 6.30 mm

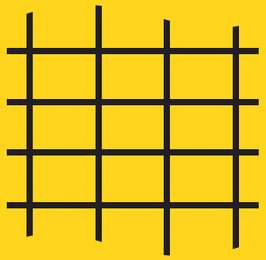
[1] The pitch of longitudinal and transverse wires shall not be less than 50 mm.

[2] Whichever is the greater.

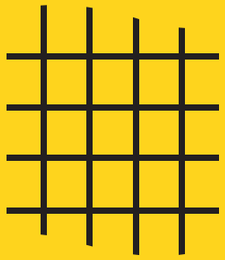
8. WELDED FABRIC FORMS



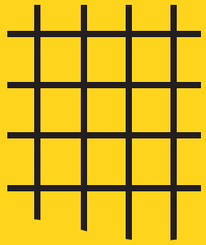
Multi Size Mesh
(Different pitches
for longitudinal wires)



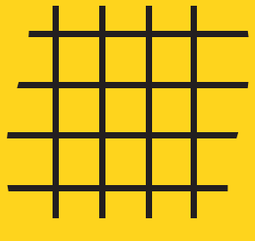
Rectangular Mesh
(Different longitudinal
and transverse pitches)



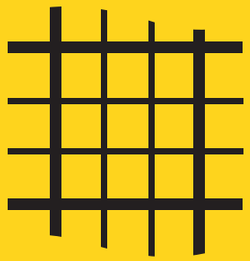
Square Mesh
(Equal longitudinal
and transverse pitches)



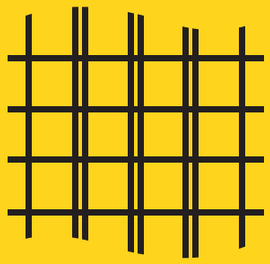
Free Longitudinal Ends
(Different longitudinal
wires end length)



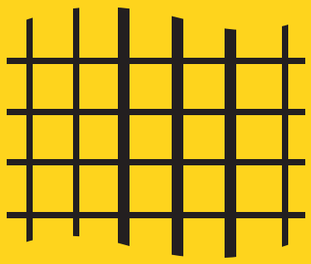
Free Transverse Ends
(Different transverse
wires end length)



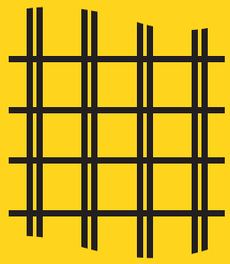
Mesh with Side Reinforcement
(Framed with reinforcement
wires of bigger size)



Single and Double Longitudinal Wires
(Same size single and double
longitudinal wires)



Two Diameters in Longitudinal Wires
(Different size longitudinal wires)



Double Longitudinal Wires
(Equal longitudinal and transverse
pitches with double longitudinal wires)

SECTION 5: PRODUCT IDENTIFICATION AND LABELING

1. REBAR AND WIRE ROD

1.1 Identification

Ezz Steel trademark is imprinted on the bar as shown in the following illustration:



Top side



Bottom side

All products carry the trademark except wire rod and plain bars that will be sold for industrial use.

In addition, marked products are identifiable with the grade designation mark according to related national/international standard.

For example: ES:262–2/2015 Grade B500DWR designation is as follows:

B Steel for concrete reinforcement
500 Minimum value of yield strength (MPa)
D Ductility class
W Intended for welding
R Ribbed bar

Marked on the bar as follows:



1.2 Labeling

The products are marked with a heat-resistance GRAPHIPLAST® label containing the following data:

- Date of production (rolling).
- Heat number/lot number.
- Trade mark of the manufacturer.
- Size.
- Length (for bundles).
- Weight.
- Number of bars/bundle (for bundles).
- Standard.
- Grade.
- Country of origin.

For local market: One label at the bundle/coil end. Bundles/coils produced according to British Standard carries two labels as per UK CARES regulations.

For export market: Two labels at the bundle/coil.

2. COLD-DRAWN WIRE AND WELDED STEEL FABRIC

2.1 Labeling

The products are marked with a heat- and dirt-resistance GRAPHIPLAST® label containing the following data:

- Date of production.
- Heat number/lot number.
- Size.
- Length and Width.
- Weight.
- Number of sheets/bundle.
- Grade.
- Customer name.
- Country of origin.

Side 1

ISO 9001
ISO 14001
ISO 45001
ISO 50001
ISO/IEC 17025

EZ Ezz DK Dikheila
IRON & STEEL
عز الدخيلة
الحديد والصلب

Made in Egypt

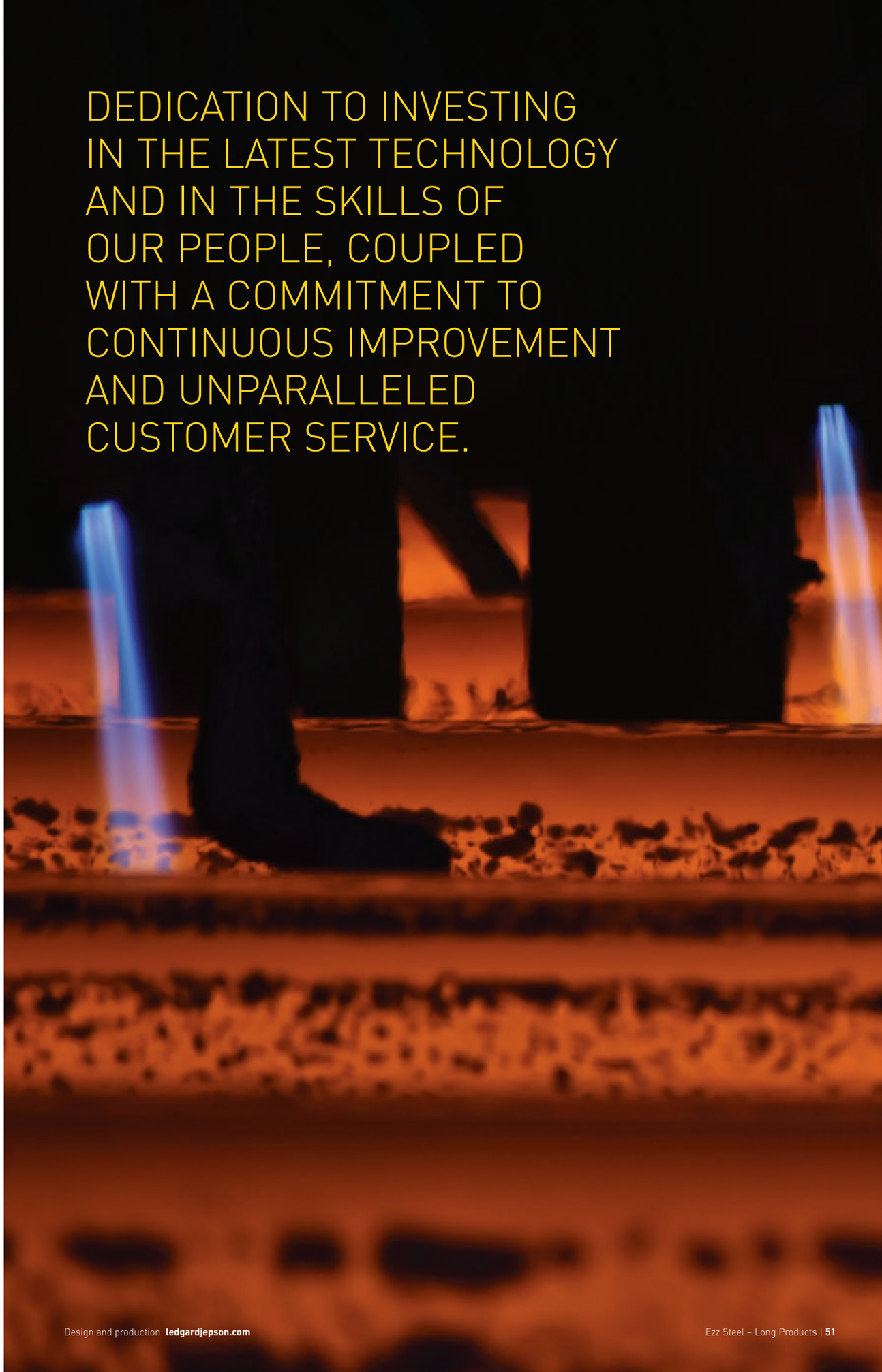
Side 2

DATE	
HEAT No./LOT No.	
SERIAL No.	
SIZE	
LENGTH	
WEIGHT	
No. of BARS/BUNDLE	
STANDARD	
GRADE	

B1-12345678-1234

B1-12345678-1234

SERIAL No.	
SIZE	



Design and production: **ledgardjepson.com**

ezzsteel
The Middle East Steel Professionals

Head Office
Four Seasons Nile Plaza
The Corporate Building
1089 Corniche El Nil
Garden City, Cairo, Egypt

Tel: +20 (2) 27989900
Fax: +20 (2) 27931953

www.ezzsteel.com