TECHNICAL SPECIFICATIONS

LATEST VERSION UPDATED ON 1ST NOVEMBER 2024

INDEX

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.
ES	–	Egyptian Standard
ISO	–	International Organization for Standardization.
ASTM	–	ASTM International Standard (formerly American Society for Testing and Materials).
EN	–	European Standard.
BS	–	British Standard.
BDS	–	Bulgarian Institute for Standardization (Български институт за стандартизация -БИС)
CSA	–	Canadian Standards Association
NF	–	French Standard (Norme Française)
DIN	–	German Institute for Standardization (Deutsches Institut für Normung)
ELOT	–	Greek Standards Organization (Ellinikos Organismos Typopoiiseos)
JS	–	Jamaican Standard
ST	–	Romanian Technical Standard (Standard Tehnic)
DSTU	–	State Standards of Ukraine
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 8 mm to Ø 40 mm as follows:

SI Units:

DIAMETER (mm)	8	10	12	14	16	18	20	22	25	28	30	32	40

Inch-Pound Units:

BAR DESIGNATION NO.	3	4	5	6	7	8	9	10	11
(INCH)	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8

Any special size from Ø 8 mm to Ø 40 mm can be produced.

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		

Any special size from Ø 5.5 mm to Ø 16.0 mm can be produced with 0.5 mm increment in diameter according to customer request.

Deformed rebar in coil:

DIAMETER (mm)	6.0	8.0	10.0	12.0	14.0	16.0

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 262-1/2023, ES 262-2/2021

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

3.3 American Standards
ASTM A615/A615M-22, ASTM A706/A706M-22[a], ASTM A510M-20

3.4 British Standard
BS 4449:2005 + A3:2016

3.5 Bulgarian Standard
BDS 9252-2007

3.6 Canadian Standard
CSA G30.18-2021

3.7 French Standards
NF A 35-080-1:2020

3.8 German Standard
DIN 488 – 2009

3.9 Greek Standard
ELOT 1421-3: 2007

3.10 Jamaican Standard
JS 33 - 2014

3.11 Romanian Standard
ST 009-2011

3.12 Ukrainian Standard
DSTU 3760:2019

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

3.1 EGYPTIAN STANDARDS

STANDARD	ES 262 – 1/2023, 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 – 2/2021, ISO 6935 – 2:2019	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
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	450–562.5	–	1.05	–	2.5
B450CWR	0.22	–	–	0.050	0.050	0.012	0.50	450–562.5	–	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	1.8	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
B600A-R	–	–	–	0.060	0.060	–	–	600	–	1.02	10	2
B600B-R										1.08		5
B600C-R										1.15		7
B600D-R	0.37	0.55	1.8	0.040	0.040	–	0.67	600–720	–	1.25	10	8
B700A-R	–	–	–	0.060	0.060	–	–	700	–	1.02	8	2
B700B-R										1.08		5
B700C-R										1.15		7
B700D-R	0.50	2.00	2.00	0.040	0.040	–	0.85	700–840	–	1.25	10	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 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 since 2019. Currently, Ezz Steel produces "steel grade B500DWR" according to Egyptian standard ES 262-2/2021.

Table 1 – Comparison of mechanical properties of steel grades B500DWR and B400B-R

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

[1] Ezz Steel standard elongation ≥14%.

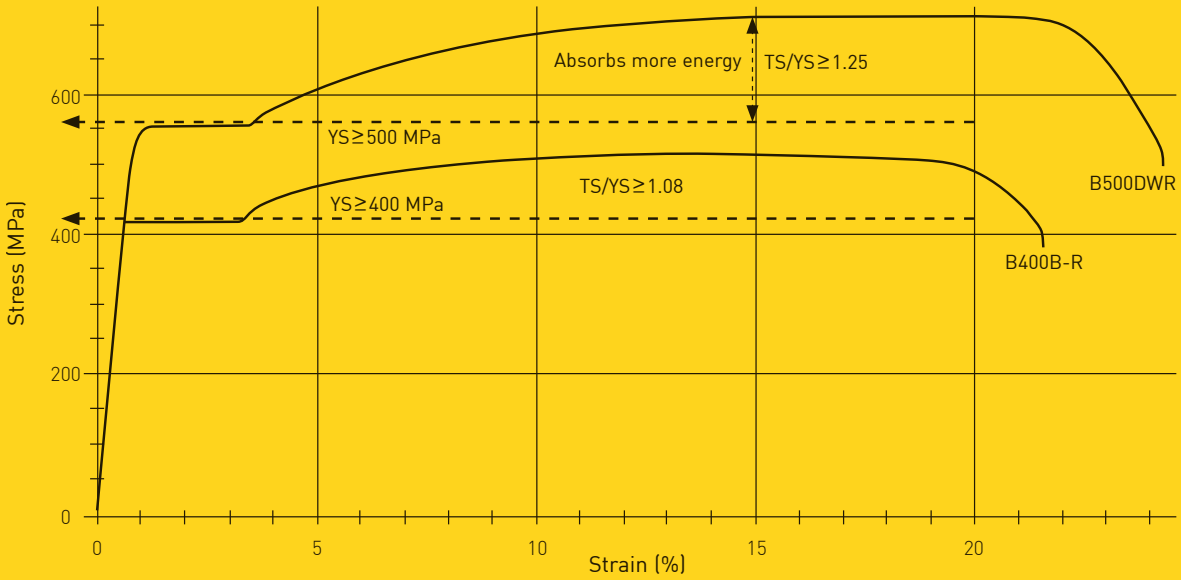
ADVANTAGES OF STEEL GRADE B500DWR:

- **Highest yield strength and tensile strength of weldable steel grades in the Egyptian standard ES 262-2/2021.**
- **Highest ductility class in the Egyptian standard ES 262-2/2021.**
- **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 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.**

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



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
B600A-R	–	–	–	0.060	0.060	–	–	600	–	1.02	10	2
B600B-R										1.08		5
B600C-R										1.15		7
B600D-R	0.37	0.55	1.8	0.040	0.040	–	0.67	600–720	–	1.25	10	8
B700A-R	–	–	–	0.060	0.060	–	–	700	–	1.02	8	2
B700B-R										1.08		5
B700C-R										1.15		7
B700D-R	0.50	2.00	2.00	0.040	0.040	–	0.85	700–840	–	1.25	10	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 STANDARD

STANDARD	ASTM A615/A615M-2022	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. (%) [2]	A_{gt} (%)
Grade 40 [1]	–	–	–	0.06	–	–	–	280	420	1.10	11–12	–
Grade 60								420	550		7–9	
Grade 80								550	690		6–7	
Grade 100								690	790			

[1] Grade 40 [280] bars are available only in bar designation no. 3 ~ 6 [size: 10 ~ 19 mm].

[2] Minimum elongation values depend on produced size.

STANDARD	ASTM A706/A706M-2022[a]	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	
Grade 100								690–815	805	1.17	10	

[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-2020** for industrial applications.
Mechanical properties are to be agreed upon with the customer.

STANDARD	ASTM A510M-2020	**ISSUING COUNTRY**	United States of America

GRADE	**CHEMICAL COMPOSITION (%)** [1]				
	C	Si	Mn	P Max.	S Max.
AISI 1006	0.08 max.	According to customer request [2]	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 %)**								**MECHANICAL PROPERTIES (MINIMUM)**				
	C	Si	Mn	P	S	N	Cu	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.05	0.05	0.012	0.80	0.50	500–650	–	1.05 [2]	–	2.5 [3]
B500B											1.08	–	5.0
B500C											1.15–1.35	–	7.5

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

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

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

3.5 BULGARIAN STANDARD

STANDARD	BDS 9252-2007	ISSUING COUNTRY	Bulgaria

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	N	Cu	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.05	0.05	0.012	0.80	0.50	500	550	1.05 [2]	–	2.5 [3]
B500B									500–625	550	1.08	–	5.0
B500C									500–625	575	1.15–1.35	–	7.5

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

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

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

3.6 CANADIAN STANDARD

STANDARD	CSA G30.18-2021	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	–
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	–
600W								600–725	700	1.15	8–10	–

[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 FRENCH STANDARDS

STANDARD	NF A 35-080-1: 2020	ISSUING COUNTRY	France

GRADE	CHEMICAL COMPOSITION (MAXIMUM %) [1]								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	N	Cu	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.050	0.050	0.012	0.80	0.50	500–650	–	1.05	–	2.5
B500B									500–650	–	1.08	–	5.0
B500C									500–625	–	1.15–1.35	–	7.5
B450B									450–585	–	1.08	–	5.0
B450C									450–562	–	1.15–1.35	–	7.5

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

3.8 GERMAN STANDARD

STANDARD	DIN 488-2009	ISSUING COUNTRY	Germany

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	N	Cu	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.050	0.050	0.012	0.60	0.47–0.50 [2]	500	550	1.05	–	2.5
B500B									500–650	550	1.08	–	5.0

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

[2] CEV ≤0.50 % for d≤28 mm/CEV ≤0.47 % for d>28 mm.

3.9 GREEK STANDARD

STANDARD	ELOT 1421-3: 2007	ISSUING COUNTRY	Greece

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	N	Cu	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500C	0.22	–	–	0.05	0.05	0.012	0.80	0.50	500–625	575	1.15–1.35	–	7.5

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

3.10 JAMAICAN STANDARD

STANDARD	JS 33-2014	ISSUING COUNTRY	Jamaica

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} (%)
300	–	–	–	0.050	0.050	–	0.40	300–425	–	1.25	10–12	–
400	0.30	0.50	1.50	0.035	0.045	–	0.55	400–525			7–9	

For steel grade 400:

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

For steel grade 300:

[1] $CEV = \%C + \frac{\%Mn}{6}$

[2] Minimum elongation values depend on produced size.

3.11 ROMANIAN STANDARD

STANDARD	ST 009-2011	ISSUING COUNTRY	Romania

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	N	Cu	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500C	0.22	–	–	0.050	0.050	0.012	0.80	0.50	500	575	1.15–1.35	16	7.5

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

3.12 UKRAINIAN STANDARD

STANDARD	DSTU 3760:2019	ISSUING COUNTRY	Ukraine

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	N	As	CEV [1]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
A240C	0.22	0.50	–	0.045	0.045	0.012	0.08	–	240	370	1.25	25	–
A400C			–		0.050			–	400	500	1.10	16	5.0
A500C			–		0.050			–	500	600	1.08	14	5.0
A500E			–		0.050			–	500–650	–	1.15–1.35	–	7.5
A600C			–		0.050			–	600	700	1.08	12	5.0
A600			1.60		0.045			–	600	700	1.08	12	5.0

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

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]
8	0.395	94.5–97.5	420	1,941
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
36	7.990	96.5–98.5	20	1,889
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.

Table 3 – Dimensions, weight per unit length and unit weight tolerance – inch-pound units

BAR DESIGNATION NO.	SIZE (inch)	SIZE (mm)	NOMINAL UNIT WEIGHT (kg/m) [1]	NUMBER OF BARS/ BUNDLE
3	3/8"	9.5	0.560	266
4	1/2"	12.7	0.994	150
5	5/8"	15.9	1.552	96
6	3/4"	19.1	2.235	68
7	7/8"	22.2	3.042	49
8	1"	25.4	3.973	38
9	1-1/8"	28.7	5.060	30
10	1-1/4"	32.3	6.404	24
11	1-3/8"	35.8	7.907	19

[1] Unit weights are according to ASTM standards.

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 4 – 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-2020

6.2 International/European Standard
EN ISO 16120-2:2017

6.3 Japanese Standard
JIS G 3505:2017, JIS G 3506:2017

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

6.1 AMERICAN STANDARD

STANDARD	ASTM A510M-20	ISSUING COUNTRY	United States of America

GRADE [1, 2]	CHEMICAL COMPOSITION (%) [3, 4]				
	C	Si	Mn	P Max.	S Max.
AISI 1006	0.08 max.	According to customer request [5]	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 3505 – 2017	ISSUING COUNTRY	Japan

GRADE	CHEMICAL COMPOSITION (%)				
	C	Si	Mn	P max.	S max.
SWRM 6	≤0.08	According to customer request [1]	≤0.60	0.040	0.040
SWRM 8	≤0.10		≤0.60	0.040	0.040
SWRM 10	0.08–0.13		0.30–0.60	0.040	0.040
SWRM 12	0.10–0.15		0.30–0.60	0.040	0.040
SWRM 15	0.13–0.18		0.30–0.60	0.040	0.040
SWRM 22	0.20–0.25		0.30–0.60	0.040	0.040

[1] 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%).

STANDARD	JIS G 3506 – 2017	ISSUING COUNTRY	Japan

GRADE	CHEMICAL COMPOSITION (%)				
	C	Si	Mn	P max.	S max.
SWRH27	0.24–0.31	0.15–0.35	0.30–0.60	0.030	0.030
SWRH32	0.29–0.36	0.15–0.35	0.30–0.60	0.030	0.030
SWRH37	0.34–0.41	0.15–0.35	0.30–0.60	0.030	0.030
SWRH42A	0.39–0.46	0.15–0.35	0.30–0.60	0.030	0.030
SWRH42B	0.39–0.46	0.15–0.35	0.60–0.90	0.030	0.030
SWRH47A	0.44–0.51	0.15–0.35	0.30–0.60	0.030	0.030
SWRH47B	0.44–0.51	0.15–0.35	0.60–0.90	0.030	0.030
SWRH52A	0.49–0.56	0.15–0.35	0.30–0.60	0.030	0.030
SWRH52B	0.49–0.56	0.15–0.35	0.60–0.90	0.030	0.030
SWRH57A	0.54–0.61	0.15–0.35	0.30–0.60	0.030	0.030
SWRH57B	0.54–0.61	0.15–0.35	0.60–0.90	0.030	0.030
SWRH62A	0.59–0.66	0.15–0.35	0.30–0.60	0.030	0.030
SWRH62B	0.59–0.66	0.15–0.35	0.60–0.90	0.030	0.030
SWRH67A	0.64–0.71	0.15–0.35	0.30–0.60	0.030	0.030
SWRH67B	0.64–0.71	0.15–0.35	0.60–0.90	0.030	0.030
SWRH72A	0.69–0.76	0.15–0.35	0.30–0.60	0.030	0.030
SWRH72B	0.69–0.76	0.15–0.35	0.60–0.90	0.030	0.030

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: 2024

ISO 10544: 2024 is complying with the requirement of ES 262-3/2015 and ISO 6935-3/2023 "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-2024

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

3.1 INTERNATIONAL STANDARD

STANDARD	ISO 10544:2024 [1]	ISSUING COUNTRY	International

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	Cu	N [2]	CEV [3]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El.$A_{5.65}$ (%)	A_{gt} (%)
CRB500	0.25	0.60	1.60	0.045	0.045	0.80	0.012	0.50	500	550	1.03	12	2.5

[1] ISO 10544:2024 is complying with the requirement of ES: 262-3/2015 and ISO: 6935-3/2023 "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] $CEV = \%C + \frac{\%Mn}{6} + \frac{\%Cr+\%Mo+\%V}{5} + \frac{\%Ni+\%Cu}{15}$

3.2 BRITISH STANDARDS

STANDARD	BS 4482:2005	ISSUING COUNTRY	United Kingdom

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	Cu	N [1]	CEV [2]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
250	0.22	–	–	0.05	0.05	0.80	0.012	0.42	250	–	1.15	–	5.0
500									500	–	1.05 [3]	–	2.5 [4]

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

[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%.

STANDARD	BS 4449:2005 + A3:2016	ISSUING COUNTRY	United Kingdom

GRADE	CHEMICAL COMPOSITION (MAXIMUM %)								MECHANICAL PROPERTIES (MINIMUM)				
	C	Si	Mn	P	S	Cu	N [1]	CEV [2]	Yield Strength (MPa)	Tensile Strength (MPa)	Tensile to Yield Ratio	El. (%)	A_{gt} (%)
B500A	0.22	–	–	0.05	0.05	0.80	0.012	0.50	500–650	–	1.05 [3]	–	2.5 [4]
B500B									500–650	–	1.08	–	5

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

[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%.

3.3 AMERICAN STANDARD

STANDARD	ASTM A1064M-2024	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 10544:2024 [1]	BS 4482:2005	BS 4449:2005 + A3:2016	ASTM A1064M-2024
5.0	0.154	± 4%	± 6.0%	± 6.0%	± 6.0%
5.5	0.186				
6.0	0.222				
6.5	0.260				
7.0	0.302				
7.5	0.347				
8.0	0.395				
8.5	0.445		± 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 10544:2024 is complying with the requirement of ES: 262-3/2015 and ISO: 6935-3/2023 "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 ISO 6935-3:2023

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

B: Length of the transverse wires

U_1 and U_2: Overhangs of the longitudinal wires

U_3 and U_4: Side overhangs of the transverse wires

b_1: Pitch of the longitudinal wires.

b_2: Pitch of the transverse wires

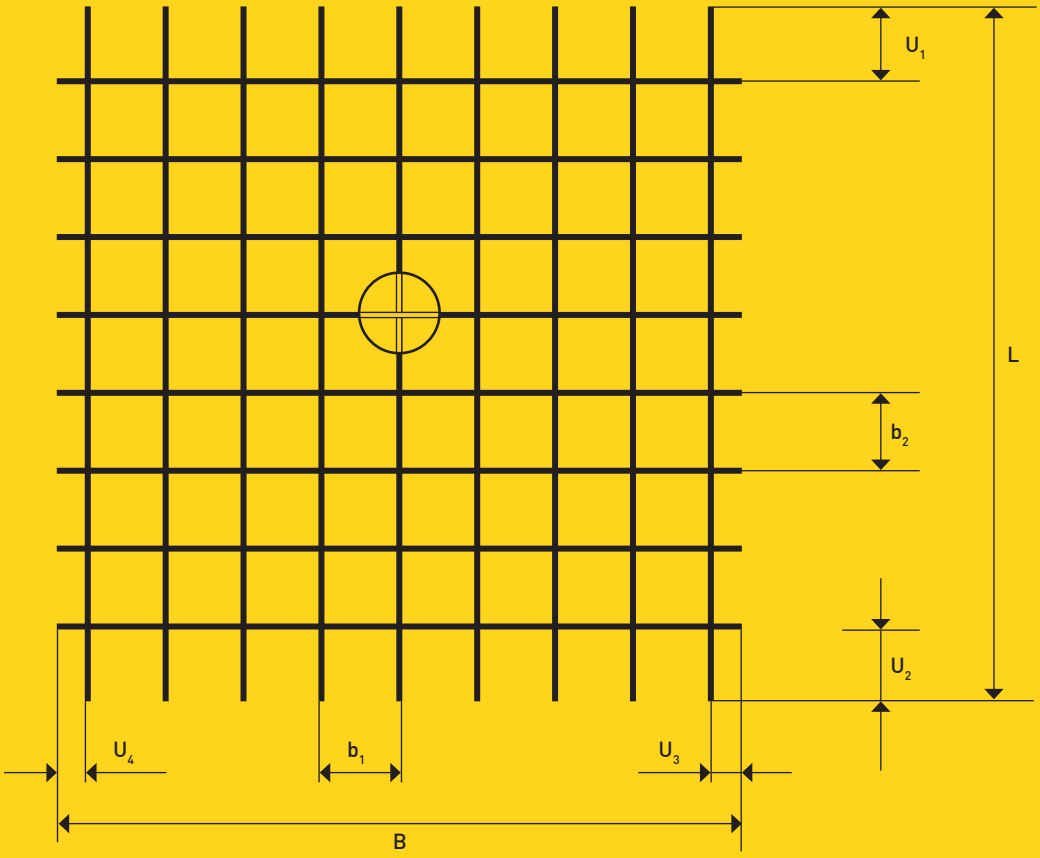
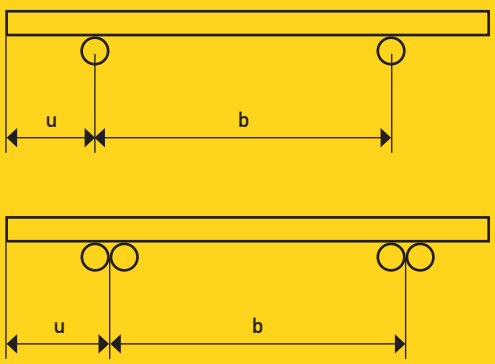


Figure 2: Pitch of the Wires (b) and Overhangs of the Wires (u).



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 6935-3/2023

5.3 British Standard
BS 4483:2005

5.4 American Standard
ASTM A1064M-2024

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 6935-3/2023
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 10544:2024.

2: Deformed bars according to the Egyptian Standard ES 262 – 2/2021.

3: Plain bars according to the Egyptian Standard ES 262 – 1/2023.

5.2 INTERNATIONAL STANDARD

STANDARD	ISO 6935 – 3/2023
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 10544:2024.

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 × 2.4 m.

5.4 AMERICAN STANDARD

STANDARD	ASTM A1064M-2024
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-2024.

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 6935-3/2023	BS: 4483:2005		ASTM A1064M-2024
		Grade CRB500	Grade 250	Grade B500A Grade B500B	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

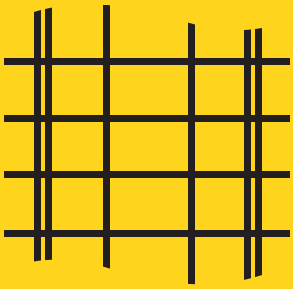
7. WELDED FABRIC DIMENSIONS TOLERANCE

DIMENSIONS TOLERANCE		ES 262-3/2015	ISO 6935-3/2023	BS: 4483:2005 [1]	ASTM A1064M-2024
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 ± 5.0% 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 ± 5.0% of wire pitch [2]	± 10 mm or ± 5% of wire pitch [2]	+ 6.30 mm

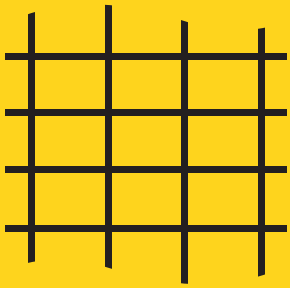
[1] The pitch of longitudinal and transverse wires shall not be less than 50 mm.

[2] Whichever is the greater.

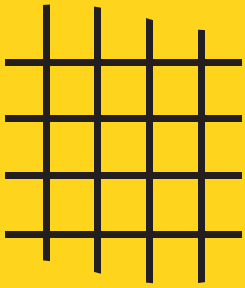
8. WELDED FABRIC FORMS



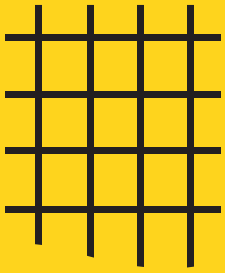
Multi Size Mesh
(Different pitches
for longitudinal wires)



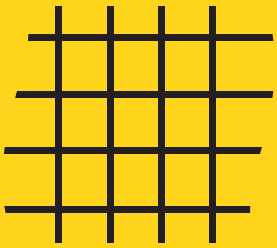
Rectangular Mesh
(Different longitudinal
and transverse pitches)



Square Mesh
(Equal longitudinal
and transverse pitches)

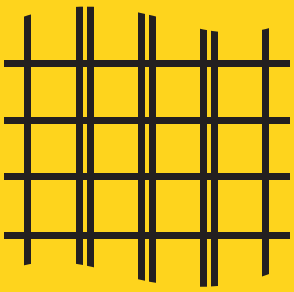


Free Longitudinal Ends
(Different longitudinal
wires end length)

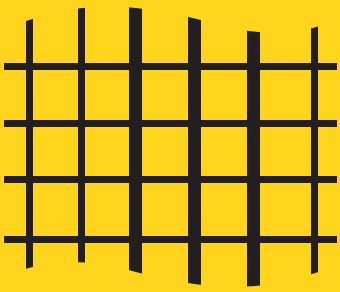


Free Transverse Ends
(Different transverse
wires end length)

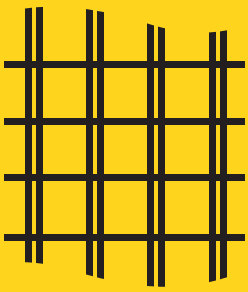
Mesh with Side Reinforcement
(Framed with reinforcement
wires of bigger size)



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 LABELLING

1. REBAR AND WIRE ROD

1.1 Identification
Ezz Steel trademark is imprinted on the bar as shown in the adjacent illustration:

Country of origin mark is also imprinted on the bar as shown in the adjacent illustration:

Option no. 1

Option no. 2

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:262–2/2021 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 adjacent:

1.2 Labelling

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

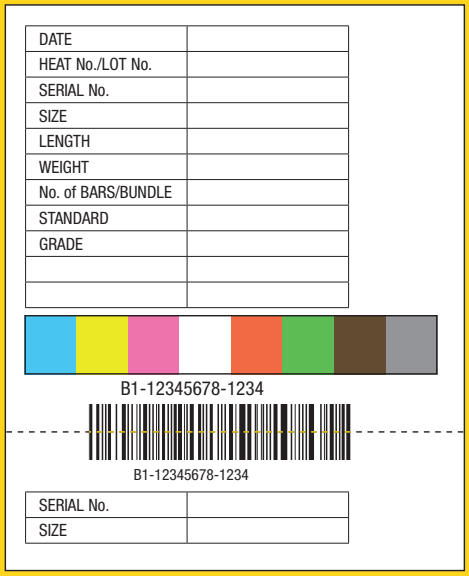
- Date of production (rolling).
- Heat number/lot number.
- Trade mark of the manufacturer.
- Size.
- Length (for bundles).
- Weight.
- Number of bars/bundle (for bundles).
- Standard.
- Grade.
- Country of origin.

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.

Side 1

Side 2



2. COLD-DRAWN WIRE AND WELDED STEEL FABRIC

2.1 Labelling

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.