

DRAFT EAST AFRICAN STANDARD

Mild steel wire for engineering purposes — Specification

DRAFT FOR PUBLIC REVIEW STAGE

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

In order to achieve this objective, the Community established an East African Standards Committee mandated to develop and issue East African Standards.

The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

DEAS 1154:2023 was prepared by Technical Committee EASC/TC 035, *Steel and steel products*.

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Mild steel wire for engineering purposes — Specification

1 Scope

1.1 This draft East African Standard specifies the quality requirements, dimensions and sampling of cold drawn mild steel wire of sizes 0.15 mm to 10 mm diameter for engineering applications with exception of fencing applications.

1.2 Steel wires and steel wire products for fencing are covered in EAS 135.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6892-1, Metallic materials — Tensile testing — Part 1: Method of test at room temperature

ISO 7989-1, Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 1: General principles

ISO 7989-2, Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc-alloy coating

ISO 404, Steel and steel products — General technical delivery requirements

ISO 7802, Metallic materials — Wire — Wrapping test

ISO 2093, Electroplated coatings of tin — Specification and test methods

3 Terms and definitions

For the purposes of this standard, the following terms and definitions shall apply.

3.1 wire rod

a semi-finished hot-rolled mild steel product capable of being drawn into wire of required diameter

3.2 wire

cold drawn or cold rolled mild steel wire of any cross-sectional shape

3.3 length

a straight piece of a drawn or rolled wire cut to a specified linear dimension.

3.4 coil

a continuous wire rolled in the form of a reel.

3.5 lot

Any quantity of coils of wire of the same thickness from which test samples shall be taken.

3.6 mild drawn or rolled

lightly drawn or rolled after annealing

3.7 hard drawn or rolled

drawn or rolled to final size without annealing

3.8 bundle

two or more coils bound together or a number of lengths bound together

3.9 consignment

any quantity of finished wire in coils or lengths delivered at one time

4 Information to be supplied by the purchaser

The following information shall be given on the enquiry or order:

- a) the number of this Standard,
- b) the product form (coils or lengths);
- c) the nominal diameter of the wire;
- d) the nominal Mass of coil (kgs);
- e) whether the wire is required to be welded;
- f) the condition of supply;
- g) the finish;
- h) any requirements for special protection;
- i) the tensile strength range, or, in the case of hard drawn or rolled wire of up to 1.25 mm diameter, the minimum tensile strength;
- j) any additional requirements, e.g. for packaging.

An example of this information to be supplied by the purchaser is:

WD/TC 035/002/2023, coils, 2.5 mm diameter wire, 500 kg, mild drawn, bright, 340 N/mm² to 500 N/mm².

5. General requirements

5.1 Supply of material

General requirements relating to the supply of mild steel wire shall be in accordance to ISO 404.

5.2 Condition of supply

The wire shall be supplied in one of the following conditions specified by the purchaser:

- a) finally annealed;
- b) mild drawn or rolled;

- c) hard drawn or rolled.

5.3 Finish

The wire shall be supplied with one of the following finishes specified by the purchaser:

- a) Annealed;
- b) Annealed, cleaned and limed;
- c) bright drawn;
- d) galvanized (zinc coated)
- e) coppered;
- f) tinned;
- g) aluzinc coated

5.4 Defects.

All finished wires shall be well and cleanly drawn to the dimensions specified. The wire shall be sound, free from splits, surface flaws, rough jagged and imperfect edges and other harmful surface defects.

6. Specific requirements

6.1 Dimensions

The nominal diameters and tolerances of mild steel wires shall be as specified in Table 1.

Table 1: Diameters of mild steel wires (Non Galvanized round wire)

S. No	Nominal Diameter (mm)	Tolerances (mm)
1	0.15	± 0.01
2	0.16	
3	0.18	
4	0.200	
5	0.224	
6	0.250	
7	0.280	± 0.015
8	0.315	
9	0.355	
10	0.400	
11	0.450	
12	0.500	
13	0.560	± 0.02
14	0.630	
15	0.710	
16	0.800	
17	0.90	
18	1.00	
19	1.12	± 0.03
20	1.25	
21	1.40	
22	1.60	± 0.04
23	1.80	
24	2.00	
25	2.24	

26	2.50	
27	2.80	± 0.05
28	3.15	
29	3.55	
30	4.00	
31	4.50	
32	5.00	
33	5.50	± 0.06
34	6.00	
35	6.30	
36	7.00	
37	7.15	
38	8.00	
39	9.00	
40	10.00	
Galvanized: All sizes		± 2.5 percent with a minimum of ± 0.025

6.2 Mechanical properties

6.2.1 Tensile test

The tensile properties of the wire shall be as specified in Table 2.

Table 2: Limits for ranges of tensile strength values

Condition of supply	Limits on tensile strength range (N/mm ²)	
	Lower limit	Upper limit
Finally annealed	280	500
Mild drawn or rolled	330	550
Hard drawn or rolled	500	1800

6.2.2 Bend test

A wire of 5 mm diameter and over shall withstand being bent through an angle of 90° round a former of diameter equal to twice its own diameter without breaking or splitting.

6.3 Chemical composition

The sulphur and phosphorus contents of the wire shall be each not greater than 0.05 % by cast analysis. The carbon content shall be not greater than 0.25 %. If the wire is required to be welded, the carbon content shall be not greater than 0.18 % and the manganese content shall be not less than 10 times the sulphur content of the cast, nor greater than 1.00 %.

6.4 Coating properties

The steel wire coating specifications shall be as specified in EAS 135.

For tin coated wire the specification for coating shall be as specified in ISO 2093 as shown on Table 3.

Table 3: Coating thickness of electroplated coatings of tin

Service condition number	(Partial) Classification code	Minimum thickness (µm)
4	Sn 30	30
3	Sn 20	20
2	Sn 12	12
1	Sn 5	5

6.4.2 Adherence test

If the wire diameter is less than or equal to 7.5 mm, the adherence of the coating shall be tested by wrapping the wire for at least six tight turns around a cylindrical mandrel. Wires of diameter greater than 7.5 mm shall undergo a bending test at an angle of at least 90° around the mandrel. Unless otherwise specified in a subsequent part of ISO 7989 or in the product standard, the relationship between the diameter of the mandrel and the diameter of the wire shall be in accordance with Table 6.

Table 4: Diameter of mandrel for wrapping test

Diameter of wire, d (mm)	Diameter of mandrel (mm)
< 4	4d
≥ 4	5d

6.5 Sampling

Unless otherwise agreed upon between the manufacturer and the purchaser, the sampling plan shall be according to Table 5.

Table 5: Scale of sampling

S/No.	Number of coils/reels in the lot	Number of coils/reels to be selected
1	Up to 25	3
2	26 to 65	4
3	66 to 180	5
4	181 to 300	7
5	Above 300	10

7 Tests methods

7.1 Tensile test shall be conducted according to method specified in ISO 6892-1.

7.2 Wrapping test shall be conducted according to method specified in ISO 7802.

7.3 Methods of testing zinc coating and zinc-aluminium coating shall be as specified in EAS 135.

7.4 Methods of testing of tin coating shall be as specified in ISO 2093.

8 Retest

8.1 Should any of the test pieces first cut from the samples not fulfill the test requirements specified in clause 7, two additional test pieces taken at random from another coil of the same lot in respect of each failure shall be taken from the samples.

8.2 Should both the additional test pieces pass the test, the lot represented shall be accepted as conforming to this standard, provided it complies with all the other requirements specified in this standard.

8.3 If either of the test pieces fails the retest, the lot shall be rejected.

9 Packaging

Finished wire coils may be wrapped with suitable material, e.g. jute, sisal or bituminous paper in order to prevent rust development.

Packaging shall be in 25, 50, 100, 250, 500, 1000, 1500, 2000, 2500 kgs and with a tolerance of $\pm 0.5\%$.

10 Marking

Coils of cold drawn mild steel wire shall legibly and durably be marked with the following information:

- a) finish (uncoated/galvanized/aluminium-zinc coated);
- b) nominal diameter (in mm), length (in mm) and quantity (in kgs or tons);;
- c) lot/batch number and date manufactured;
- d) name of manufacturer and/or registered trademark;
- f) country of origin.

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ANNEX A

(Informative)

CHEMICAL COMPOSITION

Table A.1: Non-resulfurized Carbon Steel Cast or Heat Chemical Ranges and Limits

Grade No.	Chemical composition limits %			
	Carbon, <i>Max</i>	Manganese	Phosphorous, <i>Max</i>	Sulphur, <i>Max</i>
1005	0.06 max	0.35 max	0.040	0.050
1006	0.08 ma	0.25 to 0.40	0.040	0.050
1008	0.10 max	0.30 to 0.50	0.040	0.050
1010	0.08 to 0.13	0.30 to 0.60	0.040	0.050
1011	0.08 to 0.13	0.60 to 0.90	0.040	0.050
1012	0.10 to 0.15	0.30 to 0.60	0.040	0.050
1013	0.11 to 0.16	0.50 to 0.80	0.040	0.050
1015	0.13 to 0.18	0.30 to 0.60	0.040	0.050
1016	0.13 to 0.18	0.60 to 0.90	0.040	0.050
1017	0.15 to 0.20	0.30 to 0.60	0.040	0.050
1018	0.15 to 0.20	0.60 to 0.90	0.040	0.050
1019	0.15 to 0.20	0.70 to 1.00	0.040	0.050
1020	0.18 to 0.23	0.30 to 0.60	0.040	0.050
1021	0.18 to 0.23	0.60 to 0.90	0.040	0.050
1022	0.18 to 0.23	0.70 to 1.00	0.040	0.050
1023	0.20 to 0.25	0.30 to 0.60	0.040	0.050
1025	0.22 to 0.28	0.30 to 0.60	0.040	0.050
1026	0.22 to 0.28	0.60 to 0.90	0.040	0.050
1029	0.25 to 0.31	0.60 to 0.90	0.040	0.050
1030	0.28 to 0.34	0.60 to 0.90	0.040	0.050
1034	0.32 to 0.38	0.50 to 0.80	0.040	0.050
1035	0.32 to 0.38	0.60 to 0.90	0.040	0.050
1037	0.32 to 0.38	0.70 to 1.00	0.040	0.050
1038	0.35 to 0.42	0.60 to 0.90	0.040	0.050
1039	0.37 to 0.44	0.70 to 1.00	0.040	0.050
1040	0.37 to 0.44	0.60 to 0.90	0.040	0.050
1042	0.40 to 0.47	0.60 to 0.90	0.040	0.050
1043	0.40 to 0.47	0.70 to 1.00	0.040	0.050
1044	0.43 to 0.50	0.30 to 0.60	0.040	0.050
1045	0.43 to 0.50	0.60 to 0.90	0.040	0.050
1046	0.43 to 0.50	0.70 to 1.00	0.040	0.050
1049	0.46 to 0.53	0.60 to 0.90	0.040	0.050
1050	0.48 to 0.55	0.60 to 0.90	0.040	0.050
1053	0.48 to 0.55	0.70 to 1.00	0.040	0.050
1055	0.50 to 0.60	0.60 to 0.90	0.040	0.050
1059	0.55 to 0.65	0.50 to 0.80	0.040	0.050
1060	0.55 to 0.65	0.60 to 0.90	0.040	0.050
1064	0.60 to 0.70	0.50 to 0.80	0.040	0.050
1065	0.60 to 0.70	0.60 to 0.90	0.040	0.050
1069	0.65 to 0.75	0.40 to 0.70	0.040	0.050
1070	0.65 to 0.75	0.60 to 0.90	0.040	0.050
1074	0.70 to 0.80	0.50 to 0.80	0.040	0.050
1075	0.70 to 0.80	0.40 to 0.70	0.040	0.050

1078	0.72 to 0.85	0.30 to 0.60	0.040	0.050
1080	0.75 to 0.88	0.60 to 0.90	0.040	0.050
1084	0.80 to 0.93	0.60 to 0.90	0.040	0.050
1085	0.80 to 0.93	0.70 to 1.00	0.040	0.050
1086	0.80 to 0.93	0.30 to 0.50	0.040	0.050
1090	0.85 to 0.98	0.60 to 0.90	0.040	0.050
1095	0.90 to 1.03	0.30 to 0.50	0.040	0.050

NOTE 1 — Silicon—When silicon is required the following ranges and limits are commonly used for nonresulfurized carbon steels: 0.10 max, %, 0.07 to 0.15 %, 0.10 to 0.20 %, 0.15 to 0.35 %, 0.20 to 0.40 %, or 0.30 to 0.60 %.

NOTE 2 — Copper—When required, copper is specified as an added element.

NOTE 3 — Lead—When lead is required as an added element, a range from 0.15 to 0.35 % is specified. Such a steel is identified by inserting the letter “L” between the second and third numerals of the grade number, for example, 10L18.

NOTE 4 — Boron Addition to Improve Hardenability—Standard killed carbon steels, which are fine grain, may be produced with a boron addition to improve hardenability and typically contain an intentional addition of .01 % minimum titanium. Such steels are produced to a range of 0.0005 to 0.003 % boron. These steels are identified by inserting the letter “B” between the second and third numerals of the grade number, for example, 10B46. The UNS designation is also modified by changing the last digit to “1” to indicate boron, for example, G 1046.1.

NOTE 5 — Boron Additions to Control Strain-Ageing Behavior—Intentional additions of Boron to low carbon steels for the purpose of controlling strain-ageing behavior during wire drawing is permissible only with the agreement of the purchaser. In such cases, the Boron content shall be reported in either a material test report or certification.

NOTE 6 — For steels that do not have intentional boron additions for hardenability or for control of strain aging behaviour, the boron content will not normally exceed .0008%.

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Table A.2: Non-resulfurized Carbon Steel, High Manganese, Cast or Heat Chemical Ranges and Limits

Grade No.	Chemical composition limits %			
	Carbon, <i>Max</i>	Manganese	Phosphorous <i>Max</i>	Sulphur, <i>Max</i>
1513	0.10 to 0.16	1.10 to 1.40	0.040	0.050
1518	0.15 to 0.21	1.10 to 1.40	0.040	0.050
1522	0.18 to 0.24	1.10 to 1.40	0.040	0.050
1524 ^B	0.19 to 0.25	1.35 to 1.65	0.040	0.050
1525	0.23 to 0.29	0.80 to 1.10	0.040	0.050
1526	0.22 to 0.29	1.10 to 1.40	0.040	0.050
1527 ^B	0.23 to 0.29	1.20 to 1.50	0.040	0.050
1536 ^B	0.30 to 0.37	1.20 to 1.50	0.040	0.050
1541 ^B	0.36 to 0.44	1.35 to 1.65	0.040	0.050
1547	0.43 to 0.51	1.35 to 1.65	0.040	0.050
1548 ^B	0.44 to 0.52	1.10 to 1.40	0.040	0.050
1551 ^B	0.45 to 0.56	0.85 to 1.15	0.040	0.050
1552 ^B	0.47 to 0.55	1.20 to 1.50	0.040	0.050
1561 ^B	0.55 to 0.65	0.75 to 1.05	0.040	0.050
1566 ^B	0.60 to 0.71	0.85 to 1.15	0.040	0.050
1572 ^B	0.65 to 0.76	1.00 to 1.30	0.040	0.050

NOTE 1—Silicon—When silicon is required the following ranges and limits are commonly used for nonresulfurized carbon steels: 0.10 max, %, 0.07 to 0.15 %, 0.10 to 0.20 %, 0.15 to 0.35 %, 0.20 to 0.40 %, or 0.30 to 0.60 %.

NOTE 2—Copper—When required, copper is specified as an added element.

NOTE 3—Lead—When lead is required as an added element a range from 0.15 to 0.35 % is specified. Such a steel is identified by inserting the letter “L” between the second and third numerals of the grade number, for example, 15L18.

Table A.3: Resulfurized Carbon Steels, Cast or Heat Chemical Ranges and Limits

Grade No.	Chemical composition limits %			
	Carbon, Max	Manganese	Phosphorous, Max	Sulphur, Max
1108	0.08 to 0.13	0.50 to 0.80	0.040	0.08 to 0.13
1109	0.08 to 0.13	0.60 to 0.90	0.040	0.08 to 0.13
1110	0.08 to 0.13	0.30 to 0.60	0.040	0.08 to 0.13
1116	0.14 to 0.20	1.10 to 1.40	0.040	0.16 to 0.23
1117	0.14 to 0.20	1.00 to 1.30	0.040	0.08 to 0.13
1118	0.14 to 0.20	1.30 to 1.60	0.040	0.08 to 0.13
1119	0.14 to 0.20	1.00 to 1.30	0.040	0.24 to 0.33
1132	0.27 to 0.34	1.35 to 1.65	0.040	0.08 to 0.13
1137	0.32 to 0.39	1.35 to 1.65	0.040	0.08 to 0.13
1139	0.35 to 0.43	1.35 to 1.65	0.040	0.13 to 0.20
1140	0.37 to 0.44	0.70 to 1.10	0.040	0.08 to 0.13
1141	0.37 to 0.45	1.35 to 1.65	0.040	0.08 to 0.13
1144	0.40 to 0.48	1.35 to 1.65	0.040	0.24 to 0.33
1145	0.42 to 0.49	0.70 to 1.00	0.040	0.04 to 0.07
1146	0.42 to 0.49	0.70 to 1.00	0.040	0.08 to 0.13
1151	0.48 to 0.55	0.70 to 1.00	0.040	0.08 to 0.13

NOTE 1—Silicon—When silicon is required, the following ranges and limits are commonly used: Up to 1110, incl, 0.10 max, %; 1116 and over, 0.10 max, %, 0.10 to 0.20 %, or 0.15 to 0.35 %.

NOTE 2—Because of the degree to which sulfur segregates, product analysis for sulfur in resulfurized carbon steel is not technologically appropriate unless misapplication is clearly indicated.

Table A.4: Rephosphorized and Resulfurized Carbon Steel Cast or Heat Chemical Ranges and Limits

Grade No.	Chemical composition limits %				
	Carbon, Max	Manganese	Phosphorous	Sulphur	Lead
1211	0.13	0.60 to 0.90	0.07 to 0.12	0.10 to 0.15	
1212	0.13	0.70 to 1.00	0.07 to 0.12	0.16 to 0.23	
1213	0.13	0.70 to 1.00	0.07 to 0.12	0.24 to 0.33	
1215	0.09	0.75 to 1.05	0.04 to 0.09	0.26 to 0.35	
12L13	0.13	0.70 to 1.00	0.07 to 0.12	0.24 to 0.33	0.15 to 0.35
12L14	0.15	0.85 to 1.15	0.04 to 0.09	0.26 to 0.35	0.15 to 0.35
12L15	0.09	0.75 to 1.05	0.04 to 0.09	0.26 to 0.35	0.15 to 0.35

NOTE 1 — It is not common practice to produce the 12XX series of steel to specified limits for silicon. Silicon impairs machinability.

NOTE 2 — Because of the degree to which phosphorus and sulfur segregate, product analysis for phosphorus and sulfur in the 12XX series steel is not technologically appropriate unless misapplication is clearly indicated.

Bibliography

- 1) TZS 11, Cold drawn mild steel wire for general engineering purposes — Specification.
- 2) US 2491, Mild steel wire for general engineering purposes — Specification.
- 3) IS 280:2006, Mild steel wire for general engineering purposes.
- 4) BS 1052, Specification for Mild steel wire for general engineering purposes.

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