

THAI INDUSTRIAL STANDARDS

High Carbon Steel Wire Rods

1. Scope

- 1.1 This standard covers high carbon steel wire rods to be used for the manufacture of hard drawn steel wires, oil-tempered steel wires, hard drawn steel wires for pre-stressed concrete, galvanized steel wire strands, wire ropes, etc.
- 1.2 This standard does not cover wire rods for making piano wires.

2. Definition

For the purposes of this standard, the following definitions apply:

- 2.1 HIGH CARBON STEEL WIRE RODS, hereinafter referred to as “wire rods,” means semi-finished hot rolled carbon steel products with a circular cross-section in the form of coiled wire, with a chemical composition and symbols as specified in Table 1 or Table 2.
- 2.2 COIL means a wire rod of continuous length without joints, wound into a coil.
- 2.3 RUST means an ionic compound on a metal surface generated by the reaction of iron (Fe) and oxygen (O₂), catalysed by moisture.
- 2.4 PITTING means rust eroding the metal surface into deep holes, generated by the reaction of iron and oxygen, catalysed by moisture and solutions with a chloride compound as a catalyser (solutions with a chloride compound like sea water).

3. Symbols

- 3.1 Wire rods shall be classified by the chemical composition and designated by 21 symbols as specified in Table 1 or Table 2.

4. Nominal Diameters, Tolerances, and Out-of-round

- 4.1 The nominal diameters, tolerances and out-of-round of wire rods shall comply with Table 3. Compliance is checked by the test in accordance with clause 9.2.

Table 1 Symbols and chemical composition determined by ladle analysis
(Clause 2.1, 3.1 and 5.1)

Unit in percentage

Symbols	Chemical composition				
	Carbon	Silicon	Manganese	Max. Phosphorus	Max. Sulphur
SWRH 27	0.24 to 0.31	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 32	0.29 to 0.36	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 37	0.34 to 0.41	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 42 A	0.39 to 0.46	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 42 B	0.39 to 0.46	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 47 A	0.44 to 0.51	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 47 B	0.44 to 0.51	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 52 A	0.49 to 0.56	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 52 B	0.49 to 0.56	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 57 A	0.54 to 0.61	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 57 B	0.54 to 0.61	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 62 A	0.59 to 0.66	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 62 B	0.59 to 0.66	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 67 A	0.64 to 0.71	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 67 B	0.64 to 0.71	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 72 A	0.69 to 0.76	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 72 B	0.69 to 0.76	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 77 A	0.74 to 0.81	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 77 B	0.74 to 0.81	0.15 to 0.35	0.60 to 0.90	0.030	0.030
SWRH 82 A	0.79 to 0.86	0.15 to 0.35	0.30 to 0.60	0.030	0.030
SWRH 82 B	0.79 to 0.86	0.15 to 0.35	0.60 to 0.90	0.030	0.030

Note: The chemical compositions of other elements not specified in Table 1 shall be in accordance with the agreement reached between the buyer and seller.

Table 2 Symbols and chemical compositions determined by product analysis
(Clause 2.1, 3.1 and 5.1)

Unit in percentage

Symbols	Chemical Compound				
	Carbon	Silicon	Manganese	Max. Phosphorus	Max. Sulphur
SWRH 27	0.21 to 0.35	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 32	0.26 to 0.40	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 37	0.31 to 0.46	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 42 A	0.36 to 0.51	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 42 B	0.36 to 0.51	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 47 A	0.41 to 0.56	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 47 B	0.41 to 0.56	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 52 A	0.46 to 0.61	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 52 B	0.46 to 0.61	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 57 A	0.51 to 0.66	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 57 B	0.51 to 0.66	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 62 A	0.56 to 0.71	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 62 B	0.56 to 0.71	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 67 A	0.61 to 0.76	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 67 B	0.61 to 0.76	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 72 A	0.66 to 0.81	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 72 B	0.66 to 0.81	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 77 A	0.71 to 0.87	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 77 B	0.71 to 0.87	0.10 to 0.40	0.56 to 0.94	0.040	0.040
SWRH 82 A	0.76 to 0.92	0.10 to 0.40	0.27 to 0.63	0.040	0.040
SWRH 82 B	0.76 to 0.92	0.10 to 0.40	0.56 to 0.94	0.040	0.040

Note: The chemical compositions of other elements not specified in Table 2 shall be in accordance with the agreement reached between the buyer and seller.

Table 3 Nominal diameters, tolerances and out-of-round
(Clause 4.1)

Nominal Diameter	Tolerance	Unit in millimetres
		Max. Out-of-round
5	± 0.40	0.64
5.5		
6		
6.5		
7		
7.5		
8		
8.5		
9		
9.5		
10		
10.5		
11		
11.5		
12		
12.5		
13		
13.5		
14		
14.5		
15		

Table 3 Nominal diameters, tolerances and out-of-round (Cont.)
(Clause 4.1)

Nominal Diameter	Tolerance	Unit in millimetres
		Max. Out-of-round
15.5 16 16.5 17 17.5 18 18.5 19 19.5 20 21 22 23 24 25	± 0.50	0.80
26 27 28 29 30	± 0.60	0.96
Over 30	In accordance with the agreement reached by the buyer and the seller.	In accordance with the agreement reached by the buyer and the seller.

5. Chemical Composition

- 5.1 The chemical composition of wire rods when determined by the ladle analysis (recommended for the manufacturer) shall conform to Table 1. When determined by the product analysis, it shall conform to Table 2. Compliance is checked by the test in accordance with clause 9.3.

6. Requirements

6.1 Appearance

Wire rods shall be evenly round, free from fractures, cracks, pits, and other defects harmful to use. Surface rusting is acceptable.

Compliance is checked by visual inspection.

7. Marking and labelling

7.1 A tag shall be attached to each coil of wire rod and the tag shall bear at least a number, letter or mark indicating legibly and clearly the following information:

- (1) The term "High carbon steel wire rod"
- (2) Symbols
- (3) Nominal diameter in millimetres
- (4) Weight in kilograms
- (5) Cast number or other equally informative mark
- (6) Name of manufacturer or factory with location or registered trademark
- (7) Country of manufacture

If a foreign language is used, the meaning shall correspond to the meaning in Thai specified above.

8. Sampling and criteria for conformity

8.1 Sampling and the criteria for conformity shall comply with Appendix A.

9. Testing

9.1 Preparation of test specimen

Test specimens shall be cut from each coil as illustrated in Figure 1 below.

9.1.1A test specimen with a length of 500 mm shall be cut from each of the 5 coils taken for testing on appearance, diameter, and out-of-round.

9.1.2Each test specimen taken according to clause 9.1.1 shall be cut into 3 pieces for chemical composition testing.

9.2 Diameter and out-of-round

9.2.1 Tool

Measuring equipment with a resolution of up to 0.01 mm.

9.2.2 Method of measurement

The specimen shall be measured at 3 positions within the length portion, which is turned around during the measurement. The maximum and minimum values shall be determined. The method of measurement is illustrated in Figure 2.

9.2.3 Test Report

9.2.3.1 Diameter

The maximum and minimum values of diameters measured at different positions in the samples shall be reported.

9.2.3.2 Out-of-round

The difference between the maximum and minimum values of the diameter at each position of the sample shall be reported.

9.3 Chemical composition

The chemical composition of the test specimens shall be determined by a general chemical analysis or an equivalent method, then the element contents shall be reported to 2 or 3 decimal places as applicable.

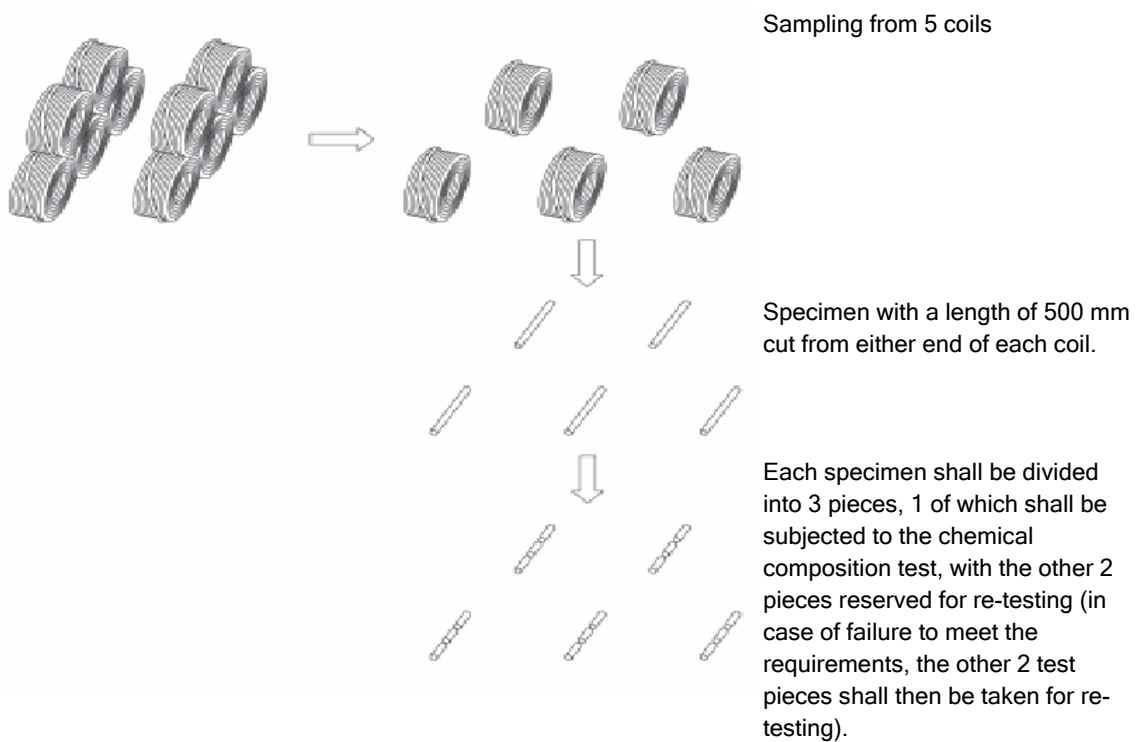
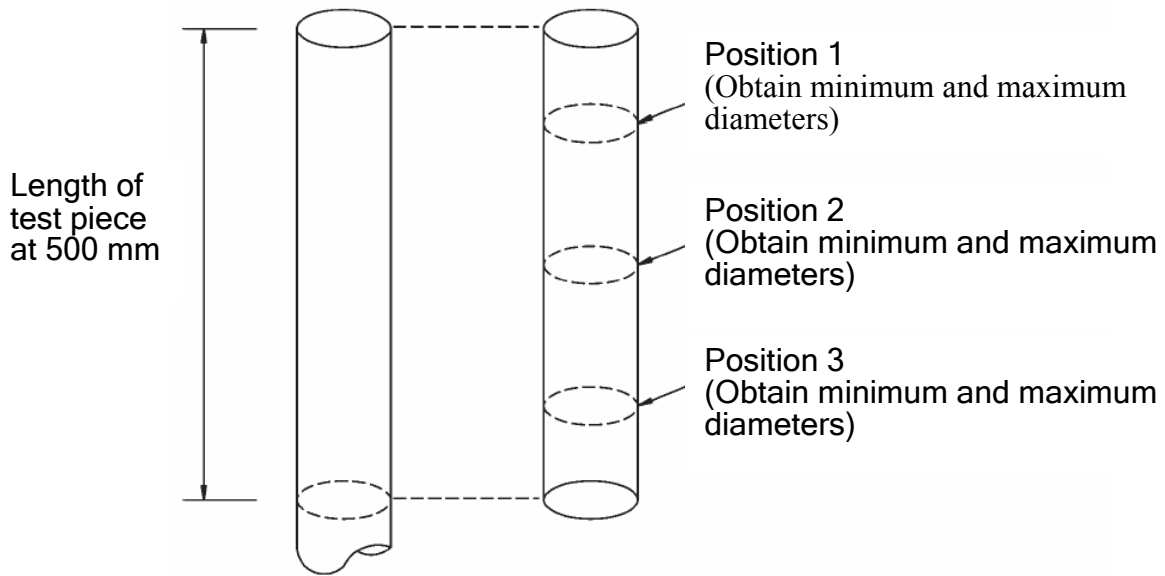


Figure 1 Sample preparation for test specimens for testing on diameter, appearance, and chemical composition of the lot not exceeding 150 tons (Clause 9.1)



**Figure 2 How to measure diameter
(Clause 9.2.2)**

Appendix A

Sampling and Criteria for Conformity (Clause 8.1)

- A.1 'Lot' means wire rods of the same symbol and nominal diameter which are manufactured or purchased or delivered at the same time.
- A.2 Sampling and acceptance shall comply with the sampling plan below or any other technically equivalent plan.
- A.2.1 Sampling and acceptance for testing on diameter, out-of-round, and appearance
- A.2.1.1 Samples shall be taken at random from the same lot as specified in Table A.1. They shall each be cut from either end of a coil, and shall be approximately 500 mm long.
- A.2.1.2 Provided that all test pieces which do not satisfy the requirements of clauses 4 and 6 do not exceed the acceptance number as specified in Table A.1, that lot shall be deemed as conforming to the requirements.

Table A.1 Sampling plan for testing diameter, out-of-round and appearance
(Clause A.2.1)

Weight per lot Ton	Test specimens (Coil)	Acceptance number
150 or less	5	0
Over 150 up to and including 500	13	1
Over 500	20	2

- A.2.2 Sampling and acceptance for testing on chemical composition
- A.2.2.1 Five samples shall be taken at random as specified in Table A.1. They shall be cut to a length adequate for making at least 3 test specimens, 1 of which shall be tested and the other 2 reserved for re-testing.
- A.2.2.2 Provided that all specimens satisfy the requirements of clause 5, that lot shall be deemed as conforming to the requirements. Should any specimen fail to fulfil the requirements of clause 5, the two specimens that were reserved shall be taken for re-testing, the result of which must satisfy all the requirements of clause 5 for that lot to be deemed as conforming to the requirements.
- A.3 Criteria for conformity
- Provided that the samples satisfy all the requirements of clause A.2.1.2 and A.2.2.2, that lot shall be deemed as conforming to this standard.
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