Republic of the Philippines
Metropolitan Cebu Water District
Magallanes Corner Lapu-lapu Sts., Cebu City

SC11-01:2003
(Revisions of ____ : ____)

MCWD TECHNICAL STANDARDS AND SPECIFICATIONS FOR STEEL BARS FOR STRUCTURAL USE

MCWD QUALITY MANAGEMENT SYSTEM
TECHNICAL STANDARDS COMMITTEE

MCWD TECHNICAL STANDARDS AND SPECIFICATIONS FOR STEEL BARS USED FOR STRUCTURAL USE

A. GENERAL

This standard specifies the requirements for hot-rolled deformed steel bars derived from billets or ingots with subsequent treatment by quenching and self-tempering for use as concrete reinforcement and other structural use.

B. MECHANICAL AND PHYSICAL REQUIREMENTS

1. Mechanical Properties

The mechanical properties of steel bars for concrete reinforcement shall conform to those specified in Table 1.

Table 1. Mechanical Properties of Weldable and Non-weldable Steel Bards

Class	Grade	Yield Strength Mpa, * Min.	Tensile Strength Mpa, ** Min.	Specimen	Elongation In 200 mm Percent Min.	Bending Angle, Degree
Non-weldable Steel bar	230	230	390	d < 25 mm d ≥ 25 mm	18 16	180
	275	275	480	d < 25 mm d ≥ 25 mm	10 8	180
	415	415	620	d < 25 mm d ≥ 25 mm	8 7	180
Weldable Steel bar	230	230	390	d < 25 mm d ≥ 25 mm	18 16	180
	275	275	480	d < 25 mm d ≥ 25 mm	16 14	180
	415	415	550	d < 25 mm d ≥ 25 mm	14 12	180

* Maximum yield strength of weldable steel bar is 540 Mpa, however a value of 560 Mpa shall be allowed for retest.

** Actual tensile strength for sizes up to 16mm shall not be less than 1.18 times the actual yield strength. Actual tensile strength for sizes 20mm and above shall not be less than 1.25 times the actual yield strength.

2. **Dimensions, mass and tolerance**

The dimensions and mass of steel bars shall conform to Table 2.

Table 3. Nominal Dimensions and Unit Mass

Nominal Diameter, mm	Nominal Perimeter, * mm	Nominal cross-sectional area, ** mm^2	Unit Mass, + Kg/m
10	31.4	78.54	0.617
12	37.7	113.10	0.888
16	50.3	201.06	1.578
20	62.8	314.16	2.466
25	78.6	490.88	3.853
28	88.6	615.75	4.834
32	100.5	804.25	6.313
* Nominal perimeter, mm = 3.1416 x nominal diameter in mm ** Nominal cross-sectional area, mm^2 = 3.1416/4 x (nominal diameter)^2 + Unit mass, Kg/m 0.00785 g/mm^3 x nominal cross-sectional in mm^2			

The standard length of steel bars shall be 6.0, 7.5, 9.0, 10.5 and 12.0 meters. The tolerance on the mass of one piece of steel bar shall be ± 6 percent. The tolerance for length of steel bars shall conform to the values specified below:

Length	Tolerance
6m	± 40 mm
For every additional 1m or fraction thereof	Add 5 mm to the above but not Exceeding ±60 mm

3. **Surface finish**

The steel bars shall be free from injurious defects. Rust, seams, surface irregularities, or mill scale shall not be a cause for rejection, provided the mass, dimensions, cross-sectional area, and tensile properties of a hand wire brushed test specimen are not less than the requirements of this specification.

C. MARKINGS

a) Manufacturer's identifying mark - a logo or symbol registered or to be registered with the Philippine Patent Office and published in the Official Gazette.
b) Bar size - Arabic number reflecting the nominal diameter.
c) Other marks will be made on a tag securely attached to each bundle of bars, each bundle composed of bars of the same size and grade.

D. AFFIDAVIT OF COMPLIANCE

The manufacturer shall furnish the purchaser with an affidavit stating that the steel bars furnished conform to all applicable requirements of this standard and the purchaser's specifications, and that all test specified herein have been performed and all test requirements have been met.

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(Revisions of SP05-02:2009)

MCWD TECHNICAL STANDARDS AND SPECIFICATIONS FOR STEEL-BLACK AND HOT-DIPPED ZINC-COATED (GALVANIZED IRON) LONGITUDINALLY WELDED STEEL PIPES, Ø15 mm THROUGH Ø300 mm FOR POTABLE WATER SUPPLY

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MCWD TECHNICAL STANDARDS AND SPECIFICATIONS FOR STEEL-BLACK AND HOT-DIPPED ZINC-COATED (GALVANIZED IRON) LONGITUDINALLY WELDED STEEL PIPES, Ø15 mm THROUGH Ø300 mm FOR POTABLE WATER SUPPLY

A. GENERAL

This standard specifies requirements for the heavy gauge, black and hot-dipped zinc-coated (galvanized) longitudinally welded steel pipes with sizes ranging from Ø15 mm through Ø300 mm for ordinary use in water service and supply lines, but is not intended for close coiling or bending, or high temperature service.

The pipe under this standard shall be in accordance with PNS 26:2003 (Philippine National Standard for Steel-Black and Hot-dipped Zinc-Coated Longitudinally Welded Steel Pipes), or of its latest edition.

B. MATERIALS AND MANUFACTURING PROCESS

The steel for welded pipes shall be made from hot rolled carbon steel strips conforming to the requirements of PNS 33, latest edition. The pipes shall be made by the electric resistance welding or furnace-butt-welding process.

For the threaded pipe, both ends shall be provided with taper threads, and a socket shall be screwed into one of the threaded ends and each provided with caps or a cap on one end and coupling on the other end. Both the pipe and coupling shall be galvanized before threading. The threaded portion of the pipe shall be coated with zinc-rich, lead-free, food grade primer to protect it from corrosion.

C. PIPE REQUIREMENTS

1. **Workmanship.** The pipe shall be straight and both ends of the pipe shall be at right angle to the axis of the pipe. The inside and outside surfaces of the pipe shall be free from grooves, cracks, pinholes and other defects.

2. **Dimensions.** The pipes shall be furnished in standard laying lengths of 6 meters (+6 mm tolerance), unless otherwise agreed on at time of purchase The dimensions, mass and tolerances of the pipe shall conform with the requirements listed in Table 1 when measured as specified in PNS 26 : 2003 or of its latest edition.

3. **Zinc Coating.** The pipe shall be zinc coated (galvanized) in a hot-dipped process in accordance with ASTM A120. The mass of zinc coating shall not be less than 550 g/m^2 of the total coated surface, as determined by the average results of the two specimens taken for test and not less than 490 g/m^2 for either of the specimens.

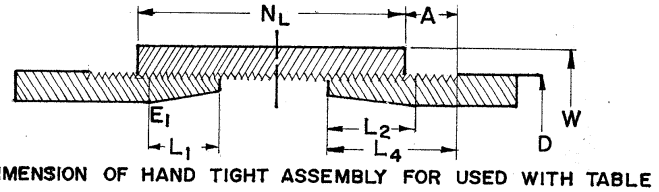
Table 1. Dimensions, Mass, and Tolerances Based on Heavy Gauge Pipes

Nominal Size (mm) (in)	Outside Diameter (mm)	Min. - Max. O.D. (mm) O.D. (mm)	Wall Thickness (mm)	Thickness Tolerance (mm)	Min. Mass (kg/m) Plane end	Tolerance on Mass (kg/m)
15 (1/2)	21.3	20.5 - 21.7	2.8	±0.28	1.28	±0.128
20 (3/4)	26.7	25.9 - 27.1	2.9	±0.29	1.70	±0.170
25 (1)	33.4	32.6 - 33.8	3.4	±0.34	2.52	±0.252
32 (1 ¼)	42.2	41.4 - 42.6	3.6	±0.36	3.43	±0.343
40 (1 ½)	48.3	47.5 - 48.7	3.7	±0.37	4.07	±0.450
50 (2)	60.3	59.7 - 60.9	4.0	±0.40	5.55	±0.555
65 (2 ½)	73.0	72.3 - 73.7	5.2	±0.52	8.70	±0.750
80 (3)	88.9	88.0 - 89.8	5.5	±0.55	11.31	±1.131
100 (4)	114.3	113.2 - 115.4	6.0	±0.60	16.02	±1.602
125 (5)	141.3	139.9 - 142.7	6.6	±0.66	21.92	±1.750
150 (6)	168.3	166.6 - 170.0	7.1	±0.71	28.22	±2.822
200 (8)	219.1	216.9 - 221.3	8.2	±0.82	42.65	±4.265
250 (10)	273.0	270.3 - 275.7	9.3	±0.93	60.50	±6.050
300 (12)	323.8	320.6 - 327.0	10.3	±1.03	79.63	±7.960

4. Threads. The pipe shall be threaded in accordance with Table 2. Each length of threaded pipe shall be provided with one coupling of which thread shall be in accordance with Table 2.

Table 3. Thread requirements on pipe and coupling

PIPE			THREADS					COUPLING	
NPS Designator	Outside Diameter, mm	Number of Threads per 25.4 mm	End of Pipe to Hand Tight Plane, mm L_1	Effective Length, mm L_2	Total Length, mm L_4	Pitch Dia. at Hand Tight Plane, mm E_1	Outside Diameter mm W	Length mm N_L	Hand Tight Stand-off (No. of Threads)
15	21.3	14	8.1	13.6	19.9	19.8	27.0	39.7	5
20	26.7	14	8.6	13.9	20.2	25.1	33.4	41.3	5
25	33.4	11.5	10.2	17.3	25.0	31.5	40.0	50.8	5
32	42.2	11.5	10.7	18.0	25.6	40.2	48.3	52.4	5
40	48.3	11.5	10.7	18.4	26.0	46.3	55.9	52.4	5.5
50	60.3	11.5	11.1	19.2	26.9	58.3	69.9	54.0	5.5
65	73.0	8	17.3	28.9	39.9	70.2	82.6	79.4	5.5
80	88.9	8	19.5	30.5	41.5	86.1	101.6	82.6	5.5
100	114.3	8	21.4	33.0	44.0	111.4	127.0	88.9	5
125	141.3	8	23.8	35.7	46.7	138.4	159.9	95.3	5
150	168.3	8	24.3	38.4	49.4	165.3	187.7	101.6	6
200	219.1	8	27.0	43.5	54.5	215.9	244.5	133.4	2
250	273.0	8	30.7	48.9	59.9	269.8	298.5	146.1	2
300	323.8	8	34.5	54.0	65.0	320.5	355.6	155.6	2



DIMENSION OF HAND TIGHT ASSEMBLY FOR USED WITH TABLE

5. Bend. Pipes shall be capable of being bent cold, without cracking at any portion and without opening of the weld, through 90 degrees round a former having a radius at the bottom of the groove equal to six times the outside diameter of the pipe as given in Table 1.

6. Flattening. No opening shall occur by fracture in a weld until the distance between the plate is less than 75 percent of the original outside diameter of the pipe and no

cracks or breaks in the metal elsewhere than in a weld shall occur until the distance between the plate is less than 60 percent of the original outside diameter. The test rings may have their inner and outer edges rounded.

7. **Hydraulic.** All pipes shall withstand to the hydraulic pressure required in Table 3. prior to zinc coating. The Hydraulic test shall be carried out using a hydrostatic tester with the standard values to be used as criteria for this test specified in Table 3.

Table 3. Hydraulic Pressure Requirement

Nominal Pipe Size (mm)	Hydraulic Test Pressure	
	mPa	Meter Water Column (MWC)
15 - 25	4.90	(500)
32 - 80	6.86	(700)
100 - 300	8.30	(850)

D. SAMPLING AND TESTING

Sampling and testing of the GI Pipes manufactured/purchased under this Standard shall be in accordance with the requirements and procedure prescribed in PNS 26 and this Standard.

E. MARKINGS

Each pipe shall be properly marked by rolling, stamping or stenciling to contain the following information:

a. Name of the Product
b. Nominal pipe size, mm
c. Schedule number and/or Nominal pressure, mPa
d. Manufacturer's name and/or its recognized trademark and production record code.
e. Seal, or mark, of the testing agency, that certified the compliance of the pipe in accordance with PNS 26:2003 or of its latest edition.

F. PRODUCT WARRANTY

The manufacturer/dealer shall guarantee the purchaser that the G.I. pipes furnished are new and of current manufacture, free from defects in materials, design, and workmanship, and shall work best within a minimum period of one (1) year starting from the date of acceptance of the products by the purchaser. During the warranty period, if the G.I. pipes furnished are found to be defective due to materials, design, and workmanship under normal condition, operation and use, the manufacturer/dealer at his own option shall either replace or repair the defective product/s to its original condition. A Certificate of Warranty is required to this effect

G. AFFIDAVIT OF COMPLIANCE

The manufacturer shall furnish the purchaser with an affidavit stating that the pipes furnished conform to all applicable requirements of this standard and the purchaser's specifications, and that all test specified herein have been performed and all test requirements have been met.

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Prepared and submitted by the Technical Standards Committee:

Project Mgt. Dept.	Date	Engineering Dept.	Date	Construction Dept.	Date

P.M.D.- North	Date	P.M.D.- South	Date	P.D.D.	Date

S.C.I.D.	Date	M.M.D.	Date	M.S.S.D.	Date

Recommending Approval:

__RAUL E. TABASA___ _____
Chairman, Tech'l. Stds. Comm. Date
Manager, Engineering Dept.

Approved:

ARMANDO H. PAREDES _____
General Manager Date