

# TRINIDAD AND TOBAGO STANDARD

## COMPULSORY

### STANDARD SPECIFICATION FOR LOW-ALLOY STEEL DEFORMED AND PLAIN BARS FOR CONCRETE REINFORCEMENT

#### PCTTS/ASTM A 706M:20XX

This Trinidad and Tobago Standard is based on ASTM A 706M-08  
Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.  
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**Gr. Z**

Public Comment

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In accordance with the Standards Act, the Bureau shall promote and encourage the development and maintenance of standards and further shall establish standards for the following: to improve goods produced or used in Trinidad and Tobago; to ensure industrial efficiency and development; to promote public and industrial welfare, health and safety; and to protect the environment.

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NOTE In order to keep abreast of progress in the industries concerned, Trinidad and Tobago Standards are subject to periodic review. Suggestions for improvements are welcome.

## COMMITTEE

The Specification Committee responsible for the development of this Trinidad and Tobago Standard comprised representatives from the following organizations:

Faculty of Engineering, University of the West Indies (Chairman) ( <i>Clement Imbert</i> )	MET-SPEC Limited ( <i>Dennis Sumadh</i> )
ArcelorMittal Point Lisas Limited ( <i>Feisal Ali</i> )	Ministry of Legal Affairs, Consumer Affairs Division ( <i>Boris Noris</i> )
Caribbean Industrial Research Institute ( <i>Marco Nunes</i> )	Ojeer's Hardware ( <i>Raficul Hosein</i> )
Caribbean Steel Mills Limited ( <i>Peter Ramdass</i> )	Reesal Industries Limited ( <i>Salick Reesal</i> )
Central Trinidad Steel Limited ( <i>Joseph Bridgelal</i> )	Sure-QUAL ( <i>Abriham Daniel</i> )
Lee Young and Partners Limited ( <i>Farhad Khan</i> )	TRINRICO Steel and Wire Products Limited ( <i>David Latchoo, Kamal Gangapersad</i> )
Metal Industries Company Limited ( <i>Benedict Chatoor</i> )	Trinidad and Tobago Bureau of Standards ( <i>Ishmael Soobrattee, Marvin Charles &amp; Darryl Thomson (Technical Secretary)</i> )

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## Foreword

This specification was declared a Trinidad and Tobago Standard with effect from..... after the draft, finalized by the Specification Committee on Steel Products had been approved by the Bureau.

The committee has recommended that this standard be compulsory because of the danger to health and safety arising from defective reinforcing steel bars in concrete construction.

This standard will be effective as a compulsory standard on a date to be notified by the Minister responsible for trade and industry in a Notice to be published in the Trinidad and Tobago Gazette, as required by the Standards Act.

This Trinidad and Tobago standard is a modified adoption of the American Society of Testing and Materials standard ASTM A 706M-08, *Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement*.

This standard, along with TTS/ASTM A 615M:20XX, *Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement*, replaces TTS 583: 2002 *Carbon steel bars for the reinforcement of concrete – Specification*. TTS/ASTM A 706M:20XX specifies steel with higher ductility requirements than is specified in TTS/ASTM A 615:20XX. Steel of higher ductility is recommended for building in areas prone to seismic activity.

It is intended that this standard guide producers, importers, retailers, building designers and contractors in respect of the size classifications and the minimum performance requirements of reinforcing bars.

This standard specifies nominal bar dimensions based on both the imperial and metric size series. This approach reflects the current market reality of reinforcing bars being commercially available in both size series in Trinidad and Tobago.

Acknowledgement is hereby given to ASTM International for permission to adopt with appropriate modifications the technical content of ASTM A 706M-08.

Although the editorial style and layout of ASTM International standards do not conform to that of Trinidad and Tobago Standards, it has been approved as suitable for publication as a Trinidad and Tobago Standard.

**Technical deviations to the original standard necessary to make the provisions relevant to Trinidad and Tobago are given in pages v to viii.**

**National deviations**

**7 Requirements for Deformations**

- Replace 7.5 with the following:

7.5 The spacing, height, and gap of deformations shall conform to the requirements prescribed in Table 1. Alternatively, bars which have nominal sizes based on a metric size series shall satisfy the requirements of Table 1M.

- Add Table 1M after Table 1, specifying dimensions for bar designation numbers based on a metric size series.

**Table 1M - Deformed bar Designation Numbers, Nominal Weights (masses), Nominal Dimensions and Deformation Requirements<sup>a</sup>**

Bar Designation No	Nominal mass per metre run kg/m	Nominal size (d) Mm	Nominal cross-sectional area mm <sup>2</sup>	Nominal perimeter mm	Deformation requirements		
					Maximum average spacing <sup>b</sup> mm	Minimum average height mm	Maximum gap <sup>c</sup> mm
6 M	0.222	6	28.3	18.8	4.2	0.19	2.4
8 M	0.395	8	50.3	25.1	5.6	0.30	3.1
10 M	0.616	10	78.5	31.4	7.0	0.40	3.9
12 M	0.888	12	113.1	37.7	8.4	0.48	4.7
14 M	1.210	14	154.1	43.9	9.8	0.60	5.8
16 M	1.579	16	201.1	50.2	11.2	0.72	6.3
20 M	2.466	20	314.2	62.8	13.9	1.01	7.9
25 M	3.854	25	490.9	78.5	17.5	1.25	9.8
28 M	4.834	28 <sup>d</sup>	616.0	88.0	19.6	1.40	11.0
30 M	5.549	30	707.0	94.2	20.9	1.51	11.8
32 M	6.313	32	804.2	100.5	22.3	1.61	12.6
40 M	9.864	40	1 256.6	125.6	28.0	2.07	15.7
50 M	15.413	50	1 963.5	157.0	35.0	2.37	19.6

<sup>a</sup> Deformation requirements do not apply to smooth bars.

<sup>b</sup> Maximum average spacing = 0.7d.

<sup>c</sup> Maximum gap = 12.5 % of nominal perimeter. These values shall only apply where there are two or less longitudinal ribs present. Requirements for gap where more than two longitudinal ribs are present shall be as specified in 8.5.

**6 Chemical Composition**

- Add new sub-clause 6.6

6.6 The maximum percentage composition limit for Nitrogen shall be 0.012% based on a heat analysis and 0.014% based on a product analysis. Higher levels may be allowed if nitrogen binding elements such as Niobium or Vanadium, are present.

## 9.1 Tensile Requirements

- Replace 9.1.1 with the following:

9.1.1 Test specimens taken from bars which conform to the designation requirements of Table 1, shall conform to the requirements for tensile properties and elongation prescribed in Table 2. Alternatively, test specimens taken from bars which conform to the designation requirements of Table 1M, shall conform to the requirements for tensile properties and elongation prescribed in Table 2M. The yield strength or yield point shall be determined by one of the methods described in 9.1.1.1 or 9.1.1.2

- Add Table 2M after Table 2, specifying tensile requirements for bar designations based on a metric size series.

**Table 2M - Tensile Requirements (metric nominal sizes)**

<b>Tensile strength, min, MPa</b>	550 <sup>a</sup>
<b>Yield strength, min MPa</b>	420
<b>Yield strength, max, MPa</b>	540
<b>Elongation in 203.2 mm, min, %</b>	
<b>Bar Designation No</b>	
6 M, 8 M, 10 M	14
12 M, 14 M, 16 M	14
20 M	14
25 M	12
28 M, 30 M, 32 M	12
40 M, 50 M	10
<sup>a</sup> Tensile strength shall not be less than 1.25 times the actual yield strength.	

## 9.2 Bending Requirements

- Replace 9.2.1 with the following:

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9.2.1 The bend test specimen shall withstand being bent around a pin without cracking on the outside radius of the bent portion. The requirements for degree of bending and sizes of pins are prescribed in Table 3 for bars conforming the designations listed in Table 1 or Table 3M for bars conforming to the designations listed in Table 1M.

- Add Table 3M after Table 3, specifying bend requirements for bar designations based on a metric size series.

**Table 3M - Bend Test Requirements (metric nominal sizes)**

Bar Designation Number	Pin Diameter
6 M, 8 M, 10 M, 12 M, 14 M, 16 M	3d
20 M, 25 M	4d
28 M, 30 M, 32 M	6d
40 M, 50 M	8d

## 14 Inspection

- Delete this cause (inclusive of 14.1 and 14.2).

## 16 Marking

- Replace 16.1 with the following:

16.1 Bars shall be separated into bundles and labelled in English using durable tags to identify the manufacturer's heat or test identification number.

- Replace 16.3 with the following:

16.3 All bars produced to this specification, except plain round bars, shall be identified by a distinguishing set of marks legibly rolled onto the surface of at least one side of the bar, at intervals not greater than 2.5 m in the order set forth in 16.3.1 to 16.3.4.

- Replace 16.3.2 with the following:

16.3.2 *Size Designation* – Bars which satisfy the requirements of Table 1 shall be designated by the Arabic number corresponding to bar designation number of Table 1. Bars which satisfy the requirements of Table 1M shall be designated by the nominal diameter followed by the letter 'M' as specified in Table 1M.

- Add the following new clause:

## 19 Compliance<sup>1</sup>

19.1 Lots under consideration shall be sampled in accordance with clause 12.

19.2 Test samples shall be tested to and satisfy the requirements of clauses 6 (Chemical Composition), 7 (Requirements for Deformations), 8 (Measurements of Deformations), 9 (Mechanical Requirements), 10 (Permissible Variation in Weight (mass)), 11 (Finish), 12 (Number of Tests and Retests) and 16 (Marking).

19.3 Lots from which test samples have failed shall be subjected to retests in accordance with clause 14.

19.4 A lot shall be considered to be in compliance with this standard if a sample taken in accordance with clause 13 satisfies the relevant requirements of clauses 6 (Chemical Composition), 7 (Requirements for Deformations), 8 (Measurements of Deformations), 9 (Mechanical Requirements), 10 (Permissible Variation in Weight (mass)), 11 (Finish) and 16 (Marking).

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<sup>1</sup> Clause 19 – Compliance, inclusive of sub-clauses 19.1 to 19.4, is a new clause.