

PBD 3 : 1992



PIAWAI BRUNEI DARUSSALAM
BRUNEI DARUSSALAM STANDARD

Specification for

**Carbon steel bars for the
reinforcement of concrete**

MINISTRY OF DEVELOPMENT
NEGARA BRUNEI DARUSSALAM

Copyright Reserved

**Construction Planning and Research Unit
Ministry of Development
Old Airport, Jalan Berakas
Bandar Seri Begawan 1190
Negara Brunei Darussalam.**

Specification for

Carbon steel bars for the reinforcement of concrete

PIAWAI BRUNEI DARUSSALAM

PBD 3 : 1992

First edition

Attention is drawn to the fact that this Brunei Darussalam Standard does not confer any immunity from legal obligations in any contract for compliance to the Standard.

The Brunei Darussalam Standards are subject to periodical review according to the current needs of the local industries to keep abreast of progress in the industries concerned. Suggestions of amendments will be recorded and in due course brought to the notice of the committees concerned.

Amendments issued since publication

Amd No.	Date of issue	Text affected

CONTENTS

	Page
Foreword	4
Committee representation	5

Specifications

1. Scope	7
2. Definitions	7
3. Sizes	9
4. Cross-sectional area and mass	9
5. Length	10
6. Steelmaking process	10
7. Chemical composition	11
8. Bond classification of deformed bars	13
9. Routine inspection and testing	13
10. Mechanical properties	14
11. Fatigue properties of deformed bar	15
12. Retests	15
13. Verification of characteristic strength	16
14. Marking	16

Appendices

A	Determination of the effective cross-sectional area of deformed bars	17
B	Bond classification of deformed bars (bond test)	18
C	Inspection, testing and certification	21
D	Method of test for fatigue properties of deformed bars	30
E	Tensile test multiplying factors	32
F	Recommended formulae for calculating projected rib area	33
G	Information to be supplied by the purchaser	34

Table

1.	Preferred nominal sizes	9
2.	Cross-sectional area and mass	10
3.	Tolerance on mass	10
4.	Chemical composition of steel grades: cast analysis	11
5.	Maximum carbon equivalent values: cast analysis	12
6.	Maximum deviations in chemical composition on product analysis	12
7.	Tensile properties	15
8.	Percentage total strain	22
9.	Bend test formers	24
10.	Rebend test formers	24
11.	Acceptability index (k) as a function of the number (n) of the test results (for a reliable failure rate of 5% (pass = 0.95) at a probability of 90% ($1 - \alpha = 0.90$))	26
12.	Test stress ranges for nominal bar sizes	31

Figures

1.	Typical mould for bond performance testing	20
----	--	----

FOREWORD

This Brunei Darussalam Standard having been adopted from the British Standard BS 4449 : 1988, and prepared under the direction of the Technical Committee on Steel for the Reinforcement of Concrete was endorsed by the Ministry of Development, Negara Brunei Darussalam and was first published in 1992.

This standard was published with all specifications reviewed in accordance to the current needs of the local building industry and the British Standard BS 4449 : 1988.

In preparing this standard, references are made to the following :-

- | | | |
|----|-----------------------|--|
| 1. | PBD 4 : 1992 | Specification for scheduling, dimensioning, bending and cutting of steel reinforcement for concrete. |
| 2. | BS 3846 : 1970 (1985) | Methods for calibrations and grading of extensometer for testing of metals. |
| 3. | BS 6200 | Sampling and analysis of iron, steel and other ferrous metals
Part 3 : Methods of analysis. |
| 4. | BS 5750 : 1987 | Quality Systems
Part 2 : Specification for production and installation. |
| 5. | Handbook 19 : 1970 | Methods for the sampling and analysis of iron, steel and other ferrous metals. |
| 6. | BS 4545 : 1970 | Methods for mechanical testing of steel wire. |

Acknowledgement is made for the use of the British Standard BS 4449 : 1988 "Carbon steel bars for the reinforcement of concrete" on which this standard is based. Any reference to "British Standard" and "BS no." are replaced with "Brunei Darussalam Standard" (Piawai Brunei Darussalam) and "PBD no." as appropriate.

COMMITTEE REPRESENTATION

The Technical Committee on Steel for the Reinforcement of Concrete was entrusted by the Ministry of Development for the preparation of this Brunei Darussalam Standard. The members of the Technical Committee are as follows :-

Awang Michael Ng	Ministry of Development
Awang Yusop Haji Ibrahim	Ministry of Development
Awang Haji Md Zin Haji Salleh	Public Works Department
Awang Mahendran Coomareswamy	Public Works Department
Awang Mohd Zain Haji Yahya	Public Works Department
Dayang Lee Siew Hung	Public Works Department
Awang Hussin Ali	Prime Minister's Department
Awang Laurie Harris	Cooper McDonald & Partners
Awang Haji Mustafa Abu Bakar	Brunei Institute of Technology
Awang Nimal S. Chandrasena	Housing Development Department
Awang Jan Hiemstra	Brunei Shell
Dayang Masni Haji Mohsin	Ministry of Industry & Primary Resources
Dr. Kevin Dean	University of Brunei Darussalam

Specification

1 Scope

This Brunei Darussalam Standard specifies requirements for weldable steel bars for the reinforcement of concrete. It covers plain round steel bars in grade 250 and deformed high yield steel bars in grade 460.

The weldability requirements for both grades of steel are specified in terms of the carbon equivalent value.

Appendix C includes a testing facility for material covered by a third party product certification scheme and a testing facility for material not covered by a third party product certification scheme.

Steel bars for use as lifting hooks are not included in this standard.

Steel bars produced by re-rolling finished products or by rolling material whose metallurgical history is not known and fully documented are excluded from this standard.

NOTE 1. Flash welds in lengths of bar are permissible. However, for some purposes, purchasers may require bars without flash welds. If so this information should be supplied to the manufacturer (see appendix G).

NOTE 2. All steels complying with this Brunei Darussalam Standard are of weldable quality. Welding procedures and consumables appropriate to the particular grade and quality should be used.

NOTE 3. A Brunei Darussalam Standard for welding steel reinforcement is in preparation.

2 Definitions

For the purposes of this Brunei Darussalam Standard the following definitions apply.

2.1 bar. A steel product of plain round or deformed cross section.

2.2 hot rolled deformed bar. A bar which has been so shaped during hot rolling that it complies with either the geometrical or performance test classification given in clause 8.