Construction Standard CS2:2012
Steel Reinforcing Bars for the Reinforcement of Concrete

The following amendments are made to CS2:2012:

1. The last sentence of the 6th paragraph of the Foreword, insert after "Quality Assured (QA) Stockists and" the following:

   "Quality Assured (QA) Coil Processors, and".

2. The last sentence of the 1st paragraph of the section "QA Stockists, insert after "Hong Kong Accreditation Service" the following:

   "(HKAS)".

3. Add before section "**Permission from BSI Standards Limited (BSI)**" the following:

   "**QA Coil Processors**

   QA Coil Processors are included in this standard to aid the Hong Kong user in ascertaining the quality of decoiled products.

   For decoiled products processed under a system of quality assurance, the responsibilities for testing of the decoiled products and ensuring its compliance with this Construction Standard lie with the QA Coil Processor. A QA Coil Processor shall be certified to the requirements of ISO 9001 by a certification body accredited by HKAS for its quality management system with a scope related to good practices on production of decoiled products to meet requirements of this Construction Standard, and shall have a third party certification to a recognized product conformity certification scheme for prefabricated (cut and bend) steel reinforcing bars (the Scheme) by a certification body, or equivalent. The inspection and the testing requirements for QA Coil Processors are stated in Section 7 of this Construction Standard."

4. Step 6 of the Flow Chart for Inspection, Testing and Certification of Steel Reinforcing Bars, change to

   "Purchaser's tests performed on steel reinforcing bars (See Cl. 5.1)"

5. Flow Chart for Inspection, Testing and Certification of Steel Reinforcing Bars, add the following notes

"NOTE 1: Steel reinforcing bars from a QA Manufacturer are straight bars or coils, and purchaser's tests are performed on straight bars or coils of steel reinforcing bars."

"NOTE 2: For inspection and testing by QA Coil Processor on decoiled products, refer to Section 7 of this Construction Standard."

"NOTE 3: Steel reinforcing bar is a generic term for reinforcing steel including straight bar, coil and decoiled product in this Standard except cold worked steel reinforcing bars as stated in Note 2 of Section 1.1."

6. Add the following in CONTENTS after "Section 6.7"

"Section 7 Quality Control on Decoiled Products
7.1 Inspection and testing by QA Coil Processor on decoiled products"

7. The 1st paragraph of Section 1.1, change to

"This Construction Standard (Standard) specifies requirements for weldable steel reinforcing bars used for the reinforcement of concrete structures. This Standard covers steel delivered in the form of steel reinforcing bars and contains provisions for plain steel reinforcing bars in grade 250 up to 12 mm in diameter and ribbed steel reinforcing bars in grades 500B and 500C."

8. The 1st and 2nd paragraphs of Clause 1.2.6, replace

"steel reinforcing bars" with "straight bars and coils".

9. Clause 1.2.18, add the following sentence to the end

"They shall include straight bar, coil and decoiled product as defined in Clauses 1.2.24, 1.2.25 and 1.2.26 in this Standard."

10. The 1st paragraph of Clause 1.2.19, change to

"A stockist is an organization that receives steel reinforcing bars from a QA Manufacturer or another stockist, and performs the requirements in accordance with this Standard. All stockists shall be Quality Assured (QA) Stockists."

11. Section 1.2, add the following Clauses:

"1.2.24 Straight bar

Ribbed or plain steel reinforcing bar manufactured in straight lengths.

1.2.25 Coil

Single length of ribbed steel reinforcing bar wound in concentric rings.

1.2.26 Decoiled product

Ribbed steel reinforcing bar manufactured in coils and subsequently straightened for further processing

1.2.27 Coil processor

A coil processor is an organization that processes coils into decoiled products. All coil processors shall be Quality Assured (QA) Coil Processors.

A QA Coil Processor shall fulfill the following qualifications:

(a) It is certified to the requirements of ISO 9001 by a certification body accredited by HKAS for its quality management system with a scope related to good practices on production of decoiled products to meet the requirements of this Standard, and

(b) It shall have a third party certification to a recognized product conformity certification scheme for prefabricated (cut and bend) steel reinforcing bars (the Scheme) by a certification body, or equivalent. The certification body shall be accredited by HKAS or its Multilateral Recognition Arrangements (MLA) partners based on ISO/IEC 17065 for the Scheme.

12. Clause 1.4.1, add the following phrase at the end of Note 1:

"for straight bar, coil and decoiled product."

13. Section 1.4, add the following Clause:

"1.4.4 Coil mass

The nominal coil mass shall be agreed at the time of order."

14. Clause 1.6.4, replaced by:

"1.6.4 Fatigue properties (Optional)

Determination of fatigue properties of ribbed steel reinforcing bars is an optional requirement of the purchaser. The purchaser should decide, on the basis of the type of structure in which the steel reinforcing bars are to be cast, whether fatigue properties are to be determined.

Where fatigue properties are to be determined, the steel reinforcing bars shall be Class 1 as described in Cl. 2.1 and shall be subjected to testing as described in Cl. 6.6. Test reports from the manufacturer may be used to verify compliance of this fatigue properties requirement.

1.6.4.1 Straight bars and coils

The fatigue testing for straight bars and coils is to determine the fatigue characteristics of straight bars and coils with a particular geometrical shape and process route in a production place. The fatigue properties for each steel grade and process route shall be established initially by testing samples selected from the upper, middle and bottom of the product diameter range. At least once a year, samples shall be tested from different straight bars and coils of one diameter from each process route. Test samples shall be selected so that all diameters for each process route shall be tested over a five-year period.

1.6.4.2 Decoiled products

The fatigue testing for decoiled products is to determine the fatigue characteristics of decoiled products produced in a production place. Initially, samples shall be taken from each production site from one decoiling machine type from the largest diameter produced. At a frequency of at least once per year, samples of one diameter shall be selected for test from each production site, from one decoiling machine. Sampling shall be carried out in such a way that the combination of material manufacturing route, type of decoiler and individual machines are covered over a five-year period.

1.6.4.3 Sampling

Each test unit shall comprise ten test specimens of steel reinforcing bars. For each diameter, five test specimens shall be selected for test from each test unit. The test specimens shall not exhibit isolated defects that are not characteristic of the steel reinforcing bars from which they are selected.

1.6.4.4 Compliance

The steel reinforcing bars shall be deemed to comply with this Standard if all five test specimens can endure 5×10^6 cycles of stress in the fatigue test as described in Cl. 6.6.

1.6.4.5 Retests

If one of the five test specimens fails in the test, a further five test specimens from the test unit shall be tested. If one of these further test specimens fails the test, the batch shall be deemed not to comply with this Standard. If all five further test specimens endure 5×10^6 cycles of stress, then the batch shall be deemed to comply with this Standard.

In the case of any failure, the test shall be considered invalid if it is initiated from a defect unique to the test piece or in the region within 2*d* of the testing machine grips (where *d* is the nominal steel reinforcing bar diameter); in this case a further single test shall be carried out."

15. Clause 3.1.1, replace:

"Steel reinforcing bars" with "Straight bars and coils".

16. Paragraph (a) of Clause 3.1.2, replace:

"steel reinforcing bar" with "straight bars and coils".

17. Clause 3.1.3.3.3, replace:

"steel reinforcing bar" with "straight bars and coils".

18. Clause 3.1.3.5, replace:

"bars" with "straight bars and coils".

19. 1st paragraph of Clause 3.1.5, replace:

"steel reinforcing bars" with "straight bars and coils".

20. Paragraph (i) of Clause 3.1.5, replace:

"steel reinforcing bar" with "straight bars and coils".

21. Title of Section 5.1, change to:

"PURCHASER'S TESTS OF STRAIGHT BARS AND COILS"

22. 1st paragraph of Clause 5.1.1, replace the 1st sentence by:

"Purchaser's tests shall be performed on straight bars and coils arriving on site."

23. 2nd paragraph of Clause 5.1.1, replace:

"steel reinforcing bars " with "straight bars and coils"; and
"bars" with "straight bars and coils".

24. Table 10, 1st column, replace:

"Steel reinforcing bar "with "Straight bars or coils"

25. Section 6.1, change to:

"6.1 CONDITIONS OF TESTING

The determination of mass per metre, chemical analysis, and the determination of bond property shall be carried out on weldable steel reinforcing bars used for the reinforcement of concrete structures in the as-delivered condition.

Tensile test, rebend test, and fatigue test shall be carried out on test specimens conforming to the following conditions:

Manufacturing and delivery condition	**Condition of testing**
Produced in straight lengths by hot rolling	As delivered[a] or aged[b]
Produced as coil and delivered decoiled	Aged[b]
Produced and delivered as coil	

[a] *Aged in the case of dispute.*
[b] *Aging method: heat the test piece to 100°C, maintain at this temperature (+/-10°C) for a period of 60 (+15,-0) min, and then cool in still air to room temperature. The method of heating is left to the discretion of the manufacturer or HOKLAS accredited laboratory. If an ageing treatment is applied to the test piece, the conditions of the ageing treatment shall be stated in the test report.*

NOTE: Aging shall be carried out after straightening, if applicable.

In the case of a test piece taken from coil, the test piece shall be straightened prior to any tests by a bend operation with a minimum amount of plastic deformation. The straightness of the test piece is critical for the tensile test and the fatigue test. The means of straightening the test piece (manual, machine) shall be indicated in the test report.

The test specimens shall be tested at a room temperature between 5ºC and 35ºC unless otherwise specified.

The length of the test specimen for rebend test shall be adjusted to suit the type of test machine in use and must be sufficient for the test specimen to be bent to such extents that comply with the requirements of Cl. 6.5.

The test specimen for tensile test shall be either at least 600 mm long or 20 times the nominal size, whichever is the greater."

26. Add the following new Section:

"

SECTION 7

QUALITY CONTROL ON DECOILED PRODUCTS

7.1 INSPECTION AND TESTING BY QA COIL PROCESSOR ON DECOILED PRODUCTS

General

The QA Coil Processor shall ensure that all coils used for production of decoiled products shall comply with this Standard and the decoiled products continue to meet the specified property requirements of the appropriate grade.

Decoiling of coil material shall be done by an automated machine made for this purpose.

7.1.1 **Inspection and testing of decoiled products by QA Coil Processor**

Inspection and testing of decoiled products by the QA Coil Processor shall include as a minimum:

(a) Visual inspection for surface geometry damage of every coil processed;
(b) Surface geometry measurement on at least one specimen per day and produced size:
(c) Tensile testing at a frequency of at least one specimen per machine type (roller or spinner) per week from each of two processed sizes. The sampling shall be such that all machines and size are covered in a six-month period. Only one specimen shall be taken from each coil.

Visual inspection and surface geometry measurement may be carried out by the QA Coil Processor using its own resources.

Tensile test shall be performed by a HOKLAS accredited laboratory. QA Coil Processor shall keep proper records of all inspection and test results.

The test shall not be seen as a release tests, but as the basis for the assessment of the long-term quality level (LTQL) as described in Cl. 3.2.

Relative rib area (f_R) of decoiled products shall comply with the characteristic rib area

requirement in Table 7. Testing on other surface geometry parameters is optional.

Tensile properties of decoiled products shall comply with the requirement in Cl. 3.1.3.3."

The Standing Committee on Concrete Technology
Development Bureau
The Government of the Hong Kong Special Administrative Region
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