

APPENDIX 4

Quality and Operations Assessment Schedule for Cold Worked Bars and Coils for the Reinforcement of Concrete Including Inspection and Testing Requirements

1 Scope

This Schedule describes the minimum quality and operational control requirements for the manufacture of cold worked bars and coils, and plain and deformed wire for concrete reinforcing steel conforming to the requirements of AS/NZS 4671 Grades 250N, 500N and 500L, and is additional to the quality management operational and general requirements contained in Appendix 1.

It covers the manufacture of cold worked bars and coils by twisting or stretching, and the manufacture of plain or deformed wire by cold rolling or cold drawing commencing with the supply of raw materials from ACRS certified or approved mills, through to the supply of finished product in straight lengths or in coil form

2 Processing

There shall be documented procedures for the control of

- a the cold working processes
- b the control of mechanical properties
- c the control of finished bar or wire sizes including, as appropriate, their dimensions, length, straightness, shape, and coil helix, that ensure consistency of product, and that the finished product conforms to the relevant specification and customer requirements.

3 Traceability

- 1 The heat or batch identity shall be maintained on all feedstock awaiting initial processing. It shall be possible to cross-reference all feedstock with the suppliers test certificates and delivery documentation.
- 2 The heat or batch identity of each bundle or coil of feedstock shall be maintained through the first processing step (typically cold twisting, stretching, rolling or drawing).
- 3 Production batches and the size of batches shall be as defined in AS/NZS 4671. The identity of production batches (which may contain more than one feedstock heat or batch number) shall be maintained up to and including the receipt of product by the customer.
- 4 Production records shall enable the heat or batch numbers (or possible heat or batch numbers) of feedstock contained in each batch of finished product to be determined. Similarly, production records shall enable the possible finished product batches that may contain any given feedstock heat or batch number to be determined.
- 5 All items, bundles or coils of finished product shall carry durable identification that enables the production batch from which it originated to be determined.

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(Note: The requirements for items 3 and 4 above may be met by recording the date, or date and shift, of production of each item, bundle, or coil of finished product, and also recording the heat or batch identities of related feedstock processed on the same day or day/shift. Other methods of achieving the outcomes required in 3 and 4 above are not excluded)

4 Product Testing

4.1 Testing by the Manufacturer

The chemical, mechanical, dimensional properties of each batch of the reinforcing steel shall conform to the requirements of AS/NZS 4671 and customer specification. The rate of testing shall be not less than that laid down in AS/NZS 4671. Where the feed material is supplied from an ACRS accredited source, the supplier's chemical test results may be used provided the cast is traceable to finished product batches.

Long-term quality levels shall be determined for each size/grade combination in the manner specified in AS/NZS 4671, or the customer's standard, as appropriate. The test results for the manufacturer's long-term quality level analysis shall be submitted to ACRS at three monthly intervals. These shall be analysed at ACRS and will form part of subsequent surveillance inspections.

4.2 Testing by ACRS

a Test Program

For each size and grade of product produced the test program for the Initial Assessment and subsequent Surveillance Inspections shall be as described in Table 1. Testing shall be in accordance with AS/NZS 4671. At the time of initial testing at least three batches of finished product of each type shall be available for the selection of the test pieces.

Table 1

| Inspection | Bar Size | Frequency |
|-------------------------|---|--------------------------------------|
| Initial Assessment | Smallest, intermediate and largest bar-size for each grade produced | 3 batches per size/grade combination |
| Surveillance Inspection | One bar-size for each grade produced | 3 batches per size/grade combination |

These samples shall be subject to testing at the frequency described in Table 2. Testing shall be carried out to the satisfaction of ACRS and ACRS Assessors shall witness not less than 30% of the testing.

Table 2

| Property | Number of tests per batch for bar -size/grade combination |
|--------------------------------|---|
| CSA and Mass | 5 |
| R _m | 5 |
| R _e | 5 |
| R _m /R _e | 5 |
| A _{gt} | 5 |
| Rebend | 3 |
| Rib Geometry | 1 |
| Chemistry | 1 |
| Macro (where applicable) | 1 |

b Aging

All mechanical test samples shall be artificially aged prior to testing as specified in AS/NZS4671.

c Duplicate Samples

For each test sample described above, a duplicate sample shall be taken for testing by an independent NATA approved test house. The number of tests may be increased in the event of any anomalies or difficulties.

d Evaluation of Test Results

A statistical comparison of product release test results, test results on duplicate samples, and test results from independent test houses, shall be undertaken for each test program.

The samples shall be deemed to comply with the requirements for yield strength (R_e) if for each batch sampled–

- i No result falls below 95% of the specified minimum characteristic value; and
- ii No result exceeds 105% of the specified maximum characteristic value; and
- iii Not more than one result falls below the specified minimum characteristic value or above the specified maximum characteristic value; and
- iv the mean of the results for each cast lies between 1.02 times specified minimum characteristic value and 0.98 times specified maximum characteristic value, or all results for each cast lie within the specified range.

The samples shall be deemed to comply with the requirements for Elongation (A_{gt}) and Ratio (R_m/R_e) if the mean of the results for each cast exceeds the specified characteristic value.

e Bond Performance (AS/NZS4671 Grade 500)

i Performance by Measurement

Where rib configurations of deformed bars or wires are shown by measurement of the projected rib area, to conform to the requirements of AS/NZS 4671, then a Bond Test need not be carried out. The testing frequency shall be as described in Tables 1 and 2 -Rib Geometry.

ii Performance by Bond Test

Bond tests as described in AS/NZS 4671, may be carried out on those deformed bars whose projected rib areas do not conform to the requirements of that standard. The bond test frequency required to establish the bond performance is six test pieces from each size within the approved size range of the manufacturer.

An independent, NATA approved test house shall carry out the bond tests.

Where bond testing is used to confirm bond performance the minimum rib dimensions under test shall be recorded and will form part of the manufacturer's production and inspection procedures. Compliance with these shall form part of subsequent ACRS inspections.

f Sample Selection

ACRS assessors shall select all samples for the above test programs.

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