

SPECIFICATION S015 - Supplemental			Bow Mooring Shackle with Bolt, Castle Nut and Split Cotter Pin	
2	29 Mar 2010	Roger Lewis	M.Yaxley	P. Dobson
1	17 Jan 2005	M. Yaxley	R. Robinson	C. Martell
Issue	Date	Written by	Checked by	Approved by

1 Scope

Specifies the requirements for the manufacture and testing of Bow Mooring Shackles.

2 Reference Drawings and Standards

The Shackles shall be manufactured in accordance with THLS Drg. No. YBD/6.

Where called for, Shackles shall conform to the following International, European and British Standards:

BS EN ISO 6892-1: Metallic materials. Tensile testing.

BS EN 10083-1 Steels for quenching and tempering.

BS EN ISO 1234 Split pins

BS EN ISO 1461 Hot dip galvanized coatings

BS EN ISO 6506-1: Metallic materials. Brinell hardness test.

ISO 2415 – Forged shackles for general lifting purposes -- Dee shackles and bow shackles

3 Material Specification

The Shackle and Bolt are to be supplied in quenched and tempered condition, forged from steel, grade 28Mn6 + QT, complying with BS EN 10083-1.

or U3 to Lloyds Rules

Chemical and mechanical properties must comply with the standards in the finished condition.

The Castle Nut material being the same, or have compatible properties, as the Shackle Bolt.

Shackle Bolts are to be fitted with a stainless steel Split Cotter Pin complying with BS EN ISO 1234.

4 Heat Treatment

To be in accordance with, and meet the requirements of BS EN 10083-1 for quenched and tempered condition or Lloyds Rules as applicable.

Test pieces from finished items are to have a Brinell hardness number in the range 179 – 255.

A Thermal history report shall be produced for each batch.

A maximum of only three heat treatments per item.

5 Manufacture

The dimensions and form of the Shackle and Bolt shall conform to Drg. No. YBD/6.

Bolt threads shall be in accordance with the drawing, allowing the nut to fit snug to the Shackle eye without causing deformation to the Shackle jaw.

The Split pin hole should be cross-drilled in the assembled condition.

Shackles shall be free from any defect that would prove detrimental to the functioning and requirements of the Shackle.

The dimensions and form as specified on the relevant drawing shall be maintained after proof load testing.

6 Testing

The method of testing applied shall conform to ISO 2415.

Type testing, according to section 11 (grade 4), shall be carried out to prove the Shackles. Subsequent proof tests shall be in accordance with the standard.

Tensile tests shall comply with BS EN ISO 6892. A Test Report to be produced in accordance with section 17.

Brinell hardness tests shall comply with BS EN ISO 6506-1. A Test Report to be produced in accordance with section 9.

Sufficient Shackles should be manufactured to allow for testing

6.1 Non-destructive examination

A non-destructive examination shall be carried out on assemblies that require proof testing. This should be by either 100% Magnetic Particle or Liquid Penetrant Examination.

Any item showing signs of burning, folds, laps or other defects shall be rejected.

6.2 Proof test

Deformation resistance and static strength tests shall comply with ISO 2415.

All assembled shackles are to be proof tested and certified to the appropriate loads in table 1.

Size (mm)	Working Load Limit (Tonnes)	Proof Force (kN)	Ultimate Strength (kN)
29	4.5	90	180
38	8	160	320

Table 1

6.3 Break Load

A break load shall be applied to one Shackle of each size per Certificate of Conformity.

Trinity House reserves the right to undertake a factory inspection and to sample test Shackles upon completion of manufacture. The manufacturer must inform Trinity House two weeks prior to when the Shackles are ready for finished treatment (section 8).

7 Marking

All shackles, which pass the proof load test, shall be legibly stamped as specified on the drawing with the following:

1. Manufacturer's mark
2. Manufacturer's Serial Number
3. The month and year of manufacture
4. The metric tonne proof load applied

Shackle Pins/Bolts 13mm diameter and above, shall legibly and indelibly be marked with the manufacturers symbol in a manner that will not impair the mechanical properties of the pin.

8 Finished Treatment

All components are to be hot dip galvanised, complying with the requirements of BS EN ISO 1461. Shackle bolts are to be spun galvanised.

9 Certificate of Conformity

The manufacturer is to confirm, by issue of a certificate of conformity, that all Shackles conform to this specification, drawings and standards.

The certificate shall also include the following original information:

TH order number
Mill Certificate for stock steel used
Heat Treatment Thermal History Report
Tensile Test Report / Certificate
Brinell Hardness Test Report / Certificate
Examination, Proof and Breaking Force Test Certificate

Separate Reports / Certificates supplied must be traceable to the Certificate of Conformity

A maximum of 50 Shackles of the same size, type and material may be covered by one certificate.

Upon delivery, a Trinity House Inspector shall inspect the Shackles; any Shackle found not complying with the requirements of this specification may be subject to rejection.