INS ENG S 17 181 Rev 2
LTDP004: 1648C TRANSPORT PACKAGE
Specification for Manufacture, Inspection and Testing of the Lid and Shock Absorber Bolts for the 1648C Transport Package

Description

This specification replaces BNFL Specification PH74282E for the manufacture of the Lid bolts and Shock Absorber Bolts. It includes a comprehensive listing of Component Part Numbers, Descriptions, Materials, Drawings, Specifications and any associated reference documents needed to manufacture these items only.

Revision and Status	2
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For checking level information see NTS document NTS/SI/401/16

Revision Record

Revision	Clause	Detailed Description of Revisions
0		First issue for tender purposes
1		Updated to included new ASTM standard for ductile fracture testing. Document transferred to NTS Template.
2		Section 10.2.3 updated to give further clarity on the testing, including yield stress, UTS, Young's modulus and temperature ranges.

Contents

Definitions

1648C	1648C Transport Package.
ASTM	American Society for Testing Materials
ASNT	American Society for Non-destructive Testing.
Contractor	The Company contracted to manufacture and supply the Fasteners.
Fasteners	Consumable Fasteners for the 1648C Transport Package.
Inspector	The NTS Nominated Inspector.
LTQR	Lifetime Quality Records.
N/A	Not Applicable.
NTS	Nuclear Transport Solutions
NDT	Non-Destructive Testing.
PCN	Personnel Certification in Non-Destructive Testing.
SQEP	Suitably Qualified and Experienced Persons.

1 Introduction

This specification replaces BNFL Specification PH74282E for the manufacture of the Lid bolts and Shock Absorber Bolts. It includes a comprehensive listing of Component Part Numbers, Descriptions, Materials, Drawings, Specifications and any associated reference documents needed in order to manufacture these items.

The Contractor shall refer to Section 5 “Drawings, Standards and Specifications” and the contract documents. The modification letter shall be as stated in the contract documents.

The Contractor shall review all information provided in the drawings and / or specifications prior to manufacture. If any of the information provided is unclear, incomplete, incorrect, or could adversely affect the operability or reliability of the equipment, then the Contractor shall inform NTS before proceeding.

All Fasteners supplied shall be within the dimensions specified on the drawings. The Contractor shall demonstrate that all Fasteners have been manufactured to the appropriate “Drawings, Standards and Specifications” in Section 5 and Table 1.

2 Scope

The scope of this specification covers the general requirements for the material, manufacture, assembly, handling, surface treatment, identification, marking, documentation, certification, testing & inspection and Packing & Despatch of Fasteners.

2.1 Fasteners comprise the following items - quantities to be as stated in the contract:-

a) M36 Lid Bolts and Captive Washers (0NF1234334 items 7 & 17)
b) M20 Shock Absorber Bolts (0NF1234333 item 13)

3 General

3.1 Drawings

All manufacturing drawings, standards or reference documents shall be the issue current at the date of tender, unless otherwise stated. Symbols etc. on drawings are in accordance with the requirements of BS 8888.

3.2 Process Outline

The Contractor shall produce suitable Manufacturing Quality Plans that demonstrate and record that manufactured items are produced, tested and stored in compliance with all contract documents.

3.3 Inspection

The Inspector retains the right to examine and audit all or part of the manufacturing processes, in order to ensure that the standards as laid down in the relevant quality plans are maintained.

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3.4 SQEP

Persons performing manufacture, inspection and testing shall be SQEP and accepted by NTS.

3.5 Data Review

The Contractor shall review the data provided prior to manufacture and determine whether any additional information is required to complete the work.

3.6 Quality Assurance

Materials shall be purchased through a BS EN ISO 9001 compliant supply route that shows the correct size, grade and quantity of material supplied. Any exception shall be approved by NTS prior to placement of the Contractors' order.

3.7 Manufacturing Deviations

Manufacturing Deviation requests shall include Technical Queries, Production Permits and Concessions. The Contractor shall issue proposed manufacturing deviations to NTS using the supplied form. Ref SOL-402-SF002 [1]

An allowance of 10 working days from receipt of the MDF shall be allowed to process the request and issue a formal response.

3.8 Contract Programme

The Contract Programme requirements are specified in Schedule 1 of the Contract.

4 Drawings Standards and Specifications

4.1 General

4.1.1 All work shall be carried out in accordance with the following standards and specifications and the relevant drawings, as listed in the contract documentation.

4.1.2 For the complete list of drawings, standards and specifications associated with the manufacture of Fasteners refer to Table 1.

4.1.3 The full list of applicable drawings and specifications are in Schedule 1 of the Contract.

4.2 British Standards referred to herein:

Standard	Description
BS 919-3:2007	Screw gauge limits and tolerances. Specification for gauges for screw threads of ISO metric form.
BS 1044-1:2008	Specification for gauge blanks. Plug, ring and calliper gauges.
BS 8888:2013	Technical product documentation and specification.
BS 2S 143	Specification for Chromium-nickel-copper-molybdenum corrosion-resisting steel (precipitation hardening) billets, forgings and parts (93-1080 MPa) - AMD 3527: August 1981; AMD 6775: December 1991; AMD 8567: May 1995; AMD 13268: November 30, 2001
BS EN ISO 3452-1:2013	Non-destructive testing. Penetrant testing Part 1. General principles.
BSI BS 3643-1	ISO metric screw threads Part 1: Principles and basic data - CORR: August 2009
BSI BS 3643-2	ISO metric screw threads Part 2: Specification for selected limits of size - CORR: June 2014
BSI BS 6072	Method for Magnetic Particle Flaw Detection - AMD 3960: September 1982; AMD 4542: June 1984; AMD 4843: April 1985.
BS EN ISO 4762	Hexagon Socket Screws and Wrench Keys: Metric Series - Part 1: Hexagon Socket Head Cap Screws - AMD 4309: July 1983; AMD 5652: August 1987; Remains Current
BS EN 12163:2016	Copper and copper alloys - Rod for general purposes.
ASME E1820 A23	Standard Test Method for Measurement of Fracture Toughness
BS7910:2019	Guidance to methods for assessing the acceptability of flaws in metallic structures

5 Materials

5.1 Grades

The types, grades and the associated national / international standards for all materials used in the manufacture of the Fasteners shall be as stated in Table 1 of this specification and the relevant drawings and specifications identified therein.

5.2 Supply

All materials/components/items shall be supplied by the Contractor unless otherwise stated in the Contract documents and shall be in accordance with the notes and details shown in the relevant standards, drawings and specifications.

All material shall be fully in accordance with the acceptance criteria of the relevant standards given in this specification and any additional requirements covered by specifications quoted in Table 1.

Unless otherwise stated in the detailed manufacturing specifications, Cast (Ladle chemical analysis and mechanical properties) certification, Product (product chemical analysis) certification and any additional requirements given in the drawings and specifications as listed in Table 1 shall be provided for all metallic materials used in the manufacture of the Fasteners.

6 Manufacture and Finish

6.1 Manufacture shall be carried out in accordance with details in the relevant Fasteners drawings and specifications.

6.2 Burrs, sharp edges and corners shall be removed from all Fasteners.

6.3 Surface finishes, including bead blasting, pickling and passivating where required, shall be as specified on the relevant Fasteners drawings and specifications.

6.4 The Contractor shall take care when handling components and the finished assemblies to ensure that dimensions and tolerances stated on the relevant Fasteners drawings are maintained.

6.5 Lid bolt (Table 1 - Item 7) threads shall be rolled.

6.6 Shock Absorber Bolts (Table 1 - Item 17) thread rolled preferred.

7 Qualification of Inspection Personnel.

7.1 NDT Personnel Qualifications

7.1.1 Personnel performing NDT shall be formally qualified. Suitable qualifications would be the appropriate PCN or ASNT certificate or equivalent as agreed with NTS.

7.1.2 If during the course of the contract the quality of work performed by any personnel is judged by NTS to be below the required standard, NTS shall have the right to demand that the person concerned be re-trained / re-qualified before being allowed to continue.

8 Identification and Marking

8.1 General

8.1.1 Identification and marking requirements of assemblies and individual components shall be as indicated in Table 2.

8.2 Identification

Component identification is achieved using an alphanumeric system constructed as follows: -

Item Number	(As shown in Table 2)
Drawing Number	(Six digit number - As shown in Table 2)
Drawing Issue	(latest issue at manufacture)
Unique Number	(three digit serial number – numbers to be supplied at contract placement)

8.2.1 The marking requirements shall be as stated in Table 2.

8.2.2 Additional Identification:

a) Any additional identification to be marked on assemblies and components are detailed in Table 2.
b) Actual weight markings for handling purposes shall be clear and adequately sized to be visible to operators during handling operations.

8.3 **Marking Methods**

8.3.1 The location, type and size of marking where applicable shall be detailed on each component drawing, with additional detail in Table 2.

8.3.2 Indenting or Embossing - this shall be performed by stamping using low stress stamps (i.e. rounded edges) or by machine marking.

8.3.3 Etching - the method of Etching shall be Laser Etching, Electro Etching or Vibro Etching.

8.3.4 The marking size will be dictated by the component dimensions but is to be clearly visible

9 Inspection

9.1 Inspection and Testing shall be carried out in accordance with the notes and details in the relevant Fasteners drawings and specifications and the following clauses.

9.2 Measurement and test equipment/instruments shall be suitably controlled.

9.3 Cast numbers and other material identity marks shall be maintained during manufacture. When hard marking is required, low stress stamps are to be used.

9.4 A full dimensional survey of each Fastener shall be carried out to confirm that critical dimensions and tolerances identified on the General Arrangement Drawing (See Section 2.1) have been maintained. Actual dimensions and tolerances shall be recorded and included in the LTQR's.

10 Testing - General

10.1 **Screw Threads**

10.1.1 Screw threads shall be gauged using "GO" and "NO-GO" screw ring and plug gauges. Gauges shall be manufactured in accordance with BS 919 Part 3 & BS 1044 Part 1.

10.2 **Lid Fixing Bolts (Only)**

10.2.1 At the forging works, the following certificates are required:

a) Chemical analysis.
b) Post heat treatment physical hardness tests of each forging.
c) Properties shall conform to the requirements of BS 2S 143C. Yield stress, ultimate tensile strength, strain at ultimate tensile strength, final elongation and reduction in area values shall be included on the certificates.
d) One bolt from each batch shall be sectioned to prove grain flow.

10.2.2 After machining, each bolt shall be inspected by magnetic particle examination both longitudinal and circumferential directions in accordance with BS 6072. Relevant linear indications greater than 1.5mm in length shall be cause for rejection.

10.2.3 Perform 10x multiple specimen, instrumented Charpy tests to determine a J resistance (J-R) curve and establish a fracture initiation criteria in accordance with ASTM E1820-23, Appendix 17 [2]. The test temperature shall be -10°C. The yield stress and ultimate tensile stress of the material shall correspond to the material test certification (10.2.1c) and they shall be corrected to -10°C using equations 7.2 and 7.3 of in BS7910:2019 [3]. The Young's Modulus of the material at -10°C shall be taken as 215,500MPa.

11 Documentation and Certification

11.1 All documentation for inclusion in the Lifetime Records (LTQR) shall be controlled and allocated a unique document number.

11.2 Documentation and Certification requirements shall be in accordance with the relevant drawings and specifications.

11.3 The LTQR shall be supplied and include all of the relevant information identified in Section 14.

12 Packing and Despatch

12.1 Packing

12.1.1 It is the responsibility of the Contractor to ensure that the Fasteners are suitably packed to protect them from damage or deterioration during any required storage period and subsequent transit.

12.1.2 Care shall be taken to ensure that damage does not occur to the Fasteners during transport. These shall be protected from dirt, damage or water during storage and transport.

12.1.3 The Contractor shall also comply with other requirements specified on the relevant NTS drawings and specifications.

12.2 Despatch

12.2.1 The packing protecting the equipment shall be marked externally with the following information:

a) The Consignee's name and address.
b) The Consignor's name and address.
c) The destination.
d) The NTS Contract number.
e) The gross weight.
f) The unique identification number.
g) Any handling constraints.

12.3 Authorisation for Despatch.

12.3.1 Before despatch of the equipment from the Contractor's works, written authorisation for release shall be obtained from NTS.

13 Schedule of Manufacturing Documents

13.1 The attached schedule details manufacturing related documentation to be supplied by P&E Contractors. Note that the requirements for other documentation are specified by the Schedule of Documents (non-manufacturing) in Schedule 1 of the Contract.

13.2 The Contractor is required to produce a schedule indicating the planned submission dates for all documentation supplied with the Plant & Equipment.

14 Lifetime Quality Records

DOCUMENT TYPE / DESCRIPTION	Submitted to NTS for information	Submitted to NTS for acceptance
Material Mill Test Certificates (Chemical and Mechanical)	✓	
Material Traceability Records	✓	
Certificates Of Conformity	✓	
NDT Procedures (LPI; MPI; Ultrasonic; Radiography)	✓	
NDT Operator Qualification	✓	
Magnetic Particle Inspection Report	✓	
Ultrasonic Test Report	✓	
Charpy Impact Test Report	✓	
Dimensional Records	✓	
Heat Treatment Records/Charts	✓	
Inspection Reports	✓	
Manufacturing Deviation Form (MDF) - Technical Query, Production Permit, Concession - PROM 088 - F06		✓
Inspection Schedule	✓	
Test Equipment Certificates (including Traceability)	✓	
Quality Release Form (QRF) - PROM 088		✓

15 References

[1] NTS, SOL-402-SF002 - TQ PP CC Request Form, Oct 2021.

[2] A. E1820-23, *Standard Test Method for Measurement of Fracture Toughness,* 2023.

[3] BS7910:2019, *Guide to Method for Assessing Flaws in Metallic Structures,* 2019.

Table 1 - List of Drawings, Descriptions and Materials

ITEM No.	DRAWING No.	DESCRIPTION	MATERIAL	MATERIAL SPEC.	MANUF. SPEC. No.
7	0NF1234334	M36 Lid Bolts	As per drawing	As per drawing	INS ENG S 17 181
17	0NF1234334	M36 Captive Washers	As per drawing	As per drawing	INS ENG S 17 181
13	0NF1234333	M20 Shock Absorber Bolts	As per drawing	As per drawing	INS ENG S 17 181

Table 2 - List of Marking Requirements

ITEM No.	DRAWING No.	DESCRIPTION	Marking Method	Marking
7	0NF1234334	M36 Lid Bolts	Stencilled or Laser Etched	Actual weight – clearly visible for handling.
13	0NF1234333	M20 Shock Absorber Bolts	Vibro or Laser Etched	13 0NF1234333 “***” Batch No.
17	0NF1234334	M36 Captive Washers	Stencilled or Laser Etched	7 0NF1234334 “***” Serial No.

*** Replace with Drawing Modification Letter (i.e 13 0NF1234333 Mod F Batch No.)