



MINISTRY OF DEFENCE (DGQA)

SQAP FOR BEARING BUSH - RUDDER BUSH AND SHAFT SLEEVE/ LINERS FOR 'A'- BRACKET, 'P'- BRACKET & STERN TUBE

Standard Quality Assurance Plan covers the technical requirements for providing Quality Assurance cover to Bearing Bushes - Rudder Bushes and Shaft Sleeve / Liners for 'A'-Bracket, 'P'-Bracket & Stern Tube

**STANDARD QAP NO. DGQA/DQA (WP)/SHAFT LINERS/19/2019/REV 0
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RECORD OF AMENDMENTS

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MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN FOR BEARING BUSH - RUDDER BUSH AND SHAFT SLEEVE / LINERS FOR 'A'- BRACKET, 'P'- BRACKET & STERN TUBE



**STANDARD QAP NO.
DGQA/DQA(WP)/SHAFT LINERS/19/2019/REV
01 OCT 2019**

 A handwritten signature in black ink, appearing to read 'A. George', is placed above a printed title. The title 'REAR ADMIRAL' is printed above 'ADGQA(WP)'.

(A GEORGE)
REAR ADMIRAL
ADGQA(WP)

Promulgated by:-

**DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
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CONDITIONS OF RELEASE

1. This Standard Quality Assurance Plan (SQAP) has been formulated for reference of the Order Placement Agencies, Inspection Authority, Inspection Agencies and the Industry. No alteration is to be made to this SQAP except by the issue of authorised amendment by DQA (WP).
2. It is to be applied, as required, for Quality Assurance during various stages of manufacture of Shaft Liners for *I/N* Ships.
3. The website <http://www.dgqadefence.gov.in> may also be referred for other QA requirements.
4. The SQAP of Shaft Liners has been prepared with reference to earlier approved QAPs and decisions made during the collegiate meeting held at DQA(WP) with OEM and representatives of the concerned Professional/ Production Directorate of the *I/N*. Any user of this SQAP, either within DGQA/ *I/N* or in industry may propose an amendment to it with valid justification. Proposals not applicable to particular contract can be sent directly to DQA (WP), New Delhi, and those directly applicable to a particular contract are to be dealt with using contract procedures.
5. DQA(WP) reserves the right to amend or modify the contents of this SQAP without consulting or informing any holder of this document.
6. The specifications and standards laid out in the SQAP are indicative only. The specifications / parameters and standards given in the Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding.
7. When this SQAP is incorporated into contracts, users are responsible for their correct application and for complying with contractual and other statutory requirements. Compliance to SQAP does not in itself confer immunity from legal obligations.
8. Enquiries in connection to these requirements may be made from:-

**DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
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STANDARDS INVOKED

| <u>Sl.</u> | <u>Specification No.</u> | <u>Description</u> |
|-------------------|--|---|
| 1. | BS EN 1982:2017 | Specification for Copper Alloy Ingot and Copper Alloy and High Conductivity Copper Castings |
| 2. | Def Stan 02-830 Pt 1, ISS: 2; 10 Aug 02 Amdt 1- 05 Mar 2003 or latest version | Gun Metal Ingots & Casting (Shaft sleeve, A-Bracket, Prop. Shaft Bushes/Liners) |
| 3. | Def Stan 02-747 Pt 1, ISS: 2, 19 Nov 2004 or latest version | Nickel, Aluminum & Bronze, Casting & Ingots |
| 4. | Def Stan 02-833, Pt 2, ISS: 2, 09 Feb 07 or latest version | Nickel, Aluminum & Bronze Alloy (Stern tube, Bracket, Bearing, Bushes) |
| 5. | ASTM E 310 | Standard Reference Radiographs for Tin Bronze Castings |
| 6. | ASTM E 272 | Standard Reference Radiographs for High Strength Copper-Base and Nickle-Copper Alloy |

Note: The standards given are indicative only and specification given in TSP / MoM of TNC / approved drawings will be applicable

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SPECIFIC REQUIREMENTS

1. All QA requirements including approval of Drawings and QAP is to be in conformance with the conditions stipulated in Quality Assurance Document **QAD-01** available at DGQA website <http://www.dgqadefence.gov.in> .
2. Testing of Chemical Composition and Mechanical / Physical properties is to be done by NABL accredited lab (including firm's NABL accredited lab).
3. If casting is being poured without integral test bar, then only pouring is to be witnessed by Inspector.
4. Radiography is to be carried out as per the approved drawing.
5. Non-Destructive Testing is to be carried out by ISNT/ ASNT level II / III qualified technician.

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ABBREVIATIONS

| | |
|------|--|
| VI | Visual Inspection |
| DI | Dimensional Inspection |
| LTC | Lab Test Certificate |
| STC | Supplier Test Certificate |
| CC | Conformance/ Compliance Certificate |
| CHP | Customer Hold Point |
| IR | Inspection Report |
| NABL | National Accreditation Board for Testing and Calibration of Laboratories |
| R | Review |
| W | Witness |
| TC | Test Certificate |
| OEM | Original Equipment Manufacturer |
| DPT | Dye Penetrant Test |
| MPT | Magnetic Particle Test |
| UT | Ultrasonic Test |
| RT | Radiography test |
| ASNT | American Society of Nondestructive Testing |
| ISNT | Indian Society of Nondestructive Testing |

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SCOPE

1. **Scope of Quality Assurance.** The scope of Quality Assurance will cover witness and review of all manufacturing activities during all stages viz. Raw Material Stage, In-process Stage and Final Stage.
2. The Standard Quality Assurance Plan contains comprehensive list of inspections and/or trials that is to be applicable for quality assurance of the equipment. In addition, quality assurance of equipment will also be governed by specific conditions laid down in Purchase Order, SOTRs and Approved Drawings. The inspections/ trials must be contemporary to latest technology/ techniques available in the industry at the time of placement of orders.
3. The following quality assurance activities will be carried out during the Quality Assurance of Equipment:-
 - (a) Visual Inspection.
 - (b) Dimensional Inspection.
 - (c) Review of Lab Test Certificates/ Supplier Test Certificates/ Compliance Certificates/ Import documents.
 - (d) Witness of in-house Lab Testing, if applicable.
 - (e) Witness of Non-destructive Testing viz. UT, DPT & MPT.
 - (f) Review of Heat Treatment Charts.
 - (g) Issue of CHP clearance.
 - (h) Issue of Dispatch Clearance or Issue of Form-IV, as applicable.

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STANDARD QUALITY ASSURANCE PLAN

Part - I: General Information

1. The following generic information must generally be indicated on each QAP as its identity:-

- (a) Equipment Name
- (b) Equipment Technical Details (as applicable)
- (c) Purchase Order Reference
- (d) Sub/Sub-Sub Orders reference (as applicable)
- (e) Name of Main Indenter/ Ordering Authority
- (f) Name of end user
- (g) Name of Firm / Manufacturer
- (h) SOTRs Reference
- (j) Yard No./ Name of Ship where to be fitted (if available)/End User
- (k) References of relevant Drawings
- (l) QAP No. & Date (as indicated by the firm)
- (m) Contractual Delivery Date
- (n) Inspection Authority
- (p) Inspection Agency
- (q) Quantity (as per PO)

Part - II:

| | |
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| Standard QAP of Shaft liner | Appendix "A" |
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SQAP FOR BEARING BUSH - RUDDER BUSH AND SHAFT SLEEVE / LINERS FOR 'A'- BRACKET, 'P'-BRACKET & STERN TUBE

| Sl. No | Material/ Component / Drg.No/ Quality Activity | Qty. as per P.O. | Characteristics / Type of Check | Quantum of Check | Reference Documents | Acceptance Criteria | Format of Record | Action by QAE | Remarks |
|--|---|------------------|---|-----------------------|--|--|---------------------------|---------------|--|
| 1.0.0 DRAWINGS/ DOCUMENT VERIFICATION | | | | | | | | | |
| 1.1.0 | Drawings and Documents | | (i) Check for availability of approved drawings | 100% | PO & SOTR/ TNC Minutes | All approved drawings are available | List of approved drawings | R | |
| | | | (ii) Verification of manufacturing drawings | 100% | | Manufacturing drawings bear complete data; The data is sufficient for production and stage inspections | List of approved drawings | R | Manufacturing drawings will be examined and referred to at the OEM premises and stamped on completion of inspections |
| 2.0.0 RAW MATERIAL INSPECTION | | | | | | | | | |
| 2.1.0 | Raw Material Analysis (Bath Sample Analysis) | | Spectro / Wet Analysis | One Sample / Heat | SOTR / TSP, TNC Minutes, Approved Drawings, Manufacturing Drawing/ Material Specification | Conformity to specifications | LTC / Mil Certificate | R | |
| 2.2.0 | Bearing Bush Includes (i) Shaft Sleeve/ Shaft Liner- A/P bracket (ii) Shaft Sleeve / Shaft Liner -Stern Tube (iii)Rudder Bush (Centrifugal Casting) | | Pouring with integral Test bar | 100% | SOTR / TSP, TNC Minutes, Approved Drawings, Manufacturing Drawings / Relevant Material Specification (Phosphor Bronze to BS 1400 Gr PB3C/ Gr. PB4/ Gr1 / Any other material specified inapproved drawing) | Casting to be as per specifications laid in reference documents | IR | R | If casting is without integral test bar, pouring to be witnessed by QAO |
| | | | Material Identification & Stamping | 100% | | Conformity to specifications | IR | W | |
| | | | Chemical Composition and Mechanical Properties | One Sample/ Lot/ Heat | | Properties to meet the laid down specifications | NABL LTC | R | |
| 3.0.0 IN-PROCESS INSPECTION | | | | | | | | | |
| 3.1.0 | Bearing Bush Includes (i) Shaft Sleeve/ Shaft Liner- A/P bracket | | VI & DI | 100% | SOTR / TSP, TNC Minutes, Approved Drawings, Manufacturing Drawing/ | Confirm to approved drawings | IR | R | |
| | | | DPT | 100% | | Surface defects | NDE | CHP for | Testing to be do |

| Sl. No | Material/ Component / Drg.No/ Quality Activity | Qty. as per P.O. | Characteristics / Type of Check | Quantum of Check | Reference Documents | Acceptance Criteria | Format of Record | Action by QAE | Remarks |
|---|--|------------------|---------------------------------|------------------|---|---|-----------------------|--------------------|---|
| (ii) Shaft Sleeve / Shaft Liner -Stern Tube (iii)Rudder Bush (Proof Machined / Machined) | | | | 100% | SOTR / TSP, TNC Minutes, Approved Drawings, Manufacturing Drawing | within permissible limits specified in applicable standard Casting to withstand the specified hydro pressure | Report IR | W CHP for W | done by ISNT/ ASNT level II or III qualified technician |
| | | | | | | | | | |
| | | | | | | | | | |
| 4.0.0 FINAL INSPECTION | | | | | | | | | |
| 4.1.0 | Bearing Bush (Finished) Includes (i) Shaft Sleeve/ Shaft Liner- A/P bracket (ii) Shaft Sleeve / Shaft Liner -Stern Tube (iii)Rudder Bush | | VI &DI | 100% | SOTR / TSP, TNC Minutes, Approved Drawings, Manufacturing Drawing/ PO | Acceptance level: (a) All Type of Shrinkage- Level-II (b) Gas Porosity and all type of inclusion- Level II (c) Cracks, Hot Tears and Inserts- Not acceptable | NDE Report & RT films | CHP for R | Testing to be done by ISNT/ ASNT level II or III qualified technician |
| 4.2.0 | Packing, Preservation and Marking | | VI | 100% | | Preserved, Marked and Packed as per specifications | | | |

Note:-

1. Equipment &accessories supplied should conform to specifications.
2. Material Testing to be done at NABL accredited laboratories.
3. NDT procedure to be approved by ASNT / ISNT Level III qualified person based on standards and acceptance criteria specified in SOTR / TSP and performed by ASNT / ISNT Level II / Level III qualified person. RT films to be stored and preserved for 05 years from date of supply of item.
4. The QAP does not apply to items not in the scope of supply of the firm.
5. The column 'Quantity as per P.O has been left blank which has to be filled by the firm as per P.O while submitting QAP for approval.