MINISTRY OF DEFENCE / DGQA

STANDARD QUALITY ASSURANCE PLAN

STEERING GEAR SYSTEM

STEERING GEAR SYSTEM IS USED FOR STEERING THE SHIP TO THE DESIRED COURSE AT ALL SPEEDS. THE SYSTEM COMPRISES OF TWO HYDRAULICALLY OPERATED RUDDERSTOCKS, MECHANICALLY LINKED TOGETHER AND DUAL HYDRAULIC POWER UNITS CONNECTED VIA A COMMON DISTRIBUTION VALVE BLOCK TO THE RUDDER OPERATING CYLINDER AND OTHER EQUIPMENT FOR NORMAL FUNCTIONING. STEERING GEAR IS CONTROLLED AND MONITORED FROM BRIDGE AND OPS ROOM IN FOLLOW UP MODE, NON- FOLLOW UP MODE & AUTO PILOT MODE

STANDARD QAP NO. DGQA/DQA (WP)/STRG GEAR/01/2018/REV-01
07 AUG 2018

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ISSUING AUTHORITY

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECTS)
'H' BLOCK, NIRMAN BHAWAN P.O
NEW DELHI - 110 011

RECORD OF AMENDMENTS

Sl. No.	Date of Amendment	Amendments	Authority	Remarks

MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN FOR STEERING GEAR SYSTEM

STANDARD QAP NO. DGQA/DQA(WP)/STRG GEAR/01/2018/REV 01 07 AUG 2018

(SP Lal)
Rear Admiral
ADGQA (WP)

Promulgated by:-

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECTS)
'H' BLOCK, NIRMAN BHAWAN P.O
NEW DELHI - 110 011

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 Steering Gear System for *IN* Ships.

3. The website ***htpp://www.dgqadefence.gov.in*** may also be referred for other Quality Assurance related inputs.

4. The SQAP has been prepared on the basis of decisions made during the collegiate meeting held at DQA(WP) with leading manufacturers of Steering Gear System and representatives of Professional Directorates and Production Directorates of the *IN*. Any user of this Standard QAP within DGQA / *IN* 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. The specifications and standards laid out in the SQAP are indicative only. The specifications / parameters and standards given in the Statement of Technical Requirement (SOTR) / Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding.

6. DQA(WP) reserves the right to amend or modify the contents of this SQAP without consulting or informing any holder of this document.

7. In case the SQAP is incorporated into contracts, users are responsible for their correct application while complying with contractual and other statutory requirements. Compliance with SQAP does not of itself confer immunity from legal obligations.

8. Enquiries in connection to these requirements may be made from:

Directorate of Quality Assurance (Warship Projects)
Ministry of Defence
'H' Block, Nirman Bhawan P.O
New Delhi - 110 011

CONTENTS

STANDARDS INVOKED

SL. NO.	SPECIFICATION	DESCRIPTION
1	AISI, SS 316	Specification for steel material.
2	ASTM E 446	RT for steel castings up to 2 inch thickness
3	ASTM E 186	RT for heavy walled steel castings
4	ASTM E 272	RT for Copper based and Nickle Copper Alloy castings
5	ASTM E 1320	Standard reference radiographs for Titanium casting
6	ASTM E 1032	Std. test method for radiographic examination of weldments
7	ASTM A 743	Std. specification for castings, Iron-Chromium, Iron-Chromium-Nickle, corrosion resistant for general application
8	ASTM A 609	Std. practice for performing pulse-echo ultrasonic examination
9	ASTM E 165	Std. practice for liquid penetrant examination
10	ASTM E 125	Std. reference photographs for MPI in ferrous castings
11	ASTM A 148	Std. specs for steel castings, high strength for structural purposes
12	ASTM A 217	Std. specs for steel castings Martensitic Stainless & Alloy for pressure containing parts
13	ASTM A 216	Std. specs for steel castings suitable for fusion welding
14	ASME Sec IX	Qualification Standard for welding, brazing & fusing procedures
15	ASME Sec V	Non-destructive examination
16	ASME Sec VIII	Rules for construction of pressure vessels
17	ASME Sec II Part A	Ferrous material specifications
18	ASME Sec II Part B	Non-ferrous material specifications
19	BS 1400	Copper alloy ingots and copper alloy and high conductivity copper castings
20	BS 4670	Specification for alloy steel forging
21	BS 2871:Part 2	Copper & Copper alloy tubes
22	EN 10250-2	Open die steel forging
23	SA 105	Specification for Carbon Steel Forging
24	IS 2062	Hot medium & high tensile structural steel
25	AISI SS 316	Specification for steel material
26	DMR 249/D40S	Structural steel
27	Def Stan 02-797 Part-4	Carbon steel fittings / Pipe work engineering

28	Def Stan 02-339	Requirement for steering and stabilizer system
29	Def Stan 02-477	Flexible hoses
30	Def Stan 61.5	Electric power supply system
31	EED-Q-071(R4)	Specification for AC motors and starters / control gears
32	ISO 2372	Specification for vibration test.
33	JSS 55555	Environmental test methods for electrical & electronic eqpt
34	NES 340	Stabilisers
35	NES 375	Valve design & manufacture
36	BR3021	Shock Testing
37	MIL-STD-740-2	SBN measurement & acceptance criteria of shipboard equipment
38	MIL-STD-167-1	Mechanical vibrations of shipboard equipment
39	MIL-STD-1474D	Design criteria standard, noise limits
40	MIL-STD-461F	EMI / EMC

Note:- The Standards given are indicative only. The specifications / standards given in the SOTR / Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding.

SPECIFIC REQUIREMENTS

1. Testing of physical and chemical properties has to be done by NABL accredited laboratory only (including firm's NABL accredited laboratory).

2. If casting is being poured without integral test bar, then only the pouring is to be witnessed by Inspector.

3. All castings are to be subjected to RT and / or UT, as applicable, to qualify the same in accordance with the approved *class* of casting, unless otherwise specified in P.O. & SOTR / TSP. The extent of RT will be as per the approved drawing. The *class* of casting is to be invariably mentioned in the drawing / DBOM.

4. All forgings are to undergo UT for soundness and integrity checks.

5. All tubes / pipes are to be subjected to Eddy Current test unless exempted in PO / TEC.

6. Shooting sketch indicating critical test zones and test zones are to be submitted prior to testing.

7. NDT procedure to be approved by ASNT / ISNT Level III qualified person based on standards and acceptance criteria specified in SOTR / TSP / applicable standards and performed by ASNT / ISNT Level II / Level III qualified person.

8. Make of the Items should be as per approved PIL / Detailed Bill of Material (DBOM) or *IN* approved sources.

9. The outsourced components in the SQAP are indicative only. OEM is to categorize the outsourced components, specific to their product, in the QAP as per the approved DBOM / Drawings and in accordance with Chapter-5 of QAD-01 R01. .

10. Imported items will be accepted against following import documents:-

(a) Bill of Lading / Shipping Bill / Airway Bill
(b) Invoice by OEM or Country of Origin Certificate with Packing List
(c) Bill for entry to warehousing
(d) OEM Confirmation Certificate
(e) Firm’s Guarantee certificate as per SOs

11. ESS test (Thermal Cyling, Random Vibration and Burn in / Endurance) as per DQA(N) policy vide letters 66301/Policy-07/DQA(N)/QA-07 dated 09 Aug 16.

12. Ingress protection testing will be as per applicable IP rating.

13. TT, EMI / EMC Test and ET will be done at Government / PSU test centers or NABL accredited labs. EMI/EMC Acceptance Test Plan is to be duly vetted by NEC Mumbai.

14. If TT, EMI/EMC and ET have already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will have to be provided for review of Inspection Agency.

15. Conformal coating of PCBs to be done as per DQA(N) policy letter 580930/DQA(N)/EL dated 17 Feb 14.

16. Bought-out items will be subjected to normal QA inspections as per QAP.

17. Since the Steering Gear System is to be subjected to IFATs, the draft Operating Instructions, Technical Documentation and firm's in-house test report is to be made available prior to raising request for conduct of the same.

ABBREVIATIONS

VI	Visual Inspection
DI	Dimensional Inspection
LTC	Lab Test Certificate
STC	Supplier Test Certificate
MTC	Material Test Certificate
CC	Conformance / Compliance Certificate
CHP	Customer Hold Point
IR	Inspection Report
NABL	National Accreditation Board for Testing and Calibration of Laboratories
P	Perform
R	Review
V	Verification
W	Witness
TC	Test Certificate
OEM	Original Equipment Manufacturer
DPT	Dye Penetrant Test
MPT	Magnetic Particle Test
SBN	Structure Borne Noise
ABN	Air Borne Noise
FATs	Factory Acceptance Trials
PQR	Procedure Qualification Record
WPS	Welding Procedure Specification
WPQ	Welder Performance Qualification
ET	Environmental Testing
EMI	Electro Magnetic Induction
EMC	Electro Magnetic Conduction
ESS	Environment Stress Screening
ASNT	American Society of Non-destructive Testing
ISNT	Indian Society of Non-destructive Testing
VME	Versa Module Europa
TT	Type Test
TSP	Technical Specifications
SOTR	Statement of Technical Requirement
DBOM	Detailed Bill of Material
QA	Quality Assurance

SCOPE

1. **Scope of Quality Assurance**. The scope of QA includes witness / review at all stages of manufacturing viz., raw material stage, in-process stage and final stage. The scope also covers witness / review of Type Testing, wherever applicable.

2. The SQAP contains comprehensive list of inspections and/or trials that are applicable for QA of the equipment. In addition, QA of the equipment will also be governed by specific conditions laid down in SOTRs and 'Approved Drawings'. The inspections / tests / trials must be contemporary to latest technology / techniques available in the industry at the time of placement of purchase order.

3. The following QA activities will be carried out for the Steering Gear System:-

(a) Visual Inspection.

(b) Dimensional Inspection.

(c) Witness of pouring in absence of integral test bar.

(d) Review of Lab Test Certificates.

(e) Witness of in-house Lab Testing, if applicable.

(f) Witness of Non-destructive Testing viz. UT, DPT & MPT.

(g) Witness of Eddy Current Test or review of Eddy Current Test Report, as applicable.

(h) Review of RT films and reports.

(j) Review of Heat Treatment Charts.

(k) Witness of Endurance Trials & Tilt Test and Review of Shock Test and SBN & ABN reports for qualification of Type Test, as applicable.

(l) Review of ET, EMI/EMC and ESS reports, in addition to Pre / Post ET inspection, as applicable.

(m) Review of Draft documentation and witness/Stamping of final documentation, as applicable.

(n) Issue of CHP clearance.

(p) Issue of Dispatch Clearance or Issue of Form-IV, as applicable.

SYSTEM DESCRIPTION

1. The Steering gear system is for steering the ship to the required course at all speeds in Auto, Follow-up and Non-follow-up modes. The twin rudder fitted on the ship is used to achieve required course.

2. The system comprises of two hydraulically operated rudderstocks, mechanically linked together, and dual hydraulic power units, connected via a common distribution valve block to the rudder operating cylinders. The steering gear is capable of moving the rudder hard over through full range of 35-0-35 degrees in 28 seconds. With ship doing full ahead at 33 Knots & both hydraulic power packs in use, the Steering Gear is capable of turning, stopping and holding the rudder at any angle over a range of 35 degrees either side of the midship.

3. Steering Gear is controlled & monitored from Bridge, OPS Room or in emergency mode from the hydraulic power pack located in Steering Gear compartment (Local Control Post)

STEERING GEAR SYSTEM

Mechanical System
Rudderstock
Rudder Assembly
Cartridge Structure
Inboard Bearing
Sleeve Bearing
Tiller
Lock Pin Assembly
Ram Pin Assembly
Synchronizing link

Hydraulic System
Power Pack
Electric Motor
Isolation Manifold
Distribution Block
Overhead Oil Tank
Reserve Oil Tank
Emergency Hand Pump
Lubrication Unit

Control System
Bridge & OPS Console
Command Selection Box
Rudder Servo Amplifier Unit
Rudder Feedback unit
MCR Unit
Rudder Angle Indicator
Rudder angle transmitter
Junction Box
ACOS
MSP

STANDARD QUALITY ASSURANCE PLAN

Part - I. **General Information**

1. The following generic information must generally be provided 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 applicable)

Part - II.

Standard QAP of Steering Gear (Hydro-Mech)	Appendix "A"
Standard QAP of Motor	Appendix "B"
Standard QAP of AC Starter & Control Panel	Appendix "C"
Standard QAP of Control System	Appendix "D"
Standard QAP of Multipoint Lubrication Pump Assembly	Appendix "E"

Appendix - 'A'
Refers to Part-II of SQAP

STANDARD QUALITY ASSURANCE PLAN FOR STEERING GEAR SYSTEM

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 / DOCUMENTS VERIFICATION**								
1.1.0	GA Drawings along with DBOM & Binding Data		Check for availability of approved drawings and DBOM & Binding Data	100%	PO & SOTR/ TNC Minutes	All approved drawings along with DBOM & Binding Data are available	List of approved drawings & Binding Data	CHP for R	Approved binding data / drawing to be verified
1.2.0	Manufacturing Drawings		Verification of manufacturing drawings with reference to approved GA drawings and DBOM for completeness and sufficiency of data to undertake production and process inspections.	100%	SOTR, GA Drawings along with DBOM	Manufacturing drawings bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	CHP for R	--
1.3.0	Type Test / ET / EMI/EMC reports		Availability & verification	100%	PO & SOTR / TNC Minutes/ JSS 55555	Equipment should be tested in the past and relevant certificate is available	Type/ Qualification test reports	CHP for R	Type / qualification test are to be conducted if not undertaken earlier or test certificate not held or equipment has undergone changes
2.0.0	**MATERIAL INSPECTION**								
2.1.0	**RUDDER BEARING ARRANGEMENT ASSEMBLY (DRG. NO……..…)**								
2.1.1	Lower Bearing Housing and Upper Bearing Housing [Inboard Bearing Housing and Outboard Bearing Housing] (Steel Casting)		(i) Pouring with integral test bar	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(iii) Heat Treatment	100%		Conformity to specifications	HT Report	R	
			(iv) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.

STANDARD QUALITY ASSURANCE PLAN FOR STEERING GEAR SYSTEM

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
			(v) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be do done by ISNT / ASNT Level II or III qualified technician
			(vi)MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
			(vii) RT	Critical Regions			NDE Report	CHP for R	
2.1.2	Rudder Stock [**Steel Forging**]		(i) Heat treatment	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	HT Report	R	
			(ii) Stamping & test piece identification	100%		Conformity to specifications	IR	W	
			(iii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
			(iv) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE	CHP for W	Testing to be do done by ISNT / ASNT Level II or III qualified technician
			(v) MPT / DPT on machined surfaces	100%			NDE	CHP for W	
2.1.3	Rudder Stock Bearing Sleeve (Upper and Lower)		(i) Pouring with integral test bar	100%		Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(iii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
			(iv)U.T followed by Pressure Test	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be do done by ISNT/ ASNT Level II or III qualified technician
			(v) MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
			(vi) RT	Critical Regions			NDE Report	CHP for R	
2.1.4	Inboard Bearing & Outboard Bearing (Lower Bearing and Upper Bearing)		(i) Pouring with integral test bar	100%	SOTR, Approved GA drawing, DBOM and	Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO.

STANDARD QUALITY ASSURANCE PLAN FOR STEERING GEAR SYSTEM

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
	(**Casting**) (# Import substitute are listed at Sl 3.1.1)		(ii) Material identification & stamping	100%	manufacturing drawings	Conformity to specifications	IR	W	
			(iii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
			(iv)U.T followed by Pressure Test	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be do done by ISNT/ ASNT Level II or III qualified technician
			(v)MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
			(vi) RT	Critical Regions			NDE Report	CHP for R	
2.1.5	(a) Thrust Bearing (b) End Piece (c) Spacer (**Cu Alloy Casting)**		(i) Pouring with integral test bar	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(iii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
			(iv) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be do done by ISNT / ASNT Level II or III qualified technician
			(v) DPT on machined surfaces	100%			NDE Report	CHP for W	
			(vi) RT	Critical regions			NDE Report	CHP for R	
2.1.6	Tiller **(Steel Casting**)		(i) Pouring with integral test bar	100%		Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(iii) Heat Treatment	100%		Conformity to specifications	HT Report	R	
			(iv) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab.
			(v) U.T	100%		Defects within	NDE	CHP for	Testing to be do done

STANDARD QUALITY ASSURANCE PLAN FOR STEERING GEAR SYSTEM

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
						permissible limits as per applicable standards / specs	Report	W	by ISNT/ ASNT Level II or III qualified technician
			(vi)MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
			(vii) RT	Critical regions			NDE Report	CHP for R	
2.1.7	Gland Follower **(SG Iron Casting**)		(i) Pouring with integral test bar	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(iii) Heat Treatment	100%		Conformity to specifications	HT Report	R	
			(iv) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
			(v) UT	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be do done by ISNT / ASNT Level II or III qualified technician
			(vi) MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
			(vii) RT	Critical regions			NDE Report	CHP for R	
2.1.8	(a) Lock Nut - Tiller (b) Stud (for Lock Nut - Tiller) (c) Stud for gland follower (Steel Forging) (d) Key - Tiller		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	100%		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
			(iii) UT (for Lock nut and Key only)	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be done by ISNT / ASNT Level II or III qualified technician
2.1.9	Hull Cartridge Structure (Rolled steel Plates)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	Review of mill TC duly cleared by CQAE(NS) as per NCD 0249
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC / CQAE(NS) report	R	Testing to be done at NABL approved laboratory.

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2.1.10	Rudder (Rolled Steel Plates)		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC / CQAE(NS) report	R	Testing to be done at NABL approved laboratory.
2.1.11	Keep plate (Structural Steel)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	CC	R	
2.1.12	Rudder Angle Transmitter and Feed Back Units- (a) Feed Back Lever (MS) (b) Transmitter Lever (MS) (c) Pins (Alloys Steel)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
2.1.13	Feed Back Unit Support		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
2.1.14	Connecting Rod		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
2.1.15	Mechanical Locking Pin Assembly (a) Locking Pin (Alloy Steel) (b) Screw-Locking Pin (MS) (c) Top Plate (Structural Steel) (d) Stud Top Plate (MS)		(i)Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.

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	(e) Collar (Structural steel)								
2.2.0	**SYNCHRONISING LINK TUBE ASSEMBLY (DRG. NO._____)**								
2.2.1	Link Tube (**Stee**l)		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	100%		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab.
			(iii) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be do done by ISNT/ ASNT Level II or III technician
2.2.2	Link end L.H. & R.H. (**Steel Forging**)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iii) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician
2.2.3	(a) Bearing Retainer (**Alloy Steel**) (b) Locking Plate (**Structural Steel**)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.2.4	Bearing Pin (**ForgedSteel**)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.2.5	Support Plate for Bearing Pin		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.2.6	Link Tube Support Bracket		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii)Mechanical properties	01 test		Conformity to	LTC	R	Testing to be done at

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			and Chemical Composition	piece/ lot / heat		specifications			NABL approved laboratory
2.3.0	**POWER UNIT ASSY (DRG. NO._____)**								
2.3.1	Pump & Motor Mounting Bracket (Steel Fabrication)		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.3.2	Sole Plate (Plates)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab
2.3.3	Manifold block **(Forging)**		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab
			(iii) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be done by ISNT / ASNT Level II or III qualified technician
2.4.0	**HYDRAULIC ACTUATOR ASSY/HYDRAULIC CYLINDER & RAM ASSEMBLY (DRG. NO____)**								
2.4.1	Tube for cylinder / Cylinder Barrel		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iii) U.T followed by pressure test @ 1.5 times working pressure, 30 mins	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be done by ISNT / ASNT Level II or III qualified technician
2.4.2	Cross Head Ram (**Steel Forging**)		(i) Heat treatment	100%		Conformity to specifications	HT Report	R	
			(ii) Stamping & test piece identification	100%		Conformity to specifications	IR	W	
			(iii) Mechanical properties and Chemical Composition	01 test piece/ lot /		Conformity to specifications	LTC	R	Testing to be done at NABL approved

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				heat					laboratory
			(iv) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	W	Testing to be done by ISNT/ASNT Level II or III qualified technician
			(v)MPT / DPT on machined surfaces	100%			NDE Report	CHP For W	
2.4.3	Cylinder Rear End Cover (Fabrication)		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii)Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.4.4	Cylinder Front End Cover (Fabrication)		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii)Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.4.5	(a) H- Beam (b) Guide Plate (c) Retainer Plate Pin (d) Cross head pin		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii)Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.4.6	Cod Piece (**Copper Alloy Casting**)		(i) Pouring with integral test bar	100%		Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(iii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iv) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician
			(v) MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
			(vi) RT	Critical regions			NDE Report	CHP for R	
2.4.7	Bearing Bush / Neck Bush (**Cu alloy Casting**)		(i) Pouring with integral test bar	100%	SOTR, Approved GA drawing, DBOM	Conformity to specifications	IR	R	If casting is without integral test bar, pouring to be

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					and manufacturing drawings				witnessed by QAO
			(ii) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(iii) Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iv)U.T followed by pressure test	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Test pressure to be recommended by firm based on design criteria viz. thickness, material & load / pressure etc. for approval. Testing to be done by ISNT/ASNT Level II or III qualified technician
			(v)MPT / DPT on machined surfaces	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	
			(vi) RT	Critical regions			NDE Report	CHP for R	
2.4.8	Steel Plates (Cylinder Base) for fabrication		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii)Mechanical properties and Chemical Composition	01 test piece/ lot / heat		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.4.9	Crosshead Slipper		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece / lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab
2.4.10	Guide Slipper		(i) Material identification & stamping	100%		Conformity to specifications	IR	W	
			(ii)Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.5.0	**SUPPLY TANK ASSY (DRG. NO._____)**								
2.5.1	Steel Plates for Fabrication		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory

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					drawings				
2.6.0	**RESERVE OIL TANK ASSEMBLY (DRG. NO. _____)**								
2.6.1	Steel Plates for Fabrication		(i) Material identification & stamping	10%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.7.0	**DISTRIBUTION BLOCK ASSEMBLY (DRG. NO._____)**								
2.7.1	Manifold Block / Distribution Block (**Steel Forging**)		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iii) U.T	100%		Defects within permissible limits as per applicable standards / specs	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician
			(iv) MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
2.8.0	**PIPES & FITTINGS (DRG. NO.____)**								
2.8.1	Cupro-Nickel Pipes (Cu-Ni 70 / 30)		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii)Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iii) Eddy Current test	100%		Tubes are free from defects	NDE Report	CHP for W	Testing to be done by ISNT / ASNT Level II or III qualified technician
			(iv) Pressure testing (1.5 times working pressure, 30 mins)	100%		Pressure Test is satisfactory	IR	W	
			(v) Annealing	100%		Conformity to specifications	HT Report	R	
2.8.2	Hydraulic Hoses and End fittings /		(i) Product Identification	100%		Conformity to specifications	IR	W	OEM TC to indicate details of Ozone test,

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	Connections		(ii) Pressure Test (1.5 times working pressure, 30 mins)	100%		Conformity to specifications	IR	CHP for W	oil resistance test & Burst Test for Hoses. Hose register to reflect hose size and shelf life.
2.9.0	**LUBRICATION ASSEMBLY (DRG. NO._____)**								
2.9.1	Brass tube		(i) Material identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iii) Eddy Current test	100%		Tubes are free from defects	NDE Report	CHP for W	Testing to be done by ISNT / ASNT Level II or III qualified technician
			(iv) Pressure test at 1.5 times working pressure, 30 mins	100%		Pressure Test is satisfactory	IR	W	
2.10.0	**ESP POWER UNIT ASSEMBLY & SUPPLY OIL TANK (DRG NO._____)**								
2.10.1	Bell Housing (Plates)		(i) Material Identification & stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
2.10.2	Manifold Block		(i) Material Identification & stamping	100%		Conformity to specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 test piece per lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
			(iii) U.T	100%		Conformity to applicable standard/ specifications	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician
			(iv)MPT / DPT on machined surfaces	100%			NDE Report	CHP for W	
2.10.3	Steel Plates for Tank Fabrication		(i) Material Identification & stamping	100%		Conformity to specifications	IR	W	

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			(ii) Mechanical properties and Chemical Composition	01 test piece / lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab
3.0.0	**OUTSOURCED COMPONENTS / ITEMS**								
3.1.0	**RUDDER BEARING ARRANGEMENT (DRG. NO.___)**								
3.1.1	Lower bearing and Upper bearing (Synthetic)		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC / CC	R	
3.1.2	Seal PTFE		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.1.3	Gland packing		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.1.4	Lantern Ring		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.1.5	Lifting Hook		Product identification	100%		Conformity to specifications	STC / CC	R	
3.1.6	Nyloc Nut		Product identification	100%		Conformity to specifications	STC / CC	R	
3.1.7	SOC. HD. Cap Bolt		Product identification	100%		Conformity to specifications	STC / CC	R	
3.1.8	Hardware Item (High Grade Alloy Steel)		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii)Mechanical properties and Chemical Composition	01 test piece per lot		Properties meet the laid down specifications	LTC	R	Testing to be done at NABL approved laboratory
3.2.0	**LINK TUBE ASSEMBLY / SYNCHRONISING LINK TUBE ASSEMBLY (DRG.NO.__)**								
3.2.1	Bearing		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC / CC	R	
3.2.2	Spring Feed Lubricator		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.3.0	**RUDDER FEED BACK UNIT / SUB COMPONENTS RUDDER BEARING ASSEMBLY (DRG. NO.____)**								
3.3.1	Feed Back Unit with Potentiometer		(i) Product identification	100%	SOTR, Approved GA drawing, DBOM and	Conformity to specifications	OEM TC /CC	R	
			(ii) Functional check on assembly	100%		Functional checks are satisfactory	IR	W	

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					manufacturing drawings / catalogue				
3.4.0	**POWER UNIT ASSY (DRG. NO____)**								
3.4.1	Couplings / Flexible Coupling		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC/ CC	R	
3.4.2	Pump		(i) Product identification.	100%		Conformity to specifications	OEM TC /CC	R	
			(ii) Functional check on assembly	100%		Functional check should be satisfactory	IR	W	
3.4.3	Hydraulic Fittings (Passivated)		(i) Product identification	100%		Conformity to specifications	OEM TC /CC	R	
			(ii) Pressure Testing (1.5 times working Pressure, 30 mins)	01 test piece per lot		Pressure Test is satisfactory	IR	W	
3.4.4	O' Rings & Bonded Seals		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Polymer Identification	100%		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory
3.4.5	Oil cooler		Inspection	100%	As per separately approved QAP		Form IV / I-note	R	
3.4.6	Accumulator Unit		(i) Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC / CC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
3.4.7	Servo Filter		Product identification	100%		Conformity to specifications	OEM TC	R	
3.4.8	Boost Filter		Product identification	100%		Conformity to specifications	OEM TC	R	
3.4.9	Suction Filter		Product identification	100%		Conformity to specifications	OEM TC	R	
3.4.10	Pressure Switch		Product identification	100%		Conformity to specifications. Calibration is indate.	OEM TC & Calibration Certificate	R	

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3.4.11	Shock & Vibration Mounts		Inspection	100%	As per SQAP / Separately approved QAP		Form IV / I-note	R	
3.4.12	Ball Valve		(i) Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC/ CC	R	
			(ii) Pressure Test and Functional Checks on assembly	100%		Pressure test and functional checks are satisfactory	IR	W	
3.4.13	Cartridge Valve		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC / CC	R	
3.4.14	Cartridge Cover		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.4.15	Solenoid Operated D.C.Valve		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.4.16	Quick Change Coupling		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.4.17	Check Valve		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	
3.4.18	Accumulator Pressure Gauge		Product identification	100%		Conformity to specifications. Calibration is indate.	OEM TC & Calibration Certificate	R	
3.4.19	Suction Filter Pressure Gauge		Product identification	100%		Conformity to specifications. Calibration is indate.	OEM TC & Calibration Certificate	R	
3.4.20	Servo Valve		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	

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3.4.21	Pressure Gauge		(i)Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications Calibration is indate.	OEM TC & Calibration Certificate	R	
			(ii)Functional Checks on assembly	100%		Pressure gauges are functional	IR	W	
3.4.22	Junction Box		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Inspection is satisfactory	IR	R	
3.5.0	**HYDRAULIC ACTUATOR OR CYLINDER RAM ASSEMBLY (DRG. NO. ____)**								
3.5.1	Actuator Bearings Spherical Roller Bearing		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC	R	
3.5.2	(a) Indicator strip (b) Packing (c)Hardware items		Product Identification	100%		Conformity to specifications	OEM TC / CC	R	
3.5.3	Wiper Ring		Product Identification	100%		Conformity to specifications	OEM TC / CC	R	
3.5.4	Chevron Packing		Product Identification	100%		Conformity to specifications	OEM TC / CC	R	
3.5.5	Rudder Locking Valve		Product Identification	100%		Conformity to specifications	OEM TC	R	
3.5.6	Dowty Seal		Product Identification	100%		Conformity to specifications	OEM TC	R	
3.5.7	Banjo Coupling		Product Identification	100%		Conformity to specifications	OEM TC	R	
3.5.8	Male Stud Coupling		Product Identification	100%		Conformity to specifications	OEM TC	R	
3.5.9	Spring Feed Lubricator		Product Identification	100%		Conformity to specifications	OEM TC	R	
3.5.10	Self-sealing Coupling with Blanking cap		Product Identification	100%		Conformity to specifications	OEM TC	R	
3.6.0	**SUPPLY TANK & RESERVE TANK ASSY (DRG. NO._____)**								
3.6.1	Spherical / Ball Valve		(i) Product identification	100%	SOTR, Approved GA	Conformity to specifications	OEM TC / CC	R	

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			(ii) Pressure Test and Functional Checks on assembly	100%	drawing, DBOM and manufacturing drawings / catalogue	Pressure test & Functional checks are satisfactory	IR	W	
3.6.2	Thermostat / Temperature switch		(i) Product identification	100%		Conformity to specifications Calibration is indate.	OEM TC & Calibration Certificate	R	
			(ii)Functional Test on assembly	100%		Functional checks are satisfactory	IR	W	
3.6.3	Magnetic Level Switch		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional Test on assembly	100%		Functional checks are satisfactory	IR	W	
3.6.4	Level gauge / Sight gauge		Product identification.	100%		Conformity to specifications	OEM TC	R	
3.6.5	O' Rings & Bonded Seals		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Polymer Identification	100%		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab
3.6.6	Air Breather		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.6.7	Charging Pump / Semi-Rotary Hand Pump		(i) Product identification.	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional check on assembly	100%		Functional checks are satisfactory	IR	W	
3.6.8	Three-way Valve		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	
3.6.9	Check Valve		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	
3.6.10	Filters		Product identification	100%		Conformity to specifications	OEM	R	

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3.6.11	Quick Change Coupling		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC	R	
3.6.12	Hardware items		Product identification	100%		Conformity to specifications	OEM TC	R	
3.6.13	Hydraulic MS Fittings (Passivated)		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
			(iii) Pressure Test (1.5 times working Pressure, 30 mins)	100%		Pressure Test is satisfactory	IR	W	
			(iv) Coating Thickness (other than passivated)	One test piece / lot		Test is satisfactory	IR	R	
3.6.14	Junction Box		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Test is satisfactory	IR	R	
3.6.15	Limit Switch		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.6.16	Spherical Plug Valve		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.6.17	Door Joint		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Test is satisfactory	IR	R	
3.6.18	Test Actuator		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.7.0	**DISTRIBUTION BLOCK ASSEMBLY (DRG. NO. ____)**								

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3.7.1	(a) Relief Valve (b) Shut off valve		(i) Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC	R	
			(ii) Visual Inspection and Dimensional Inspection	Sampling		Conformity to specifications	IR	R	
			(iii) Pressure tests	100%		Pressure Test is satisfactory	IR	W	
			(iv) Coating thickness (Other than Passivated)	01 test piece / lot		Test is satisfactory	IR	R	
3.7.2	Pump Stop Valve		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.7.3	Cylinder Stop Valve		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.7.4	Pilot Operated DC Valve		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.8.0	**EMERGENCY HAND PUMP ASSEMBLY (DRG. NO. ____)**								
3.8.1	Hand Pump		(i) Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.8.2	Air Breather		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.8.3	Hand Wheel		Product identification	100%		Conformity to specifications	STC / CC	R	
3.8.4	Shock & Vibration Mounts with fasteners		Inspection	100%	As per SQAP / Separately approved QAP		Form IV / I-note	R	
3.9.0	**PIPES FITTINGS (PIPING LAYOUT) (DRG. NO____)**								
3.9.1	O' Rings & Bonded Seals		(i) Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing	Conformity to specifications	OEM TC / CC	R	
			(ii) Polymer Identification	100%		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory

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3.9.2	MS Fittings & Adapters (Passivated)		(i) Product identification	100%	drawings / catalogue	Conformity to specifications	OEM TC / CC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Test is satisfactory	IR	R	
			(iii)Pressure test (1.5 times working Pressure, 30 mins)	100%		Pressure Test is satisfactory	IR	W	
			(iv) Coating Thickness (other than passivated)	One test piece / lot		Test is satisfactory	IR	R	
3.9.3	Filter		Product identification and Visual Inspection	100%		Conformity to specifications	OEM TC	R	
3.10.0	**LUBRICATION ASSEMBLY (Drg No.___)**								
3.10.1	Motorized Lubrication Pump Assembly		Inspection	100%	As per SQAP at Appendix-E		Form IV / I-Note	R	
3.10.2	Shock & Vibration Mount		Inspection	100%	As per SQAP / Separately approved QAP		Form IV / I Note	R	
3.10.3	Stud Stand Pipe Adopter		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC / CC	R	
3.11.0	**PORTABLE FLUSHING UNIT (Drg. No: __)**								
3.11.1	Flushing Unit Assembly		Inspection	100%	As per Separately approved QAP		Form IV / I-note	R	
3.12.0	**ESP POWER UNIT ASSEMBLY & SUPPLY OIL TANK (DRG. NO. _____)**								
3.12.1	Vane Pump		(i) Product identification.	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC / CC	W	
			(ii) Functional check on assembly	100%		Functional checks are satisfactory	IR	W	
3.12.2	Hydraulic MS Fittings & Adapters (Passivated)		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Test is satisfactory	IR	R	
			(iii) Pressure test (1.5 times working Pressure, 30 mins)	100%		Pressure Test is satisfactory	IR	W	

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			(iv) Coating Thickness (other than passivated)	One test piece / lot		Conformity to specifications	IR	R	
3.12.3	O' Rings & Bonded Seals		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii)Polymer Identification	100%		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab
3.12.4	Oil Cooler		Inspection	100%	As per separately approved QAP		Form IV / I-note	**R**	
3.12.5	Filter		Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue	Conformity to specifications	OEM TC	R	
3.12.6	Solenoid Operated DC Valve		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.12.7	Quick Change Coupling (Self-Sealing Coupling)		Product identification	100%		Conformity to specifications	OEM TC	R	
3.12.8	Check Valve		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	
3.12.9	Thermostat / Temperature switch		(i) Product identification	100%		Conformity to specifications. Calibration is indate.	OEM TC & Calibration Certificate	R	
			(ii)Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	
3.12.10	Magnetic Level Switch		(i) Product identification	100%		Conformity to specifications	OEM TC	R	
			(ii) Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	
3.12.11	Level gauge / Sight gauge		Product identification.	100%		Conformity to specifications	OEM TC	R	
3.12.12	O' Rings & Bonded Seals		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Polymer Identification	100%		Conformity to specifications	LTC	R	
3.12.13	Air Breather		Product identification	100%		Conformity to specifications	OEM TC	R	

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3.12.14	Three-way Valve		(i) Product identification	100%		Conformity to specifications	OEM TC / CC	R	
			(ii) Functional Checks on assembly	100%		Functional checks are satisfactory	IR	W	
3.12.15	Hardware items		Product identification	100%		Conformity to specifications	OEM TC	R	
3.12.16	Shock & Vibration Mounts & fasteners		Inspection	100%	As per SQAP / Separately approved QAP		Form IV / I-note	**R**	
3.12.17	Hydraulic MS Fittings (Passivated)		(i) Product identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings / catalogue drawings	Conformity to specifications	OEM TC	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
			(iii) Pressure Test (1.5 times working Pressure, 30 mins)	10%		Pressure Test is satisfactory	IR	W	
			(iv) Coating Thickness (other than passivated)	One test piece / lot		Conformity to specifications	IR	R	
3.12.18	Pressure Relief Valve		Product Identification	100%		Conformity to specifications	OEM TC / CC	R	
3.12.19	Suction Strainer		Product identification	100%		Conformity to specifications	OEM TC / CC	R	
3.12.20	Test Actuator		(i)Product Identification	100%		Conformity to specifications	OEM TC	R	
			(ii)Functional Check on assembly	100%		Functional checks are satisfactory	IR	W	
3.12.21	Pressure Gauge Panel		(i) Product Identification	100%		Conformity to specifications	OEM TC	R	
			(ii)Visual Inspection and Dimensional Inspection	100%			IR	R	
3.12.22	Note:-	1. Make of the items should be as per approved DBOM. 2. For imported components, following documents to be submitted:- (a) Bill of Lading / Shipping Bill / Airway Bill (b) Invoice by OEM or Country of Origin Certificate with Packing List (c) Bill for entry to warehousing (d) OEM Confirmation Certificate (e) Firm's Guarantee certificate as per SOs 3. The inclusion of outsourced components / items under various categories viz. Imported, COTs, Bought-out & Sub-Contracted is to be as per Chapter 5 of QAD (available at DGQA website www.dgqadefence.gov.in) 4. Physical verification / Testing of all outsourced components may be undertaken during assembly.							

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4.0.0	**IN -PROCESS / SUB -ASSEMBLY INSPECTION**								
4.1.0	**WELDING INSPECTION**								
4.1.1	WPS & PQR		Qualification of Procedure for various processes	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	WPS PQR	R	
4.1.2	WPQ		Performance Qualifications	100%			WPQ Record	R	
4.2.0	**RUDDER BEARING ARRANGEMENT ASSEMBLY (DRG. NO.___)**								
4.2.1	Lower Bearing Housing and Upper Bearing Housing		(i) Visual Inspection and Dimensional Inspection after machining	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	R	
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.2	Rudder Stock (Forging)		(i) Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.3	Rudder Stock Bearing Liners / Sleeves (Upper and Lower)		(i) Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.4	Inboard & Outboard Bearing		(i) Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.5	(a) Thrust Bearing (b) End Piece		(i) Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.6	Tiller		(i) Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	

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			after machining						
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.7	Gland Follower		(i) Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.8	(a) Lock nut Tiller (b) Stud (for Lock nut-Tiller) (c) Stud for Gland Follower		(i) Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
			(ii) Surface Finish	100%		Conformity to specifications	IR	R	
4.2.9	Rudder		(i) Visual Inspection and Dimensional Inspection	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) DPT of welding	100%		DPT is satisfactory	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician.
4.2.10	Hull Cartridge Structure		(i) Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	W	
			(ii) DPT of welding	100%		DPT, MPT and UT are satisfactory	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician.
			(iii) MPT of weld joints	100%			NDE Report	CHP for W	
			(iv) UT of critical weld joints	Critical Welds			NDE Report	CHP for W	
4.2.11	Bedding Contact of Tiller to Rudder Stock		Blue Matching	100%		Conformity to specifications. Min. 80% Bedding Contact	IR	CHP for W	
4.3.0	**LINK TUBE ASSEMBLY / SYNCHRONISING LINK TUBE ASSEMBLY (DRG. NO. ____)**								
4.3.1	Link tube		Visual Inspection and Dimensional Inspection	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	R	
4.3.2	Link end L.H. & R.H.		Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
4.3.3	Bearing Retainer		Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	

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4.3.4	Bearing Pin		Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
4.3.5	Locking Plate		Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
4.3.6	Support Plate for Bearing Pin		Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
4.3.7	Link Tube Support Bracket		Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
4.3.8	Final Assembly		Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	CHP for W	
4.4.0	**POWER UNIT ASSY (DRG. NO.____)**								
4.4.1	Pump and Motor Mounting Bracket		(i)Visual Inspection and Dimensional Inspection after machining	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Conformity to specifications	IR	R	
			(ii) DPT of weld joints	100%		Conformity to applicable standard / specifications	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician
4.4.2	Sole Plate		(i) Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
			(ii) DP Test of welding	100%		Conformity to applicable standard / specifications	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician.
4.4.3	Manifold Block		Visual Inspection and Dimensional Inspection after machining	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Conformity to specifications	IR	R	
4.4.4	Final Assembly		(i) Check the items as per assembly drawing	100%		Conformity to specifications	IR	W	
			(ii) Visual Inspection and Dimensional Inspection as per assembly drawing	100%		Conformity to specifications	IR	CHP for W	
			(iii) Shop floor test as per test procedure	100%		Inspection is satisfactory	IR	CHP for W	
4.5.0	**HYDRAULIC ACTUATOR / HYDRAULIC CYLINDER RAM ASSEMBLY (DRG NO. ____)**								
4.5.1	Tube for Cylinder / Cylinder Barrel		Visual Inspection and Dimensional Inspection	100%	SOTR, Approved GA	Conformity to specifications	IR	R	

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			after machining		drawing, DBOM, manufacturing drawings and approved ATP / FATs document				
4.5.2	Cross head Ram		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.3	Cylinder Rear end Cover		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.4	Cylinder Front End Cover		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.5	H- Beam/Guide Bar		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.6	Guide Plate / Guide Keep		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.7	Cod Piece		Visual Inspection and Dimensional Inspection after machining	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Conformity to specifications	IR	R	
4.5.8	Bearing Bush and Plate		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.9	Cross Head Slipper		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.10	Guide Slipper		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.5.11	Final Assembly		(i) Check assy. as per drawing	100%		Conformity to specifications	IR	CHP for W	
			(ii) Check for movement and stroke length	100%		Movement is satisfactory	IR	CHP for W	
			(iii) Pressure Test @1.5 times of working pressure	100%		Pressure test is satisfactory	IR	CHP for W	
4.6.0	**SUPPLY TANK ASSEMBLY (DRG. NO___)**								
4.6.1	Tank (Fabrication)		(i) Visual Inspection and Dimensional Inspection	100%	SOTR, Approved GA	Conformity to specifications	IR	R	

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			(ii) DPT of welding	100%	drawing, DBOM, manufacturing drawings and approved ATP / FATs document	DPT is satisfactory	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician.
4.6.2	Final Assembly		(i) Check the items as per assembly drawing	100%		Conformity to specifications	IR	CHP for W	
			(ii) Leakage test as per approved FATs procedure	100%		Nil leakages	IR	CHP for W	.
4.7.0	**RESERVE OIL TANK ASSEMBLY (DRG. NO. ____)**								
4.6.1	Tank (Fabrication)		(i) Visual Inspection and Dimensional Inspection	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Conformity to specifications	IR	R	
			(ii) DPT of welding	100%		DPT is satisfactory	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician.
4.6.2	Final Assembly		(i) Check the items as per assembly drawing	100%		Conformity to specifications	IR	CHP for W	
			(ii) Leakage test as per approved FATs procedure	100%		Nil leakages	IR	CHP for W	.
4.8.0	**DISTRIBUTION BLOCK ASSEMBLY (DRG. NO. ____)**								
4.8.1	Final Assembly		(i) Visual Inspection and Dimensional Inspection as per assembly drawing	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Conformity to specifications	IR	CHP for W	
			(ii) Pressure Test @ 1.5 times of working pressure, 30 mins & Functional Test	100%		Pressure Test and Functional Test are satisfactory	IR	CHP for W	
4.9.0	**EMERGENCY HAND PUMP ASSEMBLY (DRG. NO.____)**								
4.9.1	Hand Pump Assembly		(i) Visual Inspection and Dimensional Inspection as per assembly drawing	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Conformity to specifications	IR	CHP for W	
			(ii) Functional Test	100%		Functional Test are satisfactory	IR	CHP for W	
4.10.0	**ESP POWER UNIT ASSEMBLY & SUPPLY OIL TANK (DRG. NO._____)**								
4.10.1	Bell Housing		(i) Visual Inspection and Dimensional Inspection	100%	SOTR, Approved GA	Conformity to specifications	IR	R	

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			(ii) DPT of welding	100%	drawing, DBOM, manufacturing drawings and approved ATP / FATs document	DPT is satisfactory	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician.
4.10.2	Tank		(i) Visual Inspection and Dimensional Inspection	100%		Conformity to specifications	IR	R	
			(ii) DPT of welding	100%		DPT is satisfactory	NDE Report	CHP for W	Testing to be done by ISNT/ASNT Level II or III qualified technician.
4.10.3	Manifold Block		Visual Inspection and Dimensional Inspection after machining	100%		Conformity to specifications	IR	R	
4.10.4	Final Assembly		(i) Visual Inspection and Dimensional Inspection as per assembly drawing	100%		Conformity to specifications	IR	CHP for W	
			(ii) Functional & Leakage test as per approved FATs procedure	100%		Functional and Leakage Test are satisfactory	IR	CHP for W	
5.0.0	**PRE-REQUISITE -FINAL INSPECTION (IFT)**								
5.1.0	**TYPE TESTING OF HYDRAULIC SYSTEM (Actuators, Distributors, Valves, Power Pack, Pipelines and Other Hydraulic Components)**								
5.1.1	Endurance Run of Hydraulic System - 100Hrs uninterrupted		All functional parameters to be recorded	01 Unit	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	All parameters are satisfactory	Type Test Report	CHP for W	
5.1.2	Tilt Test (unit is to run for 01 hour with 20° tilt in each direction)		All functional parameters to be recorded	01 Unit		All parameters are satisfactory	Type Test Report	CHP for W	
5.1.3	Shock Analysis of Hydraulic system		Compliance to Shock Grade IN Shock Grade A / NSS II, as applicable, is to be proved	01 Unit		Equipment meets IN Shock Grade A / NSS II, as applicable	NSTL(V) Report	CHP for R	
5.1.4	Noise & Vibration		(i) Mechanical Vibration of Hydraulic System	01 Unit		Vibration amplitude within limits specified in SOTR	LTC	CHP for R	Reports to be forwarded to IHQ MoD(N) for validation / approval
			(ii)Structure Borne Noise of Hydraulic System	01 Unit		SBN meeting the limits specified in SOTR	LTC	CHP for R	
			(iii) Air Borne Sound Power radiated by Hydraulic System	01 Unit		ABN meeting the limits specified in SOTR	LTC	CHP for R	

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5.2.0	**HYDRAULIC FATS**								
5.2.1	Test Bed Facility		Suitability as per FATs requirements	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Test bed should be suitable for FATs	IR	W	
5.2.2	Internal FATs Report		All QA Checks Including Functional & Safety Parameters	100%		Internal FATs completed satisfactorily	Internal FATs Report	CHP for R	
5.2.3	FATs of Hydraulic System (Power Packs) - Proving Run 24 Hrs		(i) Verification of Type Test Report	100%		Type Test Report is available	TT Report	R	
			(ii) Visual Inspection and Dimensional Inspection	100%		Inspection is satisfactory	IR	CHP for W	
			(iii) Functional & Safety Checks	100%		Functional & Safety Checks are satisfactory	IR	CHP for W	
			(iv) Noise & vibration Checks	100%		Noise & Vibration checks are satisfactory	IR	CHP for W	
			(v) Dispatch Clearance / Form IV (if manufactured by sub- vendor)	100%			IR	R	
5.3.0	**ELECTRICAL & ELECTRONICS COMPONENTS**								
5.3.1	Motor		Inspection	100%	As per SQAP		Form IV / I-note	R	Integration trials of motor with MSP to be conducted at manufacturers place
5.3.2	Motor Starter Panel		Inspection	100%	As per SQAP		Form IV / I-note	R	
5.3.3	Control Panel		Inspection	100%	As per SQAP		Form IV / I-note	R	
5.3.4	ESS Test (for PWAs)		PWAs Testing	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP	ESS Tests are satisfactory	ESS Report	R	
5.3.5	Final Functional Test (For PWAs -DIP, DOP, AIP, AOP)		Functional Checks	100%		Final functional tests are satisfactory	Test Report	CHP for W	
5.3.6	Inter Unit Wiring Checks		Wiring checks	Random		Checks are satisfactory	Wiring Report	W	
6.0.0	**MISCELLANEOUS REQUIREMENTS**								
6.1.0	Submission of Draft Documentation		Checks of draft documentation	100%	SOTR / PO	Draft should be available	IR	CHP for R	To be forwarded to IHQ MoD(N) for approval
6.1.1	Software Quality		Software Testing	100%	Separately	Software testing is	Form IV / I-	R	

STANDARD QUALITY ASSURANCE PLAN FOR STEERING GEAR SYSTEM

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
	Checks				approved Software QAP	satisfactory	note		
6.1.2	Inspection of the test bed setup & Integrated System		As per IFT document	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / FATs document	Checks are satisfactory	IR	W	
6.1.3	TSP / TNC Compliance		Checks for compliance to TSP / TNC	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings TSP / TNC minutes	Compliance to TSP / TNC minutes	Compliance Matrix	CHP for R	
7.0.0	**FINAL INSPECTION - IFT (MECHANICAL, HYDRAULIC & CONTROL SYSTEM)**								
7.1.0	Integrated Functional Trials of Mechanical, Hydraulic & Control System on OEM Test Bed / Stand		All functional parameters to be recorded. 100 Hrs for first set. 24 Hrs Production Run for balance sets.	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / IFATs document	Satisfactory completion of all trials. Liquidation of all defects / shortcomings observed during IFATs	IFATs Report	CHP for W	
8.0.0	**PRE-REQUISITE-ISSUE OF I & T CERTIFICATE / FORM-IV**								
8.1.0	OBS Items as per Purchase Order		Product identification and Visual Inspection	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and approved ATP / IFATs document	OBS are supplied as per PO	MTC and CC	W	
8.1.1	Submission of 'As Built' Drawings'		Verification and Stamping	100%		As built drawings are complete and satisfactory	As built drawings	CHP for R	
8.1.2	Submission of Approved Documentation		Verification and Stamping	100%		Documentation is complete	Documentation	CHP for W	
8.1.3	Liquidation of observations during		Liquidation of defects	100%		All defects liquidated	IR	W	

STANDARD QUALITY ASSURANCE PLAN FOR STEERING GEAR SYSTEM

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
	IFT (If any)								
8.1.4	Weight Recording		Weighing	100%		To be within limits	Weight Certificate	W	
8.1.5	Painting & Preservation		Visual Inspection and Dry Film Thickness	100%		Painting and DFT meets the specifications	IR	W	
8.1.6	Submission of FORM4 (I & T Certificate)		Correctness	100%			FORM-4	P	

NOTE:-

1. Equipment & accessories to be supplied should conform to specifications.
2. If Type Testing, EMI/EMC and ETT have already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will be provided for review of Inspection Agency.
3. EMI / EMC test and ET will be done at Government/PSU test centers or Firm's lab if NABL accredited.
4. Material Testing to be done at NABL approved Lab.
5. 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. For RT, the shooting sketch indicating Critical Test Regions and Test Regions to be submitted prior to testing.
6. The 'Bought out' items in the QAP are indicative only. The firm is required to categorically define the 'Bought out' / COTS items specific to their products in the drawings. Items will be categorized as bought out or COTs in the QAP on the basis of approved drawings. Further, only finished products will be accepted as COTs and no raw material for manufacturing will be acceptable as a COTs item.
7. The QAP does not apply to items not in the scope of supply of the firm. Inspection of assemblies / sub-assemblies and other items which have not been included in the SQAP but form an important part of the system will also be undertaken.
8. Pressure testing of hydraulic fittings will be undertaken on assembly. All pressure testing specified in the QAP will be as per the approved ATP / FATs document.
9. Shooting sketch indicating critical test zones and test zones are to be submitted prior to testing.
10. 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.
11. Software QAP is to be approved by IHQ MoD (Navy).
12. The Functional Checks on assembly are to be undertaken at the earliest available opportunity (FATs / IFATs).
13. The defects observed during NDT of castings and forgings should be within the acceptable limits specified in the applicable standards.

Appendix - 'B'
Refers to Part-II of SQAP

STANDARD QUALITY ASSURANCE PLAN FOR MOTORS

SL. NO	MATERIAL/ COMPONENT/ DRG.NO / QUALITY ACTIVITY	QTY	CHARACTERISTIS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
1.0	**DRAWINGS/DOCUMENTS/TYPE TESTS**								
1.01	Drawings		Approved drawings	100%	PO, SOTR, TNC Minutes & EED-Q-071 (R4) (whichever is relevant)	Same as reference documents	List of approved binding drawings	CHP for R	Approval by Design Authority, Prof. Dte, Shipyard and Inspection Authority / Command HQ to be verified.
2.0	**MATERIAL INSPECTION**								
2.01	(a) SS Shaft (b) Structural Steel for Plate		Mechanical properties and Chemical Composition	Sample	Approved Drawings	Material grade std as per approved drgs	LTC (NABL Lab)	CHP for R	Sample to be drawn in presence of QA rep
2.02	(a) SS Shaft (b) Structural Steel for Plate		UT	100%	-do-	-do-	Certified by ASNT level - II Personnel	R	
2.03	(a) Stamping (b) Copper Wire		(i) Visual Inspection (ii) Dimensional Inspection (iii) Mechanical, Chemical, Thermal and Electrical Properties	Sample	-do-	-do-	STC	R	
2.04	(a) Bearing Make / Type (b) Shaft Seal (c) Misc items viz. Cable Gland, Cooling Fan etc. As per PO / Approved Drawings		(i) Visual Inspection (ii) Dimensional Inspection	100%	-do-	-do-	STC	R	
3.0	**STAGE INSPECTION**								
3.01	Rotor & Stator		(i) Visual Inspection (ii) Dimensional Inspection (iii)Calculation of air gap	100%	-do-	Approved drawings	Firm's QA Report / STC	R	
3.02	Rotor		Balancing	100%	-do-	-do-	Firm's QA Report	R	

SL. NO	MATERIAL/ COMPONENT/ DRG.NO / QUALITY ACTIVITY	QTY	CHARACTERISTIS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
4.0	**ASSEMBLY**								
4.01	Motor Assembly		Bill of Material items	100%	Approved drawings	Firm Report	IR	W	
5.0	**TEST AND TRIALS**								
5.01	Type Tests		(a) Insulation Resistance (Ambient & Hot) (b)Winding Resistance (Hot & Cold) (c) Temperature rise (d) Load test at 100%, 75% and 50 %. Determine Efficiency & PF (e) Starting Torque (f) Pull Out Torque (g) Starting Current and Run up Time (h) Reduced Voltage Test (j) Over Speed at 115% for15 minutes (k) Withstand Voltage (l) Oscilographic records of Starting Current at Full Load / No Load at Normal / Reduced Voltage (m) Phase Balance at Full Load / No Load Conditions. (n) Momentary Over-load Test at 110% for 15 sec. (p) Thermister Resistance (Ambient, Hot & Cold) (q) Hot Spot Sensing (r) IP (as applicable) (s) Direction of rotation (t) Earth Bonding (u)Protection Under Stall Condition	One motor of each frame size per lot	DEE Policy	EED-Q-071-(R4) and approved drawing	Type test report	W	

SL. NO	MATERIAL/ COMPONENT/ DRG.NO / QUALITY ACTIVITY	QTY	CHARACTERISTIS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
5.02	Routine Tests		(a) No load test (b) Over speed test at 115 % for 15 minutes (c)Short circuit test (d)Thermister resistance (ambient, hot and Cold) (e) Phase balance at no load (f)Starting torque (g)Winding resistance (Hot & Cold) (h)Space heater (where ever applicable) (j) IP (as applicable) (k)Direction of Rotation	All balance motors	EED-Q-071(R4) and approved drawing	EED-Q-071(R4) and approved drawing	Routine Test Report	W	
5.03	General for all motors		(a) Insulation test (ambient & hot) (b) High voltage test (c)Noise level test (d)Vibration test (e)Bearing check / SPM (f)Dimensional check (g)Weight check (h)Terminal / name plate check (j)Earth bond test. (k)Space heater (wherever applicable) (l)Withstood voltage	All motors	EED-Q-071(R4) and approved drawing	EED-Q-071(R4) and approved drawing	Routine Test Report	W	
5.04	Integration Trial		As per DEE Policy	One motor of each type with respective starter / control panel	DEE Policy	DEE Policy	IR	W	Starter motor integration trials to be conducted at motor manufacturer place as per IHQ policy EE/01/1-67/Power-18 dt 15 Jul 10. Only for new construction ships

SL. NO	MATERIAL/ COMPONENT/ DRG.NO / QUALITY ACTIVITY	QTY	CHARACTERISTIS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
5.05	Type tests, ETT & EMI/EMC reports		Verification	Prototype sample	PO	PO	Type test reports	CHP for R	EMI / EMC Acceptance Test Plan duly vetted by NEC Mumbai
6.0	**DOCUMENTATION**								
6.01	Documents for operation, maintenance and repair		Availability & verification	100%	PO	PO	-	CHP for R	
7.0	**PAINTING, PACKING AND PRESERVATION**								
7.01	Painting, Packing, Preservation and Marking		As per SOTR/PO	100%	Critical	SOTR / PO		CHP for W	

NOTE:-

1. Type Test, EMI/EMC and Environmental test in accordance with EED-Q-071-(R4) / JSS-55555.2012(Rev. 3) is to be carried out after QA agencies, clearance and sealing of equipment. Post ET and EMI/EMC, checks will also be conducted by QA agencies. If Type Testing, EMI/EMC and ET has already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will be provided for review of Inspection Agency. In case of any difficulty/discrepancy in carrying out the above, matter be referred to IHQ MoD(N)/DEE within 10 days of receipt of approved QAP under intimation to HQ DQA(WP).
2. EMI EMC test and ET will be done at NABL Lab. EMI/EMC Acceptance Test Plan is to be duly vetted by NEC Mumbai.
3. Equipment & Accessories to be supplied should conform to specifications.
4. Starter cum control panel is to be procured / manufactured only from Naval approved vendor as mentioned in IHQ MoD (N)/DEE Compendium of Vendors 2015 No. EE-50-30(REV-2) dated 29 Jun 15.

Appendix - 'C'
Refers to Part-II of SQAP

STANDARD QUALITY ASSURANCE PLAN FOR AC STARTERS AND CONTROL GEAR

SL. NO	MATERIAL/ COMPONENT/ DRG. NO / QUALITY ACTIVITY	QTY	CHARACTERISTCS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
1.0.0	**DRAWINGS/DOCUMENTS/TYPE TESTS**								
1.01	Drawings		Approved drawings	100%	PO, SOTR, TNC Minutes andEED-Q-071(R4) (whichever is relevant)	Same as reference document	List of approved drawings	CHP for R	Approval by design authority, Prof Dte, Shipyard and Insp. Authority / Command HQ to be verified.
2.0.0	**MATERIAL INSPECTION**								
2.01	Steel for fabrication		Dimensions	Measurement	Approved Drawings	Material grade std. as per approved drawings	IR	CHP for R	Sample to be drawn in presence of QA rep
			Surface finish	Visual			IR		
			Physical & Chemical Properties	Sample			LTC (NABL Lab)		
	COTS ITEMS								
2.02	Air Break Switch		Type No.	Verification	Make / Type as per Approved Drawings	Standard as per approved drawings	STC	R	
			Current Rating						
			Voltage Rating						
2.03	Air Circuit Breaker		Type No.	Verification	-do-	-do-	STC	R	
			Current Rating						
			Voltage Rating						
2.04	Air Break Contactor		Type No	Verification	-do-	-do-	STC	R	
			Current Rating						
			Coil Voltage						
			Auxiliary Contacts						
2.05	Bus Bar		Cross Section	Verification	-do-	-do-	STC	R	
			Conductivity						
			Bend Test						
			Tensile Test						
			Chemical composition						
2.06	Cable		Voltage Grade	Verification	Make / Type as per Approved Drawings	Standard as per approved drawings	STC	R	
			Colour						
			Nominal cross section area						
			Thickness of insulation						
			IR Value						

SL. NO	MATERIAL/ COMPONENT/ DRG. NO / QUALITY ACTIVITY	QTY	CHARACTERISTCS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
			Cond. Resistance						
2.07	Current Transformer		Type of CT (Insul-ation material used)	Verification	-do-	-do-	STC	R	
			Terminal Markings / Dimensions						
			Polarity						
			Ratio						
			Burden (Not applicable for special purpose CTs)						
			Knee pt. (Applicable for special purpose CTs Voltage)						
			ALF (Applicable for special purpose CTs)						
			ISF (Applicable for special purpose CTs)						
2.08	Control Transformer		Ratio	Verification	-do-	-do-	STC	R	
			Tapping						
			Rating						
			Terminal Markings						
2.09	Busbar Support		Flammability	Verification	-do-	Approved drawings	STC	R	
			Water absorption						
			Density						
			Tensile Strength						
			Compressive st.						
			Flexural Strength						
			Impact Strength						
			Breakdown Voltage						
			Arc Resistance						
			Dimension						
2.10	HRC Fuse & Fuse Base		Type No	Verification	Make / Type as per Approved Drawings	Approved drawings	STC	R	
			Current Rating						
			Voltage Rating Continuity						
2.11	MCCB		Type No.	Verification	-do-	-do-	STC	R	
			Current Rating						
			Voltage Rating						
2.12	MCB		Type No.	Verification	-do-	-do-	STC	R	
			Current Rating						

SL. NO	MATERIAL/ COMPONENT/ DRG. NO / QUALITY ACTIVITY	QTY	CHARACTERISTCS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
			Voltage Rating						
2.13	Meters (Voltmeters, Ammeter, Frquency meter, KWH meter, Transducer etc.)		Range / Make	Verification	-do-	-do-	STC	R	
			CTR/PTR/Shunt						
			Type of Movement						
			Calibration/ Accuracy						
2.14	Neoprene Gasket/Conductive gasket/EMI shielding as applicable		Dimensions	Verification	-do-	Standard as per approved drawings	STC	R	
			Hardness						
			Flame Test as applicable						
2.15	Voltage Transformer / Potential Transformer		Ratio	Verification	-do-	-do-	STC	R	
			Burden						
			Accuracy Class						
			Polarity						
			No of Phases						
			Voltage factor						
			Insulation Level						
			Functional checks						
2.16	Relays		Model /Type No.	Verification	-do-	Approved drawings	STC	R	
			Relay Details						
			Auxiliary contacts						
			Operational Checks						
2.17	Space Heater		Rating	Verification	-do-	-do-	STC	R	
			Wattage						
2.18	Thermostat		Range	Verification	-do-	-do-	STC	R	
			Rating						
2.19	Timer		Type No	Verification	-do-	Standard as per approved drawings	STC	R	
			Voltage Rating						
			Aux. Contacts						
2.20	Miscellaneous Electrical items (Bulbs, Lamp Holder, Resistors, PB, Actuators, Diodes, Bridge Rectifiers, Switch)		Make	Verification	-do-	-do-	STC	R	
			Rating						
2.21	Core Balanced CTs		Make	Verification	-do-	-do-	STC	R	
			Type						
			Rating						
			Primary Operating Current						

SL. NO	MATERIAL/ COMPONENT/ DRG. NO / QUALITY ACTIVITY	QTY	CHARACTERISTCS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
			CT Secondary Current						
			Tripping Time						
			Tripping Range						
2.22	Soft Starter		Make	Verification	-do-	-do-	STC	R	
			Type						
2.23	Cable Glands		Dimensional	Verification	-do-	-do-	STC	R	
2.24	Bare PCBs / PWBs		ESS Test	100%	-do-	As per extant policy (para 2 of footnote relevant)	STC / NABL Report	R	
3.0	**INPROCESS INSPECTION**								
3.01.	Fabrication/ bending Shearing / cut-outs welding		Visual	Visual Check	Approved Drgs	Standard as per approved drawings	IR	CHP for R	
			Dimension	Physical verification					
			For welding distance b/n welding spots.	Physical verification					
3.02	Surface preparation & painting		Visual	VI	-do-	Same as reference document	IR	CHP for R	
			Shade	VI					
			Coating thickness	Conduct					
			Adhesion	Conduct					
3.03	Wiring		Wiring Size	Visual Verification	-do-	-do-	IR	CHP for R	
	Continuity		Ckt Health	By Test					
4.0	**ASSEMBLY**								
4.01	Panel Assembly		Dimension	VI	Approved Drgs	Same as reference document	IR	W	
			Gland Plate assembly						
			Base Plate assembly						
			Panel Coupling						
4.02	Visual Inspection		Overall Dimension and weight	VI	-do-	-do-	IR	W	
			Mounting Arrangement of components						
			Wiring arrangement and ferruling, Gasket fixing, Cable Gland and Tally plate details						
5.0	**TEST & TRIALS**								
5.01	Functional checks		Functional checks at No load & Full Load	By Test	EED-Q-071(R4)	Same as reference	IR	W	Full load test by Current Injection

SL. NO	MATERIAL/ COMPONENT/ DRG. NO / QUALITY ACTIVITY	QTY	CHARACTERISTCS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
			IR Test before and after HV Test HV Test Milivolt drop test on Power Circuit in excess of 100A, Earth bond and Temperature rise (applicable for Panels with Busbar)			document			method
5.02	Type tests, ETT & EMI/EMC reports		Availability & verification	Prototype sample	PO, Approved drawings, EED-Q-071(R4)	Same as reference document	Type test reports	CHP for R	As per para 2 of footnote relevant
6.0	**DOCUMENTATION**								
6.01	Documents for Operation, Maintenance & Repair		Availability & verification	100%	PO	PO	-	CHP for R	
7.0	**PAINTING, PACKING AND PRESERVATION**								
7.01	Packing, Painting, Preservation and Marking		As per SOTR/PO	100%	Critical	Visual	PO	CHP for W	

NOTE:-

1. Type Test, EMI/EMC and Environmental test in accordance with EED-Q-071-(R4)/JSS-55555.2012(Rev. 3) is to be carried out after QA agencies, clearance and sealing of equipment. Post ET and EMI/EMC, checks will also be conducted by QA agencies. If Type Testing, EMI/EMC and ET have already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will be provided for review of Inspection Agency. In case of any difficulty/discrepancy in carrying out the above, matter be referred to IHQ MoD(N)/DEE within 10 days of receipt of approved QAP under intimation to HQ DQA(WP).
2. EMI EMC test and ETT will be done at NABL Lab. EMI/EMC Acceptance Test Plan is to be duly vetted by NEC Mumbai.
3. ESS test (Thermal Cyling, Random Vibration and Burn in / Endurance) as per DQA(N) policy vide letters 66301/Policy-07/DQA(N)/QA-07 dated 09 Aug 16.
4. Equipment & Accessories to be supplied should conform to specifications.
5. Starter cum Control Panel is to be procured /manufactured only Naval approved vendor as mentioned in IHQ MoD(N) / DEE Compendium of Vendors 2015 No. EE-50-30(Rev 2) dated 29 Jun 15.
6. Conformal coating of PCBs to be done as per DQA(N) policy letter 580930/DQA(N)/EL dated 17 Feb 14.

Appendix - 'D'
Refers to Part-II of SQAP

STANDARD QAP FOR STEERING GEAR ELECTRONICS AND CONTROL SYSTEM

SR. NO	COMPONENTS	QTY AS PER P.O	CHARACTERISTICS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	ACTION BY QAE	REMARKS
1.0	**DRAWINGS / DOCUMENTS VERIFICATION**								
1.1	GA Drawings along with DBOM & Binding Data		Check for availability of approved drawings and DBOM & Binding Data	100%	PO & SOTR/ TNC Minutes	All approved drawings along with DBOM & Binding Data are available	List of approved drawings & Binding Data	CHP for R	Approved binding data / drawing to be verified
1.2	Manufacturing Drawings		Verification of manufacturing drawings with reference to the approved GA drawings and DBOM for completeness and sufficiency of data to undertake production and process inspections.	100%	SOTR, GA Drawings along with DBOM	Manufacturing drawings bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	CHP for R	
2.0	**RAW MATERIAL INSPECTION**								
2.1	Steel plates for fabrication of all Panels / Consoles:- • Steering gear panel - Bridge • Steering gear panel - OPS Room • Steering gear panel - MCR • ESP starter panel with ACOS • Angle transmitter unit • Central control panel (Port / Stbd) • Local control unit (Port / Stbd) • Starter panel (Port / Stbd) • ACOS panel (Port / Stbd) • Power supply unit		(i)Material Identification & Stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Raw material confirm to given specifications	IR	W	
			(ii) Mechanical properties and Chemical Composition	01 sample per lot		Physical, mechanical and chemical properties meet the laid down specifications	LTC	R	Testing to be done at NABL approved laboratory.

SR. NO	COMPONENTS	QTY AS PER P.O	CHARACTERISTICS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	ACTION BY QAE	REMARKS
	(Port / Stbd) • Junction Boxes (Port / Stbd) • Control transformer (Port / Stbd) • Any other panel not included in the list								
3.0	**INSPECTION OF MAJOR OUTSOURCED ITEMS**								
3.1	Shock Mounts (Not part of IFT)		Inspection	100%	As per SQAP / Separately approved QAP		Form IV / I-note	R	
3.2	Motor Starter Panels		Inspection	100%	As per SQAP		Form IV / I-note / Dispatch clearance / Test Report	R	
3.3	Motors		Inspection	100%	As per SQAP		Form IV / I-note / Dispatch clearance / Test Report	R	
3.4	Rudder Feedback Unit		(i) Product Identification	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Material confirms to approved drawing	IR	R	
			(ii) Functional test	100%		Functional tests are satisfactory	OEM TC/CC and IR	W	
4.0	**IN-PROCESS/SUB - ASSEMBLY INSPECTION**								
4.1	All Panels and Consoles		(i) Visual & Dimensional Inspection	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	No visible damages; Dimensions are as per the drawing	IR	W	
			(ii) Painting (DFT)	100%		Compliance to specifications	IR	R	
4.2	Electronic units / Components / PCBs / Modules - Indigenously manufactured / assembled		ESS (a) PCB level (b) Module / sub-unit level (c) Unit / cabinet level	100%	SOTR, Approved GA drawing, DBOM manufacturing drawings and	Electronics items should clear ESS	IR	CHP for W	ESS programme is to be drawn up by vendor based on the equipment design and

SR. NO	COMPONENTS	QTY AS PER P.O	CHARACTERISTICS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	ACTION BY QAE	REMARKS
					approved ESS Programme				approved by DQA(WP)
5.0	**ENVIRONMENTAL AND TYPE TEST**								
5.1	Assemblies and Sub-assemblies of the Steering Electronics and Controls System		Pre-type test (applicable for units to undergo type testing)	01 unit of each type	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Functional test is satisfactory	Type Test Report	CHP for W	
			Environmental Tests	01 unit of each type	SOTR, Approved GA drawing, DBOM manufacturing drawings, JSS55555 and approved test plan	ETs are satisfactory	ET Report	CHP for R	
			EMI/EMC Test	01 unit of each type		EMI/EMC test is satisfactory	EMI/EMC Test Report	CHP for R	
			POST-type test (applicable for units to undergo type testing)	01 unit of each type		Functional test is satisfactory	Type Test Report	CHP for W	
6.0	**FINAL INSPECTION / FACTORY ACCEPTANCE TRIALS**								
6.1	1.Local Control Unit 2.ESP starter panel with ACOS 3.Lub Pump Starter Panel 4.ACOS panel		Visual Inspection	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings, EED-Q-071(R4)	Compliance to approved drawings and DBOM	IR	W	
			Completeness of the panel	100%		All hardware as per approved drawings and DBOM are installed	IR	W	
			Overall connection, installation & dimensions	100%		Compliance to approved drawings and DBOM	IR	W	
			Functional Checks at No Load & Full Load	100%		Functional checks is satisfactory	IR	W	Full load test by current injection method or with motor at motor manufacturer's premises as per DEE Policy
			Ingress protection check	Sample		Required degree of protection is achieved	IR	R	To be done at NABL accredited lab

SR. NO	COMPONENTS	QTY AS PER P.O	CHARACTERISTICS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	ACTION BY QAE	REMARKS
			IR Test before and after HV Test	100 %		Insulation resistance is satisfactory	IR	W	
			HV Test	100%		HV test is satisfactory	IR	W	
			Milivolt drop test if power circuit is in excess of 100A	100%		Test is satisfactory	IR	W	
			Earth bond test and temperature rise test	100%		Tests are satisfactory	IR	W	Applicable for panels with bus bar
			Painting - Visual Inspection and DFT	100%		Tests are satisfactory	IR	W	
			Weight measurement	100%		Weight as per specifications	IR	W	
6.2	1. Power Supply Unit 2. Central Control Panel 3. Bridge Console 4. OPS Room Console 5. MCR Console 6. Angle Transmitter Unit 7. Junction Box 8. Control Transformer		Visual Inspection	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings, EED-Q-071(R4)	Compliance to approved drawings and DBOM	IR	W	
			Completeness of the panel	100%		All hardware as per approved drawings and DBOM are installed	IR	W	
			Overall connection, installation & dimensions	100%		Compliance to approved drawings and DBOM	IR	W	
			Functional Checks at No Load & Full Load	100%		Functional checks is satisfactory	IR	W	Full load test by current injection method or with motor at motor manufacturer's premises as per DEE Policy
			Ingress protection check	Sample		Required IP is achieved	IR	R	Tests at NABL accredited lab
			IR Test before and after HV Test	100 %		Insulation resistance is satisfactory	IR	W	
			HV Test	100%		HV test is satisfactory	IR	W	

SR. NO	COMPONENTS	QTY AS PER P.O	CHARACTERISTICS / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	ACTION BY QAE	REMARKS
			Painting - Visual Inspection and DFT	100%		Tests are satisfactory	IR	W	
			Weight measurement	100%		Weight as per specifications	IR	W	
7.0	Software		Refer software QAP for Integrated Electronics system of steering gear system						
8.0	Documentation		Verification	100%	As per SOTR and PO	As per SOTR and PO	IR	CHP for R	
9.0	Packing & Preservation		Visual Inspection	100%	As per SOTR and PO	As per SOTR and PO	IR	CHP for W	
10.0	Submission of FORM4 / DGS&D(S)-84		Correctness	100%			FORM-4/ DGS&D(S) -84	P	

NOTES:-

1. Type Test, EMI/EMC and Environmental test in accordance with EED-Q-071-(R4)/JSS-55555.2012(Rev. 3) is to be carried out after QA agencies, clearance and sealing of equipment. Post ET and EMI/EMC, checks will also be conducted by QA agencies. If Type Testing, EMI/EMC and ET have already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will be provided for review of Inspection Agency. In case of any difficulty/discrepancy in carrying out the above, matter be referred to IHQ MoD(N)/DEE within 10 days of receipt of approved QAP under intimation to HQ DQA(WP).
2. EMI / EMC test and ET will be done at NABL Lab. EMI/EMC Acceptance Test Plan is to be duly vetted by NEC Mumbai.
3. ESS test (Thermal Cyling, Random Vibration and Burn in / Endurance) as per DQA(N) policy vide letters 66301/Policy-07/DQA(N)/QA-07 dated 09 Aug 16. ESS to be undertaken in NABL accredited Lab.
4. Equipment & Accessories to be supplied should conform to specifications.
5. Conformal coating of PCBs to be done as per DQA(N) policy letter 580930/DQA(N)/EL dated 17 Feb 14.

STANDARD QUALITY ASSURANCE PLAN FOR MULTIPOINT LUBRICATING PUMP ASSEMBLY

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 / DOCUMENTS VERIFICATION**								
1.1.0	GA Drawings along with DBOM & Binding Data		Check for availability of approved drawings and DBOM & Binding Data	100%	PO & SOTR/ TNC Minutes	All approved drawings along with DBOM & Binding Data are available	List of approved drawings & Binding Data	CHP for R	Approved binding data / drawing to be verified
1.2.0	Manufacturing Drawings		Verification of manufacturing drawings with reference to the approved GA drawings & DBOM for completeness and sufficiency of data to undertake production & process inspections.	100%	SOTR, GA Drawings along with DBOM	Manufacturing drawings bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	CHP for R	--
1.3.0	Type test / ET / EMI / EMC reports		Availability & verification	100%	PO & SOTR / TNC Minutes/ JSS 55555	Equipment should be tested in the past and relevant certificate is available	Type/ Qualification test reports	CHP for R	Type / qualification test are to be conducted if not undertaken earlier or test certificate not held or equipment has undergone changes
2.0.0	**SECTION I - RAW MATERIAL INSPECTION**								
2.1.0	**MANUFACTURED ITEMS**								
2.1.1	1. Pump body 2. Pump element 3. Reservoir 4. Base plate		(i) Material Identification & Stamping	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Mechanical properties & Chemical Composition	01 sample/ heat / lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved lab.
2.2.0	**BOUGHTOUT ITEMS**								
2.2.1	Gear box		Product Identification	100%	SOTR, Approved GA drawing, DBOM, manufacturing	Conformity to specifications	OEM TC / CC	R	

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
					drawings and catalogue				
2.2.2	Motor		Inspection	100%	As per SQAP		Form IV / I-note	R	
2.2.3	Motor Starter Panel		Inspection	100%	As per SQAP		Form IV / I-note	R	
2.2.4	Brass Tubes		(i) Material Identification & Stamping	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and catalogue	Conformity to specifications	IR	W	
			(ii) Mechanical properties & Chemical Composition	01 sample/ lot		Conformity to specifications	LTC	R	Testing to be done at NABL approved laboratory.
			(iii)Pressure testing	100%		Pressure testing is satisfactory	IR	W	
2.2.5	1. Grease Nipple 2. Limit Switch 3. Tale Tell Rod		Product Identification	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and catalogue	Conformity to specifications	STC	R	
3.0.0	**IN PROCESS INSPECTION**								
3.1.0	1. Pump body 2. Pump element 3. Reservoir 4. Base plate		Visual and Dimensional Inspection	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	R	
3.2.0	Plunger Pump Assembly on Body		Leak tightness and Dimensional Inspection	100%		Conformity to specifications	IR	R	
3.3.0	Plunger Pump Alignment		Alignment checks and Dimensional Inspection	100%		Conformity to specifications	IR	R	
4.0.0	**PRE-REQUISITE FINAL INSPECTION**								
4.1.0	**TYPE TESTING**								
4.1.1	Endurance Test - 24 hrs		Record all functional parameters	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	All parameters satisfactory. No leakages in system	IR	W	
4.1.2	Tilt Test - 30 mins at 15^{o} tilt on both side		Record all functional parameters	01 unit		All parameters satisfactory. No leakages in system	IR	W	

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
4.1.3	Vibration Test		Record vibration signatures	01 unit		To be within specified limits			
4.1.4	Shock Test		Environmental Shock Test	01 unit		Test is satisfactory	NSTL Report	R	
4.1.5	SBN Test, if applicable		Record SBN	01 unit		To be within specified limits	IR	W	
4.1.6	Shock Test		Environmental Shock Test	01 unit		Test is satisfactory	NSTL Report	R	
5.0.0	**FINAL INSPECTION / FACTORY ACCEPTANCE TRIALS**								
5.1.0	Preliminary Test		(i) Visual and Overall Dimensional Inspection	100%	SOTR, Approved GA drawing, DBOM and manufacturing drawings	Conformity to specifications	IR	W	
			(ii) Functioning of tell-tale hole	100%		Inspection is satisfactory	IR	W	
			(iii) Functioning of limit switch	100%		Inspection is satisfactory	IR	W	
			(iv) Functioning of grease filling valve	100%		Inspection is satisfactory	IR	W	
			(v) Preliminary run to check following:- • Motor / cam speed • Abnormal noise • Excessive vibration • Abnormal heating • Leakages	100%		Inspection is satisfactory. No abnormal noise, excessive vibration and leakages observed	IR	W	
5.2.0	Test without load		(i) Measure Discharge	100%	SOTR, Approved GA drawing, DBOM, manufacturing drawings and app. FATs document	Discharge is satisfactory	IR	CHP for W	
			(ii) Leakage from joints	100%		No leakages	IR	CHP for W	
			(iii)Noise and vibration test	100%		To be within limits	IR	CHP for W	
5.3.0	Full Load Test		(i) Measure Discharge	100%		Conformity to specifications	IR	CHP for W	
			(ii) Leakage from joints	100%		No leakages	IR	CHP for W	
			(iii)Noise and vibration test	100%		To be within limits	IR	CHP for W	
5.4.0	Proving Run Test - 06 hrs		(i) Measure Discharge	100%		Conformity to specifications	IR	CHP for W	
			(ii) Leakage from joints	100%		No leakages	IR	CHP for W	

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
			(iii)Noise and vibration test	100%		To be within limits	IR	CHP for W	
6.0.0	Weight Recording		Weighing	100%	SOTR, Approved GA drawing	To be within limits	Weight Certificate	W	
7.0.0	Painting		Visual Inspection	100%	SOTR & PO	Painted as per specifications	IR	R	
8.0.0	Packing, Preservation and Marking		Visual Inspection	100%	SOTR & PO	Preserved, Marked and Packed as per specifications	IR	R	
9.0.0	Submission of FORM4 / DGS&D(S)-84		Correctness	100%			FORM-4/ DGS&D(S)-84	P	

NOTE:-

1. Equipment & accessories to be supplied should conform to specifications.
2. If Type Testing, EMI/EMC and ET have already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will be provided for review of Inspection Agency.
3. EMI / EMC test and ETT will be done at Government/PSU test centers or Firm's lab if NABL accredited.
4. Material Testing to be done at NABL approved Lab.
5. 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. For RT, the shooting sketch indicating Critical Test Regions and Test Regions to be submitted prior to testing.
6. The 'Bought out' items in the QAP are indicative only. The firm is required to categorically define the 'Bought out' / COTS items specific to their products in the drawings. Items will be categorized as bought out or COTs in the QAP on the basis of approved drawings. Further, only finished products will be accepted as COTs and no raw material for manufacturing will be acceptable as a COTs item.
7. The QAP does not apply to items not in the scope of supply of the firm.
8. Inspection of assemblies / sub-assemblies and other items which have not been included in the SQAP but form an important part of the system will also be undertaken.
9. 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.