MAZAGON DOCK SHIPBUILDERS LIMITED

(A Govt. Of India Undertaking)

SHIPBUILDING DESIGN ENGINEERING
DOCKYARD ROAD, MUMBAI - 400 010

TECHNICAL SPECIFICATIONS FOR INDIGENISATION DEVELOPMENT OF SHAFT SEALS

(QUANTITY: AS PER P.R)

DOCUMENT NO.	**:**	**DR/E/IND/3008**

REV	DESCRIPTION	DATE	AUTHORISED BY
1	Separate Documents for Scope of Work and Technical Specification prepared	12.10.2022	
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CONTENTS

ACRONYMS

CFD	-	Computational Fluid Dynamics
DE	-	Diesel Engine
DER	-	Diesel Engine Room
DQA (N)	-	Directorate of Quality Assurance (Navy)
DQA (WP)	-	Directorate of Quality Assurance (Warship Production)
FATs	-	Factory Acceptance Trials
HATs	-	Harbour Acceptance Trials
IHQ MoD(N)		Integrated Headquarters Ministry of Defense (Navy)
IN	-	Indian Navy
IPMS	-	Integrated Platform Management System
MDL	-	M/s Mazagon Dock Shipbuilders Limited, Mumbai
NSTL		Naval Science and Technological Laboratory, Vizag
OEM	-	Original Equipment Manufacturer
SATs	-	Sea Acceptance Trials
SCC	-	Ship Control Center
STW	-	Setting to Work
PDR	-	Preliminary Design Review
CDR	-	Critical Design Review
MTBF	-	Mean Time Between Failure
MTTR	-	Mean Time To Repair

PART - I
TECHNICAL REQUIREMENTS

1. INTRODUCTION

These technical specifications relate to Design, Manufacture and Supply of one number of Shaft seal under Indigenisation project. The shaft seal is a partially split inboard unit for use with open water Lubrication Systems in Fixed Pitch or Controllable Pitch Propeller applications. This document is specific to the need to seals for the shaft line.

2. OBJECTIVE

Under MDL's indigenization initiative, we intend to develop a Prototype and manufacture shaft seal to be suitable for used on board Indian Naval Ships. The design parameters shall be as mentioned in this specification. MDL seeks to partner with a design cum production partner to enable MDL to develop the product.

3. RESPONSIBILITY

The firm will be responsible for Design, Manufacture and Supply of Shaft seal, along with its associated auxiliaries/accessories/controls, mounting arrangements, etc., necessary for meeting the envisaged performance and integration of the same with Shafting system. The design should ensure high reliability, economy of weight/space, resistance to shock and vibration.

4. ITEMS TO BE INDIGENISED AND SUPPLIED

Table 1

Sr. No.	ITEM DESCRIPTION	QUANTITY
1.	Stern tube seal shaft of appx. 500 mm diameter	One

5. APPLICABLE STANDARDS

Following standards / specifications or their equivalent International Standards as per their latest issues/versions shall be applicable.

Table 2

S No.	Standards/Specification	Title
i.	Defence Standard 02-304 (Part 2)	Design Requirements for Main Propulsion Shafting Auxiliaries
ii.	Defence Standard (NES) 1004	Requirements for the design and testing of equipment to meet environmental conditions.
iii.	IN Shock grade 'A'	Requirements for high impact shock qualification, shipboard equipment and systems.
iv.	MIL-S-901D	Shock tests, high impact shipboard machinery and systems.
v.	MIL-STD-740-2 (SH)	Structure-borne vibratory acceleration measurements and acceptance criteria for ship board equipment.
vi.	MIL-STD-1474-E	Air borne sound measurements and acceptance criteria of shipboard equipment.
vii.	MIL-STD-167-1(A)	Mechanical vibrations of Shipboard equipment.
viii.	IS 13161 (Part 3)	Permissible noise levels in machinery spaces
ix.	NES 1005	Painting of equipment

6. DESIGN BASIS

Shaft seal manufacturer shall ensure high quality product, in terms of performance, reliability, economy of weight/space and resistance to shock & vibration.

7. RATED POWER

Maximum rated power of prime movers and maximum shaft speeds are mentioned below. This is only for information for designing the system.

S No.	Mode of Operation	Maximum Rated Power (MW)	Maximum Shaft Speed (RPM)
(a)	Prime mover	22.37	Around 200

8. SHIP PARTICULARS

The ship particulars to be considered for shaft seal design are below,

PARTICULARS		REFERENCE DATA
Ship's dimensions	Length overall (LOA)	149 m
	Beam (water line)	16.65 m
	Draft (deep displacement)	5.37 m
Ship's displacement	Deep displacement	Around 7000 Tonnes
Expected ship's life		30 Years
Play for shaft	In degrees	Zero
Rake for shaft	In degrees	3.304 degree
Direction of rotation	Both clockwise and anti-clockwise direction to be considered.	

9. STERN TUBE SEALS

Stern tube seal shall be split type (facial) marine seal. The stern tube seal in addition should have inflatable seal for repair purpose. The stern tube seal shall have suitable connections for sea/fresh water, supplied from the ship cooling system. Compressed air required for inflating the seal.

General

- Size/type 500mm Seal, partly split Stern Tube Seal
- No. off per ship 1
- Shaft dia. 500 mm
- Lubrication Sea Water
- Includes inflatable seal
- Prevents ingress of sea water from the Stern Tube. A small leakage is allowed to lubricate contact parts of the seal when the shaft is rotating, if needed. However, no leakage is allowed when the shaft does not rotate.

- Provision for Inflatable seal is to be provided to enable repair of the main seal without a dry dock.
- Suitable provisions for Pipe connectors for delivery of water to the seal and for cooling of Stern Tube bearings as well as pipe connectors for delivery of air to an inflatable seal shall be included in the design.

Seal lifetime – 1,20,000 working hours or 25 years. The seal overhaul period or spare replacement period to be established by OEM as a part of Technical documentation.

LIMITING DIMENSIONS (Equipment):		
Parameter	Diameter	Length
Limiting Value	< 1000 mm	< 700 mm

10. MONITORING SYSTEM

i. Stern tube seal Inflate/Deflate control. (To be interlocked when shaft is not running)
ii. Stern tube seal inflated/Deflated Indication
iii. Stern tube seal inflated/Deflated feedback signal to IPMS. (3 in number of Potential free contact)

11. SHOCK QUALIFICATION

Shaft seals along and its associated auxiliaries/ accessories/ controls, shall conform to Indian Navy shock grade 'A' / NSS-I as per BR 3021 or equivalent standard for combatant ships. Indian Navy shock grade 'A' curve is placed at **Annexure '1'**, of this document.

When exposed to the specified shock condition, the equipment shall be operationally available without any time restriction, after exposure to shock.

Shock test certification to be ratified by NSTL.

12. POINT OF CONTACT

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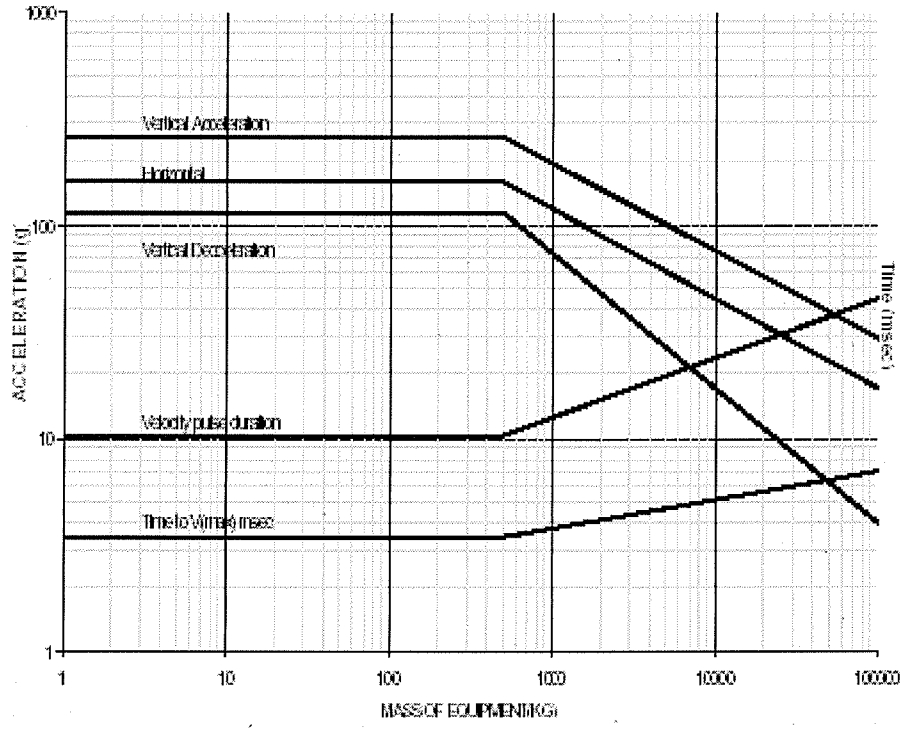
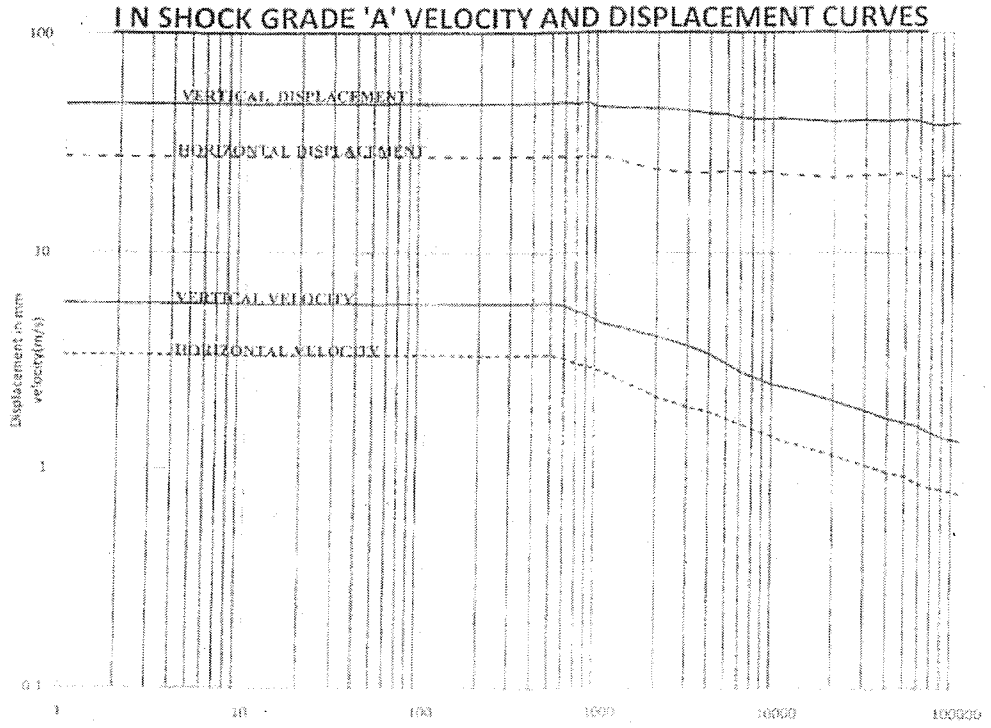
Annexure '1'
SHOCK GRADE `A' CURVES





Stern Tube Shaft Seal- (SHAFT SEALS)

PRE-QUALIFICATION CRITERIA

The determination of eligibility will take into account the technical and experience capabilities and past performance of the participating firm along with financial status; it will be based upon an examination of documentary evidence of the participating firm qualifications submitted by the participating firm as well as such other information, as the MDL deems necessary and appropriate. The participating firm willing to associate with MDL should meet the following Pre-Qualification Criteria. The firm's response could be liable for rejection in case of not meeting the Technical, commercial and financial qualification criteria as enumerated in the succeeding paragraphs.

1. **Technical:**

   a) The firm responding to tender should have domain expertise and experience in design, manufacture & supply of marine seals suitable for propulsion shafts of size more than 100mm. Firm has to submit documentary evidence (PO copies, WDCs/ Seller Tax invoice/ TPI release note, Appreciation letter etc.) in support of the same.

   b) Firm to essentially submit the following:

      i. Technical response to technical requirement projected in this document and readiness to undertake the project. A brief to be submitted as to how the firm will be executing the project

      ii. Company Profile.

      iii. List of infrastructure/equipment held by them along with details of their manufacturing facilities.

      iv. Details of personnel (Project Management Team) with designation, qualification and experience to determine their capabilities.

      v. ISO 9001:2015 or equivalent certificate

      vi. Participating firm should submit the pointwise compliance to all points in SOW. Deviation if any may be indicated with justifiable reason. Acceptance of the same will be at the discretion of MDL. Preference will be given to the firm, who will be ready to invest higher percentage towards prototype development.

2. **Commercial Qualification: -** Firms shall not be under a declaration of ineligibility issued by Govt. of India / State govt. / Public Sector Undertakings etc.

   The firms shall submit the following as a part of commercial qualification.

   a) Shop & Establishment registration certificate.
   b) Certificate of Incorporation.
   c) Registration certificate from local bodies for conducting business.
   d) MSME certificate if applicable
   e) GST certificate

3. **Financial Qualification: -**

a. Firms / consortiums (put together) shall have Average Annual turnover of Rs. 5 Cr (minimum) during the last three years ending as on 31 Mar 2022 to participate in this tender.

b. The firms shall enclose with its Proposal as per certificate issued by Chartered Accountant with their seal and signature, stating the firms net worth & turnover during the past three years. Firm to submit Balance Sheet and Profit and Loss statement for last 3 years.

c. Bidder shall demonstrate access to unutilized line of credit / overdraft facility / cash credit facility from its consortium of banks. Alternatively or complimentarily should demonstrate liquid asset in form of cash / marketable securities in its balance sheet.