

INDIAN AIR FORCE INVITES EXPRESSION OF INTEREST (EOI) FOR INDIGENOUS DEVELOPMENT OF FLIGHT REFUELLING HOSE FOR A FIGHTER AIRCRAFT

1. Commanding Officer, No. 1 Central Indigenisation and Manufacturing Depot (1CIMD), AF on behalf of HQ Maintenance Command, Indian Air Force invites Expression of Interest (Eoi) for indigenous development of **Flight Refueling Hose for a fighter aircraft** from reputed Indian firms based in India.

2. Details of equipment planned to be indigenised are as follows:-

Part No.	Description	Prototype Qty
43325602	Flight Refueling Hose	01

3. Qty 01 prototype for final functional trial and flight trials.

4. The prototype/parts of prototypes/Test sample required till laboratory tests as per various criteria specified in Tech Specs are also to be careered by the firm.

5. Likely Annual Requirement Qty-05. Based on successful completion of project, follow on orders will be placed by IAF if required.

6. Technical details along with Photographs are placed at **Appendix A**. The interested firms are requested to submit **Technical proposal along with Budgetary Quotes**. The format for Budgetary Quote is placed at **Appendix B. Quotation to be submitted for Prototype + IOQ (as per Para 2 above)**.

7. **Eligibility Criteria**. Firms based in India with adequate technical infrastructure, R&D capability with **proven experience** of design/development /manufacture/supply of **similar equipment** dealing with aviation system would be given preference. **Interested firms should have AS9100 and/or DGAQA registration and/or ISO 9001:2015 certification for manufacture or fabrication of similar equipment**. Copies of claimed certification need to be provided with response.

8. **Financial Capacity**. The firm must be financially sound (**min turnover > 50 Lakh, average of last three years**) and capable of undertaking development and testing of the items and meet mutually agreed timelines of supply.

9. **Documents to be attached in response:-**

- (a) Company profile including registration/evidence of legal status, experience, expertise.
- (b) Financial details of last three financial years with IT return.
- (c) Records of current projects, their valuation and completion dates.
- (d) Details of experience in undertaking indigenous developmental tasks with Defence, Govt, PSUs and other agencies, if any.

- (e) Detailed roadmap indicating how the vendor proposes to meet the IAF requirements.
- (f) Anticipated time frame for execution of the project.

10. **Detailed Project Report (DPR).** The DPR will be submitted by all vendors in response to EoI along with budgetary quotes:

- (a) Outline features of the proposal.
- (b) Estimated Capital expenditure.
- (c) Roles, responsibilities and expertise details of consortium members, if any.
- (d) Role of foreign technology provider, if any.
- (e) Recommended stages/phases of task with priorities & time schedules.
- (f) Requirement of specialized testing assistance where facilities are available only with government entities, DPSUs and DRDO/DGQA/DGAQA.

11. EoI completed in all aspects would be evaluated based on the supporting documents. The physical verification of the Firm's capability and expertise to execute the project may be carried out, if need be.

12. The sample of item is available at Air Force Station, Pune, which can be studied by **capable firms** any time between 0800hrs to 1400 hrs on all working days (Monday to Friday) till the date of Bid submission. The remaining details are required to be generated as part of the development process. The following be noted:-

- (a) Photographs & tech specifications of the item are enclosed.
- (b) The drawings of the item are not available and will have to be generated by firm. Approval for same, needs to be obtained before proceeding with actual development.

13. Clarifications pertaining to the EoI may be sought from:-

Commanding Officer
1CIMD, C/O 11 BRD Air Force Station Ojhar, Nasik
Pin-422221
Tele: 02550-272133
Fax: 02550-272233
E-Mail- swadeshi@nic.in

14. **Last Date for Submission: 10 May 24**

15. Any additional details can be sought by E-mail (swadeshi@nic.in) at least three days before last date of Submission.

PRELIMINARY SPECIFICATIONS: FLIGHT REFUELLING HOSE
FOR A FIGHTER AIRCRAFT

Reference Standard: MIL-H-4495D

1. **Materials.** The hose will be manufactured using virgin materials and no recycled solid waste or recycled materials would be used during manufacture.

2. **Dimensions.**
 - (a) Length 78 feet (+4, -0).
 - (b) Bore diameter of end fitting 2 inch.

3. **Operating Conditions.**
 - (a) Temperature. -45°C to + 50°C
 - (b) Pressure. 0 to 170 psi

4. **Construction.** Hose shall consist of a seamless compounded inner tube, breaker fabric, a spiral high tensile wire, synthetic rubber layer, a braid of high tensile steel wire and compounded cover. The hose shall be suitable for transfer of aviation turbine fuels used in military aircraft in India (Jet A-1). It should also be compatible to be used in conditions where hydraulic fluid is likely to be present and conditions of salt spray and prolonged high humidity. When the hose has been deployed to the full trail position and pushed back in to the fuel transfer range by the receiver aircraft, fuel is transferred from the tanker aircraft through the hose to the receiver aircraft. The fuel transfer range is marked on the hose by broad white bands each side of a black band (each 1.2m (4 feet) wide). Broad orange bands indicate the refuelling range inner and outer limit. The purpose of the bands is to show hose position to the pilot of the receiver aircraft should there be no communications between aircraft. **Please refer Annexure for further details of construction.**
 - (a) **Tube.** The tube shall be a continuous extrusion or calendered lay-up of not less than two piles of a high aromatic aviation fuel resistant synthetic aviation grade rubber compound with necessary ingredients to meet the requirements. The bore shall be smooth, free of pitting with uniform thickness of not less than 0.045 inch or 1.143 mm.
 - (i) **Strength.** Shall not be less than 1250 psi (8.6 MPa) and elongation 250%. After ageing test of fluid for 72 hours at 24°C, the tensile strength shall not be less than 4 MPa and elongation 150%.
 - (ii) **Volume.** The volume increase of hose tube after 72 hours' immersion in JetA-1 test fluid at 24°C shall not exceed 30%.
 - (b) **Carcass (Reinforcement Layer).** Carcass shall consist of a coated leno breaker fabric, helical galvanized wire, acrylonitrile build compound and high tensile steel wire braid. This reinforcement shall be well, evenly and firmly applied free from defects. Specifications of sub-parts are as follows: -

- (i) Breaker Fabric. The breaker fabric shall be maximum of 0.030 inch and shall consist of filament type nylon leno fiber cloth or equivalent fabric breaker material and shall be treated with RFL and coated with butadiene acrylonitrile.
 - (ii) Helical Wire. The helical wire shall be a continuous spiral round steel wire (galvanized or coppered)
 - (iii) Build Compound. The build compound shall consist of spiral layered of butadiene acrylonitrile.
 - (iv) Wire Braid. The wire braid shall be 0.012 inch diameter carbon steel wire with a tensile range of 350,000 to 400,000 PSI (2414 – 2758 MPa) and shall have a brass, coppered or chemical finish.
- (c) **Cover.** The cover shall be constructed of a weather and fluid resistance rubber compounded to meet the requirements of this specification. It shall be smooth, free from pitting and of uniform thickness of not less than 3/64 inch.
- (i) **Strength.** After aging in Jet A-1 test fluid for 72 hours at 24°C, the tensile strength shall be not less than 400 PSI (2.8 MPa) and shall not have been reduced more than 55% of the original strength.
 - (ii) Elongation. The original ultimate elongation shall be not less than 200%. After 72 hours' immersion in JetA-1 test fluid at 24°C the elongation shall not be less than 100%.
 - (iii) Volume. The volume increase of the cover after 72 hours' immersion in JetA-1 test fluid at 24°C shall not exceed 60%.

5. Design Aspects

- (a) Electrical continuity. The hose wall be electrically continuous throughout its full length, the wire braid or helical wire shall be used to demonstrate the hose continuity; however, continuity must also be demonstrated through end fitting when attached.
- (b) Adhesion. The original adhesion of the hose tube and outer cover shall be 12 pound per inch when tested in accordance with ASTM D380. After 72 hours immersion in the test fluid Jet A-1, at 24°C, the adhesion of the tube to outer cover shall be not less than 5 pounds per inch, when tested within 5 minutes after removal from the test fluid.
- (c) Crush resistance. The outside diameter of the hose shall not be compressed more than 10 percent when subjected to a weight of 1500 pounds (681 Kg) distributed evenly over a one-foot longitudinal section.
- (d) Flexibility. The hose shall be capable of being wound on a drum diameter which is six times the nominal inside diameter of the hose or 12 inches, whichever is greater, without cross-sectional deformation at a load of 1200 pounds (544 Kg).
- (e) Low temperature flexibility. The hose shall be capable of being repeatedly wound about a drum of a diameter equal to that determined in preceding paragraph after soak at

minus 54°C for 24 hours. The cold soak must start with the hose bent on the drum. The hose shall develop no cracks and shall meet the applicable pressure requirements.

(f) Diameter. The nominal inside diameter shall be as required to meet the requirements of the aerial refueling system. The minimum inside diameter shall be 1-1/2 inches and shall increase in increments of 1/8 inch. The outside diameter shall be the minimum to meet requirements of this specification and the intended aerial refueling system. The diameters of the hose shall be established during qualification of the refueling system and shall be controlled for all future production.

(g) Length. The length of the hose assembly shall be as required by the intended aerial refueling system and shall include end fittings, which is 78 ft (+4, -0). The hose shall no splices or joints over the continuous length. Tolerances shall be such that replacement of a hose in the aerial refueling system will not affect the operation of the system nor require readjustment of the sytem. The length shall be measured from the extreme ends of the fittings.

(h) Weight. The weight per foot of the hose shall be the minimum required to meet the requirements of this specification and the intended aerial refueling system. The actual weight if the hose shall be established during qualification of the refueling system and shall be tightly controlled for all future productions.

(j) End fittings. The hose end fittings shall be of the permanently swaged type. The end fittings shall be installed in such a manner as to make the hose assembly electrically continuous. The end fittings which is to mate with the aerial refueling reception coupling shall be in accordance with MS24358. The end fitting connecting to the tanker hose stowage system shall be as per the samples which would be provided to the chosen firm. The end fittings shall be of corrosion-resistance steel. **Cements, sealants, or adhesives shall not be used in the installation of end fittings.** The end fittings shall have a smooth bore. The fittings shall be so constructed as to insure a tight grip on the hose. The outer body shall have a rounded outer edge to prevent cutting of the hose during installation or upon sharp bending. The inner sleeve shall also be free of sharp edges to prevent cutting of the hose during installation or upon sharp bending.

(k) Bulge. The installation of the hose end fittings shall not cause the hose inner tube to bulge or reduce the inside diameter of the hose to less than the inside diameter of the end fitting.

(l) Strength. The hose assembly shall not break nor shall its end fittings pull loose when subjected to the ultimate loads. The design limit loads shall be determined by the maximum aerodynamic drag of the hose. Reception coupling and drogue of the system at the maximum design carriage speed for the store or 1500 pounds for up to 2 inches I.D. and 2000 pounds over 2 inches I.D., whichever is higher. The proof load shall be 1-1/2 times the design load. The ultimate load shall be 2-1/2 times the design limit load. **The drag calculations and limit load values would be supplied to the firm.**

(m) Concentricity. A ball with a diameter of 94.6 percent of the hose nominal inside diameter shall be able to pass freely through the hose while subjected to a vacuum of 20 inches of mercury.

(n) Elongation. The elongation when subjected to the proof tensile load shall not exceed 4.0 percent. The elongation or permanent elongation shall have no effect on the aerial refueling system cooperation. The designer of the aerial refueling system must specify any stricter requirements if needed for the system operation.

(o) Permanent elongation. The permanent elongation shall not exceed the following values at the conditions specified:

(i) 1.5 percent of total length when subjected to proof load for a period of one hour.

(ii) 2.0 percent of total length when subjected to proof load for 10 second duration repeated 500 times.

(p) Pressure. The max operating pressure shall be 170 psi. The proof pressure shall be two times the operating pressure, and the burst pressure shall be three times the operating pressure. The hose assembly shall operate satisfactorily without bulge, burst or damage for surge pressure generated by a 0.2 second closing (constant rate) gate valve closing against full flow at 50 psi at a distance of 5 feet from the outlet end of the hose.

(q) Pressure Drop. The pressure drop shall be the minimum consistent with quality hose manufacture. The actual pressure drop shall be determined for the rated flow of the system and shall be recorded as psi per foot of length based on Jet A-1 fuel characteristics.

6. **Marking and Identification.**

(a) Hose identification. Each length of the hose shall have a continuous red marking strip, resistance to fuel in accordance with MIL-M-6002, and approximately 3/8 inch wide running the entire length of hose. The cure date, serial number, part number, and manufacturer's code identification number shall be indicated by permanent type marking at three locations (the center of each length and 4 feet from each end). The other aspects of marking are depicted in figure below:-

Figure. Pattern of Hose Marking

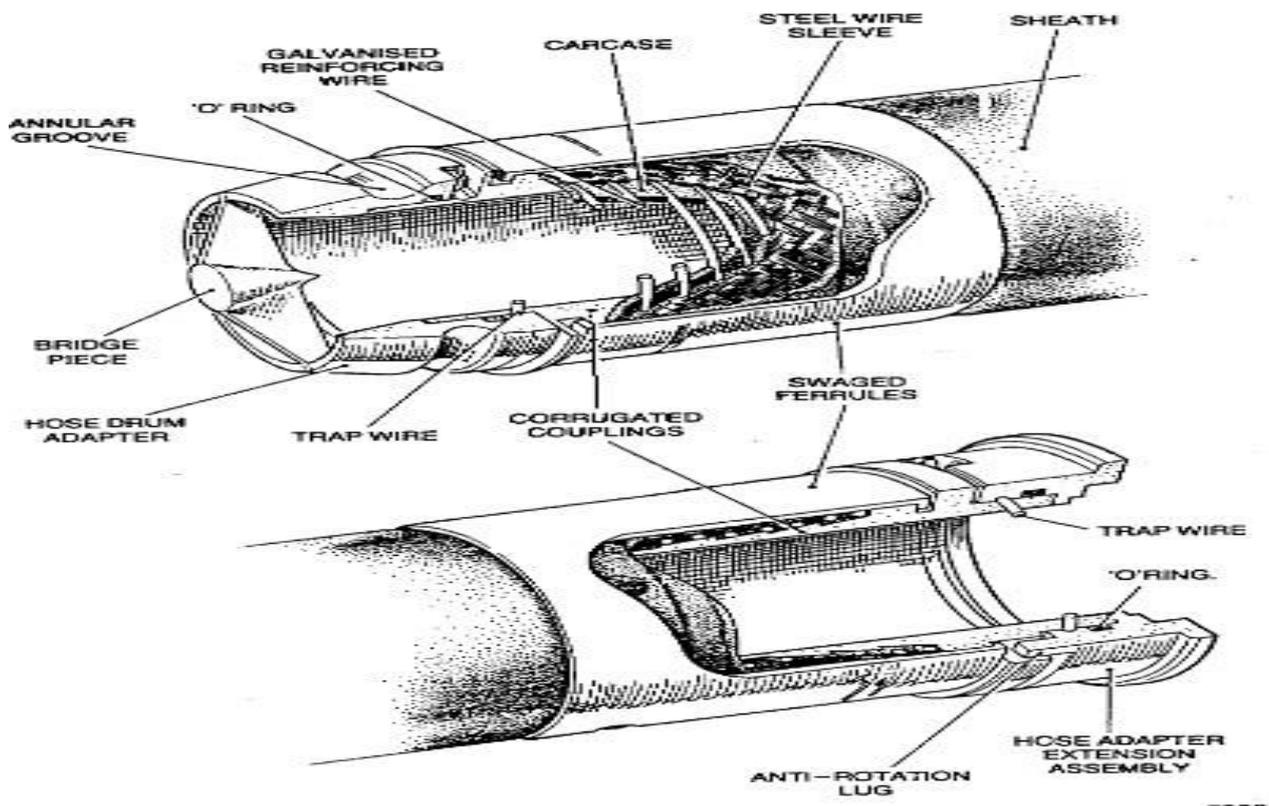
(b) Cure date. The cure date shall be indicated in the documentation provided with unique serial no/month/year of manufacture format.

7. **Expected Life.** The hose would give operational life of three years and a storage/shelf life of 5 years under controlled storage conditions.

8. **On site visit.** Potential firms are encouraged to visit Air Force Station Pune for on-site physical appreciation of the item. A minimum three days notice is required to be given to 1CIMD on email: **swadeshi@nic.in** with details of **Adhaar Card, Name and Contact No of personnel** desirous of visit. **Security clearance will be co-ordinated by 1CIMD upon such request.**

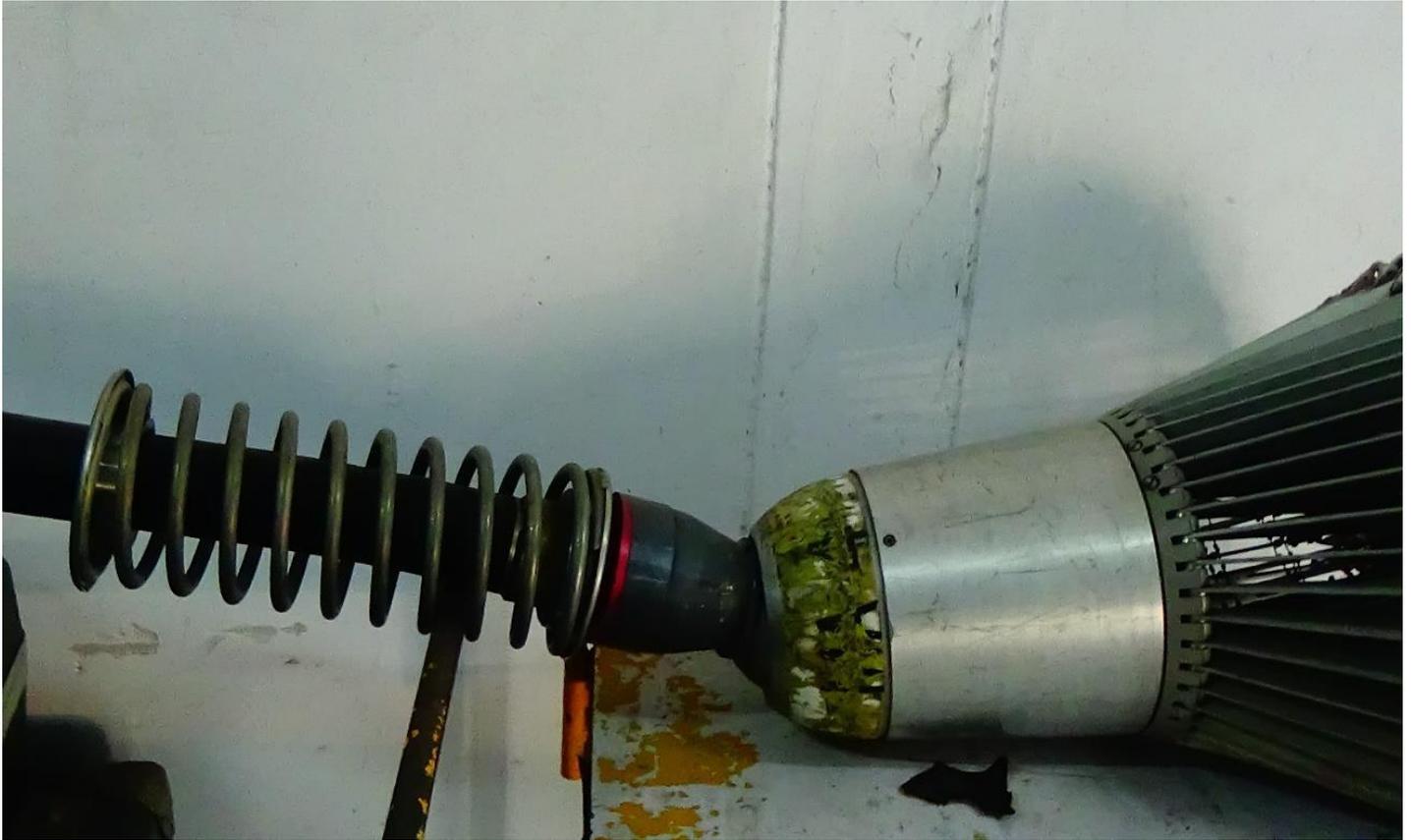
Annexure to Appendix A

HOSE PHOTOGRAPHS AND SPECIFICATIONS



7005

HOSE



HOSE WITH MA-4 COUPLING ASSY

HOSE FITMENT POINT



HOSE FITTED AT DRUM



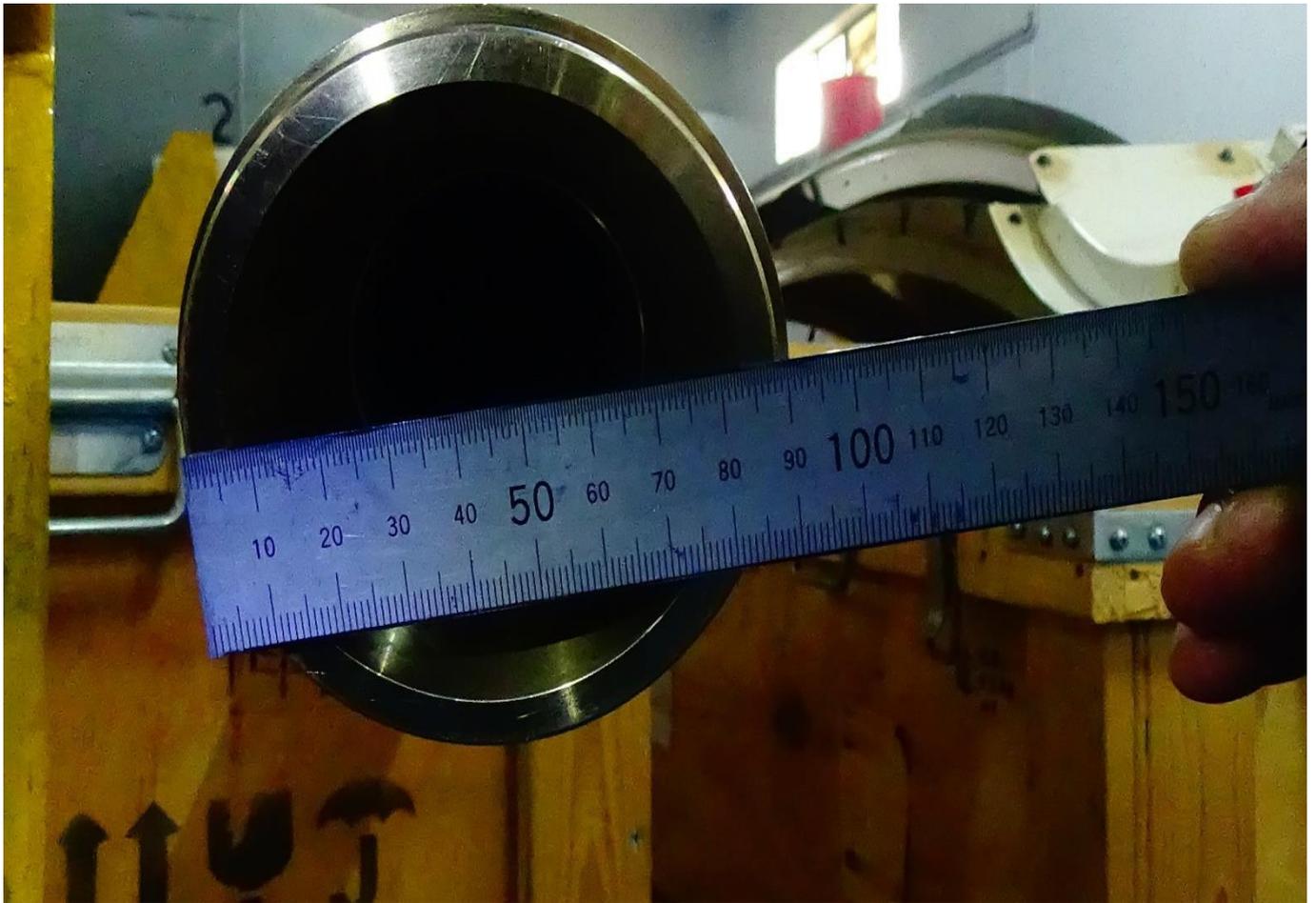
HOSE JETTISIONED AT DRUM



HOSE ADAPTOR (DRUM END)

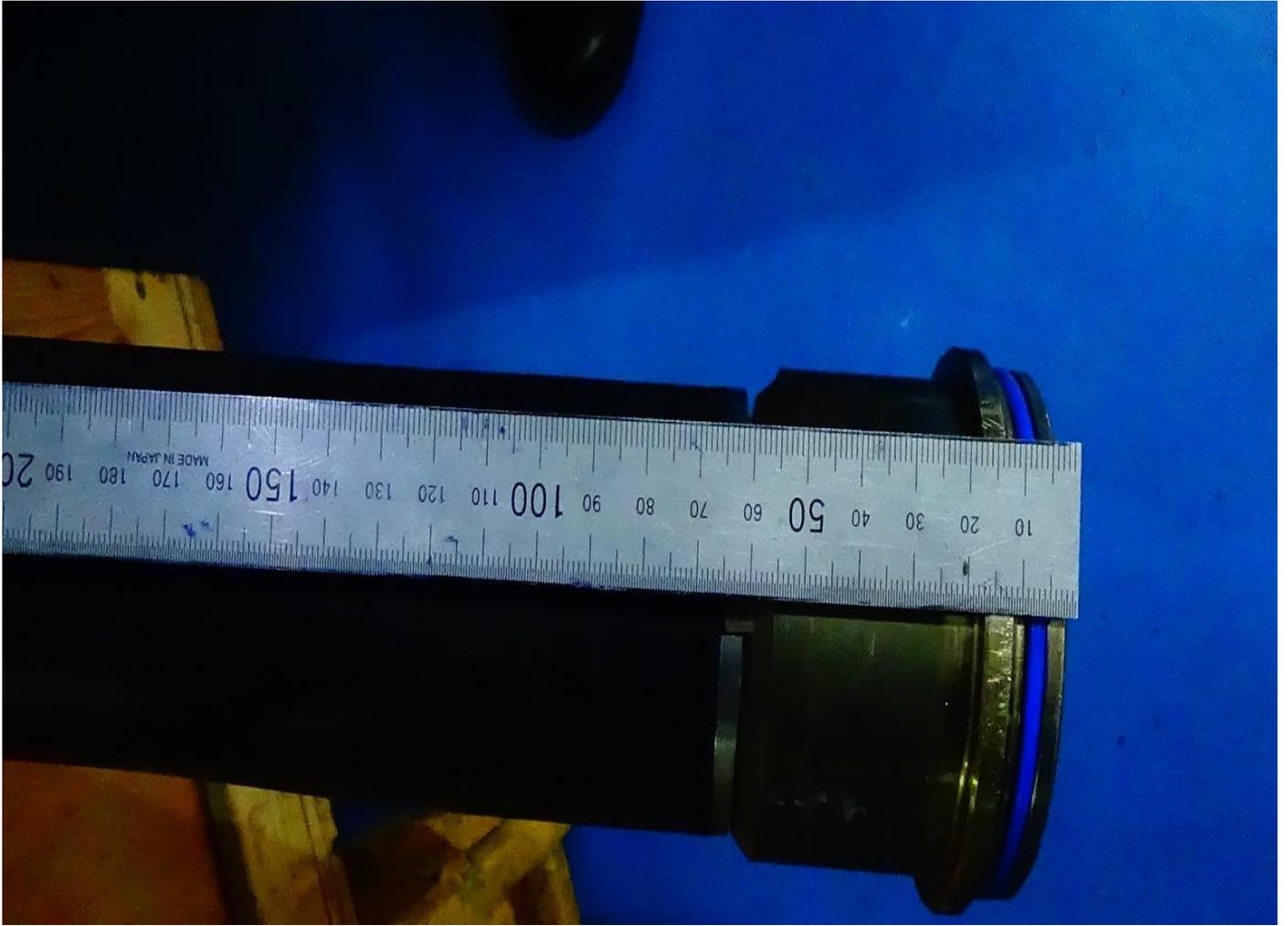


ADAPTOR END AT DRUM SIDE



ADAPTOR END TOWARDS MA-4 COUPLING SIDE

ADAPTOR END TOWARDS MA-4 COUPLING



Appendix B
(Refers to Para 6 of Eol)

Budgetary Quote
Material: IAF/Vendor

Reference: _____ dated _____

Firms Name: _____

Firm's Ref no: _____ Date: _____

GST No: _____ Validity of Quote: 120 days

For Development of Prototype

Delivery period for initial development (prototypes): 180 Days from placement of DO

Part No.	Desc.	Dev Qty	Proposed material and source of it.	Development Cost	Cost per piece of prototype	GST APPLICABLE TAXES ON		Total Development Cost with Taxes
						Dev. Cost	Prototype cost	
				Tools & Die Cost				
				Testing Charges				
				Misc. Charges				
				Design/spec. Charges				

Breakdown of prototype cost to be furnished

Material Cost	
Labour Cost	
Machine Charges	
Over Head Expenses	
Misc. Expenses	
Profit	
Total	

FOR FUTURE BULK SUPPLY

Delivery period for bulk supply: 180 days from placement of SO

COST PER PIECE			EXCISE DUTY	GST	P&F CHARGES
MOQ	MOQ	MOQ			
01-05	06-10	11 & Above			

Date:

Signature and stamp of firm with date

Note:

- (a) Detail technical specification will be available after finalization of RFP.**
- (b) Delivery period for IOQ & future supply supply: 180 days from placement of SO.**
- (d) P & F Charges have to be included in unit rates of prototype cost & Future MOQ slabs for delivery at Air Force Station, Pune.**
- (e) Potential firms are encouraged to visit Air Force Station Pune for on-site physical appreciation of the item. A minimum three days notice is required to be given to 1CIMD on email: swadeshi@nic.in with details of Adhaar Card, Name and Contact No of personnel desirous of visit. Security clearance will be co-ordinated by 1CIMD upon such request.**

Date:

Signature and stamp of firm