

**REQUEST FOR PROPOSAL FOR  
SUPPLY OF KNITTED GOLD PLATED MOLYBDENUM MESH FOR  
SPACE APPLICATION**

**January 2025**

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## 1. Introduction

Large Mesh reflectors are used as part of high gain antenna systems. Typically these reflectors are more than 4 meter in diameter and are stowed compactly during launch next to a spacecraft. Upon reaching the desired orbit, the antenna is made to deploy from ground command. Since, the large reflectors need to be stowed during launch and deployed on-orbit, the reflector surface is made of flexible materials comprising of cables/chords and RF reflective metallic mesh.

State of the art mesh antenna reflectors use knitted gold plated molybdenum mesh as the RF reflective surface. The base material of the wire is molybdenum which show high strength at lower diameters and comparably low co-efficient of thermal expansion. Molybdenum wire is gold plated to ensure good electrical contact between wires and to protect the wires from corrosion effects. The knitting of the mesh is to be carried out in a Warp knitting machine.

Since, the knitted mesh is used as part of the antenna system, the number of openings per inch (OPI) and maximum opening size of the mesh plays an important role for the RF reflectivity. A 10 OPI mesh will meet RF reflectivity requirements in the S Band frequency.

The tender being floated is for supply of knitted gold plated molybdenum mesh, which involves procurement of raw material i.e. gold plated molybdenum wire, knitting the wire as per the knitting pattern in a warp knitting machine, cleaning, packing and supplying the required quantity of knitted gold plated molybdenum mesh to ISRO.

ISRO will make an advance payment along with the purchase order for executing the order, however ISRO will not fund for the facility/infrastructure for the realisation of the order.

This tender invites bids from interested companies for supply of knitted gold plated molybdenum mesh.

## 2. Material Specifications

Gold plated molybdenum mesh to be knitted using a gold plated molybdenum wire.  
Gold plating of mesh subsequent to knitting is not permitted.

<b>Wire Material</b>		
2.1	Base wire	: Molybdenum (purity: 99.9% or better)
2.2	Outer plating	: Gold (Purity: 99.9% or better)
<b>Wire Dimension</b>		
2.3	Base Molybdenum Wire diameter	: 1.2 Mil and lower
2.4	Gold Plating	: 4% to 6% by weight (of base wire)

## 3. Knitting Pattern & Opening Size

Knitting has to be carried out using a Warp Knitting Machine of minimum 3m width.

3.1	Mesh Knit Pattern	: Alpha Knit or Tricot Knit
3.2	Mesh Opening	: 10 Openings per inch in un-stretched condition

## 4. Dimensions

<b>Mesh width &amp; Continuous Length</b>		
4.1	Width	: 3 m or higher (Un-stretched condition on spool)
4.2	Continuous Length	: 25 m or higher

(Mesh edges can be knitted with polyester textile yarns beyond 3m width for handling and packing)

## 5. Quality Assurance

<b>Knitted Mesh Defects Acceptability criterion</b>	
5.1	Maximum allowable defect Hole size: 9 mm
5.2	Defect hole per Sq- m of Mesh : Maximum 03 (three)
5.3	Defect log document Log of defects shall be inspected and reported in a document for every 5m length of mesh. Photographic evidences of defects to be maintained and supplied along with shipment.
5.4	Allowable Abrasion mark: No abrasion mark is preferred; however, in unavoidable conditions, marks should not score away gold plating
5.5	Mesh should be free of foreign materials, viz. grease, oil, dust.

## 6. Quantity

6.1	Slab-A	: 500 to 1000 Sq-m
6.2	Slab-B	: 1001 to 1250 Sq-m
6.3	Slab-C	: 1251 to 1500 Sq-m
<u>Note:</u> Quote for slab A, B and C separately.		

## 7. Cleaning and Packing

7.1	<b>Cleaning</b> The gold plated molybdenum mesh shall be cleaned using a non reactive cleaning agent so as to remove any oil/grease stains that remain on the mesh.
7.2	<b>Packing</b> The mesh shall be wound on a spool. Each layer of mesh while winding on the spool shall be separated using a layer of lint free paper. Each spool shall minimum contain 25m continuous length of mesh (75 sq-m of mesh). The spool along with roller mesh shall be packed inside a transparent polythene cover and sealed. Each roll shall be placed inside a box and shipped to ISITE/ISRO.

## 8. Deliverables

	<b>Deliverables along with shipment</b>
8.1	Gold plated Molybdenum mesh as per ordered quantity
8.2	Certificates of Chemical composition of gold plated wire
8.3	Physical and mechanical Properties of molybdenum wire used.
8.4	The summary of observed mesh defects with locations in defect log documents

## 9. Mandatory Inspection Points

Following MIP's will be carried out by ISRO personal at the knitting facility.

ISRO engineers shall be permitted to visit the vendor's premises to carry out the Inspection.

<b>MIP No</b>	<b>Milestone</b>
1	After procurement of all raw material
2	Knitting of 1 Sq-m of sample mesh
3	Pre-shipment review Before Shipment of each supply.

## 10. Schedule & Payment

Delivery: The total ordered Quantity of Mesh to be delivered within 24 months from the release of purchase order.

### Schedule:

<b>Time Line</b>	<b>Description</b>	<b>Schedule</b>	<b>Payment</b>
T0	Placement of Purchase Order		20% Advance against Bank Guarantee
T1	Supply of 1 sq-m of sample mesh for inspection at URSC	T0 + 14 months	Pro-rata Basis as per actual supply
T2	Clearance from URSC for bulk fabrication	T1 + 1 month	
T3	1 <sup>st</sup> Supply (1/3 of total ordered quantity)	T2 + 3 months	

T4	2 <sup>nd</sup> Supply (1/3 of total ordered quantity)	T3 + 3 months	
T5	3 <sup>rd</sup> Supply (remaining quantity)	T4 + 3 months	
	Total	24 months	

## 11. Quotation Details

Following documents shall be submitted along with quotations

1. A machine knitted mesh sample of approximately 200mm x 200mm shall be supplied along with the quotation. Following details about the sample shall be provided
  - a. Sample dimension
  - b. Type of knitting pattern
  - c. Size of gold molybdenum wire
  - d. Mesh opening size

The sample will be evaluated at URSC and will be returned back to the vendor.

2. Source of Molybdenum wire
3. Source of Gold plating of wire
4. Make and model of Warp Knitting machine used for knitting
5. Details of OEM
6. Detailed Schedule of execution starting from date of release of purchase order
7. Compliance Matrix for SI No-2 to 10 in our specification document

Quotations with mere comply and without documentary details will not be considered for further evaluation. Quotations not fulfilling the above points will be rejected.

Note:

1. For a vendor to be technically qualified, the sample mesh supplied along with the quotation should meet the specifications as provided in Section-2 & Section-3 of this document. The sample will be evaluated at URSC for the above specifications. Decision of URSC will be final.

2. This is a two part tender comprising of Technical Bid and Price Bid Separately
3. The price shall be quoted in Indian Rupees only
4. The price shall be quoted for per square meter of mesh.
5. Purchase order will not be split among the vendors even if other vendors agree to L1 price.