1.0 SCOPE

This requisition covers the requirements for Design, Engineering, Materials, Fabrication, Inspection, Testing, Packing and Supply of Urea Synthesis Reactor along with accessories & spares for National Fertilizers Limited, Bathinda**.**

1.1. Items to be supplied

The equipment listed below shall be supplied in accordance with the requirements specified in this requisition and the related documents as described in references:

Sr. No	Item No.	Equipment Name	Required Quantity
1.	U-DC 101	Titanium lined Urea Synthesis Reactor along with accessories & spares. (Specification Data Sheet enclosed as an Annexure-I)	01

1.2. Scope of Work/Supply

The scope of supply/work of the Bidder shall include but not limited to the following: -

1.2.1 Mechanical Design, Complete detail engineering, preparation of detailed fabrication drawings, procurement of all raw materials, fabrication, and stagewise inspection and testing of titanium lined urea synthesis reactor UDC 101 including supply of all material test certificates, painting, packing, forwarding, documentation and guarantee for the Reactor.

1.2.2 Components of the Reactor like three number inlet nozzles (extended inside the reactor by approx. 200 mm) at the bottom, top manhole cover with delta gasket and Bolts and Nuts, outlet nozzle in the top cover, TI/TR connections, All matching stub ends of ASTM A 182 F316L along with flanges and fasteners of each nozzle, All stud bolts/nuts & gaskets for all connecting flanges and CS conical skirt is included in the scope of supply.

1.2.3 Externals like lifting truniuns / lifting cover, earthling lugs, top platform lugs, insulation cleats/lugs, outlet piping sliding support clips, base plate and other necessary attachment of the reactor shall be provided by the vendor.

1.2.4 The Reactor shall have efficient leak detection system i.e. weepholes for detection of any leakage through the inner titanium lining.

1.2.5 Thermowell at top and bottom with thermocouples and TI (Thermo Indication) points for shell temperature along with its thermocouples and two spare sets of thermocouple shall be included in the scope of supply.

1.2.6 All blind flanges and gaskets for hydro testing shall be provided by the vendor.

1.2.7 Supply of Urea Synthesis Reactor complete in all respects and ready for installation (part skirt shall be welded at site, if required due to transportation limitations), as per this material requisition and attached specifications data sheet (NFB/MECH/UB/UDC 101), other documents attached to this MR and applicable code and standards.

1.2.8 Stagewise third party inspection from M/s LRIS.

1.2.9 Preparation of quality management systems/QAP and coordination with TPI for approval/review of quality control procedures and systems, including inspections and visits of TPI during manufacturing and testing shall be in the vendor's scope.

1.2.10 Testing shall include but not limited to the following: -

(i) Material testing as per standards and code requirements.
(ii) Full radiography & other NDT tests.
(iii) Hydraulic test.
(iv) Pneumatic Test.
(v) Helium leak test
(vi) Hammer Test for soundness of liner.
(vii) Ferroxyle test.
(viii) Any other test required by applicable codes and standards.

1.2.11 Painting of shell external surface with two coats of Zinc Rich primer having 25-micron thickness of each coat after surface preparation/sand blasting. Painting of skirt with one coat (25 micron thick) Zinc Rich primer and two coats (25micron thick each) epoxy paint.

1.2.12 Corrosion protection of internal surface with nitrogen purging and maintaining nitrogen pressure of 0.5 Kg/cm^{2}g pressure.(nitrogen filling attachment shall be in the scope of supplier)

1.2.13 Submission of monthly progress reports, bar charts, planning and scheduling of all activities for completion of the entire job.

1.2.14 Vendor to confirm the details of all the attachments (External & Internal) as per the approved fabrication drawings before dispatching the equipment from shop.

1.2.15 Dimensional Check Report of completed equipment against permissible tolerances duly verified by TPI should be submitted to NFL for all the details of Equipment including External & Internal attachments before dispatch of the equipment.

2.0 SCHEDULE

Equipment shall be quoted with minimum delivery period.

3.0 QUALITY

3.1 Inspection and Test Requirements

Urea Synthesis Reactor shall be manufactured and tested under stage wise third party inspection of M/S Lloyds. Vendor shall submit their QA/QC plan, inspection and test plan to third party inspector i.e.M/S Lloyds for approval. Approved QA/QC plan, inspection and test plan shall be submitted to NFL for review. Stage wise and pre-dispatch inspection shall be carried out by M/S Lloyds, as per approved QA/QC plan at vendor premises. All material, tools, etc. as required for inspection shall be provided by vendor. Hydro-testing procedure shall be submitted to M/s Lloyds for approval before hydro-testing of the equipment. Water to be used for hydro testing shall be potable water having max. 50 ppm of Chloride content.

Representative of the owner shall have right to access any stage of fabrication/manufacturing, inspection and testing such inspection and testing shall in no way absolve vendor responsibility towards performance guarantee of the equipment.

Vendor's equipment supply shall be meeting all the requirements of this material Requisition. Exceptions, Deviations and alternatives will be valid only if approved in writing by NFL.

3.2 Material

All material used for fabrication shall be virgin (no recycled material) & of tested quality and acceptable to M/s Lloyds. Material test certificate duly stamped by M/S Lloyds shall form part of documents required. Vendor will also indicate the origin of all materials used for this job.

4.0 SPECIAL TOOLS & DEVICES

Vendor shall supply all special tools and devices including bolt tensioner device (a complete system with pressure device) for top cover bolts required for site erection, commissioning and maintenance of the reactor.

5.0 SPARES

Vendor shall supply following as erection, commissioning and maintenance spares in addition to the installed fastener and gaskets:

- 20% as spare fasteners additionally (but not less than 2 sets for each requirement).
- Four (4)sets of gaskets including 4 sets of delta gaskets.
- Four (4) square meter of titanium plate having thickness of 5mm
- Four (4) square meter of titanium plate having thickness of 4mm
- Weld consumable KS-50 or equivalent (10 kg)
- Thermocouples two sets (one for top and other for bottom)

.

6.0 SHIPPING

6.1 Proper packing shall be done to facilitate safe transportation by sea/rail/road. All opening and extended components shall be suitably covered to prevent any damage. Suitable steel skids for transportation which are designed to withstand normal loads during see and inland transportation shall be included in the scope of supply.

6.2 Packing shall be capable of withstanding all hazards normally encountered during transportation including loading and unloading operation whether by crane and/ or by sliding off and it shall protect goods from weather condition.

6.3 Spare parts shall be packed separately from the equipment. Spare parts package shall be clearly marked with content and equipment number.

7.0 APPLICABLE REGULATION AND CODES:

7.1 The Material, Design, Fabrication, Inspection and Test shall be made in accordance with ASME SEC VIII Div-1 or Div-2 (Latest version) and other applicable specifications/codes/standards.

7.2 In the case of conflict among the clauses of the codes, specific requirements indicated in the specifications and the documents enclosed, the stringent requirement shall be considered. Vendor shall refer such matter to NFL for approval/resolution.

7.3 Seismic load for design of equipment shall be considered as per IS: 1893-2005 (Part-4) along with other design loads (pressure, self weight, etc.). Seismic zone is three for Bathinda.

7.4 Wind load for design of equipment shall be considered as per IS: 875-2002 along with other design loads (pressure, self weight, etc.). Basic wind speed of 47 m/s shall be considered for height up-to 10 m and 50m/s for above 10 m height.

8.0 GUARANTEE REQUIREMENT

The vendor will stand guarantee for mechanical design, material and workmanship for the equipment for the period of 42 months from the date of dispatch or 36 months from date of commissioning which ever is earlier.

9.0 ATTACHMENTS TO THIS REQUISITION

Documents listed as under shall be referred and form an integral part of this requisition.

Sr. No	Title	Document No.	Rev.No.	No. of Sheets
1.	**Data sheets**	NFB/MECH/UB/UDC 101/SDS	00	**1**
2.	**Reference Drawing**	U-10-A0-4510	00	**1**

10.0 SPECIAL NOTES

10.1 The Urea Synthesis Reactor shall be offered as shop completed pressure vessel (but skirt to be welded at site. For skirt welding at site material required like welding consumable, shall be supplied by the vendor).

10.2 Party will confirm complete interchangeability of the offered reactor with our existing Reactor and to be erected on the same foundation. To ensure interchangeability site visit, if required, shall be in the scope of supplier.

10.3 Reference Drg No. U-10-A0-4510 shall be used for various dimensions of the reactor, inlet nozzles orientation and top cover along with outlet nozzle provided in the top cover. However, vendor's own similar or better design of Titanium lined reactor conforming to applicable codes and standard will be acceptable. The offered design urea reactor should have proven performance of trouble free service for the minimum period of ten years and to be in operation as on 31.03.2012.

10.4 Highly stress attachments such as lifting lugs shall be radiographed or ultrasonically checked before post heat treatment and liquid Penetrant checked after post heat treatment.

10.5 It is the manufacturer's responsibility to assure that, as a minimum, the design complies with all applicable requirements of the codes and standards. Furthermore additional calculations shall be carried out considering the worst combinations of parameters like pressure, temperature, dead load, wind load, earthquake etc.

10.6 Vendor will arrange the visit of NFL representatives, if required, to the place where offered design urea reactor is installed, so that proven performance is checked before placement of order.

10.7 The Vendor shall be completely responsible for the compliance to Code requirements, detailing, fabrication, materials and workmanship of the equipment as per the stipulations of the requisition and its attachments. In this regard, it may be noted that review by Owner shall not relieve the Vendor of his responsibility of meeting all requirements and ensuring satisfactory performance of the equipment. Guarantee period shall be as per Purchase Condition.

10.8 A Hydraulic stud tensioner shall be supplied along with supplies as an special tool.

10.9 Top cover bolts shall be provided with protective caps and top cover should have lifting eyes.

10.10 Reactor shall be provided with two earthing connections.

10.11 Manufacturers Name plate (stainless Steel) indicating important design parameters shall be mounted on a bracket attached to the vessels.

10.12 Vendor will specify deviations (if any) form this material requisition mentioning clause numbers.

11.0 DOCUMENTS TO BE SUBMITTED

I. Documents to be submitted for technical evaluation:

(a) General arrangement drawing of the offered reactor indicating all the constructional features of the offered design, all important dimensions,

nozzle sizes & orientation and material of construction of all major parts of the urea reactor.

(b) Complete design data sheets of the offered urea Reactor along with applicable codes and standards.

(c) Deviation sheet.

(d) Technical write-up indicating design concept, construction details, salient features of the offered reactor, leak detection system details etc.

II. Documents to be submitted after placement of PO/LOI:

(a) Bar Charts (activity wise) indicating manufacturing, inspection and supply of the reactor.

(b) QAP/QCP duly approved by M/S Lloyds.

(c) Monthly Progress report along with S-curve.

III. Documents to be submitted along with supply:-

The manufacturer shall submit the complete technical documentation including, but not limited to the followings (six sets, one reproducible and one soft copy):

(a) General arrangements, Assembly and all manufacturing drawings.

(b) Strength calculations and loading data.

(c) Manufacturing details (As built).

(d) Inspection specifications.

(e) QAP/QCP and all Material test certificate.

(f) Hydraulic, pneumatic and helium leak test certificate.

(g) Operation and maintenance procedure/instructions manual.

(h) Calculation reports.

(i) Radiographs, WPS and PQR for welding joints.

(j) Heat treatment records and Stress relieving charts.

(k) Inspection Report (Data Dossier).

(l) NDT reports.

(m) Dimensional check reports.

(n) Tightening and opening procedure and details of the top cover bolts.

(o) Transport and handling information.

(p) Material test certificates.

(q) Guarantee and Interchangeability certificates.

Annexure-I

		Specification Data Sheet		Doc No.	NFB/MECH/UB/UDC 101/SDS	
				Rev No.	0	
Item Name		Urea Synthesis Reactor		Item No.	UDC 101	
General Equipment Information						
	Location	Outdoor		Installation	Vertical	
Operating Data						
	Operating Temperature	200	°C	Operating Pressure	250	Kg/cm^2 g
Mechanical Design Conditions						
	Fluid Description	Urea solution and Ammonium Carbamate solution				
	Design Temperature	210	°C	Design Pressure	260	Kg/cm^2 g
	Operating Temperature	200	°C	Operating Pressure	250	Kg/cm^2 g
	Hydro test Pressure (Hydro Test temp. not less than 17^0C)	390	Kg/cm^2 g	Pneumatic Test	260	Kg/cm^2 g
	Helium Leak Test	20	Kg/cm^2 g			
	Inner Diameter	2100	mm	Mounting	Vertical	
	Cylindrical Height	29000	mm	Overall Height (From bottom skirt to top nozzle)	35000	mm
	Volume	105	M^3	Stress Relieving and PWHT	According to code	
	Design Code	ASME SEC VIII Div-1 or Div-2 (Latest version)		Manufacturing Code	ASME SEC VIII Div-1 or Div-2 (Latest version)	
	Seismic Code	IS 1893		Wind Code	IS 875	
	Welding Joint Efficiency	1.0/As per code		Radiography	Full/As per code	
	Construction Material	Shell	ASME SA 516 Gr. 70/ASME SA 724 B			
		Lining	Titanium (ASTM B 265 Gr.2/KS50) (6,5,4,3 mm thick) (Thickness starting from bottom Length of liner: 6 mm- min up to 6 meters, 5 mm- min 3 meters, 4 mm-min 3 meters and 3 mm- remaining length.). Bottom dished end Ti thickness- min 6 mm and top dished end Ti thickness-min 5 mm.			
	Corrosion Allowance	Titanium lining (3,4,5,6 mm thick)				
	Third Party Inspection	LRIS				
	Insulation	Excluded however necessary provision for site insulation to be kept				
	Dished Ends	Hemispherical with Ti cladding				

Nozzles and Connection

	Reference	No.	Size	Rating	Face	Description
		1	3 ½ B	260 K		CO_2 Gas Inlet
		1	3 ½ B	260 K		Liquid Ammonia Inlet
		1	3 ½ B	260 K		Ammonium Carbamate (Urea Solution) Inlet
		1	5 B	260 K		Solution Outlet
		2	ID 6/10			TI connection
		2	ID 6			TR connection
		2	ID 500			Manhole in skirt
		4/6	4 B			Vent in skirt for weephole connections

Remarks

1.	Party will confirm complete Interchange ability of the offered reactor with our existing Reactor and shall be erected on existing foundation.
2.	Reference Drg No. U-10-A0-4510 shall be used for various dimensions of the reactor, inlet nozzles orientation and top cover along with outlet nozzle provided in the top cover. However vendor's own Similar or better design of Titanium lined reactor conforming to applicable codes and standards will be acceptable. The offered design urea reactor should have proven performance of trouble free service for the minimum period of ten years and shall be in operation.
3.	Externals like lifting truniuns/lifting cover, earthling lugs, top platform lugs, insulation cleats/lugs, outline piping sliding support, base plate and skirt shall be provided by the vender. Details will be finalized during detail engineering.
4.	Preparation of quality management systems/QAP and coordination with LRIS for approval/review of quality control procedures and systems, including inspections and visits of LRIS during manufacturing and testing shall be in the vender's scope.
5.	The Reactor shall have efficient leak detection system i.e. weepholes for detection of any leakage from the inner titanium lining.
6.	Urea Reactor shell construction shall be multilayer or multiwall conforming to applicable codes and standards.
7.	Titanium lining material shall be 100% Ultrasonically tested quality material.