

**NUMALIGARH
REFINERY
LIMITED**

A GOVERNMENT OF INDIA UNDERTAKING



Tender for:

**Refractory Relining at Incinerator, Rotary Kiln and Transfer Chute at CCU
At NRL Site**

Part A: Refractory Replacement of Rotary Kiln and Transfer Chute of CCU at NRL



NUMALIGARH REFINERY LIMITED

1. Introduction:

The Rotary Kiln (06-RK-00-001) is the equipment where calcination & densification of the RPC takes place and product quality is controlled. The interior of the rotary kiln (06-RK-00-001) is refractory lined. It is rotated through an ACVF drive which allows the operator to vary the speed to suit calcined coke quality and capacity. The Rotary Kiln (06-RK-00-001) includes the following equipment:

- Refractory
- Riding Rings
- Support Roller Stations
- Drive Train including:
 - Ring Gear
 - Pinion
 - Parallel Shaft and Speed Reducer
 - Motor
 - ACVF Drive Unit
 - Aux. Drive for Startup, Maintenance and Emergency
- Feed and Discharge End Air Seals.

1.1 Kiln Dimensions:

- Length - 53.35 m
- Diameter - 2.89 m
- Capacity – 384 MT per day
- Speed – 0.5 to 1.8 RPM
- Refractory Lining – 230 mm thickness

SCOPE OF WORK

Refractory Brick Relining/Castable installation shall be undertaken to replace the entire Refractory of Rotary Kiln and Kiln to Cooler transfer chute.

A. Scope of Supply : Bidder's scope of supply shall include but not limited to following:

1. Bidder shall submit a detailed list of Refractory Materials, Indicative Quantity (considering wastage) along with Breakup of Calculation required for completion of the entire work as per **Exhibit-I** in the **Pre-Bid Meeting** and with the Tender.
2. Bidder shall visit NRL Site before submission of Tender to know the exact Site condition in advance.
3. The agency shall handover 10% additional spare to NRL at the end of the work without extra cost.
4. Bidder shall also indicate the name Refractory Material Make/Manufacturer proposed to be used in the work in the Tender.
5. All type of refractory castable/bricks/SS 310 fibres/mortar/shim plates/anchors/super duty bricks/cover tiles/block insulation etc. as per specs.
6. All types of anchors required for the installation of refractory as per layout drawing given in the mail shall be in the scope of the bidder.
7. All scaffolding materials (if needed) shall be under the scope of the bidder.
8. All tools & tackles including scaffolding materials & consumables as required
9. Make of all supplied materials (excluding anchors) shall be EIL enlisted.
10. EIL may act as the TPI for supply and installation for NRL.
11. Refractory materials-LC 45, LC 70 castable and Bricks (45% and 70% high alumina) shall be as per material specs attached with the document.

B. Bidder's scope of works shall include but not limited to following:

- I. Throughout the execution of the job, safety supervisor(s) along with experienced site engineer (having scaffolding inspection competency) shall be present.
- II. Dismantling of the existing refractory, including refractory castable, refractory brick lining along the length of the rotary kiln for a total length of 51.8 m of Rotary Kiln= (26.8 m from Feed End + 25 m of the Rotary Kiln from Discharge End), Refractory castable for a total of 1.85 m) and installation of refractory in Transfer Chute.
- III. All hot jobs including anchor welding, buffing, grinding etc shall be under the scope of bidder.
- IV. Installation of refractory castable and relining of bricks as per approved drg./procedure given by NRL.
- V. Detailed application procedures, including those should be prepared by contractors and submitted to NRL before commencement of jobs.
- VI. Erection/Removal of scaffolding (if needed) for Cleaning and disposal of debris at designated locations as per EIC after completion of job.

Detailed Scope Matrix

S/N	Description/Details	NRL	M/s contractor	Remarks
(A) SITE MOBILIZATION, EXECUTION G OTHER FACILITIES				
1	Resource mobilization including deployment of Experienced Engineers, and Supervisors, Safety officers, skilled and unskilled workmen.		✓	
2	Travelling, Lodging, Boarding and Local Conveyance for contractor's staff.		✓	
3	Providing necessary gate passes for contractor's manpower, tools & tackles, machineries and supply materials.	✓	✓	Since job location is inside refinery premises, which is under CISF protection, Contractor shall apply for necessary gate passes with proper documentation as per prevailing policy. Dedicated authorized person shall be appointed by contractor for this purpose. NRL shall guide and facilitate necessary processing.
4	Provision of Road Permits as required for mobilization of tools & tackles on returnable basis.	✓		
5	Firm, flat space for site office and workshop.		✓	
6	Construction of temporary store/shed for storage of refractory materials with proper pellets/raised platforms to ensure no water ingress and proper ventilation for storage. Unloading and receipt of refractory materials shall be done only in presence of contractor's representative.	✓	✓	NRL shall provide for covered storage shed for materials as per drawings/requirements submitted by contractor. Contractor shall arrange manpower for necessary supervision, management documentation of storage.
7	Third Party Inspection of Refractory materials during manufacturing	✓	✓	NRL/ Authorized Representative may witness laboratory testing of materials at Vendor's facility, during manufacturing. The vendor shall request for NRL witness via written communication at

				least 15 days prior to the planned manufacturing date.
8	Tractor/Hydra/Trailer/Forklift required shall be provided by NRL on free issue basis during unloading and receipt of material as well as during installation of refractory bricks/castable, However Manpower required for the same shall be provided by M/s contractor	✓	✓	Equipment to be provided by NRL on free issue basis based on availability. Contractor shall arrange for auxiliary manpower required.
9	Temporary shed/office to keep the equipment/tools tackles/refractory bricks/castable for execution of jobs		✓	
10	Provide continuous work front, Clear and free access to the workfront along with work & safety permits to carry out the job.	✓	✓	Contractor shall ensure proper housekeeping to maintain continuous work front. NRL shall ensure that no other hindrances arise due to other jobs and timely issuance of safety/work permits. Proper documentation of hindrance shall be maintained by contractor and intimated to EIC in a timely manner.
11	Dismantling / Removal of entire existing damaged refractory bricks/castable lining as per scope of work		✓	
12	Disposal of Debris as designated by the EIC (client) with necessary vehicles like truck/dumper etc shall be under the scope of contractor		✓	
13	Cleaning of casing internal surfaces including cleaning with wire brush/buffing/ grinding etc. to starting the refractory brick/castable lining.		✓	
14	Application of new refractory materials as per drawings.		✓	
15	External Insulation work /Coating work required for external insulation (if required)	✓		
16	Group Insurance P.F, E.S.I and Labour License for workmen as applicable		✓	NRL will issue FORM 3 as per application submitted by contractor for labour license
17	Housekeeping on regular basis.		✓	
(B) UTILITIES G CONSUMABLES				

1	Construction Power as per job requirement at least 10 meters near workplace.	✓		
2	Potable Quality Water as per job requirement	✓		
(C) PLANT G MACHINERY				
1	Crane, hydra, etc. For handling of equipment / Shifting / Transport of materials as applicable (on free issue basis)	✓		
2	Welding Machine / Rectifier for Anchor Welding	✓		
(D) HEAVY TOOLS G TACKLES				
1	Lifting arrangements / facilities, Tools & Tackles as applicable		✓	(Equipment shall have valid certification under Factories Act. Or any other statutory authorities applicable)
2	Machinery including refractory mixing machine/Metal Jacks for holding bricks in position/Chiller Machine, Tools & Tackles etc required for Refractory lining job on returnable basis.		✓	
(E) SMALL TOOLS G TACKLES				
1	Grinding machines/Buffering machine/Welding Machine etc		✓	
2	Toolbox with required tools, including quality testing apparatus/moulds as applicable (measuring tape, Hammers, Centre Punch, right angles, spirit levels, water level tubes, wire / metal brush, Chisel, Plumb, Hacksaw frames with blades, Cutting Plier, cotton waste, etc. as applicable).		✓	
3	Water Tank to Store Water for castable lining.		✓	

MECHANICAL / HOT WORKS / SURFACE PREPARATION

1	Mechanical activities that include welding of retainer plates, casing plates, angles, shelf plates, stiffener plates, Installation of metallic sleeves, etc. as applicable for job requirement, excluding anchor welding jobs.			
2	Hot work pertaining to marking & welding of Anchors, Studs, etc. as required for Refractory lining purpose.		✓	

ELECTRICAL ITEMS

1	Area Lighting using Pole Lights & Hand Lamp (Bulbs) / LED Lights/Exhaust Fans for Local Area illumination as per job requirement.	✓		
2	Extension board, Utility connections like Electrical Cable, Wire	✓		

SAFETY ITEMS

1	Safety PPEs like Helmets, Shoes, Goggles, Nose masks, Jackets & Belts.		✓	
2	Fire Extinguishers, if required.		✓	
3	Safety Net / Fall Arrestors / Barricading Tape, if required.		✓	
4	Fencing /Barricading workplace as per job requirement.		✓	

QC / TESTING G DRYOUT:

1	Preparation and Testing of Refractory production samples for BD, CCS & PLC test max. @ 815 °C at NABL Certified lab.	✓	✓	NRL will witness sample preparation and facilitate transfer and necessary testing at NRL's scope.
2	Offering stage-wise inspection as per approved QAP / ITP.	✓	✓	Contractor must offer for stage wise inspection. Supervision of jobs will be done by Contractor. NRL will act as inspector of jobs.
3	Material Consumption Report on daily basis during work execution.		✓	
4	Daily work progress report preparation and getting it duly verified by NRL		✓	
5	Submission of weekly detailed progress report.		✓	
6	API-936 certified inspector during execution of job for ensuring QA/QC.		✓	

7	Dry Out accessories like Velocity gas burners and accessories, combustion air blowers, etc and all necessary dry out equipment.		✓	Detailed list of equipment/tools/tackles for Dry Out shall be arranged by client side (NRL), However it must be informed well in advance.
8	Burner mounting plate and exhaust arrangement with damper	✓	✓	Burner mounting plate shall be arranged by NRL. However, detailed requirement/drawing shall be provided by contractor well in advance.
9	Uninterrupted supply of fuel via NG/LPG cylinders	✓		
10	CF blanket as per requirement for dry out	✓		

TECHNICAL SPECIFICATIONS
(Part-A)

A. Material Details:

S/N	Section	Subsection	Material	Specification	Dimension / Thickness
1	Firebricks	Rotary Kiln-Feed End	Firebricks	45% Alumina Bricks	26.8 m length
		Rotary Kiln-Discharge End	Firebricks	70% Alumina Bricks	25.0 m length
2	Refractory Castable	Kiln Inlet	Refractory Castable	45% Alumina Low cement Castable	700 mm (0.7 m) length
		Kiln Outlet	Refractory Castable	70% Alumina Low Cement Castable	1150 mm (1.15 m) length
3	Transfer Chute Block	Insulation	Insulating Material	Ceramic Fibre Board of 1260 deg C Grade	25 mm thick
		Intermediate Layer	Refractory Castable	45% Alumina Low cement Castable	130 mm thick
		Outer Layer	Cover Tiles / Super duty Bricks	45% Alumina Tiles of 1550 deg C grade	63 mm thick (min)

B. Material Specifications, ITP and QAP

I.Bricks and Castable: The material specifications for both refractory bricks and castable shall adhere to the documents attached

- Specifications for Firebricks in Kiln B686-006-06-43-SP-002
- Specifications for refractory castable at feed end and discharge end and refractory materials for Transfer Chute B686-006-06-43-SP-003
- ITP and QAP for Rotary Kiln refractory materials B686-006-06-43-ITP-002

II. Anchors: As per attached Drawings. TRL-07-06-18

General Guidelines for Refractory Works:

Part -A

- Bricks shall be laid ring-wise, starting from the 6 o'clock position, progressing simultaneously toward 3 and 9 o'clock.
- After completing the lower half of the ring, the kiln shall be rotated to 90°, and laying resumed up to the keying gap.
- Final key bricks shall be placed after further rotating the kiln to bring the opening to the 12 o'clock position.
- Jacks/wedges shall be used to retain bricks in position prior to keying.
- Brick Joints shall be lined with heat setting mortar as per specifications.
- Visual inspection shall be carried out after every 5 rings.
- Brick alignment, joint tightness, ring continuity, and circularity must be ensured.
- Expansion gaps shall be provided, filled with ceramic felt/paper, without mortar as per specifications.
- After completion, the lining shall be cured as per the mortar manufacturer's recommendation and subjected to controlled heating using a specified dry-out schedule.
- Castable application shall be done as per the approved procedure.
- Dry out shall be carried out as per approved procedure.
- Necessary curing of refractory works shall be carried out wherever necessary.
- Work has to be carried out as per the approved job procedure, specifications and quality should be acceptable to NRL.

Quantity of Materials (QOM)						
Job Name: Refractory Replacement of Rotary Kiln and Transfer Chute at NRL Site						
A. Supply of Refractory Materials						
Name of the Bidder and Address:						
S/N	Location	Item and Details	Unit	Quantity	Material Make	Remarks
Rotary Kiln Brick						
1	Discharge End	70% Alumina Size (mm): 230x200x103/90EA				The given quantity shall be backed by detailed calculation for Client's review.
2		70% Alumina Size (mm):230x200x103/83EA				
3		70% Alumina Size (mm):230x200x75/50 EA				
4		70% Alumina Size (mm):230x200x75/60 EA				
5		Heat Setting Mortar 70% Alumina				
6	Feed End	45% Alumina Size (mm):230x200x103/90EA				
7		45% Alumina Size (mm):230x200x103/83EA				
8		45% Alumina Size (mm):230x200x75/50 EA				
9		45% Alumina Size (mm):230x200x75/60 EA				
10		Heat Setting Mortar 45% Alumina				
11	Low Cement (LC) Castable					
12	Kiln Inlet & Transfer Chute	LC 45				
13	Kiln Outlet	LC 70				
14	Transfer Chute	25mm Ceramic Fibre Board				
15	Transfer Chute	1550 degree grade Superduty Tiles (45% Alumina)				
16	Anchor /Stud nut					
17	Discharge End	SS-310 V-190				
18	Discharge End Outer Periphery	SS-310 V-125.6				
19	Feed End	'V' Floating Anchor SS310, 150mmx8mm				
20	Transfer Chute	'V' Anchor 125mmx6mm				
21	Transfer Chute	Stud & Nut with Washer SS304, 65mmX6mm				
22	Any other Materials not Listed above but required for satisfactory completion of the work to be given/annexed.					
Signature of Bidder						
Note:- 1. The Make of Refractory materials proposed to be used shall be mentioned above and shall be EIL enlisted. 2. The Quantity shall be inclusive of the 10% additional spares.						

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**Tender for
Refractory Relining at Incinerator, Rotary Kiln and Transfer Chute at CCU
At NRL Site**

Part B: Refractory Relining of Incinerator



NUMALIGARH REFINERY LIMITED
(A Govt. of India Enterprise)

Introduction

Numaligarh Refinery Limited (NRL), a subsidiary of Oil India Limited, and popularly known as Accord Refinery is a 3MMTPA Refinery. Commercial production commenced in October 2000. The Refinery, located in Golaghat district of Assam, is well connected by air, road and rail. The nearest airport –Jorhat is 70 kms away from NRL Site. Road distance from Guwahati to Numaligarh is about 250 kms through NH-37 towards east. The nearest rail head is at Furkating Jn, 35 kms from NRL.

The Coke Calcination Unit at NRL with a maximum capacity of 115000 TPA processes Raw Petroleum Coke with a 75% CPC Yield. This job is primarily for refractory relining at Incinerator of Coke Calcination Unit (CCU). Technology -M/s SVADALA, USA, Vendor-M/s Mukand India Ltd; & GAS HANDLING SYSTEM (M/s. Walchandnagar, Pune)).

The Incinerator is the equipment where Volatile matter and coke dust are burnt. The incinerator is equipped with two burner firing system (gas and oil). Combustion air for the burners is provided by the incinerator primary air fans (06-FN-00-009). The firing systems are used to help bring the incinerator up to process temperatures and must be used when coke feed is started to the rotary kiln to ensure the ignition and combustion of volatile matter and coke dust being drawn into the incinerator.

SCOPE OF WORK

- A. **Application Location:** The Refractory castable work shall be undertaken to change the entire refractory lining using gunning methodology at.
- I. Overhead locations at an angle of 240 degrees (from 8 o' clock to 4 o' clock position, major arc) for a length of **30.937 m**
- II. 02Nos. of transfer chutes in the Incinerator of CCU at NRL site

Dimension of the Incinerator:

- Length: 30.937 m
- Inner Diameter: 5.486 m

B. Bidder's scope of supply shall include but not limited to following:

1. Bidder shall submit a detailed list of Refractory materials, Indicative Quantity (considering wastage) along with Breakup of Calculation required for completion of the entire work as per **Exhibit-II** in the **Pre-Bid Meeting** and with the Tender.

2. Bidder shall visit NRL Site before submission of Tender to know the exact Site condition in advance.
3. The agency shall handover 10% additional spare to NRL at the end of the work without extra cost.
4. Bidder shall also indicate the name Refractory Material Make/Manufacturer proposed to be used in the work in the Tender.
5. All types of Refractory castable as per specification.
6. All types of anchors required for the installation of refractory as per layout drawing and specs.
7. All scaffolding materials shall be under the scope of the bidder.
8. All tools & tackles & consumables as required.
9. Make of all supplied materials (excluding anchors) shall be EIL enlisted.
10. EIL may act as the TPI for supply and installation for NRL.
11. NRL/EIL may witness TPI carried out by the agency.
12. Inspection of Materials by NRL: Inspection of materials shall be carried out by NRL or any other agency engaged by NRL before despatch of materials. Inspection request shall be given to NRL well in advance so that inspection can be planned and arranged by NRL without delay.

13. Throughout the execution of the job, safety supervisor(s) along with experienced site engineer (with scaffolding Inspection competency) shall be present.

14. Dismantling of the existing refractory lining, including refractory castable, CF boards, anchors and buffing in incinerator at overhead locations from 8 o' clock to 4 o' clock positions (240 degrees) for the entire length of the incinerator (i.e. 30.937 m) including two transfer chutes.

15. Erection of scaffolding inside the incinerator to carry out the removal / installation of refractory lining(s) using Gunning method at the overhead locations shall be under the scope of the bidder.

16. While doing the refractory relining job (including dismantling/scaffolding/refractory relining etc.), sufficient precautionary measures must be taken to ensure that no damage is caused to the bottom portion of the refractory (i.e. existing refractory in the 120 degrees position, bottom 4 o' clock to 8 o' clock position). Should any damage occur to this part of the refractory during the relining job, the contractor is responsible for repairing it according to the original design drawings, without claiming any additional costs for the repair

17. All hot jobs, including anchor welding, buffing etc. shall be under the scope of the bidder.

18. Installation of refractory castable as per approved drg./ procedure given by NRL.

19. Detailed application procedures, including quality control guidelines, shall be prepared by the contractor and approved by NRL.

20. Erection/Removal of scaffolding (if needed) for Cleaning and disposal of debris at designated locations as per EIC after completion of job.

18. Erection/Removal of scaffolding (if needed) for Cleaning and disposal of debris at designated locations as per EIC after completion of job.

Detailed Scope Matrix:

S/N	Description/Details	NRL	contractor	Remarks
(A) SITE MOBILIZATION, EXECUTION G OTHER FACILITIES				
1	Resource mobilization including deployment of Experienced Engineers, and Supervisors, Safety officers, skilled and unskilled workmen.		✓	
2	Travelling, Lodging, Boarding and Local Conveyance for contractor's staff.		✓	
3	Providing Necessary gate passes for contractor's manpower, tools & tackles, machineries.	✓	✓	Since job location is inside refinery premises, which is under CISF protection, Contractor shall apply for necessary gate passes with proper documentation as per prevailing policy. Dedicated authorized person shall be appointed by contractor for this purpose. NRL shall guide and facilitate necessary processing.
4	Provision of Road Permits as required for mobilization of tools & tackles on returnable basis.	✓		
5	Space for site office and workshop.	✓	✓	Site shall be provided by NRL
6	Construction of temporary store/shed for storage of refractory materials with proper pellets/raised platforms to ensure no water ingress and proper ventilation for storage. Unloading and receipt of refractory materials shall be done only in the presence of the contractor's representative.	✓	✓	NRL shall provide for covered storage shed for materials. Contractor shall arrange manpower for necessary supervision, management documentation of storage.
7	Third Party Inspection of Refractory materials during manufacturing	✓	✓	NRL/ Authorized Representative may witness laboratory testing of materials at Vendor's facility, during manufacturing. The vendor shall request for NRL witness via written communication at least 15 days prior to the planned manufacturing date.
8	Supply, Erection & Removal of scaffolding as required for Refractory lining purposes inside the Incinerator of CCU		✓	

9	Tractor/Hydra/Trailer/Forklift required shall be provided by NRL on free issue basis during unloading and receipt of material as well as during installation of refractory, However Manpower required for the same shall be provided by the Contractor	✓	✓	Equipment to be provided by NRL on free issue basis based on availability. Contractor shall arrange for auxiliary manpower required.
10	Temporary shed/office to keep the equipment/tools& tackles/refractory castable for execution of jobs		✓	
11	Provide continuous work front, Clear and free access to the work front along with work & safety permits to carry out the job.	✓	✓	Contractor shall ensure proper housekeeping to maintain continuous work front. NRL shall ensure that no other hindrances arise due to other jobs and timely issuance of safety/work permits. Proper documentation of hindrance shall be maintained by contractor and intimated to EIC in a timely manner.
12	Dismantling / Removal of existing damaged refractory lining as per scope of work		✓	
13	Disposal of Debris as designated by the EIC (client) with necessary vehicles like truck/dumper etc. shall be under the scope of contractor		✓	
14	Cleaning of casing internal surfaces including cleaning with wire brush/buffing prior to starting the refractory lining.		✓	
15	Application of new refractory materials as per drawings.		✓	
16	External Insulation work /Coating work required for external insulation (if required)	✓		
17	Group Insurance P.F, E.S.I and Labour License for workmen as applicable		✓	NRL will issue FORM 3 as per application submitted by contractor for labour license
18	Housekeeping on regular basis.		✓	
(B) MOCK UP				
1	Prior to actual application, gunning crew shall conduct a mock-up process. This mock-up shall replicate the actual working conditions and application methods to be used in the project.		✓	

2	Pre-qualified gunning crew to prepare Mock up by shooting one 45-degree overhead panel (approx. 1 m X 1 m X original thickness), center of which shall be at 1.8 m from the ground for each material to be applied. The test panel shall be fixed with anchors by bolting (so that the back of the panel can be removed for inspection after curing) and the mock-up shall be carried out with actual equipment and compressed air supply, method of mixing, etc. going to be used in actual application.	✓	✓	Test Panel for Mock up along with frame shall be provided by NRL for which the concerned contractor shall provide necessary drawings well in advance.
3	After curing, the back of the panel shall be removed and inspected. A separate test panel shall be gunned, and samples shall be cut for testing of BD & CCS (after drying at 110°C/24 hrs.) and PLC at 815 deg C/ 5 hours or at nearest temperature/ duration for which value is available in approved datasheet. NRL / authorized inspector shall inspect the test panel after curing and witness the testing and approve the mock up application.	✓		
(C) UTILITIES & CONSUMABLES				
1	Construction Power as per job requirement at least 10 meters near workplace.	✓		
2	Potable Quality Water as per job requirement	✓		

TECHNICAL SPECIFICATIONS

S/N	Category	Details
Two castable layers for overhead locations		
1.	Refractory Material for Backup Layer	Type III insulating Castable (gunning, 100 mm thick)
2.	Refractory Material Hot Face Layer	50% Dense Refractory (Gunning Grade), 130 mm thick
3.	Anchor/Stud (Backup Layer)	SS 310, 75 mm height
4.	Anchor (Hot Face Layer)	Inconel 601 anchors, 205 mm height

Drawings and Standards:

1. Refer drawing-BC8C-OOC-OC-43-OOO and B686-006-06-43-0001 for the work.
2. Material Specifications, ITP and QAP
 - CASTABLES: The material specifications for both refractory castable and anchors shall adhere to the specifications/data sheets, attached with document.
 - 6-79-0008 Rev 3 Insulating Castable TYPE Gunning Grade (Specifications for Type III insulating castable gunning grade, for base layer 100mm thick)
 - B686-006-06-43-SP-001 50% Dense Castable (Gunning grade)-(Specifications for 50% Gunning grade Dense Castable for Hot face layer, 130 mm thick)
 - B686-006-06-43-0001 _recover Layout Drawing (Castable and Anchors) _Revised - (Layout drawing of refractory castable)
 - B686-006-06-43-ITP-001 Incinerator- Inspection and Test Plan for Refractory Supply and Installation
3. ANCHORS: The design of the anchors has been revised, and the new design drawing has been attached.
4. ELECTRODES (for Anchor Welding):
 - For welding SS310 anchors, the contractor shall use the E309 MoL electrode.
 - For welding Inconel 601 anchors, the contractor shall use the ERNiCr-3 or ENiCrFe-3 electrodes.

General Guidelines for Refractory Works:

Part-B

- Castable application should be done by gunning method.
- Dry out shall be carried out as per approved procedure.
- Necessary curing of refractory works shall be carried out wherever necessary.
- Work must be carried out as per the approved job procedure, specifications and quality should be acceptable to NRL.

QUALITY TESTING AND DRYOUT			
1	Preparation and Testing of Refractory production samples for BD, CCS & PLC test max. @ 815 °C at NABL Certified lab (as per ITP provided by NRL)	✓	✓ NRL will witness sample preparation and facilitate transfer and necessary testing at NRL's scope.
2	Offering stage-wise inspection as per approved QAP / ITP.	✓	✓ Contractor must offer for stage wise inspection. Supervision of jobs will be done by Contractor. NRL will act as inspector of jobs.
3	Material Consumption Report daily during work execution.	✓	
4	Daily work progress report and getting it verified by NRL	✓	
5	Submission of weekly detailed progress report.	✓	
6	API-936 certified inspector during execution of job.	✓	
7	Dry Out accessories like Velocity gas burners and accessories, combustion air blowers, etc. and all necessary dry out equipment.	✓	A detailed list of equipment/tools/tackles for Dry Out shall be arranged by client side (NRL), however it must be informed well in advance.
8	Burner mounting plate and exhaust arrangement with damper	✓	✓ Burner mounting plate shall be arranged by NRL. However, detailed requirement/ drawing shall be provided by contractor well in advance.
9	Uninterrupted supply of fuel via NG/LPG cylinders	✓	
10	CF blanket as per requirement for dry out	✓	

MACHINERY				
S/N	List	NRL	Contractor	Remarks
1	Crane, hydra, etc. For handling of equipment / Shifting / Transport of materials as applicable (on free issue basis)	✓		
2	Welding Machine / Rectifier for Anchor Welding		✓	
3	Lifting arrangements / facilities, Tools & Tackles as applicable		✓	(Equipment shall have valid certification under Factories Act. Or any other statutory authorities applicable)
4	Machinery including refractory mixing machine/Gunning machine/Chiller Machine, Screw Jack Tools & Tackles required for Refractory lining job on returnable basis.		✓	
5	Grinding machines/Buffering machine/Welding Machine etc.		✓	
6	Toolbox with required tools, including quality testing apparatus/moulds as applicable (measuring tape, Hammers, Centre Punch, right angles, spirit levels, water level tubes, wire / metal brush, Chisel, Plumb, Hacksaw frames with blades, Cutting Plier, cotton waste, etc. as applicable).		✓	
7	Water Tank to Store Water for castable lining		✓	
8	Mechanical activities include welding of retainer plates, casing plates, angles, shelf plates, stiffener plates, Installation of metallic sleeves, etc. as applicable for job requirement, excluding anchor welding jobs.	✓		
9	Hot work pertaining to marking & welding of Anchors, Studs, etc. as required for Refractory lining purpose.		✓	
10	Area Lighting using Pole Lights & Hand Lamp (Bulbs) / LED Lights/Exhaust Fans for Local Area illumination as per job requirement.	✓		
11	Extension board, Utility connections like Electrical Cable, Wire	✓		
12	PPEs-Helmets, Shoes, Goggles, Nose masks, Jackets & Belts.		✓	
13	Fire Extinguishers, if required		✓	
14	Safety Net / Fall Arrestors / Barricading Tape, if required		✓	
15	Fencing /Barricading workplace as per job requirement		✓	

Quantity of Materials(QOM)

Job Name: Refractory Relining at Incinerator at NRL Site

A. Supply of Refractory Materials

Name of the Bidder and Address:

S/N	Item and Details	Unit	Quantity	Material Make	Remarks
1	Gunning Grade Refractory castable (Type III)				The given quantity shall be backed by detailed calculation for Client's review.
2	Gunning Grade 50% Alumina Dense Castable				
3	Y1 SS 310 Anchor				
4	Y2 Inconel Anchor				
5	Any other Materials not Listed above but required for satisfactory completion of the work to be given/annexed.				

Signature of Bidder

Note:- 1. The Make of Refractory materials proposed to be used shall be mentioned above and shall be EIL enlisted.
 2. The Quantity shall be inclusive of the 10% additional spares.

CONTRACT PERIOD

[For Part-A & Part-B Each]

Total Contractual Period: 08 Months

- I. **Material Delivery Period:** Within 3 Months from the date of NRL's communication for start of Supply after the receipt of Work order.
- II. **Execution Period:** Within 1 Month (excluding Dry out) from the date of CCU Shutdown which shall be intimated 30days in advance and accordingly the bidder should plan their resource mobilization.

Extra 04 Months is kept as Buffer period for execution flexibility due to shutdown finalization and operational dependencies

Note:

- a. Bidder shall deploy the sufficient manpower, tools & tackles etc. accordingly.
- b. Work must be carried out 24x7 in 02shifts and must plan accordingly.
- c. Agency shall start supply materials only after receipt of NRL communication for supply.

SCHEDULE OF PAYMENT
[For Part-A & B]

Against-Supply of Materials: [BOQ ITEM NO-1]

S/N	Stages of Payment	Payment Percentage (%)
1	After 100% Delivery and Acceptance of all Refractory Materials, Anchor etc. as per Exhibit-I/II	60
2	After Completion of the Installation, Dry out of the job and acceptance	40

Against-Execution at site Installation and Dry Out: [BOQ ITEM NO-2]

S/N	Stages of Payment	Payment Percentage (%)
1	Completion of the Installation, Dry out of the job and acceptance	70
2	After smooth Start-up and Handing Over	30

Note to Bidder:

1. The agency shall ensure that all supplied materials are in accordance with Tender specification.
2. The agency shall carry out receipt, unloading, unpacking of refractory materials in presence of Contractor's and NRL's representative only.
3. Supplied materials shall be as per Recommended manufacturers only.

SCC AND SAFETY REQUIREMENTS

1. Bidder shall strictly follow all safety guidelines of Client's Work Permit System, Safety manual & JSA" during the work. Daily toolbox meeting shall have to be conducted.
2. No work within the plant premises should be done without a valid work permit issued by Client.
3. Bidder shall keep the First Aid Box at site office.
4. Bidder shall follow all Safety, Quality, Health & Environment rules / standard of Client.
5. Bidder shall take care for safety & security of their staff and materials inside the Plant premises.
6. Bidder shall maintain the PPE issue and safety talk register at site.
7. Entry & exit record of workers for vessel entry job shall be maintained at site.
8. All safety measures for execution of work shall be under scope of party.
9. Bidder shall depute two safety supervisors during the job (one in day shift & one in night shift).
10. Bidder shall depute only skilled manpower having wide experience in confined space & height jobs.
11. Workers must use full body safety harness with double lane yard while working at height.
12. Bidder shall use yellow coloured safety helmet with chin strip, safety shoes, safety goggles, hand gloves, dust mask, boiler suite etc. during the work.
13. All safety harnesses, rope, pulley & other lifting items shall be certified by competent authority of State Govt. Party shall submit the certificate before start of job.
14. Welding machine: Both power and earth cable should be joint-less and have proper lugs and flame proof Connector for power supply. Earth cable should be joint-less and long enough and shall be connected near the job.
15. Non-compliance will attract penalty as per Client's safety norms.
16. Bidder shall maintain proper housekeeping of the area during job execution on daily basis & shall depute one dedicated housekeeping In-Charge at site.
17. Bidder shall make the proper barricading while disposal of debris from furnace so that flying of dust & refractory material can be avoided.
18. Arrangement of jumbo bags for handling & shifting of disposal shall be under scope of Bidder.
19. Shifting and disposal of debris from site to temporary disposal location. Temporarily disposal area shall be properly barricaded.
20. As there is no requirement/direct involvement of forest produce/minor minerals, there shall be no payment requirement against forest royalty.
21. Conditions not covered above shall be governed by GCC of NRL.