

Bharat Heavy Electricals Limited
Ramachandrapuram : : Hyderabad – 502032
M&S – DIVISION
SCOPE OF WORK (ANNEXURE-I)

Tender No.: M&S/P&S/2022/32, dt.: 23.08.2022

Name of Work: Heat Resistant Aluminum painting of Chimney connected to 6MW DG set (56 meters tall), 3X1000 kVA DG and 1X166 kVA DG set in BHEL factory.

The Work includes: Heat Resistant Aluminum painting of strakes, platforms and connected equipment like ladders up to a total area of 513 square meters.

| S.No | Description | Vendor's Acceptance (YES/NO) |
|------|--|------------------------------|
| 1. | <p>SCOPE OF WORK: The scope includes Repair of Canopy of Chimney (Welding of the Canopy at the top of the Chimney). Heat Resistant Aluminum painting of chimney connected to 6MW DG set (56 meters tall, 3 x 1000 KVA DG and 1 x 166 kVA DG set in BHEL factory, Heat Resistant Aluminum painting of strakes,platforms and connected equipment like ladders up to a total area of 513 square meters. The scope includes, - Scaffolding (Mild Steel,Cup Lock or clamping type) arrangement (on returnable basis) - One coat of Epoxy red oxide paint with DFT 30 microns per coat and Two coats of HR aluminium paint with DFT 20 microns per coat totalling 40 microns.</p> | |
| 2. | <p>GUARANTEE: The bidder shall give 5 years guarantee from the date of successful completion of aluminization.</p> <p>REGARDING QUALITY OF MATERIAL SUPPLIED: a) Bidder shall ensure guarantee for the quality of the materials used and implementation of standards for the Heat Resistant Aluminum painting. b) The Contractor shall guarantee to rectify or repeat the Heat Resistant Aluminum painting free of cost at the BHEL site, if the material identified to be defective. In the event of the supplier's not complying with the above within a reasonable time, BHEL will have the option to rectify on its own after giving one-week notice to the contractor and recover the cost from the contractor. The contractor shall not dispute the liability in any form.</p> | |

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| 3. | <p>INSPECTION:</p> <p>a) The equipment/critical items shall be inspected at the manufacturer's works or the purchaser's site by the BHEL at its discretion or its consultants' representatives. For this purpose, the supplier shall inform BHEL office/works 7 days in advance of the readiness of the stores for inspection. However, this inspection shall in no way absolve the supplier of his over-all responsibility of workmanship, quality and performance guarantee offered by the supplier. All dispatch documents shall accompany Inspection Certificates, if any, issued by the Inspecting Authority.</p> <p>b) The material on receipt of the factory/project will be inspected. The contractor shall have to replace the materials, if any, found defective at site on free of cost basis.</p> | |
| 4. | <p>WORK TO BE CARRIED OUT DURING RUNNING OF 6 MW DG sets, 3 x 1000 KVA DG sets and 1 x 166 KVA DG set.</p> <p>The DG sets connected to the chimney may be operated depends upon plant requirements. Bidder shall ensure the Heat Resistant Aluminum painting work can be done during the above period or contractor shall accept the timings given by BHEL to perform the job.</p> | |
| 5. | <p>Bidder will have to make his own arrangements for tools & tackles, Safety equipment required for the work and the BHEL will not supply any tools and tackles unless otherwise specified.</p> | |
| 6. | <p>The contractor must take all safety precautions as per the Annexure-C to avoid all accidents. He shall be responsible for all damages and accidents caused due to the negligence on his part.</p> | |
| 7. | <p>Mobilization, Transportation and Local commutation of manpower (skilled, Unskilled) & Equipment, and supervision required for the job will be in the scope of vendor.</p> | |
| 8. | <p>Mobilization period of manpower: Within 15days of work awardal. Bidder only shall arrange lodging and boarding of manpower.</p> | |
| 9. | <p>Work shall be carried out on working days only from 7.00 Hrs to 17.00 Hrs. Completion period: 4 months</p> | |
| 10. | <p>Suitable Scaffolding, Heat Resistant Aluminum paint will be in vendor scope.</p> | |
| 11. | <p>Storage facility for the equipment and consumables will be arranged by BHEL.</p> | |
| 12. | <p>Thickness measurement gauge for joint inspection of the thickness is to be arranged by vendor.</p> | |
| 13. | <p>Clearance Certificate: Should be obtained from HR/ IR Section on application by showing evidence that recoveries have been affected to the staff/workers engaged, PF & ESI matching Contributions fulfilled by the contractor for bill claim release.</p> | |
| 14. | <p>Guarantee period: 5 years Bidder has to submit Security Deposit as per BHEL terms and conditions and this amount will be released after successful completion of guarantee period.</p> | |
| 15. | <p>Penalty Clause: 0.5% of the contract value per week or part there of up to a maximum of 10% of the contract value shall be levied beyond the scheduled completion time.</p> | |
| 16. | <p>Final quality inspection will be done by M&S/BHEL executives along with bidder.</p> | |

TECHNICAL WORK DESCRIPTION:

| Item | Work Description | Vendor's Acceptance (YES/NO) |
|------|--|------------------------------|
| 1. | <p><u>Process of Aluminum Painting</u> Aluminum painting of chimney connected to 6MW DG set (56 meters tall, 3 x 1000 KVA DG and 1 x 166 kVA DG set in BHEL factory, Heat Resistant Aluminum painting of all the platforms, stairs and connected equipment like ladders up to a total area of 513 square meters.</p> <p>The scope includes,</p> <ul style="list-style-type: none"> - Scaffolding (Mild Steel, Cup Lock or clamping type) arrangement (on returnable basis). - Surface Preparation either by Sand blasting or by any other standard method. - Two coats of HR aluminum paint with DFT 20 microns per coat totaling 40 microns. | |
| 2. | <p><u>Standards to be followed</u> Aluminizing with :- Heat Resistant aluminum paint IS13183 Gr.II</p> | |
| 3. | <p><u>Surface Preparation:</u> Before painting the surface to be cleaned for any traces of oxide. Either by using sand blasting or emery paper manually.</p> | |
| 4. | <p><u>Repair of damaged portions if required</u> On site repair to be done for the damaged portions of chimney if required.</p> | |
| 5. | <p><u>Consumables used</u> All the materials required like coating consumables, Abrasive and sealants etc to be arranged by vendor.</p> | |
| 6. | <p><u>Primer Application:</u> Epoxy Red Oxide Zinc Phosphate Primer Minimum 30 Microns on the surface.</p> | |
| 6. | <p><u>Coating thickness</u> <u>Heat Resistant Aluminum painting:</u> Minimum 40 Microns (Two coats of 20 microns each).</p> | |
| 7. | <p><u>Extra scope/payment</u> Final Billing will be done on actual surface area (Square meters) on which aluminization has been done. No further payment will be made for more than 513 square meters surface area. Vendor has to visit the site to understand the scope of work and then quotation has to be submitted accordingly.</p> | |

SAFETY PRECAUTIONS TO BE FOLLOWED AT SITE:

| S.No | Safety guideline to be followed | Vendor's Acceptance (YES/NO) |
|-------------|--|-------------------------------------|
| 1 | Statutory requirements as per the sec-32 of FACTORIES ACT, 61-c of APF rules, for working at heights. | |
| 2 | Scaffolding arrangement for total height or Safety net is to be provided surrounding the existing chimney to protect the persons while painting at heights. | |
| 3 | Daily work permit is to be issued and has to be closed daily before 5PM | |
| 4 | Bidder shall take care of the people working at heights in all respect. BHEL is not responsible for any incidents happen due to lack of proper safety precautions by bidder. | |
| 5 | Safety belts, safety shoes and helmets are to be provided to workmen. | |
| 6 | Adequate arrangements for anchorage of the safety belt to be provided. | |
| 7 | A separate lifeline tied to safety belt with proper anchorage is to be provided additionally as a precautionary measure. | |
| 8 | Adequate illumination is to be provided. | |
| 9 | Barricading is to be provided around the chimney. | |
| 10 | The work area should be clear and safe from overhead electrical lines/other protecting structures. | |
| 11 | Ensure usage of personal protective Equipment's for painting like face mask, hand gloves etc. | |
| 12 | The persons working in the painting works should obtain a Medical Fitness certificate for working at height and they should not have any height phobia. | |
| 13 | All employees involved have to be informed all the precautions | |
| 14 | Work shall be closed before sunset. | |
| 15 | Work has to be carried out under continuous supervision. | |
| 16 | "Men at Work" Caution Boards are to be displayed while the job in progress. | |
| 17 | After finalization of work order, all involved men shall be imparted for safety training. | |

Surface area calculation for chimney:

1. Surface area of the tapered part:

Diameter of the bottom plate $D_1 = 3$ m

Diameter at the top of the tapered part = 1.49 m

Height of the tapered part = 28.3 m

Surface area of the tapered part = $3.142(\text{value of Pi}) \times (3+1.49) \times 28.3 / 2 = 199.63 \text{ m}^2$

2. Surface area of the top cylindrical part:

Diameter of the cylindrical part = 1.49 m

Height of the cylindrical part = 28 m

Surface area of the cylindrical part = $3.142 \times 1.49 \times 28 = 131.08 \text{ m}^2$

3. Ladder

a. 0.08×2 (sides) $\times 56.3 \times 2 = 18.016 \text{ m}^2$

b. 0.05×2 (sides) $\times 56.3 \times 7 = 39.41 \text{ m}^2$

c. 2.3×2 (Sides) $\times 56$ (Nos) $\times 0.05 = 12.88 \text{ m}^2$

d. $0.52 \times 3.14 \times 0.022 \times 188 = 6.75 \text{ m}^2$

The total ladder area = 77.086 m^2

4. Surface area of bottom flange and door = 15.55 m^2

5. Platforms = 4 Nos of Platforms

Inner radii of platform = 0.745m

Outer radii of the platform = 1.245 m

Area of the platform = $2 \times \text{Pi} \times 1.745^2 - 0.745^2 = 15.63 \text{ m}^2$

6. Round Pulley plates and gaskets = 16.2 m^2 (approx.)

7. 1000 KVA Dg set chimneys

a. Chimney of 1000 kVA DG set entails exhaust pipe and silencer. Each DG set is having 2 similar stacks

b. Exhaust pipe is having 4 cylindrical sections

c. $L_1 = 82\text{cm} = 0.82$ m, $D_1 = 14\text{cm} = 0.14$ m

d. L_2 (flange) = 29 cm = 0.29 m, $D_2 = 20$ cm = 0.2 m

e. $L_3 = 65$ cm = 0.65 m, $D_3 = 26$ cm = 0.26 m

f. $L_4 = 358$ cm = 3.58 m. $D_4 =$

g. Total area of the exhaust pipe = $A_1 + A_2 + A_3 + A_4 = 2 \pi R_1 L_1 + 2 \pi R_2 L_2 + 2 \pi R_3 L_3 + 2 \pi R_4 L_4 = 4 \text{ m}^2$

h. Length of the silencer = 162 cm = 1.62 m

i. Diameter of the silencer = 77 cm = 0.77 m

j. Area of the silencer = $2 \pi R_1 L_1 = 3.92 \text{ m}^2$

- k. Total area of one stack of DG set = Area of the exhaust pipe + area of the silencer = $4 + 3.92 = 7.92 = 8 \text{ m}^2$ (approx.)
- l. We have 3 DG sets and one 166 kVA DG set
- m. Total surface area = $7 (3 \times 2 + 1) \times 8 + 2 = 58 \text{ m}^2$

| S.No | Description | Area in m ² |
|--------------|--|------------------------|
| 1 | Surface area of tapered part | 199.63 |
| 2 | Surface area of the top cylindrical part | 131.08 |
| 3 | Ladder | 77.086 |
| 4 | Surface area of bottom flange and door | 15.55 |
| 5 | Platforms | 15.63 |
| 6 | Round Pulley plates and gaskets | 16.2 |
| 7 | 1000 kVA Chimney | 58 |
| Total | | 513 |

Total Surface are for the work of Aluminisation of Chimney connected to 6 MW DG set (56 meters tall) and other 1000 KVA DG sets in BHEL factory is 513 m²