



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT, NOIDA

Date-19-Aug-26

CORRIGENDUM- 05

PROJECTs	:	2000 TPD BCGCL COAL TO AMMONIUM NITRATE - LSTK 1
PACKAGE	:	INDUCED DRAFT COOLING TOWERS (IDCT)
ENQUIRY NO	:	77/26/6109/AMI dt.06/08/2026
SUBJECT	:	Technical amendment 03 and replies to pre-bid queries

Type of Corrigendum			
Technical Corrigendum -	☒	Commercial Corrigendum -	☒

Bidders are requested to note the following -

1. Technical amendment 03 to Technical Specifications no. PE-TS-544-165-W001 rev 01 is enclosed.
2. Replies to pre-bid queries enclosed.

All the other terms and conditions of the tender enquiry remain unchanged. All the bidders are requested to quote accordingly.

Yours faithfully,
For and on behalf of BHEL

Amit Kumar
Sr. Manager/BOP



**TECHNICAL SPECIFICATION
INDUCED DRAFT COOLING TOWER
2000 TPD BCGCL COAL TO AMMONIUM
NITRATE -
LSTK-1**

SPECN. NO.:

PE-TS-544-165-W001

AMENDMENT NO. - 03

REV. NO.

01

DATE:

19-08-2026

1.0 Following drawings / documents / details are attached in Specification.

a)

Annexure- J : Detailed specification of the coating system on concrete surfaces is attached.

Annexure- J



**BCGCL 2000 TPD COAL TO
AMMONIUM NITRATE PLANT AT
LAKHANPUR, ODISHA
INDUCED DRAFT COOLING TOWER**

SPECIFICATION NO. IS-1-25-2002/TS/IDCT

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TECHNICAL SPECIFICATION FOR
CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR
INDUCED DRAFT COOLING TOWER

ANNEXURE-J

**SPECIFICATIONS FOR 100% SOLIDS, HIGH BUILD,
ELASTOMERIC POLYURETHANE COATING FOR
CONCRETE**

SPECIFICATION NO. IS-1-25-2002/TS/IDCT



Bharat Heavy Electricals Limited
Industrial Systems Group
Post Box # 1249, IISc Post,
Prof. CNR Rao Circle, Malleswaram,
Bangalore – 560012



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1.00.00 The coating shall meet minimum requirements for materials, equipment, application, inspection, repair and handling aspects associated with the coating of Concrete using 100% Solids (Solventless) Two Component, Fast Curing Elastomeric Polyurethane Coating classified under ASTM D -16, Type V.

1.01.00 The polyurethane on the external / internal surface of the Concrete shall provide a hard yet flexible, impermeable barrier with outstanding adhesion impact and abrasion resistance as well as crack spanning capability to protect the Concrete from corrosion and abrasion. It shall cover all variations associated with operating conditions of IDCT.

1.02.00 Supplier or his licensed applicator shall obtain prior written approval from the Owner for any deviations from the requirements of this specification and / or the standard referred herein.

1.03.00 The work shall conform to following documents (latest revision or as specified) and as referred in this specification.

- | | | |
|----|----------------------------------|--|
| a) | SSPC-PS Guide 17.00, 1 Aug, 1991 | Guide for Selecting Urethane Painting System |
| b) | RP 0892-92 | NACE International Linings Over Concrete for Immersion Service |
| c) | RP 0187-96 | NACE International Design Considerations for Corrosion Control of Reinforcing Steel in Concrete. |
| d) | ASTM D 4541 | Method for Pull Off Strength of Coatings Using Portable Adhesion Testers |

2.00.00 GENERAL REQUIREMENT

2.01.00 The bidder shall perform all work in accordance with this specification and other requirements noted herein.

Bidder shall submit a detailed written description in the form of a manual covering coating equipment, procedure, materials, inspection, tests and repair etc, for Owner's approval.

2.02.00 The bidder shall also supply copies of test reports conducted by in internationally reputed test agencies evidencing that materials conform to minimum performance requirements. The bidder shall also supply certificates from coating manufacturer as under.

- That the materials (with batch numbers, dates of manufacture and shelf life) are free from all manufacturing defects.
- That the materials will meet performance criteria as given below when applied.
- That the bidder or his applicator possesses the necessary technical skills and equipment to apply these materials and is authorized by the manufacturer for this purpose.



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100% Solids, Two Component Polyurethane are specialized coatings characterized by very short pot lives. The coating shall be applied either by the coating material manufacturer himself or by his authorized applicator. The authorized applicator should have been trained and certified by the coating manufacturer and shall possess the necessary specialized equipment, trained crew and experience in spraying fast setting plural component polyurethane coatings. Contractor shall provide, for the owner's approval, details of coating manufacturer's authorized applicator including details of equipment, experience in spraying fast setting 100% Solids Polyurethane Coatings and client references for verification. In no case shall coating application be undertaken by coating contractors without prior track record of applying these materials. In addition, contractor shall provide certificate from coating materials manufacturers that the applicator possesses the necessary technical skills and equipment to apply these materials and is authorized by the manufacturer for this purpose.

2.03.00 Applied coating will be tested for dry film thickness and adhesion and hardness.

All coating operations shall be performed under the supervision of, and performed by, personnel skilled in the application of the coating system.

2.04.00 The bidder shall provide access, during all phases of work, to the Owner and their representatives.

2.05.00 All cleaning, priming and coating machines shall be equipped with rubber or wheels overlaid with hard fiber to prevent damaging the concrete surface.

2.06.00 The materials shall be applied by Airless Spray System, as per the standards specified by the material manufacturer.

2.07.00 100% Solids Polyurethane systems are solvent free eliminating solvent health hazards and flammability concerns All safety precautions warranted by good industrial hygiene practices and regulated by local, state or central laws must be taken into consideration while applying these coatings.

3.00.00 **MATERIAL SPECIFICATIONS**

3.01.00 **ELASTOMERIC POLYURETHANE COATING:**

Spray applied, Impermeable, 100% Solids, Elastomeric Aromatic Polyurethane Coating (Non Tar Extended), as per ASTM D-16, Type V (Two Component, Chemical Cure). Shall meet following criteria. All tests at ambient (25° C) unless otherwise specified.

- | | |
|--|------------------------|
| • NOMINAL THICKNESS | 2,000 Microns |
| • TENSILE STRENGTH ASTM D-638 | 17 N / mm ² |
| • ADHESION
ASTM D-4541 (Elcometer Pull Off) | 2 N / mm ² |
| • RECOVERABLE ELONGATION ASTM D-638 | 50% Min. |



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- SURFACE HARDNESS 50 Min.
ASTM D 2240 (Cured Film - Shore D)
- WATER VAPOUR PERMEABILITY 0.3 gms. / 24 Hour / M2 Max.
ASTM E - 96 / F-1249-90
- RESISTANCE TEMPERATURES 0° C to 60°C
- FLEXIBILITY Pass over 12 mm Mandrel
180° Bend -1.0 mm thick
ASTM D 1737
- ACCELERATED WEATHERING Excellent. Some Discoloration.
ASTM G – 154 53 / BS 3800 2,000 Hours
- ABRASION RESISTANCE Weight Loss 0.05 gms. Max
ASTM D 4060 /FTMS 141 Taber Abraser
H - 10 Wheel 1,000 gms., 1,000 cycles
- CHEMICAL RESISTANCE
Immersion of 30 days in sea water followed by
 - (%) Weight Change < 1.0 %
 - (%) Hardness (Shore D) Change < 5.0 %
 - (%) Tensile Strength Change < 5.0 %

3.02.00 PRIMER

Primer shall be used on new concrete surfaces before application of PU coating.

Damp tolerant, penetrating, sealing primer shall be applied at 100-125 Microns Wet Film Thickness in accordance with the recommendation of the Polyurethane Coating manufacturer.

4.00.00 SURFACE PREPARATION

4.01.00 The bidder shall be responsible for the structural integrity of the concrete.

The use of form release agents shall be compatible to the coating. Contractor shall take measures in concrete casting to provide a suitable surface finish that shall be compatible with subsequent application of coating. The measures shall include providing well compacted, dense concrete with minimal air entrainment and a relatively smooth surface finish. Pond floor shall be vacuum dewatered.

Remove any fins or protrusions using power grinding. These may also be required to be removed for applications requiring an even finish.

Residual bug – holes beneath the surface of the coating shall be opened by sweep blasting and flooded with Polyurethane coating during spray application. Any larger voids shall be filled with Elastomeric Polyurethane hand mix material or compatible grout. Active cracks shall be bridged by using Elastomeric Polyurethane over Industrial Nylon / Polyester Fabric. Any exposed steel surfaces shall be wire brush cleaned and primed before coating application.



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- 4.02.00 Exterior waterproofing shall be applied to the structure below the finished ground level and up to at least 300 mm above it. The structure shall be sealed from the exterior (soil side) to block capillary action of moisture through the concrete. Leaks from groundwater can permeate the entire concrete thickness. The exterior waterproofing system must be suitable for the expected exposure condition.
- 4.03.00 Before general surface preparation, surface contaminants (if any) shall be removed. Oil and Grease shall be removed by multiple detergent wash, preferably using steam. (Solvents shall not be used as they will cause the petroleum products to penetrate the concrete surface). Chemically contaminated concrete shall be neutralized prior to complete surface preparation. Acidic surfaces shall be neutralized using an alkaline cleaner and rinsed with fresh water and then cleaned with steam and detergent. After chemical cleaning, surface will be tested for residual chemicals. pH shall be tested using ASTM D - 4262 using pH test paper on rinse water. Concrete shall be dried thoroughly thereafter.
- 4.04.00 Sweep blast the concrete surface using expendable abrasive. The blast nozzle should be kept at sufficient distance to avoid over blast and exposing of aggregate. Following blasting remove dust using air jet (with the abrasive turned off).
- 4.05.00 Any of the following methods of surface preparation may be used to achieve a near white blast cleaned surface:
- a) Dry abrasive blasting using compressed air, blast nozzles and abrasive.
 - b) Dry abrasive blasting using a dosed cycle, re-circulating abrasive system, with compressed air, blast nozzle, and abrasive, with or without vacuum for dust and abrasive recovery.
 - c) Dry abrasive blasting using a dosed cycle, re-circulating abrasive system with centrifugal, wheels and abrasive (such as Wheelabrator).
- 4.06.00 Compressed air used for blast cleaning shall be clean, dry and free of moisture and oil. Moisture separators, oil separators, traps or other equipment may be necessary to achieve clean, dry air.
- 4.07.00 Blast cleaning operations shall be done in such a manner that no damage is done to partially or entirely completed portions of the work.
- 4.08.00 Dry blast cleaning shall not be concluded during times when the surface will become wet after blast cleaning.
- 4.09.00 Non-metallic disposable mineral abrasive such as silica sand shall be the chosen abrasive for open blasting operations. Steel grit and shot are approved abrasive media for blast cleaning in closed cycle, recirculating abrasive systems (compressed air, vacuum and centrifugal wheel). No other abrasive media shall be used without prior approval.
- 4.10.00 The cleanliness and size of recycled abrasive shall be maintained to ensure compliance with this standard.
- 4.11.00 The blast cleaning abrasive shall be dry and free of oil, grease and other contaminants. Applicator shall use abrasive media of size that will ensure the necessary roughness desired.

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4.12.00	Dust and residues shall be removed from prepared surface by brushing, blowing off with clean, dry air or vacuum cleaning. Moisture separators, oil separators, traps or other equipment may be necessary to achieve clean, dry air.			
4.13.00	Prior to the application of Elastomeric Urethane on new concrete surface, sufficient time must pass to allow the excess moisture to evaporate. This time will vary on conditions and is normally 14-28 days. After the curing period has elapsed, concrete must be checked for the presence of excess moisture on and beneath the surface using a Delmhorst BD-8 Moisture Detector. A reading of 2% and under indicates that the concrete is ready to be coated. The moisture content must not only be checked on the surface but beneath it by driving nails 6-12 mm into the concrete and placing the probes on the nail - heads. Alternatively, the moisture may be tested by the Plastic Sheet Test ASTM D-4263. The test involves taping a 450 mm X 450 mm, 0.1 mm thick clear plastic sheet to the surface of the concrete for a duration of 16 hours. Absence of any droplets of moisture underneath the plastic sheet indicates that the concrete is ready for coating. In cases of continued ingress of moisture from localised areas of concrete, apply propane blow torch to ensure that the moisture content as specified above is achieved.			
5.00.00	PRIMING			
5.01.00	Before beginning priming and coating, measure the humidity using a sling psychrometer and calculate the dew point. The relative humidity must be lower than 85%. Temperature of concrete surface must be at least 3°C higher than the dew point. Under controlled conditions, it is possible to heat the concrete surface to eliminate condensation problems.			
5.02.00	The type of primer used shall be as described in the coating specification 3.02.00.			
5.03.00	Primer shall be sprayed onto the cleaned surface with a wet film thickness of 75-125 Microns. Since the primer penetrates into the concrete surface, no DFT measurements will be taken and estimation shall be on volumetric basis. The primer on application shall be free from runs or drips or areas of excessive thickness.			
5.04.00	The primed surface shall be protected so that it will not come into contact with rain, dust or other substances until completely hardened and coated with the Elastomeric Polyurethane Top Coat.			
5.05.00	Primed surface should be over coated within the time recommended for the approved type of primer. In the event that the re-coat interval of primed surface is exceeded without top-coating with the Elastomeric Polyurethane, the surface must be re-primed.			
6.00.00	COATING			
6.01.00	Nominal thickness of the Elastomeric Polyurethane shall be 2,000 Microns, measured in accordance with 7.02.02. Being a thixotropic, high build, non-levelling coating, the Elastomeric Polyurethane coating shall take the contour / profile of the substrate. Coating shall be done only at times when the substrates temperature is at least 3°C over the dew point. Hourly measurements of dew point and surface temperatures shall be made prior to and when coating is under progress. Surface temperature should be minimum 5°C and should not exceed 70°C.			



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- 6.02.00 Equipment for the spray application shall be in conformity with system specification, meeting minimum specified by the coating manufacturer. Equipment shall consist of Material Feed Pumps, Purge Pump, Proportioning Pump, Mix Manifold, Static Mixer, Interconnecting Hoses etc.
- 6.03.00 Partially used and unused material drums must be tightly sealed and contain a blanket of nitrogen to prevent moisture contamination when not in use.
- 6.04.00 Before application on the substrate apply a test patch for runs or drips and gel time as well as tack free time.
- 6.05.00 The proportioning pump shall be fitted with a numeric counter to keep track of the volume while spraying.
- 6.06.00 Entire thickness shall be built up in a single application (with a number of passes). If the surface is large enough to require more than one day for the coating, the edges of the coated areas shall be feathered and roughened with a grinding too) prior to beginning priming and coating.
- 6.07.00 Areas not to be coated shall be masked with disposable plastic sheets, cardboard etc.
- 6.08.00 Visual inspection shall be made for film discontinuities such as air bubbles, blowholes, skips, shadows. Such defects will be marked and repaired with Elastomeric Polyurethane hand mix kit with slower pot life after roughening the edges.
- 7.00.00 **INSPECTION**
- 7.01.00 All work under this specification shall be subject to inspection by the owner or his representative. All parts of work shall be accessible. The applicator shall correct such work as is found defective and not as per the specifications.
- 7.02.00 The following tests shall be made:
- During coating application, the wet film thickness will be measured using Nordson wet Film Gauge as per ASTM D 4414.
- 7.02.01 Adhesion
- Pull Off adhesion to Concrete measured using an portable adhesion tester such as Positest AT-CM Elcometer or equivalent as per ASTM D4541 on fully cured (7 days) concrete. Frequency shall be 3 readings per 1,000 Sq.M of coated area. The average of readings from three five randomly selected areas shall constitute the adhesion and shall be minimum 2 N/mm² (see below). Test area to be flat (without curvature). The following method will be used to determine whether coating meets adhesion requirements



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Elcometer Reading	Type of Failure		Result / Conclusion
> 2 N / mm ²	T1	90% or more of break at coating - concrete interface	Coating meets adhesion criteria. Take actual reading of bond strength.
	T2	90% or more of break within the concrete	Concrete Failure. Coating adhesion exceeds 2N/mm ²
< 2 N / mm ²	T1	90% or more of break at coating - concrete interface	Coating does not meet adhesion criteria. Take actual reading of bond strength achieved.
	T2	90% or more of break within the concrete	Concrete lacks sufficient strength to provide necessary adhesion figure. Coating adhesion accepted.

7.02.02 Film Thickness (DFT)

The film thickness shall be determined from the thickness of the coating detached along with the Elcometer dollies of the adhesion test and the readings shall be recorded. Frequency shall be identical to adhesion test. Average of 3 reading shall constitute the film thickness and shall be at least 2,000 Microns. Minimum spot reading shall be 1,800 Microns. Recommended spread rate by the manufacturer for the specified thickness of the PU coating shall be ascertained and adhered to during the coating process.

7.02.03 Hardness (Durometer)

Cured films (7 days) shall be tested for hardness using Durometer (Shore D) as per ASTM D 2240.

BHEL replies to pre-bid queries

Sl. No.	Reference Clause of Tender Document	Existing Provision	Bidder's Query/ Deviations requested	BHEL Reply
1.	Revised Key Plan and Terminal Point Details Annexure - 3	Hot Water Header pipe within 15 meters of IDCT is in Bidder's scope.	Please confirm, butterfly valve for hot water header pipe is not in bidder's scope. We have only considered butterfly valves for riser pipes in our scope.	Bidder to follow specification.
2.	Properties of Paint Specification for high performance moisture compatible corrosion resistant coating system Annexure G	Properties of Paint: Dry Film thickness (ASTM – T – 1186) – 160 ± 10 µm per coat	Please specify number of coats and total DFT of corrosion resistant coating to be done on IDCT	i) Coating All concrete surfaces in direct contact with water/ water spray/moist air shall be applied with High build heavy duty polyurethane coating having formulation of 100 % solids, solvent free after grit blasting of the concrete surface. Thickness of polyurethane coating shall be 2.0 mm. Suitable primer as per standard Practice/manufacturers' recommendation shall be used. The detailed specification of the coating system on concrete surfaces is given in ANNEXURE – J as per Amendment-03. All concrete surfaces subject to water/ water spray/moist air up to and including Fan Deck slab level including basin slab, inner faces of peripheral walls, all faces of cell partition wall, all faces of columns, all faces of beams (both cast in situ and precast), bottom surface of fandek slab for counter flow tower and both surface of fandek slab for cross flow tower, inner face of fanstack, all faces of hot water basin (for cross flow tower), etc as applicable shall receive the said polyurethane coating after cleaning and drying of the concrete surface. Exterior surfaces of cooling tower shall be coated with one coat of High Performance Moisture Compatible Corrosion Resistant Coating System of minimum 150 micron as per Annexure-G followed by finish coat of two pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. (applicable in case of RCC cooling tower)