



BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT, NOIDA

Date-28-Oct-20

CORRIGENDUM- 09

PROJECT	:	(3X200MW+ 3X500MW + 1X500MW) KORBA FGD PROJECT	
PACKAGE	:	AGITATOR	
TENDER ENQUIRY NO	:	PE/PG/KR1/E-6508/2020	Date: 01/09/2020
BID SUBMISSION DUE DATE	:	02/11/2020, 2.00 PM	
SUBJECT	:	REGARDING REPLY OF PRE BID QUERY & AMENDMENT 2 of Technical Specification no. PE-TS-466-571-18000-A001	

Type of Corrigendum			
Technical Corrigendum -	☒	Commercial Corrigendum -	☐

In reference to the above mentioned tender enquiry for **AGITATOR** package

Please find attached the reply of Pre-Bid query asked by bidders along with this Corrigendum no. 9, also find attached AMENDMENT 2 of Technical Specification no. PE- TS- 466- 571- 18000- A001.

All the other terms and conditions of the tender enquiry remains same.

Yours faithfully,

For and on behalf of BHEL

Ref: Enquiry: PE/PG/KR1/E-6508/2020 Dtd. 01.09.20				
Item: Supply of Agitator for (3X200+ 3X500 +1X500) MW NTPC KORBA TPP FGD				
S.No.	Ref. clause	Page No.	As mention in Spec.	To be read as
1	Clause 3 (c)/ANNEXURE -B OF AMENDMENT -1 OF TECHNICAL SPECIFICATION (specification No. PE-TS-466-571-18000-A001),	9 OF 18	Normal solid particle size d50/slurry analysis.	Revised agitator schedule is attached as Annexure- A.
2	Clause 4.1 (II)/ANNEXURE -C OF AMENDMENT -1 OF TECHNICAL SPECIFICATION (specification No. PE-TS-466-571-18000-A001),	11 OF 18	Clause No- II, CFD analysis requirement.	Refer Annexure- B

ANNEXURE - A

KORBA (FGD) STPP, Stage-I,II& II (3x200MW +3x500 MW+1X500 MW)

	Description	AUXILIARY ABSORBENT TANK	LIMESTONE SLURRY STORAGE TANK	PRIMARY HYDROCYCLONE FEED TANK	SECONDARY HYDROCYCLONE FEED TANK	FILTRATE WATER TANK	WASTE WATER TANK	ABSORBER AREA DRAIN SUMP	GYPSUM AREA DRAIN SUMP	LIMESTONE AREA DRAIN SUMP
		1	2	3	4	5	6	7	8	9
1	Tank Detail:									
a	Tank shape	Vertical Cylindrical	Vertical Cylindrical	Vertical Cylindrical	Vertical Cylindrical	Vertical Cylindrical	Vertical Cylindrical	Rectangular(RCC sump	Rectangular(RCC sump)	Rectangular(RCC sump)
b	Dimension of tank (m)	13.5 Dia X 13.5 H*	16 Dia X 16 H*	8 Dia X 8.9 H*	6.5 Dia X 7.3 H*	6.5 Dia X 7.0 H*	8.5 Dia X 9.7 H*	4 W X4 L X4 H*	4 W X4 L X4 H*	4 W X4 L X4 H*
c	Capacity of tank (in m3)	1817.9 m ³	3056 m ³	422 m ³	225.6 m ³	215.69 m ³	522 m ³	56 m ³	56 m ³	56 m ³
d	No. of tanks	1 no.	2 nos. (1W + 1S)	1 no.	1 no.	1 no.	1 no.	5 nos.	1 no.	1 no.
e	Total no. of tanks for five (3x200 MW + 4x500 MW) units	1 no.	2 no.	1 no.	1 no.	1 no.	1 no.	5 nos. (1 for each unit)	1 no.	1 no.
f	Minimum liquid level in the tank	1.0	1.0	1.0	1.0	1.0	1.0	1.4	1.4	1.4
g	Normal liquid level in the tank	12.5	15.0	8.2	6.6	6.3	9.0	3.3	3.3	3.3
h	Maximum liquid level in the tank	12.7	15.2	8.4	6.8	6.5	9.2	3.5	3.5	3.5
2	Agitator selection dat									
a	Type	Blade turbine - marine propeller side entry	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)
b	Medium to be handled	Gypsum slurry	Limestone slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Limestone slurry
c	Seal Type	Mechanical seal (emergency flush start)	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required
d	Duty	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
e	Agitator location	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
f	Operation	Intermittent -Whenever FGD is under maintenance	Continuous.	Continuous.	Continuous.	Continuous.	Continuous.	Intermittent	Intermittent	Intermittent
g	MOC of Agitator	side entry - Agitator Shaft (which continuously in contact with slurry) and blades shall be made with Alloy 926 or better material.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.	Agitator blades shall be made with Alloy 926 or better material & Agitator shaft can be rubber lined.
h	Quantity of Agitators per Tank	3 nos. - side entry	1 No.	1 No.	1 No.	1 No.	1 No.	1 No.	1 No.	1 No.
i	Total Quantity for five units	3 nos. - side entry	2 No's	1 No.	1 No.	1 No.	1 No.	5 No's	1 No.	1 No.
3	Slurry Analysis									
a	Slurry to be handled	Gypsem slurry	Limestone slurry	Gypsem slurry	Gypsem slurry	Gypsem slurry	Gypsem slurry	Gypsem slurry	Gypsem slurry	Limestone slurry
b	Maximum solid particle size	200 mesh (74 μ)	200 mesh (74 μ)	200 mesh (74 μ)	200 mesh (74 μ)	6-7 mm	200 mesh (74 μ)	6-7 mm	6-7 mm	6-7 mm
c	Normal solid particle size, d50	325 mesh (44 μ)	325 mesh (44 μ)	325 mesh (44 μ)	325 mesh (44 μ)	325 mesh (44 μ)	325 mesh (44 μ)	6-7 mm	6-7 mm	6-7 mm
d	Solid to be handled	gypsum along with Limestone & other impurities	Limestone + impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	Limestone + impurities
e	Chloride concentration	max 26000 ppm	max 1000 ppm	max 26000 ppm	max 26000 ppm	max 26000 ppm	max 26000 ppm	max 26000 ppm	max 26000 ppm	max 1000 ppm
f	Hardness of particle	5-7 mohs scale	5-7 mohs scale	5-7 mohs scale	5-7 mohs scale	5-7 mohs scale	5-7 mohs scale	5-7 mohs scale	5-7 mohs scale	5-7 mohs scale
g	Slurry concentration, wt%	30%	30 wt%	30 wt%	16.60%	11%	3%	30%	30%	30 wt%
h	Sp. Gravity of slurry	1.216	1.215	1.216	1.112	1.067	1.023	1.216	1.216	1.215
i	Sp. Gravity of Lime Stone & Gypsum	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)
j	Viscosity of Slurry	10 cP	30 cP	10 cP	4 cP	4 cP	3 cP	10 cP	10 cP	30 cP
k	pH	4 to 8	4 to 8	4 to 8	4 to 8	4 to 8	4 to 8	4 to 8	4 to 8	5 to 8
l	SiO ₂ Content	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l
m	Temperature	Normal -62 deg C; Design-70 deg C.	Normal -45 deg C; Design-55 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -58 deg C; Design-70 deg C	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -45 deg C; Design-55 deg C.
4	Motor									
a)	Total Power consumed	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
b)	Motor Rating	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
c)	Motor Explosion Proof Class	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof
d)	Motor Protection Class	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor
e)	Motor Efficiency Class	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3
5	Impeller									
a)	Type of impeller	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
b)	No. of impeller per agitator	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
c)	Impeller diameter	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
d)	Impeller tip speed	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
e)	Operating speed	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
f)	Agitator Pumping Capacity	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
g)	Volume/Agitator	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
6	Baffle Plates (not in bidder's scope)									
a)	No. & size of baffle plates	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
b)	Thickness of baffle plates (mm)	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
c)	Distance from Bottom of the tank	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
7	Nozzle (not in bidder's scope)									
a)	Size of the nozzle on which agitator frame is mounted	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	NA	NA	NA
8	Loads									
a)	Static Load	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
b)	Dynamic load	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
c)	Torsional Moment (Nm)	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
d)	Bending Moment (Nm)	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
9	Power loading for Auxiliary power consumption	Not applicable	Applicable	Applicable	Applicable	Applicable	Applicable	Not applicable	Not applicable	Not applicable
10	Parameters to be considered compulsarily by bidder for design of Agitators									
a)	Uniform suspension of solids by Agitators	The agitators shall keep the solid particles in suspended mode in liquid slurry with “Full off-Bottom Suspension” of solid particles to 98% of liquid column to virtually “Uniform Solid Concentration”.								
b)	Mounting of Agitaor (For vertical mounting)	The Agitators shall be mounted on the Agitator platform which shall be approximately at a height of 1.0 m from the tank roof. However, the Agitator platform is excluded from bidder's scope.								
c)	Power Number for Agitator	0.3 - 0.35	0.3 - 0.35	0.3 - 0.35	0.3 - 0.35	0.3 - 0.35	0.3 - 0.35	0.3 - 0.35	0.3 - 0.35	0.3 - 0.35
d)	Impeller tip dia/ tank dia	--	1/3 (approx)	1/3 (approx)	1/3 (approx)	1/3 (approx)	1/3 (approx)	1/3 (approx)	1/3 (approx)	1/3 (approx)
e)	Minimum number of stage of impeller	2	2	2	2	2	2	1	1	1
Notes										
1	There shall be complete re-suspension of all solids after a 24 hour outage. Accumulation of solids shall not prevent agitator restart.									
2	Agitation shall be provided to prevent settlement of slurry by side entry agitators . All the side-entry agitators shall be similar.									
3	Tank low level trip requirement shall be provided by the bidder									
4	Maximum Sound Pressure Level at a height of 1.5 m above floor level in elevation, and at a distance of 1.0 m horizontally shall be 85 dBA.									
5	*Although the height of all tanks is fixed above, same may vary slightly during detailed engineering as per design calculation of tanks.									
6	Slope of roof shall be considered approximate 5 deg for all the tanks.									

ANNEXURE-B

PRE-BID CLARIFICATION SCHEDULE - KORBA (FGD) STPP, Stage-I,II& II (3x200MW +3x500 MW+1X500 MW)

S.No.	Section/Clause/ Page No.	Statement of the referred clause	Clarification required	BHEL Reply
1	Technical Corrigenda/specification No. PE-TS-466-571- 18000-A001,Section- I,Rev 01,Sub section – C1,4.1 Technical requirement clause No-II	Clause No- II, CFD analysis requirement.	Please let us know that CFD analysis requirement is for all Tags /Types or wrt any specific tag.	CFD requirement shall be for all continuously running agitators except for the sump agitators (which are intermittent in operation) and only one out of two limestone slurry tank agitators.
2			Please specify scenario of CFD analysis. 1 st scenario = Start up, 2 nd Scenario = normal operation and 3 rd scenario = Restart after the power failure.	Bidder to note that the requirement for the uniform suspension has been specified in the technical specification. Accordingly, CFD analysis shall be done to meet the technical specification requirement.
3			Please Provide D80 particle size distribution data.	Please refer the agitator schedule for the particle distribution data. Bidder shall design the agitator using the data given in the technical specification.
4			What parameters needs to be checked during the analysis? Velocity of particle distribution requirement or specific gravity variation across the tank	The parameters shall be decided based on the requirements given in the technical specification.
5			Time duration for the study.	To be decided by the bidder based on the requirement given in the technical specification.