Reply of Pre Bid Queries [LOT-1_dt. 11.05.2021]

NAME OF WORK : Civil & Structural Works for Bagging Building, Wagon Loading Platform, Conveyor Gantry, Instrument Air Package, Pipe Rack & Substation Building at Talcher Fertilizers Ltd., Angul, Odisha

TENDER NO : PNPM/PC-183/E/201/NCB

SL. NO.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERY	OWNER'S REPLY
	SEC. NO.	Page No.	Clause No.	Subject		
1	Instructions to Bidders	29 of 444	12.5	Schedule of Rates / Bid Prices	Please note that as per present market conditions steel price is very much fluctuating in our Country. We have received fluctuated offer from M/s. SAIL in last 90 days. From BOQ, we understand that total involvement of Reinfircement Steel & Structural Steel works more than 13,000 MT so, it is very much difficult for any bidder to ascertain the future price range of steel during the contract period as of now. Therefore, we are requesting you to kindly included Price Variation towards Steel (Reinforcement & Structural Steel) Clause for this tender	Price Variation is not applicable to this tender. Hence, bidder to quote only firm Price as per NIT condition.
2	General Conditions of Contract	157 of 444	Section- I. 2.4	Power Supply	The cost of power supply shall be payable to the EMPLOYER every month for Construction Works power which would be deducted from the running account bills. Please confirm the charges of Electric Power supply per Kwh	The standrad charges shall be as per Odisha Govt norms.
3	General Conditions of Contract	159 of 444	Section-II 2.5	Land for Contractor's Field Office, Godown and Workshop	Request to provide the required land for installation of Plant & Machineries, Structural works fabrication yard Site etc. adjacent to work site or nearest to site on free of cost basis.	SHALL BE MADE AVAILABLE TO THE CONTRACTOR AS PER THE AVAILABILITY WITHIN PLANT BATTERY LIMIT.
4	Special Conditions of Contract	235 of 444	Terms of Payment	Mobilization Advance	Request to approve interest free Mobilisation Advance @10% of total Contract Price will be paid on submission of Bank Guarantee of equivalent amount.	Under Review
5			Item No. 1.05	Disposal of excavated earth / building rubbish / malba/ coal ash and similar unservicable, dismantled or waste materails	Please confirm that necessary approvals, charges for municipal approved dumping ground to be considered in Owner's account.	FOR DISPOSAL BEYOND THE PLANT PREMISES CONTRACTOR TO TAKE NECESSARY APPROVAL & PAY MUNICIPAL CHARGES. IT SHALL NOT BE ON OWNER'S ACCOUNT.

Reply of Pre Bid Queries [LOT-1_dt. 11.05.2021]

NAME OF WORK : Civil & Structural Works for Bagging Building, Wagon Loading Platform, Conveyor Gantry, Instrument Air Package, Pipe Rack & Substation Building at Talcher Fertilizers Ltd., Angul, Odisha

TENDER NO : PNPM/PC-183/E/201/NCB

SL. NO.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERY	OWNER'S REPLY
	SEC. NO.	Page No.	Clause No.	Subject		
6	BOQ		Item No. 6.0	Fly Ash Brick	BOQ Item No. 6.01, Crushing strength of Fly Ash Brick is asking as CD = 10 whereas Item No. 6.03 Crushing strength asking as CD = 7.5. In local market Fly Ash Bricks having Crushing strength of 75 Kg/sqcm is usually available. So, please allow Fly Ash Brcks of CD = 7.5 for all items of Brickwork and confirm the same	SHALL BE AS PER SOR ITEM OF BRICK WORK.
7	BOQ		Item No. 7.01	Supply of all Structural Steel	As per SOR description Structural Steel Grade is minimum 250(Fe410W) and Plates – Grade 275JR/JO and S355JO to BS EN 10025 (as per availability). Kindly provide us the meaning of minimum 250 Grade and also provide us the IS Grade material specification for Grade 275JR/JO and S355JO to BS EN 10025. Bidder understands that Structural steel material grade is IS 2062 Gr. E 250 only. If any other grade is required to supply kindly provide us the available IS Grade of the	SHALL BE E250 ONLY.
				Supply of all Structural Steel	Kindly provide us the section wise involvement in MT to ascertain to cost of materials for supply of Steel. Also provide us the percentage of WPB section (if applicable)	THE QTY. OF STRUCTURAL STEEL (S.S) IN MT HAS ALREADY BEEN PROVIDED IN SOR. SECTION WISE BREAKUP OF S.S SHALL BE PROVIDED DURING DETAILED ENGINEERING
				Painting Works for Structure	Bidder understands that all painting work including intermediate and final painting works shall be done at fabrication shop. Any touch up painting if required shall be done by bidder at site.	FINAL COAT OF PAINITING SHALL BE DONE AT SITE.

Reply of Pre Bid Queries [LOT-1_dt. 11.05.2021]

NAME OF WORK : Civil & Structural Works for Bagging Building, Wagon Loading Platform, Conveyor Gantry, Instrument Air Package, Pipe Rack & Substation Building at Talcher Fertilizers Ltd., Angul, Odisha

TENDER NO : PNPM/PC-183/E/201/NCB

SL. NO.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERY	OWNER'S REPLY
	SEC. NO.	Page No.	Clause No.	Subject		
8	BOQ		Item No. 10.02	Elastomeric Polyurethane Waterproofing Membrane	Please provide the approved vendor list.	THE SPECIFICATION ARE ALREADY MENTIONED IN THE NIT. BIDDER HAVE TO SUBMITTED THE CREDENTIALS OF MANUFACTIURES FOR APPROVAL AFTER AWARD OF JOB.
9	BOQ		Item No. 14.08	UPVC Sheet	Please provide the approved vendor list.	THE SPECIFICATION ARE ALREADY MENTIONED IN THE NIT. BIDDER HAVE TO SUBMITTED THE CREDENTIALS OF MANUFACTIURES FOR APPROVAL AFTER AWARD OF JOB.
10	BOQ		Item No. 16	Piling Rig	Conventional Tripod with power winch will be used, please confirm Please confirm the Structures name for Piling work	SHALL BE AS PER NIT
11	General			Cement	In BOQ, only Piling work to be done by using of OPC or PPC or PSC, but rest of works type of Cement is not Specified whereas in Technical Specfication OPC43/53 specified for concreting works. In the case of PPC, it is easily available and used in other important Industrial Plants by other Clients as supply of OPC Cement will be very irregular and also not be available as per Project requirement where quantity is substantial as very few leading approved Cement Manufacturers are produces OPC Cement. B&R request to approve PPC Instead of OPC to maintain the smooth progress of the	SHALL BE AS PER NIT
12	General			Soil Test Report/ Bore Log Data	Please provide the Bore Log Data/ Soil Test Report of the working area of all proposed structure locations, enabling us to access the sub soil condition and Ground Water Table. Also Soil Test Report is required for Piling Work cost analysis.	SOIL REPORT OF NEAR BY AREA IS ATTACHED FOR REFERENCE PURPOSE ONLY.

Reply of Pre Bid Queries [LOT-1_dt. 11.05.2021]

NAME OF WORK : Civil & Structural Works for Bagging Building, Wagon Loading Platform, Conveyor Gantry, Instrument Air Package, Pipe Rack & Substation Building at Talcher Fertilizers Ltd., Angul, Odisha

TENDER NO : PNPM/PC-183/E/201/NCB

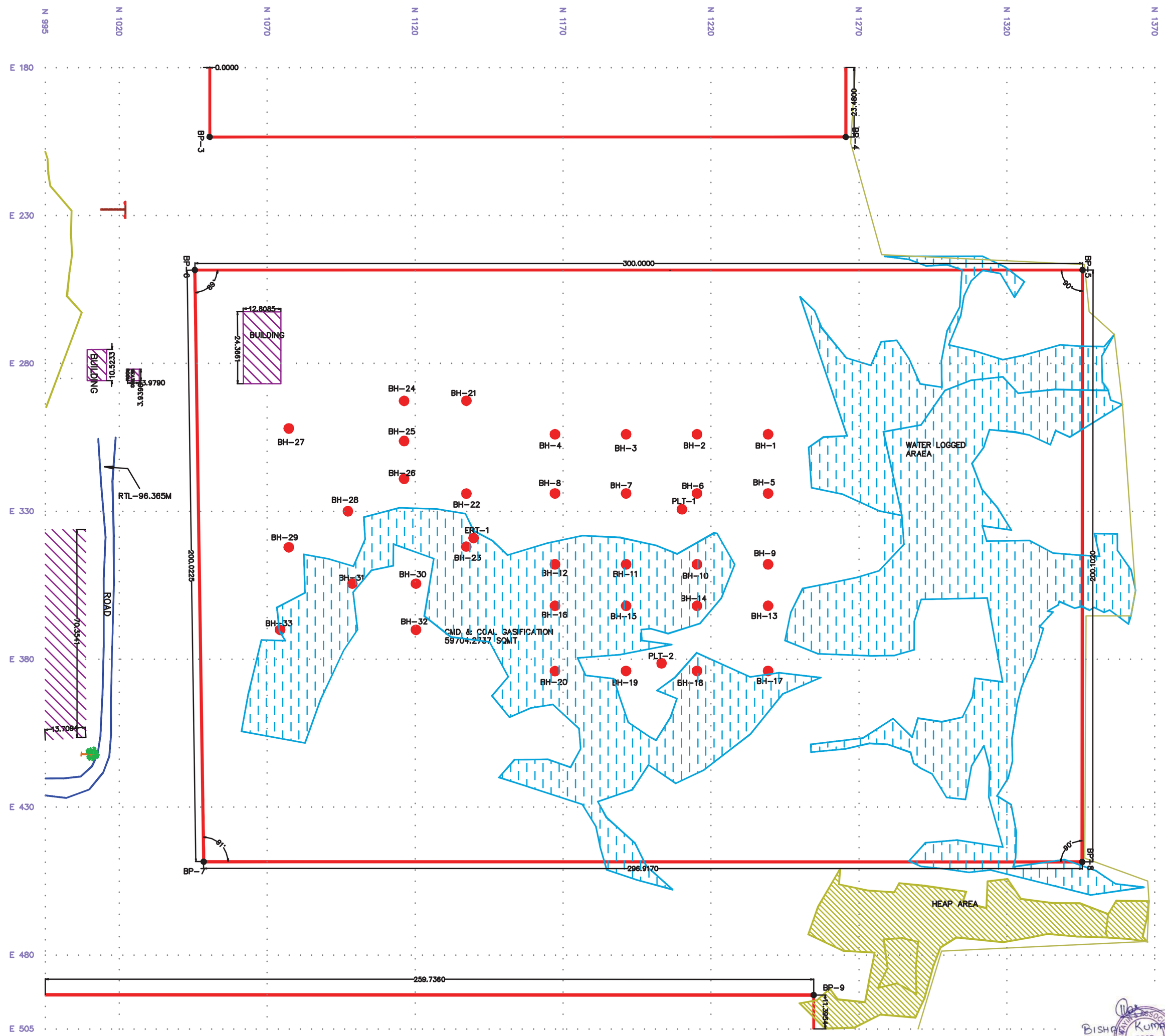
SL. NO.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERY	OWNER'S REPLY
	SEC. NO.	Page No.	Clause No.	Subject		
13	General			Drawings	Please provide the following structures G.A. Drawings a) UREA BAGGING BUILDING b) RAILWAY SIDING PLATFORM c) INSTRUMENT AIR PACKAGE d) DG BUILDING SHED e) ELECTRICAL EQUIPMENT BUILDING	ALREADY ATTACHED WITH NIT DOCUMRNT. HOWEVER REST OF DRG. TO BE PROVIDED AFTER DETAIL ENGINEERING.

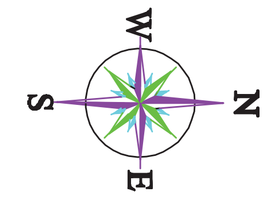
Reply to Pre Bid queries (Lot-1_dt 11.05.2021)

CIVIL & STRUCTURAL WORKS FOR BAGGING BUILDING,WAGON LOADING PLATFORM,CONVEYOR GANTRY, INSTRUMENT AIR PACKAGE, PIPE RACK & SUBSTATION BUILDING AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

S.no	Clause No.	Existing Clause	Bidders Query	PDIL Clarification
1	BOQ item no 1.05	Supplying and filling with selected good earth brought from source approved by the Engineer -in- Charge in trenches, plinth, under floors, sides of foundation etc., at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering (Rate shall include Royalty, Taxes, Octoroi, etc., levied by the local authorities, all transportation, loading and unloading, etc., and nothing extra will be paid on this account including compaction under floor with mechanical vibrater / road roller including watering).	For obtaining of borrowed soil, is any approved source is provided by PDIL? - **Please Confirm**	For borrowed soil beyond plant premises contractor to take necessary approval from local authorities. It shall not be owner's account.
2	BOQ item no 1.06	Disposal of excavated earth / building rubbish / malba /coal ash and similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to municipal approved dumping ground or as approved by Engineer-in-charge, beyond 500 m initial lead, for lead distance upto 5 km including all lifts involved.	Is Approval from Municipality is taken by PDIL for disposal of earth in Municipal lands - **Please Clarify**	For disposal beyond plant premises contractor to take necessary approval & pay municipal charges. It shall not be owner's account.
3	BOQ item no 16.01	Boring, providing and installing bored cast-in-situ R.C.C. piles using cement concrete of grade M30 …… No extra payment shall be made on this account.) Length of pile up to 20 ± 2.0 meters below cut-off level. 600 mm dia pile boring in soil layer	Please provide the depth between the Pile cut-off level and Pile bottom	As clearly stated in the Item Length of the pile shall be 20 + - 2 m below the cut off level.
4	BOQ item no 16.02	Boring, providing and installing bored cast-in-situ R.C.C. piles using cement concrete of grade M30 …… no extra payment shall be made on this account.) Length of pile up to 20 ± 2.0 meters below cut-off level. 600 mm dia pile boring in moderately weathered sedimentary /sandstone/claystone rock layer including rock socketing as per IS 14593	Please provide the depth between the Pile cut-off level and Pile bottom	As clearly stated in the Item Length of the pile shall be 20 + - 2 m below the cut off level.
5	SCC clause no: 6	Availability of water & power at site is very limited. Contractor shall have to make his own arrangements for Construction work.	Please provide Construction Power and Construction water at one point on cost free basis	Construction water and power Shall be provide at one point on chargeable basis
6	BOQ Item No 7.01	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position with necessary welding and/or bolting with MS bolts conforming to property class 8.8 of IS: 1367 at all heights as per approved fabrication drawings of all types of structural steel work in columns, portals, girders, lattice girders, beams, crane girders, M.S rails, monorails, bracings, trusses, purlins, rafters, side runners, sag rods, hand railings, staircase stringers and steps, walkway, toe plates, floor grids, sag rods with M.S. rounds, side walling, conveyor gantries, trestle for pipe and cable racks, gusset plates, etc., either made of rolled steel joists, channels, angles, tees, flats, plates , universal sections or built up from plates and/or rolled steel sections including necessary site and shop fasteners, complete in all respects as per approved fabrication drawings, standards and direction of Engineer-in-Charge : With providing and applying primer coat, intermediate coats and finish coat after the preparation of surfaces on structural steel work complete in all respects as per technical specifications and direction of Engineer-in- Charge.	Request to provide the Grade of Structural Steel (i.e E350, E250 or any other)	The Grade of Structural steel shall be E250.

S.no	Clause No.	Existing Clause	Bidders Query	PDIL Clarification
7	BOQ Item No 7.02	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position structural steel work in cat ladders and cages at all heights including brackets, cleats, plates, rungs, chain, pins, hinges, etc., framed, bolted and/or welded together and fixed in position including necessary plugs and plugging and painting complete in all respects and as per direction of Engineer-in-Charge :With providing and applying primer coat, intermediate coats and finish coat after the preparation of surfaces on structural steel work complete in all respects as per technical specifications and direction of Engineer-in-Charge.	Request to provide the Grade of Structural Steel (i.e E350, E250 or any other)	The Grade of Structural steel shall be E250. The tender is based on SOR item basis, Brief scope is already mentioned in the tender. Kindly mention specifically which part is not clear.
8	4	Detailed scope of Works	Please provide the civil scope in detail, the provided details are not clearly mentioned	
9			Open space for batching plant shall be provided by PDIL at free of cost.	Space for batching plant shall be provided subject to availability in plant
10			Please provide the Geotechnical investigation report	Soil Report of near by area is shared for reference purpose only.
11			Please confirm the Availability of land for Site Fabrication	Land for site fabrication shall be provided
12			Please confirm the distance between Bagging plant and Substation Building	Approx Within 1 km
13			Please provide the Tapping points and distance of Conveyor Structures ,	Refer plot plan attached in NIT.
14			Plot drawing Indicating Conveyor galleries along with distance from Bagging Plant	Refer plot plan attached in NIT.
15			Please provide the Breakup of each building to assess the crane requirements	Location to access crane shall be provided to successful bidder after discussion.
16			Kindly provide the plot drawing highlighting the Electrical Equipment Building, DG Building, Instrument Air package etc along with distance from the Bagging plant	Location is being finalized moreover all facilities in 1 km range.
17			We request to provide the tentative date of start of work.	Tentatively in the month of Oct, 2021.
18			Due to the pandemic, the cash flows have been affected . In the view of better mobilisation of the site. we request PDIL to provide interest free mobilisation advance	Under Review
19			Due to uncertainty of Steel price in the market , we request PDIL to provide the Escalation for Supply commodities like Steel, Cement, Electrodes etc	Escalation is not allowed. bidder to quote firm price only.





LEGENDS:-

PROPOSED BOUNDARY	
BOUNDARY POINT	
ROAD	
BUILDING	
BORE HOLE POINT	
POND/WATER LOGGED AREA	
HEAP AREA	

CO-ORDINATES OF BOREHOLE:

CO-ORDINATES OF BORE HOLE

BH	EASTING	NORTHING	R.L 'm'
BH-1	304.000	1239.300	95.439
BH-2	304.000	1215.300	95.211
BH-3	304.000	1191.300	95.075
BH-4	304.000	1167.300	95.229
BH-5	324.000	1239.300	95.474
BH-6	324.000	1215.300	95.208
BH-7	324.000	1191.300	95.195
BH-8	324.000	1167.300	95.326
BH-9	348.000	1239.300	95.333
BH-10	348.000	1215.300	95.093
BH-11	348.000	1191.300	94.692
BH-12	348.000	1167.300	94.794
BH-13	362.000	1239.300	95.118
BH-14	362.000	1215.300	94.798
BH-15	362.000	1191.300	94.762
BH-16	362.000	1167.300	94.737
BH-17	384.000	1239.311	95.063
BH-18	384.000	1215.311	94.912
BH-19	384.000	1191.289	95.252
BH-20	384.056	1167.289	94.786
BH-21	292.665	1137.335	96.458
BH-22	324.050	1137.342	95.249
BH-23	342.000	1137.300	95.025
BH-24	292.700	1116.308	96.387
BH-25	306.300	1116.308	94.898
BH-26	319.000	1116.302	95.302
BH-27	302.000	1077.300	96.479
BH-28	330.000	1097.289	95.361
BH-29	342.200	1077.300	95.172
BH-30	354.501	1120.300	95.38
BH-31	354.501	1098.800	94.978
BH-32	370.100	1120.300	95.35
BH-33	370.100	1074.399	95.065
PLT-1	313.954	1179.194	95.22
PLT-2	375.03	1203.258	94.969
ERT-1	342.00	1137.30	95.025

NOTE : ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.

CLIENT	Talcher Fertilizers — TALCHER FERTILIZERS LIMITED (TFL)	
CONTRACTOR		
TITLE	LOCATION PLAN	
PROJECT	DETAILED SOIL INVESTIGATION WORKS, SURVEY WORKS OF COAL GASIFICATION & AMMONIA UREA PLANT, TALCHER.	
PREPARED BY		
SCALE: 1:1000	DRAWING. NO.	REV

BISHNU KUMAR DAS. M.TECH (GEOTECH)

DESIGN PARAMETERS

- Since the project site is having uniform Sub-Soil stratification, for CGU area boreholes grouped into two zones viz., Zone-01 (BH-01 to BH-14 & BH-16 to BH-33) & Zone-02 (BH-15). Based on bore logs, Field & Laboratory Test results, the following Design Soil Profile has been used for the analysis of Open Foundation and Pile Foundations:

ZONE-01(BH-01 to 14 & BH-16 to 33)

Layer No.	Stratum Description	Depth in (m)	Average 'N' Value	Thickness of Stratum (m)	Shear Parameters		Liquid Limit	Density Y_b (gm/cc)
					C (kg/cm^2)	Ø (°)		
1	Clayey Sand	NGL to 3.15	39 to 83	3.15	0.10	23	31	1.90
2	Compact Clay	3.15 to 6.51	96 to >100	3.36	0.52	2	43	1.79
3	Weathered Rock (Clay stone)	6.51 to 10.64	>100	4.13	Completely Weathered (Sedimentary Rock)			
4	Sandstone	10.64 to 16.92	>100	6.28	Completely to Moderately Weathered (Sedimentary Rock)			
5	Clay stone	16.92 to 21.55	>100	4.63	Highly to completely Weathered (Sedimentary Rock)			

* Table 1.1

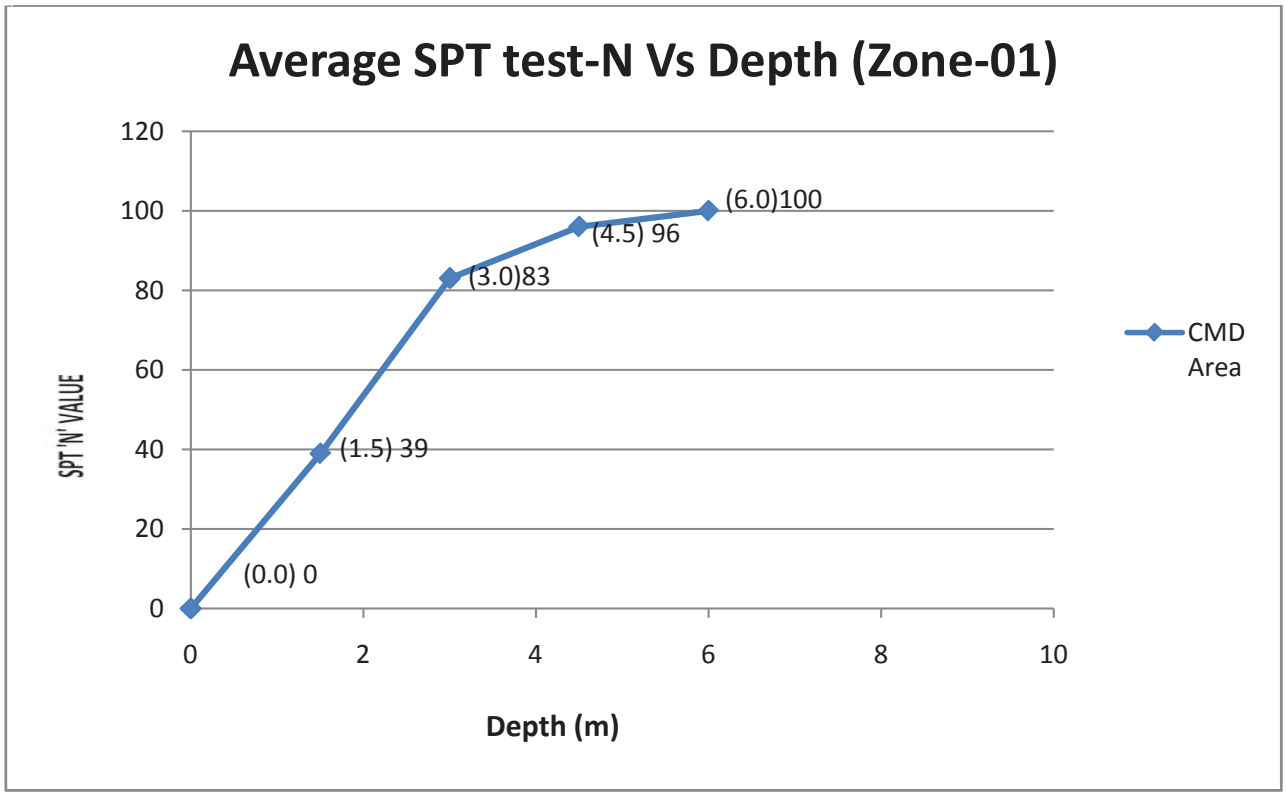
ZONE-02 (BH-15)

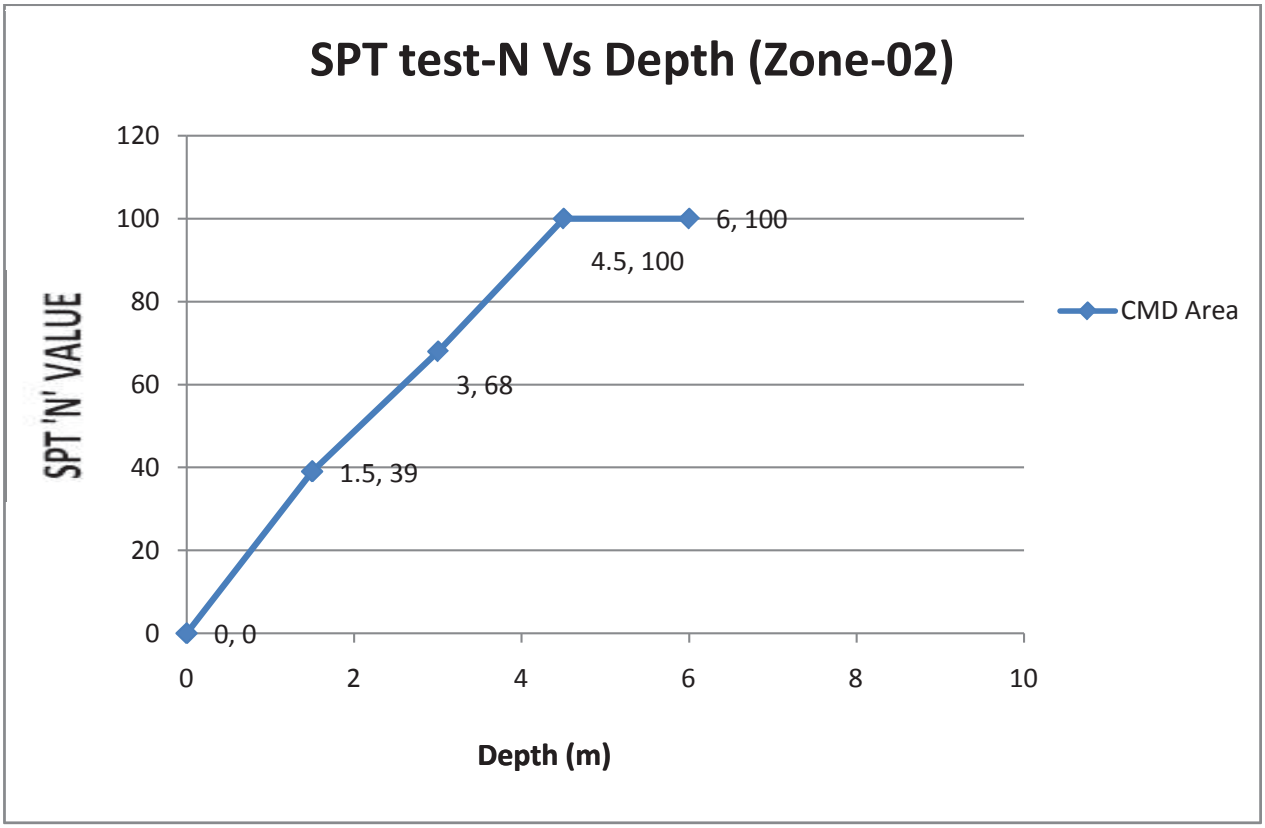
Layer No.	Stratum Description	Depth in (m)	Average 'N' Value	Thickness of Stratum (m)	Shear Parameters		Liquid Limit	Density Y_b (gm/cc)
					C (kg/cm^2)	Ø (°)		
1	Clayey Sand	NGL to 3.00	39 to 68	3.00	0.11	22	32	1.93
2	Compact Clay	3.00 to 8.00	>100	5.00	0.54	0	41	1.78
3	Weathered Rock (Clay stone)	8.00 to 17.90	>100	9.90	Highly to Moderately Weathered (Sedimentary Rock)			
4	Clay stone	17.90 to 27.40	>100	9.50	Completely Weathered (Sedimentary Rock)			

* Table 1.2

Note:

Rock classification is based on RQD % of rock.


Average SPT test-N Vs Depth (Zone-01)
SPT 'N' VALUE
120
100
80
60
40
20
0
0
2
4
6
8
10
(0.0) 0
(1.5) 39
(3.0)83
(4.5) 96
(6.0)100
Depth (m)
CMD Area


SPT test-N Vs Depth (Zone-02)
SPT 'N' VALUE
120
100
80
60
40
20
0
0
2
4
6
8
10
0, 0
1.5, 39
3, 68
4.5, 100
6, 100
Depth (m)
CMD Area


BISHOW KUMAR DAS.
MTECH (GEOTECH)

ANALYSIS OF STRATUM

LOCATION: (CMD & Coal Gasification Unit Area)

Zone-01

BH-01 to 14 & BH-16 to 33

Stratum	Average Depth Range (max21.55m)	'N' Value	Type of soil	State
I	0.00-3.15	39 to 83	Clayey sand	Dense to Very Dense
II	3.15-6.51	96 to >100	Compact clay	Very Hard
III	6.51-10.64	>100	Weathered Rock	Sedimentary Rock
IV	10.64-16.92	>100	Sand stone	Sedimentary Rock
V	16.92-21.55	>100	Clay stone	Sedimentary Rock

Zone-02

BH-15

Stratum	Average Depth Range (max27.40m)	'N' Value	Type of soil	State
I	0.00-3.00	39 to 68	Clayey sand	Dense to Very Dense
II	3.00 - 8.00	>100	Compact clay	Very Hard
III	8.00 - 17.90	>100	Weathered Rock	Sedimentary Rock
V	17.90 - 27.40	>100	Clay stone	Sedimentary Rock

BISHOP KUMAR DAS.
M.TECH (GEOTECH)

COEFFICIENT FRICTION BETWEEN SOIL AND CONCRETE FOUNDATION:

Location-CMD & CGU Area

Zone-01

(BH-01 to 14 & 16 to 33)

Description of Strata	Coefficient of friction (μ)	
	Minimum	Maximum
Clayey sand	0.35	0.45
Compact clay	0.30	0.35
Weathered Rock/ Sand stone/ Clay stone	0.65	0.70

Zone-02

(BH-15)

Description of Strata	Coefficient of friction (μ)	
	Minimum	Maximum
Clayey sand	0.35	0.45
Compact clay	0.30	0.35
Weathered Rock/ Clay stone	0.65	0.70

BISHWAJIT KUMAR DAS.
M.TECH (GEOTECH)

DYNAMIC PROPERTIES OF SOIL

POISSON'S RATIO- (μ)

Poisson's ratio is worked out from lateral strain (E_3) to axial strain (E_1) by Triaxial Compression Test apparatus on soil sample of cylindrical shape, subjected to direct acting in three mutually perpendicular direction viz, major principal stress in vertical direction and minor principal stress in lateral direction by fluid pressure and the plane shear failure is determined and test result is tabuled.

Poisson's ratio (μ) = E_3/ E_1

MODULUS OF ELASTICITY-(E)

Modulus of elasticity is obtained from the formula given below;

$$\delta L = PL_0/A_0E$$

$$E = PL_0/(A_0 \times \delta L)$$

SHEAR MODULUS-(G)

Shear Modulus is determined as per IS code 5249:1992 and result is tabulated.

$$G = E/2(1+\mu)$$

BULK MODULUS-(B)

(From Soil mechanics by T.William Lambe & Robert V.Whitman)

$$B = E/3(1-2E)$$

BH No:-15

Parameter	Results
Poisson's Ratio(μ)	0.32
Modulus of Elasticity (E) in kg/cm^2	640.00
Shear Modulus (G) in kg/cm^2	245.59
Bulk Modulus (B) in kg/cm^2	593.01

SHEAR WAVE VELOCITY)

The Shear Wave Velocity at site is 1050 m/s.

BISHAL KUMAR DAS. MTECH (GEOTECH) SATYANAGAR

ALLOWABLE BEARING CAPACITY OF SQUARE FOOTING FROM SHEAR PARAMETER

* Based on the design parameters tabulated in Table 1.1, the following are the analysis of safe bearing capacity in open foundation:

Zone-01(BH No: 01 to 14 & 16 to 33)

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)			
			Shear Consideration	Allowable Settlement		
				25mm	40mm	75mm
CMD & Coal Gasification Unit (Zone-01)	1.50	Up to 3.0	30.94	40.03	64.05	120.10
		>3.0 to <6.0	33.55	36.72	58.75	110.16
	2.00	Up to 3.0	36.30	37.42	59.87	112.26
		>3.0 to <6.0	38.56	33.89	54.22	101.67
	3.00	Up to 3.0	47.46	39.02	62.44	117.07
		>3.0 to <6.0	48.85	34.37	55.00	103.12
	4.00	Up to 3.0	25.66	31.35	50.16	94.04
		>3.0 to <6.0	24.49	29.63	47.40	88.88
	5.00	Up to 3.0	27.39	25.70	41.12	77.10
		>3.0 to <6.0	25.05	25.25	40.41	75.76

* Table No. 1.3

ALLOWABLE BEARING CAPACITY OF STRIP FOOTING FROM SHEAR PARAMETER

* Based on the design parameters tabulated in Table 1.1, the following are the analysis of safe bearing capacity in open foundation:

BH No: 01 to 14 & 16 to 33

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)			
			Shear Consideration	Allowable Settlement		
				25mm	40mm	75mm
CMD & Coal Gasification Unit (Zone-01)	1.50	5 x 1	25.82	56.37	90.19	169.10
		10 x 2	26.02	38.92	62.27	116.76
		15 x 3	27.20	36.09	57.74	108.27
		20 x 4	28.92	35.49	56.78	106.47
		25 x 5	30.78	34.83	55.74	104.50
		30 x 6	32.71	43.07	68.91	129.20
	2.00	5 x 1	31.70	45.81	73.29	137.42
		10 x 2	30.65	35.23	56.37	105.70
		15 x 3	31.67	32.65	52.25	97.96
		20 x 4	33.22	31.92	51.06	95.75
		25 x 5	34.97	31.18	49.89	93.55
		30 x 6	36.83	38.46	61.53	115.38
	3.00	5 x 1	44.58	31.25	50.00	93.75
		10 x 2	40.86	35.97	57.56	107.92
		15 x 3	41.00	33.35	53.36	100.06
		20 x 4	42.10	31.67	50.68	95.02
		25 x 5	43.59	30.69	49.11	92.08
		30 x 6	45.27	37.61	60.18	112.84
	4.00	5 x 1	27.38	28.70	45.93	86.11
		10 x 2	21.75	30.79	49.27	92.38
		15 x 3	19.93	27.92	44.68	83.77
		20 x 4	19.06	26.52	42.43	79.56
		25 x 5	18.57	25.43	40.69	76.30
		30 x 6	18.27	30.78	49.24	92.33
	5.00	5 x 1	30.64	25.68	41.09	77.05
		10 x 2	23.58	25.79	41.79	77.38
		15 x 3	21.28	24.35	38.96	73.06
		20 x 4	20.17	22.49	35.98	67.47
		25 x 5	19.54	21.58	34.53	64.75
		30 x 6	19.14	25.92	41.48	77.77

* Table No. 1.4

ALLOWABLE BEARING CAPACITY OF MAT FOOTING FROM SHEAR PARAMETER

Mat Foundation:

BH No: 01 to 14 & 16 to 33

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)		
			Shear Consideration	Allowable Settlement	
				25mm	40mm
CMD & Coal Gasification Unit (Zone-01)	1.50	6 x 6	35.03	44.98	71.96
		10 x 10	41.30	42.65	68.25
		15 x 15	49.40	40.88	65.41
		20 x 20	57.58	39.65	63.44
		25 x 25	65.79	38.55	61.68
		30 x 30	74.03	37.55	60.08
		12 x 6	31.62	43.94	70.31
		20 x 10	36.25	42.08	67.33
		30 x 15	42.29	40.64	65.02
		40 x 20	48.41	39.47	63.15
		50 x 25	54.56	38.42	61.46
		60 x 30	60.73	37.44	59.90
	2.00	6 x 6	39.96	40.94	65.51
		10 x 10	46.05	38.21	61.14
		15 x 15	54.06	36.45	58.32
		20 x 20	62.20	35.17	56.27
		25 x 25	70.39	34.16	54.65
		30 x 30	78.60	33.24	53.19
		12 x 6	36.51	39.52	63.24
		20 x 10	40.97	37.52	60.03
		30 x 15	46.92	36.04	57.66
		40 x 20	53.00	34.96	55.93
		50 x 25	59.13	34.00	54.39
		60 x 30	65.28	33.11	52.98
	3.00	6 x 6	50.02	41.78	66.76
		10 x 10	55.68	37.46	59.94
		15 x 15	63.47	35.09	56.15
		20 x 20	71.50	33.45	53.52
		25 x 25	79.62	32.12	51.39
		30 x 30	87.80	30.97	49.56
		12 x 6	46.51	39.47	63.15
		20 x 10	50.54	36.42	58.27
		30 x 15	56.28	34.45	55.13
		40 x 20	62.25	33.00	52.80
		50 x 25	68.32	31.83	50.92
		60 x 30	74.42	30.79	49.26

* Table No. 1.5

BISHWAJIT KUMAR DAS. M.TECH (GEOTECH) SATYANAGAR

ALLOWABLE BEARING CAPACITY OF MAT FOOTING FROM SHEAR PARAMETER

Mat Foundation:

BH No: 01 to 14 & 16 to 33

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)		
			Shear Consideration	Allowable Settlement	
				25mm	40mm
CMD & Coal Gasification Unit (Zone-01)	4.00	6 x 6	23.53	35.27	56.43
		10 x 10	22.81	31.17	49.86
		15 x 15	22.66	28.40	45.44
		20 x 20	22.76	26.82	42.91
		25 x 25	22.95	25.57	40.92
		30 x 30	23.19	24.52	39.23
		12 x 6	21.81	33.00	52.80
		20 x 10	21.10	29.64	47.43
		30 x 15	20.90	27.70	44.33
		40 x 20	20.93	26.33	42.13
		50 x 25	21.05	25.20	40.33
		60 x 30	21.21	24.24	38.73
	5.00	6 x 6	24.67	30.26	48.41
		10 x 10	23.70	26.15	41.84
		15 x 15	23.43	23.39	37.43
		20 x 20	23.46	21.69	34.70
		25 x 25	23.62	20.45	32.71
		30 x 30	23.84	19.42	31.07
		12 x 6	22.90	27.76	44.41
		20 x 10	21.96	24.74	39.58
		30 x 15	21.65	22.58	36.13
		40 x 20	21.62	21.19	33.90
		50 x 25	21.72	20.07	32.12
		60 x 30	21.85	19.12	30.60

* Table No. 1.6

ALLOWABLE BEARING CAPACITY OF SQUARE FOOTING FROM SHEAR PARAMETER

* Based on the design parameters tabulated in Table 1.2, the following are the analysis of safe bearing capacity in open foundation:

Zone-02

BH No: 15

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)			
			Shear Consideration	Allowable Settlement		
				25mm	40mm	75mm
CMD & Coal Gasification Unit (Zone-02)	1.50	Up to 3.0	29.91	39.58	63.34	118.75
		>3.0 to <6.0	32.24	36.27	58.03	108.80
	2.00	Up to 3.0	34.91	39.08	62.53	117.24
		>3.0 to <6.0	36.90	35.14	56.22	105.41
	3.00	Up to 3.0	45.33	52.60	84.15	157.79
		>3.0 to <6.0	46.47	47.00	75.21	141.01
	4.00	Up to 3.0	23.98	43.56	69.70	130.69
		>3.0 to <6.0	22.23	42.01	67.21	126.03
	5.00	Up to 3.0	25.57	35.09	56.15	105.27
		>3.0 to <6.0	23.35	35.25	56.40	105.76

* Table No. 1.7

ALLOWABLE BEARING CAPACITY OF STRIP FOOTING FROM SHEAR PARAMETER

* Based on the design parameters tabulated in Table 1.2, the following are the analysis of safe bearing capacity in open foundation:

BH No: 15

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)			
			Shear Consideration	Allowable Settlement		
				25mm	40mm	75mm
CMD & Coal Gasification Unit (Zone-02)	1.50	5 x 1	25.08	51.69	82.70	155.07
		10 x 2	24.92	37.04	59.26	111.12
		15 x 3	26.12	35.68	57.09	107.05
		20 x 4	27.66	34.75	55.60	104.24
		25 x 5	29.35	34.41	55.05	103.22
		30 x 6	31.10	42.74	68.38	128.22
	2.00	5 x 1	30.62	42.69	68.31	128.08
		10 x 2	29.43	34.27	54.84	102.82
		15 x 3	30.30	34.10	54.57	120.31
		20 x 4	31.67	32.77	52.43	98.31
		25 x 5	33.25	32.33	51.73	97.00
		30 x 6	34.93	40.07	64.11	120.21
	3.00	5 x 1	42.73	28.70	45.93	86.11
		10 x 2	38.98	41.20	65.92	123.59
		15 x 3	38.99	44.95	71.92	134.86
		20 x 4	39.94	43.01	68.82	129.03
		25 x 5	41.26	41.97	67.15	125.91
		30 x 6	42.77	51.79	82.86	155.37
	4.00	5 x 1	25.66	28.70	45.93	86.11
		10 x 2	20.36	43.97	70.35	131.91
		15 x 3	18.64	38.80	62.09	116.41
		20 x 4	17.81	37.29	59.67	111.88
		25 x 5	17.34	36.07	57.70	108.20
		30 x 6	17.06	43.99	70.39	131.98
	5.00	5 x 1	28.69	28.70	45.93	86.11
		10 x 2	22.05	35.02	56.03	105.06
		15 x 3	19.88	33.25	53.20	99.76
		20 x 4	18.83	31.06	49.69	93.17
		25 x 5	18.23	30.13	48.21	90.39
		30 x 6	17.85	36.67	58.67	110.01

* Table No. 1.8

ALLOWABLE BEARING CAPACITY OF MAT FOOTING FROM SHEAR PARAMETER

Mat Foundation:

BH No: 15

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)		
			Shear Consideration	Allowable Settlement	
				25mm	40mm
CMD & Coal Gasification Unit (Zone-02)	1.50	6 x 6	33.58	44.64	71.42
		10 x 10	39.27	43.03	68.84
		15 x 15	46.65	41.95	67.12
		20 x 20	54.12	41.33	66.13
		25 x 25	61.61	40.81	65.30
		30 x 30	69.13	40.34	64.54
		12 x 6	30.35	43.61	69.78
		20 x 10	34.55	42.45	67.91
		30 x 15	40.05	41.70	66.72
		40 x 20	45.63	41.15	65.84
		50 x 25	51.25	40.67	65.07
		60 x 30	56.88	40.22	64.35
	2.00	6 x 6	38.15	42.66	68.26
		10 x 10	43.68	40.49	64.79
		15 x 15	50.97	39.26	62.82
		20 x 20	58.40	38.49	61.58
		25 x 25	65.87	37.96	60.74
		30 x 30	73.37	37.50	59.99
		12 x 6	34.90	41.18	65.89
		20 x 10	38.94	39.76	63.61
		30 x 15	44.35	38.82	62.11
		40 x 20	49.89	38.26	61.21
		50 x 25	55.48	37.78	60.45
		60 x 30	61.10	37.35	59.76
	3.00	6 x 6	47.52	57.45	91.92
		10 x 10	52.62	52.59	84.15
		15 x 15	59.71	50.17	80.28
		20 x 20	67.02	48.68	77.89
		25 x 25	74.44	47.55	76.08
		30 x 30	81.89	46.60	74.55
		12 x 6	44.19	54.35	86.95
		20 x 10	47.82	51.13	81.80
		30 x 15	53.03	49.26	78.82
		40 x 20	58.47	48.03	76.84
		50 x 25	64.00	47.11	75.38
		60 x 30	69.58	46.32	74.11

* Table No. 1.9

ALLOWABLE BEARING CAPACITY OF MAT FOOTING FROM SHEAR PARAMETER

Mat Foundation:

BH No: 15

Location	Depth in 'm'	Width of Footing in 'm' (L x B)	Net Safe Bearing Capacity (t/m^2)		
			Shear Consideration	Allowable Settlement	
				25mm	40mm
CMD & Coal Gasification Unit (Zone-02)	4.00	6 x 6	21.82	50.41	80.66
		10 x 10	21.11	45.54	72.86
		15 x 15	20.93	42.44	67.91
		20 x 20	20.97	40.95	65.52
		25 x 25	21.11	39.87	63.79
		30 x 30	21.29	38.98	62.37
		12 x 6	20.22	47.17	75.47
		20 x 10	19.52	43.32	69.31
		30 x 15	19.30	41.40	66.24
		40 x 20	19.32	40.21	64.33
		50 x 25	19.37	39.29	62.87
		60 x 30	19.50	38.54	61.66
	5.00	6 x 6	22.83	42.80	68.48
		10 x 10	21.88	37.97	60.76
		15 x 15	21.58	35.07	56.10
		20 x 20	21.57	33.51	53.62
		25 x 25	21.67	32.52	52.03
		30 x 30	21.83	31.73	50.76
		12 x 6	21.17	39.26	62.81
		20 x 10	20.27	35.92	57.48
		30 x 15	19.94	33.85	54.16
		40 x 20	19.88	32.74	52.39
		50 x 25	19.93	31.93	51.08
		60 x 30	20.03	31.25	50.00

BISHAL KUMAR DAS.
M.TECH (GEOTECH)

ALLOWABLE BEARING CAPACITY FROM PLATE LOAD TEST

Location	PLT No	Depth in (m)	Plate Size (m)	Footing size (m)	Allowable pressure from PLT graph(when st=25mm)
					For 25mm
CMD & Coal Gasification Unit	01	1.80	0.50	1	69.25
				2	47.85
				3	41.35
				4	38.65
				5	35.24
	02	1.80	0.50	1	63.25
				2	44.50
				3	39.25
				4	35.02
				5	32.24

* Table No. 1.11

- The Recommended value for the foundation at a depth

  1.80 m depth footing size 3 x 3 is 40.30 T/m^2 for 25 mm settlement.

  As per Client required

  2.00 m depth footing size 3 x 3 is 44.78 T/m^2 for 25 mm settlement

  2.50 m depth footing size 3 x 3 is 55.97 T/m^2 for 25 mm settlement

BISHWAJIT KUMAR DAS. MTECH (GEOTECH)

ANALYSIS OF LOAD CAPACITIES IN PILE FOUNDATION

BORED CAST IN-SITU PILE:

- The recommended Pile Capacity of bored cast-in-situ RCC Piles for different length and diameters shall be as follows:
- Pile cut-off level is considered as 2.00m below Natural Ground Level (NGL)
- Since the soil strata in this location (CMD & Coal Gasification Unit) has been possess Zone-01 the top soil as Clayey Sand (Dense in Nature) followed by Compact Clay and Sedimentary Rock composition, the Safe load carrying capacity of pile foundation has been tabulated as below (Table No.1.12)
- Since the soil strata in this location (CMD & Coal Gasification Unit) has been possess Zone-02 the top soil as Clayey Sand (Dense in Nature) followed by Compact Clay and Sedimentary Rock composition, the Safe load carrying capacity of pile foundation has been tabulated as below (Table No.1.13)

Zone-01(BH-01 to 14 & 16 to 33)

Pile Diameter (m)	Length of Pile below Cut-Off Level (m)	Safe Load Carrying Capacity of Pile (MT)		
		Compression	Uplift / Tension	Lateral Capacity
0.45	13.50	265.23	242.81	11.50
0.50		297.87	270.20	13.62
0.60		365.06	325.21	18.23
0.75		470.61	408.34	26.05
0.80		507.06	436.21	28.88

* Table No. 1.12

Zone-02

(BH-15)

Pile Diameter (m)	Length of Pile below Cut-Off Level (m)	Safe Load Carrying Capacity of Pile (MT)		
		Compression	Uplift / Tension	Lateral Capacity
0.45	13.50	273.58	245.84	11.50
0.50		307.80	273.56	13.62
0.60		378.56	329.24	18.23
0.75		490.43	413.38	26.05
0.80		529.25	441.59	28.88

* Table No. 1.13

DISCUSSION AND CONCLUSION

Based on the field and laboratory test results and the given recommendations the following are summarized:

- Since the project CMD & CGU site is having uniform Sub-Soil stratification, boreholes has been grouped in two zones viz., Zone-1 (BH-01 to 14 & 16 to 33) & Zone-2 (BH-15). Based on bore logs, Field & Laboratory Test results, the following Design Soil Profile has been used for the analysis of Open Foundation and Pile Foundations.

General Observation opinion:

- For CMD & CGU area in Zone-01 the top surface layer consists of Clayey sand which is dense to very dense in condition up to an average depth of 3.15m. Mostly the ground water table was encountered at a depth 1.25m to 2.25m.
- Undulation the top layer, there is a presence of compact clay with 'N' value greater than 100. The condition of soil strata is very hard upto an average depth of 6.55m followed by weathered Rock, Sand stone & Clay stone.
- For CMD & CGU area in Zone-02 the top surface layer consists of Clayey sand which is dense to very dense in condition up to an average depth of 3.15m.
- Undulation the top layer, there is a presence of compact clay with 'N' value greater than 100. The condition of soil strata is very hard upto an average depth of 6.55m followed by weathered Rock & Clay stone.
- Difference in soil strata w.r.to ground levels and water table has been represented in a profile manner (please refer sub-soil profile).
- At project site, it is observed that Sedimentary Rocks composition of Clay stone and Sandstone at deeper depths is present.
- From the analysis of rock tests, it is noted that moderate weathering is formed at entire area with sandstone (fine grained) followed by clay stone.
- Details of rock test details have been given in Annexure-B of the report.

BISHWAJIT KUMAR DAS.
M.TECH (GEOTECH)

Recommendations for Foundation consideration:

- For lightly loaded structures in Zone-01(i.e., for structure loading upto 47 t/m^2) Shallow/Open foundation of footing size 3.0 x 3.0 m upto 3.00m depth may be considered, please refer TABLE:-1.3
- For lightly loaded structures in Zone-02(i.e., for structure loading upto 45 t/m^2) Shallow/Open foundation of footing size 3.0 x 3.0 m upto 3.00m depth may be considered, please refer TABLE:-1.7
- For heavy loaded structures i.e. Pile foundation please refer TABLE:- 1.12 & 1.13
- From the test results being performed (in-situ and laboratory), it is clear that there is no requirement of soil improvement in the site location. Moreover, the project site is not prone to liquefaction zone.

Suitability of the soils to be used as fill material:

- As per the laboratory test results the soil present at site location is clayey sand with slight plasticity. So it is recommended to use excavated soil as back filling material followed with layer to layer compaction upto maximum density.
- Since they will exhibit slight to no plasticity the soils can be compacted to fairly good compaction and provides good backfill and foundation support.
- For CMD & CGU Area the natural ground water table is available at minimum depth of 1.25m to maximum 2.25m.