Report
On

SOIL TESTING

FOR

SITE ID- IN-1366765

SITE NAME:- LONI MIDC

SITE ADD.- RAMRAO KERBA PATIL, 2619, GAT NO 36/1, A/P LONI, TQ. UDGIR DIST LATUR

REF. NO.- GD-IND-2019-20-075

DATE:- 6th Aug 2019

FOR

INDUS TOWER LIMITED

MAHARASHTRA

PREPARED BY

Green Design

15A Bhale Estate rear wing,3rd floor ,Behind new India insurance ,
Pune –Mumbai rd. Wakdewadi, Pune-411005.
Mob.No : +91 – 8446677977.
E –mail:-project@greendesignindia.com
Website: -www.greendesignindia.com

Summary of Test

As per the various test carried out, our recommendations are as follows.

1. Safe bearing capacity of soil is 25 T/m^2 at 2.00m depth
2. Remove Excavated Soil/Rock up to 2.0.
3. Use excavated soil/Rock for back filling.
4. R. C. C. Shallow foundation is recommended for tower, DG and Shelter foundation.
5. Water table was not found.
6. No chemicals found in soil.
7. Level difference of 200 mm observed in plot.
8. Site is covered with small trees and vegetation. Hence site cleaning is required.

CERTIFICATE

Certified by:	Mr. B.N.Jagtap
Designation:	Geotechnical Engineer
Qualification:	B.E. (Civil). M. Tech (Geotechnical Engineering IITR)

INDEX

1. INTRODUCTION

The purpose of the soil investigation is to arrive at an optimum design for the tower foundations. The telecom towers are generally 3-legged or 4-leggedbraced steel structures varying from 30m to 60m height. The weight ranges from 5 to 15 tons depending on the type of tower. Under extreme conditions of wind loading, the load on each leg will be in the range of 25 to 100 tonnes in compression, 25 to 100 tons in uplift and 2 to 10 tons in lateral thrust. In most cases, the uplift capacity of the foundation governs the design.

As part of contracting work M/Green Design Pune collected samples of soil/strata from project area & carried out Geotechnical Investigation work for proposed Structure. The soil samples are collected and laboratory tests are conducted in well-equipped laboratory at Pune.

The details of site exploration including foundation recommendations are given in this report.

2. SCOPE OF WORK

The scope of the Geotechnical investigation was as mentioned below. It was comprehensive enough to enable to estimate or determine the following:

i) The engineering properties of the soil:

a) Field Tests:

-Depth, thickness and variability

- Visual Identifications.

b) Laboratory tests(Soil)

-Natural Moisture content, density

- Sieve Analysis

-Atterberg's Limit

-Triaxial Shear Test

-Direct Shear Test

-Unconfined compression test.

-Swelling Pressure.

-Chemical Analysis.

-Crushing Strength of Rock

c) Chemical analysis of water

ii) Suitable depth of foundation:

3. TERMINOLOGY

Following are the terminologies used in the report. (IS: 1904 – 1966)

1) Safe Bearing Capacity (SBC)

Maximum intensity of loading that the foundation will safely carry without the risk of shear failure of soil irrespective of any settlement that may occur.

2) Clays

An aggregate of microscopic and sub microscopic particles derived from the chemical decomposition and disintegration of rock constituents. It is plastic within a moderate to wide range of water content. The particles are less than 0.002 mm size.

3) Firm Clay

Clay, which had its natural moisture content, can be moulded bysubstantial pressure with the fingers and can be excavated with aspade.

4) Soft Clay

Clay, which had its natural moisture content can be easily mouldedwith the fingers and readily excavated.

5) Stiff Clay

Clay, which had its natural moisture content cannot be moulded withthe fingers and requires a pick or pneumatic spade for its removal.

6) Foundation

That part of a structure which is in direct contactwith soil and transmits loads into it.

7) Raft Foundation

Foundation continuous into all directions, covering an area equal to orgreater than the base area of the building or structure.

8) Gravel

Cohesion less aggregates of rounded, sub rounded, angular, subangular or flat fragments of more or less unaltered rocks or minerals,90% of the particles having a size greater than 2 mm less than 60mm.

9) Sand

Cohesion less aggregates of rounded, sub rounded, angular, subangular or flat fragments of more or less unaltered rocks or minerals,90% of the particles having a size greater than 0.06 mm less than 2.0mm in size.

10) Coarse sand

Sand which contains 90% of particles of size greater than 0.6 mm andless than 2.0 mm.

11) Medium Sand

Sand, which contains 90% of particles of size greater than 0.2 mm and less than 0.6 mm.

12) Fine Sand

Sand, which contains 90% of particles of size greater than 0.06 mmand less than 0.2 mm.

13) Silt

A fine granular soil with little or no plasticity. If shaken in the palm ofthe hand, a pat of saturated inorganic silt expels enough water tomake its surface appears glossy. If the pat is stressed or squeezedbetween the fingers, it surface again becomes dull. The size ranges forsilt are as follows:-

a) Coarse Silt : 0.06 to 0.02 mm
b) Medium Silt : 0.02 to 0.006 mm
c) Fine Silt : 0.006 to 0.002 mm

14) Soft Rock

A rocky cemented material, which offers a high resistance to diggingup with pick axes and sharp tools, but which does not normallyrequires blasting or chiselling for excavation.

15) Hard Rock

A rock which offers a high resistance to digging up with pick axes andsharp tools and normally which requires blasting or chiselling forexcavation. Also hard rock offers a high resistance to metal tools andgenerates heavy sparks at the time of excavation.

16) Black Cotton Soil

Inorganic clays of medium to high compressibility, which is generallycohesive in nature and exerts swelling pressure when comes incontact with moisture or water.

4.SITE INVESTIGATION & EXPLORATION

The investigation of the site is an essential prerequisite to the construction ofall civil engineering work with a view to assess the general suitability of the site for the proposed tower and enable in preparing an adequate and economical design.

In particular, it is necessary to assess the changes that may occur during orafter the construction of the structure due to the choice of material or method of construction, which may adversely, affects safety of structure or after itsperformance or utility. The investigation of the site is being carried out and inaccordance with the principles set by IS 1892 – 1979.

Before carrying out soil exploration programme, detail information about thesite is being collected.

Site exploration can be carried out by most common and satisfactory methodseven by IS 1892– 1979 are,

a) Method of trial pits

b) Method of boring

c) Heading

In our site exploration programme, we have adopted second method, i.e., methodof boring. In site exploration programme, particular attention shall be paid tothe ground water level, soil profile is being plotted and variation of soil strata ismarked according to the depth of excavation.

The sites where problem of water logging in rainy season may cause, in suchareas, it is desirable to determine the contour of the water table surface inorder to indicate the direction of the natural drainage and to obtain the basis ofthe design of intercepting drains to prevent the influx of ground water to thesite from higher grounds.

Brief Description of Site:-

1. Site level from Road – Site is located at plain ground.
2. Site is covered with small trees.
3. No filled up Ground found
5. Water Table- No water table
6. Site Location – Site is located at plain Ground and level difference of 200 mm observed.
7. Remove all trees and vegetation before starting site activity.

TAKING TRIAL BORES

BORE HOLE NO:- BH-1 **DOE**:- **R.L:** M**ETHOD OF BORING**:- ROTATY/ WASH
TOTAL DEPTH:- 10.00m **Co-Ordinate(X,Y) :-** **GROUND WATER LEVEL**:- NE

BORELOG

Depth(m)	R.L (m)	THICKNESS OF LAYER	LOG	VISUAL DESCRIPTION OF STRATA	FIELD TEST SPT					TYPE OF SAMPLE	CORE DRILLING			WASH WATER COLOUR
					15	15	15	N	N_{corr}		CORE PIECES	Total RECOVERY %	R. Q. D %	
0.0m														
1		3.00		Highly to Completely Weathered & Decomposed Rock						SP	---	13	00	Brown
2										SP/ CP	1/3	23	00	
3		4.50		Highly Weathered & Fractured Rock						SP/ CP	4/12	35	08	
4														
5										SP/ CP	13/24	46	19	
6														
7										CP	25/39	41	08	
8		2.50		Moderately Weathered & Fractured Rock						CP	40/48	65	26	Greyish Brown
9										CP	49/57			
10														
11														
12														
13														
14														
15														

GRAVEL CLAY ROCK
SAND FILLINGS MURUM
BOULDERS SILT

ABBBRV DS :DISTURBED SAMPLE
WS :WASH SAMPLE
UDS :UNDISTURBED SAMPLE
C.P : CORE PIECES
N.E : NOT ENCOUNTERED
S.P.T STANDARD PENETRATION TEST
V.S.T VANE SHEAR TEST
DOE : Date of Exploration

Scale:V1:100
H NTS
Borelog No.1
DRWN BY:-JBK
CHKD BY :- BNJ

5. LABORATORY TESTS
CHARACTERISTICS OF SOIL

(AS PER IS: 1498 – 1970)
(Reaffirmed in 1997)

1. Grain Size Analysis:- (IS:2720 Part:-IV) Grain Size Analysis

Depth of Sample (m)	Gravel	Sand	Silt & Clay	Engg. Classification
0.00 to 1.50	---	---	---	---

Depth of Water Table : NA

2. Determination of water content :- (IS:2720 Part 2). Determination of water content

3. Specific gravity :- (IS:2720 Part 3) Determination of specific gravity

Section 1- Fine Grained Soils

Section 2- Fine, medium and coarse grained soils.

4. Dry & Bulk Density : - (IS:2720 Part:-XXIX) Determination of Dry Density of Soils In-place by the Core-cutter Method

Depth of Sample (m)	Moisture Content	Specific Gravity	Bulk Density (gm/cc)	Dry Density (gm/cc)
0.00 to 1.50	---	---	---	---

5. Liquid and Plastic Limit :-(IS: 2720 Part:-5) Determination of Liquid and Plastic Limit

6. Shrinkage Factors:- (IS:2720 Part:- 6) Determination of shrinkage factors

7. Free Swell Index :- (IS: 2720 Part:-XL) Determination of Free Swell Index of Soils

8. Swelling pressure :- (IS:2720 Part:-XLI) Measurement of Swelling Pressure of Soils

Depth of Sample (m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Shrinkage Limit (%)	Free Swell Index
0.00 to 1.50	---	---	---	---	---

9. **Triaxial Shear Test:-** (IS: 2720 Part:-11) Determination of the Shear Strength Parameters of a specimen tested in Triaxial compression .

10. Shear Strength Test:- (IS:2720 Part:-10) Determination of unconfined compressive strength

Depth of Sample (m)	Direct Shear Test Parameters		Unconfined Compressive Strength (kN/m^2)
	Undrained Cohesion (C_u) kN/m^2	Angle of Internal Friction (ϕ)	
0.00 to 1.50	---	---	---

Chemical Properties of Soil

Sample Depth Below EGL	Chloride Content g/l	Sulphate Content g/l	P^H
0.00 to 1.50	---	---	---

From above results site can be classified under class 1 as per IS-456, therefore attack of sulphates and chlorides to O.P.C.is negligible. Hence O.P.C. construction can be made consideration to foundation and underground works.

ROCK CORE LAB TEST RESULTS					
Hole No.	BH-1				
Sample Depth (m)	3.0 to 4.5	4.5 to 6.0	6.0 to 7.5	7.5 to 9.0	9.0 to 10.0
Sample No.	12	19	28	40	49
Sample Length (cm)	10.85	10.82	10.748	10.770	10.840
Sample Diameter (cm)	5.42	5.43	5.426	5.423	5.433
L/D Ratio	2.00	1.99	1.981	1.986	1.995
Oven Dry Density (gm/cc)	2.31	2.53	2.648	2.664	2.626
Saturated Density (gm/cc)	2.42	2.60	2.700	2.741	2.715
Water Absorption (%)	2.62	2.50	1.870	1.525	2.835
Porosity (%)	10.72	6.79	5.206	7.780	8.858
Specific Gravity	2.59	2.71	2.793	2.888	2.882
Strength (kg/cm^2)	126	147	294	281	207
Saturation Period (Day)	1	1	1	1	1

6. RECOMMENDATIONS

ESTIMATE OF SAFE BEARING CAPACITY

1**) SBC at 2.00m depth**

Assume Density of Soil/Murum/Rock =1.70 t/m^3

$q_d = cN_c\ S_c*d_c*i_c + q(N_q-1)S_q*d_q*i_q+0.5B*\gamma*\ N_\gamma*\ d_\gamma\ *\ s_\gamma\ *\ i_\gamma\ *\ W'$ *(IS:6403:1981 Cl.5.1.2)*

q= Effective surcharge at the base of foundation

d_c, d_q, d_γ = Depth factors=1

i_c, i_q, i_γ = Inclination factors=1

N_c, N_q , N_γ = Bearing capacity factors

s_c, s_q, s_γ = Shape factors

W' = Correction factor for location of water table =0.5

N=40 consider $\phi=35^0$ c=0.0 kN/m^2

N_c=46.12 N_q=33.3 N_γ=48.03

S_c=1.3 s_q=1.2 s_γ=0.6 $d_c=d_q=d_\gamma=1$ $i_c=i_q=i_\gamma=1$

$q_d = cN_c\ S_c*d_c*i_c + q(N_q-1)S_q*d_q*i_q+0.5B*\gamma*\ N_\gamma*\ d_\gamma\ *\ s_\gamma\ *\ i_\gamma\ *\ W'$

B = 1.50 m

Take overburden Pressure q=17*2.0=34 kN/m^2

q_d = 34*(33.3-1)*1.2*1*1+0.5*1.5*17*48.03*1*0.6*1*0.5

=1501.55kN/m^2

Take Factor of safety (F.S) = 3.0

SBC= q_d /3.0 = 1501.55/3.0 = 500.52kN/m^2=50.05 T/m^2

SBC is conservatively Restricted to 25 T/m^2

Settlement Analysis:-

SPT(N)= 40 No.s

Settlement Analysis: - *(IS 8009 :(Part-I)-1976 Cl.9.1.4)*

Take Allowable settlement = 40mm

SPT (N_{avg}) = 40

Assume width of foundation B= 3m

Settlement per unit pressure for ($1kg/cm^2$) = 0.0078m

SBC = $25T/m^2$ = $2.5kg/cm^2$

Water table correction = 0.5

Total Settlement = (2.5*0.0078)/0.5= 0.039 =39.0mm < 40mm .....ok

So Allowable Net bearing capacity may take 25 T/m^2 at 2.0m depth

ALLOWABLE BEARING PRESSURE

Sr. No	BH No.	Footing Depth (m)	Type of strata	Recommended Bearing Capacity			
				UB Capacity (T/Sq.m)	FS	SBC (T/Sq.m)	Allowable Bearing Capacity (T/Sq.m)
01	01	2.0	Highly to Completely Weathered Rock	150.16	3.00	50.05	25.00
02	01	2.5		183.10	3.00	61.03	28.00
03	01	3.0		216.05	3.00	72.02	30.00

Type of Foundations:

The following open types of Foundations are recommended.

i) RCC Isolated / Strip Footing

Additional Recommendations:

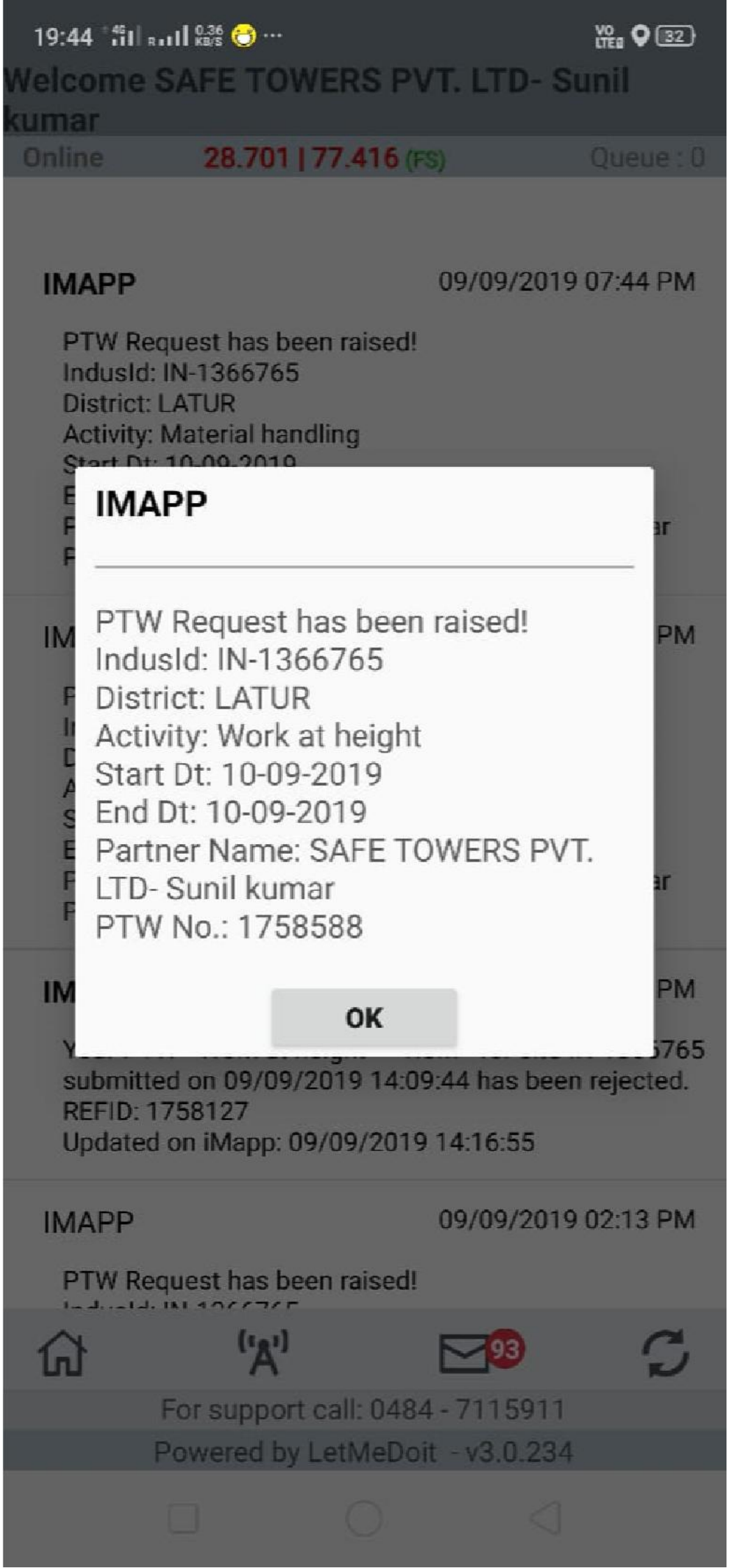
· The recommended minimum depth of foundation shall be 2.0m below NGL.

· All the columns are to be connected by an RCC Tie Beam at plinth level

Note:-

1. **The foundation should be anchored into the preferred strata at least 300mm.**
2. **The report submitted as per actual site investigation as well as laboratory test results on soil samples collected during SPT and bore hole drilling.**
3. **Designing of foundation should be done with considering all the loads and combination of loads as per relevant IS Codes.**

PHOTOS OF LONI MIDC SITE


19:44
Welcome SAFE TOWERS PVT. LTD- Sunil kumar
Online
28.701 | 77.416 (FS)
Queue : 0
IMAPP
09/09/2019 07:44 PM
PTW Request has been raised!
IndusId: IN-1366765
District: LATUR
Activity: Material handling
IMAPP
PTW Request has been raised!
IndusId: IN-1366765
District: LATUR
Activity: Work at height
Start Dt: 10-09-2019
End Dt: 10-09-2019
Partner Name: SAFE TOWERS PVT. LTD- Sunil kumar
PTW No.: 1758588
OK
submitted on 09/09/2019 14:09:44 has been rejected.
REFID: 1758127
Updated on iMapp: 09/09/2019 14:16:55
IMAPP
09/09/2019 02:13 PM
PTW Request has been raised!
93
For support call: 0484 - 7115911
Powered by LetMeDoit - v3.0.234

IMAPP 13/09/2019 09:36 pm

PTW Request has been raised!
IndusId: IN-1366765
District: LATUR
Activity: Electrical
Start Dt: 14-09-2019
End Dt: 14-09-2019
Partner Name: OSPS Telecom Services Pvt Ltd - Bhaskar Shende
PTW No.: 1765374

IMAPP 13/09/2019 09:35 pm

PTW Request has been raised!
IndusId: IN-1366765
District: LATUR
Activity: Work at height
Start Dt: 14-09-2019
End Dt: 14-09-2019
Partner Name: OSPS Telecom Services Pvt Ltd - Bhaskar Shende
PTW No.: 1765372

INDUS TOWERS LTD.

Spear Logistics Private Limited

C/O Indus Towers Limited , BEHIND INDIAN OIL PETROL PUMP , PUNE NAGAR ROAD , LONIKAND PUNE 412216
MAHARASHTRA

Not For Sale. Material To Be Delivered At Site

STN

STN	**2020640**		**DATE :**	**Monday, 19 August, 2019**			
MRF NO	19150082847 / 1914565373		**Req. Date :**				
Contact Person :	**Mir Sultan**		**Vehicle No. :**	**MH13AN2343**			
MOBILE NO	-		**GRN NO**				
SITE ADDRESS	**LONI MIDC UDGIR**		**Tpt_Name:**	**OSPS te**			
SITE ID	IN-1366765		**LR No**	**1**			
Delivery location	**Indus Towers Limited , BEHIND INDIAN OIL PETROL PUMP , PUNE NAGAR ROAD , LONIKAND PUNE 412216**		**Escort:**				
CONSIGNEE :	**Indus Towers Limited**		**Contact no**				
S.No.	**Item**	**Particulars**	**Unit RATE**	**QTY**	**Del. Qty**	**Amount Rs.**	**Remarks**
1	14-900000-0-00-ZZ-ZZ-322	Flange Foundation Bolts : 8.8 Grade:-Size M27X1050- 30 M GBM & 30 M Unicam+	1013.62	24	24	24326.88	Not for Sale
2	14-925F50-0-01-ZZ-ZZ-002	Tower Template Set, 30M GBM Flange Monopole w/o Camouflage 180 KMPH Normal Wt. 149.4 Kgs, Version -1.0	8057.04	1	1	8057.04	
3	12-440000-0-01-ZZ-ZZ-000	Earthing,Maintenance Free Chemical Earthing,Version 1.0	0.01	2	2	0.02	
4	12-201G80-0-00-ZZ-ZZ-034	Cable Harness for Tamperproof Alarm of SMPS with D25 Pin Male Connector and 15M Alarm Cable,0.5 MM Dia,12 Pair,Solid Annealed Tinned Copper (ATC) HRFR	499	1	1	499	
5	18-642000-C-01-ZZ-ZZ-000	EMF Signage,Sticker Type Version 1.0,(Size, Description, Color & font as per DOT Guidelines, Weather Resistant, Fade Proof - for installation in Monopole sites only) Version 1.0, - Capex	31	1	1	31	
6	18-521500-0-01-ZZ-ZZ-000	Fall Protection System, Monopole (GBM/RTM), Without Brackets - 30m	2800	1	1	2800	
7	14-900000-0-00-ZZ-ZZ-318	Supply of Pipe Mount Generic - single GSM antenna mount (For angular & Tubular towers)vertical/sloped portion of tower, JQ942-MW-GENMOUNT - Supply to ware house,Version - 5.0 WT. = 44.29 kg	3384	2	2	6768	
8	11-894900-0-02-08-ZZ-000	Battery Bank,VRLA+ 48V,600 Ah, Make- HBL,Version 2.0	170094.44	1	1	170094.44	
9	14-5130Q0-0-01-15-ZZ-000	Battery Bank cabinet, Outdoor IP55, Space For Battery Bank 600 Ah,with provision for Next GEN OD SMPS Mounting, Make- MAK Engineers,Version 1.0	23603	1	1	23603	
10	11-63B2E0-0-03-02-ZZ-000	SMPS,Outdoor IP54 -48V,Total Capacity 24KW,Loading Capacity 12 KW (4X3),4000W, Make- Emerson,Version 2.1,with space for 2 cartridge(1 cartridge=3X4000W Rectifier) & loaded with 1 cartridge	70897.78	1	1	70897.78	
11	18-236000-C-01-ZZ-ZZ-000	Fire Extinguisher, ABC Type, 4kg, Version 1.0, Capex	1300	1	1	1300	
12	11-D21D22-0-01-17-ZZ-000	TX RACK, 19", Outdoor IP55, 21U, Floor mount, 48V DC Fan, Make- Maxbros, Version 1.0	21756	1	1	21756	
						0	
						0	
WORDS: Value Mentioned for Transportation Purpose Material not for sale				**TOTAL VALUE**		330133.16	

Prepared By :

Signature :

Authorized By : Mr. Amol Nalagande

Signature

Verfied By: Mr. Mr. Vikas Pachkude

Signature :

Received By :

Signature

RECEIVED
INDUS TOWERS LTD.
By OSPS
Date 19/8/19 Time
IMEI/SF Name

INDUS TOWERS
C/o. FM India Supply Chain Pvt. Ltd.
Unique Warehousing, Survey No-11,
Lonikand, Tal.Haveli, Dist.Pune-412216
OUTWARD
Date: 19.8.19 Time: 23:15
Entry No: 113720
GRN No: DATE:
S/S Name & Sign:

AZHAR
9011813976

ESIC
Employees' State Insurance Corporation

Insurance

0

Monthly Contribution > Online Challan Form

Transaction Details

* Required Fields

Transaction status:	Completed Successfully
Employer's Code No:	52000202200001099
Employer's Name:	O S P S TELECOM SERVICES
Challan Period:	Nov-2019
Challan Number :	05219141747533
Challan Created Date	13-12-2019 14:36:38
Challan Submitted Date	13-12-2019 14:59:49
Amount Paid:	13075.00
Transaction Number:	193474810951

Print Close

कर्मचारी भविष्य निधि संगठन
Employees' Provident Fund Organization
भविष्य निधि भवन, १४, भीकाजी कामा प्लेस, नई दिल्ली - ११००६६
Bhavishya Nidhi Bhawan, 14, Bhikaji Cama Place, New Delhi - 110066

Generated On 13/12/2019 12:51:

Payment Confirmation Receipt

TRRN No :	1201912014544
Challan Status :	Payment Confirmed
Challan Generated On :	12-DEC-2019 19:59:03
Establishment ID :	APHYD0042194000
Establishment Name :	OSPS TELECOM SERVICES PVT. LTD.
Challan Type :	Monthly Contribution Challan
Total Members :	51
Wage Month :	NOV-2019
Total Amount (Rs) :	99,403
Account-1 Amount (Rs) :	66,785
Account-2 Amount (Rs) :	1,734
Account-10 Amount (Rs) :	28,891
Account-21 Amount (Rs) :	1,993
Account-22 Amount (Rs) :	0
Payment Confirmation Bank :	HDFC Bank
CRN :	240131219004970
Payment Date :	13-DEC-2019
Payment Confirmation Date :	13-DEC-2019
Total PMRPY Benefit :	0