Morphology, Architecture of zero slums in Bhubaneswar city, India

Abstract:

A slum is unplanned and thickly populated residential clusters connoted with poverty and staggered livelihood in urbans. Parameters of slums are poor services liveable structure, high density, hazardous location, health, education, and social exclusion secured of tenure. Present work involves the implementation of zero slum concept of the sustainable development goal (SDG-11). It has been proposed to design and drawing with the site plan is prepared for in 25 Blocks consisting of 998 units over 6.23 Acre and rehabilitate about 3000 slum dwellers out of about 7000 dwellers in distorted Kargil Baste in Bhubaneswar in central areas of BBSR between airport and railway line. The methodology involves identification of present slums and the proposed rehabilitation area by GIS and RS approach, insitu demographic survey, soil survey, large map and the design and drawing using AUTO CAD, STADPRO, scheduling by MS software. The cutting edge concept of zero slums can be possible when part of the present slum areas are rehabilitated by the federal Municipal Corporation at zero cost houses, interim transits sheds for new comers and provide affordable compartments at cost along with redevelopment of existing slums giving land rights.

Keywords: Bhubaneswar; Kargil baste; Jaga Mission; SDG 11; Soil tests; Zero slums;

Introduction:

Odisha, one among the east coast state of India, is spread over 155706 Km2, the 8th largest area wise and 11th population wise. Culturally well recognised the state had Cuttack was the capital until 1950 according to well connectivity, economically hotspot, historically, and politically important. But rise in population, and want of extension, the new capital was found suitable near city centring the land of temples, the Bhubaneswar. The extension was declared new Bhubaneswar, the capital city of Odisha, within the hills of Khandagiri and Udayagiri, encircled by the southerly Mahanadi branches, the Kuakhai, and the Daya. Quality water, air and space for accommodation have forced for its expansion and as on date it is smart city mission, [1]; [2]; [3]

Initially the city (Lat.- 20º19’N and Long. 85º 5’E) was planned to put up 40K people in 1946 by architect Konigsberg in 1946 along with contemporary cities Chandigarh, and Jamshedpur. The 16.84km2 space occupied have expanded today to ample space for horizontal/ vertical extension, healthy climate, quality of life, peaceful livelihood, infrastructure, moderate weather, federal transparency, and well communicated through NH 216 and 316, EC railways, and airport facilities. The area sprawled geo-spatially accommodating 1million people has been exalted to a smart city in 2016 that become a centre for higher education, astounding health care amenities and a corporate hub, [4], [5].

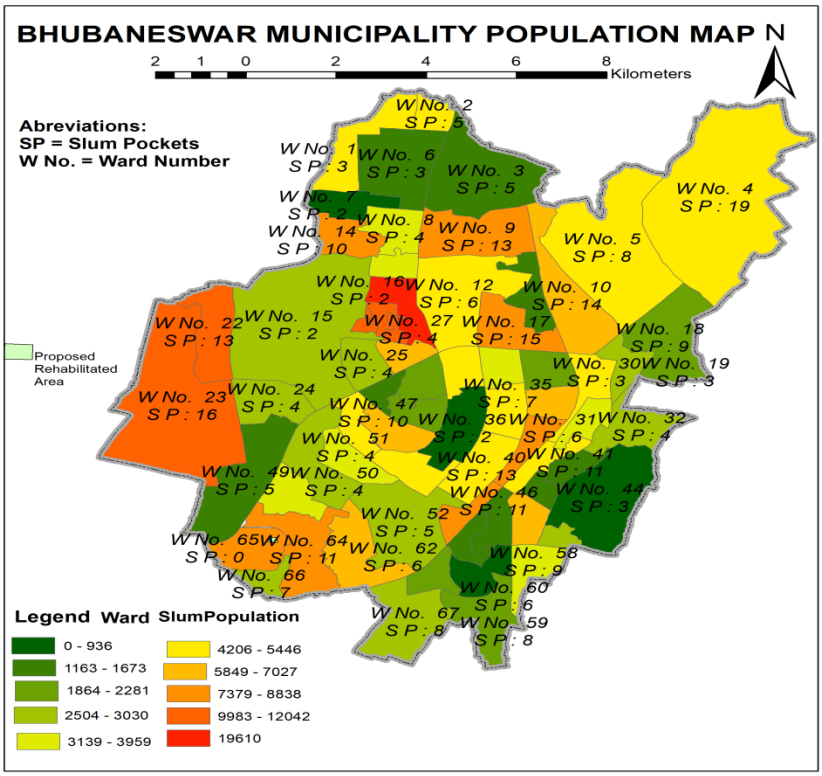


Fig 1: Population wise slum area ranges in Bhubaneswar city as per year 2008

Informal congested settlements in urban areas are slums. Slum dwellers live in unhealthy environment un-hygienic condition. They lack basic needs of life like food, sanitation, drainage, energy, health care, and government assistances. The slums flourish in cities poorly planned, lack of job, meeting high cost of livelihood, accommodating increasing migrants from rural areas. At times, natural disasters, urbanization, social exclusion, informal economy and vote bank politics, and social conflicts, [6].

Slums are indispensable and unavoidable for developing cities as they are the part to development through providing services. They temporary habitations near the huge constructions deprived of sanitation, federal/ municipal privileges, worthy governance, connectivity, adequate electric connections, resourceful energy for usage, acceptable accommodation, health care, education, integrated public transport systems, and tranquil healthy atmosphere to him and his family, [7], [8], [9]

The cause of the countryside people migrated to the capital city and created slums paucity of Land near work site, urban poor's economic problem, Illegal settlement, getting new jobs, unemployment, natural calamity, and large family, indebtedness family conflict, losing earning member, high education, better health care, market and higher aspiration.

Review of Literature

chart 1: Population and Slum statistics of the urban Local Bodies, Odisha

S. No.	ULBs	As per Census 2001							
		Total Population	% of Slum Population	Slum House-holds	Slum Population	Male	Female	SC	ST
1	Bargarh (M)	63678	**50.60**	6368	32218	33115	30563	10626	3472
2	Brajarajnagar (M)	76959	**48.24**	7474	37123	19309	17814	8489	4854
3	Sunabeda (NAC)	58884	**37.80**	5409	22259	11154	11105	6154	6596
4	Jharsuguda (M)	76100	**36.73**	5674	27955	14560	13395	6544	8175
5	Raurkela (M)	224987	**32.37**	15325	72831	38976	33855	4544	11313
6	Bhawanipatna (M)	60787	**28.33**	3531	17218	8985	8233	4504	1222
7	Balangir (M)	85261	**23.48**	4002	20023	10172	9851	7333	1446
8	Brahmapur (MC)	307792	**23-19**	13286	71388	36990	34398	9288	436
9	Puri (M)	157837	**21.39**	6759	33768	17758	16010	3535	58
10	Sambalpur (M)	153643	**20.00**	6441	30726	15860	14866	5569	3055
11	Cuttack (MC)	534654	**17.56**	18019	93910	49585	44325	21295	834
12	Jeypur (M)	76625	**13.26**	2338	10164	5023	5141	1755	2631
13	Baleshwar (M)	106082	**12.75**	2877	13521	7035	6486	1974	1845
14	Bhubaneswar (MC)	648032	**11.02**	18048	71403	38289	33114	8646	8402
	Total	**2631321**	**21.07**	**115551**	**554507**	**306811**	**279156**	**100256**	**54339**

Source: Slum Data of Orissa, Census of India-2001
Department of Housing & Urban Development, Govt. of Orissa

Zero slum concepts with clean energy provision are the sustainable development goals of the government, mobility/transportation, living standard, flexibility, and environment that can be classified as city and slum dwellers, [13], [14]. There recognised slums in Bhubaneswar are 436 numbers identified by BMC out of which 116 are authorised, and 320 unauthorised, [6]

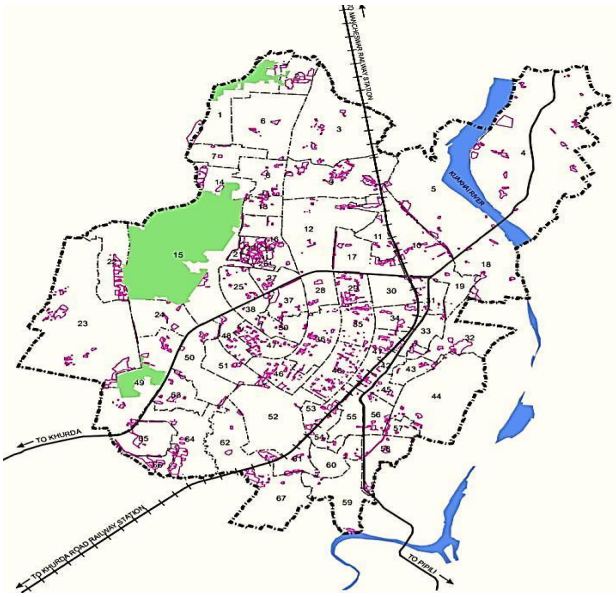
The political interests, undermined extortions to abolish, rehabilitate resettlement or redevelopment of slums for slum squirting. Better accommodations are the choices for the urban poor. Abolish, or upgradation of slums have originated political conflict of interest among the local politician to satisfy their vote bank. The politicians at times use them to eliminate, relocate or rehabilitate the slums considering their ignorance during electoral proc3ess (Table 1).

According to the 2011 census, about 13.7mi households comprising of 17.4% of urban populace of India reside in slums. In Andhra Pradesh (AP), Chhattisgarh, Madhya Pradesh (MP), Odisha and West Bengal, more than 1 out of 5 urban households live in slums. In Odisha, the average population of the shantytowns is about 21.07% of the total. The population and the slum demography in different towns in Odisha (**Table 1)**

Slums statistics Odisha/ Bhubaneswar

The present Municipal commissioner at Bhubaneswar (BMC) is housed in an expanse of 135 km^2, comprising of 67 wards. The city has a population of 885,363 people, with a 'slum' population of 163,983 people (18.5%) as per Census 2011. The capital city of Odisha tells the saga of three cities, i.e. the old city around the temple (pre-independence period), 2ndly the

planned capital city 1950 to 1980, and presently the expanded, ‘unplanned’ expansion in between. India is transforming to cosmopolitan to smart cities. Search for livelihoodIndians are migrating from rural to urban



map 1: Located slum areas in different slums in Bhubaneswar (pink)

Disparity between high cost of land, low income, and poor infrastructure in Bhubaneswar leads to slum generation. The word map with location of slum in Bhubaneswar is shaded pink. The formation of the slum began with temporary dwelling huts over the Huda of Jhar-Pokhari near Pokhariput area (Unit 21) (Fig 2(a) and Fig 2(b)).

Fig 2(a): No proper drainage facilities

Fig 2(b): Housing Condition in Slum Area

The present work involves rehabilitation of 1018 slum households from with at least 3886 people living in unhygienic environment, inadequate infrastructure and lack of basic services such as sanitation and safe drinking water facilities, [15].

Objectives

The scope and objective of present study is to conduct socio-economic survey of the shanty towns of Bhubaneswar, the socio-economic and political settings of the slum residents. The role model is to ascertain and affirm the slum dwellers as per improvement and clearance act 1973 for Karnataka state. The environmental impact studies (EIA) is conducted for the area clearance and redevelopment of slums in Bhubaneswar. As a solution to zero/redevelopment, alternate improved accommodation and infrastructural amenities with a conceptual model has been prepared to resettle, rehabilitate and redevelop slums identified with central, state assistance on partly financed, or public private partnership (PPP) mode.

the re-settlement area should have provisions for basic amenities, like drinking water, street lights, roads, community health, hospital, drains, public lavatories, storm water drains, social security and community hall activities wherever promising. Access to the delivery of civil amenities as per the need is to be provided to the urban poor. The quality of life of the slum dwellers should develop by social awareness and community growth employing NGO's.

Study Area

The 2nd largest shanty town in Bhubaneswar is the Kargil slum 25° 2' N lat. and 88°9'0" E long that runs houses between the airport area and the east coast rail tracks leading to Khordha. Presently the bastee (ward No 62) has been expanded to an area 18494m2 and under governance of Bhubaneswar Municipal Corporation.

Kargil Bastee is housed within an abandoned stone quarry. It is slum development within Bhubaneswar, about 1018 households and providing shelter to nearly 3886people choosing from six clusters in the Pokhariput area. With little or no access except electricity and colony water supply, is available to cater the basic services or government support a human demands for

comfortable livelihood. This cluster is chosen because of the old and the largest one, adjacent to the Biju Pattnaik International airport and habitat of antisocial.

The 3km long slum is crowded accommodating various groups of people of different caste creed and colour. Urban Micro Business Centre is purposefully situated directly opposite the slum. The weather of Bhubaneswar is typically humid and tropical. Maximum temperatures rise as high as 45°C in May and June and falls to about 16°C in December and January. The average rainfall is 1505 mm. This area is mostly cover by laterite soil.

Table 1: Population and Slum statistics of the urban Local Bodies, Odisha

Sl No	Ward No	Bastee name	Slum Name	House Hold	Population	Reference
1	62	Kargil	Bhakta Madhu Nagar	153	587	As per 2008 Slum Data as Exact EB of Census Data is not available
2	62	Kargil	Kargil Bastee	1018	3866	
3	62	Kargil	Kelasahi	327	1225	
4	62	Kargil	Ma Tarini Bastee	96	359	
5	62	Kargil	Bhoi Bastee	131	524	EB-851
6	62	Kargil	Tarini Bastee	118	466	
Total in ward 62				1843	7027	

After selection of study area, the map is downloaded from universal map downloader on that particular area and we done the digitization by Arc GIS. The survey involves exact households, schools, tree, road, railway line etc. The project constitutes slum areas are irregular settlements of buildings and huts. The area has high population density, unauthorised land occupations, and hazardous infrastructures, buildings that do not meet the basic livelihood standards like clean water, sanitation, women intimidation, geriatrics negligence, and other social amenities under the pandemics 2019, [16], [17].

Methodology:

Rehabilitation Kargil slum area at GANGAPATNA needs immediately warranted for safety of international airport and protection of Government land located at 13km distance from Khandagiri and adjacent to the ring road encircling BBSR. All the 7027 people shall be difficult to resettle them all at a stage. It is proposed to rehabilitate in phase wise so that planning can be done easily within the funds allocated by the Government. It has been proposed to design and drawing with the site plan is prepared for in 25 Blocks (998 units to be designed over 6.23 Acre). Disparity between high cost of land, infra-structure and lower incomes of migrants prefer to have

slum creation. Present study envisage Rehabilitation and Resettlement of a Slum area of about 1018 households with at least 3886 people living in unhygienic environment, inadequate infrastructure and lack of basic services. The provisions emphasized are citizen services, sustained urban planning, mobility and green groundwork, liveability Socio-physically, socio-spatially and simultaneously the environment by the low-income resettlement models, [18], 19]. The procedures adopted are

1. Selection of area by GIS methods for finding the vacant and its dimensions for the expanse suitable for rehabilitation for optimum livelihood.
2. Demographic survey and analyze their economic status.in the slum area.
3. The exploration of the suitable soil of the area for foundation of multistoried buildings along with the field reconssiance survey.
4. Advanced survey for planning in a large scale map of 1:1000 or 1:2000scale.
5. Designing and preparation of drawing for the resettled colony along with community services by using AUTO CAD.
6. The design of footings, columns, other beams, staircases, and slabs using the STAD-Pro software.
7. Since Bhubaneswar area lies in Zone III earth quake zone, the structures are earth quake resistance design.
8. The construction scheduling is to be done for efficient construction planning.

The frame work of the rehabilitation planning and design has been made based on the works of various authors, [20], and [21].

Rehabilitation destination:

Selected Slum area is KARGIL BASTE, Which is nearest of Biju Patnaik International Airport has been proposed to be rehabilitated to Ghangapatna Tehsil village which is about 15kms. It is completely a sparse bushy jungle area without private lands. Part of the existing slum needs to be rehabilitated at concessional payment mode or part subsidized mode make resettlement process easy and fast. The site plan for in 25 Blocks (998 units over 6.23 Acre), design and drawing prepared. The project duration proposed is 40 Months (Fig 3(a) and Fig 3(b).

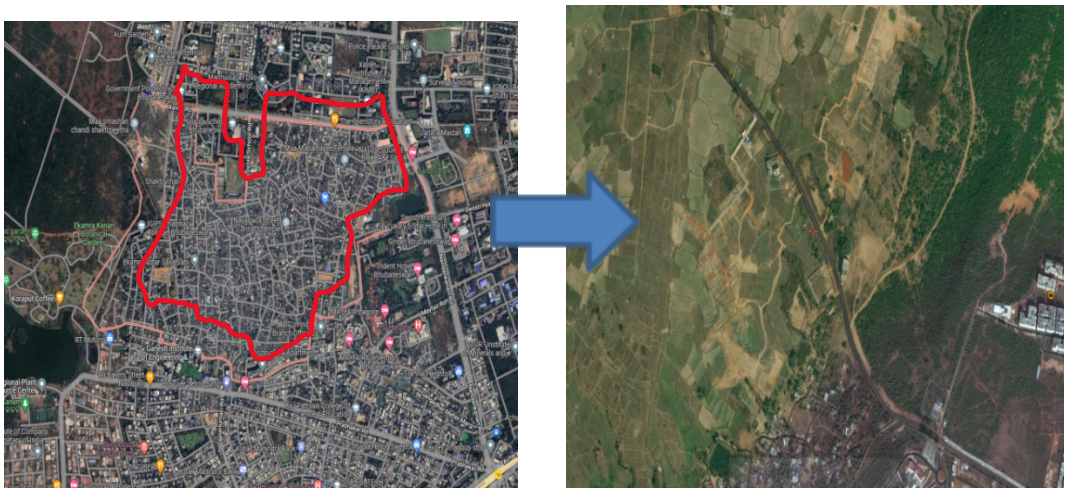


Fig: - 3(a) Rehabilitation place (Kargil Bastee) Fig 3(b):- Resettlement place Ghangapatna

Field Survey

The demo graphic survey of the present Baste has been taken up where the numbers of houses are counted with number of males, females, and children below 15years. The primary data was analysed before advancing for the rehabilitation scheme (**Table 2**).

Table 2: Insitu part of field survey of the slum area needs to be rehabilitated (Kargil Bastee)

SL NO	OWNER'S NAME	DESIGNATION	MEMBERS	MALE	FEMALE	MONTHLY INCOME
RAY-01	PARBATI TUDU	LABOUR	3	2	1	13500
RAY-02	BANAMBAR PRADHAN	MISTRI	2	1	1	9000
RAY-03	PADMANAVA SAHOO	WORKER	3	2	1	13500
RAY-03A	HADUBANDHU PATRA	WORKER	5	3	2	22500
RAY-04	GOLARE TALE	HOUSE WIFE	6	3	3	27000
RAY-05	RAVICHAND	LABOUR	6	3	3	27000
RAY-06	HADUBANDHU PATRA	BUSINESS	4	2	2	60000
RAY-07	SHIVARAM PRADHAN	WORKERS	4	2	2	18000
RAY-08	TUNI ROUT	HOUSE WIFE	5	3	2	22500

Advanced survey

After downloading the satellite image from the universal Image downloader, the image was digitalized followed by buffering to acquire the buffered image finally. The houses, ponds, colonies, roads are marked. The new area is in Fig 4 & Fig 5.

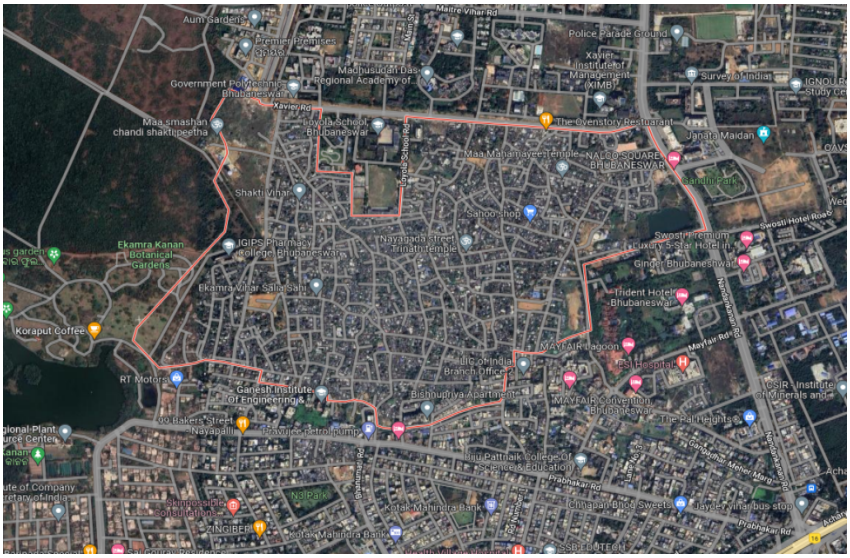
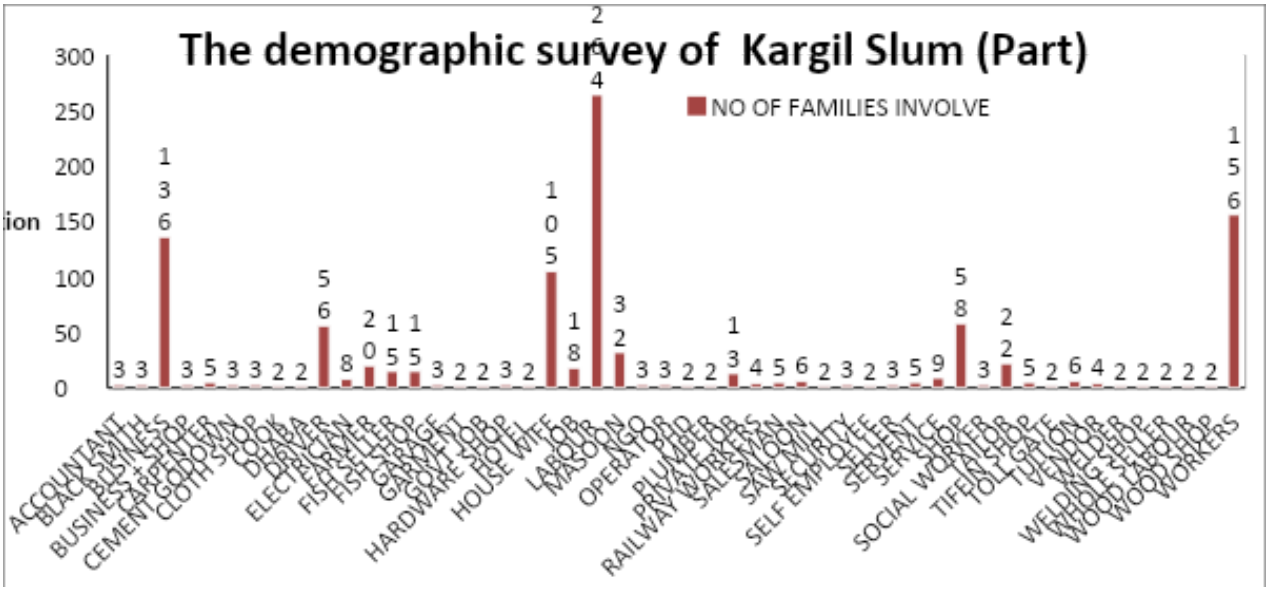


Fig: - 4 Digitization of the prosed area to be rehabilitated

Fig 5: The demographic survey of the proposed rehabilitation area in Ghangapatna

Water Content

The water a soil sample contains is it's "soil moisture content'. The "Water content" is stated as a ratio that range from 0 (completely dry) to the value of the materials porosity at saturation. The three samples obtained and have average water content obtained are 34.39%.



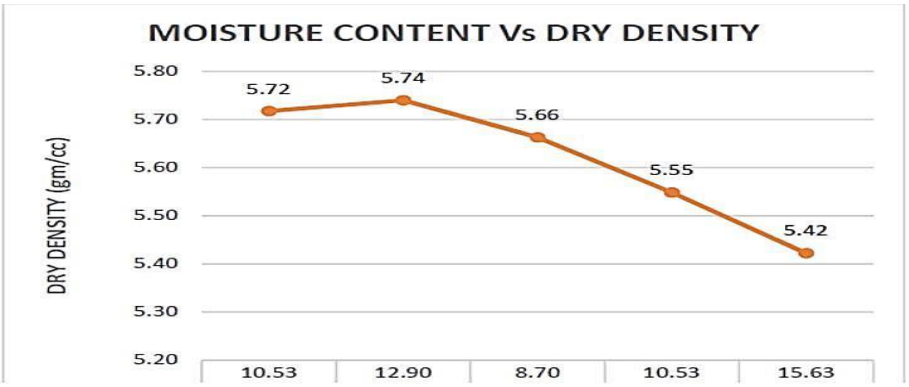


Fig 6: The curve for moisture content vs. dry density.

Optimum Moisture Content (OMC)

The optimum soil water content is the amount of water when dry unit weight at maximum can be attained after proper compaction. A maximum dry unit weight should be of void soil. The optimum moisture content of a soil is determined in the laboratory by the Proctor Compaction Test (PCT). It is the stage at which the soil sample converted densest, and should gain its maximum dry density. The device is the Mold Diameter 10.2 Cm, Height 11.6 Cm, Volume 944, Cc, Weight 4502 Gm., Weight 4502 Gm. **(Fig 6) (Table 3)**

Table 3: Bulk Density of the Soil 9n the proposed area of rehabilitation

Determination No.	1	2	3	4	5
Weight of water add, Ww(gm)	210	280	350	420	490
Weight of mould + compacted soil (gm)	6665	6796	6824	6810	6779
Weight of compacted soil, W(gm)	5721	5852	5880	58866	58835
Water add in percentage (%)	6%	8%	10%	12%	14%
Bulk density (gm/cc) = W / (Mould volume)	6.06	6.20	6.23	6.21	6.18
Dry density (gm/cc) = Bulk density / (1 + w)	5.72	5.74	5.66	5.55	5.42

The average OMC = 12.90 and the Max Dry Density = 5.74

Unconfined Compressive Test (UCS)

Unconfined Compressive Strength (UCS) is the highest axial compressive stress that a specimen of straight cylinder sample can bear under unconfined settings, when the confining stress is zero. It is alternatively called as the uniaxial compressive strength of that material as the imposition of the compressive stress is along one axis only, X-axis. (**Table 4)**

Table 4: Unconfined Compressive Test (UCS) of soil

Time (min)	Compⁿ Dial Reading (DL) LC =0.01 mm	Strain e =DL/L %	Area AC =AO /1.e (cm2)	Ring Reading (1Div =1Kg)	Axial Load P (Kg)	Compression Stress P / AO (Kg/cm2)
0	0	0	10.35	0	0	0

0.5	100	1.32	11.5	1	1	0.09
1	200	2.63	11.6	2	2	0.17
1.5	300	3.46	11.82	3	3	0.26
2	400	5.28	11.98	5	5	0.42
2.5	500	6.58	12.15	7	7	0.58
3	600	7.9	12.32	9	9	0.78
3.5	700	9.21	12.5	11	11	0.83
4	800	10.53	12.69	12	12	0.95
4.5	900	11.34	12.87	13	13	1.01
5	10000	13.16	13.09	14	14	1.07
5.5	1100	14.47	13.37	14	14	1.06
6	1200	15.79	13.48	13	13	0.96

Weight of Sample = 435.27gm; Unconfined compressive strength q_u = 1.07 (kg/cm^2) and Shear Strength of the soil, $C_c = q_u/2$ = 0.535 (kg/cm^2)

Safe Bearing Capacity

The capacity of the soil that supports the structural load to the ground without any shear failure or settlement is called safe bearing capacity of the soil. The safe bearing capacity of soil = Ultimate bearing capacity (UB)/(Area x Factor of Safety) (**Table 5**), **Table 6, Table 7**

Table 5: Property of the safe bearing capacity of soil of the proposed area of rehabilitation

Properties	
Cohesion	0.48kg/cm2
Angle of Internal Friction	8 Degree
Dry Density	1.541 in gm/cc
Specific Gravity	2.551
Coefficient of volume change (mv)	0.0128
Factor of Safety	2.81
“e”, Void ratio	0.655 Computed
Shear Failure Type (taken)	Intermediate

Table 6: Safe Bearing Capacity and Safe Bearing Pressure of the Ghangapatana Soil sample

Type	Size (m)	Depth (m)	SBC in t/m^2	100 mm permissible (SBP) settlement (t/m2)	Suggested SBC for design of foundation (t/m2)
RCC Raft Footing	Dia=16.0	2.25	16.30	+19	16.30
		2.5	16.48		16.48
		3	16.85		16.85

Table7: The table showing the characteristics of the soil at Ghangapatana, near Bhubaneswar

The characteristic of the Parameter	The average results
Soil Type	Laterite
Water content	34.39(%)
Specific gravity (sp. Gr)	2.81
Max dry density (MDD)	5.75
Optimum dry density (OMC)	12.9
Unconfined compressive strength (UCS)	1.07 kg/cm2
Shear strength of the soil	0.535 kg/cm2
Grain Size Distribution	Gravel = 36.6 %; Sand = 63.2 %; Fines = 0 %
SBC for Raft Foundation depth above 3m	16.6 T/m2

The Plan of a single dwelling unit, a single complex and the site lay out plan is given in in Fig **7(a), Fig 7(b) and & fig 7 (c).** The section plan of the Mat foundation in a single unit in resettled village and the section plan of the footing in the raft foundation in the resettled housing are in Fig **7 (d), and Fig 7 (e)**

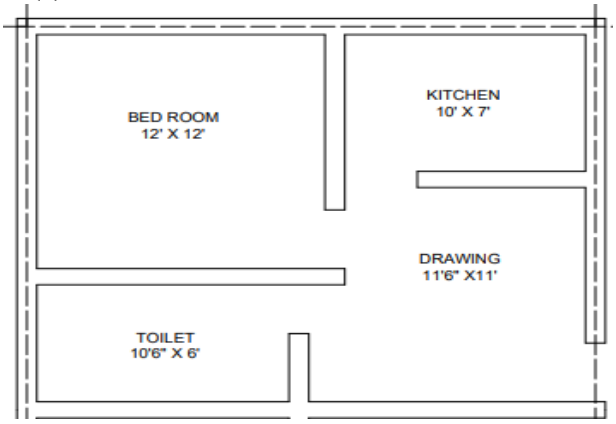


Fig 7 (a) : One single dwelling unit in resettlement colony

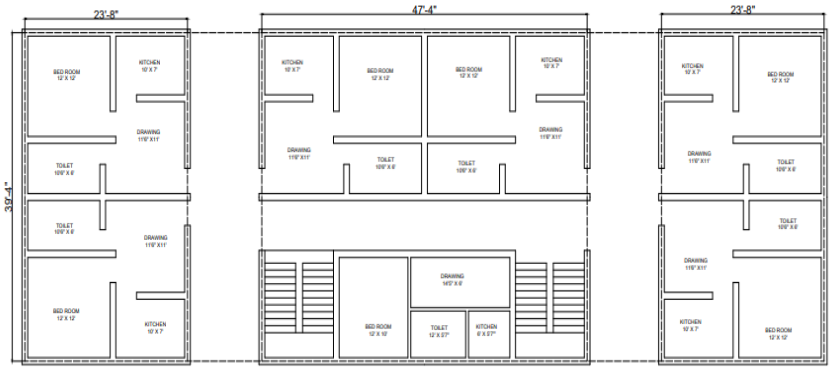


Fig 7(b): One single dwelling floor in the resettlement colony at Ghangapatna

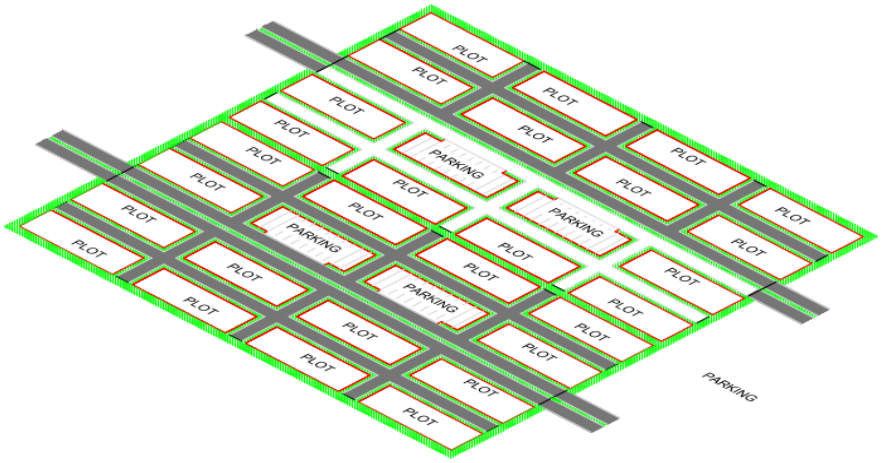


Fig 7 (C): The site layout plan at Ghanga Patna, in Bhubaneswar (Resettlement colony)

Design and Detailing
Foundation

Fig 7 (d): The section plan of the Mat foundation in a single unit in resettled village

Mat foundation has been provided in this structure because the bearing capacity is poor. SBC is 16 T/m2 and the axial load build up is 881kN, the mat foundation is adopted . The foundation supports the entire building loads and safety transfer it to thr ground. Details of the foundation positions are given in Fig 7(a), 7(b), 7(c), 7(d), and 7(e)

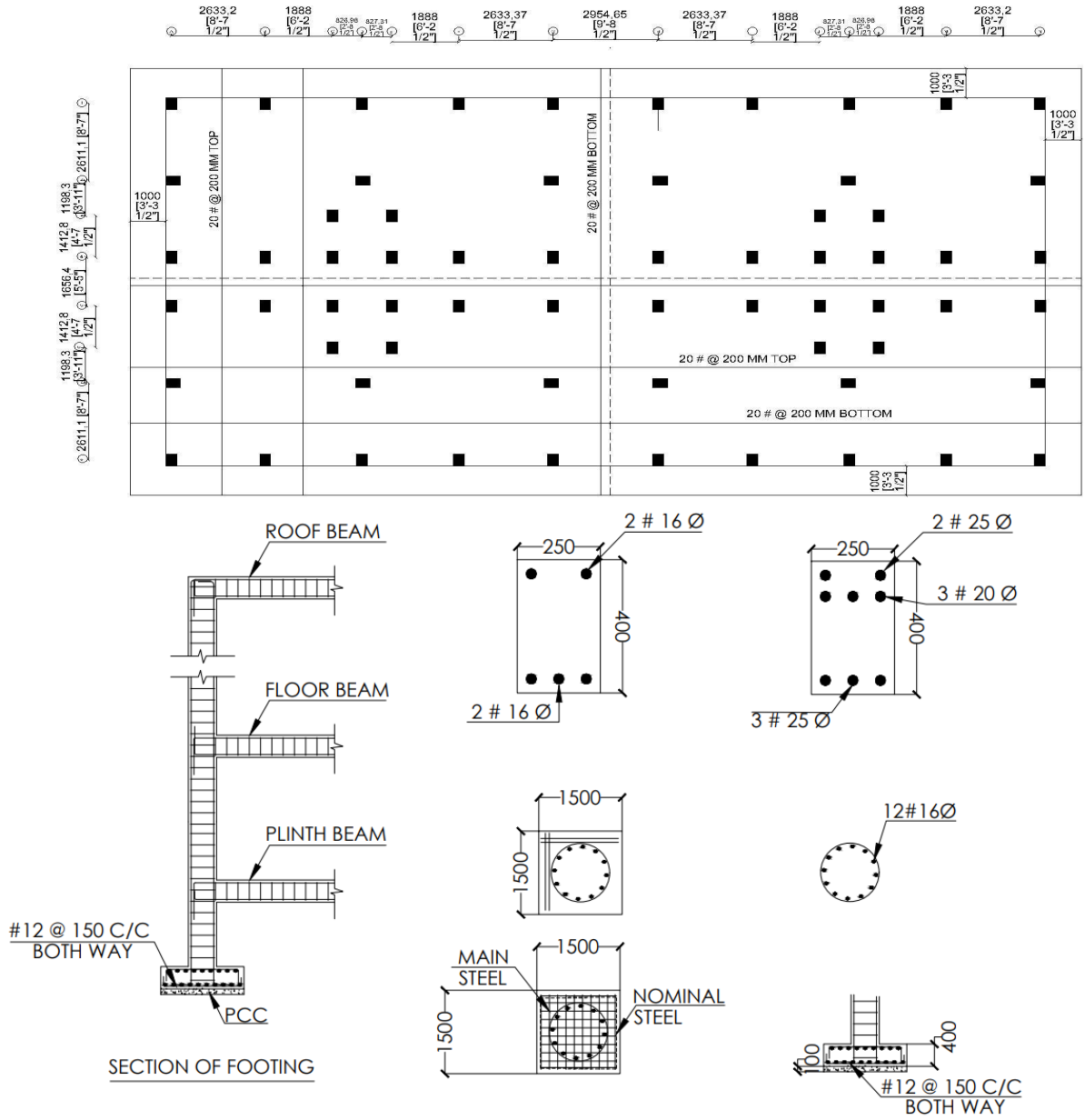


Fig 7 (d): The section plan of the footing in the raft foundationin resettlement units

Beam

Beam is the RCC structure that primarily takes lateral loads to the axis of the beam's, when the mode of deflection is mainly bending. The loads on the beam results in the reaction forces at the junction where beam is supported. The resultant of the forces acting on the beam produces shear force (SF) and bending moment (BM) within the beam.

Beam details

The dimensional size of the beam is 0.380 X 0.500 m, where the size of the stirup is 0.28 x 0.41 m. The reinforcement details are : Top bar = 2 @ 18mm dia; Bottom bar = 2@ 18mm dia; Mid bar = 2@ 10mm dia; Stirrups = 10mm Dia @ 180mm c/c, 2 legged

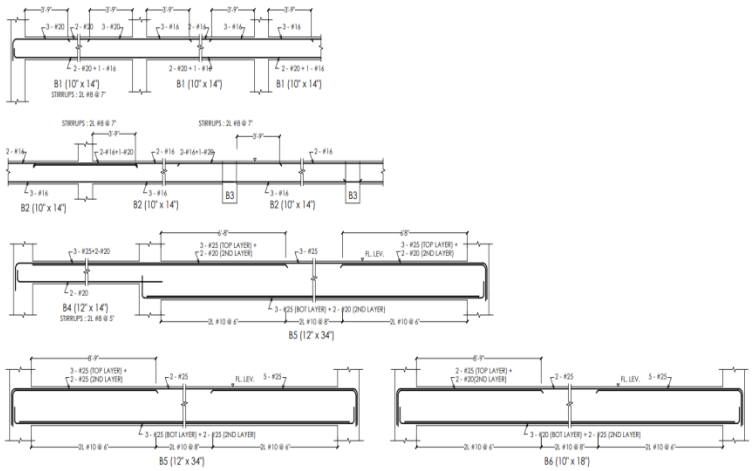


Fig:- 8: Sectional of Beam of the proposed structure

Column

A column in a structure is the component that transmits, the weight of the over load above to other structural components below through compression. Column is a compression member in a structure. The column transmits the over head structure load to the base which may be made of stone, brick or RCC Fig 9(a) and Fig 9 (b).

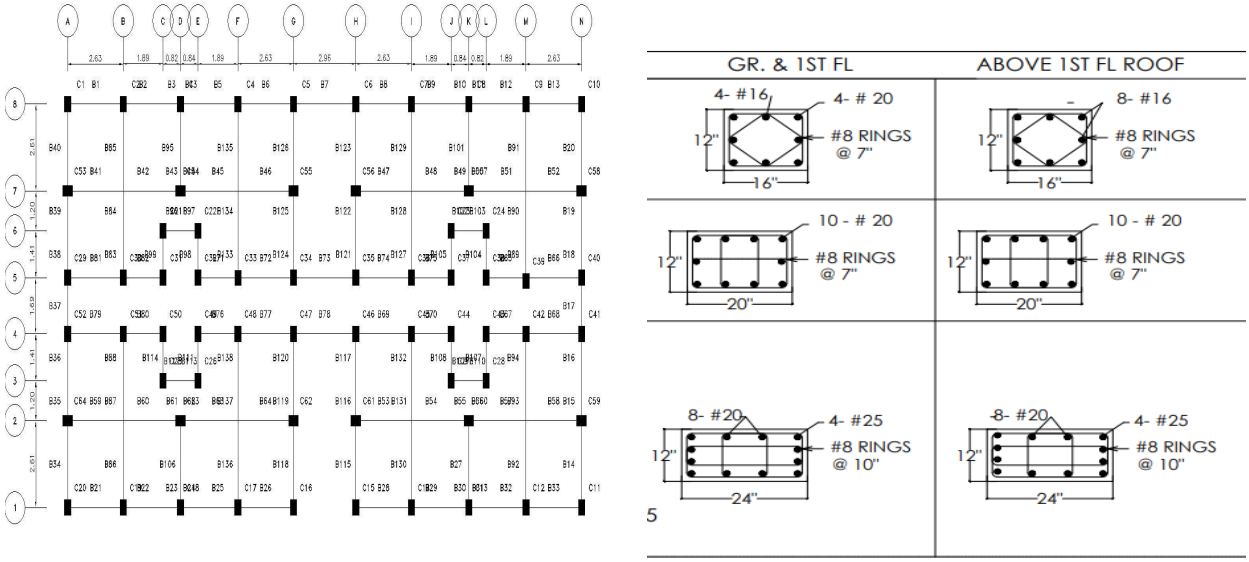


Fig 9(a): The coloumns position, sizes, (b) Reinforcement details, in ground and floors

Column details:

The size of the column is 0.300 x 0.460 m; The size of stirup is 0.230 x 0.380 m, 0.380m, 0.220 x 0.230 m. Reinforcement Details are (i) Total = 12 # 20mm dia (b) Stirrups = 10mm Dia @ 200mm c/c

Staircase Details

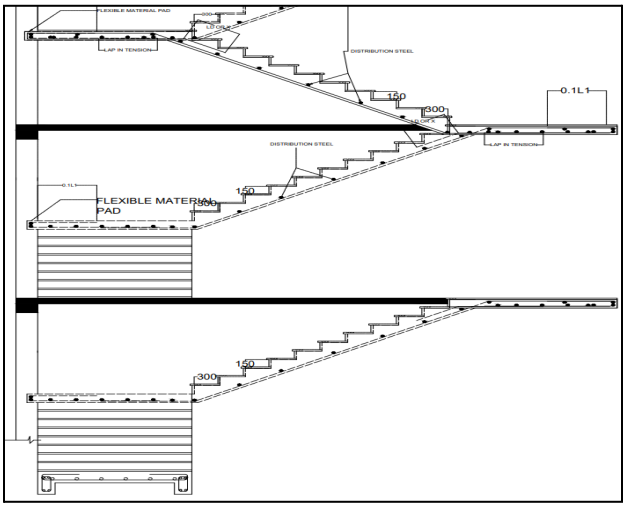


Fig 10: Section of Staircase of the proposed building

A staircase connects places between two elevations that is designed to bridge two altitudes of a structure by dividing the height to smaller heights, called steps. Stairs may be straight, round, or may consist of two or more straight pieces connected at angles depending upon designer's choice (Fig 10).

Slab Details

A cement concrete slab is the structural part of buildings, comprising of a flat, horizontal surface made of cast concrete. The slabs are of steel reinforcment of 100 and 500 mm thick, are often used to make floors and ceilings, Fig (11).

Fig 11 : The various Bending Moment areas of the slab

The Ultimate moment is 2 kN/m. The details of reinforcement provided are 8mm ϕ @ 200mm c/c, clear cover is 15mm and the thickness of the slab is 150mm.

Dead load &Live load Calculation

Table 8 :Self-weight calculation of the individual components of structures

#	Structural component	Wt of load	Calculation	design load
1	The beam & column (Taken by software)	Self-weight	0.5m*0.3m*1m*25kn/m^3	3.75kn/m3
2	The slab	Self-weight	0.152m*25kn/m3	3.8kn/m2
3	Floor finishes	Dead Load	1kn/m2	1kn/m2
4	Furniture & equipment	Dead Load	1kn/m2	1kn/m2
5	Total dead load given	Dead Load		5.8Kn/m^2
6	Total Live load	Live Load	As per IS-875 Part 2	3kn/m2

Seismic Load Calculation

1. The earth quake impact on construction is subject to the stiffness of structure, soil media stiffness, tallness and position of the structure.
2. Bhubaneswar belongs to zone II. Annex E, of IS-1893(part -1):2002
3. Zone factor , Z= 0.16
4. h = total elevation of the construction
5. Time in x direction ,T =(0.075* h) *0.75

Wind Load Calculation

1. Wind load is subject to the velocity of the wind at the location, and height of the structure Wind analysis is done based on recommendation given in (IS-875(part 3) ,1987)
2. The design wind speed can be calculated as : $V_z = V_b * K_1 * K_2 * K_3$

   Where V_b –wind speed in m/s; V_z – design wind speed at height z in m/s;

   K_1 – risk factor; K_2- factor for designing wind speed; based on structural elevation & land; K_3- factor of topography

From IS code, Basic wind speed Vb -50m/s, for Bhubaneswar, and K1-1.08 & K2-1.12 (the territory is category-2) K3 =1. Hence; Design wind speed = 50m/s*1.08*1.12*1 = 60.48m/s (Fig 12) [Appendix A, IS-875(part 3), 1987],

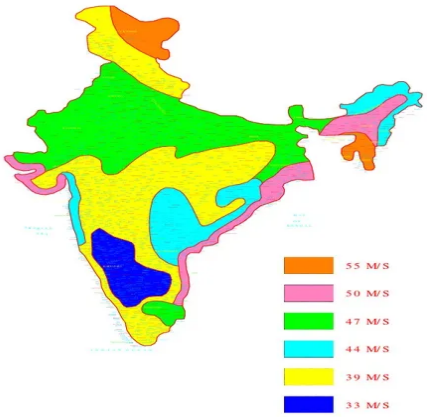


Fig 11 : Wind speed at Bhubaneswar and various zone in India

Fig 12 (a) : The side view of the proposed Unit Fig 12 (b): The back view of the proposed unit

Fig 12 (c): The back view of the proposed unit

The wind speed diagram, the different views of the building is given in Fig 11, and Fig 12 (a), Fig 12 b), and fig 12 (C).

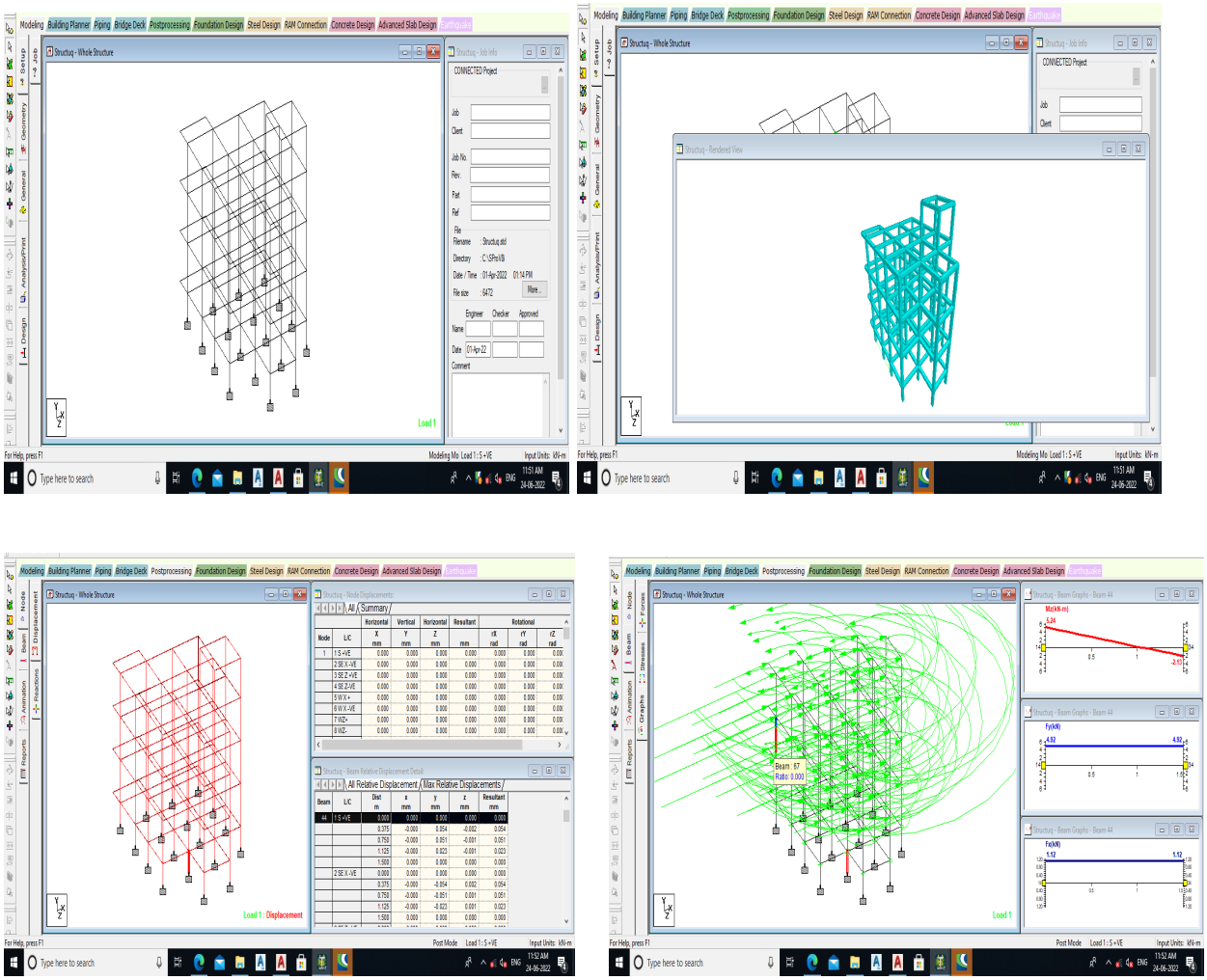
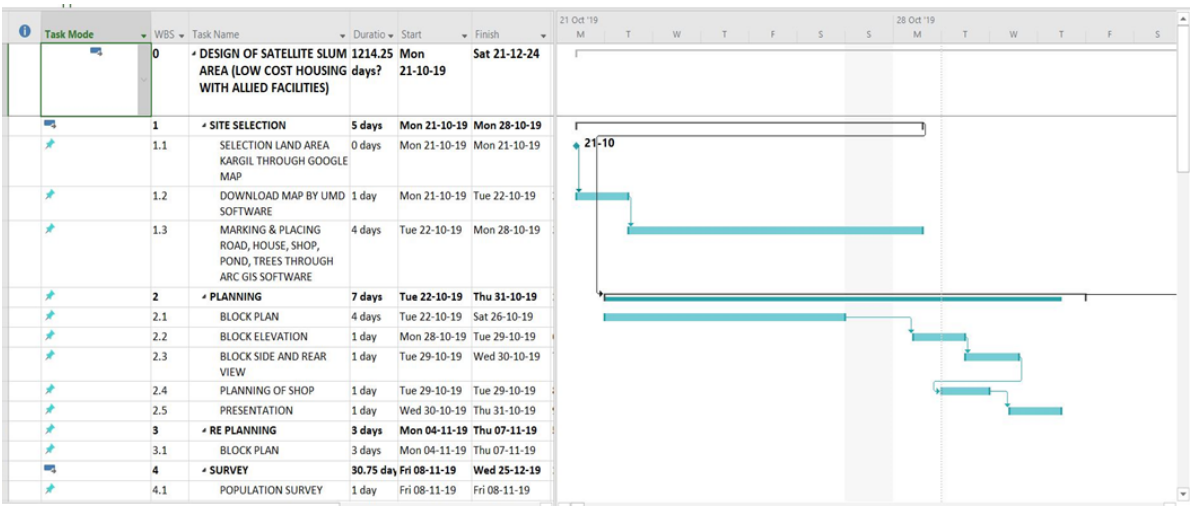


Fig 13: The base shear response of the model subjected to wind forces and earthquake tremors (Grid presentation, 3D diaphragm, Post processing-displacement vs. Load, wind effect),



Task Mode	WBS	Task Name	Duration	Start	Finish
	0	DESIGN OF SATELLITE SLUM AREA (LOW COST HOUSING WITH ALLIED FACILITIES)	1214.25 days?	Mon 21-10-19	Sat 21-12-24
	1	SITE SELECTION	5 days	Mon 21-10-19	Mon 28-10-19
	1.1	SELECTION LAND AREA KARGIL THROUGH GOOGLE MAP	0 days	Mon 21-10-19	Mon 21-10-19
	1.2	DOWNLOAD MAP BY UMD SOFTWARE	1 day	Mon 21-10-19	Tue 22-10-19
	1.3	MARKING & PLACING ROAD, HOUSE, SHOP, POND, TREES THROUGH ARC GIS SOFTWARE	4 days	Tue 22-10-19	Mon 28-10-19
	2	PLANNING	7 days	Tue 22-10-19	Thu 31-10-19
	2.1	BLOCK PLAN	4 days	Tue 22-10-19	Sat 26-10-19
	2.2	BLOCK ELEVATION	1 day	Mon 28-10-19	Tue 29-10-19
	2.3	BLOCK SIDE AND REAR VIEW	1 day	Tue 29-10-19	Wed 30-10-19
	2.4	PLANNING OF SHOP	1 day	Tue 29-10-19	Tue 29-10-19
	2.5	PRESENTATION	1 day	Wed 30-10-19	Thu 31-10-19
	3	RE PLANNING	3 days	Mon 04-11-19	Thu 07-11-19
	3.1	BLOCK PLAN	3 days	Mon 04-11-19	Thu 07-11-19
	4	SURVEY	30.75 days	Fri 08-11-19	Wed 25-12-19
	4.1	POPULATION SURVEY	1 day	Fri 08-11-19	Fri 08-11-19

Fig 14: The scheduling of the future building for project duration 3 Years 4 Months

The base shear response of the model subjected to wind forces and earthquake tremors (Grid presentation, 3D diaphragm, Post processing-displacement vs. Load, wind effect) are in fig 13 and the scheduling is in fig 14**.**

Discussion:

India is transforming to cosmopolitan to smart cities. Search for livelihood Indians are migrating from rural to urban. With one thousand million slum dwellers in the world, India contribute 35.2% of its total population warranting to focus (as per SDG 7 for adequate affordable, modern, and clean energy & SDG 11 for sustainable cities and communities with zero slum concept) on affordable house, livelihood, education, health security, amenable basic services, transport, mobility and safety but under threat [22] (Quadeer et al., 2022). Energy supply is not clean as 60% of GHG emissions are accounted on date and 1.7% from renewables globally [23], [24], [25] [26], [27].

To attain low carbon economy and initiatives demand attempts to invite emerging climate initiative innovations. Urban slums add to the GHG, waste pollutions, environmental degradation, (http://wdi.world bank.org/table/WV.3). The Cape Town and the Bombay city attempting with zero slum that may be costly as federal initiatives. But isolated and part promotion of through public awareness, promoting dialog, PPP mode, big data dissemination, and concerted practices of urban planning can be efficient, fast and cost effective, [28], [29], [30], [31], [32] [33], [34], [35].

To make the city Bhubaneswar smart, it must have innovations in its constructions, roads, digital technology and economy growth, safe livelihood, good society and environment and above all the achievements in quality of life, [36]. Slums are the initial basement for immigrant's low cost, affordable shelter without a settled establishment for himself and his family. This is the vibrant places for amalgamation of various people from cast, creed and colour, slums give chance to its people multiple culture struggling to make an honest living, vibrant lifestyle, under broad urban poverty and formal employment. With all odds, they develop economic rationality and novel dwelling solutions, [37]

Slums are excruciating housing of urban poor, unsafe, dearth of rudimentary services, unsafe shanty dingy houses, overcrowding, built up over menacing land. These fragmented families, have most of its members un/under employed, and economically backward, physically, and socially excluded. Shanty town people have restricted access to credit and formal job markets due to stigmatization, discrimination and geographic isolation. These dingy towns are recipients of the capital's nuisances, industrial effluents and noxious waste. The only land available to slum occupants is most of the cases fragile, dangerous, disorderly or polluted for land-dwelling and mobility ([25], [23], and [27].

This can be ameliorated through upgrading slum, rehabilitating, redressal of poverty, room for newcomers, low wages, structuring urbanization and economy, creating job opportunities, legitimizing slums, planning for both urban and rural areas. Collaterally planning for rural changes side by side urban expansion with economic development is warranted in present scenario[28][29] (UN -2016, Mishra et al, 2020).

Affordable lodging has become foremost concern in the metropolises. BMC (Bhubaneswar Municipal Corporation) has been in pipe line progress to provide reasonably priced housing to slum dwellers or at concessional rate or giving property rights under JAGA mission in Odisha. The total shantytown inhabitants of the state constitute 3.7% of its total population, comparably lower than other states in India. The JAGA Mission is covering 1.7mi slum inhabitants gradually mainstreaming dingy bastee through a combination of land rights and shelter.

Conclusion:

Slum Progression in BBSR is questioned today whether a Problem or solutions. Slum less urban agglomeration needs adaptation to waste spills, environmental degradation, response to shocks, and stresses that shall lead to sustainable, resilient, tranquil, and address inequality, social Stability, informality, insecurity, and climate change issues related to slum less urban agglomeration with innovative digital world. The SDG 11 stresses upon teamwork and alliance, planning and scheduling, authoritative governance, fiscal policies, and learning that can sustain positive change

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