2nd International Conference on Advanced Research in Biology, Engineering, Science and Technology (ICARBEST'16)
Organized by
International Journal of Advanced Research in Biology, Engineering, Science and Technology (IJARBEST)
19th February 2016

STRUCTURAL DESIGN OF STILT+4 BUILDING

K. CHANDRA SEKAR[1], V. MARIAPPAN[2], V.GNANA SAKTHI VEL[3], E.VINOTH KUMAR[4]

U.G. Scholars, Department of Civil Engineering, PSN College of Engineering and Technology (Autonomous), Tirunelveli, India [1,2,3,4]

Abstract— The materials chosen for the development of the building are done in understanding to the BIS codal procurements. The building is developed in a manner that it guarantees appropriate light and air-course in every one of the rooms. Water supply for the building is guaranteed by bore well and open water supply line. All the essential requirements for a building are taken into record and are given. The construction work is properly supervised adhering to all the safety measures, rules and regulations. The building is constructed in such a way that it provides the occupants a great pleasure and no inconvenience.

Index Terms—Air Coarse Structure, Open Water Supply Line, Stilt+4 Building

I. INTRODUCTION

According to the needs of customer and by following rules and regulations formulated by PWD, plan for Stilt+4 storey (G+4) 1BHK residential apartment was created using AUTOCAD. The following figures are to be drawn for ease of construction process:

i. Typical to Above floor plan.
ii. Ground floor plan.
iii. Plinth beam details.
iv. Centre line details (for column marking at site of construction).

The following IS codes were used for designing the structure at sholinganallur site:

i. The structural members are to be analyzed and designed as per Indian Standard code IS : 456 – 2000.
ii. Reinforcement detailing are to be provided as mentioned in design aid SP 34 : 1987.

Construction site of ongoing project "Kings Trinity" at Modicum has to be visited to know about the onsite provision of reinforcement details for structural members like slab, beam laymen.

Loads acting on the structure are:

A. Dead load

Dead load of structural members (slab, beam and stair case) are calculated using the formula:

DL = C/S dimension of member x ρ_c (5.1)

Units: kN/m^2 for slab, kN/m for beam and stair case, and kN for column and footing.

10% of self weight of column is taken as self weight of footing.

B. Live load

Live load acting on a structure is obtained as per Indian standard codal provision for design loads for buildings and structures [IS : 875 (Part – 2) – 1987]. For, residential buildings live load generally considered is 2 kN/m^2.

C. Wind load

Action of wind on a structure is mostly considered for buildings and structures with more than 5storeys. Wind load acting on a structure is computed based on Indian standard codal provision for design of loads for buildings and structures [IS : 875 (Part – 3) – 1987]. Thus, action of wind force is neglected for designing G+4 apartment at cathedral Road Chennai.

D. Seismic load

Seismic load acting on a structure is computed based on IS criteria for earthquake resistant design of structures [IS : 1893 (Part – 1) – 2002]. Seismic load thus computed are (refer fig 5.1):

i. At first floor level = 8.49 kN
ii. At second floor level = 34.73 kN
iii. At third floor level =30.73 KN
iv. At Fourth floor level =27.73 KN
v. At roof level = 52.20 kN

II. MATERIALS USED IN CONSTRUCTION

Following are the materials used for the construction of a building.

1. Bricks.
2. Sand.
3. Cement.
4. Stone.
5. Timber.
6. Metal.
7. Floor Tiles.
8. Roof Tiles.
9. Reinforcement.
10. Plastic Materials.

11. Doors & Windows.
12. Asphalt Bitumen.
13. Coloring Material.
14. White Cement.
15. Paints & Varnishes.
16. Brick Ballast.
17. Sanitary Materials.
18. Water.
19. Finishing Tiles. Etc.

Christo Ananth et al. [5] proposed a system, this fully automatic vehicle is equipped by micro controller, motor driving mechanism and battery. The power stored in the battery is used to drive the DC motor that causes the movement to AGV. The speed of rotation of DC motor i.e., velocity of AGV is controlled by the microprocessor controller.This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

III. STRUCTURAL DESIGN

By: R.MANIVANNAN, M.E	RM Engineering Consultants				Project :	
Date:10/07/15					`	
Chd.RBR					Subject: SLAB S2	
			Dept: structural engineering			

TWO WAY SLAB DESIGN

			lg. Span (L_y)	sh. Span(L_x)	
Panal size		=	3.50	3.46	
	f_{ck}	=	25	N/mm^2	
	f_y	=	415	N/mm^2	
EDGE COND.	2	ONE SHORT EDGE DISCONT.			
	L_y/L_x	=	1.02		
(Assume D=		=	125	mm	
Dead load of the slab		=	D*25 =	3.13	Kn/m^2
	Floor finishes	=		3.00	Kn/m^2
	Live load	=		1.50	Kn/m^2
	Total load (w)	=		7.63	Kn/m^2
	α_x(-ve)	0.0382			

=

$\alpha_x(+ve)$
= 0.0288

$\alpha_y(-ve)$
= 0.0370

$\alpha_y(+ve)$
= 0.0280

The Factored Moments are			Moment in KNm	At in m^2	8 tor mm c/c	10 tor mm c/c	12 tor mm c/c
$M_x(-ve)$ =	$\alpha_x(-ve)$ $*w*l_x^2*1.5$	=	5.23	147	342	534	769
$M_x(+ve)$ =	$\alpha_x(+ve)$ $*w*l_x^2*1.5$	=	3.94	110	456	713	1026
$M_y(-ve)$ =	$\alpha_y(-ve)$ $*w*l_x^2*1.5$	=	5.07	155	324	506	728
$M_y(+ve)$ =	$\alpha_y(+ve)$ $*w*l_x^2*1.5$	=	3.83	117	431	673	969

d_{req} = $SQRT((M_x*10^6)/(0.138*f_{ck}*b))$ = 120 mm

D_{prov} = 125 mm

dx_{prov} = 101 mm

dy_{prov} = 93 mm

Provide 125 mm Thk 8 tor @ 300 mm c/c in Shorter direction &
8 tor @ 300 mm c/c in longer direction

Check for Deflection :

Percentage of Tension reinforcement @ mid span = 0.17

$f_s = 0.58*f_y*$ $\frac{\text{Area of c/s of steel required}}{\text{Area of c/s of steel provided}}$ = 158 N/mm^2

Basic span/eff depth ratio for continuous slabs	=	31			
Modification factor	=	2.00			
Coefficient for max ratio of span/eff depth	=	63			
Effective Depth required	=	55	<	101	mm
		SAFE			

Fig.1. Provision of crank in slab

Fig.2. Reinforcement – One way slab

IV. CONCLUSION

The materials chosen for the development of the building are done in understanding to the BIS codal procurements. The building is developed in a manner that it guarantees appropriate light and air-course in every one of the rooms. Water supply for the building is guaranteed by bore well and open water supply line. All the essential requirements for a building are taken into record and are given. The construction work is properly supervised adhering to all the safety measures, rules and regulations.

The building is constructed in such a way that it provides the occupants a great pleasure and no inconvenience.

REFERENCES

[1] SP : 34 – 1987, "Handbook on Concrete Reinforcement and Detailing", BIS, New Delhi.
[2] IS : 1893 (Part – 1) – 2002, "Criteria for Earthquake Resistant Design of Structures", BIS, New Delhi.
[3] Banglong Fu, Zengda Zou,Yuqi Zhang, Guoliang Qin,Xiangmeng Meng, (2014),"High speed TIG-MAG hybrid arc welding of mild steel plate", Journal of Materials Processing Technology, Vol.214,pp.2417-2424, 2014.
[4] Cemal Meran,"Prediction of optimized welding parameters for joined brass plates using genetic algorithm"(2014),Materials and Design, Vol.27,pp.356-363.
[5] M.A.Fathima, M.Gnana Soundarya, M.L.Jothi Alphonsa Sundari, B.Gayathri, Praghash.K., Christo Ananth, "Fully Automatic Vehicle For Multipurpose Applications", International Journal of Advanced Research in Biology, Ecology, Science and Technology (IJARBEST), Vol 1,Special Issue 2,November 2015, pp: 8- 12.
[6]M.A.Fathima, M.Gnana Soundarya, M.L.Jothi Alphonsa Sundari, B.Gayathri, Praghash.K., Christo Ananth, "Fully Automatic Vehicle For Multipurpose Applications", International Journal of Advanced Research in Biology, Ecology, Science and Technology (IJARBEST), Vol 1,Special Issue 2,November 2015, pp: 8- 12.
[7]Ericson M and Sandstrom R,"Influence of welding speed of friction stir welds and comparison with MIG and TIG"(2012),Internation Journal of Fatigue, Vol.25,pp.1379-1387.