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STEP BY STEP APPROACH TO BUILDING CONSTRUCTION

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Abstract— It was observed that Changes in plan of residential individual building were more frequently observed due to the changing needs of the consumer, so the structure had to be designed only after getting final approval from consumer. Analysis and design of slab was not easily possible by using STAAD – Pro as there were computational errors made by the software. For residential apartments, detailed cost estimate must be provided considering the future cost inflation (i.e. cost inflation during construction period) of construction materials used. Reinforcement are usually provided with 8mm, 12mm and 16mm dia bars, due to ease of availability in market. For residential apartments, M20 and M25 grade of concrete are usually used. In the Proposed system, 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—STAAD, M20, M25 Concrete Grade

I. INTRODUCTION

Steel reinforcing bars shall be of mild steel or deformed steel of standard specifications and shall be free from corrosion. The steel bar shall be round, and capable of being bent accurately and placed in position as per design and drawing and bound together tight with 20 S.W.G. anneled steel wire at their point of intersection

Centering and shuttering shall be made with timber or steel plate close and tight to prevent leakage or mortar with necessary props, bracing and wedges, sufficiently strong and stable and should not yield on laying concrete and made in such a way that they can be stacked and removed gradually without disturbing the concrete

PROPORTION OF CEMENT CONCRETE: - Cement concrete shall be 1:11/2:3 proportions by volume for slabs, beams and lintels and 1:11/2:3 proportion for columns.

MATERIAL FOR CONCRETE: - Cement, sand and coarse aggregate shall be same as for cement concrete.

MIXING: - Mixing shall be done in clean water, masonry plot form of sufficient size bricks, Ballast shall be starched in a rectangular layer of uniform thickness usually 30 cm (12").

LAYING: - Before laying the concrete, he shuttering shall be clean free from dust and other foreign matters. The concrete shall be deposited (not dropped) in its final position. If case of columns and usually it is desirable to place concrete in full height if practical so as to avoid construction joints but the progress of concreting in the vertical direction shall be restricted to one meter per hour. Care should be taken that the time between mixing and placing of concrete shall not exceed 20 minutes so that the initial setting process is not interfered with.

COMPACTING: - Concrete shall be compacted by mechanical vibrating machine until a dense concrete is obtained. The vibration shall continue during the entire period of placing concrete.

II. FINISHING WORKS

Plastering all ceiling and R.C.C works in c.m 1:3
Plastering inside and outside walls in c.m 1:5

BRICKS: - All brick shall be first class of standard specification made of good brick earth through burnt. Brick shall be regular in a shape and shall be free from cracks. Flaw and lumping of any kind bricks shall not absorb water more then one sixth by compressing in water. Bricks shall have a min crushing strength of 105kg.per sum

MORTAR: - Mortar shall be specified and material of mortar shall be of standard specification. Sand shall be Clean and free from organic matter

SOAKING OF BRICKS : - Brick shall be fully soaked in clean water by submerging in a tank for a period of 12hours immediately before use. Soaking shall be continued till air bubbling.

LAYING : - Bricks shall be well laid unless otherwise specified.vertical joint of conservative coarse shall be not came directly over come one another vertical joints in alternate coarse shall came directly over one another . No damaged or broken bricks shall used

CURING: - The brickwork shall be kept wet for a period of at least 10 days after laying. The top of walls shall be flooded with water by matter small weak mortar edging to contain at least 2-5 deep.

SCAFFOLDING: - Necessary and suitable scaffolding shall be sound and sports and member

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sufficiently strong so as to withstand. Allloads likely to come upon them.

A. JOINERY WORKS

a) Entrance door:
Entrance door with 5"x3" Teak wood frame, 5"x1½"Teakwood shutters with 1" teak wood plank as per the selected design with necessary brass hinges, ultra vertiboltgodrej lock, Brass tower bolt, magnetic catch or door stopper with magic eyes.

b) Other doors:
For Remaining inside doors 4"x x2½ T.W frames with moulded skin door shutter.
With glide c.p 2 lever lock, S.S hinges, P.C tower bolt, stopper etc.

c) Windows:
For window 4"x 2½ T.w frame with 3"x1½" T.W single leaf shutter or 4mm-pinhead, 4" SS hinges, 4" handle, 8" stay etc complete or Captive make UPVC window.

d) Ventilators:
4"x 2½ T.W frame ventilator with adjustable louver with pinhead glass arrangement

B. FLOORING

Flooring & Tiles works:
a) For Toilet walls 10"x16" or 12"x18" sizes dado 7' height with simple design & Flooring with 10"x10" or 12"x12" size ceramic anti skid tile. Basic cost 70/sft.
b) Room flooring using 2'x2' vitrified tile with 4" skirting.
Basic cost of Tile 70/sft.
c) Car-Parking area flooring – Ultra tile floor.
Kitchen works: Counter Top 20mm tk black granite slab with half round nosing, 40" x 20" SS sink, with drain board 1no, 10" x 13" size glazed tile dado 2'-0" above plat form.

C. ELECTRICAL:

Electrical works:
Electrical points up to point level with total number of 110 points per floor using Multicore Finolex wire. Modular switch, Automatic phase change over switch &braker arrangement. Including wiring for inverter, (Excluding Electrical fittings & MES main Connection / Panel board & cable work).

WATER & DRAINAGE WORKS

Water supply and sanitary arrangements:
Concealed ¾ C-PVC pipelines with ISI brand fittings for toilet inside, outside with 1" & 1¼ U- PVC open line with fittings. Parryware/Hindware make wall mounting closetwith flush valve, Washbasin for each toilet, Jaguarcontinental range fittings. Outside soil line with 4" □ PVC pipe, 2½"□ PVC pipe for waste line and 4" PVC pipe for drainage works with necessary concrete manhole chamber 2'x2'.

D.STAIRCASE:

R.C.C waist slab, m.s Balusters & T.W railing for internal stairs, steps using 1'x1' Vitrified tile.

E.WEATHERING COURSE: With Brick jelly lime concrete over one course of flat pressed tiles laid in c.m 1:4

PAINTING WORKS:

- Ceiling and inside wall with premium emulsion 2 coats over 2 coats of cement based wall Patti & one coat of primer.
- Outside wall with Ace exterior emulsion 2 coats over one coat of primer.
- Enamel paint for doors, windows and grill 2 coats over one coat of primer & paint.
- Varnishing of Entrance door.

F. OTHER MISCELLEANEOUS WORKS:

M.S GRILL:
20mm x 6mm flat section for window grills or suitable 12mm square rods with simple design inserted into the windows.

PEST CONTROL TREATMENT:
Pest Control Treatment will be given all round the building in 3 stages- Foundation / basement & outside all-round after completion of work.

PAINTING WORKS:

- Ceiling and inside wall with premium emulsion 2 coats over 2 coats of cement based wall Patti & one coat of primer.
- Outside wall with Ace exterior emulsion 2 coats over one coat of primer.
- Enamel paint for doors, windows and grill 2 coats over one coat of primer & paint. Varnishing of Entrance door.
- Christo Ananth et al. [5]-[6] 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.

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III. STEP BY STEP APPROACH

By: R.MANIVANNAN, M.E	RM Engineering Consultants				Project :	
Date:10/07/15						
Chd.RBR					**Subject: SLAB S3**	
			Dept: structural engineering			

TWO WAY SLAB DESIGN

			lg. Span (L_y)	sh. Span(L_x)	
Panal size		=	5.68	3.46	
	f_{ck}	=	25	N/mm²	
	f_y	=	415	N/mm²	
EDGE COND.	2	ONE SHORT EDGE DISCONT.			
	L_y/L_x	=	1.65		
(Assume D=		=	125	mm	
Dead load of the slab		=	D*25 =	3.13	Kn/m²
	Floor finishes	=		3.00	Kn/m²
	Live load	=		1.50	Kn/m²
	Total load (w)	=		7.63	Kn/m²

α_x(-ve) = 0.0612
α_x(+ve) = 0.0464
α_y(-ve) = 0.0370
α_y(+ve) = 0.0280

The Factored Moments are			Moment in KNm	At in m²	δ tor mm c/c	10 tor mm c/c	12 tor mm c/c
M_x(-ve) =	α_x(-ve) *w*l_x^2*1.5	=	8.38	239	210	328	473
M_x(+ve) =	α_x(+ve) *w*l_x^2*1.5	=	6.35	180	280	437	630
M_y(-ve) =	α_y(-ve) *w*l_x^2*1.5	=	5.07	155	324	506	728
M_y(+ve) =	α_y(+ve) *w*l_x^2*1.5	=	3.83	117	431	673	969

d_{req} = SQRT((M_u*10⁶)/(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*	Area of c/s of steel required / Area of c/s of steel provided	=	258	N/mm²
Basic span/eff depth ratio for continuous slabs		=	31	
Modification factor		=	1.62	
Coefficient for max ratio of span/eff depth		=	50	
Effective Depth required		=	69	< 101 mm

SAFE

G.BEAM DESIGN

DATA PROVIDED:
Span=3m
Width of support=380mm
Service load=5kN/m
M25, Fe415
B=230, d=330
Effective span=clear span+ effective depth
=3+0.33=3.33m
Centre to centre supports=3.33+0.38=3.71m
Loads:-
Self wt=0.23*0.33*25=1.90kN/m
Live load =2kN/m
=3.9*1.5=5.85kN/m
Moment and shear force:
$Mu=0.125Wu\ l^2=0.125*5.85*3.71^2=10.06$kN.m

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Vu=0.5wul=0.5*5.85*3.71=19.20kN
Tension reinforcement:-
Mu,lim=0.138fckbd^2
=0.138*25*380*330^2*10^{-6}kNm
Mu<Mu,lim under reinforced

Mu=0.87*fy*Ast*d [1-Ast fy /bdfck]
10.06*10^6=0.87*415*Ast*330[1-Ast415/230*330*25]
10.06*10^6=119.15*10^3 Ast-310.48*10^3 Ast^2
Ast=383.68mm^2
Provide 2 Nos of 12mm dia bar
1 No of 12mm dia bar
Fsc={0.0035(158-50)/158}2*10^5 =478.48N/mm^2
Asc=132.71*10^6 /361(330-50)=1308mm^2
Fsc ≥ 0.87fy
478 ≥ 361
Check For Shear Stress:-
V = 19.20kN
τ_v =vu/ bd =19.20*10^3 /(230*330)= 0.25N/mm^2
P_t = 100 Ast/bd=100*383/230*330=0.504
Refer table19 of IS456-2000
τ_c = 0.49N/mm^2
Since $\tau_v > \tau_c$ shear reinforcements are required
Check for deflection:-
P_t=0.504
$(L/d)_{max}$ =$(L/d)_{basic}$*k_t*k_c*k_f=23*1.1*1*1=25.3
$(L/d)_{actual}$ =3000/330=9.09
$(L/d)_{max} > (L/d)_{actual}$ (hence safe)

Fig.1. Beam – Column – Beam Connection

IV. CONCLUSION

It was observed that Changes in plan of residential individual building were more frequently observed due to the changing needs of the consumer, so the structure had to be designed only after getting final approval from consumer. Analysis and design of slab was not easily possible by using STAAD – Pro as there were computational errors made by the software. For residential apartments, detailed cost estimate must be provided considering the future cost inflation (i.e. cost inflation during construction period) of construction materials used. Reinforcement are usually provided with 8mm, 12mm and 16mm dia bars, due to ease of availability in market. For residential apartments, M20 and M25 grade of concrete are usually used. In the Proposed system, 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.

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