MULTISTOREYED CAR PARK

PROJECT REPORT

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF ENGINEERING IN CIVIL ENGINEERING OF THE BHARATHIYAR UNIVERSITY, COIMBATORE-46

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1989-90

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Certificate

This is to certify that the Report entitled

MULTISTOREYED CAR PARK

has been submitted by

Mr ______________________

in partial fulfilment for the award of Bachelor of Engineering in the Civil Engineering Branch of the Bharathiyar University, Coimbatore-641 046 during the academicyear 1989-90

Guide

Head of the Dept.

Certified that the candidate was examined by us in the Project Work Viva-Voce Examination held on ______________ and the University Register Number was ______________

Internal Examiner

External Examiner

ACKNOWLEDGEMENT

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1 SYNOPSIS

This project work consists of planning, analysis and design, including the preparation of general drawings and Structural drwaing of a typical multi Storeyed car park. The detailed estimate of quantities and abstract of the cost involved has also been prepared.

The design of main structural frame has been carried out by using working stress method.

Ground Floor :-

The height of Ground Floor is 3·om. sufficient space is provided to park about 200 two wheelers, in the Ground floor. Two wheellers are parked in parallel. A seperate ramp is provided about 5m width and length 60m is provided for the cars to travel from Ground floor to other floors.

Area of ground floor = 30 X 30m^2.

I, II, III Floors :-

The height of each floor is 3.0m sufficient space is provided is each floor to park about 30 cars in each floor. Cars are parked in Parallel. A separate ramp is provided for car to travel from one floor to another. The width of ramp is 5m and for 'U' turn, 7.0m width is provided and length 60m. The ramp is provided for one way trafic. The size of each parking stall is 2.5m x 5.0m. The width of trafic lane is 5.0m.

Area of Ist Floor
IInd Floor = $30 \times 30\ m^2$.
IIIrd Floor

Lift room :-

Lift is provided on two ends of two corners. It has a dimension of 4.5m x 2.8m.

Toilets :-

A separate Toilet facilities for both men and women is provided at Ground Floor. The size of each toilet is 1.25 x 1m. The size of Ladies toilet is 1.25 x 1m floor.

Ramp :-

The width of ramp is 5m and length of ramp is 60m. The ramp is provided for one way trafic. The size of each parking stall is 2.5m x 5.0m. The width of the traffic lane is 5.0m. A kerb distance of about 0.6m to provided, to enable the passengers to be to rear side of the vehicle.

Electrical Duct :-

A separate vertical Electrical duct is provided to carry all electrical main lines.

Sufficient lighting arrangement are provide in the floors and use stand by power generator.

Details and Specifications of standards has been collected from National Building code.

The necessary architectural drawings and Structural drawings and also prepared and given in respective chapter.

Estimated Cost :-

The total cost of the project is Rs. 75,00,000.

2. GENERAL REPORT

NECESSITY OF THIS PROJECT:-

Manchester of South India, Cotton City - The city of above said glories is COIMBATORE CITY which is one of the Metropolitan Cities in Tamil Nadu, having population of about 12 lakhs. The population grows rapidly because of it's Industrial and other resources. The city is situated on NH-47 - MADRAS COCHIN HIGHWAY. The city is in its dynamic state of growth and it is expecting strides in Industrial Development. The city has been bringing a worthy amount of Foreign Exchange by it's exports of Textile Machineries, Motors, Pumps, Banians, Garments, Handloom Products, etc. The city has the highest standard of living and plays a very significant role in developing economy of the country and the state.

The city is located at the foots of famous hill resort Udhagamandalam which well known as Queen of Hills, one of the important tourist centre in India. The famous temple Maruthamalai and Patteswarar Temple at Perur are situated on the outskirts of the city.

NEED FOR MULTI STOREYED PARKING:-

Good communication system connecting Coimbatore City with other parts of the country by rail, road and air are also available in addition to Telex and other postal services. The above factors implies fact that the city has gathered the status of tourism importance as well as pilgrimage momentous centre. Hence, tourist and Business people are attracted from all over India.

The factors discussed above signifies the inflow of Industrialists to the city. Hence we can see most shopping centres & Industrial establishment are more, the space required for parking of vehicles of these owners and workers are increased considerably. Hence most cars and two wheelers are parked in roadsides of town hall causing very much inconvenience to the traffic and the public. The much feature of this project is a multi level car parking to park about 150 cars at 3 floors and 250 two wheelers in ground floor. The reasons for taking this project is as follows.

One of the important problems created by road traffic is parking. Not only do vehicles, street space to move about, but also requires street space to park, where the occupants can be loaded and unloaded. It is roughly estimated that out of 8,760 Hours in a year the car run on are average when it is parked.

Every car owner would wish to park the car as closely as possible to minimise the walking distance. This results in a great demand for parking space in that area where the activities are concentrated with the growing population of motor vehicles. The problem of parking has taken serious prepositions.

Hence we decided to construct a parking lot to park these vehicles. Again the selected multistoreyed parking complex as a best one when compared to construct parking due to following reasons.

ILL EFFECTS OF STREET PARKING:-

One of the serious ill effects is the loss of street space and attendant traffic congestion. The capacity of the street is reduced, the journey speed drops down, and the journey time and delay increases. The operational costs of vehicles are thereby increased causing serious economic loss to the community.

ACCIDENTS:-

The manoeuver associated with parking and unparking are known to cause road accidents. Careless opening of doors of a parked vehicles moving out of a parked position and bringing a car to the parking location

location from the main stream of traffic are some of the common causes of parking accidents.

OBSTRUCTION TO FIRE FIGHTING OPERATIONS:-

Parked cars obstruct the movement of fire fighting vehicle and greatly impede thin operations. They block access to hydrants and access to Buildings.

ENVIRONMENT:-

Parked vehicle disgrade the environment of the city centre. Stoppings and starting of vehicles results in noise and fumes. Cars and vehicles parked into every little available space debase the visual aesthetics and building seems to rise from plinth of cars.

The above are only a flow of the ill effects of street parking we have discussed. In view of the above we have decided that multistoreyed parking complex is far superior than street parking.

3. SPECIFICATIONS

For deciding the size of car parking stall and for design purposes the size of cars, weight, Turning radius, etc were required. For that the specifications of various cars available in India are collected from the dealers. The size of parking stalls, turning radius, etc have been provided as per the specifications. The specifications of various cars are listed here.

DIMENSIONS OF MARUTI 800 CAR

OVERALL LENGTH	-	3300 mm.
OVERALL HEIGHT	-	1410 mm.
OVERALL WIDTH	-	1405 mm.
WHEEL BASE	-	175 mm.
TREAD : FRONT	-	1200 mm.
REAR		
GROUND CLEARANCE	-	170 mm.

WEIGHT:-

CURB WEIGHT	-	620 kg.
GROSS AXLE WEIGHT		
RATING : FRONT	-	480 kg.
REAR	-	500 kg.
GROSS VEHICLE WEIGHT RATING	-	980 kg.
TURNING RADIUS	-	4.4 m

PREMIER PADMINI CAR DIMENSIONS.

FRONT TRACK	-	660 mm.
REAR TRACK	-	930 mm.
TURNING CIRCLE	-	10.50 m.
TOE IN	-	4 mm.
OVERALL LENGTH	-	3930 mm.
OVERALL WIDTH	-	1460 mm.
OVERALL HEIGHT	-	1468 mm.
GROUND CLEARANCE	-	132 mm.
UNLADDEN WEIGHT	-	920 kg.
KERB WEIGHT	-	895 kg.
REAR CAMPER CASTER	-	1.95 kg/m^2

AMBASSADOR CAR DIMENSIONS.

TRACK FRONT	-	1359 mm.
TRACK REAR	-	1346 mm.
TURNING CIRCLE RADIUS		
R. H. LOCK	-	10.83 m.
L. H. LOCK	-	10.74 m.
TOE IN	-	2.4 mm
OVERALL LENGTH	-	4312 mm.
OVERALL WIDTH	-	1676 mm.
OVERALL HEIGHT	-	1600 mm
GROUND CLEARANCE	-	159 mm.
UNLADDEN WEIGHT	-	1165 kg.
KERB WEIGHT	-	1116 kg.

CONTESSA CAR

FRONT TRACK	-	958 mm.
REAR TRACK	-	953 mm.
LENGTH	-	4571 mm.
WIDTH	-	1699 mm.
HEIGHT	-	1374 mm.
KERB WEIGHT	-	1138 kg.
GROSS WEIGHT	-	1588 kg.
GROUND CLEARANCE	-	159 mm.

PLANNING

INTRODUCTION:-

Planning is an art of an arrangement of the building components required into a best way so that it satisfies the all convenients and appearance. Appearance is an attractive manner and the secondary item is consideration of convenience in relation to components of the building such as school/college building, office buildings, workship buildings, car parking, Bank buildings are common. Each type of multistoreyed building plan should get through well in planning with corresponding requirements. At the same time the cost of the buildingis limited.

GENERAL CONSIDERATION IN PLANNING:

The selection of site plays a main role in planning. For our project namely the multi storeyed car parking the site available is near the Big - Bazzar Street in Townhall. The existing retail marketing is going to be shifted and in that place this structure has been proposed to construct.

The above site comes under sectioned town planning scheme.

ORIENTATION OF THE BUILDING:-

The placing of building with respect to the geographical direction (east, west, north and south) the direction of wind, the altitude and arimuth of sun is known as orientation of building. It is placed in such a way that it attains maximum benefit from the nature and at the same time it satisfies the architectural requirements.

REQUIREMENTS OF A MULTISTOREY PARKING:-

Surface parks consume too much of the precious land in the heart of the city and are not therefore always feasible. One of the alternatives when land is costly is to provide multistorey car parks. Such facilities have become common and popular in many cities.

Multistorey car parks are designed for a capacity of about 300 to 400 cars. Larger capacity tends to increase the time for unparking a car. About five floors is also the upper limit for the same reason.

Some of the desirable standards requirements of a multistorey car parks are.

i) Gradient of Ramp : 1 in 10 generally and 1 in 8 for very short ramp.

ii) Clear height between floors : 2.1 (min.)

iii) Parking Stall Dimension : 2.5m x 5.0m.

iv) Inside Radius of Curve : 7 m.

v) Width of Traffic Lane on Ramps and Entrances : 3.75 m.

vi) Gradient of Slopping Floors : Not steeper than 1 in 20.

vii) Loading Standards : 7 KN /m^2.

The arrangement of floors and the access ramp needs careful through and large number of a alternatives are available. Ramps are preferably one way.

The car parking floors, the ramps the entrance and the exits should be well lighted. If the garage is without external walks as is often the case, there is no need for artificial means for ventilation. Otherwise mechanical ventilators should be provided.

The operation of the multistorey car parks can be with customer parking or attendant parking or combination of the two.

SALIENT FEATURS OF OUR PROJECT PLANNING:-

Our project consists of several salient features. A few are listed below.

GROUND FLOOR:-

Ground floor is meant for parking two wheelers like scooters, motor cycle etc. About 200 two wheelers can be parked in side Ground Floor.

The height of Ground Floor is 3 m. In the ground floor two office rooms are provided in the size of 5 x 5 m. One room is for the persons who are regulating the traffic inside the complex. Eight toilets of size 1.25 x 1.0 m are provided separately for ladies and gents in the Ground Floor. A Power Room is also provided in the ground floor for Electrical Power Control of the Building and to keep a Electric Power Generator to carry lifts for light in case of power failure.

I, II, III FLOORS:-

The height of each floor is 3.0 m sufficient space is provided in each floor to park about 35 cars in each floor. Cars are parked in parallel. A separate Ramp is provided in each floor to enable the cars to travel from one floor to another.

Lift Room:-

Lift is provided on two ends of the structure in each floor. It has a dimension of 4.5m x 2.8m. It is having a capacity of 8 members. The car speed is 0.75 km/sec to 1.5 km/sec solid sliding doors are used for loading method of control is car switch control. The car door is of a solid sliding door with automatic closing and opening devices. In any case power failures generator used so that lift is provided at corner.

Toilet:-

A separate toilet facilities for both men and women is provided in the ground floor. The size of the Ladies and gents toilet is 1.25 x 1m. More than that urinals and wash basins are provided. Above wash basins provide a mirror.

Facts about Multi Storeyed Building:

When the number of stories of any building are more, load bearing structure becomes heavy and hence uneconomical. Instead of this conventional type reinforced concrete Skelteral Structure enclosed by this walls of brick or any other material will be much cheaper.

Multistorey framed building consists of a multistorey net work of beams and columns which are built monolithically and rigidly with each other at their function. All members of such a frame are continous at their ends. Beside this reduction due to continuity of such structure they tend to distribute the load more uniformly and eliminate to excessive effects of localised loads. The effects of horizontal load such as wind and Earth quakes are spread over the structure as a whole increasing is safety considerably.

In the fields of housing and civil construction like residential building, office buildings, car parking public buildings, hospitals and hotel etc are built as multistorey frame building. Steel as well as concrete are used exclusively for the construction of building frames. It has become necessary for all civil Engineering Students to be familar with the planning, analysis, design and estimate of multistorey framed Structure.

Hence it is proposed to choose a problem of multistorey framed structure as the project work.

4.1 DESIGN OF SLAB AND RAMP

DIMENSIONS

Overall width of the bridge= 5.0 + 0.6 + 0.6 +

= 6.2 m.

Width of kerb is taken as 0.6 m.

Assume thickness of slab = 400 mm.

Allowing effective cover = 30mm.

Effective spon = 5 + deff.

Effective Depth deff = 400 - 30 = 370 mm.

Effective Span = 5+0.370 = 5.37 m.

OVERALL WIDTH OF BRIDGE = 6.2 m.

EFFECTIVE SPAN OF BRIDGE = 5.37 m.

B.M. CALCULATION:-

a) Dead Loads

Weight of wearing coat = 6.2 x 230 N/m^3 = 1426 N/m^2.

Weight of Slab = 0.4 x 250 N/m^3 = 100 N/m^2.

Total D.L = 1526 N/m^2

B.M. due to D.L. for 1m = $\frac{1526x(5.37)^2x1}{8}$ = 5500.64 N-m

= 5.5 kn - m

= 5.5 x 10^6 N - nm.

b) Live Load :-

Since the clear width of the Road way is 6.2 m provision can be made for two lanes.

Clear distance 'g' between two taxis

$$g = 0.4 \text{ m.}$$

For clear width of Road way 5 m.

Min clearance f between the outer edge of the wheel and the road way face of the kerb = 150 mm = 0.15 m.

GROUND CONTACT AREA:-

Width of contact area = 380 mm = 0.38 m = W

Length of contact area = 200 mm = 0.2 m = B

Distance between centres of wheels of two trains = w + g

= 0.38 + 0.4

= 0.78 m.

Distance between Roadway face of kerb and centre of wheels $= 0.15 + \frac{0.2}{2} = 0.3\text{m.}$

For the max. B.M condition Heavy loads namely axle loads of 68 kn will be placed symettrically with respect to the span.

For this position of heavy axle loads, the other wheel loads are of f the span.

$$\text{Impact factor} = \frac{4.5}{6.0 + L} = \frac{4.5}{6+5.37} = 0.4$$

DISTRIBUTAION OF CONCENTRATED LOAD ON THE SLAB:-

For a single concentrated load eff width shall be taken $e = kx\left(1-\frac{x}{l}\right) + N.$

Where l = effective span = 5.37 m.

x = distance of load from near support = 2.085 m

k = constant depending on the ratio $\frac{l^1}{l}$

l^1 = width of slab = 6.2 m.

l = 5.37

$$\frac{l^1}{l} = \frac{6.2}{5.37} = 1.15$$

k = 2.62

W = Breadth of concentration area

= Width of tyre + 2 x thickness of wearing coat.

= 0.5 + 2 x 0.08 = 0.66 m.

$$\text{effective width } e = kx\left[1 - \frac{x}{l}\right] + w$$

$$= 2.62 \times 2.085 \left[1 - \frac{2.085}{5.37}\right] + 0.66$$

$$= 4.00 \text{ m}$$

This means the effective width of the heavy loads will over lap.

Effective width of all heavy loads

$$= 0.6 + 0.3 + 1.8 + \text{to } .32 \text{ to } 0.6 \text{ m}$$

$$= \underline{6.2 \text{ m}}.$$

Load to be considered per m width $= \frac{2 \times 6.8}{6.2}$

$= 21.94$ KN.

DISPERSION OF LOAD ALONG THE SPAN:-

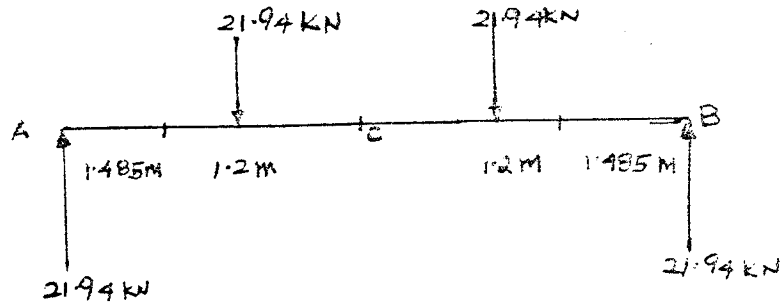
Effective length of slab on which the wheel load acts shall be taken as equal to the dimension of the tyre contact area over the wearing surface of the span plus twice the overall depth of the slab inclusive of the thickness of wearing surface.

Effective length on which wheel load is appear $= 0.25 + 2\ (0.4 + 0.08) = 1.21$ m..

But distance between for Class A loading $= 1.2$ m.

The effective length of dispension is almost equal to wheel space.

The loading for a one metre wide strip is therefore taken as shown in fig.



Max. B.M will occur when both the trains are at the centre.

Max B.M will occur at Centre Point 'C'

$$\text{Max B.M} = 21.94 \times \frac{5.32}{2} - 21.94 \times 0.6$$

B.M due to impact = 0.4x45.75 = 18.30 Kn-m.

= 18.30×10^6 N - nm.

Total B.M per metre width = 5.5 + 45.75 + 18.3

= 69.55 KN - m.

For M_{20} concrete $\sigma cbc = 7.0 \ N/nm^2$

Fe415 Steel $\sigma st = 230 \ N/nm^2$.

Therefore K = 0.29

J = 0.9

Q = 0.91

P = 0.44

Equating M.R. to max B.M

Qbd^2 = M.R.

$$0.91 \times 1000 \times d^2 = 69.55 \times 10^6$$

$$d = \sqrt{\frac{69.55 \times 10^6}{0.91 \times 1000}}$$

$$= 276 \text{ m}$$

provide D = 305 mm.

Effective depth = 305 - 25 - 9 = 271 mm.

25 mm clear cover and 18 mm bars are provided.

$$\text{Area of Stee Ast} = \frac{BM}{\sigma st. \ j.d.} = \frac{69.55 \times 10^6}{230 \times 0.9 \times 271}$$

$$= 1239.82 \text{ mm}^2$$

$$\text{spacing for 18 mm bars} = \frac{/4 \times (20)^2 \times 100°}{1239.82 \text{ mm}^2.}$$

$$= 205.25 \text{ mm.}$$

provide 20 mm bars @ 200 mm spacing c/c.

CHECK OF SPACING:-

The horizontal distance between the parallel main reinf shall not be more than 3 x deff or 450 mm. which is smaller.

3 x 271 = 813 mm or 415 mm

200 mm 813 mm

450 mm

Provide 20mm bars a. Spacing 200mm C/c.

DISTRIBUTION STEEL :

B.M. for distribution steel = [45.1+18.04] +41.2

= 69.55 KN - m.

$$\text{Use 20mm bars, Ast} = \frac{69.55 \times 106}{230 \times 0.9 \times 271} = 1239.82 mm^2$$

$$\text{Spacing} = \frac{\pi/4(20)^2}{1239.82} \times 1000 = 205.25mm$$

= 200mm C/c

check for spacing:-

200mm 5 X d = 1335mm

450 mm.

Provide 20 mm bars a. 200 mm C/c. Spacing.

SHEAR:-

Max Shear will occur when loads are near the support.

Effective width of slab for load hear the support

$$e = Kx \left[1 - \frac{x}{X} \right] + W$$

k = Constant = 2.62.

x = Distance of load from hear the support

= 0.6m.

W = Breath of concentration area.

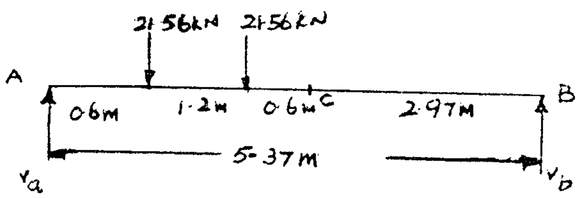
$$e = 2.62 \times 0.6 \left[1 - \frac{0.6}{5.37} \right] + 0.66 = 2.056.$$

Now also the effective width will overlap when both trains are present the effective width $= 0.6+0.3+1.8+0.78+1.8+ \dfrac{2.056}{2}$

$= 6.308m.$

Load to be consider per in width $= \dfrac{2 \times 68.01}{6.308}$

$= 21.56$ KN.



Effective width of slab for second load.

$$e = Kx \left[1 - \frac{x}{e}\right] + W$$

$$= 2.62 \times 0.6 \left[1 - \frac{1.8}{5.37}\right] + 0.66$$

$$= 3.79$$

Effective width when both trains are present

$= 6.2m.$

Load to be consider permeter width $= \dfrac{2 \times 68}{6.2}$

$= 21.94$ KN.

Shear force $= \dfrac{21.56 \times 3.57 + 21.94 \times 4.77}{5.37} = 33.82$KN

S.F due to L.L	=	33.82 KN
S.F. due to impact (33.82 X 0.4)	=	15.53 KN
S.F. due to Dead load $(1.53 \times \frac{5.37}{2})$	=	4.11 KN
Max S.F.		51.46 KN

CHECK FOR SHEAR :

$$\text{Normal Shear Stress} = q = \frac{V}{bd} = \frac{51.46 \times 10^3}{1000 \times 271}$$

$$= 0.19 \ N|mm^2$$

$$\frac{100\ Ast}{bd} = \frac{100 \times 5 \times /4\ (20)^2}{1000 \times 271} = 0.47$$

$$\tau_c = 0.22 + \frac{0.47 - 0.22}{0.25} \times (0.5 - 0.48)$$

$$= 0.24 \ N|mm^2$$

for 366 mm K = 1

$K \ \tau_c = 0.24$

$\tau_v < \tau_c < K\tau_c$

MIN SHEAR REINFORCEMENT:-

$$Sv = \frac{Asv \times sv}{0.45}$$

Assume 4 legged Stirrups and 6 mm bars

$$= Sv = \frac{4x \quad \pi/4 \quad (6)^2 x250}{0.4 \times 1000} = 70.7 \text{ mm}$$

65mm

CHECK:-

Sv = 65 mm 0.75 d = 275 mm

Hence O. K.

Provide 4 legged 6 mm bars @ 65mm c/c.

4.2 ANALYSIS OF FRAMES

INTRODUCTION:-

Analysis of frames can be carried out by elastic and working load analysis. Elastic analysis namely moment distribution method is used for the analysis by taking little portion of the frame called SUBSTITUTING FRAME the moments can be calculated.

The analysis is carried out by the following steps:

(i) Preliminary dimension of beams.

(ii) Preliminary dimension of columns.

(iii) Design moments for beams and columns by moment distribution method using substitute frame method.

To carry out the analysis of frame, the dimension of beams and columns are required, so that M.I,stiffness and distribution factors are calculated. So it is necessary to determine the size of the member first in analysis.

LOADS:-

Dead Load:-

self weight of slab = 95.3 kn.

Wearing coat = 50 kn.

Self weight of slab = 24.4 kn.

Total Dead Lead = 169.71 kn

Live Load:-

Live Load = 187.5 kn.

Total load on Beam = 187.5 + 169.71 = 357.21 kn.

DISTRIBUTAION FACTOR:-

COLUMN:-

Size = 400 x 400 mm.

$I = 1/12\ bd^3$

$= 1/12 \times 400 \times 400^3$

$= 2.133 \times 10^{10}\ mm^4$

$D.F = \frac{4EI}{l} = \frac{4xEx2.133x10^{10}}{3000} 2.84 \times 10^6$

BEAM:-

Size = 650 x 300 mm.

$I = 1/12\ bd^3$

$= 1/12 \times 400 \times 400^3$

$= 2.133 \times 10^{10}\ mm^4$

$D.F = \frac{4EI}{l} = \frac{4x\ E \times 2.133 \times 10^{10}}{5000} = 17.44 \times 10^6$

D.F for intermediate column $= \frac{2.84 \times 10}{2\ (2.84x10^6+17.44x10^6)}$

$= 0.07$

D.F for Beam = $\dfrac{17.44 \times 10^6}{2(2.84\times10^6 + 17.44\times10^6)}$

= 0.43

D.F for Corner Column = $\dfrac{2.84 \times 10^6}{2\times2.84\times10^6 + 17.44\times10^6}$

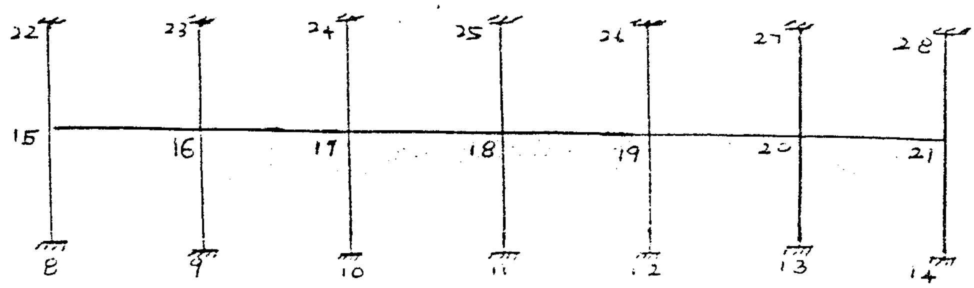
= 0.123

D.F for Corner Beam = $\dfrac{17.44 \times 10^6}{2 \times 2.84 \times 10^6 + 17.44 \times 10^6}$

= 0.75

Span	Dead load F.E.M. (kn-m)	Total Load F.E.M (kn - m)
15,16	$\frac{WL}{12} = \frac{169.71 \times 5}{12}$ = 70.71	$\frac{WL}{12} = \frac{357.12 \times 5}{12}$ = 148.8
16,17	70.71	148.8
17,18	70.71	148.8
18,19	70.71	148.8
19,20	70.71	148.8
20,21	70.71	148.8

To find the Max - vc B.M at Joints:-



JOINT 15 :-

JOINT	15	16	
MEMBER	15,16	16,15	16,17
D.F	0.754	0.43	0.43
1. D.L.F.E.M			-70.71
2. T.L.F.E.M	-148.8	148.8	
3. Distribute and C/o	-16.79		
4. Add (2) and (3)	-132.01		
5. Distribute	66.005		
6. Total Moments (4 + 5)	-66.005		

JOINT 16 :-

JOINT	15	16		17	
MEMBER	15,16	16,15	16,17	17,16	17,18
D.F	0.753	0.43	0.43	0.43	0.43
1.D.L.F.E.M					-70.71
2.D.L.F.E.M	-148.8	148.8	-148.8	148.8	
3.Distributive and C/o		56.02	-16.79		
4. Add (2) and (3)		204.82	-165.59		
5. Distributive		-16.87	-16.87		
6. Total (4+5)		187.95	-182.46		

JOINT 17 :-

JOINT	15	16		17		18	
MEMBER	15,16	16,15		16,17	17,18	18,17	18,19
D.F	0.753	0.43	0.43	0.43	0.43	0.43	0.43
1.D.L.F.E.M	-70.71	70.71					-70.71
2.T.L.F.E.M			-148.8	148.8	-148.8	148.8	
3.Distribute and carry over							
4.Add(2) and (3)				165.9	-165.9		
5.Distribute				-	-		
6.Total Sum (4+5)				165.59	-165.59		

To find the +ve B.M at mild span:-

Mild span of 15,16

JOINT	15	16		17	
MEMBER	15,16	16,15	16,17	17,16	17,18
D.F	0.753	0.43	0.43	0.43	0.43
1.D.L.F.E.M			-70.71	70.71	
2.T.L.F.E.M	-148.8	148.8			-148.8
3.Distribute	112.05	-33.58		33.58	
4.Carryover	12.64	-31.31			
Total	-40.9	139.94			

Positive B.M at mid span

$$= \frac{wl^2}{8} - \frac{(40.9 + 139.94)}{2}$$

=

$$= \frac{3}{2} \times 148.8 - 90.42$$

= 132.78 kn-m

MID SPAN OF 16, 17

JOINT	15	16		17		18	
MEMBER	15,16	16,15	16,17	17,16	17,18	18,17	18,19
D.F	0.753	0.43	0.43	0.43	0.43	0.43	0.43
1.D.L.F.E.M	-70.71	70.71			-70.71	70.71	
2.T.L.F.E.M			-148.8	148.8			-148.8
3.Distribute	53.25		33.58	-33.58		33.58	
4.Carry Over		26.63	-16.79	16.79	16.79		
5.Distribute			-4.23	-14.44			
Total Moments			-136.24	117.57			

Positive B.M. at mid span

$$= \frac{3}{2} \times 148.8 - \frac{(136.24 + 117.57)}{2}$$

$$= 96.3 \text{ kn - m.}$$

MOMENTS IN COLUMN

I

JOINT	15	16		17		18		19		20		21
D.F for column TOP	0.123	0.07		0.07		0.07		0.07		0.07		0.123
bottom	0.123	0.07		0.07		0.07		0.07		0.07		0.123
Member (beams)	15,16	16,15	16,17	17,16	17,18	18,17	18,19	19,18	19,20	20,19	20,21	21,20
D.F	0.754	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.754
1. Total load F.E.M	-148.8	148.8	-70.71	70.71	-148.8	148.8	-70.71	70.71	-148.8	148.8	-70.71	70.71
2. Distribution and C/o	-16.79	56.10	16.79	-16.79	-16.79	16.79	16.79	-16.79	-16.79	16.79	-26.66	-16.79
3. Add (1) and (2)	-165.59	204.9	-53.92	53.92	-165.59	165.59	-53.42	53.92	-165.59	165.59	-97.37	53.92
Distribute Top column	20.37	-14.37		7.82		-7.82		7.82		-4.78		-6.63
Bottom	20.37	-14.34		7.82		-7.82		7.82		-4.78		-6.63

JOINT	15											
D..F for columns												
Top	0.123											
Bottom	0.123											
Member (beams)	15,16	16,15	16,17	17,16	17,18	18,17	18,19	19,18	19,20	20,19	20,21	21,20
D.F	0.754	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.754
1. F.E.M	-70.71	70.71	-148.8	148.8	-70.71	70.71	-148.8	148.8	-70,71	70.71	-148.8	148.8
2. Distribute and C/o	16.79	26.66	-16.79	+16.79	16.79	-16.79	-16.79	16.79	16.79	-16.79	56.10	16.79
3. Add (1) and (2)	-53.92	97.37	-165.59	165.59	-53.92	53.92	-165.59	165.59	-53.92	53.92	-92.7	165.59
4. Distribute												
Top	6.63	4.78		-7.82		7.82		-7.82		2.72		-20.37
Bottom	6.63	4.73		-7.82		7.82		-7.82		2.72		-20.37

MAXIMUM -ve B.M.

POINT	MEMBER	D.F	FINAL MOVEMENT
15	15,16	0.754	-66.005
16	16,15	0.43	187.95
	16,17	0.43	-182.46
17	17,16	0.43	165.59
	17,18	0.43	-165.59
18	18,17	0.43	165.59
	18,19	0.43	-165.59
19	19,18	0.43	165.59
	19,20	0.43	165.59
20	20,19	0.43	187.95
	20,21	0.43	-182.46
21	21,20	0.754	-66.005

MAXIMUM +ve B.M AT MID SPAN

JOINT	M MEMEBER	D.F	FINAL MOVEMENT
15	15,16	0.753	132.78
16	16,17	0.43	96.3
17	17,18	0.43	96.3
18	18,19	0.43	93.3
19	19,20	0.43	96.3
20	20,21	0.43	96.3
21	21,20	0.753	132.70

MOMENTS IN COLUMN

JOINT	MEMBER	D.F	FINAL MOMENT
15	15,22	0.123	20.37
	15,8	0.123	20.37
16	16,23	0.07	-14.34
	16,9	0.07	-14.34
17	17,24	0.07	7.82
	17,10	0.07	7.82
18	18,25	0.07	-7.82
	18,11	0.07	-7.82
19	19,26	0.07	7.82
	19,12	0.07	7.82
20	20,27	0.07	-4.78
	20,13	0.07	-4.78
21	21,28	0.123	-6.63
	21,14	0.123	-6.63

MOMENTS IN COLUMN - II

JOINT	MEMBER	D.F.	FINAL MOVEMENT
15	15, 8	0.123	6.63
16	15,22	0.123	6.63
16	16,23	0.07	4.78
	16, 9	0.07	4.78
17	17,24	0.07	-7.82
	17,10	0.07	-7.82
18	18,25	0.07	7.82
	18,11	0.07	7.82
19	19,26	0.07	-7.82
	19,12	0.07	-7.82
20	20,27	0.07	2.72
	20,13	0.07	2.72
21	21,28	0.123	-20.37
	21,14	0.123	-20.37

4.3 DESIGN OF BEAMS

PRELIMINARY DESIGN :

a) BEAM:_ Assume size = 650 X 300 mm.

For live load the F.E.M = $6.25 \times 7.5 \times 5 \times \frac{5}{48}$

= 24.42 KN-m.

For Dead load the F.E.M = 123.62 X 5 X 5/48

= 64.39 KN-m.

For Beam Self Wt = 0.65 X 0.3 X 25

= 4.875 KN/m.

$$F.E.M = \frac{Wl^2}{12} = \frac{4.875 \times (5)^2}{12} = 10.16 \text{ KN-M}$$

Total F.E.M = 98.97 KN-M.

$$d.reqd = \sqrt{\frac{M}{Q.b}} = \frac{98.97 \times 10^6}{0.91 \times 300}$$

= 602.10mm

Assume depth is correct

T - beam Design:

Max BM = 187.95 KN - M

Max S.F = 60.14 KN

Breath of flange

$$bf = \frac{10}{6} + bw + 6\ Df$$

$$= \frac{5000}{6} + 300 + 6 \times 305$$

$= 2963.33$ mm.

Assume 40 mm effective cover to tensile steel.

$Xc = 0.4\, d = 0.4 \times 915 = 366$ mm (for balanced section).

$$M = bf\, Df.\ cbc\ \frac{2xc - Df}{2xc}\ \left(d - \frac{Df}{3}\right) \frac{3xc - 2.Df}{2xc - Df}$$

$$= 2963.33 \times 305 \times 7\ \frac{2 \times 366 - 305}{2 \times 366}\ 915 - \frac{305}{3}\ \frac{3 \times 360 - 2 \times 305}{2 \times 366 - 305}$$

$= 2.9509 \times 10^{8}$ N-nm.

$= 295.09$ Kn - m.

295.09 187.95 Kn-m.

The section to be designed as simgly reinforced section.

Area of tension Steel reqd. $Ast = \frac{M}{\sigma st\ Jd}$

$$= \frac{187.95 \times 10}{230 \times 0.9 \times 915}$$

$= 992.32\ mm^2$

Assume 16mm bars

provide 6 nos. of 16 mm bars.

CHECK OF SHEAR:-

$V = 60.14$ Kn

$$\tau v = \frac{V}{bd} = \frac{60.14 \times 10^3}{300 \times 915} = 0.22\ N/nm^2$$

$$\frac{100\ Ast}{bd} = \frac{100 \times 1206}{300 \times 915} = 0.44$$

$$\tau c = 0.22 + \frac{0.3 - 0.22}{0.25} \times 0.44 - 0.25 \quad 0$$

$\tau c = 0.28\ N/nm^2$

$\tau v < \tau c$ Hence safe.

provide min shear reinforcement.

Min shear reinforcement:-

Provide minimum shear reinforcement in the form of Vertical Stirrups.

Provide 8 mm 2 legged stirrups.

$$\frac{As}{b.sv} = \frac{0.4}{fy}$$

$$\frac{50 \times 2}{300xsv} = \frac{0.4}{250}$$

sv = 208.33 mm 200 mm throughout.

Adopt 8 mm Ø 2 legged stitrrups @ 200 mm C/c.

4.4 DESIGN OF COLUMNS

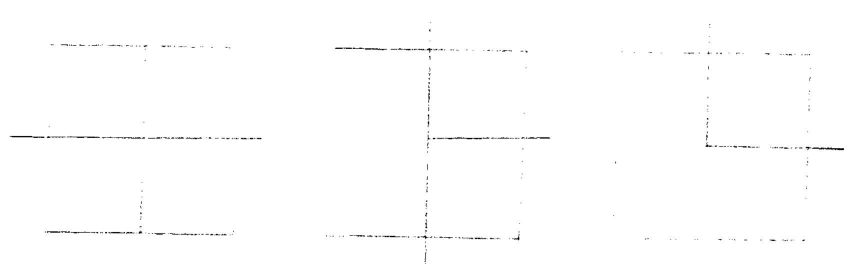
INTRODUCTION:-

Columns are mostly subjected to axial loads and biaxial moments. Initially the B.M. is unknown. So that axial load coming on the column at a particular section is multiplied by afactor depending on its position. The factor is selected from the table given below. The equivalent direct load obtained after multiplying the axial load by a suitable factor is divided by allowable direct compressive stress to obtain the C.S area from which size of column can be fixed.

TABLE:-

TYPES OF COLUMNS

TOP	TOP BUT ONE	LOWER
1.0	1.0	1.0
4.5	2.0	1.4
6.6	2.3	1.8



PRELIMINARY DESIGN OF COLUMN

Corner column (Cl) Top

Load from the beam	=	83.88 KN
Total load	=	83.88 KN
Self of colum (10%)	=	8.38 KN
		92.268 KN

Equivalent axial load = Load factor Xtotal load

= 6.6 X 92.268

= 608.968 KN

Allowable comp stress for M20 = 5 N|mm^2

Area of column = $\frac{608.968 \times 10^3}{5}$

= 121793.76 mm^2

Provided area 400 X 400 mm = 160000 mm^2

Hence safe.

Intermediate colums :- (Top)

Load from the beam	=	167.76 KN
Self (assume 10%)	=	16.77 KN
		184.53 KN

Equivalent axial load = 2 X 184.53

= 369.06 KN

Allowable comp Stress = 5 N|mm²

Area of column reqd = $\frac{369.06 \times 10^3}{5}$

= 73812 mm^2

Provide column size 400 X 400 = 160000

Hence safe:

<u>Intermediate colums :-</u> (Top but one)

Load from the beam	=	335.52 KN
Total load	=	335.52 KN
Self (Assume 10%)	=	33.552 KN
		369.072 KN

Equivallent axial load = 1 X 369.072 KN

Allowable stress in comp = 5 N|mm²

Area of column reqd = $\frac{369.072 \times 10^3}{5}$

= 738144 mm^2

Provide column size 400 X 400 = 160000 mm^2

Hence safe.

DESIGN OF COLUMN :

Load to the lower column = 369.072 X 4

= 1476.29 KN

Self of the lower column = 0.4 X 0.4 X 3 X 25

= 12 KN

Total arial load 1476.29+12 = 1488.29 KN

Let assume σ_{cc} = 5 N|mm² for M20 and assume 0.8% steel.

Asc = 0.008 Ag

Ac = Ag - 0.008 Ag

= 0.992 Ag

Assumed section 400 X 400 mm.

P = σ_{cc} Ac + σ_{sc} Ac

P = 1488.29 X 1000 = 5(400X400-Asc) + 190Asc

Asc = 3720.49 mm²

use 20 mm bars of 12 nos

Transverse rainforcement:

a) Dia of lateral ties shall not be less than the grater of the following.

i) $\frac{1}{4}$ th dia of largest longitudinal bar.

ii) 5mm.

iii) Minimum available in market = 6mm

Adopt 8mm

b) Pitch of lateral ties

i) 400 mm

ii) 20 X 16 = 320 mm.

iii) 48 X 8 = 384 mm.

So that the pitch has to be less than 320mm, adopt a pitch of 300mm.

Provide 8mm ø lateral ties @ 300mm c/c.

4.5 DESIGN OF FOOTINGS

DESIGN OF FOOTING :

Size of column	=	400 X 400 mm.
Total load from column	=	1488.29 KN
Self of plinth beam	=	0.65 X 0.3 X 25X 5
	=	24.4 KN
Assume Self of footing	=	10%
Assume depth of footing	=	1.5m.

DESIGN :

Total axial load on column = 1515.87 KN

Self of footing = 151.59 KN

Total load = 1667.46 KN

The Safe bearing capacity of soil = 200 $KN|m^2$

Area of footing required $= \frac{1667.46}{200}$

$= 8.34 m^2$

Side of Square footing = 8.34 = 2.89m

Provide Square footing of 3m X 3m

The actual bearing pressure $= \frac{1515.87}{3 \times 3} = 168.4\ KN|m^2$

$$M\ X\ x = 168.43 \times \left(\frac{3+0.4}{2} \times 1300\right) \times \left(\frac{0.4+2 \times 3}{3+0.4} \times \frac{1.3}{3}\right)$$

$$= 303.62 \text{ KN - m}$$

$$d = \sqrt{\frac{M}{Q.b}}$$

$$= \sqrt{\frac{303.62 \times 10^6}{0.9 \times 400}}$$

$$= 913.30\text{mm.}$$

Provide $D = 990$ mm

$d = 915$ mm

$$Ast = \frac{303.62 \times 10^6}{230 \times 0.9 \times 915} = 21603.02 \text{ mm}^2$$

Provide 12 mm bars and 16 nos of bars both ways.

CHECK FOR SHEAR:

$$V = q0 \; [BXB - (a+d)\;(b+d)]$$

$$= 168.43 \; [3X3 - (0.4 + 0.915)\;(0.4 + 0.915)]$$

$$= 1224.62 \text{ KN.}$$

The Nominal shear Stress $= \dfrac{V}{2[(a+d) + (b+d)]dcc}$

$$\tan^{-1}\theta = \frac{990}{1300}$$

$$\theta = 37^\circ \; 17^1$$

$$\tan\theta = \frac{x}{457.5}$$

$$x = 348.4$$

$= 990 - 348.4$

$= 641.6mm$

$$\tau_v = \frac{1224.62 \times 10^3}{2 \times 2\ (400+915) \times 641.6}$$

$= 0.36\ N|mm^2$

Permissible Shear Stress = ks

$$Ks = 0.5 + \frac{400}{400} = 1.5 \text{ grater than } 1$$

$Ks = 1.0$

Permissible shear stress $= 1 \times 0.16 \times \sqrt{20}$

$= 0.72\ N|mm^2$

Hence safe in shear.

4.6 DESIGN OF LIFT ROOM

INTRODUCTION

The lifts are provided in the building so that are easily accessible from all intromces. For maximum efficiency lights are placed at ends of each corner if possible. As per recommondations of the IS - 1860 two lights are provided at two ends of the building at each floor. The main advantage of positioning the lifts so that the all machines and switch gears may be housed in one machine room.

The machine room is placed immediatly above the lift as this has several advantages such as reduced load on the building, lower the cost of the lift, a smaller lift wall for a given size of lift car and reduced power consumption. Access to the machine room is provided by an internal staircase. The machine room is provided with a trap door. The man hole size is 60cm X 60cm.

LIFT ROOM DESIGN

DATA:-

Rated Load = 8 persons in 1 life.

Car speed = 0.75 to 1.5 m/sec.

Car door solid sliding with automatic closing and opening devices.

Method of Control = Car Switch Control

Loading Doors = Solid Sliding Door.

DESIGN DATA FOR FLOOR SLAB

Size of the room = 4.5 m x 2.8 m

Loading flow machine room = 10,000 N/m^2

Depth of lift pit = 10,000 N/m^2

Weight of Lift = 15000 N.

DESIGN OF MACHINE ROOM SLAB

Ly = 4.4 m   Lx = 2.8 m.

$\frac{Ly}{Lx} = \frac{4.5}{2.8}$ 1.6   2.   Two way continuous Slab.

Condition of the slab = all side continuous.

Assume slab thickness as 200 mm.

Result of slab = 0.2 x 1 x 1 x 25 = 5000 N/m^2

Floor finishes = 1000 N/m^2

Live load = 10,000 N/m^2

TOTAL LOAD = 11,000 N/m^2

MOMENTS IN SHORTSPAN DEIRECTION

$$Mx = x \quad Wx \quad lx^2$$

$$x = 0.0545$$

$$y = 0.032$$

NAGATIVE MOMENT

$$Mx = 0.0545 \times 16000 \times 2.8^2$$

$$= 6836.46 \text{ N.m}$$

POSITIVE MOMENT :

$$Mx = 0.0424 \times 16000 \times 2.8^2$$

$$= 5318.56 \text{ N-m}$$

MAX MOMENT IN LONG SPAN DIRECTION

$$\alpha_Y = 0.032 \ (-\ ve)$$

$$\alpha_y = 0.024 \ (+\ ve)$$

$$(My)_{-ve} = 0.032 \times 16000 \times 2.8^2$$

$$= 4014.08 \text{ N-m}$$

$$(My)_{+ve} = 0.024 \times 16000 \times 2.8^2$$

$$= 3010.56 \text{ N-m}$$

DESIGN MOMENT

$$= 6836.46 \text{ N-m}$$

$$d = 6836.46 \times 10^3/(0.8 \quad \times 1000)$$

$d = 90 \quad 200$ mm provided Hence sales

provide $d = 120$ mm

$$D = 120 + \frac{10}{2} + 15 = 140 \text{ mm}$$

CALCULATION OF AREAS OF STEEL :

$$(Ast)_{+ve} = \frac{4014.08 \times 10^3}{140 \times 0.87 \times 120}$$

$$= 284.44 \text{ mm}^2$$

Provide 10 mm @ 180 mm c/c

$Ast = 320 \text{ mm}^2$

AREAS OF STEEL IN SHORTER SPAN

$$Ast = \frac{6836.46 \times 10^3}{140 \times 0.87 \times 120} = 478.74 \text{ mm}^2$$

Provide 10mm bars @ 150mm c/c

$Ast = 501 \text{ mm}^2$

DESIGN OF LIFTROOM ROOZ SLAB

$Ly = 4.5$ m ; $Lx = 2.8$

$$\frac{Ly}{Lx} = \frac{4.5}{2.8} = 1.6 \quad 2$$ Hence two way slab

LOADING

Assume slab thickness as 150 mm.

1. self of slab = $0.15 \times 1 \times 1 \times 25 \times 10^3$ = 3750 N/m^2

2. Floor finishes (mortor finishes) = 400 N/m^2

3. Live Load = $750 \times 1 \times 1$ = 750 N/m^2

Total Load = 4900 N/m^2

$(\alpha x)_{+ve}$ = 0.0424

$(\alpha x)_{-ve}$ = 0.0545

$(\alpha y)_{-ve}$ = 0.032

$(\alpha y)_{+ve}$ = 0.024

Mx = $x\ Wx\ lx^2$

$(Mx)_{+ve}$ = $0.0424 \times 4900 \times 2.8^2$

= 1628.83 N - m

$(Mx)_{-ve}$ = $0.0545 \times 4900 \times 2.8^2$

= 2093.672 N - m

$(My)_{+ve}$ = $y\ Wy\ lx^2$ = $0.024 \times 4900 \times 2.8^2$

= 921.984 N - m.

$(My)_{-ve}$ = $0.032 \times 4900 \times 2.8^2$

= 1229.312 N-m

Design moment = 2093.672 N-m

$$d = \frac{2093.672 \times 10^3}{0.87 \times 1000} = 70.85 < 150 \text{ mm}$$

Provided Hence safe

Provide D $= 80 + \frac{10}{2} + 15 = 100$ mm

d $= 80$ mm

CALCULATION OF AREAS OF STEEL IN SHORT SPAN

$$Ast = \frac{2093.672 \times 10^3}{140 \times 0.87 \times 80} = 219.92 \text{ mm}^2$$

Part Steel $= 246$ mm^2

Hence provide from 8mm bars @ 180 mm c/c.

Ast $= 279.72$ mm^2

AREAS OF STEEL IN LONGER SPAN

$$Ast = \frac{1229.31 \times 10^3}{140 \times 0.87 \times 80} = 129 \text{ mm2}$$

steel $= 146$ mm^2

Hence provide 8mm bars @ 180 mm c/c.

Ast $= 279.72$ mm^2

5. ESTIMATION

INTRODUCTION:-

Estimation is an essential thing for a building since it has connection with money, which governs the quality of work. It consists of two, subdisisions as "Detailed Estimate" and "Abstract Estimate".

The Abstract Estimate consists of the calculation of amount using quantities and rates. The local market for various items in and around Coimbatore, have been collected and used here.

The detailed Estimate consists of the determination of amounts of various types of work. The quantities are determination for all the floors.

For the item like water supply, electrification, sanitary fittings, supervisor charges etc. The amount has been as lumpsum.

5.1 DETAILED ESTIMATION

Sl.No	Description of Work	Nos.	L (m)	B (M)	D (m)	Qnty. (m³)	Total (m³)
1	2	3	4	5	6	7	8
1	Earth Excavation for column footing.	77	3.0	3.0	1.50	1039.5	1039.5
2	Earth Excavavation for plinth beam		45.6	27.2	0.650	806.21	806.21
3	Filling the basement with excavation earth layers of 40 cm thick cell ramped and consolidated including watering with std. std. specification.		45.6	27.2	0.4	496.13	496.13
4	Filling the basement with sand layers of 20 cm thick wall ramped and consolidated.		45.6	27.2	0.4	248.1	248.1

5	Concrete Mix M_{20} (1:1½:3) and Torshell footing	77	3.0	3.0	1.24	859.32	859.32
6	R.C.C 1:1½:3 for columns at footing level.	77	0.4	0.4	2.6	32	32
7	R.C.C. 1:1½:3 for columns at ground floor, I, II & III floor level.	4x77	0.4	0.4	3.0	36.96	147.84
8	R.C.C. 1:2:4 for plinth beam	60	5.0	0.3	0.65	58.5	58.5
9	R.C.C. 1:2:4 for Ground floor, I, II & III floor level.	4x36	5.0	0.3	0.65	140.4	140.4
10	R.C.C 1:2:4 for Floor slabs of all floors.	4x60	5.0	5.0	0.305	1830	1830
11	R.C.C 1:2:4 for all ramps.	12	30.0	5.0	0.305	549	549
12	R.C.C. 1:2:4 for lift room slab	2	4.0	2.5	0.2	4.0	4.0

1	2	3	4	5	6	7	8
13	Filling the basement with exlarated earth layers of 40cm thick wall rammed and consolidated including watering with specification	1	45.6	27.2	0.4	496.13	493.13
14	Filling the basement with sand layers of 15cm thick wall rammed and consolidated	1	45.6	27.2	0.15	186.10	186.10
15	Brick work in G.F C.M. 1:5 using country Bricks						
	30cm thick walls	1	20	0.3	1.0	6.0	
	30cm thick walls	2	30	0.3	1.0	18.0	
	30cm thick walls	1	15	0.3	1.0	4.5	
	30cm thick walls	1	10	0.3	1.0	3.0	
	30cm thick walls	2	5.0	0.3	3.0	9.0	
	30cm thick walls	3	5.0	0.3	3.5	13.5	
	30cm thick walls	2	4.0	0.3	3.0	7.2	
	20cm thick walls	2	2.5	0.2	3.0	3.0	
	20cm thick wall	8	1.25	0.2	2.5	4.8	
							74.0

1	2	3	4	5	6	7	8
	Deduct for renti-rentilators	2	1.0	0.3	0.4	0.24	
	Deduct for doors	2	2.0	0.3	1.0	1.2	
							1.44
16	Brick work in I,II,&III floors						
	30cm Brick walls	3X2	30.0	0.3	1.0	54.0	
	30cm Brick walls	3X2	25.0	0.3	1.0	45.0	
							99.0
17	Brickwork for all ramps	6	30.0	0.3	1.0	54.0	
	30cm thick						
	thick Brick walls	6	25.0	0.3	1.0	45.0	
		12	10.0	0.3	1.6	36.0	135.0
18	Plastering area (G.F)						
	Ceiling Area		27.2	27.2		739.84	
	Plastering inside					190.0	
	Plastering outside					208.0	
							1,187.00

1	2	3	4	5	6	7	8
	Deduct for Doors & ventilators					1.44	
							1,185.56
19	Plastering area I,II&III						
	Ceiling area	4	27.2	27.2		2959.36	
	Plastering inside	4	27.2	1.0		108.8	
	Plastering outside	4	30.0	1.0		120.0	
							3,188.16
20	Plastering for Ramps floors	12.0	30.0	5.0		1800.00	
		6	30.0	1.0		180.0	
		6	25.0	1.0		150.0	
		12	10.0	1.0		120.0	2,250.0
21	Base foundation footing 1:4:6	77	3.0	3.0	0.25	173.0	173.0
22	Weathering course for Roof slab					230.175	230.175
23	Glass frames for all floors at all sides						

5.2 ABSTRACT ESTIMATE

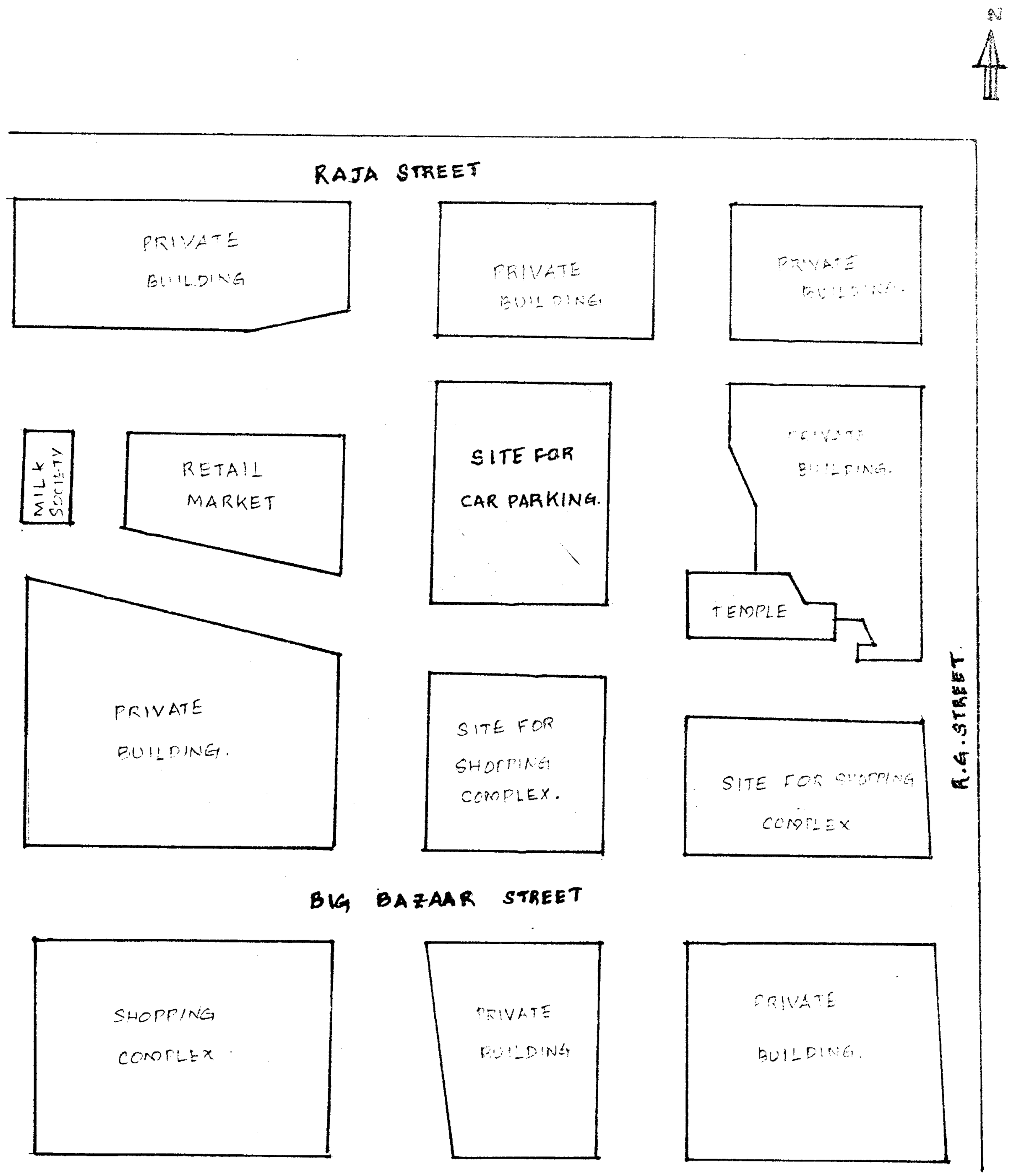
S.NO	QNTY	SUBHEADS OF ITEM OF WORK	RATE	UNIT	AMOUNT
1	2	3	4	5	6
			Rs.		Rs.
1	1845.71	Earthwork ineexlavation foundn and plinth beams in ordinary soile including black cotton soil including dressing of sides and ramming of bottoms including getting getting out the excendated soil and disposal of excenated soil in surplus.	25	1 cum	46,142.75
2	949.82	R.C.C 1:1½:3 for footings, colums & beams below G.L including shuttering and reinft	1300	1 cum	12,34,766.0
3	496.13	Filling of Basement upto plinth level of Building	7	1 cum	3,472.91
4	248.1	Sand filling	19		4,713.9
5	1240.32	Flooring over abed of C.C 1:4:8 using 40cm Hard gramite metal 10cm thick	25	1 cum	31,008.0

1	2	3	4	5	6
			Rs.		Rs.
6	859.32	Concrete Mix 1:1½:3 and torsteel for footing	1300	1 cum	11,17,116
7	308	Brick work in super Structure for all floors with C.M 1:5 using with good country Bricks	950	1 cum	2,92,600.0
8	1,076.0	Plastering of walls with C.M 1:5 12cm thickness both outside & inside of parapet walls	22	m^2	23,672.0
9	5499.2	Plastering the ceiling with 1:4	12	m^2	65,990.4
10	147.84	R.C.C 1:1½:3 for all columns including shuttering & Reinft	1,300	cum	1,91,192.0
11	198.9	R.C.C. 1:2:4 for all beams	1,200	cum	2,58,570.0
12	2379	R.C.C 1:2:4 for all floors slabs & Ramps	1,100	cum	26,16,900.0
13	1.5	R.C.C 1:2:4 for lift Room slab	1,100	cum	1,650.0

1	2	3	4	5	6
14	14.112	R.C.C for wall lift room	1,100	cum	15,523.2
15	230.175	Weathering course for Roof slab. 7.5cm thick Brick jelly lime concrete and to laid with one course of machine tail set in concrete mix 1 in 3	300	cum	69,052.5
16	173.0	1:4:6 Mix Base foundation	1,300	cum	2,24,900.0
17	5,499.2	Floor finished	75	m^2	4,12,440.0
18	1456.0	Colour washing & snow-cem to wash outside	35	m^2	50,960.0
19	72.4	Compound wall	650	m^3	47,060.0
20		Grin gates			20,000
21		Doors for Rooms			2,000
22	587.52	Glass & Frames for all floors	200	m^2	1,17,504.0
23		Supplying & electing the lifts			1,25,000.0
24		Provision for electrification includig Genset			2,50,000.0

1	2	3	4	5	6
25		Architectural reclearing			2,00,000.00
		and fluctnation in rates			
					74,77,233,26
				SAY	75,00,000.00

ESTIMATED COST Rs. 75,00,000.00/-



SITE PLAN.

NOT TO SCALE.

7. CONCLUSION

In today's high density vehicular traffic parking space is an important problem. So a multi-storeyed parking complex is essential and justified.

In a survey conducted near the Town Hall area, Coimbatore City nearly 200 cars required parking facilities in a peak period of 5 - 8 p.m. An average of 500 cars were in need of parking space per day.

By collecting a nominal fee of Rs.3/= for cars and Rs.1/= for two wheelers for using parking facilities a net sum of Rs.2,000/= can be collected in a day. This amounts to 7.5 lakhs a year with parking intensity high on holidays and festival seasons. Thus the project cost of 75 lakhs can be appreciated in a decade which makes this project highly feasible.

Thus in areas where limited parking space is avialable one can go in for a multi-storey parking lot. This is already in uses in developed countries and has met with great success. This also allows good security and safety to the parked vehicles.

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