PLANS AND DESIGN

OF

A NEW HOTEL IN MOUKHTARA

BY

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1948

Incorrect Title

First Hotel in MOUKHTARA

BY

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P A R T I

L E B A N O N

No one can deny that Lebanon is a summer resort for the Middle East in general and for the Arab countries in particular. From the early history , Lebanon , and especially its mountains has been and will remain the only refuge of homeless people in war or in peace time . Its climatic characteristics and geographical position make of it the best and the most beautiful country of the Middle East .

A general look from the sea coast to the high mountains, from the widest plain to the deepest valley will reveal to the tourist or the foreigner the contrast of nature and the beauty of landscape . Lebanon , beside its glittering cascades and sparkling waterfalls , beside the grandeur of its cedars and the attractive charm of its grots , possesses many valuable historical ruins as Baalbak , Beit-El-Dine and all the remains of the Pheniciens in Saidon , Tyre and Djbeil . All these in addition to the climate , attract wealthy people from neighbouring countries to spend their summer in this small country of ours .

A little study of Lebanon from the economic point of view shows that it is not an industrial nor a highly advanced agricultural country ; one of its main resources is tourism and summer vacationing and even recently winter sports which , in the future

if very well developed , will give more profit than these small local commercial businesses .

There is no doubt that our main income , especially in the mountains , comes from visiting foreigners who spend a short period of time in our mountains .

* Source of statistics ?.

Here are some statistics showing the necessity of modern improvement to our mountains : in the year 1939 the number of people coming from abroad to spend their summer season in Lebanon was 2350 persons ; while in the year 1946 , after several mountain resorts had developed along modern lines in the way of buildings and new hotels , the number increased to 8900 persons . If we consider for a usual person a stay of two months and an expense of 300 L.L.per month , the total amount spent by foreigners will be approximately 5,358,000 L.L. = 2 x 300 x 8930 which is nearly one tenth of the government budget . It is necessary to provide for these visitors all the means of comfort and enjoyment ; from this consideration arises the need of new and modern hotels .

The government has realized the importance of such hotels and has more or less helped in the erection of new ones in some localities , but on the other hand , the government is to be blamed in that it has concentrated all its effort in the development of particular area in Lebanon , neglecting many other places that would have been much more beautiful as summer resorts than Alley , Sofar or Bhamdoon .

S H O U F - D I S T R I C T

One of these forgotten spots in this small or rather "Great Lebanon" is the Shouf - District .You can be sure that nobody from Beirut knows where Maasser is located .To make it clear I will describe it briefly here.

Maasser is a village of about 9000 inhabitants in the Shouf-District . It is situated on a hill-top at an altitude of 1400 meters and at a distance of 70 kilometers from Beirut . It is surrounded by thick forests of oak-trees and large vine-yards. It is dominated and overlooked by a high mountain covered with tall, ancient cedars . If we compare it to Baskinta which every one knows , we can not see very much difference whether in climate, beauty , altitude , population , situation or distance from Beirut.

This is a general description of Maasser , but it is nothing compared to many other beautiful villages that are more developed and advanced comparatively in civilization; among them we can list Deir-El-Kamar , Beit-El-Dine , Moukhtara , Ain-Zhalta, Barouk and many others that are scattered all along the most fertile and forested mountain of Lebanon .

A small trip from Damour to Djezeen up the mountainous side will allow you to pass through allthe main cities and villages of the Shouf-District . Deir-El-Kamar is the first one you reach after a 45 minutes drive on a newly constructed asphalt road , meandering along a thick forested water shed .

Here is Beit-El-Dine with its old and new Shabee-Castle. You can not avoid visiting this historical remain , where the glory of our ancestors and the genius of their architects reveal the aristocratic way of leaving in the 18th century of our history .

M O U K H T A R A

There is only a 15 minutes drive between Beit-El-Dine and Moukhtara .On your way you go up many hills and down many valleys; you cross more than two bridges indicating the highly irrigated area of that region .Wide plains of wheat and corn , groves of apples , figs and pears spread on both sides of the road . Huge and projecting rocks of various color and shape lie at various distances to show the striking contrast between the grassy surface of the soil and the hard stiff surface of the stones . Before you reach Moukhtara you go down a valley to cross the last bridge of Aoally river . There , you look for a while to one bank of the river and see mills operated by hydraulic power surrounded by nut-trees . On the other bank , rhododendrons and rose-bays spread between the rocks and throw their red flourishing flowers on the smooth pebbles of the ground .

Here is Moukhtara at an altitude of 950 meters . It is spreading on a gentle slopy water-shed , overlooking the deep valley of Barook river from which it owes the productivity of its soil . A canal of 10 miles long with a capacity of 35 cubic feet per second brings water to generate electric power and irrigate the city land . The canal is 80 feet higher than the village so that electricity is generated first and then the water flows in all directions to be used for irrigation and many other sanitary purposes . This abundance of water is rarely found in mountainous cities , thus in Moukhtara it solves many difficult problems often

encountered in country regions as sewage , drainage and water supply. The electric power station being in the village itself , the voltage drop in houses is not appreciable so that the lamps and the lights are at their maximum efficiency .

Finally , Gemblat Castle , which is the most outstanding feature of that district ,contributes in making of Moukhtara the most beautiful village of that region.

P A R T II

THE NEW HOTEL

Importance :

You will be surprised when you realize that in all this big part of the Eastern region of Lebanon not a single hotel has been built , and very little thought has been given to building one .You will , of course , find in the cities that we have described , small inns and few houses turned into hotels , but none is properly designed as such . The person who comes from Egypt , Iraq or Palestine seeks first his comfort and enjoyment before the beauty of nature and the high altitude of the place.Therefore the only means of attracting people to the Shouf-District are new, modern and accomodating hotels.

When Tyre and Saidon will be turned into petrol centers , that region will become in the near future one of the most convenient places for week-end journeys for all the foreigners and employees of the Tapline living along the sea coast .

Situation :

In my opinion Moukhtara is the most suitable spot for a new hotel because of reasons stated above .Being in the center of the district and surrounded by many small villages , Moukhtara is frequently crowded by the neighbouring populations who come usually to take their monthly food provision; thus it is a small commercial center for nearly 35 country villages totalling about 85,000 people. On the other hand it has a supreme power on all that region both in the moral and the political influence. This is not only due to

its position and to its relatively high standard of living ,but mainly to the Gemblat family which has been for centuries the leader of the district .

The problem now is to select a convenient and an available land for the erection of the New Hotel .Its position is affected by many factors , one of them is the main road and the other is its position with respect to the surrounding buildings so as not to be blocked in the future by any new construction .It will not be logical to build it in the outskirts of the village , on an isolated spot , even though we can find many beautiful and romantic places , because of the difficulties that will be encountered such as sewage , water supply , electricity , motor road and finally communication with the public center of the village in case of need or help .

A wide flat piece of land situated near the market place between the road to Djezeen and the private car road to Gemblat properties is the best available land for this new project . Its position on the upper most part of the village makes of the hotel appear from the distance a highly dominant new building beside the old construction of the huge Gemblat Castle .

Composition :

A hotel in its general sense means a dwelling where a number of people spend a period of time in a collective way of living . Its composition , therefore , will have to comform to the ways and means of making such a life easy , comfortable and pleasant .

The predominant principle that governs the design of a hotel and generally every dwelling house is the groupment of units according to their objects and their functions . The reception quarters , the service quarter and all the sanitary accessories should be arranged in such a way that every one will form an independant part in itself but completing at the same time the general requirements of the building . Thus a hotel is a villa but on a large scale where the salon , the dining room , the kitchen , the library and all the places of entertainment are in the ground floor , leaving the first and the next floor as sleeping quarters . This type of arrangement has proved to be the best for social needs and accomodation purposes .

The entrance and the main façades have their outstanding features ; they reveal the character , the type and the quality of the hotel ; They have, beside ,their attractive influence, their psychological effect .

In the composition of our New Hotel in Moukhtara many points were taken into consideration especially economy , simplicity and modernity of type . Being the first one in that district , the hotel is limited to a fixed number of rooms , not more than 40, and provision is to be made for future development . Another important point which will characterize this hotel in its composition is the available apartments in any sizes , because customers who would like to stay for one or two days do not very much frequent that region , while families either from Beirut or from Egypt who look for quiet and cheap places would prefer that spot

more than Aley , Sofar or Bhamdoun . In addition , the swimming pool and the wide garden surrounding it make the hotel the most enjoyable place in that part of Lebanon .

Having considered the hotel in its general composition , it will be necessary to describe its units in details .

The entrance with its large three steps of 6 meters wide and the circular column on the corner of the last one shows the simplicity and the heavy imposing character of the structure .

A lobby of IO x 6 meters confronted by the main large staircase is so designed with its wide corridors and rounded edge corners that it affords an easy circulation to all main parts of the ground floor . The director's office is located at the North corner of the lobby with its circular windows so that any person using the lift or going up or down the stairs , in or out from the main door can be seen by the man in charge .

The salon which has an area of II x 9 meters overlooks on one side the main street from two wide windows and on the other side the garden and the swimming pool from a glass and iron door . It can accomodate about 50 persons when it is used as a salon affording 2 sq meters for every person ; or 66 couples when used as a dancing room providing I.5 sq meters per couple . The iron door opens to a terrace of 8 x 6 meters thus adding a new area in the case of a dancing party .The orchestra is located on the East corner so that it can play for both the salon and the terrace or the salon and the garden as needed .

The dining room is II x 8 meters with an area of 88 sq.meters It is opposite to the salon forming with it two large symetrical

units with respect to the main entrance . When the hotel is entirely housed , 55 persons approximately will be living in it . Considering that all of them take their meal at the same time, the dining room will have a density of I.6 sq.meters per person which is a fair average area for a man with his table, chair and enough space for easy circulation .

The café , at the West corner , is an annex to the hotel. It is not a necessary unit , and usually in modern European hotels it is away from it ; but here in Lebanon , with the oriental charater of people , it becomes a necessary one and even one of the main sources of income to the hotel . It has its own entrance facing the central place of the village . Its total area is 64 sq. meters and thus able to contain 32 persons affording 2 sq.meters for each one .

The library and the games room form two independant units overlooking the main road to Djezeen .

The service quarters composed mainly ofthe kitchen , storage maids'room and laundry form a separate part but related to the other parts of the hotel by wide corridors and large doors.The kitchen with its own service entrance is so located that it can serve both the café and the dining room . Its size is 7 x 6 meters forming nearly half the area of the dining room .

A glance at the composition of the ground floor will show that the main idea was the grouping of units according to their objects. Thus the sitting room , the entertainment places and the library are on one side , while the service quarters with the dining room , the café and the garage are on another side ; both

are symetrical about a main axis passing through the lobby and the main door .

The first and the second floor are of the same arrangement; each one is composed of two main aisles : one for single and double bed rooms , the other for apartments .The two aisles are separated by a salonette which can be used for both .Each bed room has its own bath ,closet and veranda. The single bed room has an area of 3.50 x 4.50 sq. meters and the double bed room 3.75 x 5.00 sq.meters

The apartments are of different sizes and available for any family of any number of persons . There are apartments composed of two sleeping rooms with a salon , dining room , kitchen and bath ; others of one bed room , salon and kitchen ; there is even an apartment of one bed room and a salon only . Therefore the choice depends upon the desire , the cost and the number of persons in the family . In addition , two baths are connected with the main corridor so as to be used by the maids serving the high class families .

Almost all the baths are located in the inside taking their air and light from a central shaft of I.00 x 2.00 meters , thus leaving the façades undistorted but giving more space for sleeping rooms .

The outstanding features of the main façade is the high and wide windows with the horizontal cornices around . To break the horizontality of lines, projecting units and verandas with broken down corners give vertical lines so that a real contrast is shown in the general appearance of the building.

What gives an imposing character to this small hotel is the wide garden and the high trees surrounding it . Then the swimming pool witn its cabins , sand pits , solariums , lawns and all the green places around contribute in making that quarter the most enjoyable place in our Shouf-District .

P A R T III

Design

Specifications and formulae used :

Slabs :

a) L.L. + D.L. = 550 kg./sq.m

b) M = $I/IO\ W\ L^2$

c) d = $0.369\ (red.M)^{I/2}$

Verandas , corridors and stairways :

a) L.L. + D.L. = 800 kg./sq.m

b) M = $I/IO\ W\ L^2$

c) d = $0.369\ (M)^{I/2}$

d) Area of steel = $0.02379\ (M)^{I/2}$

Rectangular beams :

a) M = $I/IO\ W\ L^2$

b) d = $0.4\ (M/B)^{I/2}$

c) Area of steel = $\frac{M}{7/8 \times I200 \times d}$

T-Beams :

a) H = $(0.06 \times M)^{I/3}$

b) d = H + t - 4 or 6

c) Area of steel = $\frac{M}{7/8 \times I200 \times d}$

Materials used :

Concrete	specific weight	= 2500 kg/cu.m
Limestone	specific weight	= 2500 kg/cu.m
Hollow bricks ,I0 cm thick	w	= I600 kg/cu.m
Concrete blocks 20 cm thick,	w	= 2500 kg/cu.m
Bearing power of the soil		5 kg/sq. cm
Allowable stress in steel		= I200 kg/sq.cm
Allowable stress in concrete		= 50 kg/sq.cm
Allowable shearing stress (without web reinforcement)		= 5 kg/sq.cm
Allowable shearing stress (with web reinforcement)		= I2 kg/sq.cm

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All the formulae and the specifications for steel and concrete are from AIDE -MEMOIRE DUNOD in his book Béton Armé , page II4 - II9

Design of slabs ;

Salon ; games room ; library ; maids'room

Maximum dimensions : 3.50 x 4.00 meters

In short direction :

Assumed L.L. +D.L. = 550 kg/sq.m

a = 3.50/4.00 = 0.875

B .....= 0.454

Moment :

M = I/I0 x 550 x 3.5 x 3.5 = 675 kgm

Reduced M = 675 x 0.454 = 308 kgm

Effective depth:

$d = 0.369\ (308)^{I/2}$ = 6.5 cm

Thickness of slab :

t = 6.5 + 2.5 = 9.00 cm

For safety and for distributing the weight of partition walls uniformely use t = I0 cm

Steel area :

$S = 0.02379\ (30800)^{I/2}$ = 4.2 sq.cm

Use 6 round bars I0 mm per meter

In long direction :

B ..... = 0.230

Moment : M = I/I0 x 550 x 4 X 4 = 890 kgm

Reduced M = 890 x 0.230 = 204 kgm

d $= 0.369\ (204)^{I/2}$ = 5.3 cm

Area of steel $= 0.02379(20400)^{I/2}$ = 3.28 sq.cm

Use 7 round bar 8 mm per meter

Lobby , dining room and café

Maximum dimensions 5.00 x 5.00 m

In both diréctions :

L.L. + D.L. = 550 kg/sq.m

a .....= I

B .....= 0.333

Moment M = I/I0 x 550 x 5 x 5 = I370 kgm

Reduced M = 0.333 x I370 = 460 kgm

Effective depth :

$d = 0.369\ (460)^{I/2}$ = 8 cm

Thickness of slab :

= 8 + 2 = I0 cm

Steel area :

$= 0.02379\ (46000)^{I/2}$ = 5.I sq.cm

Use 8 round bars I0 mm per meter

Garage and service quarter .

Maximum dimensions : 5.00 x 3.50 m

In short direction :

a = 3.50/5.00 = 0.70

B = ...= 0.675

Moment :

M = I/I0 x 550 x 3.5 x 3.5 = 670 kgm

Reduced moment :

M = 0.675 x 670 = 460 kgm

Effective depth :

$d = 0.369\ (460)^{I/2}$ = 8 cm

Thickness of slab :

t = 8 + 2 = IO cm

Steel area :

= 0.02379(46000) = 5.I sq.cm

)Use 8 round bars IO mm per meter

IN long direction :

B .....= 0.I07

Moment : I/IO x 550 x 5 x 5 = I370 kgm

Reduced moment :

= 0.I07 x I370 = I47 kgm

Steel area :

$= 0.02379\ (I4700)^{I/2}$ = 2.88 sq.cm

Use 6 round bars 8 mm per meter

First and second floor

Sleeping room and apartments

Maximum dimensions 4.00 x 5.00 m

In short direction :

L.L. + D.L = 550 kg / sq.m

a = 4/5 = 0.80

B = ... = 0.549

Moment M = I/IO x 550 x 4 x 4 = 880 kgm

Reduced M = 0.549 x 880 = 484 kgm

Effective depth :

d = 0.369 (484) = 8 cm

Thickness of slab :

t = 8 + 2 = IO cm

Steel area :

$= 0.02379\ (48400)^{I/2}$ = 5.2 sq. cm

In long direction:

B ..... = 0.I70

Moment = I/I0 x 550 x 5 x 5 = I370 kgm

Reduced moment = 0.I70 x I370 = 230 kgm

Steel area : $0.02379(23000)^{I/2}$ = 3.6 sq.cm

Use 6 round bars I0 mm per meter

CORRIDORS

Maximum width = 2.00 m

In short direction:

L.L + D.L. = 800 kg/sq.m

Moment = I/I0 x 800 x 2 x 2 = 320 kgm

Effective depth : $= 0.369(320)^{I/2}$ = 6.8 cm

Thickness of slab :

t = I0 cm = I0 cm

Steel area :

$= 0.02379(32000)^{I/2}$ = 4.3 sq. cm

Use 6 round bars I0 mm per m

VERANDAS

Maximum width = I.00 m

Concentrated load : 0.I5 x 0.50 x 2500 = I87 kg

L.L + D.L. ..... = 800 kg

Moment :

M' = I87 x I = I87 kgm

M'' = I/2 x 800 x I x I = 400 kgm

M = I87 + 400 = 587 kgm

Effective depth:

d = $0.369(587)^{I/2}$ = 9 cm

Total thickness : 9 + 3 = I2 cm

Steel area :

$= 0.02379 \ (\ 58700)^{I/2}$ $= 5.8$ sq.cm

Use 8 round bars I0mm per m

Every third bar is bent down to help the concrete in the compression stress . At the walls and above the beams every second bar is bent up at a distance of I/5 the span to take care of the negative bending moment , the other bar continues straight down .

Under each partition wall that does not rest on a beam , or stone wall and on the middle of every sleeping room ,a concealed beam is made consisting of 2 round bars I2 mm in both sides the compression and the tension , poured with the slab and within it .

Stair case

Dimensions 6.00 x 5.00 m

It will be assumed that 50 % of the land is supported by a slab action fixed in two directions and the other 50 % is supported by a cantiliver action fixed on a 30 cm wall.

In long direction : (Slab action)

L.L. + D.L. = 800 kg/sq.m

50 % of D.L. + L.L. = 400 kg/sq.m

Inclined lenght :

$(\ 6x6 + 2.5x2.5)^{I/2}$ = 6.52 m

Moment :

$M = I/I0 \times 400 \times 6.52 \times 6.52 = I700$kgm

Effective depth :

$d = 0.368 \ (I700)^{I/2}$ = I5.5 cm

Thickness : t = I5.5 + 3.5 = I9 cm

Steel area :

$= 0.02379(I70000)^{I/2}$ = 9.9 sq.cm

Use 7 round bars I4 mm per Meter

In short direction : (cantiliver action)

L.L + D.L. = 800 kg/sq.m

50 % of(D.L. + L.L.) = 400 kg/sq.m

Moment M = I/2 x 400 x 2.2 x 2.2 = 970 kgm

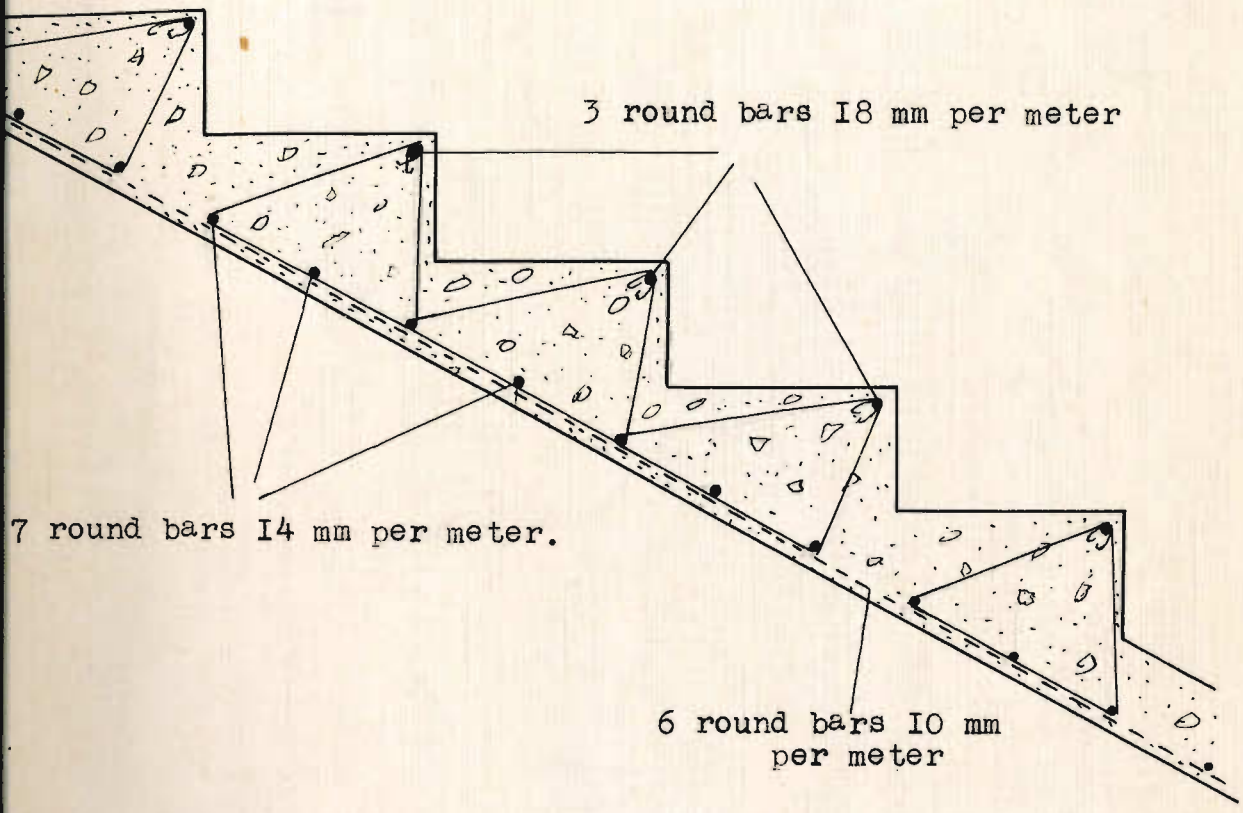
Steel area :

$= 0.02379\ (97000)^{I/2}$ = 7.4 sq cm

Use 3 bars I8 mm per m

or one bar I8 mm per step

In the longitudinal side use 6 bars I0 mm per meter to hold and tie the I4 mm bars .



Section showing the arrangement of steel bars in the stair case .

SCALE : I/IO

DESIGN OF BEAMS

Outside beams :

Beam B.I Span = 4.00 m

D.L. + L.L.

a) Outside wall :0.35 x 9 x 2500 =7850 kgm

b) Slab 2 x 550 x 3 =3.300 kg/m

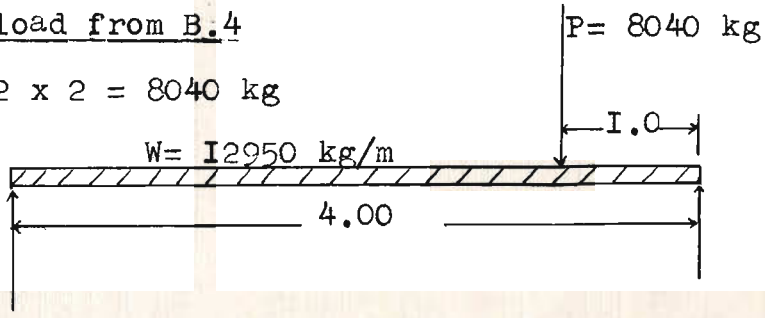
c) Verandas = 000

d) Assumed weight = I000kg/m

Total w ..... = I2950kg/m

Concentrated load from B.4

P = 20I0 x 4/2 x 2 = 8040 kg



Moments:

Moment of uniform loads:

M = I/I0 x I2950 x 4 x 4 = 20600 kgm

Moment of concentrated loads:

M = 8040 x I/4 x 2 = 4020 kgm

Total moment : 20600 + 4020 = 24620 kgm

Taking a width of beam equal to 40cm , the effective depth will be :

$d = 0.4\ (24620/0.40)^{I/2} = I.00$ m

The depth will be taken as I05 cm

Steel area :

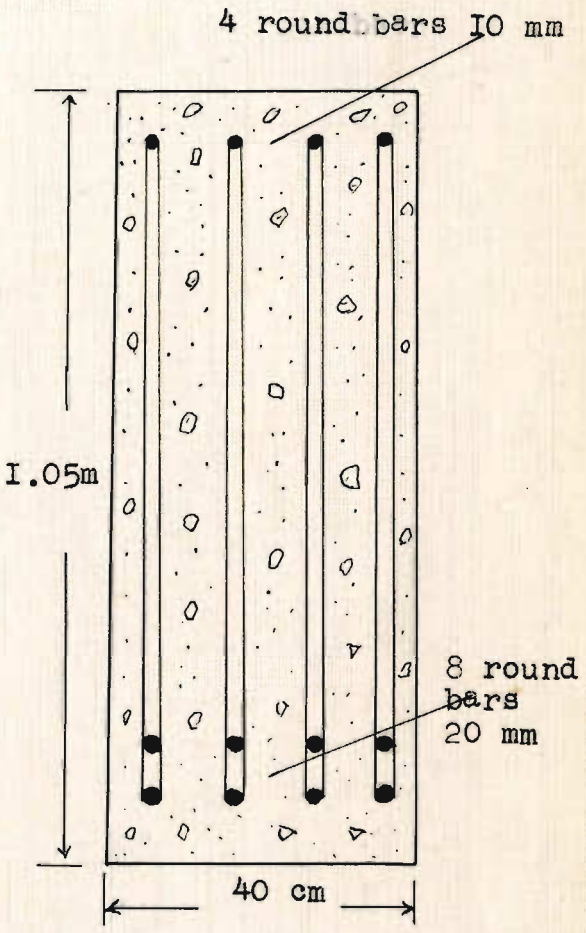
$$= \frac{2462000}{0.87 \times I200 \times I00} = 23.5 \text{ sq.cm}$$

Use 8 round bars 20 mm

Section of beam B.I

The t wo middle bars in the upper row are bent at :

0.28 x 4 = I.I5 m from each end.



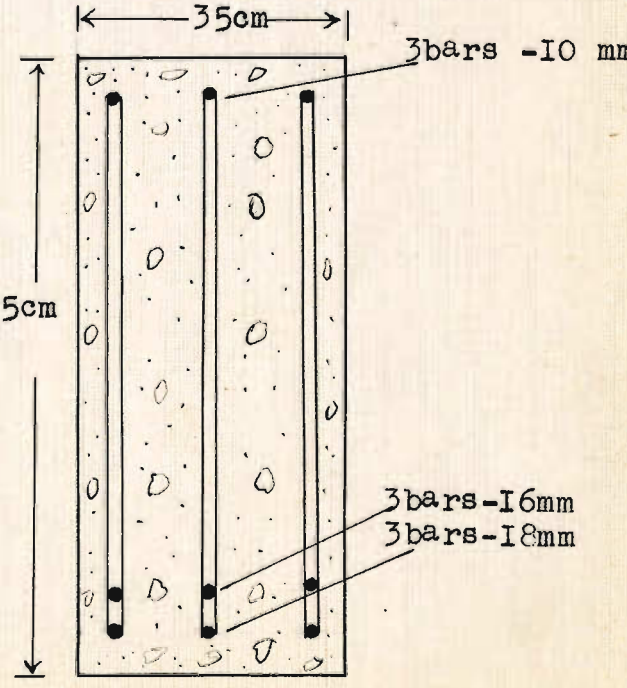
SCALE : I/IO

Section of beam B.2

The middle bar in the upper row is bent up at :

0.3 x 2.8 = 0.80m

from each end.



SCALE : I/IO

Beam B.2 Span 2.80 m

D.L. + L.L.

a) Outside wall : 0.35 x 9 x 2500 = 7850 kg/m

b) Slab 3 x 550 x 3 = 4950 kg/m

c) Verandas I x 800 = 800 kg/m

d) Assumed weight : = 900 kg/m

Total weight : I4500 kg/m

Moment :

M = I/I0 x I4500 x 2.8 x 2.8 = II300 kgm

Taking a width of 30 cm the effective depth will be :

$d = 0.4\ (II300/0.30)^{I/2}$ = 80 cm

Total depth : 80 + 5 = 85 cm

Steel area :

$$= \frac{II30000}{0.87 \times I200 \times 80} = I3.6 \text{ sq.cm}$$

Use 3 round bars I8 mm +
3 round bars I6 mm

Beam B.3 Span : 7.00 m

D.L. + L.L.

a) Outside wall : 0.35 x 9 x 2500 = 7850 kg/m

b) Slab 2.2 x 550 x 3 = 3640 kg/m

c) Verandas 2 x 800 = I600 kg/m

d) Own weight = I500 kg/m

Total w ..... = I4590 kg/m

Moment : M = I/I0 x I4590 x 7 x 7 = 7I500 kgm

Taking a width of 50 cm the effective depth will be :

$d = 0.4(71500/0.50)^{1/2}$ = 152 cm

Total depth will be :

152 + 8 = 160 cm

Steel area :

$$= \frac{7150000}{0.87 \times 1200 \times 152} = 44.8 \text{ sq.cm}$$

Use 12 round bars 22 mm

INTERIOR BEAMS

Beam B.4 Span : 7.00

D.L. + L.L.

a) Interior wall : 0.10 x 4 x 1600 = 640 kg/m

b) Slab 3 x 550 = 1650 kg/m

c) Assumed weight = 400 kg/m

Total W ..... = 2650 kg/m

Moment : 1/10 x 2650 x 7 x 7 = 13000 kgm

Height of beam below slab :

$H = (0.06 \times 1300000)^{1/3}$ = 44 cm

Effective depth =

44 + 10 - 4 = 50 cm

Steel area :

$$= \frac{1300000}{0.87 \times 1200 \times 50} = 25 \text{ sq.cm}$$

Use 8 round bars 20 mm

The width of the beam will be taken as 35 cm

Check for shear :

Reaction = 2650 x 7/2 = 9300 kg

Shear that can be resisted is : 12x35x48=20000 kg

Section of beam B.3

The section taken is (O.K.)

The first two middle bars are bent up at :

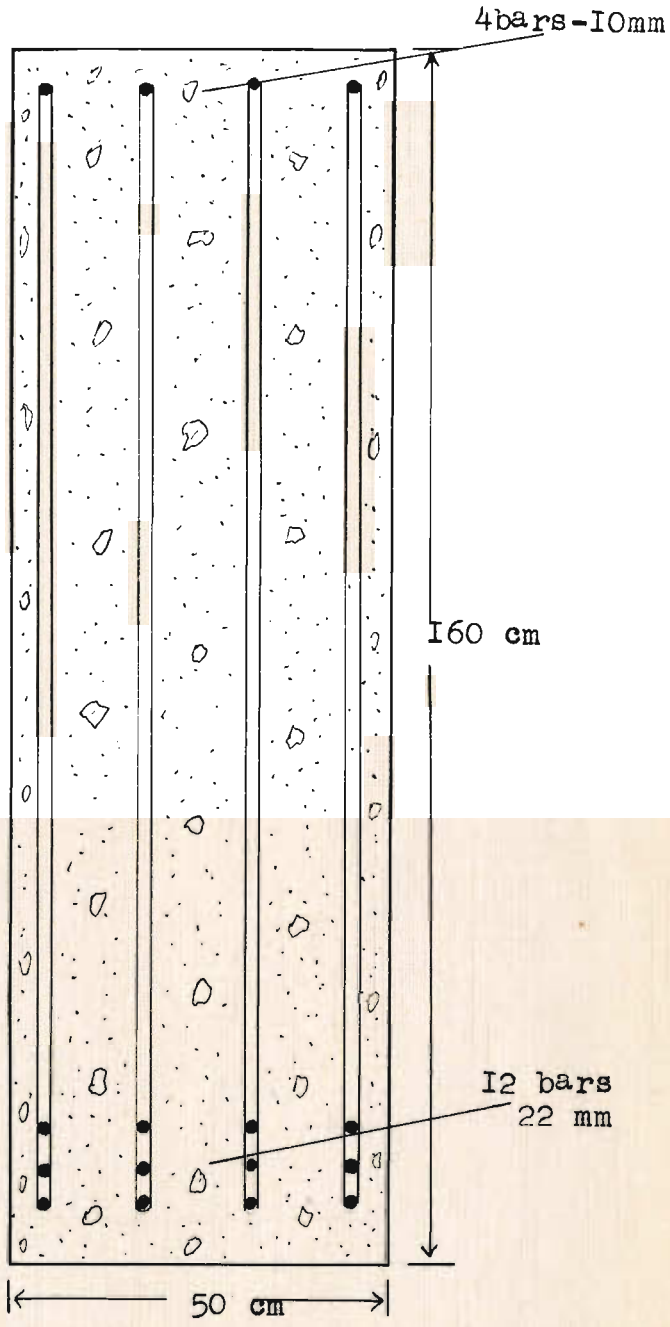
0.3 x 7 $^{+}$= 2.IO m

The two outside bars are bent up at :

0.25 x 7 = I.75 m

From each end .

SCALE :I/IO



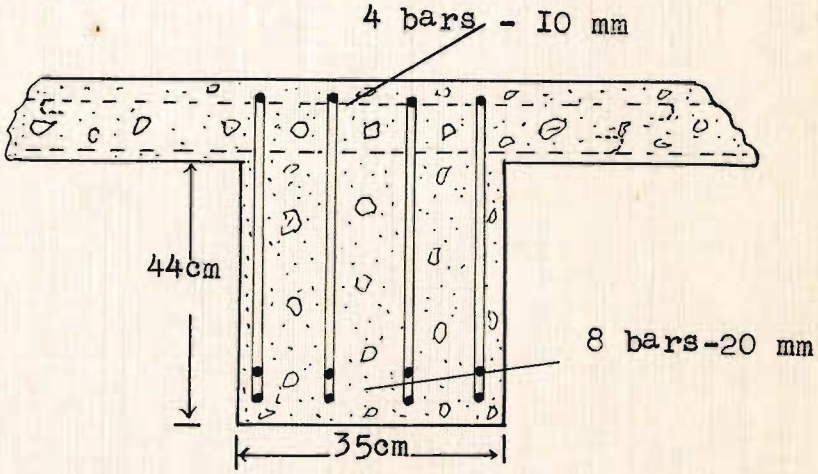
Section of beam B.4

The two middle bars are bent up at :

0.30 x 7 = 2.I0 m

The two outside bars at :

0.I5 x 7 = I.05 m



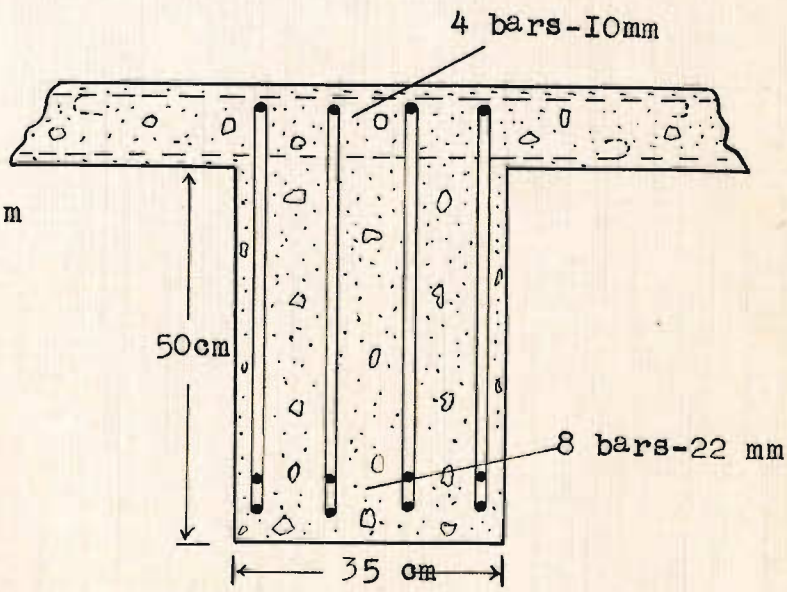
SCALE : I/I0

Section of beam B.5

The two middle bars are bent up at : 0.3 x 9 = 2.70 m

The outside two bars at :

0.I5 x 9 = I.35 m



Beam B.5 Span :9.00 m

D.L. +L.L.

a) Interior wall : 0.I0 x 4 x I600 = 640 kg/m

b) Slab I.80 x 550 = 990 kg/m

c) Assumed weight = 500 kg/m

Total W ..... = 2I30 kg/m

Moment : I/I0 x 2I30 x 9 x 9 = I7200 kgm

Depth below the slab:

$$H = (0.06 \times I720000)^{I/3} = 48 \text{ cm}$$

Assumed width = 35 cm

Effective depth

d= 50 + I0 -5 = 55 cm

Steel area :

$$= \frac{I720000}{0.87 \times I200 \times 55} = 30.\text{sq.cm}$$

Use 8 round bars 22 mm

Check for shear :

Reaction = 2I30 x 9/2 = 9600 kg

Shear that can be resisted by beam :

I2 x 35 x 55 = 23000 kg (O.K.)

Beam B.6 Span 8.00 m

D.L. + L.L.

Interior wall : 0.I0x 4 x I600 = 640 kg/m

Slab 3.75 x 550 = 2050 kg/m

Assumed weight = 400 kg/m

Total weight : 3090 kg/m

Moment : I/I0 x 3090 x 8 x 8 = I9800 kgm

Height below the slab :

$$H = (0.06 \times 1980000)^{1/3} = 50 \text{ cm}$$

Assumed width of beam = 35 cm

Effective depth =

$$d = 50 + 10 - 6 = 54 \text{ cm}$$

Steel area :

$$= \frac{1980000}{0.87 \times 1200 \times 54} = 34 \text{ sq. cm}$$

Use 8 round bars 24 mm

Check for shear .

Reaction : 3090 x 8/2 = I2360 kg

Shear that can be resisted :

I2 x 35 x 54 = 22800 kg (O.K)

Beam B.7 Span II.00 m

D.L. + L.L.

a) Interior wall : 0.I0 x 4 x I600 = 640kg/m

b) Slab 2.5 x 550 = I370 kg/m

c) Own weight = 300 kg/m

Total W = 23I0 kg/m

Moment : I/I0 x 23I0 x II x II = 28000 kgm

Reduced moment : I/3 x 28000/2 = 9350 kgm

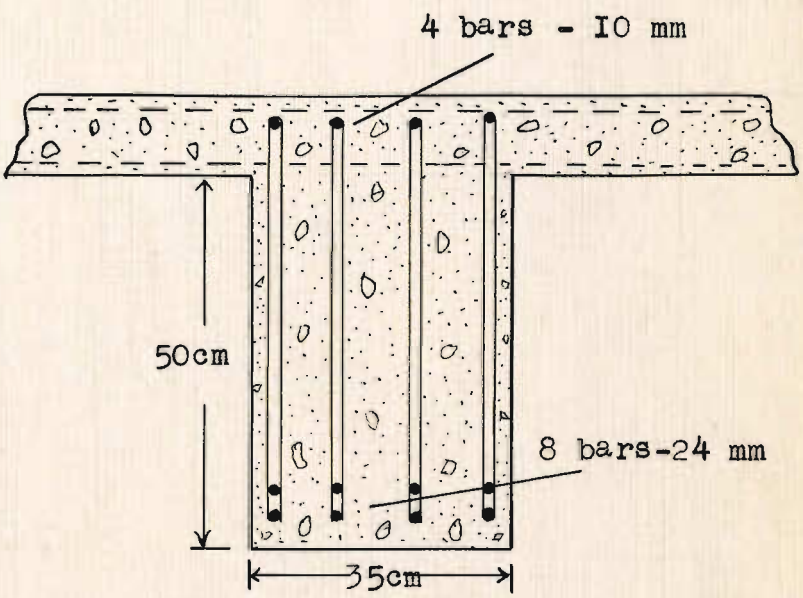
The width and depth are the same as those of beam B.6

Steel area :

$$\frac{935000}{0.87 \times 1200 \times 54} = 16.0 \text{ sq.cm}$$

Use 3 bars I8 mm

Section of beam B.6



The two middle bars are bent up at :

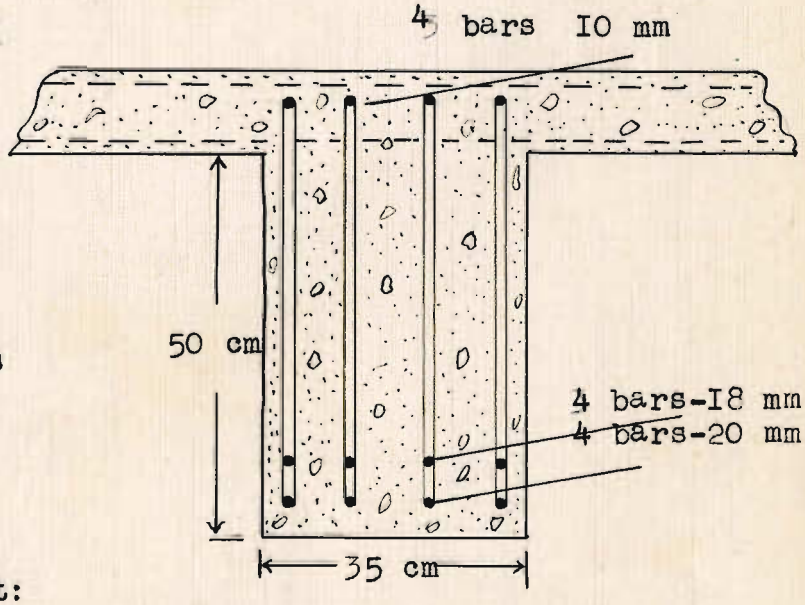
0.3 x 8 = 2.40 m

The two outside bars at:

0.I5 x 8 = I.20 m

SCALE : I/IO

Section of bean B.7



The two middle bars are bent at:

0.3 x II = 3.3 m

The outside bars at:

0.I5 x II = I.6I m from each end

Scale : I/IO

Beam B.8 Span 5.00 m

D.L.+L.L.

a) Wall

0.I5 x 4 x 2500 = I500 kg/m

b) Slab :

4 x 600 = 2400 kg/m

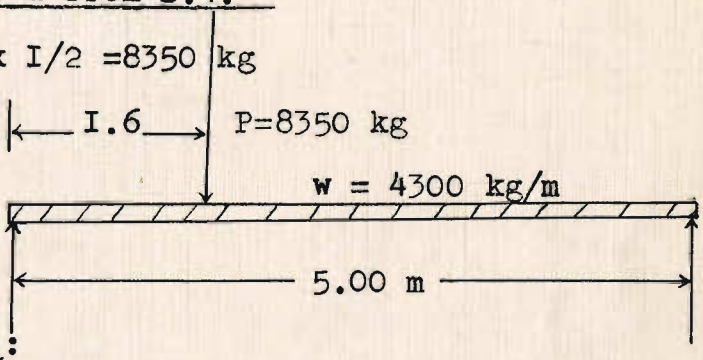
c) Own weight :

= 400 kg/m

Total W 4300 kg/m

Concentrated load from B.4.

P=2650 x 6.30 x I/2 =8350 kg



Right reaction :

= 4300 x 5/2 + 8350 x I.6/5 = I3360 kg

Left reaction :

= 4300 x 5/2 + 8350 x 3.4/5 = I6500 kg

Point of zero shear :

I3360 x I/4300 = 3.I m

Maximum moment :

$$= I3360 \times 3.I - \frac{4300 \times 3.I \times 3.I}{2} = 20700 \text{ kgm}$$

Reduced moment :

20700 x 4/5 = I6500 kgm

Depth below the slab :

$$H = (0.06 \times I650000)^{I/3} = 50 \text{ cm}$$

Effective depth :

d = 50 + I0 - 6 = 54 cm

The assumed width is : 40 cm

Steel area:

$$= \frac{I650000}{0.87 \times I200 \times 54} = 29.2 \text{ sq.cm}$$

Use 8 round bars 22 mm

Check for shear :

Maximum reaction : I6500 kg

The shear that can be resisted by the beam:

I2 x 40 x 54 = 25000 kg (O.K.)

Beam B.9. Span 2.5 m

D.L. + L.L.

a) Interior wall :

0.I0 x 4 x I600 = 640 kg

b) Slab :

2 x 550 = II00 kg

c) Own weight :

= 200 kg

Total weight per m I940 kg

Moment : I/I0 x I940 x 2.5 x 2.5 = I220 kgm

Depth below slab:

$$H = (0.06 \times I22000)^{I/3} = 25 \text{ cm}$$

Assumed width :

d= 25 + I0 - 4 = 3I cm

Steel area :

$$= \frac{I22000}{0.87 \times I200 \times 3I} = 3.78 \text{ sq.cm}$$

Use 2 bars I6 mm

Section of beam B.8.

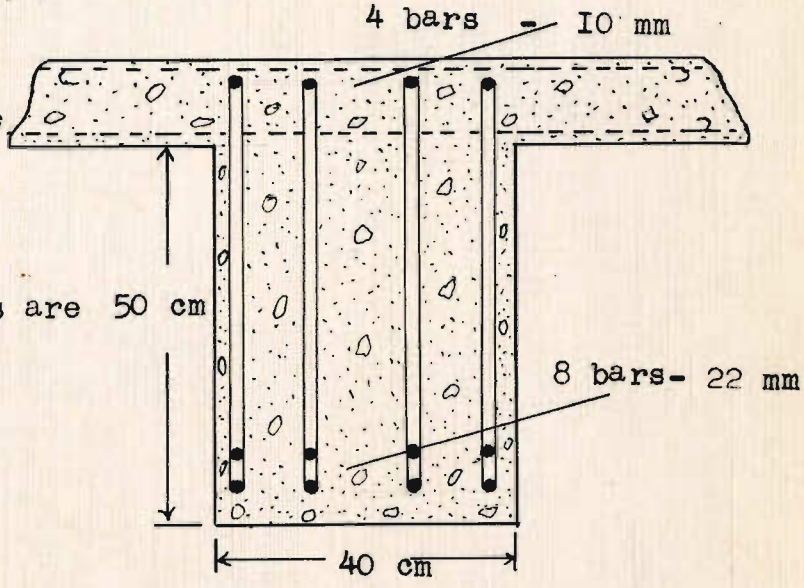
The two middle bars in the upper row are bent up at:

0;3 x 5 = I.50 m

The two outside bars are bent up at:

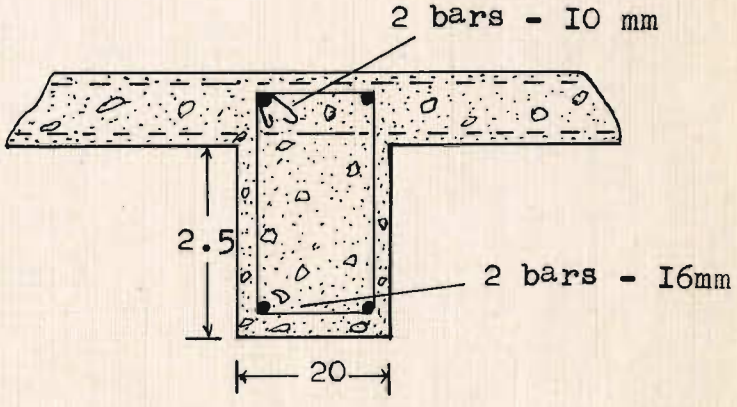
0.I5 x 5 = 0.75 m

from each end



SCALE : I/IO

Section of beam B.9



SCALE I/IO

At each floor an outside concrete belt of 20 cm width and 25 cm depth is poured with the slab. It is reinforced with two bars - I6 mm in the lower side and two bars -I4mm in the upper side .Its purpose is to tie the beams together and to distribute the reactions of the interior beams uniformly to the foundation .

The stirrups are of 6 mm round bars ; the spacing between two stirrups is I2 cm at the ends of the beam and the spacing is increased gradually 2 cm every two stirrups. The maximum spacing allowed is 35 cm .

Foundations.

Type : continuous wall

Bearing power of soil : 5 kg / sq. cm

Design ofthe outside wall foundation:

The rocky soil is at about two meters from the surface of the ground .

It will be assumed that the concentrated loads on the wall coming from the beams are transmitted to the foundations along an angle of 45°

Weight on foundation per running meter :

a) From outside wall : 0.35 xI6 x 2500 = I4000 kg/m

b) From verandas : 800 x 2 = I600 kg/m

c) Frm slabs : 550 x 2 x 3 = 3300 kg/m

d) From beam B.3. : $\frac{\text{I4590 x 7/2}}{\text{2 x 7 x tan 22° 30'}}$ = 8800 kg/m

Total weight = 27700 kg/ m

Area needed : $A = \frac{27700}{5} = 5500$ sq. cm

Width of foundation : $b = \frac{5500}{100} = 55$ cm

Allowing I0 cm from each side the total width will be

B = 55 + 20 = 75 cm

Just below the level of the ground , a reinforced concrete belt is made all around the building . It is of 45 cm and 35 cm deep . It is reinforced with 6 bars I4 mm on the upper and the lower side . Its main function is to distribute the loads uniformly to the ground and to stop any crack caused

by an unusual settlement of the foundations .

Design of inside wall foundations :

Weight on ground per running meter :

a) From inside wall : 0.20 x I5 x 2500 = 7500 kg/m

b) From slabs : 550 x 4 x 3 = 6600 kg/m

c) From beam B.4. :

$$\frac{2650 \times 7/2 \times 2 \times 3}{2 \times II \times \tan 22°.30'} = 6I00 \text{ kg/m}$$

d) From beam B.6 :

$$\frac{3090 \times 8/2 \times 2 \times 3}{2 \times II \times \tan 22° 30'} = 8000 \text{ kg/m}$$

e) From beam B.9 :

$$\frac{I940 \times 2.5/2 \times 2 \times 3}{2 \times II \times \tan 22° 30'} = I600 \text{ kg/m}$$

Total weight : 29800 kg/m

Area needed : $A = \frac{29800}{5} = 6000$ sq.cm

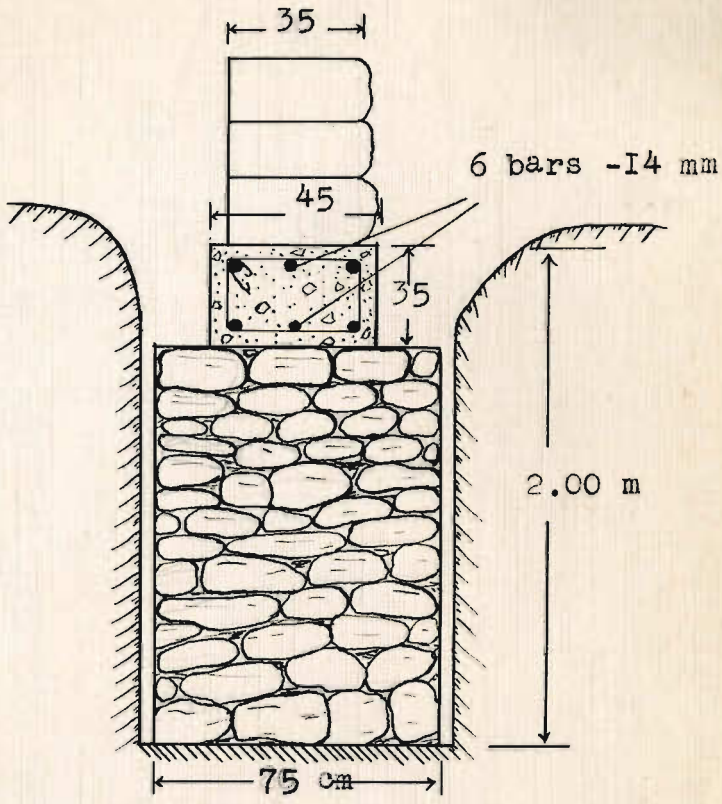
Width of foundations : $b = \frac{6000}{I00} = 60$ cm

Allowing I0 cm from each side , the total width is

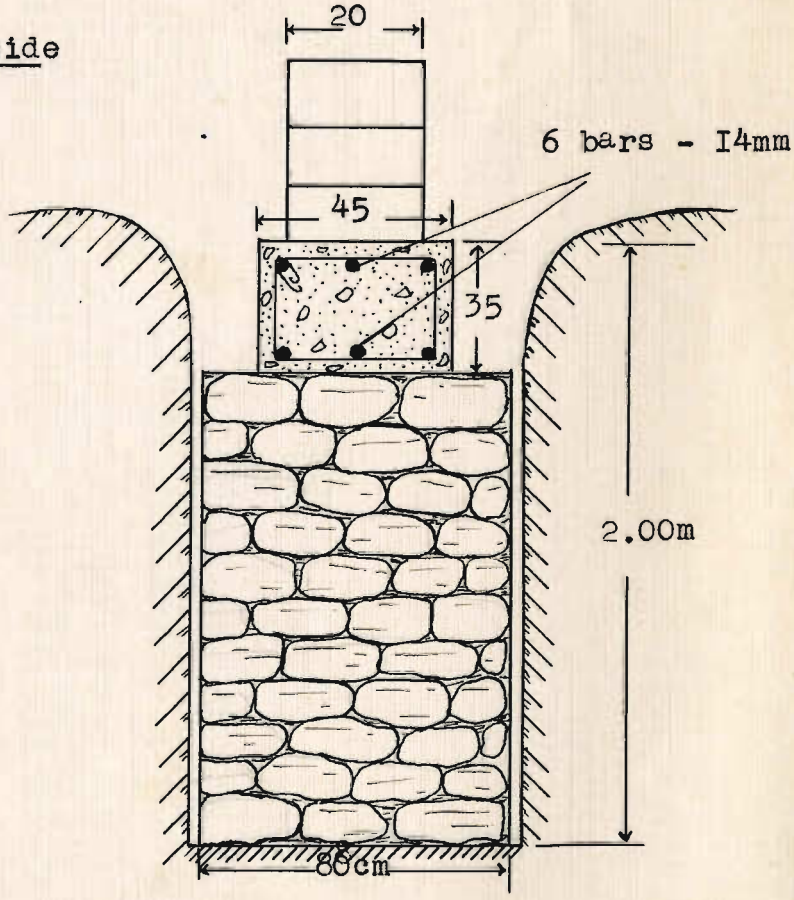
B = 60 + 20 = 80 cm

A belt of the same shape as that of the outside wall is made over every interior foundation . The reinforcement is also the same .

Section through outside wall foundation .



Section through inside wall foundation.



P A R T IV

Estimate of cost :

Almost in all engineering projects and especially in those undertaken for personal interest , an economic consideration has to be made including the sum of money which should be invested and the probable income that this project will give in return to the owner or company.

You can not expect from a student who has not yet any idea of the practical work to give you precise figures of the cost and income ,but the following considerations will show a very rough estimate .

The hotel occupies a ground area of 945 sq. m that is to say 45 x 2I . Taking an average cost of I00 L.L. per Sq.m per floor , the cost of the building will be : 945 x I00 x 3 = 285000 L.L.

The hotel is composed of 45 rooms ; supposing that each room needs 600 L.L. to be furnished , and allowing I0000 L.L. for the kitchen , dining room , salon and library , the total cost of the furniture will be approximately : 600 x 45 + I0000 = 37000 L.L.

Supposing that I5000 L.L. are needed for the garden , the swimming pool and the 20 cabins around it, the total sum needed is then :

Building ..... 285 000 L.L.

Furniture.....37 000 L.L.

Swimming .....I5 000 L.L.

Total ..... 337 000 L.L.

Income :

The hotel will not have a full house all the year through ; we can consider in general that I5 rooms out of 45 will be occupied all the year . Allowing 3 L.L. per day per room , the annual income will be then I5 x 3 x 360 = I6200 L.L

The bar can render as an average a revenue of 5 L.L. per day totalling I800 L.L. per year .

The swimming pool can be used by the public ~~almost~~ about during four months . Considering that I5 persons swim every day with 0.50 L.L. per person , the net income is then :

0.50 x I5 x 4 x 30 = I000L.L

We can finally allow as an additional income a I000 L.L. per year from dancing parties , thea parties or any social activities .

Annual income :

a) Hotel ..... I6200 L.L.

b) Bar .....I800 L.L.

c) Swimming pool .....I000 L.L.

d) Social activities .....I000 L.L.

Total ..... 20000 L.L.

The annual rate of profit will be :

$$\frac{20000 \times 100}{337000} = 6\%$$

Conclusion :

A simple look to Sofar or Souk-el-Gharb will show how much their first hotels influenced the surroundings: new buildings of modern type were erected , the cost of land nearby was raised and even in some places new small villages began to grow in the neighbouring part of the hotel .

The hotel has a wider influence ; it is a factor of civilization and a help to the improvement of the locality economically and socially . From the new foreigners and the high classes of people living in it ; new ideas , new principles and new ways of living spread over all the inhabitants, thus changing more or less slowly their old inherited traditions and their obsolete way of thinking ; besides , this hotel will need quite a large number of workers , employees and managers , so providing new jobs and prospects for any young man complaining from lack of profitable activities .

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