PLANNING AND DESIGN OF THE MAIN BUILDING OF A FIVE STAR HOTEL

A Project Report

Submitted by

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Certificate

*This is to certify that the project report entitled **"PLANNING AND DESIGN OF THE MAIN BUILDING OF A FIVE STAR HOTEL"** submitted by **Mr. Aneesh Philipose, Mr. Bejoy. P, Mr. Praveen. V, Mr. Praveen. V. S, Miss. Sujitha. K.V, and Mr. Sunley George Mathew** to the Department of Civil Engineering, College of Engineering Studies, Cochin University of Science and Technology, Kochi-22 in partial fulfilment of the requirements for the award of B.Tech.Degree in Civil Engineering is a bonafide record of work carried out by them.*

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"A hundred times everyday we remind ourselves that our inner and outer life are based on the labors of others" **-Einstein**

If words are considered as symbols of approval and tokens of acknowledgement, then let words play the heralding role of not only praising and glorification, but also to exhibit the deeply embedded feeling of thanks and gratefulness.

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Project Team

ABSTRACT

The business and tourist sector flourishing in Cochin city, we have planned and designed the construction of the main building of a five star hotel of approved standards to fulfill the needs of the current situation.

In our project, The Purple Ace, Cochin, we have aimed to satisfy the basic requirements of a five star hotel. Allocating the available space for different functions the entire structure was developed. The structure was then analysed and designed in STAAD III.

The Purple Ace, Cochin, a grand revival of true Kerala hospitality. A luxury hotel that combines business with pleasure, style with substance, form with function.

Located at Edapally, the heart of Cochin and yet free from its din and bustle. The Purple Ace is just 4 kms from Ernakulam Town railway station and 20 kms from the new Cochin International Airport at Nedumbassery. From the four-line Cochin Bye pass, you can easily nip in and out of the hotel, without getting caught in the city's crawling traffic.

The Purple Ace has 37 lavishly appointed and centrally air conditioned rooms and suites. It has two specialty restaurants, a 24-hour bar and four banquet/conference halls varying in capacity from 314.88sq m to 47.92 sq m.. Then there is the quiet and fully equipped business centre. The health centre overlooking the swimming pool completes the picture. The picture of business blending beautifully with pastime!

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ABBREVIATIONS

BIS	:	Bureau of Indian Standards
DL	:	Dead Load
LL	:	Live Load
TL	:	Total Load
c/c	:	Centre to centre

NOTATIONS

Ag	Gross Area of Concrete Section
As	Area of Steel in a Column
A_{st}	Area of Tension Steel
A_{sv}	Area of Stirrup
b	Breadth of Beam or Slab or Larger Dimension of Rectangular Column
d	Effective Depth of Beam or Slab
d'	Effective Cover to Reinforcement on Compression face
e	Eccentricity
f_{ck}	Characteristic Compressive Strength of Concrete
f_y	Characteristic Strength of Steel
I	Moment of Inertia
l	Length of Column or Span of Beam
l_x	Short Span of Slab
l_y	Long Span of Slab
m	Modular Ratio
M	Bending Moment
M_u	Factored Moment
M_{XX}	Moment about X-axis due to design loads
M_{yy}	Moment about Y-axis due to design loads
p	Percentage of steel
q_0	Net Upward Soil Pressure
S_v	Spacing of Stirrups
V	Shear force
V_u	Factored Shear Force
τ_v	Nominal Shear stress
τ_c	Permissible Shear Stress in Concrete
σ_{bc}	Permissible Stress in Concrete in bending
#	Deformed Bar

to our dear parents and friends...


PURPLE ACE

1. INTRODUCTION

Cochin, the queen of the Arabian Sea has recently witnessed unprecedented trends of urbanisation, which have been influenced by the backwaters bordering its edges. With the Cochin city progressing at a very fast pace in the commercial sector, major projects have been undertaken to quench the forth coming needs. Technology soaring heights, its impact is clearly visible in this small, beautiful city.

Cochin City, a blend of beauty and technology, has become a major attraction for both tourists and business entrepreneurs. Though, towards the core, which is heavily charged with meaning and activity, the suburbs of this city are in the process of clinging to the standards. With the functioning of the new Cochin International Airport at Nedumbassery, India's second largest, the need for hotels of approved standards and hospitality arose in its proximity. Since accessibility is the key for not only functional but also psychological reasons, the selection of site should suit the appropriate needs.

Our project, the planning and design of the main building of a five star hotel, has aimed at filling this void. The project was developed in order to incorporate the analysis and design part of civil engineering. Our project, is the accomplishment of the structural design of the main building of the hotel, The Purple Ace, Cochin.

1.1 AIMS

The main aim of our project was to apply practically, the various theories we have studied in the last four years. Apart from the functional planning and main structural design, the landscape development is also made with a view of the perspective developed in 3D-Studio Max.

1.2 METHODOLOGY

The study is done in two phases

(i) Planning

(ii) Design

Planning included book reviews, site visits etc. which formed the basis of our study.

The second phase comprised of developing a functional plan/master plan in accordance with the latest standards and the functional requirements of the building. Then modelling of the structure was done in STAAD III. The complete analysis and design of the structure was done in STAAD III. A single frame was selected, analysis and design of the building was done manually. Various structural components comprising slabs, stair, lintels, retaining wall and pile foundations were designed manually. Manual design confirms to the Indian standards as per the different codes of the bureau of Indian standards. The load calculations and analysis results together with the design of the various structural members are recorded in tables.

1.3 SCOPE

The scope of the study encompasses various aspects in the structural analysis and design of a building using STAAD III. Nowadays, most of the civil engineering projects are done using this software. Having done this project it enabled us to gain exposure in various computer applications related to civil engineering.

1.4 LIMITATIONS

Due to the complexity and size of the project, manual analysis and design of the complete structure could not have been done. Moreover, many advanced structural designs have been avoided. The roof slab of the main porch and also large span slab of the lobby could have been designed as grid and coffered floor. Also the stairs could have been designed as folded plates. In order to reduce the number of pages in report only the analysis and designs of typical frame selected has been kept. The structural drawings were also limited to the particular frame. The STAAD input file is kept in the report so that the structure can be developed in the software for further investigation and development of the structure.

The main constraint in the completion of the project was time. However the project was successfully completed in the restricted time.

Functional Planning

2. FUNCTIONAL PLANNING

The main building of the hotel has 37 lettable rooms. The locality including the immediate approach and environs are suitable for the hotel.

- The distance from Cochin International Airport is 20 km.
- The distance from Ernakulam Town railway station is 4 km.
- The main shopping area is 2 km away.
- All public rooms and private rooms are well appointed and fully air-conditioned.
- All rooms have attached bathrooms.
- The kitchen, pantry and cold storage are designed to ensure efficiency of operation and well equipped.
- Ladies and Gentlemen's cloakrooms are clean and equipped with furniture and fittings of a standard befitting a hotel of this category.

➢ CONSTRUCTION

A splendid ten storeyed structure where symmetry and simplicity being the tone of construction. Through a straight tree lined driveway the visual impact of the awesomely huge structure, its vast lawns and spaciousness delights and almost takes ones breath away. Luxuriously spacious rooms with high ceilings add to the distinctiveness of the facade, architectural features and the general constructions of the building.

➢ MAINTENANCE

Maintenance of the structure is given top priority so that the building functions in accordance with the approved standards. The responsibility is handed over to different specialised groups.

➢ PARKING

Ample parking space is provided in the front and towards the side of the structure as per the requirements. Provision for parking at the front and covered parking towards the sides is given. Tree linings provide shade to the parking area.

➢ SWIMMING POOL

A well-designed and properly equipped swimming pool is provided at the rear with access from basement floor. Various accessories like a Pool bar, a Sauna, Jacuzzi and a health club adds to the comfort and convenience.

➢ BATHROOMS

Bathrooms are modern in design and well equipped with fittings of the best available quality befitting a hotel of this category, with 24-hour services of hot and cold water. The floors and walls are covered with impervious materials of good design and workmanship.

➢ RECEPTION

A reception and information counter attended by trained and experienced personnel is placed near the main entrance.

➢ LOBBY

An extravagantly spacious lobby with an atmosphere of comfort and convenience makes the difference. The flood of light from the panelled glass surrounding it brings living quality to the lobby. The tall columns adorned with wooden carvings add to the third dimension of height. If space can do some magic, we have done it with an atrium which enhances space.

➢ CONFERENCE FACILITIES

Four fully air conditioned conference/banquet halls are provided on the first floor. The quality of space and environment within the conference room and the banquet hall contributes greatly towards the reflection of its purpose. Separate access has been provided through lifts and stairs exclusively for these areas.

➢ SHOPPING FACILITIES

A travel agency, foreign exchange, pharmacy, gift shop, bakery and a flower shop are included in the hotel. All these units are well arranged to blend with the total functioning of the hotel. Access has been provided from within the building in the ground floor.

➢ LIFTS

For the smooth and easy vertical transportation of clients within the building four efficient lifts are provided from the lobby. A service lift, which connects kitchen, makes catering to various floors of the building effective.

➢ FURNISHING OF BEDROOMS

All guest rooms are comfortable, adequate in size and well furnished, with properly textured curtains, carpets, etc in good taste. The architectural envelopes of these rooms are clean lined and fully live up the promise of the outside.

➢ LIGHTING

Believing lights can do magic, lighting arrangements and fixtures in the entire building are designed to ensure functional excellence.

➢ COMMUNICATIONS

A telephone connection is provided in each room for the use of guest and visitors. Provision for television and Internet access is given in each room.

➢ RESTAURANTS

Well-equipped, well-furnished restaurants are provided with 24hours food and beverage service. The interior spaces work well around a central circulation area with stand-up facilities and an assortment of counters.

➢ BAR

An elegant well furnished bar/permit room with an atmosphere of comfort, to serve hot and cold beverages is provided. Black is strong here giving depth to the picture. The room is dim lit with ceiling of dark shades, which adds to its essence. Floors are given lighting and the dark colour gives it a surrounding, to unwind after a hard day of boredom battles and brainstorming. Let the spirits of our clients soar as the sun sets on every eventful day.

➢ HYGIENE

The kitchen, pantry and cold storage is clean and organized for efficiency. Scientific and hygienic methods are used in working and for the washing of glasses, crockery, cutlery etc.

➢ HOUSE KEEPING

Housekeeping is provided at the highest possible standard. The various records, keeping track of the functioning of different units are well maintained and sufficient space is allocated for this purpose.

➢ SAFETY MEASURES

Sprinklers and smoke detectors are provided on each floor. There is an emergency fire exit having access to all floors.

➢ OTHER SERVICES

24-hour service is provided for reception, information and telephones. Provision for reliable laundry and dry-cleaning services is given. Keeping in view of the comfort and pleasure of our guests, various services such as Internet access, Jacuzzi, sauna, pub and discotheque are given. A uniquely placed space for antiques, handicrafts, etc makes it a dream world of experience.

2.1 FUNCTIONAL FEATURES

- **Ground Floor**

On entering Purple ace, the first thing that our eyes light upon is the reception, lobby and lounge. The reception covers an area of 78.87sq m..The waiting area can accommodate more than 30 guests at a time. The lobby covers an area of 158.83sq m and has access to lifts, stairs, restaurant, bar and to the shopping area. Four lifts are provided from the lobby of which two of them have access to all floors and the other two to the first floor, to minimize the crowd from the banquet hall/conference rooms. The restaurant has an area of 232.89 sq m. Moving towards the right we can see a bar having an area of 123.26 sq m. Kitchen, one of the most important part of the hotel occupies 461.97 sq m. The shopping area covers an area of 69 sq m.

- **First Floor**

As we move on to the first floor, there are three banquet/conference rooms and a fully equipped business centre. The first conference room is a quietly elegant room for board meetings and private discussions having a capacity of 50 to 75 pax. The second one has a capacity of 40. The fully equipped and well-staffed business centre has a lounge and two cabins for private discussions, complete with computers, phone, fax, photocopying facilities and supported by efficient secretarial assistance. A multi cuisine specialty restaurant, which can accommodate 100 guests at a time, covers an area of 221.76 sq m. It also houses the Managing Director and General Manager's cabins, which covers an area of 150 sq m close to the181.34 sq m office room.

- **Second Floor**

The second floor consists of a lobby and a corridor. Guest rooms start from this floor. It has a Presidential suite, two king size suites, two queen size suites, and two twin bed rooms.

- **Typical Floors**

These floors house five guest bedrooms which includes one king size suite , two twin rooms and two queen size suite for each floor.

- **Basement Floor**

The basement floor has a health centre, which also houses a gymnasium, jacuzzi, sauna, steam bath, ayurvedic massage centre and a laundry. A pub and discotheque is provided to add colour and essence to its functioning.

- **Other Features**

The Purple Ace, Cochin has gorgeously landscaped lush green lawns most ideal for wedding receptions and cocktail parties. Overlooking the lawns there is a restaurant, which depicts the typical Kerala style of temple architecture. It also has a King size swimming pool and tiny baby pool.

Structural Analysis

3. STRUCTURAL ANALYSIS

The analysis of the entire structure is done in STAAD III due to restricted time available. Hence a single frame is selected and manual analysis is done. The analysis is done by the moment distribution method .In this method all the members of the structures are initially assumed fixed at the ends, in position and direction, and fixed end moments due to external loads are worked out. The joints are assumed to be locked and the external moments and forces are applied to achieve fixity of the members at the joints .The external moments are called unbalanced moment and the external forces are called sway forces .The external moment is applied to prevent rotation of the joints and the external forces are applied to prevent displacement of the joints .The restraints provided at a joint are released and their effects on the joint and other joints are evaluated. One by one all the joints are released and the effects are evaluated this process is continued till the external moments or forces at the joints are zero or negligible.

3.1 LOAD CALCULATIONS

The different loads on the structure are taken based on the relevant Indian Standard Specifications BIS 1987. The following loads were considered for the design.

3.1.1 Live load

- Banquet hall 5kN/mm^2
- Other areas 3kN/mm^2

3.1.2 Dead load

- Dead load of concrete 25kN/m^3
- Dead load of brick wall 22kN/m^3

For the purpose of structural analysis a preliminary load study was done to know the sizes of beams and columns. The design of slabs and stairs were done and their loads were used for the analysis of the structure.

3.2ANALYSIS OF BEAMS

The analysis is done by the moment distribution method .In this method all the members of the structures are initially assumed fixed at the ends, in position and direction, and fixed end moments due to external loads are worked out. The joints are assumed to be locked and the external moments and forces are applied to achieve fixity of the members at the joints .The external moment is called unbalanced moment and the external forces are called sway forces .The external moment is applied to prevent rotation of the joints and the external forces are applied to prevent displacement of the joints .The restraints provided at a joint are released and their effects on the joint and other joints are evaluated. One by one all the joints are released and the effects are evaluated and this process is continued till the external moments or forces at the joints are zero or negligible.

Table No.1 ANALYSIS OF BEAMS

Joint	A			B				C				D		
Member	AA^1	AA^{11}	AB	BB^1	BB^{11}	BA	BC	CC^1	CC^{11}	CB	CD	DD^1	DD^{11}	DC
DF	0.33	0.56	0.11	0.30	0.51	0.10	0.09	0.10	0.21	0.16	0.53	0.08	0.18	0.45
FEM	-	-	-58.24	-	-	58.24	-56.46	-	-	56.46	-3.92	-	-	3.92
Distribution	19.21	32.61	6.41	-0.53	-0.90	-0.178	-0.16	-5.25	-11.03	-8.40	-27.85	0.82	1.85	4.63
Carry over	-	-	-0.089	-	-	3.205	-4.20	-	-	-0.08	2.315	-	-	-13.925
Distribution	0.029	0.05	0.009	0.30	0.51	0.10	0.09	-0.22	-0.47	-0.36	-1.18	-1.23	2.77	6.94
Carry over	-	-	0.05	-	-	0.0045	-0.18	-	-	0.0045	3.47	-	-	-0.59
Total moment	19.239	32.66	-51.86	-0.23	-0.39	61.37	-60.91	-5.47	-11.5	47.62	-27.17	2.05	4.62	0.975

Joint		E				F				G				
Member	DE	EE^{1}	EE^{11}	ED	EF	FF^{1}	FF^{11}	FE	FG	GG^{1}	GG^{11}	GF	GH	HH^{1}
DF	0.29	0.08	0.18	0.29	0.45	0.11	0.22	0.55	0.12	0.18	0.38	0.22	0.22	0.21
FEM	-14.20	-	-	14.20	-3.92	-	-	3.92	-100.15	-	-	100.15	-100.15	-
Distribution	2.98	-0.82	-1.85	-2.98	-4.63	10.59	21.17	52.93	11.55	-	-	-	-	-13.51
Carry over	-1.49	-	-	1.49	26.465	-	-	-2.315	-	-	-	5.775	-9.325	-
Distribution	4.47	-2.24	-5.03	-8.11	-12.58	0.25	0.51	1.27	0.28	0.639	1.35	0.78	0.78	-0.13
Carry over	-4.05	-	-	2.235	0.635	-	-	-6.29	0.39	-	-	0.14	-0.09	-
Total moment	-12.29	-3.06	-6.88	6.835	5.97	10.84	21.68	49.51	-87.93	0.639	1.35	106.845	-108.785	-13.64

Joint	H			I				J				K		
Member	HH^{11}	HG	HI	II^{1}	II^{11}	IH	IJ	JJ^{1}	JJ^{11}	JI	JK	KK^{1}	KK^{11}	KJ
DF	0.21	0.29	0.29	0.19	0.19	0.26	0.36	0.30	0.50	0.10	0.10	0.33	0.56	0.11
FEM	-	100.15	-35.83	-	-	51.74	-56.47	-	-	56.47	-58.24	-	-	58.24
Distribution	-13.51	-18.65	-18.65	0.90	0.90	1.23	1.70	0.53	0.89	0.177	0.177	-19.22	-32.61	-6.41
Carry over	-	-	0.615	-	-	-9.325	-0.88	-	-	0.85	-3.205	-	-	0.88
Distribution	-0.13	-.18	-0.18	1.76	1.76	2.40	3.33	0.71	1.18	0.240	0.24	-0.29	-0.49	-0.096
Carry over	-	0.39	1.2	-	-	-0.09	0.12	-	-	1.665	-0.048	-	-	0.12
Total moment	-13.64	81.71	-52.85	2.66	2.66	45.95	-51.23	1.24	2.07	59.40	-61.07	-19.51	-33.10	52.73

Structural Design

4. STRUCTURAL DESIGN

The design of the structural members is done using the limit state method of design. This method is selected for doing the design, mainly due to the fact that it considers a factor of safety for the design with which the members are designed. The design of members by this method is commonly practised nowadays mainly due to its reliability over the working stress method. All designs are done according to the provisions of the Bureau of Indian Standards.

4.1 DESIGN OF SLABS

Slabs are plate elements forming floors and roofs of buildings and carrying distributed loads primarily by flexure. A slab may be supported by beams or walls and may be used as the flange of a T-beam or L-beam. Moreover a slab may be simply supported, or continuous over one or more supports and is classified according to the manner of support

- One way slabs spanning in one direction
- Two way slabs spanning in both directions
- Circular slabs
- Flat slabs resting directly on columns with no beams and
- Grid floors and ribbed slabs.

In this project we are dealing with the first two types of slabs. Slabs are designed by using the same theories of bending and shear as are used for beams. The following methods of analysis are available.

- Elastic analysis → idealisation into strips or beams
- Semi empirical coefficients as given in the code and
- Yield line theory

If the cross section areas of the three basic structural elements beam, slab and column are related to the amount of steel reinforcement provided, it will be seen that the percentage steel is usually maximum in a column than in a beam and the last in a slab.

The distinction between a beam and a slab can be made as follows.

- Slabs are analysed and designed as having a unit width that is, 1m wide strips.
- Compression reinforcement is used only in exceptional cases in a slab.
- Shear stresses are usually very low and shear reinforcement is not provided. It is preferred to increase the depth of a slab and hence reduce the shear stress rather than provide shear reinforcement.
- Slabs are usually much thinner than beams.

Slabs, which are having length more than twice the breadth, are called one-way slabs (i.e., ly/lx ratio >2). When slabs are supported on four sides, two way spanning occurs. Such slabs may be simply supported or continuous on any or all sides.

For the accurate analysis and design, the loads that are likely to come should be estimated to a good degree of accuracy. We have adopted the Indian standard code of practice for plain and reinforced concrete IS 456 – 1978 in our project. The live load for slabs, which are considered to be a gathering area (Banquet hall) is taken as $5kN/m^2$. The load on roof slab is also taken as $3kN/m^2$ as provision for roof top restaurant is given. As per code of practice for design loads for buildings and structures IS 875 – 1987, we have taken the load of concrete as $25kN/m^3$ and of brickwork as $22kN/m^3$.

The slabs in this project are analysed using elastic theory and designed using limit state method. The elaborate design of a two way slab and a one way slab is shown and all other slabs have been done using a computer program written in C language and details are furnished in tabular form. We have used M_{20} concrete and Fe415 steel through out the design.

4.1.1 Design of Two Way Slab

This slab is an interior panel. i.e., all edges are continuous. Using M_{20} concrete and Fe415 steel.

Assuming an overall depth of 230mm i.e. 230mm

Using 12mmϕ bars and providing 15mm clear cover.

Effective spans

$l_y = 6.14 + (0.23 - 0.006 - 0.015) = 6.349\text{m}$

$l_x = 5.89 + (0.23 - 0.006 - 0.015) = 6.099\text{m}$

$$l_y/l_x = \frac{6.349}{6.099} = 1.04 < 2$$

Hence it is a two-way slab

Loads

Considering width of slab	=	1m
Dead load	=	$1 \times 0.23 \times 25 = 5.75\text{kN/m}^2$
Live load	=	$1 \times 5 = 5\text{kN/m}^2$
Load due to finishes	=	0.7kN/m^2
Total load, w	=	11.45kN/m^2

Bending moments

There will be negative moment at continuous edge and positive moment at mid span.

$$M_x = \alpha_x w l_x^2$$

$$M_y = \alpha_y w l_x^2$$

Calculating the value of Bending Moment Coefficients.

$$\alpha_x\ (\text{-ve}) = 0.32 + \frac{(.037\text{-}.032)}{(1.10 - 1.0)}(1.04 - 1) = .034$$

$$\alpha_x\ (\text{+ve}) = 0.024 + \frac{(.028\text{-}.024)}{(1.10 - 1.0)}(1.04 - 1) = .0256$$

α_y (-ve) = 0.032

α_y (+ve) = 0.024

M_x (-ve) = $0.034 \times 11.45 \times (6.09)^2 \times 1.5$

= 21.66kNm

M_{ux} (+ve) = $0.0256 \times 11.45 \times (6.09)^2 \times 1.5$

= 20.385kNm

M_{uy} (+ve) = $.24 \times 11.45 \times (6.09)^2 \times 1.5$

= 15.285kNm

Check for depth

$$d = \sqrt{\frac{M}{Rb}}$$

$$R = 0.36\ \frac{X_{umax}}{d}\left(1 - 0.42\ \frac{X_{umax}}{d}\right) \cdot f_{ck}$$

$$= 0.36 \times 0.48\ (1 - 0.42 \times 0.48)20 \quad = 2.759$$

$$d_{req} = \sqrt{\frac{21.66\times10^6}{2.759\times1000}} = 88.60\text{mm} < d_{available}$$

Hence Safe

Reinforcements

Mid span

$$Ast_{xx} = \frac{M_{x+ve}}{0.87\times f_y \times d \times a_l}$$

$$a_l = 1 - \frac{0.42x_u\ max}{d}$$

$$= 1 - 0.42\times 0.48 = 0.80$$

$$Ast_{xx} = \frac{16.305\times10^6}{0.87\times415\times209\times0.80}$$

$$Ast_{min} = \frac{0.12}{100} \times b \times D$$

$$= \frac{0.12}{100} \times 1000 \times 230 = 276mm^2$$

So providing minimum reinforcement

$$\text{Spacing} = \frac{113}{276} \times 1000 = 409mm$$

From code maximum spacing is the least of 3d and 450mm.

3d = 3 × 209 = 627mm

Provide 12mm ϕ bars @ 400mm c/c

$$Ast_{yy} = \frac{15.285 \times 10^6}{0.85\times415\times197\times0.8} = 274.9mm^2$$

Provide 12mm ϕ bars @ 400mm c/c

At the Edges

$$Ast_{xx} = \frac{21.66\times10^6}{0.85\times415\times209\times0.8} = 358.8mm^2$$

$$\text{Spacing} = \frac{113}{358.8} \times 1000 = 314.9mm$$

Provide 12mmϕ bars @ 310mm c/c

$$Ast_{yy} = \frac{20.385\times10^6}{0.85\times415\times197\times0.8} = 366.6mm^2$$

$$\text{Spacing} = \frac{113}{366.6} \times 1000 = 308mm$$

Provide 12mm ϕ bar @ 300mm c/c

Corner reinforcement

Area of corner reinforcement $= \dfrac{3}{4} \times$ max: positive reinforcement area

$= 202.5\ \text{mm}^2$

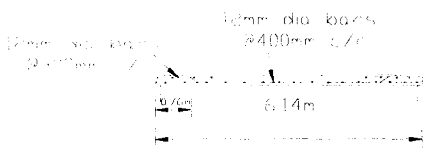
Size of corner mesh $= 0.2 \times 5.89\text{m} = 1.17\text{m}$

Check for deflection

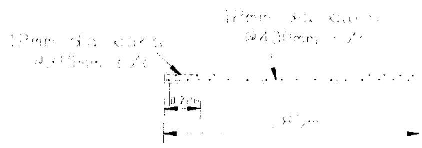
$$\frac{l_x}{d \times mf} = \frac{6.09}{0.209 \times 1.6} = 18.21 < 26$$

$$\frac{l_y}{d \times mf} = \frac{6.349}{0.209 \times 1.6} = 20.1 < 26$$

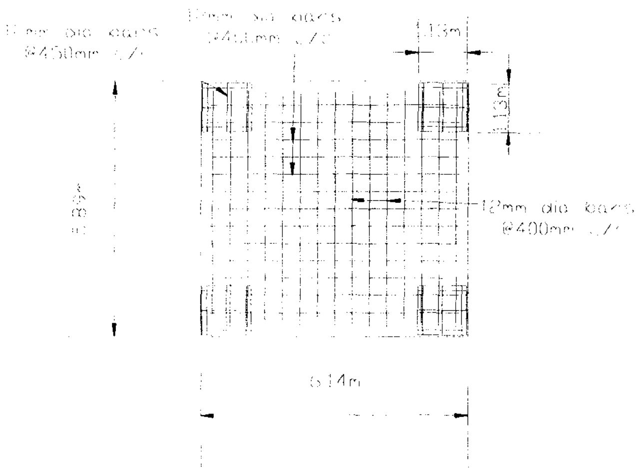
Hence safe.



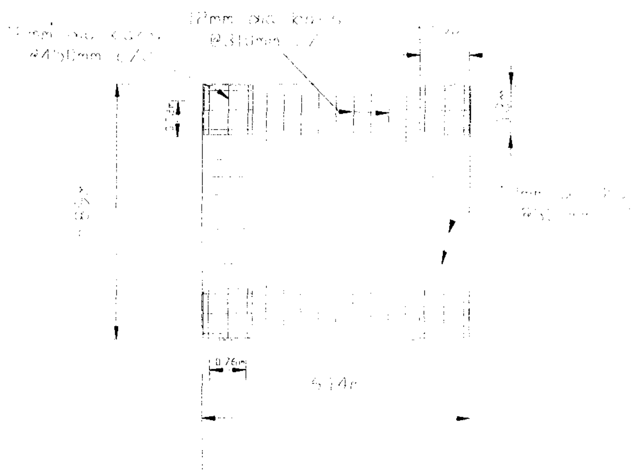
Section along long span



Section along short span



Plan of bottom reinforcement



Plan of top reinforcement

4.1.2 Design of one way slab

l_y = 7.43m

l_x = 2.0m

$$\frac{l_y}{l_x} = \frac{7.43}{2.0} = 3.7 > 2$$

Hence one way slab

Assuming a depth of 100mm

Loads

Dead load = $1 \times 1 \times .1 \times 25$ = 2.5kN/m^2

Finishes = 0.7kN/mm^2

Live load = 3kN/m^2

Total Load = 6.2kN/m^2

Bending Moments

$$M_{max} = \frac{Wl^2}{8}$$

$$= \frac{1.5 \times 6.2 \times 2.1^2}{8} = 5.13\text{kNm}$$

Check for depth

$$d = \sqrt{\frac{M_{max}}{R_b}}$$

$$= \sqrt{\frac{5.13 \times 10^6}{2.75 \times 1000}} = 43.19\text{mm} < 79\text{mm}$$

Hence O.K.

Main Reinforcement

$$\text{Ast} = \frac{5.13 \times 10^6}{0.87 \times 415 \times 79 \times 0.8} = 224.81\text{mm}^2$$

$$Ast_{min} = \frac{0.12bD}{100}$$

$$= \frac{0.12}{100} \times 1000 \times 100 = 120mm^2$$

$$\text{Spacing} = \frac{113}{224.81} \times 1000 = 502.6mm$$

Provide 10mm ϕ bars @ 240mm

Distribution steel

Provides minimum reinforcement as distribution steel, Ast $= 120mm^2$

Using 8mm ϕ bars

$$\text{Spacing} = \frac{50.2}{120} \times 1000 = 418mm$$

Provide 8mm ϕ bars @ 310mm c/c.

4.1.3 Computer Programme For Design Of Slabs

```
#include<stdio.h>
#include<math.h>
main()
{
float Lx,Ly,dx,q,bd,LL,mf1,mf2,d,dy,D,factor,lx,ly,b,DL,w;
float Mxpos, Mypos, Mxneg, Myneg, Mmax, dben, Abar, Axpos, Aypos;
float Axneg,Ayneg,Amin,sxpos,sypos,sxneg,syneg,ptensrft1;
float ptensrft2,ratio1,ratio2,deflnx,deflny,sdbn;
float alpha1,alpha2,alpha3,alpha4,a1,a2,b1,b2,nlr1,nlr2,nhr1,nhr2;
printf("Enter Ly & Lx in mm\n");
scanf("%f %f",&Ly,&Lx);
ratio1=Ly/Lx;
if (ratio1<2)
{printf("Two way slab\n");
d=Lx/26;
printf("Depth=%fmm\n",d);
printf("enter your depth in mm\n");
scanf("%f",&dx);
printf("Enter bar dia used in mm\n");
scanf("%f",&bd);
dy=dx-bd;
D=dx+15+bd/2;
printf("Overall depth=%fmm\n",D);
lx=Lx+D-15-0.5*bd;
ly=Ly+D-15-1.5*bd;
printf("Effective span lx=%f mm\n",lx);
printf("Effective span ly=%f mm\n",ly);
printf("Enter Liveload in KN/m\n");
scanf("%f",&LL);
b=1000;
DL=25*D/b;
```

```
w=LL+DL+0.7;
printf("Total load w=%f Kn/sq.m\n",w);
printf("ratio1=%f\n\n",ratio1);
printf("Enter values for alphaxpos:a1,a2,nlr1,nhr1\n\n");
scanf("%f%f%f%f",&a1,&a2,&nlr1,&nhr1);
alpha1=a1+(((a2-a1)*(ratio1-nlr1))/(nhr1-nlr1));
printf("Enter values of alphaypos\n\n");
scanf("%f",&alpha2);
printf("Enter values of alphaxneg:b1,b2,nlr2,nhr2\n\n");
scanf("%f%f%f%f",&b1,&b2,&nlr2,&nhr2);
alpha3=b1+(((b2-b1)*(ratio1-nlr2))/(nhr2-nlr2));
printf("Enter values of alpha4\n\n");
scanf("%f",&alpha4);
printf("alpha1=%f\n alpha2=%f\n",alpha1,alpha2);
printf("alpha3=%f\n alpha4=%f\n",alpha3,alpha4);
q=(w*lx*lx*1.5)/(1000000);
Mxpos=alpha1*q;
Mypos=alpha2*q;
Mxneg=alpha3*q;
Myneg=alpha4*q;
printf("Mxpos=%f\n Mypos=%f\n Mxneg=%f\n Myneg=%f\n",
                        Mxpos, Mypos, Mxneg, Myneg);
ratio2=ly/lx;
Mmax=Mxpos;
if(Mypos>Mmax)
Mmax=Mypos;
if(Mxneg>Mmax)
Mmax=Mxneg;
if(Myneg>Mmax)
Mmax=Myneg;
printf("Mmax=%f KNm\n",Mmax);
dben=sqrt(Mmax*1000000/(2.75*b));
```

```
if(dben>dx)
{printf("Assumed depth is insufficient Revise\n");
}
else
{printf("Assumed depth is sufficient Depth obtnd=%fmm\n",dben);
}
printf("Details of steel reinforcement\n");
Abar=(3.14*bd*bd)/4;
Amin=0.12*D*10;
factor=1000000/(0.87*415*dx*0.798);
Axpos=Mxpos*factor;
if (Axpos<Amin)
Axpos=Amin;
sxpos=(Abar*b)/Axpos;
printf("Axpos=%fsq.mm\n",Axpos);
printf("provide %f mm bars at %f mm c-c\n",bd,sxpos);
Aypos=Mypos*factor;
if (Aypos<Amin)
Aypos=Amin;
sypos=(Abar*b)/Aypos;
printf("Aypos=%fsq.mm\n",Aypos);
printf("provide %f mm bars at %f mm c-c\n",bd,sypos);
Axneg=Mxneg*factor;
if(Axneg<Amin)
Axneg=Amin;
sxneg=(Abar*b)/Axneg;
printf("Axneg=%fsq.mm\n",Axneg);
printf("provide %f mm bars at %f mm c-c\n",bd,sxneg);
Ayneg=Myneg*factor;
if(Ayneg<Amin)
Ayneg=Amin;
syneg=(Abar*b)/Ayneg;
```

```
printf("Ayneg=%fsq.mm\n",Ayneg);
printf("provide %f mm bars at %f mm c-c\n",bd,syneg);
ptensrft1=(100*Axpos)/(b*dx);
printf("Enter modifn factor if ptensrft1=%f\n",ptensrft1);
printf("ly/lx ratio2=%f\n\n",ratio2);
scanf("%f",&mf1);
deflnx=Lx/(dx*mf1);
if(deflnx<26)
{printf("Deflnx in limits as =%f\n\n",deflnx);
}
else
{printf("deflnx unsatisfactory as=%f\n\n",deflnx);
}
ptensrft2=(100*Axpos)/(b*dy);
printf("Enter modifn factor if ptensrft2=%f\n",ptensrft2);
printf("ly/lx ratio2=%f\n\n",ratio2);
scanf("%f",&mf2);
deflny=Ly/(dy*mf2);
if(deflny<26)
{printf("Deflny in limits as=%f\n\n",deflny);
}
else
{printf("Deflny unsatisfactory as=%f\n\n",deflny);
}
}
if(ratio1>2)
{
printf("one way slab\n");
d=Lx/26;
printf("The depth d=%fmm\n\n",d);
printf("Enter your depth in mm\n\n");
scanf("%f",&dx);
```

```
printf("Enter your bar dia in mm\n\n");
scanf("%f",&bd);
D=dx+15+bd/2;
printf("Overall depth=%fmm\n\n",D);
lx=Lx+D-15-0.5*bd;
printf("Enter liveload in KN/sq.m\n\n");
scanf("%f",&LL);
b=1000;
DL=25*D/b;
w=LL+DL+0.7;
printf("Total load=%f KN/sq.m\n\n",w);
Mmax=(1.5*w*lx*lx)/(8000000);
printf("Mmax=%f KN/sq.m\n\n",Mmax);
dben=sqrt((Mmax*1000000)/(2.75*b));
if(dx>dben)
{printf("The assumed value of depth is satisfied\n");
printf("depth=%fmm\n\n",dben);
}
else
{
printf("revise depth\n\n");
}
printf("Details of steel reinforcements\n\n");
Axpos=(Mmax*1000000)/(0.87*415*dx*0.798);
Amin=0.12*D*10;
if(Axpos<Amin)
Axpos=Amin;
printf("Axpos=%fsq.mm\n\n",Axpos);
Abar=(3.14*bd*bd)/4;
sxpos=(Abar*b)/Axpos;
printf("Provide %fmm dia bars as main rft at %fmm c-c\n\n",bd,sxpos);
sdbn=(3.14*16*b)/Amin;
```

```
if(sdbn>(5*dx));
sdbn=5*dx;
if(sdbn>450)
sdbn=450;
printf("Provide 8mm dia bars as distrbn rft at %fmm c-c\n\n",sdbn);
ptensrft1=(100*Axpos)/(b*dx);
printf("Enter modif factor if ptensrft=%f\n\n",ptensrft1);
scanf("%f",&mf1);
deflnx=Lx/(dx*mf1);
if(deflnx<26)
{
printf("Deflnx in limits as=%f\n\n",deflnx);
}
else
{
printf("Deflnx unsatisfactory as=%f\n\n",deflnx);
}
}
}
```

Table No.2. DESIGN OF GROUND FLOOR SLABS

Sl.No	Ly (mm)	Lx (mm)	D (mm)	w (kN/m^2)	Area of Steel Reinforcement (mm^2)				Spacing of Reinforcement (mm)			
					Middle section		Edge section		Middle section		Edge section	
					$A_{xx(+ve)}$	$A_{yy(+ve)}$	$A_{xx(-ve)}$	$A_{yy(-ve)}$	$S_{x(+ve)}$	$S_{y(+ve)}$	$S_{x(-ve)}$	$S_{y(-ve)}$
1.	6640	5890	230	11.45	439	372	583	499	255	300	170	225
2.	6140	5890	230	11.45	320	298	425	393	350	380	265	285
3.	6140	5890	230	11.45	320	298	425	393	350	380	265	285
4.	6640	5890	230	11.45	439	372	583	499	255	300	170	225
5.	6640	5890	230	11.45	352	298	470	393	320	380	240	285
6.	6140	5890	230	11.45	276	276	365	340	405	405	310	330
7.	6140	5890	230	11.45	276	276	365	340	405	405	310	330
8.	6640	5890	230	11.45	352	298	470	393	320	380	240	285
9.	6010	4020	170	9.95	248	204	320	204	450	450	350	450
10.	6010	4020	170	9.95	248	204	320	204	450	450	350	450
11.	4770	4100	170	9.95	204	204	257	204	450	450	440	450
12.	6010	4100	170	9.95	254	204	329	204	445	450	340	450
13.	6010	4100	170	9.95	254	204	329	204	445	450	340	450
14.	4770	4100	170	9.95	204	204	257	204	450	450	440	450
15.	7430	5054	210	8.95	338	252	445	252	330	440	250	440
16.	7430	4190	200	8.70	240	240	311	240	450	450	360	450
17.	7430	4130	200	8.70	240	240	305	240	450	450	370	450
18.	22240	3100	140	7.20	408	-	-	-	275	-	-	-
19.	7430	4130	200	8.70	240	240	305	240	450	450	370	450

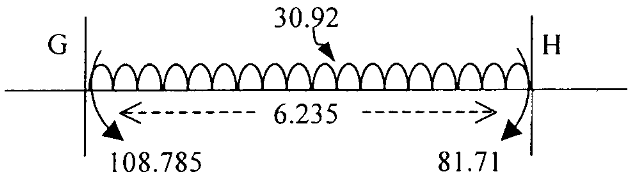
20.	7430	4190	200	8.70	240	240	311	240	450	450	360	450
21.	7430	5054	210	8.95	338	252	445	252	330	440	250	440
22.	3660	3510	150	7.45	180	180	180	180	450	450	450	450
23.	3660	3510	150	7.45	180	180	180	180	450	450	450	450
24.	7430	5054	210	8.95	338	252	445	252	330	440	250	440
25.	7430	4190	200	8.70	240	240	311	240	450	450	360	450
26.	7430	4130	200	8.70	240	240	287	240	450	450	390	450
27.	7430	6600	200	8.70	338	280	449	373	330	405	250	300
28.	8320	850	140	7.20	168	-	-	-	450	-	-	-
29.	7430	6600	200	8.70	338	280	449	373	330	405	250	300
30.	7430	4130	200	8.70	240	240	287	240	450	450	390	450
31.	7430	4190	200	8.70	240	240	311	240	450	450	360	450
32.	4130	3100	210	8.2	195	168	168	168	450	450	450	450
33.	8090	3100	140	7.20	408	-	-	-	275	-	-	-
34.	14320	3100	140	7.20	168	-	-	-	450	-	-	-
34a.	4130	3100	210	8.2	195	168	168	168	450	450	450	450
35.	7430	5950	230	9.45	420	313	558	420	265	360	200	265
36.	7430	2000	140	7.20	177	-	-	-	450	-	-	-
37.	7430	2000	140	7.20	177	-	-	-	450	-	-	-
38.	7430	5950	230	9.45	420	313	558	420	265	360	200	265
39.	12250	1530	140	7.20	168	-	-	-	450	-	-	-
40.	8360	7460	260	10.20	646	567	862	312	175	195	130	360

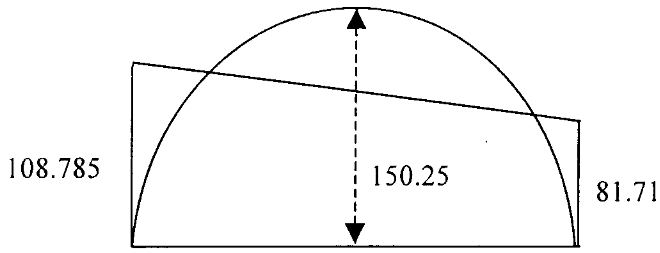
Table No.3. DESIGN OF TYPICAL FLOOR SLABS

Sl. No	Ly(mm)	Lx(mm)	D(mm)	w (kN/m²)	Area of Steel Reinforcement (mm²)				Spacing of Reinforcement (mm)			
					Middle section		Edge section		Middle section		Edge section	
					$A_{xx(+ve)}$	$A_{yy(+ve)}$	$A_{xx(-ve)}$	$A_{yy(-ve)}$	$S_{x(+ve)}$	$S_{y(+ve)}$	$S_{x(-ve)}$	$S_{y(-ve)}$
1.	6010	4020	170	7.95	246	204	323	204	450	450	350	450
2.	6010	4020	170	7.95	246	204	323	204	450	450	350	450
3.	4770	4100	170	7.95	204	204	232	204	450	450	450	450
4.	6010	4100	170	7.95	204	204	263	204	450	450	430	450
5.	6010	4100	170	7.95	204	204	263	204	450	450	430	450
6.	4770	4100	170	7.95	204	204	232	204	450	450	450	450
7.	22240	3100	140	7.20	408	-	-	-	275	-	-	-
8.	7430	4190	200	8.70	335	240	443	240	335	450	255	450
9.	7430	4130	200	8.70	240	240	310	240	450	450	365	450
10.	7430	6600	230	9.47	361	306	484	404	310	365	230	275
11.	7430	6600	230	9.47	361	306	484	404	310	365	230	275
12.	7430	4130	200	8.70	240	240	310	240	450	450	365	450
13.	7430	4190	200	8.70	335	240	443	240	335	450	255	450
14.	8320	850	140	7.20	168	-	-	-	450	-	-	-
15.	14320	3100	140	7.20	408	-	-	-	275	-	-	-
16.	7790	6890	250	9.95	568	493	759	300	195	225	145	375

4.2 DESIGN OF BEAMS

In this chapter we are showing the manual design of one beam GH from the frame which we have analysed using moment distribution method.





Max –ve BM = 108.785kNm

d_{req} at supports = $\sqrt{\dfrac{1.5\times108.785\times10^6}{2.76\times230}}$ = 507mm

D_{reqd} = 507 + 8 + 25 = 540mm < 750

Hence safe

Area of Steel

$$\frac{M}{bd^2} = \frac{1.5\times108.785\times10^6}{230\times717^2} = 1.38$$

d^1 = 25 + 8 = 33

Mu_{lim} = $0.36 \times 0.48\,(1 - 0.42 \times 0.48)\,230 \times 717^2 \times 20 = 326.26 \times 10^6$Nmm

$$\frac{d'}{d} = \frac{33}{567} = 0.046$$

Taking d^1/d = 0.1

From SP16, Table 2

$$P_t = .426$$

$$Ast = \frac{0.426 \times 230 \times 750}{100} = 734.85mm^2$$

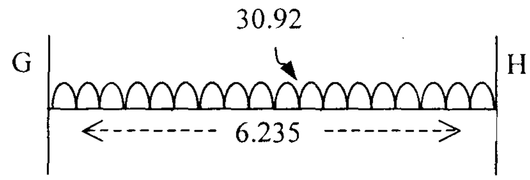
No. of bars = 4 Nos. 16mm dia.

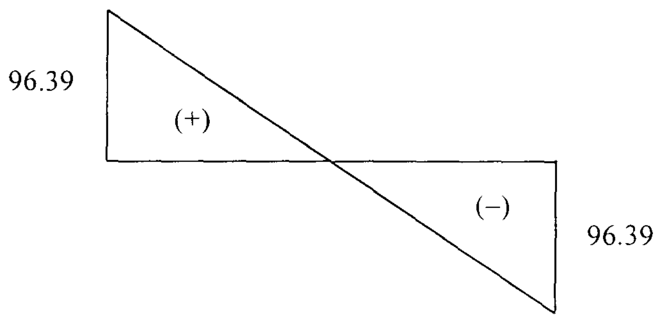
$$Ast_{min} = \frac{0.85bd}{fy}$$

$$= \frac{0.85 \times 230 \times 717}{415} = 337.77mm^2$$

Providing 4Nos. 16mmϕ bars

Shear Design





$$V_u = 96.39 \times 1.5 = 144.59kN$$

$$\tau_v = \frac{V_u}{bd}$$

$$= \frac{144.59 \times 10^3}{230 \times 717} = 0.88$$

$\tau_{cmax} = 2.8N/mm^2$

$A_{sv} = \pi/4 \times 8^2 \times 2 = 100.53mm^3$

$$\frac{100Asv}{bd} = \frac{100\times100.53}{230\times717} = 0.061$$

$\tau_c = 0.36N/mm^2$

$\tau_v > \tau_c < \tau_{cmax}$

Since $\tau_v > \tau_c$

$V_{us} = V_u - \tau_c bd$

$= 144.59 \times 10^3 - 0.36 \times 230 \times 717$

$= 85.22kN$

$$S_v = \frac{0.87 f_y \times A_{sv} \times d}{V_{us}}$$

$$= \frac{0.87\times415\times100.53\times717}{85.22\times10^3} = 305.38mm \approx 300mm$$

Provide 2 legged 8mmϕ stirrups @ 300mm c/c

Mid section

Maximum +ve moment = 55kNm

$M_u = 55 \times 1.5 = 82.5kNm$

$$\frac{M_u}{bd^2} = \frac{82.5\times10^6}{230\times717^2} = 0.70$$

$P_t = 0.203$

$$Ast = \frac{0.203\times230\times750}{100} = 350.175mm^2$$

Providing 2 16mmϕ bars.

4.3 DESIGN OF COLUMNS

Assuming size of the column as 400 × 900mm

Unsupported height, h = 4.5m

l_{uns} = 4.5m

Effective length = $1.67 \times l_{uns}$

Effective length = $1.67 \times 4500 = 7515$mm

Axial force, P_u = 667.2kN

M_x = 0.95kNm

M_z = -3.1kNm

$$\frac{l_{eff}}{b} = \frac{7515}{400} = 18.79 > 12$$

Hence long column

Let percentage of steel = 2%

$$\frac{p\%}{f_{ck}} = \frac{0.02}{20} = 1 \times 10^{-3}$$

$$\frac{P_u}{bdf_{ck}} = \frac{667.2\times10^3}{400\times900\times20} = 0.093$$

Effective cover, d^1 = 40 + 20/2 = 50mm

d^1/D = 50/400 = 0.125

$$\frac{M_{ux'}}{f_{ck}\,bd^2} = 0.0375$$

$M_{ux'}$ = $0.0375 \times 400 \times 900^2 \times 20$

= 2.43×10^8Nmm

d^1/B = 50/900 = 0.055

$$\frac{M_{uz'}}{f_{ck}\ bd^2} = 0.0375$$

$$M_{uz'} = 2.43 \times 10^5 Nmm$$

To find P_{uy}, $\frac{P_{uy}}{A_g} = 15$

$P_{uz} = 15 \times 400 \times 900 = 5.4 \times 10^6$

From IS 456,

$$\left(\frac{M_{ux}}{M_{ux1}}\right)^{\alpha_n} + \left(\frac{M_{uz}}{M_{uz1}}\right)^{\alpha_n} \leq 1$$

$$\alpha_n = \frac{P_u}{P_{uz}}$$

$$= \frac{667.2\times10^3}{5.4\times10^6} = 0.123$$

Taking $\alpha_n = 1$

$$\rightarrow \left(\frac{0.95\times10^6}{2.43\times10^8}\right)^1 + \left(\frac{-3.1\times10^6}{2.43\times10^8}\right)^1$$

$$= -8.84 < 1$$

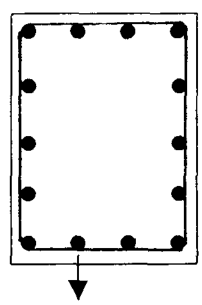
Hence Safe

Area of steel, $= 0.02 \times 400 \times 900$

$= 7.2 \times 10^3 mm^2$

No. of bars used $= \frac{7.2\times10^3}{490.83} = 15$Nos.

Spacing given @ 7cm c/c distance.



4.4 DESIGN OF STAIRS

In our project we are providing 3 stairs for the vertical transportation from floor to floor which includes one main stair which connects the lobby to all the floors, one service stair which connects the kitchen to the different floors and third stair which is provided for the access to the banquet hall and also acts as a fire stair.

Here we are showing the elaborate design of main stair.

Floor height = 4.8m

Assuming the rise and tread as 16cm and 28cm respectively.

Design of Flight AB

Effective length = 1.93 + 2.24 + .46 + .23/2 + .23/2 = 4.86m

$$Cos\ \theta = \frac{T}{\sqrt{T^2+R^2}}$$

$$= \frac{28}{\sqrt{28^2+16^2}} = \frac{1}{1.15}$$

Dead load of going

Assuming thickness of waist slab = 250mm

∴ Self weight of waist slab = 25× 0.25 × 2 × 1= 12.5kN/m

Self weight of waist slab in plan = 12.5 × 1.151 = 14.3875kN/m

Dead load of steps

Weight of one step per metre run = ½ × 0.16 × 2 × 25 = 4kN/m

Assuming dead load of finishes = 1kN/m^2

∴ Dead load of finish per metre = 1 × 2 = 2kN/m

∴ Total dead load of going = 14.38 + 4 + 2 = 20.38kN/m

Dead load of landing = 12.5 + 2 = 14.5kN/m

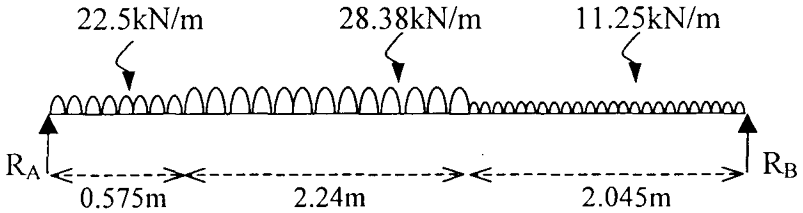
Live load = 4kN/m^2

$\therefore$ Live load per metre $= 4 \times 2 = 8kN/m$

$\therefore$ Total load on going $= 28.38kN/m$

$\therefore$ Total load on landing $= 22.5kN/m$

Check for bending



$$\Sigma M_B = 0$$

$$4.86R_A = 22.5 \times 0.575 \left(4.86 - \frac{0.575}{2}\right) + 28.38 \times 2.24 \left(\frac{2.24}{2} + 2.045\right) + \left(11.25 \times \frac{2.045^2}{2}\right)$$

$\therefore R_A = 58.41kN \qquad R_B = 41.10kN$

$$M_{xx} \text{ at mid span } = 58.41x - 22.5 \times 0.575 \left(x - \frac{0.575}{2}\right) - 28.38\left(x - \frac{0.575}{2}\right)^2$$

For M_{max}, Shear force $= 0$

$$\therefore \frac{dM_x}{d_x} = 0, \text{ gives position of maximum moment}$$

$$58.41 = 12.93x + 28.38x - 16.31$$

$$\therefore x = 1.81m \text{ from A}$$

$$\therefore M_{max} = 64.38kNm$$

M_u, factored moment $= 1.5 \times 64.38 = 96.57kNm$

$$d = \sqrt{\frac{M_u}{R_u\, b}} = \sqrt{\frac{96.57\times10^6}{2.76\times2\times10^3}} = 132.26mm < 250mm - 20mm \text{ ie } = 230m$$

Hence O.K.

Main Reinforcement

$$\text{Area of steel, Ast} = \left(1 - \sqrt{1 - \frac{4.6\,M_u}{f_{ck}bd^2}}\right) bd$$

$$= 0.5 \times 20 \left(1 - \sqrt{1 - \frac{4.6\times 96.57\times 10^6}{20\times 2\times 230^2\times 10^3}}\right) 2\times 10^3\times 230$$

$$= 1232\text{mm}^2$$

Using 12mmϕ bars,

$$\text{Spacing} = \frac{1.13\times 100\times 2000}{1232} = 183 \approx 180\text{mmc/c}$$

Distribution Reinforcement

$$\text{Area of steel, } A_{st} = \frac{0.12}{100} \times 2000 \times 230 = 600\text{mm}^2$$

$$\text{Using 8mm}\phi\text{ bars, spacing} = \frac{0.5\times 100\times 2000}{600} = 166 \approx 165\text{mmc/c}$$

Design of flight BC

Effective length	=	8.82m
Assume thickness of stair	=	300mm
∴ Self weight of slab	=	$0.3 \times 25 \times 1.93 \times 1 = 14.47$kN/m
Self weight of slab in plan	=	$14.47 \times 1.151 = 16.65$kN/m
Dead load of steps per metre	=	$\frac{1}{2} \times 0.16 \times 1.93 \times 25 = 3.86$kN/m
Dead load of finishes per metre	=	$1 \times 1.93 = 1.93$kN/m
Live load per metre	=	$4 \times 2 = 8$kN/m
Total load on going	=	$16.65 + 3.86 + 1.93 + 8 = 30.44$kN/m
Total loading on landing	=	$14.47 + 1.93 + 8 = 24.4$

$$8.82\,R_B = 12.2 \times 2.115\,\frac{2.115}{2} + 0.755 + 3.08 + 0.755 + 2.115) +$$

$$24.4 \times 0.755\,(8.82 - 2.115 - \frac{0.755}{2}) + 30.44 \times$$

$$3.08\,(8.82 - 2.115 - 0.755 - \frac{3.08}{2})^2$$

$$+ 24.4 \times 0.755\,(\frac{0.755}{2} + 2.115) + 12.2 \times \frac{2.115^2}{2}$$

$$\therefore R_B = R_C = 91.1\text{kN}$$

Maximum bending occurs at midspan, at 4.41m from B

$$\therefore M_{max} = 91.1\times4.41 - 12.2\times2.115\,(4.41 - \frac{2.115}{2}) - 24.4 \times 0.755$$

$$\times (4.41 - 2.115 - \frac{0.755}{2}) - 30.44\,\frac{(4.41 - 2.115 - 0.755)^2}{2}$$

$$= 401.75 - 86.5 - 35.32 - 72.19$$

$$= 207.74\text{kNm}$$

Factored Moment M_u = 311.61kNm

$$\therefore\ d = \sqrt{\frac{M_u}{R_u \times b}} = 241.86 < 300 - 200 = 280\text{mm}$$

Hence O.K. by bending

Details of reinforcement

Main reinforcement

$$Ast = \frac{0.5\times20}{415}\left(1 - \sqrt{1 - \frac{4.6\times311.61\times10^6.}{20\times1.93\times10^3\times280^2}}\right)$$

$$= 3574.53\text{mm}^2$$

Using 12mmϕ bars,

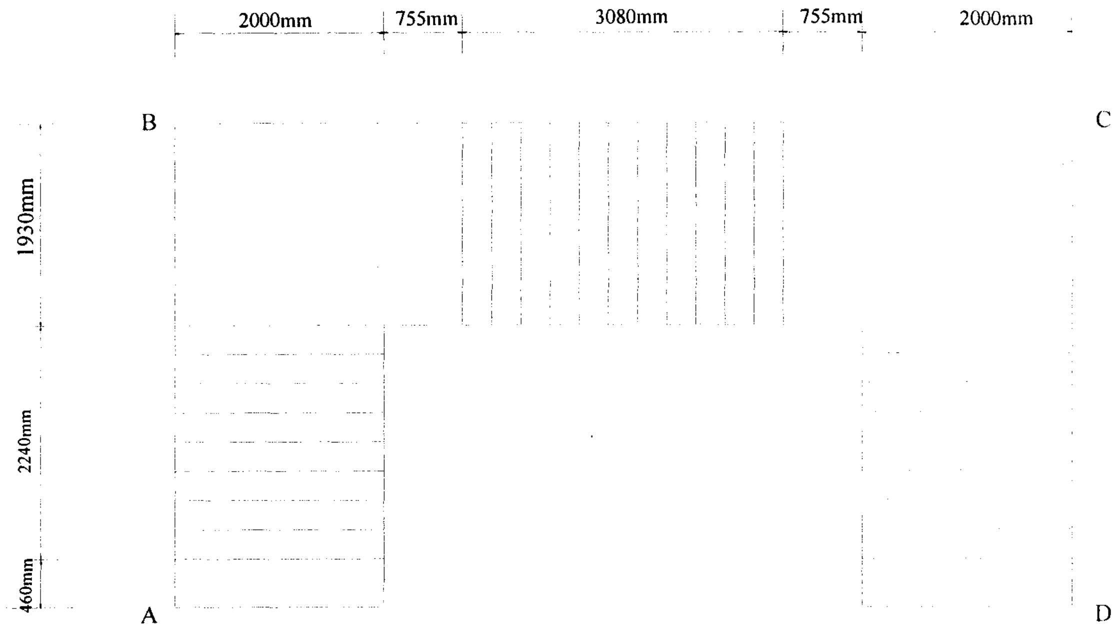
$$\text{Spacing} = \frac{1.13. \times100\times1.93\times10^3}{3574.53} = 61\text{mm} \approx 60\text{mm c/c}$$

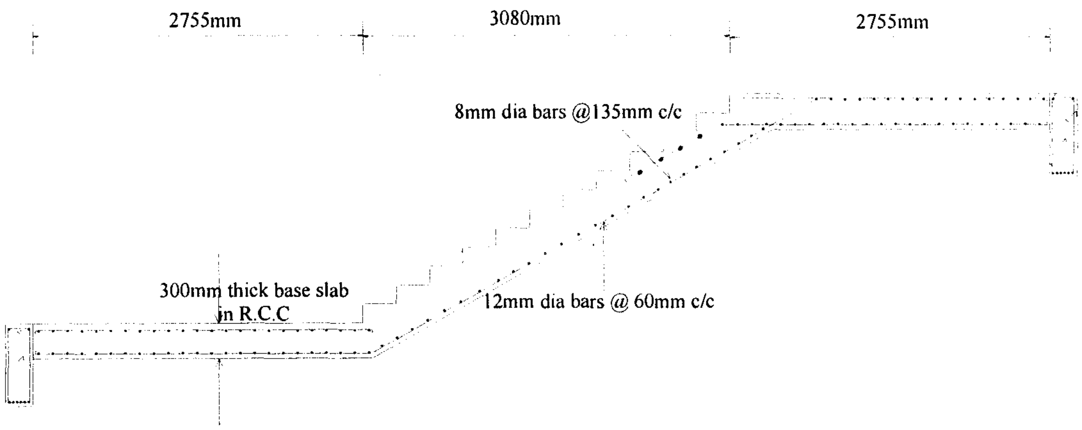
Distribution Reinforcement

$$A_{st} = \frac{0.12}{100} \times 1930 \times 300 \quad = 694.8\text{mm}^2$$

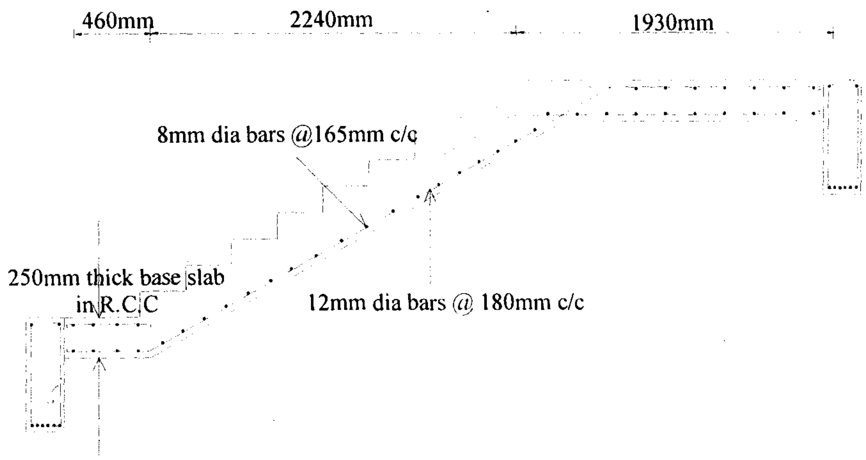
Using 8mmϕ bars,

$$\text{Spacing} = \frac{0.5 \times 100 \times 1930}{694.8} = 138.81 \approx 135\text{mmc/c}$$





Flight BC



Flight AB and CD

4.5 DESIGN OF LINTELS

4.5.1 Lintels Over Doors D

D	=	1.2×2.1m
Width	=	0.23m
Thickness	=	150mm
Span	=	$1.2 + 2 \times 0.15 = 1.5$m
d	=	$150 - 10/2 - 15 = 130$mm

Loads

Self weight	=	$0.23 \times 0.15 \times 1.5 \times 25 = 1.30$kN
Load of walls	=	$0.23 \times 22 \times \frac{1}{2} \times 1.5 \times 0.75 = 2.85$kN
Total Load	=	4.15kN
Load per m run	=	$\frac{4.15}{1.5} = 2.77$kN/m

$$M_u = \frac{2.77 \times 1.5 \times 1.5^2}{8} = 1.168\text{kNm}$$

$$d = \sqrt{\frac{1.168 \times 10^6}{2.76 \times 230}} = 42.89\text{mm}$$

$$A_{st} = \frac{1.168\times10^6}{0.87\times415(130 -.42\times.48\times130)} = 31.168mm^2$$

$$A_{st\ min} = \frac{.85bd}{fy}$$

$$= \frac{.85\times230\times130}{415} = 61.24mm^2$$

Providing minimum reinforcement using 8mm ϕ bars

No. of bars = 2 Nos.

Check for shear

Shear force , V = 1300 + 2850/2 = 2725 N

Factored shear force , V_u = 1.5 × 2725 = 4087.5 N

$\tau_v = V_u / bd$

= 0. 11 N / mm^2 < permissible τ_c = 0.12 N/mm^2

∴ O.K in shear.

4.5.2 Lintels Over windows

Width = 230mm

Span = 3 + 2 × 0.15 = 3.3m

Depth = 150mm

Effective depth = 150 – 5 – 15 = 130mm

Loads

Self weight = 0.23 × 0.15 × 3.3 × 25 = 2.85kN

Load of walls = 0.23 × 22 (½ × 3.3 × 1.15) = 9.6kN

Total load = 12.45kN

Load per m run = $\frac{12.45}{3.3.}$ = 3.77kN/m

$$M_u = \frac{1.5 \times 3.77 \times 3.3^2}{8} = 7.7\text{kNm}$$

$$d = \sqrt{\frac{7.7 \times 10^6}{230 \times 2.76}} = 110.13\text{mm} < 130\text{mm}$$

Hence O.K.

$$A_{st} = \frac{7.7 \times 10^6}{0.87 \times 415(130 - 0.42 \times 0.48 \times 130)} = 205\text{mm}^2$$

No. of bars = 3Nos.

Provide 3Nos. #10mm ϕ bars

Check for shear

Shear force, V = 2850 + 9600/2 = 7650 N

Factored shear force , V_u = 1.5 × 7650 = 1147.5 N

$\tau_v = V_u / bd$

= 0. 33 N / mm^2 < permissible τ_c = 0.50 N/mm^2

∴ Hence O.K in shear

4.6. DESIGN OF RETAINING WALL

Since the basement floor is at a level of 4.5 m below the level, retaining walls are also designed to withstand against earth pressures. We are showing the elaborate design of retaining wall.

Unit wt. of soil γ = $16.67 kN/m^3$

Angle of repose = 30°

Bearing capacity, q_0 = $147 kN/m^3$

μ = 0.57

Using M_{20} concrete & Fe415 steel

1. Design constants

$$\frac{Xu_{max}}{d} = 0.48$$

$$Ru = 0.36\ \frac{Xu_{max}}{d}\left(1 - 0.42\ \frac{Xu_{max}}{d}\right) fck$$

$$= 0.36 \times 0.48\ (1-0.42 \times 0.48) \times 20 = 2.759$$

2. Depth of foundation

$$d_l = \frac{qo\ ka^2}{\gamma}$$

$$ka = \frac{1\text{-}Sin\theta}{1+Sin\theta}$$

$$= \frac{1\text{-Sin}30}{1\text{+Sin}30} = 0.333$$

$$d_l = \frac{147}{16.67} \times (0.333)^2 = 0.9$$

$\therefore$ d_l = 1m

3. Dimension of the base

length $L = 0.4 - 0.6h$

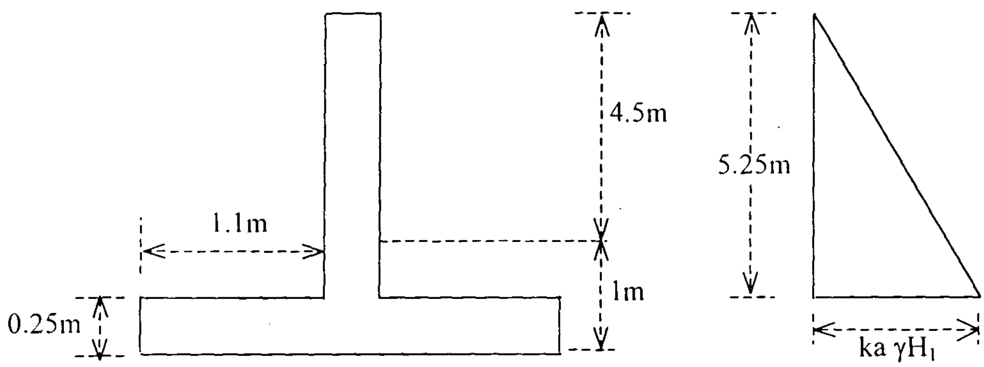
$= 0.5 \times (4.5 + 1) = 2.75\text{m}$

$$d = \frac{L}{12} = \frac{2.75}{12} = 0.23\text{m}$$

$d = 0.25\text{m}$

Toe slab $= 0.4 \times L = 0.4 \times 2.75 = 1.1\text{m}$

4. Dimensions of stem



$Pa = \frac{1}{2} ka\gamma H^2$

$= \frac{1}{2} \times 0.333 \times 16.67 \times 5.25^2 = 76.6\text{kN}$

$$\text{Moment} = 1.5 \times 76.6 \times \frac{5.25}{3} = 201\text{kNm}$$

$$d = \sqrt{\frac{Mu_{lim}}{Rub}}$$

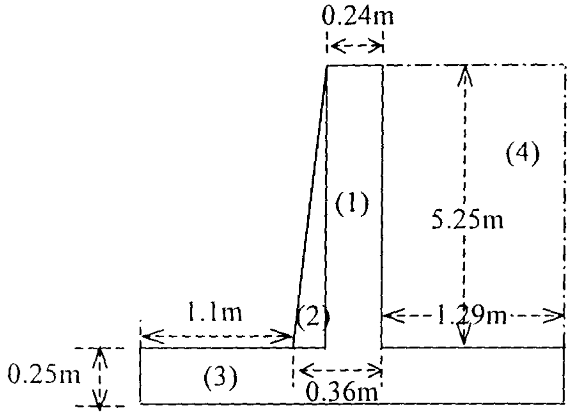
$$= \frac{201 \times 10^6}{2.759 \times 1000} = 269.9\text{m}$$

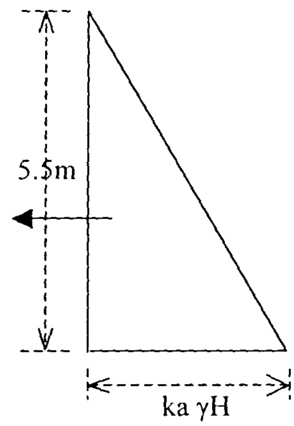
Providing 300mm thickness

With effective cover = 360mm

Without effective cover = 240mm

5. Stability of the wall





Sl.No	Designation	Force	L.A.	Moment
1.	W1	0.24×5.25×1×25 = 31.5	2.85	89.8
2.	W2	½ ×0.12×5.25×25 = 7.87	1.18	9.29
3.	W3	0.25×2.75×1v25 = 17.`9	1.375	23.64
4.	W4	5.25×1.29×1×16.67 = 112.89	2.1	237.63

$\sum W = 169.45kN$ $M_R = 360.36kNM$

$Pa = \frac{1}{2}\, karH^2$

$= \frac{1}{2} \times 0.333 \times 16.67 \times 5.52 = 83.96kN$

$$M_O = 83.96 \times \frac{5.5}{3} = 153.93kNm$$

Factor safety against overturning

$$= \frac{\sum M_R}{\sum Mo} = \frac{360.36}{153.93} = 2.34$$

Minimum value = 1.55

Hence Safe

Factor of safety against sliding

$$\frac{\mu \Sigma W}{Pa} = \frac{0.57 \times 169.45}{83.96} = 1.75$$

Minimum value = 1.55, hence OK

6 Calculation of upward soil pressure

$$\bar{x} = \frac{\Sigma M}{\Sigma W} = \frac{206.43}{169.45} = 1.22$$

$$e = b/2 - \bar{x} = \frac{2.75}{2} - 1.22 = 0.155$$

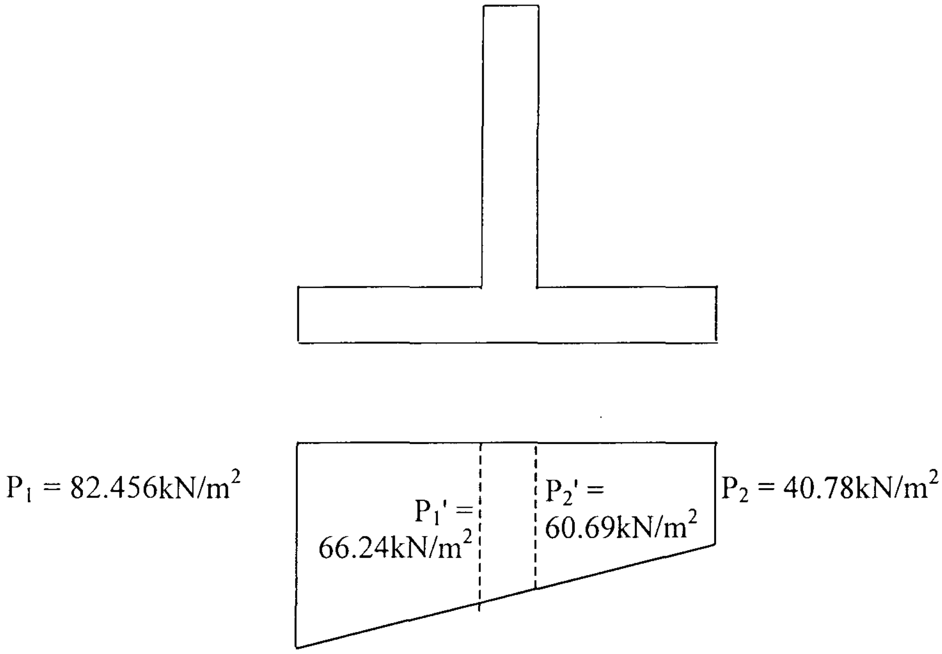
e< b/6, for no tension to develop

$$P_1 = \frac{\Sigma W}{b}\left(\frac{1+6e}{b}\right)$$

$$P_2 = \frac{\Sigma W}{b}\left(\frac{1-6e}{b}\right)$$

$$P_1 = \frac{169.45}{2.75}\left(1 + \frac{6 \times 0.155}{2.75}\right) = 82.456 kN/m^2$$

$$P_2 = \frac{169.45}{2.75}\left(1 - \frac{6 \times 0.155}{2.75}\right) = 40.78 kN/m^2$$



7. Design of toe slab

Self wt. of toe slab $= 1.1 \times 0.25 \times 1 \times 25 = 6.875kN$

Soil press $= \frac{1}{2}(P_1 + P_1') \times 1.1 \times 1$

$= \frac{1}{2}(82.456 + 66.24) \times 1.1 = 81.78kN$

$$\text{Centroid} = \left(\frac{a+2b}{a+b}\right) \times \frac{h}{3}$$

$$= \left(\frac{66.24+2\times82.456}{66.24+82.456}\right) \times \frac{1.1}{3} = 0.57$$

$$\therefore M = -6.875 \times 0.55 + 81.78 \times 0.57 = 42.83kNm$$

$$M_{ulim} = 42.83 \times 1.5 = 64.245kNm$$

$$d = \sqrt{\frac{M_{ulim}}{R_u b}}$$

$$= \sqrt{\frac{64.245\times10^6}{2.759\times10^3}} = 152.6mm$$

$\therefore$ d = 160mm

$$A_{st} = \frac{0.5 f_{ck} bd}{f_y}\left(1 - \sqrt{1 - 4.6 \frac{M_u}{f_{ck} bd^2}}\right)$$

$$= \frac{0.5\times20\times1000\times200}{415}\left(1 - \sqrt{1 - 4.6\frac{64.245\times10^6}{20\times1000\times200^2}}\right)$$

$$= 992.3 \text{ mm}^2$$

Using 12mm dia bars

Area of one 12mm dia bar $= \frac{\pi\times12^2}{4} = 113.1\text{mm}^2$

No. of bars required $= \frac{992.3}{113.1} = 9$ Nos

Provide 9 - #12mmϕ bars

8. Design of heel slab

Soil press $= \frac{1}{2}(P_2' + P_2)\times1.29\times1$

$= \frac{1}{2}(60.69 + 40.78)\times1.29 = 65.45\text{kN}$

Centroid $= \left(\frac{60.69 + 2\times40.78}{60.69 + 40.78}\right)\times\frac{1.29}{3}\times0.6$

M $= 8.1 + 112.89 - 65.45 = 55.5\text{kNm}$

$M_{ulim} = 55.5\times1.5 = 83.32$ kNm

$$d = \sqrt{\frac{M_{ulim}}{R_u b}}$$

$$= \sqrt{\frac{83.32\times10^6}{2.759\times10^3}} = 173.77\text{mm}$$

$\therefore$ Providing d = 200mm

$$A_{st} = \frac{0.5 f_{ck} bd}{f_y}\left(1 - \sqrt{1 - 4.6\frac{M_u}{f_{ck} bd^2}}\right)$$

$$= \frac{0.5 \times 20 \times 1000 \times 200}{415} \left(1 - \sqrt{1 - 4.6 \frac{83.32 \times 10^6}{20 \times 1000 \times 200^2}}\right)$$

$$= 4713.9 \text{ mm}^2$$

$\therefore$ providing 20mmϕ bars

Number of bars required = 15Nos.

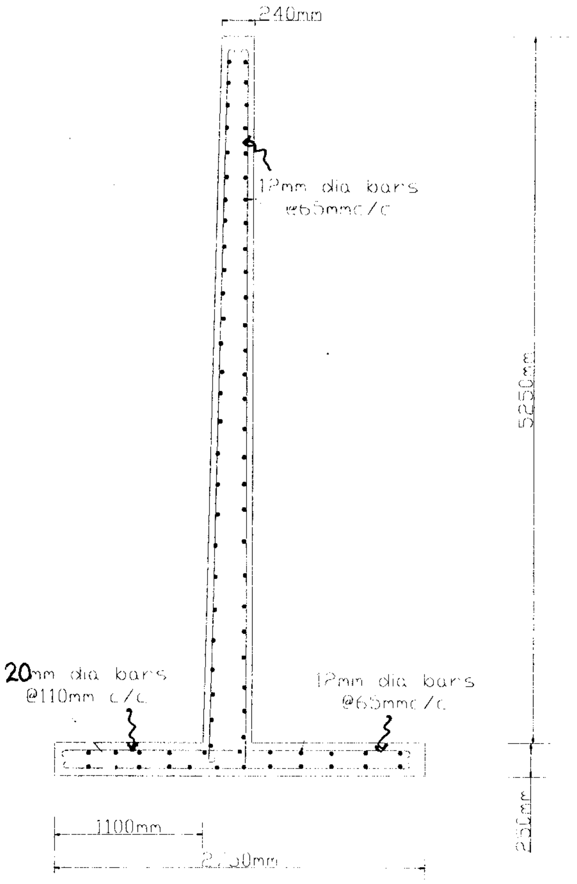
9. Design of stem

$$A_{st} = \frac{0.5 f_{ck} bd}{f_y}\left(1 - \sqrt{1 - 4.6 \frac{M_u}{f_{ck} bd^2}}\right)$$

$$= \frac{0.5 \times 20 \times 1000 \times 240}{415} \left(1 - \sqrt{1 - 4.6 \frac{201 \times 10^6}{20 \times 1000 \times 240^2}}\right) = 2569.4 \text{ mm}^2$$

Using 12 mm dia bars

No. of bars required = 23 nos



Analysis And Design Using STAAD III

5. ANALYSIS AND DESIGN USING STAAD III

5.1 DETAILS OF THE ANALYSIS SOFTWARE

STAADIII for windows is a comprehensive structural engineering software that addresses all aspects of engineering-model development, analysis, design, verification and visualisation. STAADIII for windows is based on the principles of finite element analysis and is available in a "concurrent engineering" profile. It is capable of analysing and designing structures consisting of both frames and shell elements. Following are the main options available from the concurrent graphics environment.

STAADIII	Analysis and design
STAAD PRE	Graphical input generator
STAAD POST	Graphical post processing
STAAD INTDES	Interactive design of structural components

STAADIII uses a command language based input format which can be created through a text editor or through STAAD PRE, graphical input generator or through CAD, based formats.

Analysis facilities available in STAADIII are,

1. Stiffness Analysis-based on the matrix displacement method.
2. Second Order Analysis
   (i) P-Delta Analysis –incorporates secondary loading.
   (ii) Non Linear Analysis –incorporates both secondary loading and geometric stiffness correction.

3. Dynamic Analysis–solution of free vibration problems response spectrum analysis and fixed vibration analysis.

5.2 IDEALISATION OF STRUCTURE

All the beams and columns of the main building of our hotel were included as prismatic members with six degrees of freedom (3D beam elements). The columns at the foundation level were assumed to be pinned.

5.3 LOAD COMBINATION

The load on beams from slabs has been considered as uniformly distributed on the entire span. This loading was arrived at by considering equivalent uniformly distributed load from the triangular or trapezoidal pattern in the case of two way slabs and rectangular pattern in the case of one-way slabs. In this case dead load, live load, wind load and their combination has been considered. The load cases 1, 2 and 3 correspond to dead load, live load and wind load respectively. Load cases 4 and 5 correspond to combination of dead load and live load, dead load and wind load respectively. The load case 6 is given as the combination of dead load, live load and wind load. The intensities of wind load are calculated from the IS 875 (Part 3). The whole structure was analysed for these 6 different loading conditions and the design was carried out based on the most critical loading condition.

The analysis result consists of member end forces, which includes shear forces and bending moments, deflection of members, support reactions etc.

The analysis turned out well with the deflection of the structure within the permissible limits. The member forces, support displacements and support reactions obtained are given in tables.

5.4 INPUT FILE

STAAD SPACE

INPUT WIDTH 72

UNIT METER KNS

JOINT COORDINATES

1 6.78 -4.5 -31.806; 2 6.78 -4.5 -25.691; 3 6.78 -4.5 -19.573; 4 33.25 -4.5 -31.806; 5 33.25 -4.5 -25.691; 6 33.25 -4.5 -19.573; 7 20.015 -4.5 -31.806; 8 20.015 -4.5 -25.691; 9 20.015 -4.5 -19.573; 10 8.78 -4.5 -19.573; 11 31.25 -4.5 -19.573; 12 8.78 -4.5 -15.32; 13 10.19 -4.5 -15.32; 14 10. 19 -4.5 -18.173; 15 12.37 -4.5 -18.173; 16 12.37 -4.5 -15.32; 17 13.78 -4.5 -19.573; 18 13.78 -4.5 -15.32; 19 13.78 -4.5 -10.99; 20 20.015 -4.5 -15.32; 21 20.015 -4.5 -10.99; 22 26.25 -4.5 -15.32; 23 31.25 -4.5 -15.32; 24 31.25 -4.5 -10.99; 25 26.25 -4.5 -10.99; 26 8.78 -4.5 -10.99; 27 26.25 -4.5 -19.573; 28 4.42 -4.5 -15.32; 29 0. -4.5 -15.32; 30 -5.376 -4.5 -9.572; 31 -5.376 -4.5 -5.748; 32 0. -4.5 0.; 33 4.42 -4.5 0.; 34 8.78 -4.5 0; 35 0. -4.5 -7.66; 36 4.42 -4.5 -7.66; 37 8.78 -4.5 -7.66; 38 15.605 -4.5 -7.66; 39 24.425 -4.5 -7.66; 40 31.25 -4.5 -7.66; 41 4.42 -4.5 3.33; 42 16.005 -4.5 3.33; 43 16.005 -4.5 10.99; 44 24.025 -4.5 3.33; 45 24.025 -4.5 10.99; 46 12.74 -4.5 0.; 47 12.74 -4.5 3.33; 48 27.29 -4.5 0.; 49 27.29 -4.5 3.33; 50 15.718 -4.5 12.887; 51 24.312 -4.5 12.887; 52 24.312 -4.5 20.711; 53 15.718 -4.5 20.711; 54 40.03 -4.5 -15.32; 55 45.406 -4.5 -9.572; 56 45.406 -4.5 -5.748; 57 40.03 -4.5 0.; 58 40.03 -4.5 -7.66; 59 35.61 -4.5 -15.32; 60 35.61 -4.5 -7.66; 61 15.605 -4.5 -5.93 62 15.605 -4.5 -1.07; 63 15.605 -4.5 0.; 64 24.425 -4.5 -5.93; 65 22.195 -4.5 -3.77; 66 22.195 -4.5 -1.07; 67 20.015 -4.5 -1.07; 68 24.425 -4.5 -1.07; 69 17.835 -4.5 -3.77; 70 17.835 -4.5 -1.07; 71 20.015 -4.5 -3.77; 72 24.425 -4.5 0.; 73 31.25 -4.5 0.; 74 35.61 -4.5 0.; 75 7.325 -4.5 3.33; 76 7.325 -4.5 7.16; 77 7.325 -4.5 10.99; 78 13.64 -4.5 10.99; 79 13.64 -4.5 12.887; 80 26.39 -4.5 12.887; 81 26.39 -4.5 10.99; 82 32.705 -4.5 3.33; 83 35.61 -4.5 3.33; 84 32.705 -4.5 10.99; 85 32.705 -4.5 7.16 86 13.64 -4.5 3.33; 87 26.39 -4.5 3.33; 88 13.78 -4.5 -25.691; 89 13.78 -4.5 -31.806; 90 26.25 -4.5-5.691; 91 26.25 -4.5 -31.806; 92 6.78 0. -31.806; 93 6.78 0. -25.691; 94 6.78 0. -19.573; 95 33.25 0. -31.806; 96 33.25 0. -25.691; 97 33.25 0. -19.573; 98 20.015 0. -31.806; 99 20.015 0. -25.691; 100 20.015 0. -19.573; 101 8.78 0. -19.573; 102 31.25 0. -19.573; 103 8.78 0. -15.32; 104 10.19 0. -15.32; 105 10.19 0. -18.173; 106 12.37 0. -18.173; 107 12.37 0. -15.32; 108 13.78 0. -19.573; 109 13.78 0. -15.32; 110 13.78 0. -10.99; 111 20.015 0. -15.32; 112 20.015 0.-10.99; 113 26.25 0. -15.32; 114 31.25 0. -15.32; 115 31.25 0. -10.99; 116 26.25 0. -10.99; 117 8.78 0. -10.99; 118 26.25 0. -19.573; 119 4.42 0. -15.32; 120 0. 0. -15.32; 121 -5.376 0. -9.572; 122 -5.376 0. -5.748; 123 0. 0. 0.; 124 4.42 0. 0.; 125 8.78 0. 0.; 126 0. 0. -7.66; 127 0. 0. -3.812; 128 4.42 0. -3.812; 129 8.78 0. -3.812; 130 4.42 0. -7.66; 131 8.78 0. -7.66; 132 15.605 0. -7.66; 133 24.425 0. -7.66; 134 31.25 0. -7.66; 135 4.42 0. 3.33; 136 16.005 0. 3.33; 137 16.005 0. 10.99; 138 24.025 0. 3.33; 139 24.025 0. 10.99; 140 12.74 0. 0.; 141 12.74 0. 3.33; 142 27.29 0. 0; 143 27.29 0. 3.33; 144 15.718 0. 12.887; 145 24.312 0. 12.887; 146 24.312 0. 20.711; 147 15.718 0. 20.711; 148 40.03 0. -15.32; 149 45.406 0. -9.572; 150 45.406 0. -5.748; 151 40.03 0. 0.; 152 40.03 0. -7.66; 153 35.61 0. -15.32; 154 35.61 0. -7.66; 155 31.25 0. -3.83; 156 35.61 0. -3.83; 157 40.03 0. -3.83; 158 15.605 0. -5.93; 159 15.605 0. -1.07; 160 15.605 0. 0.; 161 24.425 0. -5.93; 162 22.195 0. -3.77; 163 22.195 0. -1.07; 164 20.015 0. -1.07; 165 24.425 0. -1.07; 166 17.835 0. -3.77; 167 17.835 0. -1.07; 168 20.015 0. -3.77; 169 24.425 0. 0.; 170 31.25 0. 0.; 171 35.61 0. 0.; 172 7.325 0. 3.33; 173 7.325 0. 7.16; 174 7.325 0. 10.99; 175 13.64 0. 10.99; 176 13.64 0. 12.887; 177 26.39 0. 12.887; 178 26.39 0. 10.99; 179 32.705 0. 3.33; 180 35.61 0. 3.33; 181 32.705 0. 10.99; 182 35.61 0. 10.99; 183 32.705 0. 7.16; 184 13.64 0. 3.33; 185 26.39 0. 3.33;

186 13.64 0. 7.16; 187 26.39 0. 7.16; 188 4.42 0. 10.99; 189 13.78 0. -25.691; 190 13.78 0. -31.806; 191 26.25 0. -25.691; 192 26.25 0. -31.806; 193 10.483 -4.5 10.99; 194 29.548 -4.5 10.99; 195 29.548 0.10.99; 196 10.483 0. 10.99; 197 20.015 4.5 -19.573; 198 8.78 4.5 -19.573; 199 8.78 4.5 -15.32; 200 10.19 4.5 -15.32; 201 10.19 4.5 -18.173; 202 12.37 4.5 -18.173; 203 12.37 4.5 -15.32; 204 13.78 4.5 -19.573; 205 13.78 4.5 -15.32; 206 13.78 4.5 -10.99; 207 20.015 4.5 -15.32; 208 20.015 4.5 -10.99; 209 26.25 4.5 -15.32; 210 31.25 4.5 -15.32; 211 31.25 4.5 -10.99; 212 26.25 4.5 -10.99; 213 8.78 4.5 -10.99; 214 26.25 4.5 -19.573; 215 0. 4.5 0.; 216 4.42 4.5 0.; 217 8.78 4.5 0.; 218 0. 4.5 -7.66; 219 0. 4.5 -3.812; 220 4.42 4.5 -3.812; 221 8.78 4.5 -3.812; 222 4.42 4.5-7.66; 223 8.78 4.5 -7.66; 224 15.605 4.5 -7.66; 225 24.425 4.5 -7.66; 226 31.25 4.5 -7.66; 227 4.42 4.5 3.33; 228 16.005 4.5 3.33; 229 16.005 4.5 10.99; 230 24.025 4.5 3.33; 231 24.025 4.5 10.99; 232 12.74 4.5 0; 233 12.74 4.5 3.33; 234 27.29 4.5 0.; 235 27.29 4.5 3.33; 236 15.718 4.5 12.887; 237 24.312 4.5 12.887; 238 24.312 4.5 20.711; 239 15.718 4.5 20.711; 240 40.03 4.5 0.; 241 40.03 4.5 -7.66 242 35.61 4.5 -7.66; 243 31.25 4.5 -3.83; 244 35.61 4.5 -3.83; 245 40.03 4.5 -3.83; 246 15.605 4.5 -5.93; 247 15.605 4.5 1.07; 248 15.605 4.5 0.; 249 24.425 4.5 -5.93; 250 22.195 4.5 -3.77; 251 22.195 4.5 -1.07; 252 20.015 4.5 1.07; 253 24.425 4.5 -1.07; 254 17.835 4.5 -3.77; 255 17.835 4.5 -1.07; 256 20.015 4.5 -3.77; 257 24.425 4.5 0.; 258 31.25 4.5 0.; 259 35.61 4.5 0. 260 7.325 4.5 3.33; 261 7.325 4.5 7.16; 262 7.325 4.5 10.99; 263 13.64 4.5 10.99; 264 13.64 4.5 12.887; 265 26.39 4.5 12.887; 266 26.39 4.5 10.99; 267 32.705 4.5 3.33; 268 35.61 4.5 3.33; 269 32.705 4.5 10.99; 270 35.61 4.5 10.99; 271 32.705 4.5 7.16; 272 13.64 4.5 3.33; 273 26.39 4.5 3.33; 274 13.64 4.5 7.16; 275 26.39 4.5 7.16; 276 4.42 4.5 10.99; 277 29.548 4.5 10.99; 278 10.483 4.5 10.99; 279 20.015 9. -19.573; 280 8.78 9. -19.573; 281 8.78 9. -15.32; 282 10.19 9. -15.32; 283 10.19 9. -18.173; 284 12.37 9. -18.173; 285 12.37 9. -15.32; 286 13.78 9. -19.573; 287 13.78 9. -15.32; 288 13.78 9. -10.99; 289 20.015 9. -15.32; 290 20.015 9. -10.99; 291 26.25 9. -15.32; 292 31.25 9. -15.32; 293 31.25 9. -10.99; 294 26.25 9. -10.99; 295 8.78 9. -10.99; 296 26.25 9. -19.573; 297 0. 9. 0.; 298 4.42 9. 0.; 299 8.78 9. 0; 300 0. 9. -7.66; 301 0. 9. -3.812; 302 4.42 9. -3.812; 303 8.78 9. -3.812; 304 4.42 9. -7.66; 305 8.78 9. -7.66; 306 15.605 9. -7.66; 307 24.425 9. -7.66; 308 31.25 9. -7.66; 309 16.005 9. 3.33; 310 16.005 9. 10.99; 311 24.025 9. 3.33; 312 24.025 9. 10.99; 313 12.74 9. 0.; 314 12.74 9. 3.33; 315 27.29 9. 0.; 316 27.29 9. 3.33; 317 40.03 9. 0.; 318 40.03 9. -7.66 319 35.61 9. -7.66; 320 31.25 9. -3.83; 321 35.61 9. -3.83; 322 40.03 9. -3.83; 323 15.605 9. -5.93; 324 15.605 9. -1.07; 325 15.605 9. 0.; 326 24.425 9. -5.93; 327 22.195 9. -3.77; 328 22.195 9. -1.07; 329 20.015 9. -1.07; 330 24.425 9. -1.07; 331 17.835 9. -3.77; 332 17.835 9. -1.07; 333 20.015 9. -3.77; 334 24.425 9. 0.; 335 31.25 9. 0.; 336 35.61 9. 0.; 337 13.64 9. 3.33; 338 26.39 9. 3.33; 339 20.015 13.5 -19.573; 340 8.78 13.5 -19.573; 341 8.78 13.5 -15.32; 342 10.19 13.5 -15.32; 343 10.19 13.5 -18.173; 344 12.37 13.5 -18.173; 345 12.37 13.5 -15.32; 346 13.78 13.5 -19.573; 347 13.78 13.5 -15.32; 348 13.78 13.5 -10.99; 349 20.015 13.5 -15.32; 350 20.015 13.5 -10.99; 351 26.25 13.5 -15.32; 352 31.25 13.5 -15.32; 353 31.25 13.5 -10.99; 354 26.25 13.5 -10.99; 355 8.78 13.5 -10.99; 356 26.25 13.5 -19.573; 357 0. 13.5 0.; 358 4.42 13.5 0.; 359 8.78 13.5 0.; 360 0. 13.5 -7.66; 361 0. 13.5 -3.812; 362 4.42 13.5 -3.812; 363 8.78 13.5 -3.812; 364 4.42 13.5 -7.66; 365 8.78 13.5 -7.66; 366 15.605 13.5 -7.66; 367 24.425 13.5 -7.66; 368 31.25 13.5 -7.66; 369 16.005 13.5 3.33; 370 16.005 13.5 10.99; 371 24.025 13.5 3.33; 372 24.025 13.5 10.99; 373 12.74 13.5 0.; 374 12.74 13.5 3.33; 375 27.29 13.5 0.; 376 27.29 13.5 3.33; 377 40.03 13.5 0; 378 40.03 13.5 -7.66; 379 35.61 13.5 -7.66; 380 31.25 13.5 -3.83; 381 35.61 13.5 -3.83; 382 40.03 13.5 -3.83; 383 15.605 13.5 -5.93; 384 15.605 13.5 -1.07; 385 15.605 13.5 0.; 386 24.425 13.5 -5.93; 387 22.195 13.5 -3.77; 388 22.195 13.5 -1.07; 389 20.015 13.5 -1.07; 390 24.425 13.5 -1.07; 391 17.835 13.5 -3.77; 392 17.835 13.5 -1.07; 393 20.015 13.5 -3.77; 394 24.425 13.5 0.; 395 31.25 13.5 0.; 396 35.61 13.5 0.; 397 13.64 13.5 3.33; 398 26.39 13.5 3.33; 399 20.015 18. -19.573; 400 8.78 18. -19.573; 401 8.78 18. -15.32; 402 10.19 18. -15.32; 403 10.19 18. 18.173;

404 12.37 18. -18.173; 405 12.37 18. -15.32; 406 13.78 18. -19.573; 407 13.78 18. -15.32; 408 13.78 18. -10.99; 409 20.015 18. -15.32; 410 20.015 18. -10.99; 411 26.25 18.-15.32; 412 31.25 18. -15.32; 413 31.25 18. -10.99; 414 26.25 18. -10.99; 415 8.78 18. -10.99; 416 26.25 18. -19.573; 417 0. 18. 0.; 418 4.42 18. 0.; 419 8.78 18. 0.; 420 0. 18. -7.66; 421 0. 18. -3.812; 422 4.42 18. -3.812; 423 8.78 18. -3.812; 424 4.42 18. -7.66; 425 8.78 18. -7.66; 426 15.605 18. -7.66; 427 24.425 18. -7.66; 428 31.25 18. -7.66; 429 16.005 18. 3.33; 430 16.005 18. 10.99; 431 24.025 18. 3.33; 432 24.025 18. 10.99; 433 12.74 18. 0.; 434 12.74 18. 3.33; 435 27.29 18. 0.; 436 27.29 18. 3.33; 437 40.03 18. 0.; 438 40.03 18. -7.66; 439 35.61 18. -7.66; 440 31.25 18. -3.83; 441 35.61 18. -3.83; 442 40.03 18. -3.83; 443 15.605 18. -5.93; 444 15.605 18. -1.07; 445 15.605 18. 0.; 446 24.425 18. -5.93; 447 22.195 18. -3.77; 448 22.195 18. -1.07; 449 20.015 18. -1.07; 450 24.425 18. -1.07; 451 17.835 18. -3.77; 452 17.835 18. -1.07; 453 20.015 18. -3.77; 454 24.425 18. 0.; 455 31.25 18. 0.; 456 35.61 18. 0.; 457 13.64 18. 3.33; 458 26.39 18. 3.33; 459 20.015 22.5 -19.573; 460 8.78 22.5 -19.573; 461 8.78 22.5 -15.32; 462 10.19 22.5 -15.32; 463 10.19 22.5 -18.173; 464 12.37 22.5 -18.173; 465 12.37 22.5 -15.32; 466 13.78 22.5 -19.573; 467 13.78 22.5 -15.32; 468 13.78 22.5 -10.99; 469 20.015 22.5 -15.32; 470 20.015 22.5 -10.99; 471 26.25 22.5 -15.32; 472 31.25 22.5 -15.32; 473 31.25 22.5 -10.99; 474 26.25 22.5 -10.99; 475 8.78 22.5 -10.99; 476 26.25 22.5 -19.573; 477 0. 22.5 0.; 478 4.42 22.5 0.; 479 8.78 22.5 0.; 480 0. 22.5 -7.66; 481 0. 22.5 -3.812; 482 4.42 22.5 -3.812; 483 8.78 22.5 -3.812; 484 4.42 22.5 -7.66; 485 8.78 22.5 -7.66; 486 15.605 22.5 -7.66; 487 24.425 22.5 -7.66; 488 31.25 22.5 -7.66; 489 16.005 22.5 3.33; 490 16.005 22.5 10.99; 491 24.025 22.5 3.33; 492 24.025 22.5 10.99; 493 12.74 22.5 0.; 494 12.74 22.5 3.33; 495 27.29 22.5 0; 496 27.29 22.5 3.33; 497 40.03 22.5 0.; 498 40.03 22.5 -7.66; 499 35.61 22.5 -7.66; 500 31.25 22.5 -3.83; 501 35.61 22.5 -3.83; 502 40.03 22.5 -3.83; 503 15.605 22.5 -5.93; 504 15.605 22.5 -1.07; 505 15.605 22.5 0.; 506 24.425 22.5 -5.93; 507 22.195 22.5 -3.77; 508 22.195 22.5 -1.07; 509 20.015 22.5 -1.07; 510 24.425 22.5 -1.07; 511 17.835 22.5 -3.77; 512 17.835 22.5 -1.07; 513 20.015 22.5 -3.77; 514 24.425 22.5 0.; 515 31.25 22.5 0.; 516 35.61 22.5 0.; 517 13.64 22.5 3.33; 518 26.39 22.5 3.33; 519 20.015 27. -19.573; 520 8.78 27. -19.573; 521 31.25 27. -19.573; 522 8.78 27. -15.32; 523 10.19 27.-15.32; 524 10.19 27. -18.173; 525 12.37 27. -18.173; 526 12.37 27. -15.32; 527 13.78 27. -19.573; 528 13.78 27. -15.32; 529 13.78 27. -10.99; 530 20.015 27. -15.32; 531 20.015 27. -10.99; 532 26.25 27. -15.32; 533 31.25 27. -15.32; 534 31.25 27. -10.99; 535 26.25 27. -10.99; 536 8.78 27. -10.99; 537 26.25 27. -19.573; 538 0. 27. 0.; 539 4.42 27. 0.; 540 8.78 27. 0.; 541 0. 27. -7.66; 542 0. 27. -3.812; 543 4.42 27. -3.812; 544 8.78 27. -3.812; 545 4.42 27. -7.66; 546 8.78 27. -7.66; 547 15.605 27. -7.66; 548 24.425 27. -7.66; 549 31.25 27. -7.66;550 16.005 27. 3.33; 551 16.005 27. 10.99; 552 24.025 27. 3.33; 553 24.025 27. 10.99; 554 12.74 27. 0; 555 12.74 27. 3.33; 556 27.29 27. 0; 557 27.29 27. 3.33; 558 40.03 27. 0.; 559 40.03 27. -7.66;560 35.61 27. -7.66; 561 31.25 27. -3.83; 562 35.61 27. -3.83; 563 40.03 27. -3.83; 564 15.605 27. -5.93; 565 15.605 27. -1.07; 566 15.605 27. 0.; 567 24.425 27. -5.93; 568 22.195 27. -3.77; 569 22.195 27. -1.07; 570 20.015 27.1.07; 571 24.425 27. -1.07; 572 17.835 27. -3.77; 573 17.835 27. -1.07; 574 20.015 27. -3.77; 575 24.425 27.0.; 576 31.25 27. 0.; 577 35.61 27. 0; 578 13.64 27. 3.33; 579 26.39 27. 3.33; 580 20.015 31.5 -19.573; 581 8.78 31.5 -19.573; 582 31.25 31.5 -19.573; 583 8.78 31.5 -15.32; 584 10.19 31.5 -15.32; 585 10.19 31.5 -18.173; 586 12.37 31.5 -18.173; 587 12.37 31.5 -15.32; 588 13.78 31.5 -19.573; 589 13.78 31.5 -15.32; 590 13.78 31.5 -10.99; 591 20.015 31.5 -15.32; 592 20.015 31.5 -10.99; 593 26.25 31.5 -15.32; 594 31.25 31.5 -15.32;595 31.25 31.5 -10.99; 596 26.25 31.5 -10.99; 597 8.78 31.5 -10.99; 598 26.25 31.5 -19.573; 599 0. 31.5 0.; 600 4.42 31.5 0.; 601 8.78 31.5 0.; 602 0. 31.5 -7.66; 603 0. 31.5 -3.812;604 4.42 31.5 -3.812; 605 8.78 31.5 -3.812; 606 4.42 31.5 -7.66; 607 8.78 31.5 -7.66; 608 15;605 31.5 -7.66; 609 24.425 31.5 -7.66; 610 31.25 31.5 -7.66; 611 16.005 31.5 3.33; 612 16.005 31.5 10.99; 613 24.025 31.5 3.33; 614 24.025 31.5 10.99; 615 12.74 31.5 0.; 616 12.74 31.5 3.33; 617 27.29 31.5 0.; 618 27.29 31.5 3.33; 619 40.03 31.5 0.; 620 40.03 31.5 -7.66;

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MEMBER INCIDENCES

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MEMBER PROPERTY INDIAN
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6011 TO 6013 6016 6019 TO 6021 6028 TO 6032 6036 6041 TO 6046 6047 PRI YD .7 ZD .35
6001 TO 6010 6014 6015 6017 6018 6022 TO 6027 6033 TO 6035-
6037 TO 6040 6048 TO 6059 PRI YD .35 ZD .7
5511 TO 5513 5516 5519 TO 5521 5528 TO 5533 5536 5541 TO 5546 5547 PRI YD .8 ZD .35
5501 TO 5510 5514 5515 5517 5518 5522 TO 5527 5534 5535 5537 TO 5540 -
5548 TO 5559 PRI YD .35 ZD .8
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5001 TO 5010 5014 5015 5017 5018 5022 TO 5027 5034 5035 5037 TO 5040 -
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4511 TO 4513 4516 4519 TO 4521 4528 TO 4533 4536 4541 TO 4546 4547 PRI YD .8 ZD .35
4030 4044 4537 4539 PRI YD .4 ZD .85
4501 TO 4510 4514 4515 4517 4518 4522 TO 4527 4534 4535 4538 4540 -
4548 TO 4559 PRI YD .35 ZD .8
4011 TO 4013 4016 4019 TO 4021 4028 4029 4031 TO 4033 4036 –
4039 TO 4043 4045 PRI YD .8 ZD .35
4001 TO 4010 4014 4015 4017 4018 4022 TO 4027 4034 4035 4046 4047 -
4050 TO 4056 4059 PRI YD .35 ZD .8
4048 4049 4037 4038 4057 4058 PRI YD .4 ZD .8
3511 TO 3513 3516 3519 TO 3521 3528 TO 3533 3536 3541 TO 3548 3550 -
3553 3554 3557 3558 PRI YD .8 ZD .4
3501 TO 3510 3514 3515 3517 3518 3522 TO 3527 3534 3535 3537 TO 3540 -
3549 3551 3552 3555 3556 3559 TO 3569 PRI YD .4 ZD .8
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3062 TO 3064 3068 TO 3073 3084 TO 3086 3089 3092 3093 PRI YD .9 ZD .4
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2564 2566 2567 2572 2573 2580 2581 PRI YD 1. ZD .5
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2064 TO 2066 2069 2072 2073 PRI YD 1. ZD .5
2001 TO 2006 2010 TO 2019 2022 2023 2030 TO 2035 2039 2045 -
2054 TO 2056 2059 TO 2061 2067 2068 2070 2071 2025 TO 2028 PRI YD .5 ZD 1.

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386 TO 395 402 TO 405 407 TO 427 430 TO 437 451 TO 458 501 TO 507 509 TO 547 550 551
556 TO 585 590 TO 612 623 TO 629 631 TO 653 669 TO 674 677 678 701 TO 730 733 734
739 TO 759 764 TO 786 797 799 TO 803 805 TO 815 831 TO 838 901 TO 929 932 TO 970 977 TO 983
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1232 TO 1270 1277 TO 1283 1295 TO 1330 1333 TO 1371 1378 TO 1384 1395 TO 1430 1433 TO 1471
1478 TO 1484 1495 TO 1524 101 TO 108 9716 9717 9734 9735 9752 9753 9770 9771 9788 9789 9797 -
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1271 1273 TO 1276 1230 1231 PRI YD .6 ZD .23
1171 1173 TO 1176 PRI YD .7 ZD .23
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787 TO 792 PRI YD .8 ZD .35
804 PRI YD 1. ZD .5
731 732 793 TO 796 760 763 PRI YD .75 ZD .23
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5060 TO 5071 5560 TO 5571 6060 TO 6071 PRI YD .35 ZD .7
7501 7502 PRI YD 1. ZD 1.
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2086 TO 2089 2608 TO 2611 PRI YD .5 ZD 1.
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3590 TO 3593 4072 TO 4075 4572 TO 4575 PRI YD .4 ZD .9
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6072 TO 6075 6572 TO 6575 PRI YD .35 ZD .7
7043 TO 7046 PRI YD .35 ZD .35
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3112 TO 3117 3594 TO 3599 PRI YD .9 ZD .4
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2090 TO 2095  8 308 PRI YD 1. ZD .5
117 118 PRI YD .6 ZD .23
119 TO 121 461 TO 463 679 TO 681 841 TO 843 1551 TO 1553 9720 TO 9722 -
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MEMBER RELEASE
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1438 END MZ
99 441 659 821 987 1087 1187 1287 1387 1487 1541 END MZ
CONSTANT
E CONCRETE ALL
DENSITY CONCRETE ALL
POISSON CONCRETE ALL
SUPPORT
1158 TO 1180 1182 TO 1201 1203 TO 1236 1237 to 1242 1087 1089  1152 TO 1157 1181 1202 1118-
1119 1088 PINNED
DEFINE WIND LOAD
TYPE 1
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EXPOSURE .7 YR 0. 45.
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LOAD 1 DL
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MEMBER LOAD
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48 103 453 UNI GY -15.48
1139 1196 1239 1296 1340 1396 1440 1496 1502 UNI GY -7.28
570 678 744 832 939 996 1039 1096 UNI GY -7.28
39 102 366 452 UNI GY -7.28
1442 1498 1501 UNI GY -7.28
101 368 454 677 746 834 995 1041 1098 1195 1241 1298 1395 UNI GY -7.28
1342 1398 1495 1504 UNI GY -8.19
941 1095 1141 1198 1295 UNI GY -8.19
41 451 572 670 831 998 UNI GY -8.19
104 UNI GY -8.19
42 45 46 55 56 369 372 373 392 393 573 576 577 607 608 747 750 751 -
781 782 942 945 946 965 966 1042 1045 1046 1065 1066 1142 1145 1146 -
1165 1166 1242 1245 1246 1265 1266 1343 1346 1347 1366 1367 1443 1446 -
1447 1466 1467 1509 1512 TO 1515 UNI GY -22.77
1179 1199 1279 1299 1380 1399 1480 1499 1505 UNI GY -8.9
643 671 807 835 979 999 1079 1099 UNI GY -8.9
81 105 419 455 UNI GY -8.9
1405 1507 9797 UNI GY -13.86
1305 9788 UNI GY -13.86
1105 1205 9770 UNI GY -13.86
905 1005 9734 9752 UNI GY -13.86
705 9716 UNI GY -13.86
13 107 313 457 513 673 837 UNI GY -13.86
1001 1101 1201 1301 1401 UNI GY -8.9
9 309 509 701 901 UNI GY -8.9
1300 1400 1500 1506 UNI GY -8.9
836 1000 1100 1200 UNI GY -8.9
106 456 672 UNI GY -8.9
10 TO 12 16 310 TO 312 316 510 TO 512 516 702 TO 704 708 902 TO 904 -
908 1002 TO 1004 1008 1102 TO 1104 1108 1202 TO 1204 1208 -
1302 TO 1304 1308 1402 TO 1404 1408 1518 TO 1520 1522 UNI GY -22.77
706 711 712 714 TO 720 723 724 728 729 731 TO 734 739 740 756 757 -
769 TO 774 779 780 783 TO 785 787 TO 789 791 798 804 806 808 809 906 -
911 912 914 TO 920 923 924 928 TO 935 951 TO 958 963 964 967 TO 969 -
971 TO 976 978 980 981 1006 1011 1012 1014 TO 1020 1023 1024 -
1028 TO 1035 1051 TO 1058 1063 1064 1067 TO 1069 1071 TO 1076 1078 -
1080 1081 1106 1111 1112 1114 TO 1120 1123 1124 1128 TO 1135 -
1151 TO 1158 1163 1164 1167 TO 1169 1171 TO 1176 1178 1180 1181 1206 -
1211 1212 1214 TO 1220 1223 1224 1228 TO 1235 1251 TO 1258 1263 1264 -
1267 TO 1269 1271 TO 1276 1278 1280 1281 1306 1311 1312 1314 TO 1321 -

1324 1325 1329 TO 1336 1352 TO 1359 1364 1365 1368 TO 1370 -
1372 TO 1377 1379 1381 1382 UNI GY -22.77
743 752 938 947 1038 1047 1138 1147 1238 1247 1339 1348 UNI GY -22.77
726 926 1026 1126 1226 1327 UNI GY -22.77
748 811 943 983 1043 1083 1143 1183 1243 1283 1344 1384 UNI GY -22.77
721 722 741 742 921 922 936 937 1021 1022 1036 1037 1121 1122 1136 -
1137 1221 1222 1236 1237 1322 1323 1337 1338 UNI GY -22.77
301 TO 304 307 308 327 TO 333 345 354 TO 356 361 362 378 379 387 394 -
408 411 412 424 425 501 TO 504 507 508 527 TO 533 537 538 547 -
556 TO 558 563 564 567 568 582 583 592 595 597 611 626 628 632 635 -
636 648 649 UNI GY -22.77
530 534 535 540 541 550 TO 555 557 559 560 565 566 586 TO 591 596 -
598 TO 600 605 606 609 610 619 TO 625 627 629 630 650 TO 652 -
653 UNI GY -22.77
334 335 338 339 348 357 358 363 364 380 381 386 388 389 402 404 405 -
430 TO 433 UNI GY -22.77
1 TO 4 7 8 14 25 27 28 32 33 36 37 51 TO 54 57 62 TO 68 70 73 74 -
86 TO 89 92 TO 95 UNI GY -22.77
1420 1421 1424 1425 1429 TO 1436 1452 TO 1459 1470 1472 1474 TO 1477 -
1479 1481 1482 UNI GY -7.59
654 655 UNI GY -22.77
96 438 656 818 984 1084 1184 1284 1414 UNI GY -3.23
116 448 666 828 994 1094 1194 1294 1394 1494 1548 UNI GY -22.77
109 110 114 115 446 447 459 460 664 665 675 676 826 827 839 840 992 -
993 1092 1093 1192 1193 1292 1293 1392 1393 1492 1493 1549 1550 9718 -
9719 9736 9737 9754 9755 9772 9773 9790 9791 9799 9800 UNI GY -9.75
LOAD 2 LL
MEMBER LOAD
1396 1397 1496 1497 1502 1503 UNI GY -47.79
1096 1097 1196 1197 1296 1297 UNI GY -47.79
452 669 678 832 833 996 997 UNI GY -47.79
102 103 453 UNI GY -47.79
1195 1198 1295 1298 1395 1398 1495 1498 1501 1504 UNI GY -20.55
670 677 831 834 995 998 1095 1098 UNI GY -20.55
101 104 451 454 UNI GY -20.55
44 84 371 422 575 646 749 810 944 982 1044 1082 1144 1182 1244 1282 -
1345 1383 1445 1483 1511 1516 UNI GY -22.9
1399 1499 1505 1508 9789 9798 UNI GY -20.81
835 838 999 1099 1199 1299 9717 9735 9753 9771 UNI GY -20.81
105 108 455 458 671 674 UNI GY -20.81
106 456 672 836 1000 1100 1200 1300 1400 1500 1506 UNI GY -24.38
107 457 673 837 1507 9716 9734 9752 9770 9788 9797 UNI GY -24.38
1481 1482 UNI GY -11.55
1405 UNI GY -8.93
1411 UNI GY -17.87

1410 1413 UNI GY -23.2
1424 1430 UNI GY -9.22
1406 1412 1419 UNI GY -18.46
1415 1418 UNI GY -10.21
1416 1417 UNI GY -11.65
1420 1436 1453 1458 UNI GY -10.13
1454 TO 1457 UNI GY -14.09
1421 1435 1452 1459 UNI GY -10.
1464 1465 1468 1469 UNI GY -32.44
1426 1428 1470 1471 1478 1479 UNI GY -16.67
1439 1448 UNI GY -8.2
1440 1449 UNI GY -23.99
1441 1450 UNI GY -6.88
1473 1475 UNI GY -20.41
1431 1432 UNI GY -19.71
1460 TO 1463 UNI GY -28.07
1407 TO 1409 UNI GY -10.21
1407 1409 UNI GY -20.81
1307 1309 UNI GY -20.81
907 909 1007 1009 1107 1109 1207 1209 1307 1309 UNI GY -20.81
1381 1382 UNI GY -11.54
1305 UNI GY -8.93
1311 UNI GY -17.87
1307 TO 1309 1315 1318 UNI GY -10.21
910 913 1010 1013 1110 1113 1210 1213 1310 1313 UNI GY -23.2
914 917 1014 1017 1114 1117 1214 1217 UNI GY -10.21
980 981 1080 1081 1180 1181 1280 1281 UNI GY -11.54
907 TO 909 1007 TO 1009 1107 TO 1109 1207 TO 1209 UNI GY -10.21
905 1005 1105 1205 UNI GY -8.93
911 1011 1111 1211 UNI GY -17.87
915 916 1015 1016 1115 1116 1215 1216 1316 1317 UNI GY -11.65
923 929 1023 1029 1123 1129 1223 1229 1324 1330 UNI GY -9.23
906 912 918 1006 1012 1018 1106 1112 1118 1206 1212 1218 1306 1312 -
1319 UNI GY -18.46
953 TO 956 1053 TO 1056 1153 TO 1156 1253 TO 1256 1354 TO 1356 -
1357 UNI GY -14.09
959 TO 962 1059 TO 1062 1159 TO 1162 1259 TO 1262 1360 TO 1362 -
1363 UNI GY -28.07
963 964 967 968 1063 1064 1067 1068 1163 1164 1167 1168 1263 1264 -
1267 1268 1364 1365 1368 1369 UNI GY -32.45
919 935 952 957 1019 1035 1052 1057 1119 1135 1152 1157 1219 1235 -
1252 1257 1320 1336 1353 1358 UNI GY -10.13
920 934 951 958 1020 1034 1051 1058 1120 1134 1151 1158 1220 1234 -
1251 1258 1321 1335 1352 1359 UNI GY -10.
938 947 1038 1047 1138 1147 1238 1247 1339 1348 UNI GY -9.4

939 948 1039 1048 1139 1148 1239 1248 1340 1349 UNI GY -25.36
940 949 1040 1049 1140 1149 1240 1249 1341 1350 UNI GY -6.58
925 927 969 970 977 978 1025 1027 1069 1070 1077 1078 1125 1127 1169 -
1170 1177 1178 1225 1227 1269 1270 1277 1278 1326 1328 1370 1371 1378 -
1379 UNI GY -16.67
972 974 1072 1074 1172 1174 1272 1274 1373 1375 UNI GY -20.41
930 931 1030 1031 1130 1131 1230 1231 1331 1332 UNI GY -19.71
808 809 UNI GY -11.54
705 UNI GY -8.93
711 UNI GY -17.87
723 729 UNI GY -9.22
706 712 718 UNI GY -18.45
710 713 UNI GY -23.2
707 TO 709 714 717 UNI GY -10.21
715 716 UNI GY -11.65
719 740 757 773 UNI GY -10.13
720 739 756 774 UNI GY -10.
769 TO 772 UNI GY -14.09
775 TO 778 UNI GY -28.07
779 780 783 784 UNI GY -32.41
725 727 785 786 805 806 UNI GY -16.63
743 752 UNI GY -9.3
744 753 UNI GY -25.05
745 754 UNI GY -7.89
735 737 UNI GY -21.74
793 TO 796 UNI GY -17.94
758 759 767 768 UNI GY -19.3
797 798 803 804 UNI GY -14.56
788 791 UNI GY -18.82
731 732 UNI GY -18.72
736 738 UNI GY -20.9
812 TO 815 UNI GY -14.53
313 513 UNI GY -11.18
319 519 UNI GY -22.37
318 321 518 521 UNI GY -29.04
322 325 522 525 UNI GY -12.79
323 324 523 524 UNI GY -14.85
338 344 540 546 UNI GY -26.53
314 320 326 514 520 526 UNI GY -23.1
315 TO 317 515 TO 517 UNI GY -12.79
328 362 528 564 UNI GY -10.13
327 361 527 563 UNI GY -10.
336 359 436 437 536 561 595 TO 598 UNI GY -22.36
337 360 434 435 539 562 601 TO 604 UNI GY -28.08
339 343 541 545 UNI GY -12.59

364 390 566 599 UNI GY -20.26

363 391 565 600 UNI GY -20.01

332 379 532 583 UNI GY -10.13

333 378 533 582 3025 3026 3053 3054 UNI GY -10.

329 331 354 356 359 529 531 556 558 561 UNI GY -8.3

330 355 530 557 UNI GY -7.28

334 335 357 358 534 535 559 560 UNI GY -16.19

340 342 394 395 407 408 542 544 611 612 631 632 UNI GY -15.31

365 374 569 578 UNI GY -8.64

366 375 570 579 UNI GY -22.07

367 376 571 580 UNI GY -6.16

426 427 605 606 609 610 UNI GY -30.95

402 403 405 406 623 624 629 630 UNI GY -15.82

430 433 651 652 UNI GY -14.11

431 432 650 653 UNI GY -14.68

380 381 388 389 584 585 593 594 UNI GY -16.59

428 429 619 TO 622 UNI GY -19.49

614 617 UNI GY -20.41

548 549 UNI GY -19.71

350 352 552 554 UNI GY -21.74

351 353 553 555 UNI GY -19.96

507 508 635 643 648 UNI GY -11.75

636 649 UNI GY -11.04

501 TO 504 UNI GY -10.62

505 506 633 634 639 640 UNI GY -21.24

644 645 UNI GY -25.19

638 642 UNI GY -23.49

637 641 UNI GY -22.08

307 308 411 419 424 UNI GY -19.4

412 425 UNI GY -18.19

301 TO 304 UNI GY -17.88

305 306 409 410 415 416 UNI GY -35.77

414 418 UNI GY -38.8

413 417 UNI GY -36.38

420 421 UNI GY -31.83

7 8 73 81 86 UNI GY -14.74

74 87 UNI GY -13.82

1 TO 4 UNI GY -13.58

5 6 71 72 77 78 UNI GY -27.17

76 80 UNI GY -29.48

75 79 UNI GY -27.64

82 83 UNI GY -24.71

13 UNI GY -8.72

19 UNI GY -17.44

15 TO 17 22 25 UNI GY -10.21

18 21 UNI GY -22.35
27 33 UNI GY -8.73
14 20 26 UNI GY -17.46
23 24 UNI GY -11.18
29 31 57 58 69 70 UNI GY -15.65
88 89 UNI GY -17.4
38 47 UNI GY -7.72
39 48 UNI GY -23.05
40 49 UNI GY -6.16
51 TO 54 UNI GY -16.5
90 91 UNI GY -18.17
34 35 UNI GY -19.93
60 63 UNI GY -19.9
65 TO 68 UNI GY -14.63
92 95 UNI GY -13.82
93 94 UNI GY -12.52
1521 TO 1523 UNI GY -20.81
515 517 707 709 UNI GY -20.81
15 17 315 317 UNI GY -20.81
AREA LOAD
914 TO 917 925 TO 927 1014 TO 1017 1025 TO 1027 1114 TO 1117 -
1125 TO 1127 1214 TO 1217 1225 TO 1227 1315 TO 1318 1326 TO 1328 -
1415 TO 1418 1426 TO 1428 ALOAD -7.2
943 944 950 982 983 1043 1044 1050 1082 1083 1143 1144 1150 1182 1183 -
1243 1244 1250 1282 1283 1344 1345 1351 1383 1384 1444 1445 1451 1483 -
1484 ALOAD -7.2
950 970 TO 973 975 TO 977 1050 1070 TO 1073 1075 TO 1077 1150 -
1170 TO 1173 1175 TO 1177 1250 1270 TO 1273 1275 TO 1277 1351 -
1371 TO 1374 1376 TO 1378 1451 1471 TO 1474 1476 TO 1478 ALOAD -7.2
731 732 793 TO 796 ALOAD -9.45
714 TO 717 725 TO 727 ALOAD -7.42
748 749 755 810 811 ALOAD -7.42
755 786 TO 789 798 804 805 ALOAD -7.42
720 785 797 799 ALOAD -7.42
756 764 803 806 ALOAD -7.42
758 759 ALOAD -7.42
767 768 ALOAD -7.42
735 761 762 790 TO 792 ALOAD -7.42
322 TO 325 340 TO 342 522 TO 525 542 TO 544 ALOAD -7.42
370 371 377 422 423 574 575 581 646 647 ALOAD -7.42
377 395 TO 398 403 406 407 581 612 TO 615 624 630 631 ALOAD -7.42
333 378 386 394 402 404 405 408 533 582 590 611 623 625 629 -
632 ALOAD -7.42
380 388 584 585 593 594 ALOAD -7.42
350 383 384 399 TO 401 552 587 588 616 TO 618 ALOAD -7.42

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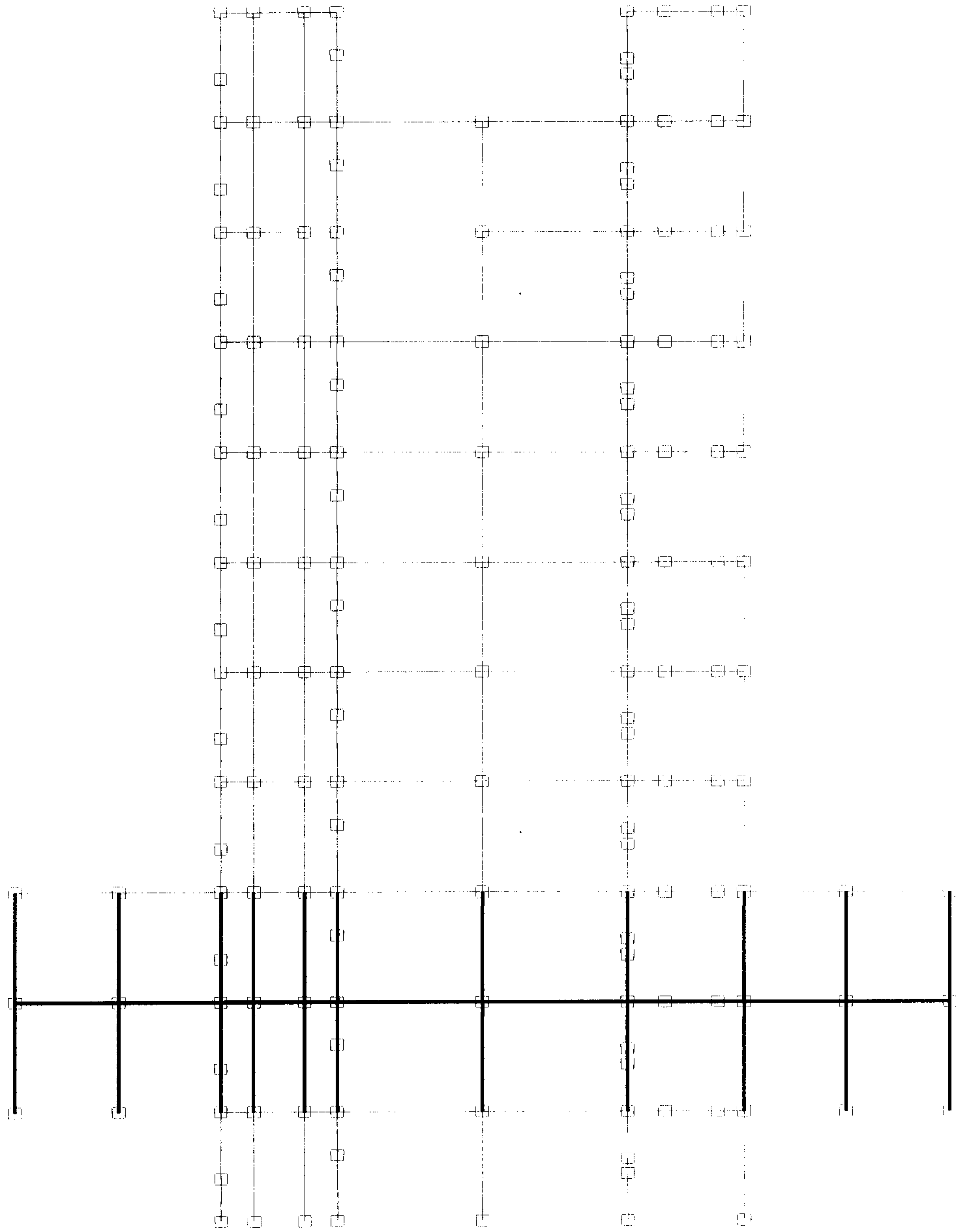
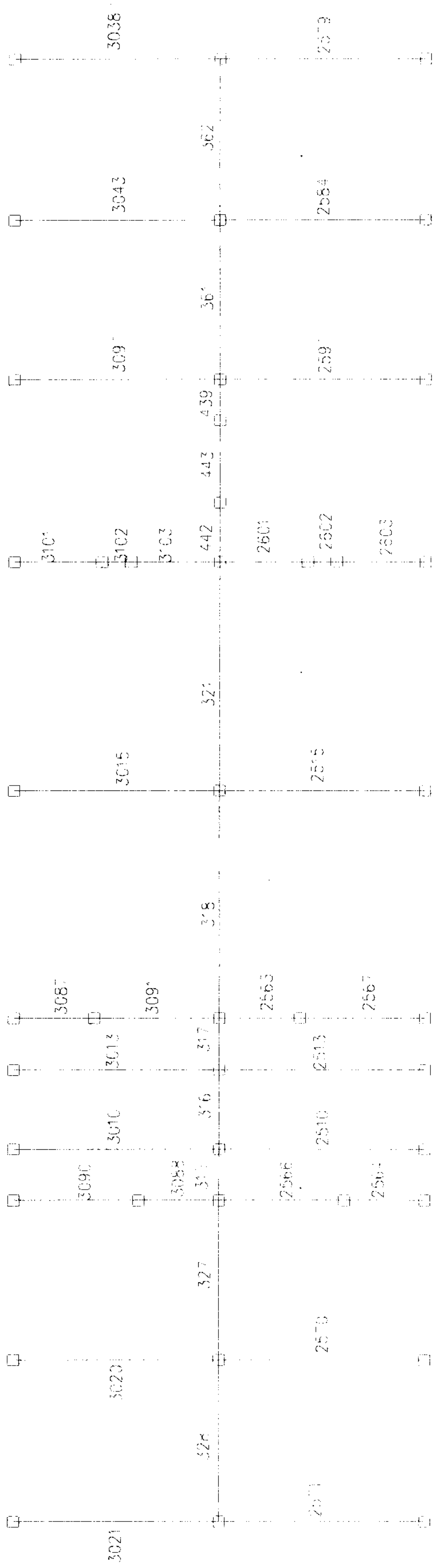
346 347 428 429 548 549 619 TO 622 ALOAD -7.42
43 44 50 84 85 ALOAD -7.2
50 58 TO 61 66 68 69 ALOAD -7.2
34 35 90 91 ALOAD -7.42
MEMBER LOAD
1518 1520 UNI GY -3.3
1510 1514 1515 1517 1519 1522 UNI GY -2.65
1509 1512 UNI GY -3.19
1513 UNI GY -6.39
AREA LOAD
1519 1524 TO 1526 ALOAD -7.2
1518 1520 1528 1530 ALOAD -7.2
1509 1512 1514 1515 1531 TO 1534 1536 ALOAD -7.42
MEMBER LOAD
654 655 816 817 UNI GY -2.8
1314 1387 1414 1487 UNI GY -3.23
1387 1487 UNI GY -25.44
1287 UNI GY -2.8
1541 UNI GY -3.23
99 441 659 821 987 1087 1187 UNI GY -28.
AREA LOAD
1541 ALOAD -7.2
MEMBER LOAD
109 110 459 460 675 676 839 840 1549 1550 9718 9719 9736 9737 9754 -
9755 9772 9773 9790 9791 9799 9800 UNI GY -25.44
122 123 464 465 682 683 844 845 1554 1555 9723 9724 9741 9742 9759 -
9760 9777 9778 9795 9796 9804 9805 UNI GY -7.06
LOAD 3 WL
WIND LOAD X 1. TYPE 1
LOAD COMB 4
1 1.5 2 1.5
LOAD COMB 5
1 1.5 3 1.5
LOAD COMB 6
1 1.2 2 1.2 3 1.2
PERFORM ANALYSIS PRINT ALL
UNIT MMS NEWTON
START CONCRETE DESIGN
CODE INDIAN
FC 20. ALL
DESIGN COLUMN Y
DESIGN BEAM 1 TO 108 111 TO 113 301 TO 445 451 TO 458 501 TO 663 -
669 TO 674 677 678 701 TO 825 831 TO 838 901 TO 991 995 TO 1091 -
1095 TO 1191 1195 TO 1291 1295 TO 1391 1395 TO 1491 1495 TO 1545 9716 -
9717 9734 9735 9752 9753 9770 9771 9788 9789 9797 9798
```

CONCRETE TAKE OFF
END CONCRETE DESIGN
UNIT METER KNS
PRINT SUPPORT REACTIONS
PRINT ANALYSIS RESULTS
PRINT MEMBER FORCES ALL
PLOT BENDING FILE
FINISH





Frame Whose analysis and design results are shown

5.5 ANALYSIS RESULTS

5.5.1 Member End Forces

Units Force - kN

Length - m

Member 315

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-z
1	12	-6.61	-37.34	2.81	.69	-.92	-27.27
	13	6.61	43.07	-2.81	-.69	-3.05	-29.42
2	12	-18.44	-33.79	5.94	.42	-4.46	-35.12
	13	18.44	81.17	-5.94	-.42	-3.92	-45.93
3	12	26.83	-75.14	-2.00	-.08	1.82	-48.95
	13	-26.83	75.14	2.00	.08	1.00	-57.00
4	12	-37.57	-106.70	13.13	1.67	-8.07	-93.58
	13	37.57	186.36	-13.13	-1.67	-10.45	-113.02
5	12	30.33	-168.72	1.22	.92	1.35	-114.33
	13	-30.33	177.32	-1.22	-.92	-3.07	-129.63
6	12	2.14	-175.53	8.10	1.24	-4.26	-133.60
	13	-2.14	239.25	-8.10	-1.24	-7.16	-158.82

Member 316

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-z
1	13	-12.18	25.72	-.71	-.09	1.37	8.91
	16	12.18	32.78	.71	.09	.17	-16.60
2	13	-30.46	15.56	.46	-.13	.73	14.42
	16	30.46	12.32	-.46	.13	-1.73	-10.89
3	13	21.50	-71.29	-.99	.38	1.16	-77.94
	16	-21.50	71.29	.99	-.38	1.01	-77.47
4	13	-63.97	61.93	-.37	-.34	3.14	35.00
	16	63.97	67.64	.37	.34	-2.34	-41.23
5	13	13.98	-68.35	-2.55	.44	3.78	-103.54
	16	-13.98	156.10	2.55	-.44	1.78	-141.10
6	13	-25.37	-36.00	-1.49	.19	3.90	-65.52
	16	25.37	139.66	1.49	-.19	-.65	-125.95

Member 317

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-z
1	16	-16.41	27.73	-2.67	-.11	.61	20.09
	18	16.41	-22.00	2.67	.11	3.16	14.97
2	16	-26.90	113.72	-5.29	-.32	3.68	76.65
	18	26.90	-66.34	5.29	.32	3.77	50.29
3	16	15.52	-83.98	-2.00	-.03	1.24	-56.69
	18	-15.52	83.98	2.00	.03	1.58	-61.72
4	16	-64.97	212.17	-11.94	-.65	6.44	145.11
	18	64.97	-132.51	11.94	.65	10.39	97.89
5	16	-1.33	-84.38	-7.01	-.21	2.78	-54.90
	18	1.33	92.97	7.01	.21	7.10	-70.13
6	16	-33.35	68.96	-11.95	-.55	6.64	48.06
	18	33.35	-5.23	11.95	.55	10.21	4.24

Member 318

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	18	-18.16	10.27	-.21	-.15	.64	5.48
	20	18.16	15.07	.21	.15	.68	-20.46
2	18	-7.85	88.65	.21	-.03	-.84	84.62
	20	7.85	92.41	-.21	.03	-.50	-96.35
3	18	17.37	-14.25	-.49	-.05	1.70	-44.22
	20	-17.37	14.25	.49	.05	1.37	-44.66
4	18	-39.01	148.38	.00	-.27	-.29	135.14
	20	39.01	161.23	.00	.27	.28	-175.21
5	18	-1.19	-5.98	-1.06	-.31	3.51	-58.11
	20	1.19	43.99	1.06	.31	3.08	-97.67
6	18	-10.36	101.60	-.59	-.28	1.81	55.05
	20	10.36	146.09	.59	.28	1.87	-193.76

Member 321

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	20	-30.64	9.03	-.25	.40	.69	10.03
	22	30.64	16.31	.25	-.40	.86	-32.75
2	20	-19.35	87.32	-.14	.14	.46	82.39
	22	19.35	93.75	.14	-.14	.40	-102.43
3	20	27.14	-12.93	-.43	-.05	1.15	-40.78
	22	-27.14	12.93	.43	.05	1.54	-39.86
4	20	-74.99	144.52	-.58	.82	1.73	138.64
	22	74.99	165.09	.58	-.82	1.88	-202.77
5	20	-5.25	-5.86	-1.02	.53	2.76	-46.12
	22	5.25	43.87	1.02	-.53	3.60	-108.92
6	20	-27.42	100.09	-.98	.59	2.77	61.98
	22	27.42	147.59	.98	-.59	3.36	-210.05

Member 327

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	12	2.67	37.21	-.46	.16	1.27	-4.82
	28	-2.67	79.78	.46	-.16	.76	-87.98
2	12	-7.08	11.06	-.32	1.53	.99	-7.73
	28	7.08	32.54	.32	-1.53	.40	-39.11
3	12	-5.80	53.19	-.56	-.17	2.26	93.29
	28	5.80	-53.19	.56	.17	.18	138.61
4	12	-6.62	72.41	-1.17	2.53	3.38	-18.83
	28	6.62	168.49	1.17	-2.53	1.74	-190.63
5	12	-4.69	135.60	-1.54	-.01	5.29	132.70
	28	4.69	39.89	1.54	.01	1.41	75.94
6	12	-12.25	121.75	-1.61	1.82	5.42	96.88
	28	12.25	70.97	1.61	-1.82	1.60	13.82

Member 328

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	28	12.11	60.33	.16	1.32	-.48	47.88
	29	-12.11	58.27	-.16	-1.32	-.24	-43.32
2	28	-2.18	24.63	.11	-.07	-.24	21.94
	29	2.18	20.14	-.11	.07	-.24	-12.03
3	28	2.24	79.68	.71	.59	-1.57	172.55
	29	-2.24	-79.68	-.71	-.59	-1.59	179.66
4	28	14.90	127.45	.41	1.88	-1.08	104.74
	29	-14.90	117.63	-.41	-1.88	-.72	-83.03
5	28	21.53	210.03	1.32	2.86	-3.08	330.64
	29	-21.53	-32.12	-1.32	-2.86	-2.74	204.50
6	28	14.61	197.58	1.18	2.21	-2.75	290.85
	29	-14.61	-1.52	-1.18	-2.21	-2.48	149.16

Member 361

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	23	-12.76	-43.97	.05	-.76	.27	-173.15
	59	12.76	160.97	-.05	.76	-.49	-273.61
2	23	-10.57	-42.60	.08	-1.78	-.13	-116.46
	59	10.57	86.20	-.08	1.78	-.24	-164.33
3	23	69.37	-43.08	-.60	-.14	2.12	-68.06
	59	-69.37	43.08	.60	.14	.51	-119.79
4	23	-35.00	-129.85	.20	-3.82	.21	-434.40
	59	35.00	370.75	-.20	3.82	-1.09	-656.92
5	23	84.92	-130.58	-.83	-1.35	3.57	-361.81
	59	-84.92	306.08	.83	1.35	.03	-590.10
6	23	55.25	-155.59	-.56	-3.22	2.71	-429.20
	59	-55.25	348.30	.56	3.22	-.26	-669.28

Member 362

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	59	21.52	64.25	-.08	-1.35	.17	61.54
	54	-21.52	54.35	.08	1.35	.19	-39.66
2	59	6.04	24.96	.00	-.41	-.05	25.94
	54	-6.04	19.82	.00	.41	.07	-14.58
3	59	42.73	-71.41	.66	.48	-1.57	-155.69
	54	-42.73	71.41	-.66	-.48	-1.36	-159.95
4	59	41.34	133.82	-.12	-2.64	.17	131.23
	54	-41.34	111.25	.12	2.64	.38	-81.36
5	59	96.37	-10.74	.87	-1.31	-2.10	-141.21
	54	-96.37	188.65	-.87	1.31	-1.75	-299.42
6	59	84.34	21.36	.69	-1.54	-1.75	-81.84
	54	-84.34	174.70	-.69	1.54	-1.32	-257.03

Member 439

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	23	-25.90	-31.89	-3.88	.09	1.92	-122.81
	959	25.90	36.12	3.88	-.09	2.41	84.89
2	23	-17.69	11.60	-2.86	.05	1.88	-64.03
	959	17.69	-11.60	2.86	-.05	1.31	76.96
3	23	55.75	12.34	-1.40	-.60	.48	19.30
	959	-55.75	-12.34	1.40	.60	1.08	-5.54
4	23	-65.39	-30.44	-10.11	.21	5.71	-280.26
	959	65.39	36.78	10.11	-.21	5.57	242.79
5	23	44.78	-29.32	-7.93	-.77	3.61	-155.26
	959	-44.78	35.67	7.93	.77	5.23	119.03
6	23	14.59	-9.54	-9.78	-.55	5.15	-201.05
	959	-14.59	14.62	9.78	.55	5.75	187.58

Member 442

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	22	-26.10	72.96	1.30	.00	-.99	118.22
	963	26.10	-66.83	-1.30	.00	-1.11	-5.34
2	22	-16.16	47.90	.49	-.08	.00	97.10
	963	16.16	-47.90	-.49	.08	-.80	-19.74
3	22	49.82	5.86	6.69	1.61	-5.10	-8.17
	963	-49.82	-5.86	-6.69	-1.61	-5.71	17.62
4	22	-63.40	181.29	2.69	-.12	-1.49	322.97
	963	63.40	-172.10	-2.69	.12	-2.86	-37.61
5	22	35.59	118.22	12.00	2.42	-9.14	165.07
	963	-35.59	-109.03	-12.00	-2.42	-10.23	18.43
6	22	9.07	152.06	10.19	1.84	-7.31	248.58
	963	-9.07	-144.71	-10.19	-1.84	-9.14	-8.94

Member 443

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	963	-24.42	52.80	-.45	.09	.33	21.69
	959	24.42	-44.18	.45	-.09	.69	88.38
2	963	-16.25	47.94	-1.44	.05	1.57	29.64
	959	16.25	-47.94	1.44	-.05	1.71	79.19
3	963	56.88	-12.34	-1.01	-.60	1.09	-22.67
	959	-56.88	12.34	1.01	.60	1.21	-5.34
4	963	-61.00	151.11	-2.84	.21	2.85	77.00
	959	61.00	-138.19	2.84	-.21	3.59	251.36
5	963	48.69	60.68	-2.19	-.77	2.13	-1.48
	959	-48.69	-47.77	2.19	.77	2.85	124.57
6	963	19.45	106.08	-3.49	-.55	3.59	34.39
	959	-48.69	-47.77	2.19	.77	2.85	124.57

Member 2510

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	653	1252.68	7.68	.13	.17	.03	17.20
	13	-199.66	-7.68	-.13	-.17	-.63	17.37
2	653	754.80	13.80	4.00	-1.13	-7.18	32.21
	13	-754.80	-13.80	-4.00	1.13	-10.82	29.88
3	653	-49.31	32.14	1.09	-.86	-2.03	70.79
	13	49.31	-32.14	-1.09	.86	-2.89	73.82
4	653	3011.21	32.22	6.20	-1.43	-10.72	74.11
	13	-931.69	-32.22	-6.20	1.43	-17.17	70.87
5	653	1805.05	59.73	1.84	-1.02	-3.00	131.99
	13	-725.53	-59.73	-1.84	1.02	-5.27	136.79
6	653	2349.80	64.34	6.27	-2.17	-11.01	144.24
	13	-286.18	-64.34	-6.27	2.17	-17.20	145.29

Member 2513

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	656	1293.45	1.99	-.71	1.58	1.78	8.55
	16	-1240.44	-1.99	.71	-1.58	1.43	.42
2	656	964.53	-14.72	5.02	.59	-8.63	-21.18
	16	-964.53	14.72	-5.02	-.59	-13.96	-45.07
3	656	40.47	31.97	-1.10	-.57	2.33	69.08
	16	-40.47	-31.97	1.10	.57	2.63	74.79
4	656	3386.96	-19.09	6.46	3.25	-10.28	-18.95
	16	-3307.44	19.09	-6.46	-3.25	-18.79	-66.98
5	656	2000.88	50.94	-2.73	1.50	6.17	116.43
	16	-921.36	-50.94	2.73	-1.50	6.10	112.81
6	656	2758.14	23.09	3.84	1.91	-5.43	67.73
	16	-2694.52	-23.09	-3.84	-1.91	-11.87	36.16

Member 2515

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	660	1492.90	9.65	-.32	-1.89	1.81	27.72
	20	-1439.89	-9.65	.32	1.89	-.36	15.71
2	660	2039.79	10.12	3.69	-.76	-4.32	27.54
	20	-2039.79	-10.12	-3.69	.76	-12.30	17.99
3	660	11.28	11.31	-.25	.44	.46	14.88
	20	-11.28	-11.31	.25	-.44	.68	36.00
4	660	5299.04	29.66	5.06	-3.98	-3.77	82.90
	20	-5219.52	-29.66	-5.06	3.98	-18.99	50.55
5	660	2256.28	31.44	-.87	-2.18	3.41	63.90
	20	-2176.76	-31.44	.87	2.18	.49	77.57
6	660	4252.77	37.29	3.74	-2.65	-2.46	84.17
	20	-4189.16	-37.29	-3.74	2.65	-14.37	83.64

Member 2563

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	18	1341.03	-3.30	13.06	.83	-8.96	-12.13
	719	-1361.76	3.30	-13.06	-.83	-14.02	6.32
2	18	1384.38	-37.14	2.65	1.33	16.14	-99.92
	719	-1384.38	37.14	-2.65	-1.33	-20.80	34.55
3	18	148.21	20.90	.83	1.61	-1.54	51.27
	719	-148.21	-20.90	-.83	-1.61	.07	-14.49
4	18	4088.11	-60.66	23.56	3.24	10.77	-168.07
	719	-4119.21	60.66	-23.56	-3.24	-52.23	61.31
5	18	2233.86	26.40	20.84	3.65	-15.75	58.72
	719	-2264.96	-26.40	-20.84	-3.65	-20.92	-12.26
6	18	3448.34	-23.45	19.85	4.52	6.77	-72.93
	719	-3473.22	23.45	-19.85	-4.52	-41.70	31.66

Member 2564

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	652	1352.12	9.33	-1.88	-.91	-9.14	21.32
	720	-1331.39	-9.33	1.88	.91	12.45	-4.90
2	652	883.54	12.29	-10.51	-.21	-3.82	28.54
	720	-883.54	-12.29	10.51	.21	22.32	-6.91
3	652	-118.22	23.92	-1.70	-1.26	.82	22.59
	720	118.22	-23.92	1.70	1.26	2.17	19.50
4	652	3353.49	32.43	-18.60	-1.69	-19.43	74.79
	720	-3322.39	-32.43	18.60	1.69	52.16	-17.72
5	652	1850.85	49.87	-5.38	-3.26	-12.47	65.88
	720	-1819.75	-49.87	5.38	3.26	21.94	21.90
6	652	2540.93	54.64	-16.92	-2.87	-14.55	86.95
	720	-2516.05	-54.64	16.92	2.87	44.34	9.23

Member 2566

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	720	1296.66	9.43	1.81	-.93	4.15	5.36
	12	-1264.38	-9.43	-1.81	.93	-9.11	20.47
2	720	828.68	11.94	-3.51	-1.20	15.84	7.11
	12	-828.68	-11.94	3.51	1.20	-6.23	25.60
3	720	-120.35	16.98	-1.34	1.42	2.26	-19.73
	12	120.35	-16.98	1.34	-1.42	1.41	66.26
4	720	3188.01	32.05	-2.55	-3.20	29.98	18.71
	12	-3139.59	-32.05	2.55	3.20	-23.01	69.11
5	720	1764.47	39.61	.71	.73	9.62	-21.56
	12	-1716.05	-39.61	-.71	-.73	-11.55	130.09
6	720	2405.99	46.02	-3.65	-.86	26.70	-8.71
	12	-2367.25	-46.02	3.65	.86	-16.71	134.80

Member 2567

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	719	1391.98	-3.89	3.98	-.36	-9.65	-5.76
	658	-1424.26	3.89	-3.98	.36	-1.26	-4.91
2	719	1442.39	-37.33	10.95	.67	-22.74	-34.18
	658	-1442.39	37.33	-10.95	-.67	-7.26	-68.09
3	719	147.57	19.87	-.39	-.72	1.16	14.31
	658	-147.57	-19.87	.39	.72	-.08	40.15
4	719	4251.55	-61.83	22.39	.46	-48.59	-59.90
	658	-4299.97	61.83	-22.39	-.46	-12.77	-109.50
5	719	2309.32	23.97	5.38	-1.62	-12.74	12.83
	658	-2357.74	-23.97	-5.38	1.62	-2.00	52.86
6	719	3578.32	-25.61	17.44	-.50	-37.48	-30.75
	658	-3617.06	25.61	-17.44	.50	-10.31	-39.43

Member 2570

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1219	415.27	-4.40	3.79	.00	.00	.00
	28	-362.26	4.40	-3.79	.00	-17.07	-19.81
2	1219	327.35	-1.77	11.35	.00	.00	.00
	28	-327.35	1.77	-11.35	.00	-51.10	-7.99
3	1219	35.24	56.06	.27	.00	.00	.00
	28	-35.24	-56.06	-.27	.00	-1.23	252.26
4	1219	1113.93	-9.27	22.72	.00	.00	.00
	28	-1034.41	9.27	-22.72	.00	-102.25	-41.70
5	1219	675.78	77.48	6.10	.00	.00	.00
	28	-596.26	-77.48	-6.10	.00	-27.45	348.67
6	1219	933.44	59.86	18.51	.00	.00	.00
	28	-869.82	-59.86	-18.51	.00	-83.27	269.35

Member 2571

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1220	438.02	2.29	10.93	.00	.00	.00
	29	-385.00	-2.29	-10.93	.00	-49.17	10.31
2	1220	256.65	-.22	10.51	.00	.00	.00
	29	-256.65	.22	-10.51	.00	-47.30	-1.01
3	1220	-96.92	44.48	6.71	.00	.00	.00
	29	96.92	-44.48	-6.71	.00	-30.20	200.16
4	1220	1042.00	3.10	32.16	.00	.00	.00
	29	-962.48	-3.10	-32.16	.00	-144.70	13.96
5	1220	511.65	70.16	26.46	.00	.00	.00
	29	-432.13	-70.16	-26.46	.00	-119.05	315.71
6	1220	717.30	55.86	33.78	.00	.00	.00
	29	-653.68	-55.86	-33.78	.00	-152.00	251.36

Member 2579

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1228	424.08	.12	10.71	.00	.00	.00
	54	-371.06	-.12	-10.71	.00	-48.21	.52
2	1228	306.35	4.80	12.85	.00	.00	.00
	54	-306.35	-4.80	-12.85	.00	-57.82	21.58
3	1228	79.27	48.85	-5.60	.00	.00	.00
	54	-79.27	-48.85	5.60	.00	25.21	219.81
4	1228	1095.65	7.37	35.34	.00	.00	.00
	54	-1016.13	-7.37	-35.34	.00	-159.04	33.15
5	1228	755.02	73.44	7.67	.00	.00	.00
	54	-675.50	-73.44	-7.67	.00	-34.51	330.50
6	1228	971.64	64.51	21.55	.00	.00	.00
	54	-908.02	-64.51	-21.55	.00	-96.99	290.29

Member 2584

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1233	573.60	23.53	3.58	.00	.00	.00
	59	-520.59	-23.53	-3.58	.00	-16.12	105.90
2	1233	426.88	17.36	10.86	.00	.00	.00
	59	-426.88	-17.36	-10.86	.00	-48.87	78.12
3	1233	-31.00	57.30	-.22	.00	.00	.00
	59	31.00	-57.30	.22	.00	1.00	257.86
4	1233	1500.72	61.34	21.67	.00	.00	.00
	59	-1421.20	-61.34	-21.67	.00	-97.50	276.02
5	1233	813.90	121.25	5.04	.00	.00	.00
	59	-734.38	-121.25	-5.04	.00	-22.68	545.64
6	1233	1163.38	117.83	17.07	.00	.00	.00
	59	-1099.76	-117.83	-17.07	.00	-76.79	530.25

Member 2597

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	663	19.87	-.63	-21.30	-1.13	52.17	-19.49
	23	14.06	.63	21.30	1.13	43.70	16.66
2	663	46.43	4.84	-9.70	-.41	31.95	-.38
	23	-46.43	-4.84	9.70	.41	11.70	22.17
3	663	-6.74	11.40	3.16	.07	-8.28	24.93
	23	6.74	-11.40	-3.16	-.07	-5.95	26.36
4	663	99.45	6.32	-46.50	-2.31	126.18	-29.80
	23	-48.56	-6.32	46.50	2.31	83.09	58.25
5	663	19.70	16.15	-27.21	-1.59	65.84	8.16
	23	31.19	-16.15	27.21	1.59	56.62	64.53
6	663	71.48	18.73	-33.41	-1.77	91.01	6.07
	23	-30.76	-18.73	33.41	1.77	59.33	78.23

Member 2601

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	22	1388.87	-19.92	93.17	4.55	-80.60	-37.42
	974	-1403.35	19.92	-93.17	-4.55	-98.28	-.83
2	22	1156.72	-.23	35.12	3.11	-14.76	3.58
	974	-1156.72	.23	-35.12	-3.11	-52.67	-4.03
3	22	-7.92	1.85	-2.86	.47	2.10	5.01
	974	7.92	-1.85	2.86	-.47	3.39	-1.47
4	22	3818.38	-30.23	192.43	11.49	-143.04	-50.76
	974	-3840.10	30.23	-192.43	-11.49	-226.43	-7.28
5	22	2071.42	-27.11	135.47	7.54	-117.76	-48.61
	974	-2093.14	27.11	-135.47	-7.54	-142.34	-3.44
6	22	3045.20	-21.97	150.52	9.76	-111.92	-34.59
	974	-3062.57	21.97	-150.52	-9.76	-177.08	-7.59

Member 2602

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	974	1662.61	-17.22	92.46	6.73	-93.65	-5.95
	1077	-1667.44	17.22	-92.46	-6.73	34.48	-5.07
2	974	1295.64	-.13	44.05	3.35	-41.29	1.76
	1077	-1295.64	.13	-44.05	-3.35	13.09	-1.84
3	974	-15.88	.36	-1.99	-1.42	2.71	1.05
	1077	15.88	-.36	1.99	1.42	-1.44	-.82
4	974	4437.38	-26.03	204.76	15.12	-202.41	-6.29
	1077	-4444.62	26.03	-204.76	-15.12	71.36	-10.37
5	974	2470.10	-25.29	135.70	7.97	-136.42	-7.35
	1077	-2477.33	25.29	-135.70	-7.97	49.57	-8.83
6	974	3530.85	-20.39	161.42	10.39	-158.68	-3.78
	1077	-3536.64	20.39	-161.42	-10.39	55.37	-9.28

Member 2603

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1077	1667.44	-17.22	92.46	6.73	-34.48	5.07
	662	-1682.07	17.22	-92.46	-6.73	-144.89	-38.48
2	1077	1295.65	-.13	44.05	3.35	-13.09	1.84
	662	-1295.65	.13	-44.05	-3.35	-72.36	-2.10
3	1077	-15.88	.36	-1.99	-1.42	1.44	.82
	662	15.88	-.36	1.99	1.42	2.43	-.12
4	1077	4444.63	-26.03	204.76	15.12	-71.36	10.37
	662	-4466.57	26.03	-204.76	-15.12	-325.88	-60.87
5	1077	2477.34	-25.29	135.70	7.97	-49.57	8.83
	662	-2499.28	25.29	-135.70	-7.97	-213.70	-57.90
6	1077	3536.65	-20.39	161.42	10.39	-55.37	9.28
	662	-3554.20	20.39	-161.42	-10.39	-257.79	-48.84

Member 3010

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	13	1103.61	1.55	-.34	.61	.13	2.95
	104	-1065.44	-1.55	.34	-.61	1.41	4.01
2	13	673.99	1.14	6.39	.53	-12.42	1.61
	104	-673.99	-1.14	-6.39	-.53	-16.32	3.52
3	13	-48.11	27.37	1.77	-2.04	-3.87	60.60
	104	48.11	-27.37	-1.77	2.04	-4.11	62.55
4	13	2666.40	4.03	9.06	1.71	-18.43	6.85
	104	-2609.15	-4.03	-9.06	-1.71	-22.36	11.29
5	13	1583.25	43.37	2.14	-2.13	-5.61	95.33
	104	-1526.00	-43.37	-2.14	2.13	-4.04	99.84
6	13	2075.39	36.07	9.38	-1.07	-19.39	78.20
	104	-2029.59	-36.07	-9.38	1.07	-22.82	84.09

Member 3013

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	16	1149.52	-2.04	-1.67	1.21	3.30	-3.77
	107	-1111.35	2.04	1.67	-1.21	4.21	-5.41
2	16	859.09	-10.23	8.24	.54	-15.57	-19.96
	107	-859.09	10.23	-8.24	-.54	-21.53	-26.08
3	16	48.07	26.61	-1.78	-1.73	4.23	58.83
	107	-48.07	-26.61	1.78	1.73	3.79	60.90
4	16	3012.92	-18.41	9.86	2.61	-18.41	-35.60
	107	-2955.66	18.41	-9.86	-2.61	-25.98	-47.23
5	16	1796.38	36.85	-5.18	-.79	11.30	82.59
	107	-1739.13	-36.85	5.18	.79	11.99	83.25
6	16	2468.01	17.20	5.75	.01	-9.65	42.12
	107	-2422.21	-17.20	-5.75	-.01	-16.24	35.30

Member 3015

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	20	1390.86	-1.68	-4.50	-.50	8.41	-4.35
	111	-1352.69	1.68	4.50	.50	11.83	-3.20
2	20	1766.01	-.75	7.11	.07	-12.68	-3.34
	111	-1766.01	.75	-7.11	-.07	-19.33	-.03
3	20	9.62	22.49	-.55	-.25	1.11	49.48
	111	-9.62	-22.49	.55	.25	1.37	51.74
4	20	4735.30	-3.64	3.92	-.66	-6.40	-11.53
	111	-4678.05	3.64	-3.92	.66	-11.25	-4.85
5	20	2100.71	31.22	-7.57	-1.12	14.28	67.69
	111	-2043.46	-31.22	7.57	1.12	19.80	72.81
6	20	3799.78	24.08	2.48	-.82	-3.79	50.15
	111	-3753.97	-24.08	-2.48	.82	-7.36	58.21

Member 3020

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	28	203.18	-13.82	8.00	-.34	-15.17	-20.31
	119	-165.01	13.82	-8.00	.34	-20.85	-41.90
2	28	166.78	-6.64	32.47	-.28	-61.78	-9.20
	119	-166.78	6.64	-32.47	.28	-84.35	-20.66
3	28	8.29	48.27	.71	.54	-1.38	59.56
	119	-8.29	-48.27	-.71	-.54	-1.79	157.65
4	28	554.95	-30.69	60.72	-.94	-115.43	-44.26
	119	-497.69	30.69	-60.72	.94	-157.80	-93.85
5	28	317.20	51.67	13.06	.30	-24.83	58.88
	119	-259.95	-51.67	-13.06	-.30	-33.96	173.62
6	28	453.90	33.37	49.42	-.10	-94.00	36.06
	119	-408.10	-33.37	-49.42	.10	-128.39	114.11

Member 3021

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	29	207.05	17.14	26.01	-.34	-51.27	34.27
	120	-168.88	-17.14	-26.01	.34	-65.78	42.87
2	29	125.49	1.98	28.89	.17	-56.22	6.56
	120	-125.49	-1.98	-28.89	-.17	-73.80	2.36
3	29	-34.10	31.79	5.26	.83	-11.86	28.81
	120	34.10	-31.79	-5.26	-.83	-11.81	114.24
4	29	498.81	28.69	82.36	-.25	-161.23	61.26
	120	-441.55	-28.69	-82.36	.25	-209.37	67.85
5	29	259.41	73.40	46.90	.73	-94.69	94.63
	120	-202.16	-73.40	-46.90	-.73	-116.38	235.67
6	29	358.12	61.10	72.20	.79	-143.21	83.58
	120	-312.32	-61.10	-72.20	-.79	-181.67	191.36

Member 3038

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	54	197.68	-22.49	25.48	.29	-50.05	-47.50
	148	-159.51	22.49	-25.48	-.29	-64.59	-53.70
2	54	147.00	-4.56	35.98	-.17	-70.27	-16.98
	148	-147.00	4.56	-35.98	.17	-91.62	-3.53
3	54	23.41	14.52	-5.77	.45	13.86	-15.65
	148	-23.41	-14.52	5.77	-.45	12.12	81.00
4	54	517.02	-40.57	92.18	.19	-180.49	-96.71
	148	-459.77	40.57	-92.18	-.19	-234.32	-85.85
5	54	331.64	-11.95	29.55	1.11	-54.29	-94.72
	148	-274.38	11.95	-29.55	-1.11	-78.71	40.95
6	54	441.70	-15.03	66.82	.69	-127.76	-96.15
	148	-395.90	15.03	-66.82	-.69	-172.91	28.53

Member 3043

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	59	276.64	57.76	7.64	.59	-14.60	105.80
	153	-238.47	-57.76	-7.64	-.59	-19.80	154.12
2	59	213.13	33.94	32.00	.42	-60.97	60.08
	153	-213.13	-33.94	-32.00	-.42	-83.02	92.65
3	59	-2.28	30.80	-.58	.56	1.19	18.15
	153	2.28	-30.80	.58	-.56	1.44	120.44
4	59	734.65	137.55	59.46	1.52	-113.36	248.82
	153	-677.40	-137.55	-59.46	-1.52	-154.23	370.15
5	59	411.53	132.83	10.59	1.74	-20.12	185.92
	153	-354.28	-132.83	-10.59	-1.74	-27.53	411.83
6	59	584.98	146.99	46.87	1.89	-89.26	220.83
	153	-539.18	-146.99	-46.87	-1.89	-121.65	440.64

Member 3087

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	109	1221.23	-3.29	18.30	1.61	-16.99	-9.49
	795	-1236.16	3.29	-18.30	-1.61	-15.22	3.70
2	109	1209.26	-17.70	6.74	.76	21.88	-44.99
	795	-1209.26	17.70	-6.74	-.76	-33.75	13.84
3	109	80.58	26.68	1.30	2.19	-2.29	57.78
	795	-80.58	-26.68	-1.30	-2.19	.01	-10.82
4	109	3645.74	-31.48	37.56	3.55	7.34	-81.72
	795	-3668.13	31.48	-37.56	-3.55	-73.45	26.31
5	109	1952.71	35.08	29.39	5.71	-28.92	72.44
	795	-1975.10	-35.08	-29.39	-5.71	-22.81	-10.69
6	109	3013.28	6.83	31.61	5.48	3.12	3.96
	795	-3031.20	-6.83	-31.61	-5.48	-58.74	8.06

Member 3088

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	12	1173.60	.54	1.31	-.73	-22.30	1.81
	796	-1158.67	-.54	-1.31	.73	19.98	-.85
2	12	781.55	.61	-3.14	.64	-26.57	.91
	796	-781.55	-.61	3.14	-.64	32.10	.16
3	12	-100.82	39.39	-2.09	-2.74	2.70	75.06
	796	100.82	-39.39	2.09	2.74	.98	-5.73
4	12	2932.73	1.73	-2.73	-.13	-73.31	4.08
	796	-2910.34	-1.73	2.73	.13	78.12	-1.04
5	12	1609.17	59.90	-1.16	-5.20	-29.40	115.30
	796	-1586.77	-59.90	1.16	5.20	31.45	-9.88
6	12	2225.20	48.65	-4.70	-3.39	-55.41	93.34
	796	-2207.29	-48.65	4.70	3.39	63.67	-7.71

Member 3090

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	796	1120.83	1.10	5.73	.21	2.82	1.02
	103	-1097.59	-1.10	-5.73	-.21	-18.53	2.00
2	796	719.95	.43	-1.22	.01	20.76	-.34
	103	-719.95	-.43	1.22	-.01	-17.41	1.53
3	796	-102.66	25.84	-1.62	.58	3.12	8.44
	103	102.66	-25.84	1.62	-.58	1.33	62.35
4	796	2761.17	2.30	6.77	.32	35.36	1.02
	103	-2726.31	-2.30	-6.77	-.32	-53.91	5.28
5	796	1527.26	40.40	6.16	1.18	8.91	14.19
	103	-1492.40	-40.40	-6.16	-1.18	-25.80	96.52
6	796	2085.75	32.84	3.47	.95	32.04	10.94
	103	-2057.86	-32.84	-3.47	-.95	-41.53	79.05

Member 3091

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	795	1270.05	-4.24	11.42	-.31	-17.56	-3.84
	18	-1293.29	4.24	-11.42	.31	-13.73	-7.77
2	795	1274.15	-17.64	6.74	.54	-25.46	-14.45
	18	-1274.15	17.64	-6.74	-.54	7.01	-33.89
3	795	80.18	24.57	-.27	-2.56	.76	13.06
	18	-80.18	-24.57	.27	2.56	-.01	54.26
4	795	3816.30	-32.82	27.23	.35	-64.54	-27.44
	18	-3851.16	32.82	-27.23	-.35	-10.08	-62.50
5	795	2025.34	30.50	16.72	-4.30	-25.20	13.83
	18	-2060.20	-30.50	-16.72	4.30	-20.61	69.73
6	795	3149.25	3.22	21.46	-2.79	-50.72	-6.28
	18	-3177.14	-3.22	-21.46	2.79	-8.07	15.11

Member 3097

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	23	175.82	14.97	-9.11	-.13	19.52	34.81
	114	-141.89	-14.97	9.11	.13	21.49	32.56
2	23	108.93	13.40	5.16	.20	-10.23	30.72
	114	-108.93	-13.40	-5.16	-.20	-13.01	29.59
3	23	32.01	25.54	2.34	-.45	-5.59	59.55
	114	-32.01	-25.54	-2.34	.45	-4.92	55.39
4	23	427.12	42.56	-5.92	.10	13.94	98.30
	114	-376.23	-42.56	5.92	-.10	12.72	93.23
5	23	311.74	60.77	-10.17	-.87	20.89	141.53
	114	-260.84	-60.77	10.17	.87	24.86	131.93
6	23	380.10	64.70	-1.94	-.46	4.44	150.09
	114	-339.39	-64.70	1.94	.46	4.27	141.05

Member 3101

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	113	999.36	-20.57	29.44	.67	-27.35	-38.63
	962	-1013.83	20.57 -29.44	-.67	-29.18	-.87	
2	113	872.40	.74	-11.49	1.11	28.44	4.93
	962	-872.40	-.74	11.49	-1.11	-6.38	-3.51
3	113	-9.70	20.34	-2.02	-1.27	.62	40.12
	962	9.70	-20.34	2.02	1.27	3.26	-1.07
4	113	2807.64	-29.76	26.93	2.67	1.64	-50.55
	962	-2829.35	29.76	-26.93	-2.67	-53.35	-6.58
5	113	1484.48	-.35	41.13	-.90	-40.09	2.24
	962	-1506.20	.35	-41.13	.90	-38.88	-2.91
6	113	2234.47	.60	19.12	.61	2.06	7.70
	962	-2251.84	-.60	-19.12	-.61	-38.76	-6.54

Member 3102

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	962	1110.80	-18.24	34.31	1.95	-41.99	-6.58
	1063	-1115.62	18.24	-34.31	-1.95	20.03	-5.09
2	962	894.09	1.12	-3.99	1.30	2.14	.93
	1063	-894.09	-1.12	3.99	-1.30	.42	-.22
3	962	-15.81	18.05	-.48	-3.97	1.48	6.49
	1063	15.81	-18.05	.48	3.97	-1.17	5.06
4	962	3007.33	-25.69	45.48	4.88	-59.78	-8.48
	1063	-3014.57	25.69	-45.48	-4.88	30.67	-7.96
5	962	1642.48	-.29	50.74	-3.02	-60.76	-.14
	1063	-1649.72	.29	-50.74	3.02	28.28	-.05
6	962	2386.89	1.11	35.80	-.85	-46.04	1.00
	1063	-2392.68	-1.11	-35.80	.85	23.13	-.30

Member 3103

LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1063	1115.63	-18.24	34.31	1.95	-20.03	5.09
	22	-1130.25	18.24	-34.31	-1.95	-46.53	-40.48
2	1063	894.09	1.12	-3.99	1.30	-.42	.22
	22	-894.09	-1.12	3.99	-1.30	8.16	1.95
3	1063	-15.81	18.05	-.48	-3.97	1.17	-5.06
	22	15.81	-18.05	.48	3.97	-.23	40.08
4	1063	3014.57	-25.69	45.48	4.88	-30.67	7.96
	22	-3036.51	25.69	-45.48	-4.88	-57.56	-57.80
5	1063	1649.72	-.29	50.74	-3.02	-28.28	.04
	22	-1671.66	.29	-50.74	3.02	-70.15	-.61
6	1063	2392.68	1.11	35.80	-.85	-23.13	.30
	22	-2410.23	-1.11	-35.80	.85	-46.33	1.85

5.6 DESIGN RESULTS

5.6.1 Design of Beams

BEAM NO. 315 DESIGN RESULTS

LENGTH: 1410.0 mm SIZE: 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	352.5 mm	705.0 mm	1057.5 mm	1410.0 mm
TOP REINF.	2-#10	2-#10	5-#10	5-#10	9-#10
BOTTOM REINF.	3-#16	2-#16	2-#16	2-#16	2-#16
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c

BEAM NO. 316 DESIGN RESULTS

LENGTH: 2180.0 mm SIZE: 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	545.0 mm	1090.0 mm	1635.0 mm	2180.0 mm
TOP REINF.	2-#16	2-#16	2-#16	2-#16	3-#16
BOTTOM REINF.	4-#12	3-#12	3-#12	2-#12	2-#12
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c

BEAM NO. 317 DESIGN RESULTS

LENGTH: 1410.0 mm SIZE : 230.0 mm X 750.0 mm COVER:25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	352.5 mm	705.0 mm	1057.5 mm	1410.0 mm
TOP REINF	2-#20	2-#20	2-#20	2-#20	2-#20
BOTTOM REINF.	3-#12	3-#12	2-#12	3-#12	4-#12
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c

BEAM NO. 318 DESIGN RESULTS

LENGTH: 6235.0 mm SIZE: 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	1558.7 mm	3117.5 mm	4676.2 mm	6235.0 mm
TOP REINF.	8-#10	2-#10	5-#10	5-#10	11-#10
BOTTOM REINF.	5-#10	5-#10	5-#10	5-#10	2-#10
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c c

BEAM NO. 321 DESIGN RESULTS

LENGTH: 6235.0 mm SIZE: 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	1558.7 mm	3117.5 mm	4676.2 mm	6235.0 mm
TOP REINF.	2-#20	2-#20	2-#20	2-#20	3-#20
BOTTOM REINF.	3-#12	3-#12	3-#12	3-#12	2-#12
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c

BEAM NO. 327 DESIGN RESULTS

LENGTH: 4360.0 mm SIZE : 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	1090.0 mm	2180.0 mm	3270.0 mm	4360.0 mm
TOP REINF.	7-#10	5-#10	2-#10	5-#10	11-#10
BOTTOM REINF.	2-#16	2-#16	2-#16	2-#16	3-#16
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c

BEAM NO. 328 DESIGN RESULTS

LENGTH: 4420.0 mm SIZE: 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	1105.0 mm	2210.0 mm	3315.0 mm	4420.0 mm
TOP REINF.	9-#16	3-#16	2-#16	2-#16	2-#16
BOTTOM REINF.	2-320	2-#20	2-#20	3-#20	3-#20
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c

BEAM NO. 361 DESIGN RESULTS

LENGTH: 4360.0 mm SIZE: 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	1090.0 mm	2180.0 mm	3270.0 mm	4360.0 mm
TOP REINF.	2-#32	2-#32	2-#32	2-#32	4-#32
BOTTOM REINF.	7-#20	4-#20	2-#20	2-#20	6-#20
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 125 mm c/c	2 legged #8 @ 100 mm c/c	2 legged #10 @ 125 mm c/c

BEAM NO. 362 DESIGN RESULTS

LENGTH: 4420.0 mm SIZE: 230.0 mm X 750.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	1105.0 mm	2210.0 mm	3315.0 mm	4420.0 mm
TOP REINF.	6-#12	3-#12	3-#12	5-#12	13-#12
BOTTOM REINF.	6-#12	4-#12	3-#12	3-#12	2-#12
SHEAR REINF.	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c	2 legged #8 @ 150 mm c/c

BEAM NO. 439 DESIGN RESULTS

LENGTH: 1115.0 mm SIZE: 230.0 mm X 700.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	278.7 mm	557.5 mm	836.2 mm	1115.0 mm
TOP REINF.	3-#12	3-#12	3-#12	3-#12	3-#12
BOTTOM REINF.	5-#20	5-#20	5-#20	5-#20	4-#20
SHEAR REINF.	2 legged #8	2 legged #8	2 legged #8	2 legged #8	2 legged #8
	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c

BEAM NO. 442 DESIGN RESULTS

LENGTH: 1615.0 mm SIZE: 230.0 mm X 700.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	403.7 mm	807.5 mm	1211.2 mm	1615.0 mm
TOP REINF.	9-#16	7-#16	5-#16	3-#16	2-#16
BOTTOM REINF.	3-#12	3-#12	3-#12	3-#12	3-#12
SHEAR REINF.	2 legged #8	2 legged #8	2 legged #8	2 legged #8	2 legged #8
	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c

BEAM NO. 443 DESIGN RESULTS

LENGTH: 2270.0 mm SIZE: 230.0 mm X 700.0 mm COVER: 25.0 mm

SUMMARY OF PROVIDED REINF. AREA					
SECTION	.0 mm	567.5 mm	1135.0 mm	1702.5 mm	2270.0 mm
TOP REINF.	3-#12	3-#12	2-#12	2-#12	3-#12
BOTTOM REINF.	5-#10	5-#10	6-#10	11-#10	17-#10
SHEAR REINF.	2 legged #8	2 legged #8	2 legged #8	2 legged #8	2 legged #8
	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c	@ 150 mm c/c

5.6.2 Design of Columns

COLUMN NO. 2510 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3999.98 Sq.mm.
MAIN REINFORCEMENT	Provide 20 - 16 dia. (.80%, 4021.24 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5708.98 Muzl : 618.92 Muyl : 287.15	

COLUMN NO. 2513 DESIGN RESULTS

LENGTH : 4500.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3037.64 Sq.mm.
MAIN REINFORCEMENT	Provide 28 - 12 dia. (.63%, 3166.73 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5418.11 Muzl : 692.54 Muyl : 330.63	

COLUMN NO. 2515 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	5599.98 Sq.mm.
MAIN REINFORCEMENT	Provide 28 - 16 dia. (1.13%, 5629.73 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 6192.58 Muzl : 402.02 Muyl : 187.82	

COLUMN NO. 2563 DESIGN RESULTS

LENGTH: 1760.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3694.36 Sq.mm.
MAIN REINFORCEMENT	Provide 12 - 20 dia. (.75%, 3769.91 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 320 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5616.60 Muzl : 576.91 Muyl : 274.82	

COLUMN NO. 2564 DESIGN RESULTS

LENGTH: 1760.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3999.98 Sq.mm.
MAIN REINFORCEMENT	Provide 20 - 16 dia. (.80%, 4021.24 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5708.98 Muzl : 593.58 Muyl : 274.89	

COLUMN NO. 2566 DESIGN RESULTS

LENGTH: 2740.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3999.98 Sq.mm.
MAIN REINFORCEMENT	Provide 20 - 16 dia. (.80%, 4021.24 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5708.98 Muzl : 592.77 Muyl : 274.50	

COLUMN NO. 2567 DESIGN RESULTS

LENGTH: 2740.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3856.48 Sq.mm.
MAIN REINFORCEMENT	Provide 8 - 25 dia. (.79%, 3926.99 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 380 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5665.60 Muzl : 539.86 Muyl : 256.96	

COLUMN NO. 2570 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	1435.00 Sq.mm.
MAIN REINFORCEMENT	Provide 8 - 16 dia. (.32%, 1608.50 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4933.71 Muzl : 255.12 Muyl : 122.16	

COLUMN NO 2571 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3999.98 Sq.mm.
MAIN REINFORCEMENT	Provide 20 - 16 dia. (.80%, 4021.24 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5708.98 Muzl : 601.56 Muyl : 278.77	

COLUMN NO. 2579 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	1428.98 Sq.mm.
MAIN REINFORCEMENT	Provide 8 - 16 dia. (.32%, 1608.50 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4931.89 Muzl : 273.45 Muyl : 130.76	

COLUMN NO 2584 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 500.0 mm X 1000.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3999.98 Sq.mm.
MAIN REINFORCEMENT	Provide 20 - 16 dia. (.80%, 4021.24 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5708.98 Muzl : 625.24 Muyl : 290.25	

COLUMN NO. 2597 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2559.99 Sq.mm.
MAIN REINFORCEMENT	Provide 24 - 12 dia. (.85%, 2714.34 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 3653.75 Muzl : 142.48 Muyl : 312.33	

COLUMN NO. 2601 DESIGN RESULTS

LENGTH: 1920.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	5717.78 Sq.mm.
MAIN REINFORCEMENT	Provide 12 - 25 dia. (1.84%, 5890.49 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 380 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4608.19 Muzl : 129.78 Muyl : 286.96	

COLUMN NO. 2602 DESIGN RESULTS

LENGTH: 640.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	7729.01 Sq.mm.
MAIN REINFORCEMENT	Provide 16 - 25 dia. (2.45%, 7853.98 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 380 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5216.08 Muzl : 139.24 Muyl : 313.40	

COLUMN NO. 2603 DESIGN RESULTS

LENGTH : 1940.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	8923.70 Sq.mm.
MAIN REINFORCEMENT	Provide 12 - 32 dia. (3.02%, 9650.97 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 380 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5577.18 Muzl : 190.63 Muyl : 428.08	

COLUMN NO. 3010 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 900.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2879.99 Sq.mm.
MAIN REINFORCEMENT	Provide 28 - 12 dia. (.88%, 3166.73 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4110.46 Muzl : 158.34 Muyl : 394.67	

COLUMN NO. 3013 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 900.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2702.17 Sq.mm.
MAIN REINFORCEMENT	Provide 24 - 12 dia. (.75%, 2714.34 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4056.72 Muzl : 151.57 Muyl : 363.77	

COLUMN NO. 3015 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 900.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	7420.91 Sq.mm.
MAIN REINFORCEMENT	Provide 24 - 20 dia. (2.09%, 7539.82 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 320 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 5482.96 Muzl : 133.44 Muyl : 341.62	

COLUMN NO. 3020 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 400.0 mm X 900.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2365.72 Sq.mm.
MAIN REINFORCEMENT	Provide12 – 16 dia. (.67%, 2412.74 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 3955.03 Muzl : 480.15 Muyl : 198.04	

COLUMN NO. 3021 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 400.0 mm X 900.0 mm COVER: 40.0 mm

REQD. STEEL AREA	4117.56 Sq.mm.
MAIN REINFORCEMENT	Provide 40 - 12 dia.(1.26%, 4523.89 Sq.mm.)
TIE REINFORCEMENT	Provide 8mm dia. rectangular ties @190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4484.52 Muzl : 645.03 Muyl : 258.39	

COLUMN NO.3038 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 400.0 mm X 900.0 mm COVER: 40.0 mm

REQD. STEEL AREA	4082.23 Sq.mm.
MAIN REINFORCEMENT	Provide 40 - 12 dia. (1.26%, 4523.89 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4473.84 Muzl : 669.02 Muyl : 268.93	

COLUMN NO.3043 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 400.0 mm X 900.0 mm COVER: 40.0 mm

REQD. STEEL AREA	4642.24 Sq.mm.
MAIN REINFORCEMENT	Provide 24 - 16 dia. (1.34%, 4825.49 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 255 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4643.10 Muzl : 745.62 Muyl : 297.91	

COLUMN NO.3087 DESIGN RESULTS

LENGTH: 1760.0 mm CROSS SECTION: 900.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	3455.99 Sq.mm.
MAIN REINFORCEMENT	Provide 32 - 12 dia. (1.01%, 3619.11 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4284.56 Muzl : 98.95 Muyl : 242.01	

COLUMN NO.3088 DESIGN RESULTS

LENGTH: 1760.0 mm CROSS SECTION: 900.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2879.99 Sq.mm.
MAIN REINFORCEMENT	Provide 28 - 12 dia. (.88%, 3166.73 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. Rectangular ties @190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4110.46 Muzl : 151.20 Muyl : 376.91	

COLUMN NO.3090 DESIGN RESULTS

LENGTH: 2740.0 mm CROSS SECTION: 900.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2879.99 Sq.mm.
MAIN REINFORCEMENT	Provide 28 - 12 dia. (.88%, 3166.73 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4110.46 Muzl : 150.94 Muyl : 376.28	

COLUMN NO.3091 DESIGN RESULTS

LENGTH: 2740.0 mm CROSS SECTION: 900.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	4031.98 Sq.mm.
MAIN REINFORCEMENT	Provide 36 - 12 dia.(1.13%, 4071.50 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 4458.65 Muzl : 100.24 Muyl : 247.07	

COLUMN NO.3097 DESIGN RESULTS

LENGTH: 4500.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	1873.21 Sq.mm.
MAIN REINFORCEMENT	Provide 4 - 25 dia. (.61%, 1963.50 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 380 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 3446.17 Muzl : 151.96 Muyl : 324.47	

COLUMN NO.3101 DESIGN RESULTS

LENGTH: 1920.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2559.99 Sq.mm.
MAIN REINFORCEMENT	Provide 24 - 12 dia. (.85%, 2714.34 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 3653.75 Muzl : 145.31 Muyl : 318.23	

COLUMN NO.3102 DESIGN RESULTS

LENGTH: 640.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2559.99 Sq.mm.
MAIN REINFORCEMENT	Provide 24 - 12 dia. (.85%, 2714.34 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 3653.75 Muzl : 98.93 Muyl : 209.70	

COLUMN NO.3103 DESIGN RESULTS

LENGTH: 1940.0 mm CROSS SECTION: 800.0 mm X 400.0 mm COVER: 40.0 mm

REQD. STEEL AREA	2559.99 Sq.mm.
MAIN REINFORCEMENT	Provide 24 - 12 dia. (.85%, 2714.34 Sq.mm.)
TIE REINFORCEMENT	Provide 8 mm dia. rectangular ties @ 190 mm c/c
SECTION CAPACITY (KNS-MET) Puz : 3653.75 Muzl : 95.52 Muyl : 203.19	

Landscape Development

6.LANDSCAPE DEVELOPMENT

The site landscape is developed in such a way that the circulation patterns are well arranged and the open spaces are covered with greenery. Development is done in such a way that landscaping elements like paving, signages, lampposts, fountains, ponds etc are incorporated so that good and promising views are obtained from different habitable rooms in the building. Hence the overall character of the building is developed.

6.1CONCEPT OF THE DESIGN

The structure should have oneness with the land surrounding it. The natural and other scenic views should be highlighted while the unwanted views should be screened off. Here the strategy for designing becomes more definitive and meticulous.

The concept of the design is to develop a formal appearance in an aesthetically appealing way in the front areas of the land with substantial screening and vistas towards the back areas. As a part of the usual landscape the necessary requirements are provided.

6.2 ELEMENTS OF THE DESIGN

The design consists of the natural elements like berms, water, vegetation which are properly arranged to give a neat and formal appearance. Many artificial elements are also included in the design. The artificial elements include car parking as per the standards of such a building, a well paved circulation pattern, lampposts to provide lighting at night, signages that indicate the various informations regarding to the site.

A perfect blend of the natural and the artificial elements in the landscape transforms the view to such a picture which not only improves the character of the building as a whole but also gives a pleasing and aesthetically appealing appearance. The landscape developed, is shown in the perspective view of the site.

Conclusion

7.CONCLUSION

As we are entering into a new era of sustainable development, the need for projects like this and their construction and implementation can change the whole scenario of the human society. While considering the need of a star hotel in the city of Cochin, Purple Ace has been designed to stand up to the mark. The proximity of the site to the Nedumbaserry Airport and its access to the National Highway has promoted the suitability of the project. The location of the site at a place like Edapally will surely provide a calm, serene and peaceful atmosphere to the visitors of Purple Ace.

The planning of the project was done only after having case studies and reviews of different such projects and also references and interviews with well-known civil engineers and architects. This project has enabled us to have a review of what we have learnt. Through this we were able to peep in, and deal with the modern phases concerning civil engineering such as analysis and design of the structures in STAADIII, rendering in 3DSTUDIOMAX and various other computer applications which we consider as a great success There are also many other phases in the project like the environmental part, interior design, preparation of estimate etc but the restricted time allowed us to do only planning and design of the main building.

By doing such a project, we have learnt to share our ideas and incorporate them in the project, which we hope has given the means for a good design. We worked as a team, not dividing the work among each, but by doing each part of the project together itself. On the lighter side, we have even learnt to sacrifice our personal interests and put forth more work hours, making small sacrifices on each of our parts.

With the upcoming of many other challenging projects, we hope Purple Ace stands out and becomes a landmark for the beautiful city of Cochin.

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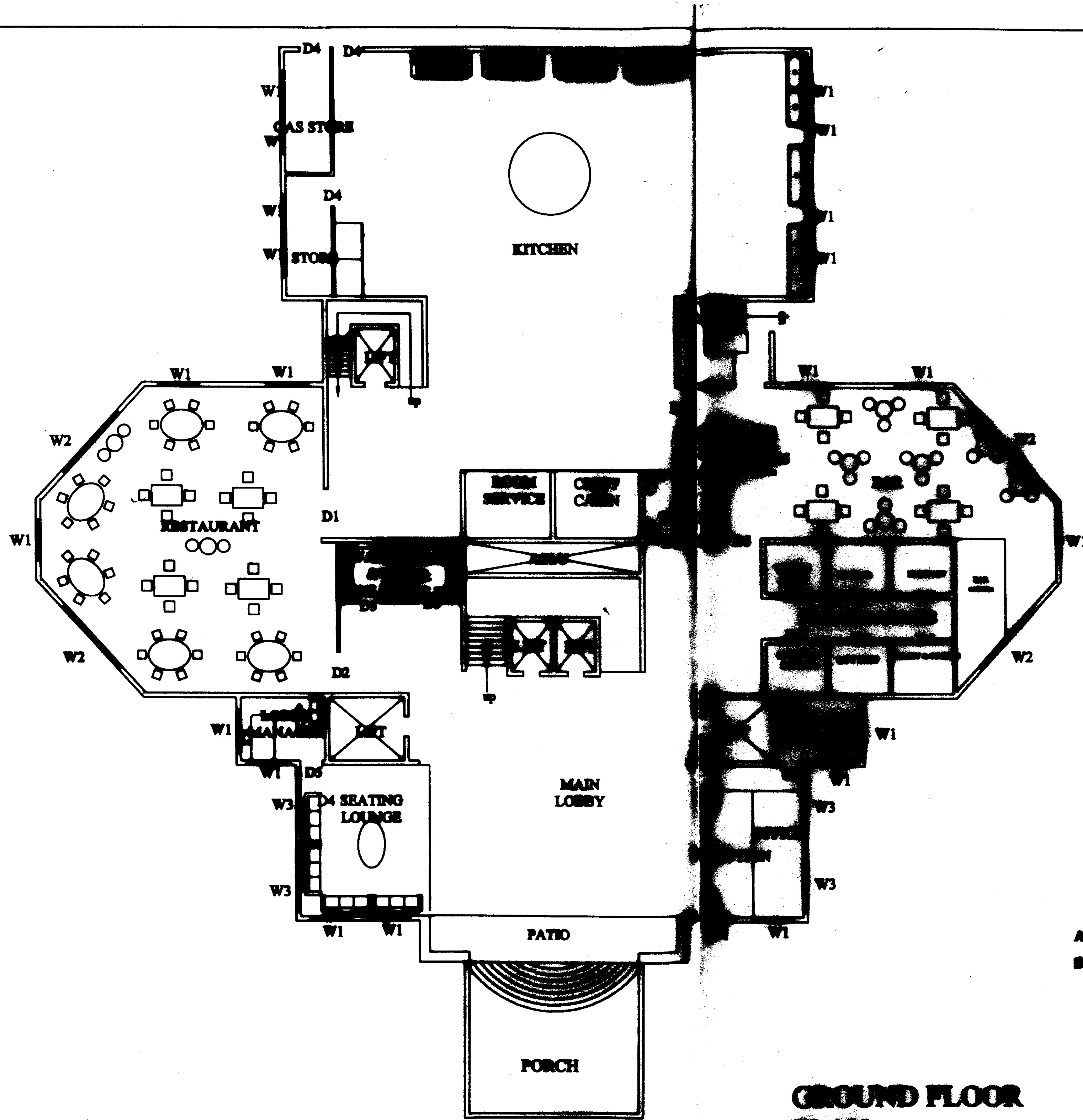
Drawings



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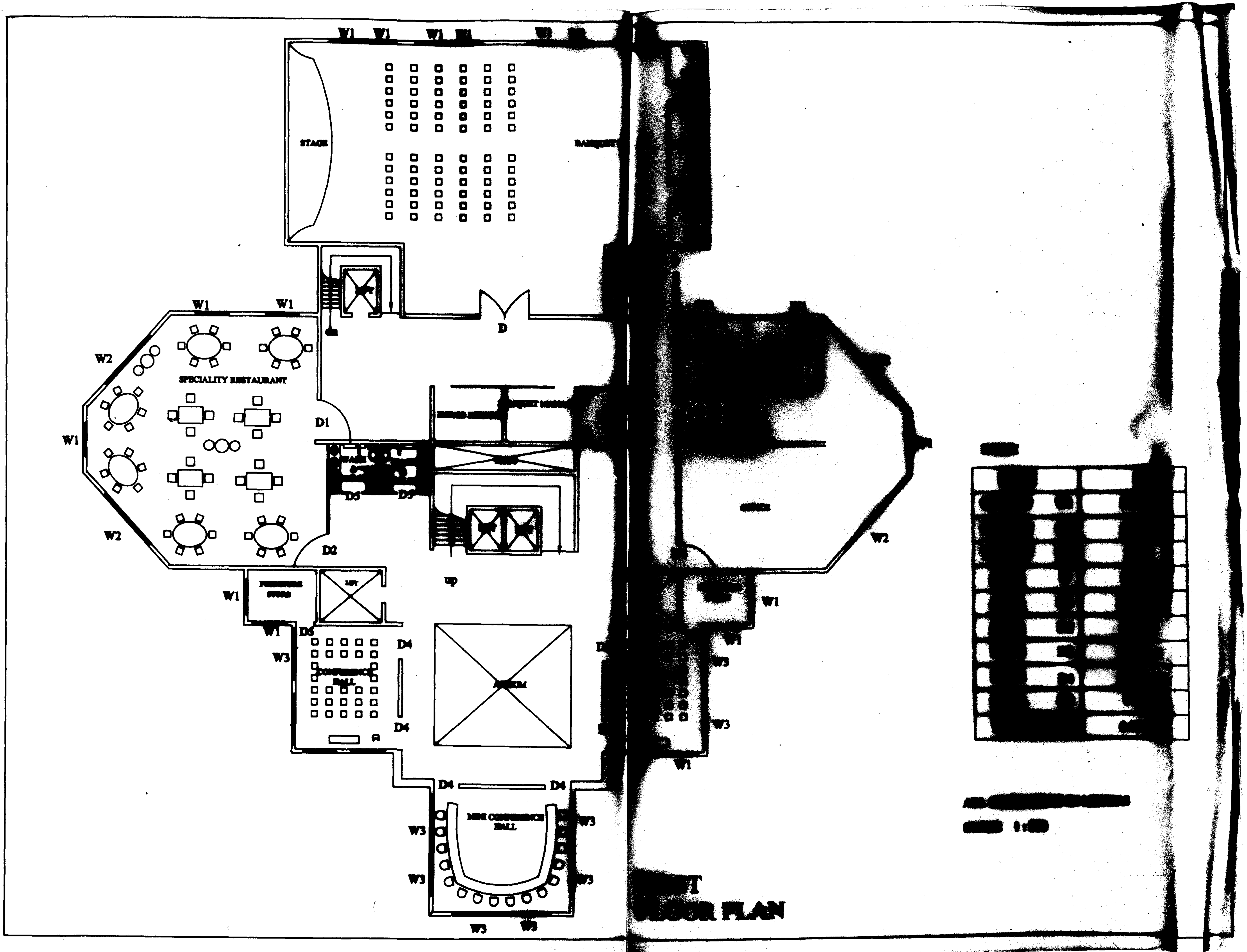
GROUND FLOOR PLAN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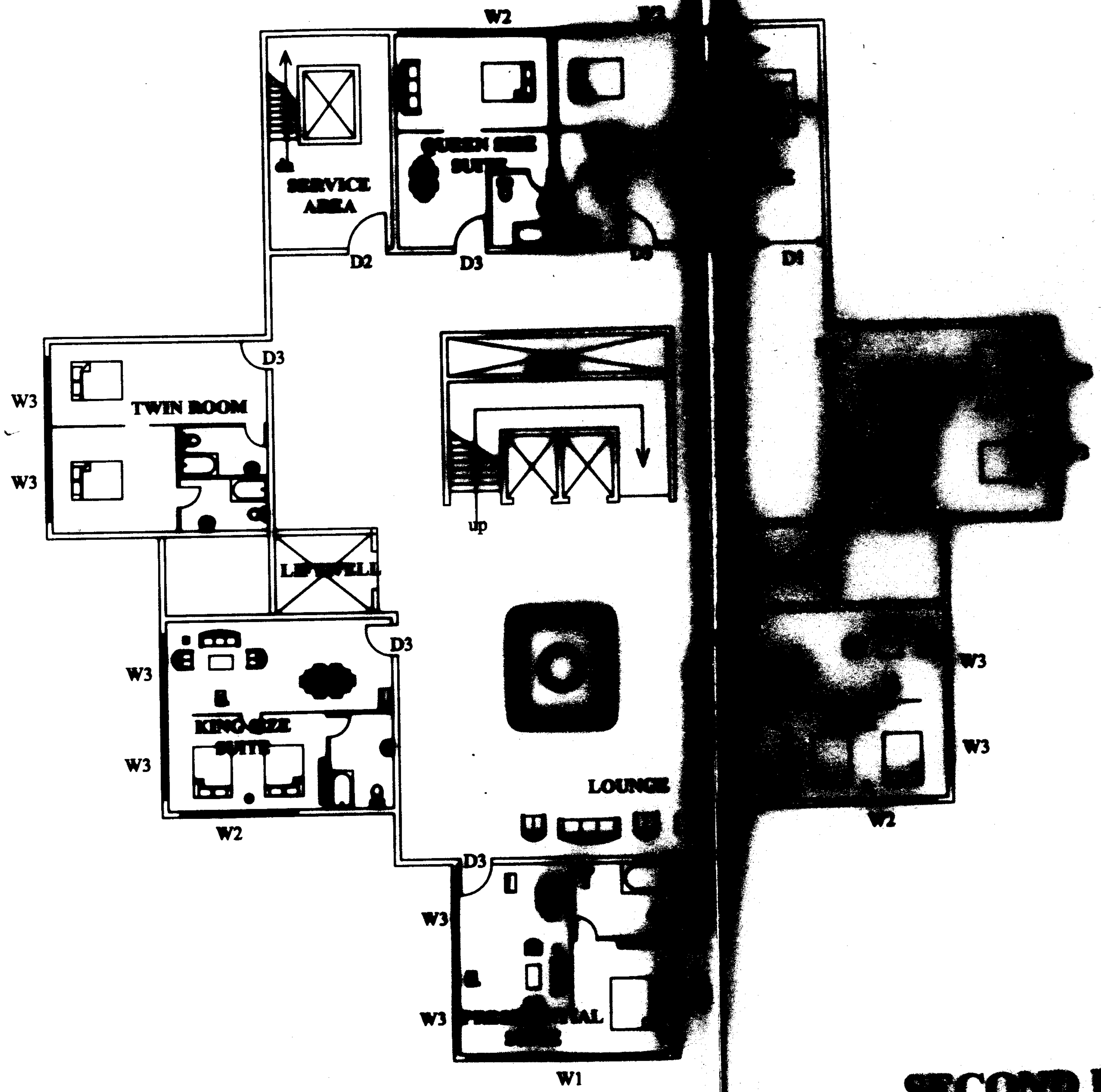
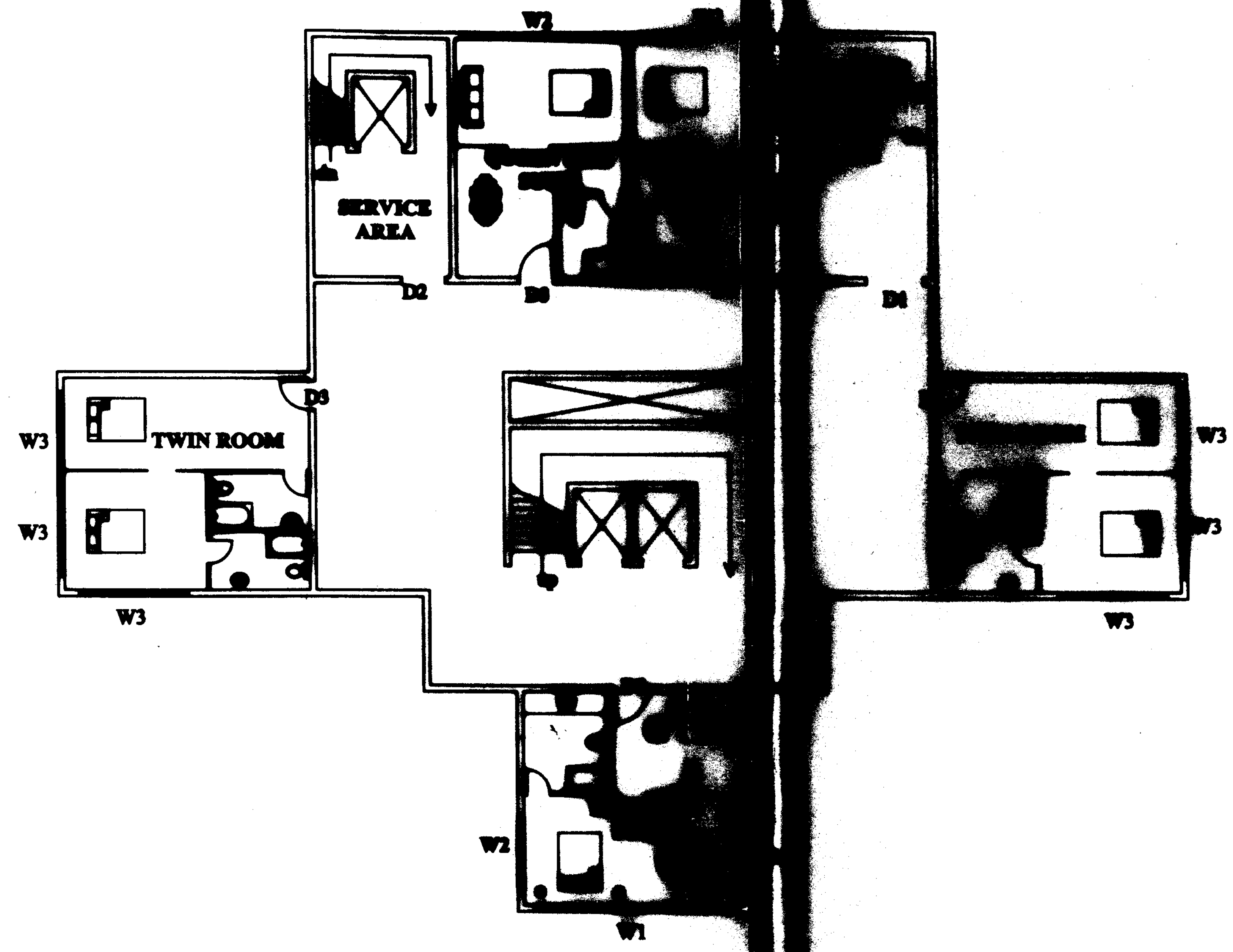
BANQUET
SPECIALITY RESTAURANT
D
D1
D2
D4
D5
W1
W2
W3
LIFT
FURNITURE STORE
up
CONFERENCE HALL
MINI CONFERENCE HALL
FLOOR PLAN



SECOND FL[illegible] PLAN



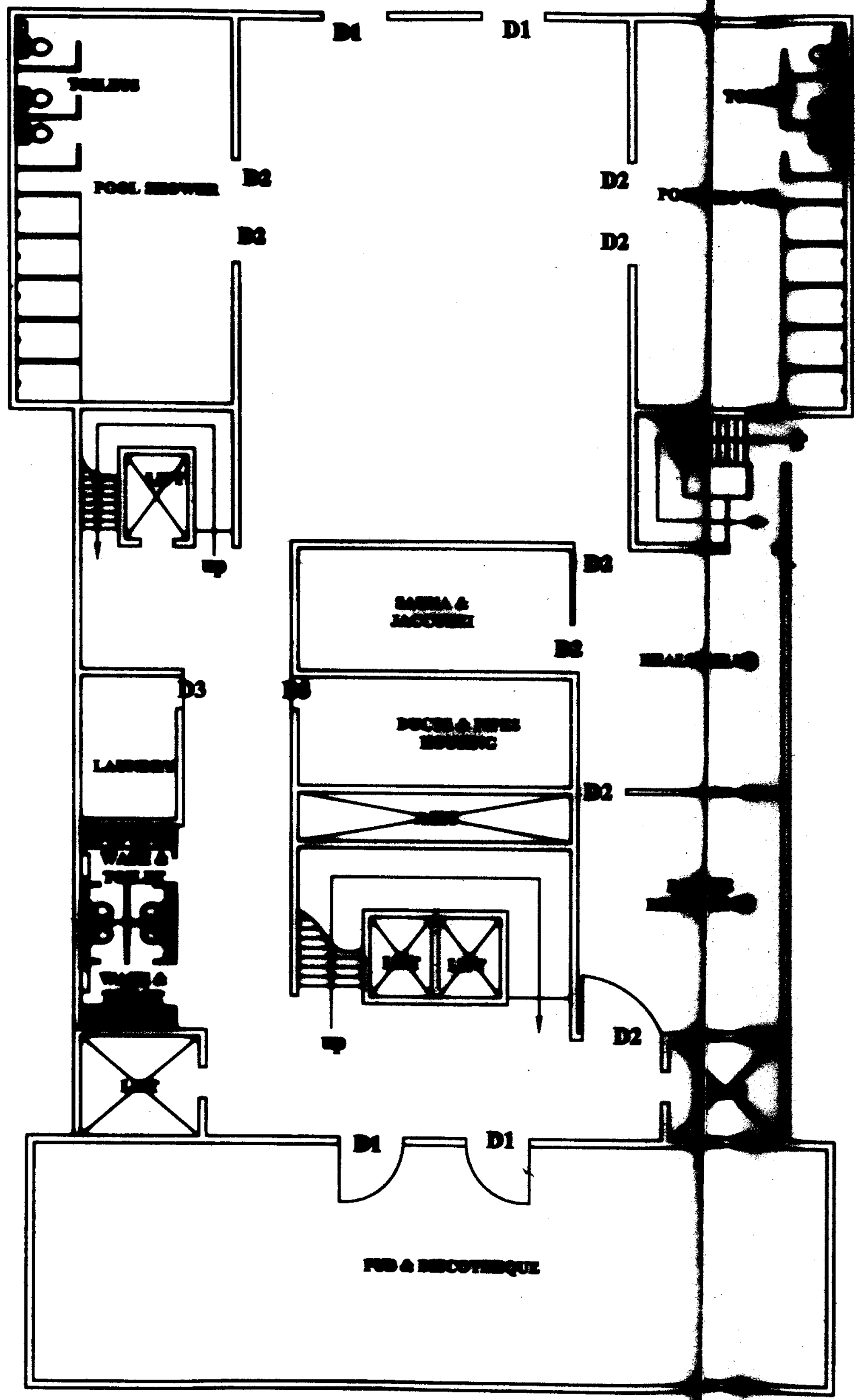
CAL FLOOR

INDEX

ITEM		SIZE
WINDOW	W1	6.5 X 3
WINDOW	W2	2.5 X 3
WINDOW	W3	3.5 X 2
DOOR	D1	2 X 2.2
DOOR	D2	1.5 X 2.2
DOOR	D3	1.2 X 2.2
TOILET DOORS		0.75 X 2

ALL DIMENSIONS IN METERS

SCALE 1 : 200

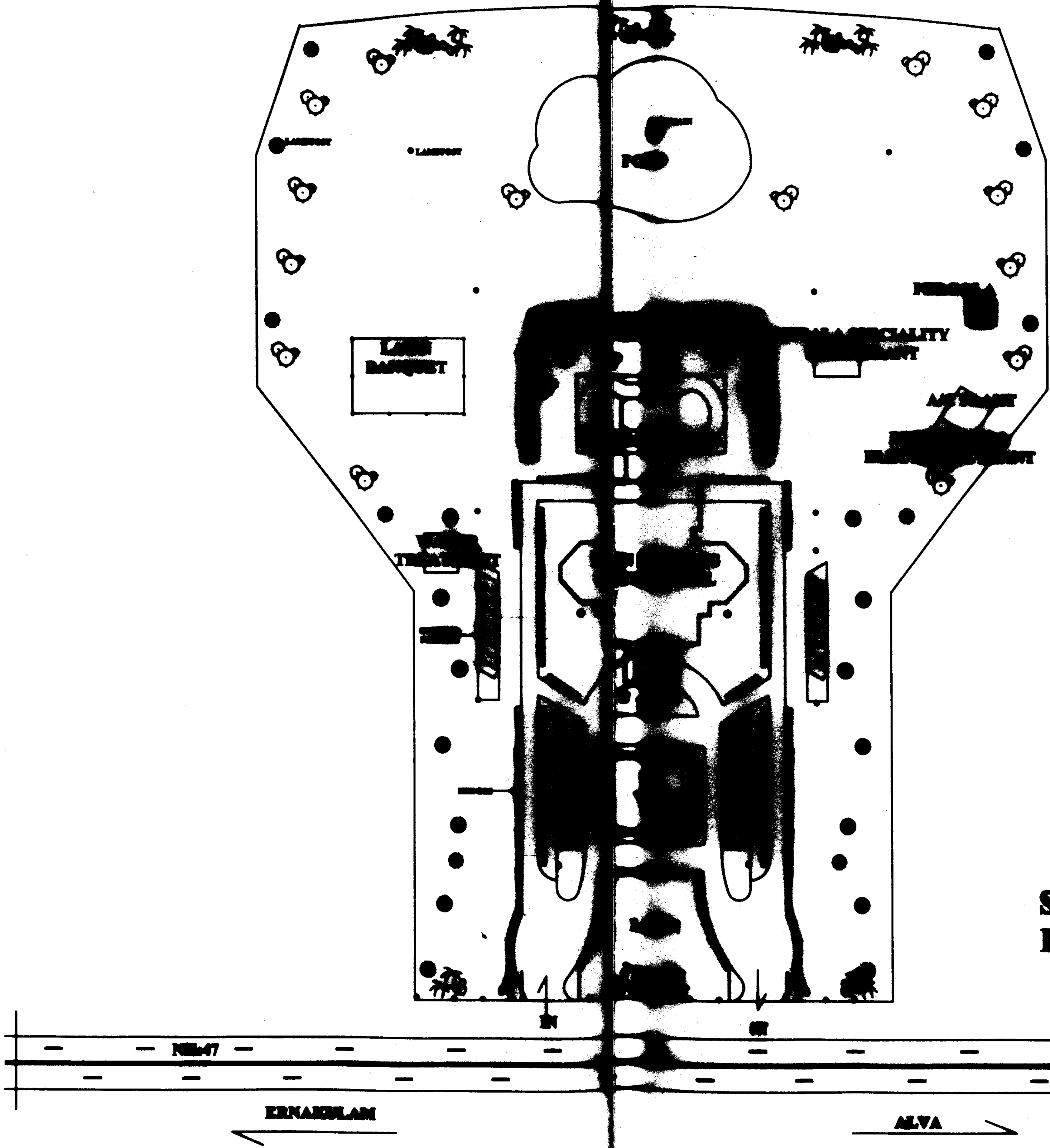


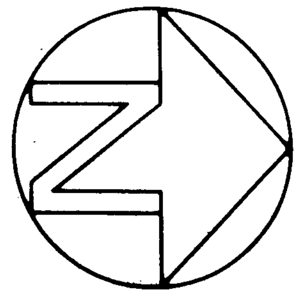
INDEX

ITEM		SIZE
DOOR	D1	2 X 2.2
DOOR	D2	1.5 X 2.2
DOOR	D3	1 X 2.2

ALL DIMENSIONS IN METERS
SCALE 1 : 200

BASEMENT FLOOR PLAN





ALL DIMENSIONS
IN METERS

SCALE 1:1200

SITE AND
LANDSCAPE PLAN


PURPLE ACE