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CASAGRAND PREMIER BUILDER LIMITED

STRUCTURAL DESIGN BASIS REPORT
Type-01

PROJECT TITLE:

Plan showing the proposed Construction of Residential Non-high rise building (Villa No. 1 to 116) consists of Ground Floor + First Floor, Totally 116 D/U, Comprised in Survey Nos. 85/1B, 86/2A, 86/2B, 86/3, 87/2, 102/1B, 103/3A, 103/3B, 105/1, 105/2 and105/3A of Sonallur Village, Vandalur Taluk, Chengalpet District.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

STRUCTURAL CONSULTANT

GENESYS **CONSULTING ENGINEERS**

No.2, S1 Flat, 1St Street, Kandhan Nagar, Ponniamman Medu, Chennai-600110.
Mobile:9677016079/9600109450, E:Genesys3112022@gmail.com

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1.0 INTRODUCTION

The basic aim of the structural design is to build a structure, which is safe, fulfilling the intended purpose during its estimated life span, economical in terms of initial and maintenance cost, durable and also maintaining a good aesthetic appearance. A building is considered to be structurally sound, if the individual elements and the building as a whole satisfy the criteria for strength, stability and serviceability and in seismic areas additional criteria for ductility and energy absorption capabilities. The overall building must be strong enough to transfer all loads through the structure to the ground without collapsing or losing structural integrity by rupture of the material at the critical sections, by transformation of the whole or parts into mechanisms or by instability.

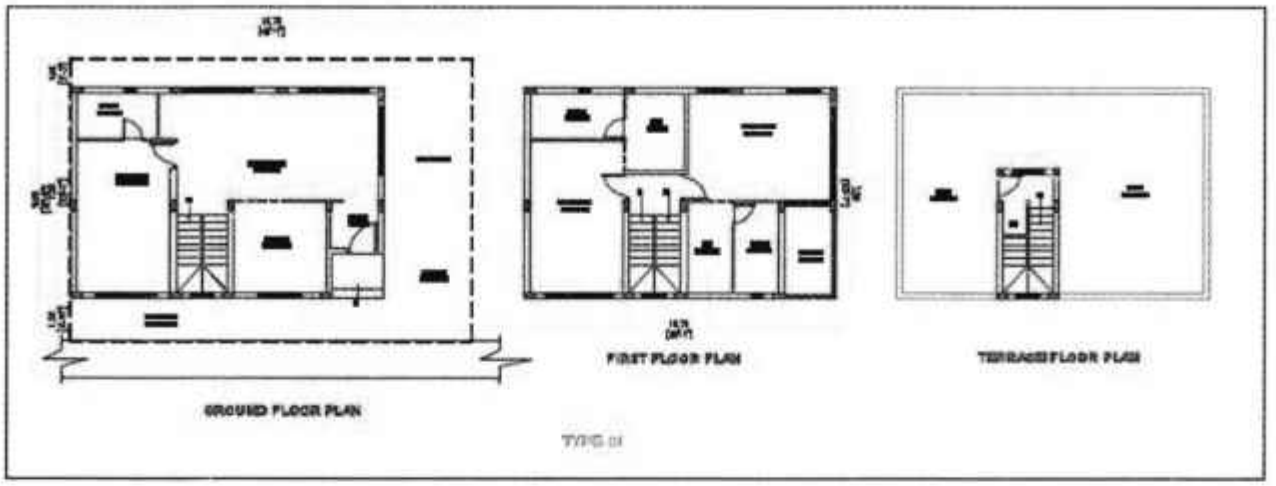
The intent of this document is to identify and record all the pertinent input requirements, analysis &design criteria for structural design of the **Ground+1 Upper floor totally 116 Dwelling building**. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning in delivering the structural scheme of the building. The scheme will becompatible with the architectural theme, satisfy the functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structures.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

2.0 BUILDING DESCRIPTION

Name Of Project	: Villa Buildings For M/s Casagrand Premier Builder Limited
Location	: Sonallur, Chengalpet
Type of Building	: Residential Building(VILLA TYPE)
Building Typology	: Reinforced Cement Concrete Framed Building
Plan Shape	: Regular Shape
Number of Stories	: Ground floor + 1 upper floor.
Position of the Building	: Free Standing
Total Height	: 9.30m from plinth level
Inter Storey Height	: 3.25 m.
Max Width Of Beam	: 200mm
Wall Thickness	: 200/100mm
Floor/Roof structure	: 125/150 mm floor slab
Location of site	: Sonallur, Chengalpet

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004



SITE CUM FLOOR PLAN

3.0 STRUCTURAL SYSTEM

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000

Material	: Reinforced Cement Concrete Frame
System	: Special Moment Resisting Frame
Floor System	: One Way/Two way Solid Slab
Foundation System	: Isolated Footing
Material Strengths	: Member Concrete Grade
Columns	: M25
Beams	: M25
Slabs	: M25
Foundation	: M25

Steel type Grade Thermo mechanically Treated Fe 550
Minimum clear cover is to be provided to main steel

For Footing	: Side Cover 50 mm
For Column	: 40mm
For Beam	: 25 mm for side face
	: 25 mm for bottom
For Slab	: 20 mm

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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4.0 LIST OF CODES

- In the analysis, design and detailing of the building, the latest editions of following Indian Standardswill be referred.
- IS 456 – 2000 - Plain and reinforced concrete- code of practice
- IS 1893 – (Part I) – 2016 Criteria for earthquake resistant design of structures.
- IS 875 – (Part –I) – 1987 edition 3.1(1997-12) Code of practice for design loads (other than earthquake) for buildings and structures- Dead loads
- IS 875 – (Part- II) – 1987 - reaffirmed 1997) Code of practice for design loads(other than earthquake) for buildings and structures.- Imposed loads
- IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) forbuildings and structures.- Wind loads
- IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other thanearthquake) for buildings and structures- special loads and load combinations.
- IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- codeof practice.

5.0 MATERIAL OF CONSTRUCTIONS

The building is RCC frame structure with Isolated Footing Foundation, columns, beams and floor slabs beingused as diaphragms in redistribution of lateral forces.

CONCRETE

- The minimum Grade of Concrete in all RCC structural members shall be M25.
- Concrete of Grade M15 shall be used in filling, plum concrete, leveling courses and other non-structural items.
- Density of reinforced concrete is assumed as 25 kN/cum.
- Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 provisions fordurability and strength criteria.

CEMENT

Ordinary Portland Cement of grade 43, grade 53 or higher confirming to IS 8112 and IS 12269 isspecified for concrete grades ranging from M25 to M30.

MASONRY

- Masonry works shall be made done with AAC Blocks.

AGGREGATES

The sizes of coarse aggregates conform to IS 383.Nominal maximum size of coarse aggregate shall be20 mm, suitably graded as per the requirement of mix design.

The fine aggregates conform to the specifications of IS 515.

WATER

Mixing Water shall confirm to IS 456: 2000, SP-23 "Handbook for Concrete Design".

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

REINFORCEMENT

High yield strength deformed bars conforming to IS 1786 with fy = 550 N/ sq.mm shall be used.

6.0 LOADING PARAMETERS

Self-Weights

Self-weight of the structural members will be considered on the basis of the following properties.

- Density of reinforced concrete : 25.0 kN/cu.m
- Density of plain concrete /Plumconcrete : 24.0 kN/cu.m
- Density of steel : 78.5 kN/cu.m
- Density of floor finishes / plasters : 20.4 kN/cu.m
- Density of soil : 18.0 kN/cu.m
- Density of Brick Wall : 20.0 kN/cu.m
- Density of AAC Block : 9.0 kN/cu.m
- Density of Solid Block Wall : 18.0 kN/cu.m
- Screeds : 18.0 kN/cu.m
- Cementations water proofing : 2.5 kN/sq.m
- Lift Machine Room load : 15.0 kN/sq.m
- False ceiling : 0.5 kN/sq.m

Dead load (DL):

Dead load including self-weight of various materials & finished items relevant to the design work and shall be considered as per IS: 875 (Part I)-1987. Suspended loads if any such as cable tray, piping & lightening fixtures shall also be considered as dead loads.

Floor Loads		**UDL (kN/sqm)**
125mm THICK Slab	0.125X1X25	3.125
150mm THICK Slab	0.150X1X25	3.75
Wall Loads		**UDL (kN/m)**
200mm THICK WALL(including Plastering)	0.20X(3.05-0.40)X9.0 0.045X(3.05-0.40)X9.0	4.77 1.07
200mm THICK WALL(including Plastering)	0.20X(3.25-0.40)X9.0 0.045X(3.25-0.40)X9.0	5.13 1.15
100mm THICK WALL (including Plastering)	0.10X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.39 1.07
100mm THICK WALL (including Plastering)	0.11X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.82 1.15

A. MANJUBASHINI M.E.,
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- Floor Finish : 1.5 KN/sq.m
- Water Proofing/Terrace : 3.0 KN/sq.m
- Toilet Filling : 4.0 KN/sq.m
- Staircase Waist Slab : 6.0 KN/sq.m
- Dead load of waist slab = 0.15X1X25 = 3.75
- Dead load of concrete steps = 0.075X1X25 = 1.875 say 6KN/Sqm
- Dead Load of Beam = 0.2X0.40X25 = 2.0KN/m

Live Loads on floors

Live Load shall be Considered as per IS-875 (part -2)-1987.

Residential Building

- All Rooms and Kitchen 2.0 KN/Sqm
- Toilet and Bath Rooms 2.0KN/Sqm
- Corridors, passages, staircases including tire escapes,balcony and stores 3.0KN/Sqm
- Terrace 1.5 KN/Sqm

Wind Load

Wind Load Shall be considered as per IS-875 (part-3)-2015Basic Wind Speed Shall be Obtained from IS 875 = V_b
Design wind speed at the Height of

$Vz = V_b x K1 x K2 x K3 x K4$

K1 - Probablity Factor = 1.0
K2 - Terraine Roughness and height Factor = 1.01
K3 - Tophography factor = 1.0
K4 - Impartance factor = 1.0

Vz = 50X1.0x1.01x1.0x1.0 = 50.5 M/s

Design Wind pressure
Pz = 0.6Vz^2
Pz = 0.6*50.5^2
Pz = 1530.15 N/sqm =1.53KN/sqm

Seismic Loads

The seismic load calculations will becarried out in accordance with IS 1893(Part 1): 2016.Seismic Zone	III
Importance Factor	1.0
Seismic Zone Factor	0.16
Response reduction Factor	5.00
Fundamental natural period – approx.	0.177

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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Since the structure is a R.C.C. structure an approximate damping value of 5% will be considered. Space frame analysis of the structure will be carried out using response spectrum method all our detailing practicesand provisions are and will be governed by IS: 1893 and IS: 456

Deflection Limit

Deflection limit shall be considered accordance with IS: 456-2000

Control of Deflections

The deflection shall generally be limited to the following

- The final deflection due to all loads including the effects of temperature, creep and shrinkage andmeasured from the as-cast level of the supports of floors, roofs, and all other horizontal members,should not normally exceed span/250.
- The deflection including the effects of temperature, creep and shrinkage occurring after the erection ofpartitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less

Basic values of Span to Effective Depth ratios

The vertical deflection limit may generally be assumed to be satisfied provided that the span depth ratio ornot greater than the value obtained as below

Basic value of span to effective depth ratio for spans up to 10m:

- Cantilever 7
- Simply supported 20
- Continuous 26

For span above 10m

The above value multiply 10/spam in meter
Ks =10/span in meter

Limit on Crack width

Limit on crack with shall be consider as per **IS :456-2000** the width of crack to a maximum limit of **0.3mm formild exposure conditions. 0.2mm** is prescribed for structure exposed to **continues moisture** conditions **And 0.1mm for the structure sever, very sever and extreme exposure** conditions

7.0 ANALYSIS OF FRAME

A Non-multi- storied frame consists of beams and columns whose degree of indeterminacy is very high. The Frame analysis of various members such as beams, columns Using STAAD PRO SOFTWARE requires bending moment, shear force and direct thrust at all sections.
The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members. This data will then be used to verify adequacy of the member sizes adopted and after further iterations arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

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Structural Engineer Grade - I (SE)
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8.0 LOAD COMBINATIONS

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

FOR MEMBER DESIGN

GC-01 = 1.0 x DEAD + 1.0 x LIVE
GC-02 = 1.5 x DEAD + 1.5 x LIVE
WX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WX
WX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WX
WX1-03 = 1.5 x DEAD + 1.5 WX
WX1-04 = 1.5 x DEAD - 1.5 WX
WX1-05 = 0.9 x DEAD + 1.5 WX
WX1-06 = 0.9 x DEAD - 1.5 WX
WX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WY
WX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WY
WX2-09 = 1.5 x DEAD + 1.5 WY
WX2-10 = 1.5 x DEAD - 1.5 WY
WX2-11 = 0.9 x DEAD + 1.5 WY
WX2-12 = 0.9 x DEAD - 1.5 WY
EX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQX
EX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQX
EX1-03 = 1.5 x DEAD + 1.5 EQX
EX1-04 = 1.5 x DEAD - 1.5 EQX
EX1-05 = 0.9 x DEAD + 1.5 EQX
EX1-06 = 0.9 x DEAD - 1.5 EQX
EX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQY
EX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQY
EX2-09 = 1.5 x DEAD + 1.5 EQY
EX2-10 = 1.5 x DEAD - 1.5 EQY
EX2-11 = 0.9 x DEAD + 1.5 EQY
EX2-12 = 0.9 x DEAD - 1.5 EQY

9.0 STABILITY OF STRUCTURE

For the purpose of stability of the structure as a whole against overturning,w,

The restoring moment shall not be less than 1.2 times the maximum over turning moments dueto dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered. The restoring moments due to imposed loads shall be ignored.

The factor of safety against sliding shall not be less than 1.40.

Factor of safety against buoyancy shall not be less than 1.20 ignoring the superimposed loading.

10.0 GEOTECHNICAL DATA & SOIL PARAMETERS

As per the Geotechnical data, the recommended type of foundation is Isolated Footing

Depth of the Foundation = 1.50M Depth

11.0 FOUNDATION RECOMMENDATIONS & FOUNDATION SYSTEM

Foundation Type : Isolated Footing

Depth of Foundation : 1.50M From NGL and SBC=200KN/m^2

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Structural Engineer Grade - I (SE)
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CASAGRAND PREMIER BUILDER LIMITED

STRUCTURAL DESIGN BASIS REPORT
Type-02

PROJECT TITLE:

Plan showing the proposed Construction of Residential Non-high rise building (Villa No. 1 to 116) consists of Ground Floor + First Floor, Totally 116 D/U, Comprised in Survey Nos. 85/1B, 86/2A, 86/2B, 86/3, 87/2, 102/1B, 103/3A, 103/3B, 105/1, 105/2 and 105/3A of Sonallur Village, Vandalur Taluk, Chengalpet District

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

STRUCTURAL CONSULTANT

GENESYS **CONSULTING ENGINEERS**

No.2, S1 Flat, 1St Street, Kandhan Nagar, Ponniamman Medu, Chennai-600110.
Mobile:9677016079/9600109450, E:Genesys3112022@gmail.com

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1.0 INTRODUCTION

The basic aim of the structural design is to build a structure, which is safe, fulfilling the intended purpose during its estimated life span, economical in terms of initial and maintenance cost, durable and also maintaining a good aesthetic appearance. A building is considered to be structurally sound, if the individual elements and the building as a whole satisfy the criteria for strength, stability and serviceability and in seismic areas additional criteria for ductility and energy absorption capabilities.The overall building must be strong enough to transfer all loads through the structure to the ground without collapsing or losing structural integrity by rupture of the material at the critical sections, by transformation of the whole or parts into mechanisms or by instability.

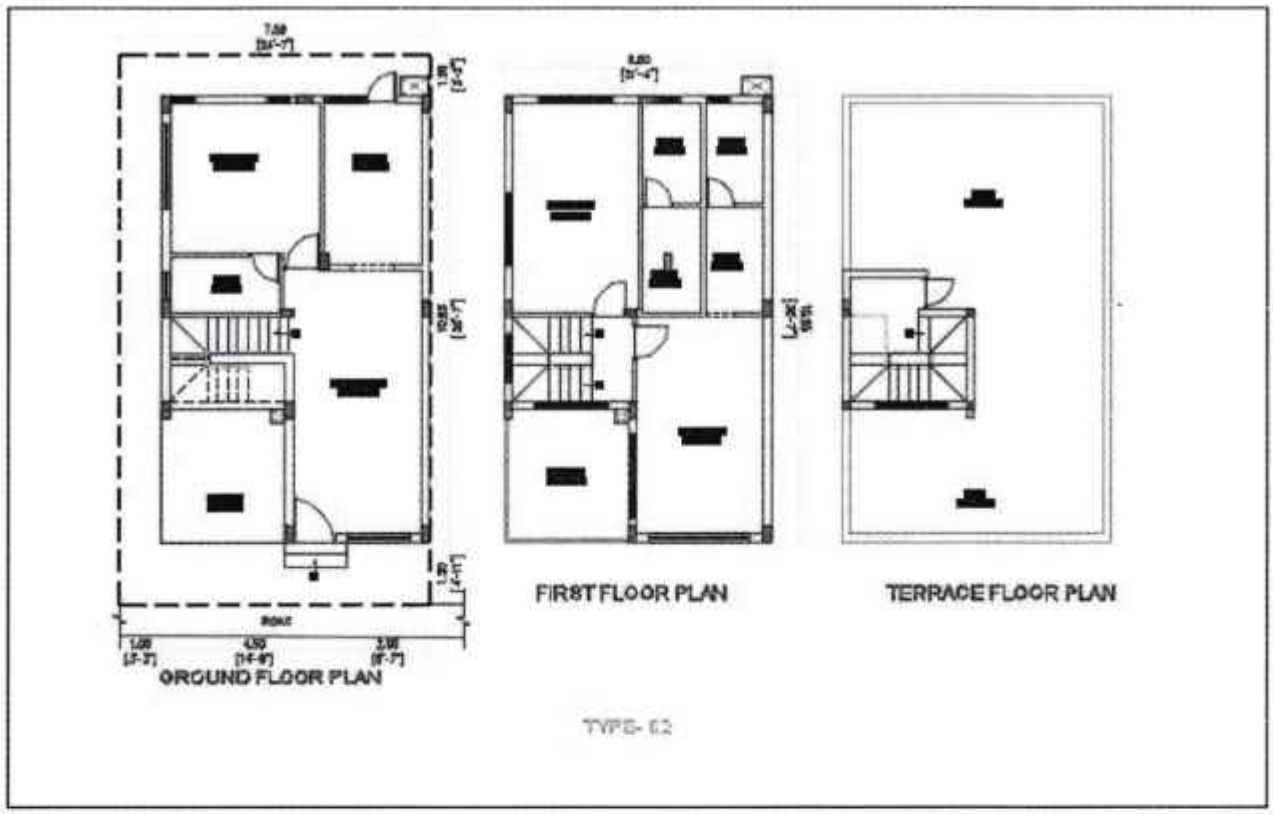
The intent of this document is to identify and record all the pertinent input requirements, analysis &design criteria for structural design of the **Ground+1 Upper floor totally 116 Dwelling building**. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning in delivering the structural scheme of the building. The scheme will becompatible with the architectural theme, satisfy the functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structures.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

2.0 BUILDING DESCRIPTION

Name Of Project	: Villa Buildings For M/s Casagrand Premier Builder Limited
Location	: Sonallur, Chengalpet
Type of Building	: Residential Building(VILLA TYPE)
Building Typology	: Reinforced Cement Concrete Framed Building
Plan Shape	: Regular Shape
Number of Stories	: Ground floor + 1 upper floor.
Position of the Building	: Free Standing
Total Height	: 8.90m from plinth level
Inter Storey Height	: 3.05 m.
Max Width Of Beam	: 200mm
Wall Thickness	: 200/100mm
Floor/Roof structure	: 125/150 mm floor slab
Location of site	: Sonallur, Chengalpet

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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SITE CUM FLOOR PLAN

3.0 STRUCTURAL SYSTEM

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000

Material	: Reinforced Cement Concrete Frame
System	: Special Moment Resisting Frame
Floor System	: One Way/Two way Solid Slab
Foundation System	: Isolated Footing
Material Strengths	: Member Concrete Grade
Columns	: M25
Beams	: M25
Slabs	: M25
Foundation	: M25

Steel type Grade Thermo mechanically Treated Fe 550
Minimum clear cover is to be provided to main steel

For Footing	: Side Cover 50 mm
For Column	: 40mm
For Beam	: 25 mm for side face
	: 25 mm for bottom
For Slab	: 20 mm

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4.0 LIST OF CODES

- In the analysis, design and detailing of the building, the latest editions of following Indian Standardswill be referred.
- IS 456 – 2000 - Plain and reinforced concrete- code of practice
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- IS 875 – (Part- II) – 1987 - reaffirmed 1997) Code of practice for design loads(other than earthquake) for buildings and structures.- Imposed loads
- IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) forbuildings and structures.- Wind loads
- IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other thanearthquake) for buildings and structures- special loads and load combinations.
- IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- codeof practice.

5.0 MATERIAL OF CONSTRUCTIONS

The building is RCC frame structure with Isolated Footing Foundation, columns, beams and floor slabs beingused as diaphragms in redistribution of lateral forces.

CONCRETE

- The minimum Grade of Concrete in all RCC structural members shall be M25.
- Concrete of Grade M15 shall be used in filling, plum concrete, leveling courses and other non-structural items.
- Density of reinforced concrete is assumed as 25 kN/cum.
- Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 provisions fordurability and strength criteria.

CEMENT

Ordinary Portland Cement of grade 43, grade 53 or higher confirming to IS 8112 and IS 12269 isspecified for concrete grades ranging from M25 to M30

MASONRY

- Masonry works shall be made done with AAC Blocks.

AGGREGATES

The sizes of coarse aggregates conform to IS 383.Nominal maximum size of coarse aggregate shall be20 mm, suitably graded as per the requirement of mix design.

The fine aggregates conform to the specifications of IS 515.

WATER

Mixing Water shall confirm to IS 456: 2000, SP-23 "Handbook for Concrete Design".

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REINFORCEMENT

High yield strength deformed bars conforming to IS 1786 with fy = 550 N/ sq.mm shall be used.

6.0 LOADING PARAMETERS

Self-Weights

Self-weight of the structural members will be considered on the basis of the following properties.

- Density of reinforced concrete : 25.0 kN/cu.m
- Density of plain concrete /Plumconcrete : 24.0 kN/cu.m
- Density of steel : 78.5 kN/cu.m
- Density of floor finishes / plasters : 20.4 kN/cu.m
- Density of soil : 18.0 kN/cu.m
- Density of Brick Wall : 20.0 kN/cu.m
- Density of AAC Block : 9.0 kN/cu.m
- Density of Solid Block Wall : 18.0 kN/cu.m
- Screeds : 18.0 kN/cu.m
- Cementations water proofing : 2.5 kN/sq.m
- Lift Machine Room load : 15.0 kN/sq.m
- False ceiling : 0.5 kN/sq.m

Dead load (DL):

Dead load including self-weight of various materials & finished items relevant to the design work and shall be considered as per IS: 875 (Part I)-1987. Suspended loads if any such as cable tray, piping & lightening fixtures shall also be considered as dead loads.

Floor Loads		**UDL (kN/sqm)**
125mm THICK Slab	0.125X1X25	3.125
150mm THICK Slab	0.150X1X25	3.75
Wall Loads		**UDL (kN/m)**
200mm THICK WALL(including Plastering)	0.20X(3.05-0.40)X9.0 0.045X(3.05-0.40)X9.0	4.77 1.07
200mm THICK WALL(including Plastering)	0.20X(3.25-0.40)X9.0 0.045X(3.25-0.40)X9.0	5.13 1.15
100mm THICK WALL (including Plastering)	0.10X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.39 1.07
100mm THICK WALL (including Plastering)	0.11X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.82 1.15

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- Floor Finish : 1.5 KN/sq.m
- Water Proofing/Terrace : 3.0 KN/sq.m
- Toilet Filling : 4.0 KN/sq.m
- Staircase Waist Slab : 6.0 KN/sq.m
- Dead load of waist slab = 0.15X1X25 = 3.75
- Dead of load of concrete steps = 0.075X1X25 = 1.875 say 6KN/Sqm
- Dead Load of Beam = 0.2X0.40X25 = 2.0KN/m

Live Loads on floors

Live Load shall be Considered as per IS-875 (part -2)-1987.

Residential Building

- All Rooms and Kitchen 2.0 KN/Sqm
- Toilet and Bath Rooms 2.0KN/Sqm
- Corridors, passages, staircases including tire escapes,balcony and stores 3.0KN/Sqm
- Terrace 1.5 KN/Sqm

Wind Load

Wind Load Shall be considered as per IS-875 (part-3)-2015Basic Wind Speed Shall be Obtained from IS 875 = V_b
Design wind speed at the Height of

$Vz = V_b x K1 x K2 x K3 x K4$

K1 - Probablity Factor = 1.0
K2 - Terraine Roughness and height Factor = 1.01
K3 - Tophography factor = 1.0
K4 - Impartance factor = 1.0

Vz = 50X1.0x1.01x1.0x1.0 = 50.5 M/s

Design Wind pressure

Pz = 0.6Vz^2
Pz = 0.6*50.5^2
Pz = 1530.15 N/sqm =1.53KN/sqm

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Seismic Loads

The seismic load calculations will becarried out in accordance with IS 1893(Part 1): 2016.Seismic Zone	III
Importance Factor	1.0
Seismic Zone Factor	0.16
Response reduction Factor	5.00
Fundamental natural period – approx.	0.178

Since the structure is a R.C.C. structure an approximate damping value of 5% will be considered. Space frame analysis of the structure will be carried out using response spectrum method all our detailing practicesand provisions are and will be governed by IS: 1893 and IS: 456

Deflection Limit

Deflection limit shall be considered accordance with IS: 456-2000

Control of Deflections

The deflection shall generally be limited to the following

- The final deflection due to all loads including the effects of temperature, creep and shrinkage andmeasured from the as-cast level of the supports of floors, roofs, and all other horizontal members, should not normally exceed span/250.
- The deflection including the effects of temperature, creep and shrinkage occurring after the erection ofpartitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less

Basic values of Span to Effective Depth ratios

The vertical deflection limit may generally be assumed to be satisfied provided that the span depth ratio ornot greater than the value obtained as below

Basic value of span to effective depth ratio for spans up to 10m:

- Cantilever 7
- Simply supported 20
- Continuous 26

For span above 10m

The above value multiply 10/spam in meter
Ks =10/span in meter

Limit on Crack width

Limit on crack with shall be consider as per **IS :456-2000** the width of crack to a maximum limit of **0.3mm formild exposure conditions. 0.2mm** is prescribed for structure exposed to **continues moisture** conditions **And 0.1mm for the structure sever, very sever and extreme exposure** conditions

7.0 ANALYSIS OF FRAME

A Non-multi- storied frame consists of beams and columns whose degree of indeterminacy is very high. The Frame analysis of various members such as beams, columns Using STAAD PRO SOFTWARE requires bending moment, shear force and direct thrust at all sections.
The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members. This data will then be used to verify adequacy of the member sizes adopted and after further iterations arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

8.0 LOAD COMBINATIONS

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

FOR MEMBER DESIGN

GC-01 = 1.0 x DEAD + 1.0 x LIVE
GC-02 = 1.5 x DEAD + 1.5 x LIVE
WX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WX
WX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WX
WX1-03 = 1.5 x DEAD + 1.5 WX
WX1-04 = 1.5 x DEAD - 1.5 WX
WX1-05 = 0.9 x DEAD + 1.5 WX
WX1-06 = 0.9 x DEAD - 1.5 WX
WX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WY
WX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WY
WX2-09 = 1.5 x DEAD + 1.5 WY
WX2-10 = 1.5 x DEAD - 1.5 WY
WX2-11 = 0.9 x DEAD + 1.5 WY
WX2-12 = 0.9 x DEAD - 1.5 WY
EX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQX
EX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQX
EX1-03 = 1.5 x DEAD + 1.5 EQX
EX1-04 = 1.5 x DEAD - 1.5 EQX
EX1-05 = 0.9 x DEAD + 1.5 EQX
EX1-06 = 0.9 x DEAD - 1.5 EQX
EX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQY
EX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQY
EX2-09 = 1.5 x DEAD + 1.5 EQY
EX2-10 = 1.5 x DEAD - 1.5 EQY
EX2-11 = 0.9 x DEAD + 1.5 EQY
EX2-12 = 0.9 x DEAD - 1.5 EQY

9.0 STABILITY OF STRUCTURE

For the purpose of stability of the structure as a whole against overturning, w,

The restoring moment shall not be less than 1.2 times the maximum over turning moments dueto dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered. The restoring moments due to imposed loads shall be ignored.

The factor of safety against sliding shall not be less than 1.40.

Factor of safety against buoyancy shall not be less than 1.20 ignoring the superimposed loading.

10.0 GEOTECHNICAL DATA & SOIL PARAMETERS

As per the Geotechnical data, the recommended type of foundation is Isolated Foundation.

Depth of the Foundation = 1.50M Depth

11.0 FOUNDATION RECOMMENDATIONS & FOUNDATION SYSTEM

Foundation Type : Isolated Footing.

Depth of Foundation : 1.50M From NGL and SBC=200KN/m^2

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

CASAGRAND PREMIER BUILDER LIMITED

STRUCTURAL DESIGN BASIS REPORT
Type-03

PROJECT TITLE:

Plan showing the proposed Construction of Residential Non-high rise building (Villa No. 1 to 116) consists of Ground Floor + First Floor, Totally 116 D/U, Comprised in Survey Nos. 85/1B, 86/2A, 86/2B, 86/3, 87/2, 102/1B, 103/3A, 103/3B, 105/1, 105/2 and 105/3A of Sonallur Village, Vandalur Taluk, Chengalpet District.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

STRUCTURAL CONSULTANT

GENESYS **CONSULTING ENGINEERS**

No.2, S1 Flat, 1St Street, Kandhan Nagar, Ponniamman Medu, Chennai-600110.
Mobile:9677016079/9600109450, E:Genesys3112022@gmail.com

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A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

1.0 INTRODUCTION

The basic aim of the structural design is to build a structure, which is safe, fulfilling the intended purpose during its estimated life span, economical in terms of initial and maintenance cost, durable and also maintaining a good aesthetic appearance. A building is considered to be structurally sound, if the individual elements and the building as a whole satisfy the criteria for strength, stability and serviceability and in seismic areas additional criteria for ductility and energy absorption capabilities. The overall building must be strong enough to transfer all loads through the structure to the ground without collapsing or losing structural integrity by rupture of the material at the critical sections, by transformation of the whole or parts into mechanisms or by instability.

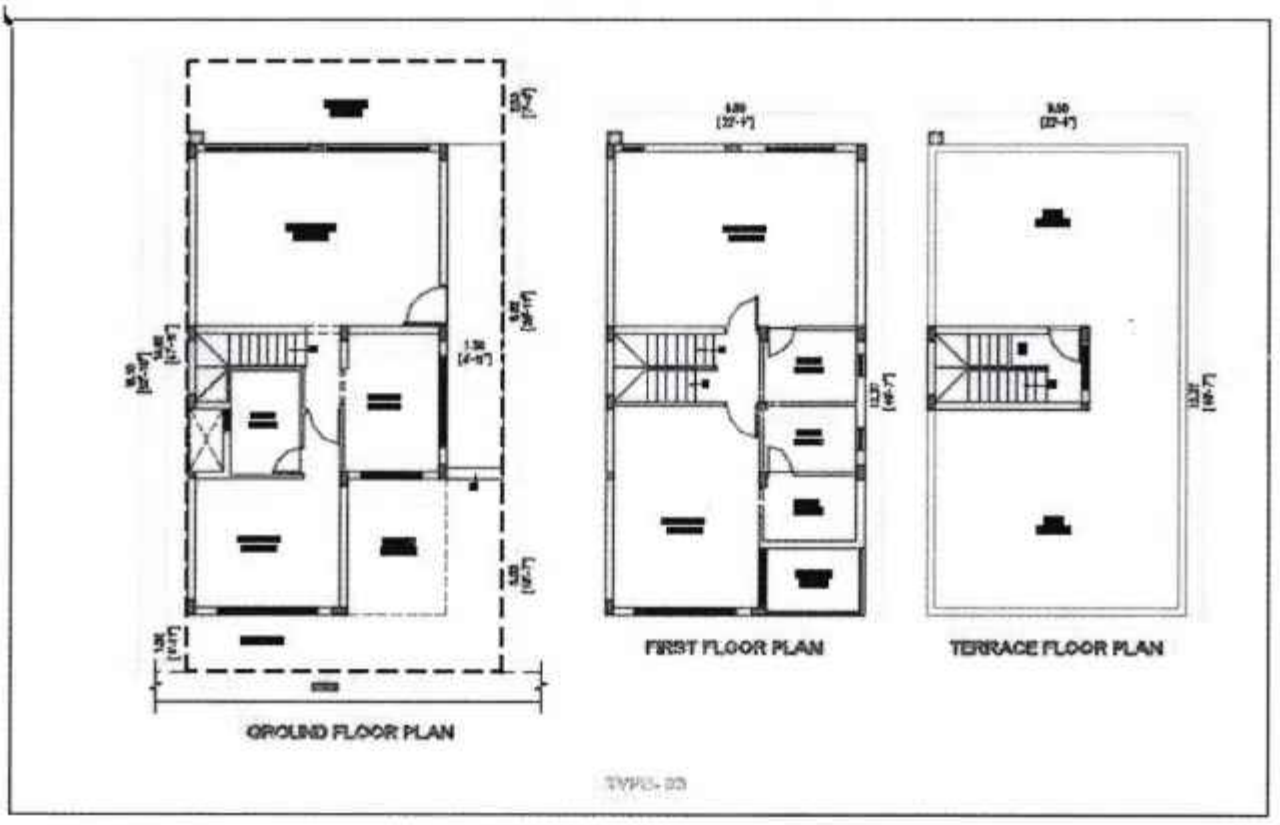
The intent of this document is to identify and record all the pertinent input requirements, analysis &design criteria for structural design of the **Ground+1 Upper floor totally 116 Dwelling building**. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning in delivering the structural scheme of the building. The scheme will becompatible with the architectural theme, satisfy the functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structures.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

2.0 BUILDING DESCRIPTION

Name Of Project	: Villa Buildings For M/s Casagrand Premier Builder Limited
Location	: Sonallur, Chengalpet
Type of Building	: Residential Building(VILLA TYPE)
Building Typology	: Reinforced Cement Concrete Framed Building
Plan Shape	: Regular Shape
Number of Stories	: Ground floor + 1 upper floor.
Position of the Building	: Free Standing
Total Height	: 9.30m from plinth level
Inter Storey Height	: 3.25 m.
Max Width Of Beam	: 200mm
Wall Thickness	: 200/100mm
Floor/Roof structure	: 125/150 mm floor slab
Location of site	: Sonallur, Chengalpet

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004



SITE CUM FLOOR PLAN

3.0 STRUCTURAL SYSTEM

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000

Material	: Reinforced Cement Concrete Frame
System	: Special Moment Resisting Frame
Floor System	: One Way/Two way Solid Slab
Foundation System	: Isolated Footing
Material Strengths	: Member Concrete Grade
Columns	: M25
Beams	: M25
Slabs	: M25
Foundation	: M25

Steel type Grade Thermo mechanically Treated Fe 550
Minimum clear cover is to be provided to main steel

For Footing	: Side Cover 50 mm
For Column	: 40mm
For Beam	: 25 mm for side face
	: 25 mm for bottom
For Slab	: 20 mm

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

4.0 LIST OF CODES

- In the analysis, design and detailing of the building, the latest editions of following Indian Standardswill be referred.
- IS 456 – 2000 - Plain and reinforced concrete- code of practice
- IS 1893 – (Part I) – 2016 Criteria for earthquake resistant design of structures.
- IS 875 – (Part –I) – 1987 edition 3.1(1997-12) Code of practice for design loads (other than earthquake) for buildings and structures- Dead loads
- IS 875 – (Part- II) – 1987 - reaffirmed 1997) Code of practice for design loads(other than earthquake) for buildings and structures.- Imposed loads
- IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) forbuildings and structures.- Wind loads
- IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other thanearthquake) for buildings and structures- special loads and load combinations.
- IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- codeof practice.

5.0 MATERIAL OF CONSTRUCTIONS

The building is RCC frame structure with Isolated Footing Foundation, columns, beams and floor slabs beingused as diaphragms in redistribution of lateral forces.

CONCRETE

- The minimum Grade of Concrete in all RCC structural members shall be M25.
- Concrete of Grade M15 shall be used in filling, plum concrete, leveling courses and other non-structural items.
- Density of reinforced concrete is assumed as 25 kN/cum.
- Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 provisions fordurability and strength criteria.

CEMENT

Ordinary Portland Cement of grade 43, grade 53 or higher confirming to IS 8112 and IS 12269 isspecified for concrete grades ranging from M25 to M30

MASONRY

- Masonry works shall be made done with AAC Blocks.

AGGREGATES

The sizes of coarse aggregates conform to IS 383.Nominal maximum size of coarse aggregate shall be20 mm, suitably graded as per the requirement of mix design.

The fine aggregates conform to the specifications of IS 515.

WATER

Mixing Water shall confirm to IS 456: 2000, SP-23 "Handbook for Concrete Design".

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

REINFORCEMENT

High yield strength deformed bars conforming to IS 1786 with fy = 550 N/ sq.mm shall be used.

6.0 LOADING PARAMETERS

Self-Weights

Self-weight of the structural members will be considered on the basis of the following properties.

- Density of reinforced concrete : 25.0 kN/cu.m
- Density of plain concrete /Plumconcrete : 24.0 kN/cu.m
- Density of steel : 78.5 kN/cu.m
- Density of floor finishes / plasters : 20.4 kN/cu.m
- Density of soil : 18.0 kN/cu.m
- Density of Brick Wall : 20.0 kN/cu.m
- Density of AAC Block : 9.0 kN/cu.m
- Density of Solid Block Wall : 18.0 kN/cu.m
- Screeds : 18.0 kN/cu.m
- Cementations water proofing : 2.5 kN/sq.m
- Lift Machine Room load : 15.0 kN/sq.m
- False ceiling : 0.5 kN/sq.m

Dead load (DL):

Dead load including self-weight of various materials & finished items relevant to the design work and shall be considered as per IS: 875 (Part I)-1987. Suspended loads if any such as cable tray, piping & lightening fixtures shall also be considered as dead loads.

Floor Loads		**UDL (kN/sqm)**
125mm THICK Slab	0.125X1X25	3.125
150mm THICK Slab	0.150X1X25	3.75
Wall Loads		**UDL (kN/m)**
200mm THICK WALL(including Plastering)	0.20X(3.05-0.40)X9.0 0.045X(3.05-0.40)X9.0	4.77 1.07
200mm THICK WALL(including Plastering)	0.20X(3.25-0.40)X9.0 0.045X(3.25-0.40)X9.0	5.13 1.15
100mm THICK WALL (including Plastering)	0.10X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.39 1.07
100mm THICK WALL (including Plastering)	0.11X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.82 1.15

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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- Floor Finish : 1.5 KN/sq.m
- Water Proofing/Terrace : 3.0 KN/sq.m
- Toilet Filling : 4.0 KN/sq.m
- Staircase Waist Slab : 6.0 KN/sq.m
- Dead load of waist slab = 0.15X1X25 = 3.75
- Dead of load of concrete steps = 0.075X1X25 = 1.875 say 6KN/Sqm
- Dead Load of Beam = 0.2X0.40X25 = 2.0KN/m

Live Loads on floors

Live Load shall be Considered as per IS-875 (part -2)-1987.

Residential Building

- All Rooms and Kitchen 2.0 KN/Sqm
- Toilet and Bath Rooms 2.0KN/Sqm
- Corridors, passages, staircases including tire escapes,balcony and stores 3.0KN/Sqm
- Terrace 1.5 KN/Sqm

Wind Load

Wind Load Shall be considered as per IS-875 (part-3)-2015Basic Wind Speed Shall be Obtained from IS 875 = V_b
Design wind speed at the Height of

$Vz = V_b x K1 x K2 x K3 x K4$

K1 - Probablity Factor = 1.0
K2 - Terraine Roughness and height Factor = 1.01
K3 - Tophography factor = 1.0
K4 - Impartance factor = 1.0

Vz = 50X1.0x1.01x1.0x1.0 = 50.5 M/s

Design Wind pressure

Pz = 0.6Vz^2
Pz = 0.6*50.5^2
Pz = 1530.15 N/sqm =1.53KN/sqm

Seismic Loads

The seismic load calculations will becarried out in accordance with IS 1893(Part 1): 2016.Seismic Zone	III
Importance Factor	1.0
Seismic Zone Factor	0.16
Response reduction Factor	5.00
Fundamental natural period – approx.	0.191

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

Since the structure is a R.C.C. structure an approximate damping value of 5% will be considered. Space frame analysis of the structure will be carried out using response spectrum method all our detailing practicesand provisions are and will be governed by IS: 1893 and IS: 456

Deflection Limit

Deflection limit shall be considered accordance with IS: 456-2000

Control of Deflections

The deflection shall generally be limited to the following

- The final deflection due to all loads including the effects of temperature, creep and shrinkage andmeasured from the as-cast level of the supports of floors, roofs, and all other horizontal members,should not normally exceed span/250.
- The deflection including the effects of temperature, creep and shrinkage occurring after the erection ofpartitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less

Basic values of Span to Effective Depth ratios

The vertical deflection limit may generally be assumed to be satisfied provided that the span depth ratio ornot greater than the value obtained as below

Basic value of span to effective depth ratio for spans up to 10m:

- Cantilever 7
- Simply supported 20
- Continuous 26

For span above 10m

The above value multiply 10/spam in meter
Ks =10/span in meter

Limit on Crack width

Limit on crack with shall be consider as per **IS :456-2000** the width of crack to a maximum limit of **0.3mm formild exposure conditions. 0.2mm** is prescribed for structure exposed to **continues moisture** conditions **And 0.1mm for the structure sever, very sever and extreme exposure** conditions

7.0 ANALYSIS OF FRAME

A Non-multi- storied frame consists of beams and columns whose degree of indeterminacy is very high. The Frame analysis of various members such as beams, columns Using STAAD PRO SOFTWARE requires bending moment, shear force and direct thrust at all sections.
The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members. This data will then be used to verify adequacy of the member sizes adopted and after further iterations arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

8.0 LOAD COMBINATIONS

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

FOR MEMBER DESIGN

GC-01 = 1.0 x DEAD + 1.0 x LIVE
GC-02 = 1.5 x DEAD + 1.5 x LIVE
WX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WX
WX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WX
WX1-03 = 1.5 x DEAD + 1.5 WX
WX1-04 = 1.5 x DEAD - 1.5 WX
WX1-05 = 0.9 x DEAD + 1.5 WX
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WX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WY
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EX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQX
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EX1-03 = 1.5 x DEAD + 1.5 EQX
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EX2-11 = 0.9 x DEAD + 1.5 EQY
EX2-12 = 0.9 x DEAD - 1.5 EQY

9.0 STABILITY OF STRUCTURE

For the purpose of stability of the structure as a whole against overturning, w,

The restoring moment shall not be less than 1.2 times the maximum over turning moments dueto dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered.The restoring moments due to imposed loads shall be ignored.

The factor of safety against sliding shall not be less than 1.40.

Factor of safety against buoyancy shall not be less than 1.20 ignoring the superimposed loading.

10.0 GEOTECHNICAL DATA & SOIL PARAMETERS

As per the Geotechnical data, the recommended type of foundation is Isolated Foundation.

Depth of the Foundation = 1.50M Depth

11.0 FOUNDATION RECOMMENDATIONS & FOUNDATION SYSTEM

Foundation Type : Isolated Footing.

Depth of Foundation : 1.50M From NGL and SBC=200KN/m^2

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

CASAGRAND PREMIER BUILDER LIMITED

STRUCTURAL DESIGN BASIS REPORT
Type-04

PROJECT TITLE:

Plan showing the proposed Construction of Residential Non-high rise building (Villa No. 1 to 116) consists of Ground Floor + First Floor, Totally 116 D/U, Comprised in Survey Nos. 85/1B, 86/2A, 86/2B, 86/3, 87/2, 102/1B, 103/3A, 103/3B, 105/1, 105/2 and105/3A of Sonallur Village, Vandalur Taluk, Chengalpet District.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

STRUCTURAL CONSULTANT

GENESYS **CONSULTING ENGINEERS**

No.2, S1 Flat, 1St Street, Kandhan Nagar, Ponniamman Medu, Chennai-600110.
Mobile:9677016079/9600109450, E:Genesys3112022@gmail.com

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A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

1.0 INTRODUCTION

The basic aim of the structural design is to build a structure, which is safe, fulfilling the intended purpose during its estimated life span, economical in terms of initial and maintenance cost, durable and also maintaining a good aesthetic appearance. A building is considered to be structurally sound, if the individual elements and the building as a whole satisfy the criteria for strength, stability and serviceability and in seismic areas additional criteria for ductility and energy absorption capabilities. The overall building must be strong enough to transfer all loads through the structure to the ground without collapsing or losing structural integrity by rupture of the material at the critical sections, by transformation of the whole or parts into mechanisms or by instability.

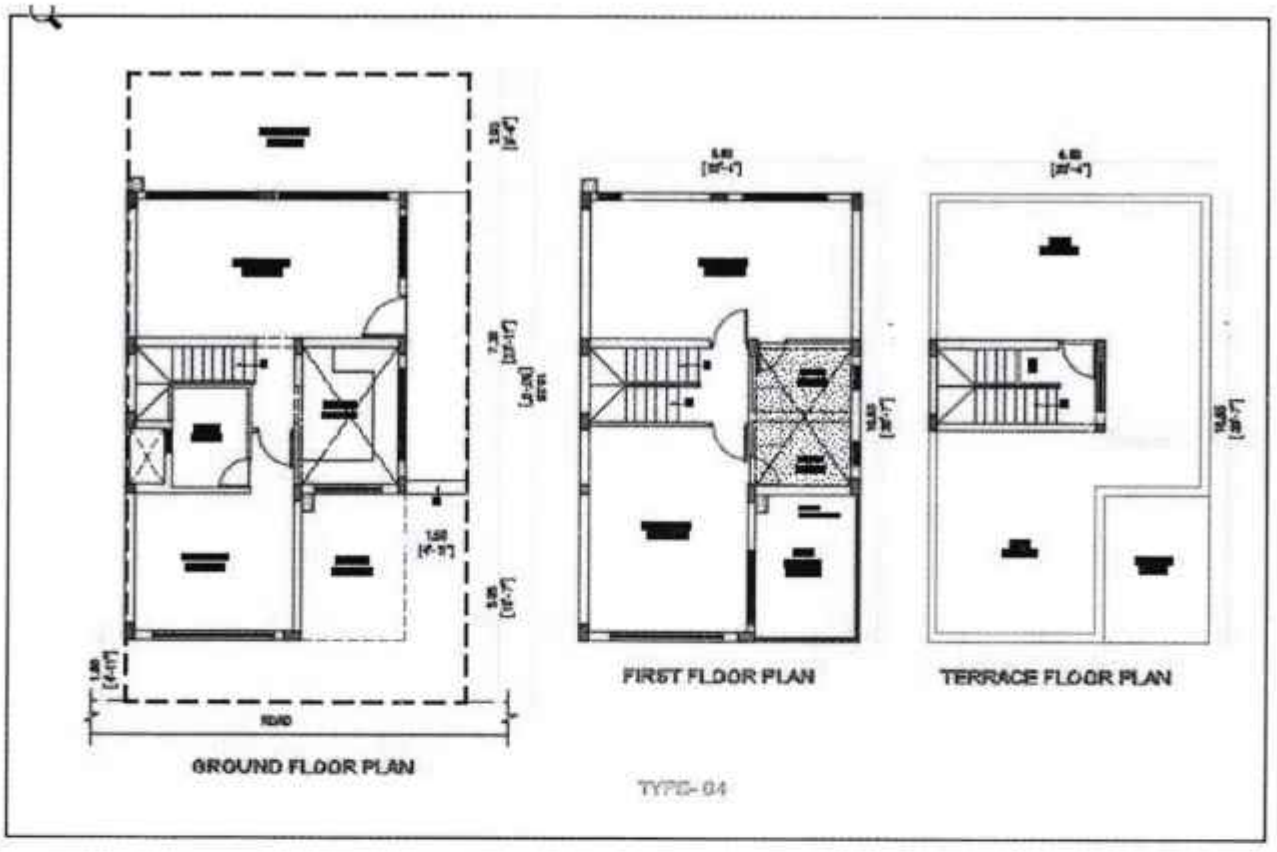
The intent of this document is to identify and record all the pertinent input requirements, analysis &design criteria for structural design of the **Ground+1 Upper floor totally 116 Dwelling building**. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning in delivering the structural scheme of the building. The scheme will becompatible with the architectural theme, satisfy the functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structures.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

2.0 BUILDING DESCRIPTION

Name Of Project	: Villa Buildings For M/s Casagrand Premier Builder Limited
Location	: Sonallur, Chengalpet
Type of Building	: Residential Building(VILLA TYPE)
Building Typology	: Reinforced Cement Concrete Framed Building
Plan Shape	: Regular Shape
Number of Stories	: Ground floor + 1 upper floor.
Position of the Building	: Free Standing
Total Height	: 9.30 from plinth level
Inter Storey Height	: 3.25 m.
Max Width Of Beam	: 200mm
Wall Thickness	: 200/100mm
Floor/Roof structure	: 125/150 mm floor slab
Location of site	: Sonallur, Chengalpet

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004



SITE CUM FLOOR PLAN

3.0 STRUCTURAL SYSTEM

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000

Material	: Reinforced Cement Concrete Frame
System	: Special Moment Resisting Frame
Floor System	: One Way/Two way Solid Slab
Foundation System	: Isolated Footing
Material Strengths	: Member Concrete Grade
Columns	: M25
Beams	: M25
Slabs	: M25
Foundation	: M25

Steel type Grade Thermo mechanically Treated Fe 550
Minimum clear cover is to be provided to main steel

For Footing	: Side Cover 50 mm
For Column	: 40mm
For Beam	: 25 mm for side face
	: 25 mm for bottom
For Slab	: 20 mm

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

4.0 LIST OF CODES

- In the analysis, design and detailing of the building, the latest editions of following Indian Standardswill be referred.
- IS 456 – 2000 - Plain and reinforced concrete- code of practice
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- IS 875 – (Part –I) – 1987 edition 3.1(1997-12) Code of practice for design loads (other than earthquake) for buildings and structures- Dead loads
- IS 875 – (Part- II) – 1987 - reaffirmed 1997) Code of practice for design loads(other than earthquake) for buildings and structures.- Imposed loads
- IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) forbuildings and structures.- Wind loads
- IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other thanearthquake) for buildings and structures- special loads and load combinations.
- IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- codeof practice.

5.0 MATERIAL OF CONSTRUCTIONS

The building is RCC frame structure with Isolated Footing Foundation, columns, beams and floor slabs beingused as diaphragms in redistribution of lateral forces.

CONCRETE

- The minimum Grade of Concrete in all RCC structural members shall be M25.
- Concrete of Grade M15 shall be used in filling, plum concrete, leveling courses and other non-structural items.
- Density of reinforced concrete is assumed as 25 kN/cum.
- Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 provisions fordurability and strength criteria.

CEMENT

Ordinary Portland Cement of grade 43, grade 53 or higher confirming to IS 8112 and IS 12269 isspecified for concrete grades ranging from M25 to M30

MASONRY

- Masonry works shall be made done with AAC Blocks.

AGGREGATES

The sizes of coarse aggregates conform to IS 383.Nominal maximum size of coarse aggregate shall be20 mm, suitably graded as per the requirement of mix design.

The fine aggregates conform to the specifications of IS 515.

WATER

Mixing Water shall confirm to IS 456: 2000, SP-23 "Handbook for Concrete Design".

A. MANJUBASHINI M.E.,
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REINFORCEMENT

High yield strength deformed bars conforming to IS 1786 with fy = 550 N/ sq.mm shall be used.

6.0 LOADING PARAMETERS

Self-Weights

Self-weight of the structural members will be considered on the basis of the following properties.

- Density of reinforced concrete : 25.0 kN/cu.m
- Density of plain concrete /Plumconcrete : 24.0 kN/cu.m
- Density of steel : 78.5 kN/cu.m
- Density of floor finishes / plasters : 20.4 kN/cu.m
- Density of soil : 18.0 kN/cu.m
- Density of Brick Wall : 20.0 kN/cu.m
- Density of AAC Block : 9.0 kN/cu.m
- Density of Solid Block Wall : 18.0 kN/cu.m
- Screeds : 18.0 kN/cu.m
- Cementations water proofing : 2.5 kN/sq.m
- Lift Machine Room load : 15.0 kN/sq.m
- False ceiling : 0.5 kN/sq.m

Dead load (DL):

Dead load including self-weight of various materials & finished items relevant to the design work and shall be considered as per IS: 875 (Part I)-1987. Suspended loads if any such as cable tray, piping & lightening fixtures shall also be considered as dead loads.

Floor Loads		**UDL (kN/sqm)**
125mm THICK Slab	0.125X1X25	3.125
150mm THICK Slab	0.150X1X25	3.75
Wall Loads		**UDL (kN/m)**
200mm THICK WALL(including Plastering)	0.20X(3.05-0.40)X9.0 0.045X(3.05-0.40)X9.0	4.77 1.07
200mm THICK WALL(including Plastering)	0.20X(3.25-0.40)X9.0 0.045X(3.25-0.40)X9.0	5.13 1.15
100mm THICK WALL (including Plastering)	0.10X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.39 1.07
100mm THICK WALL (including Plastering)	0.11X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.82 1.15

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- Floor Finish : 1.5 KN/sq.m
- Water Proofing/Terrace : 3.0 KN/sq.m
- Toilet Filling : 4.0 KN/sq.m
- Staircase Waist Slab : 6.0 KN/sq.m
- Dead load of waist slab = 0.15X1X25 = 3.75
- Dead of load of concrete steps = 0.075X1X25 = 1.875 say 6KN/Sqm
- Dead Load of Beam = 0.2X0.40X25 = 2.0KN/m

Live Loads on floors

Live Load shall be Considered as per IS-875 (part -2)-1987.

Residential Building

- All Rooms and Kitchen 2.0 KN/Sqm
- Toilet and Bath Rooms 2.0KN/Sqm
- Corridors, passages, staircases including tire escapes,balcony and stores 3.0KN/Sqm
- Terrace 1.5 KN/Sqm

Wind Load

Wind Load Shall be considered as per IS-875 (part-3)-2015Basic Wind Speed Shall be Obtained from IS 875 = V_b
Design wind speed at the Height of

$Vz = V_b x K1 x K2 x K3 x K4$

K1 - Probablity Factor = 1.0
K2 - Terraine Roughness and height Factor = 1.01
K3 - Tophography factor = 1.0
K4 - Impartance factor = 1.0

Vz = 50X1.0x1.01x1.0x1.0 = 50.5 M/s

Design Wind pressure

Pz = 0.6Vz^2
Pz = 0.6*50.5^2
Pz = 1530.15 N/sqm =1.53KN/sqm

Seismic Loads

The seismic load calculations will becarried out in accordance with IS 1893(Part 1): 2016.Seismic Zone	III
Importance Factor	1.0
Seismic Zone Factor	0.16
Response reduction Factor	5.00
Fundamental natural period – approx.	0.189

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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Since the structure is a R.C.C. structure an approximate damping value of 5% will be considered. Space frame analysis of the structure will be carried out using response spectrum method all our detailing practicesand provisions are and will be governed by IS: 1893 and IS: 456

Deflection Limit

Deflection limit shall be considered accordance with IS: 456-2000

Control of Deflections

The deflection shall generally be limited to the following

- The final deflection due to all loads including the effects of temperature, creep and shrinkage andmeasured from the as-cast level of the supports of floors, roofs, and all other horizontal members, should not normally exceed span/250.
- The deflection including the effects of temperature, creep and shrinkage occurring after the erection ofpartitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less

Basic values of Span to Effective Depth ratios

The vertical deflection limit may generally be assumed to be satisfied provided that the span depth ratio ornot greater than the value obtained as below

Basic value of span to effective depth ratio for spans up to 10m:

- Cantilever 7
- Simply supported 20
- Continuous 26

For span above 10m

The above value multiply 10/spam in meter
Ks =10/span in meter

Limit on Crack width

Limit on crack with shall be consider as per **IS :456-2000** the width of crack to a maximum limit of **0.3mm for mild exposure conditions. 0.2mm** is prescribed for structure exposed to **continues moisture** conditions **And 0.1mm for the structure sever, very sever and extreme exposure** conditions

7.0 ANALYSIS OF FRAME

A Non-multi- storied frame consists of beams and columns whose degree of indeterminacy is very high. The Frame analysis of various members such as beams, columns Using STAAD PRO SOFTWARE requires bending moment, shear force and direct thrust at all sections.
The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members. This data will then be used to verify adequacy of the member sizes adopted and after further iterations arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

8.0 LOAD COMBINATIONS

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

FOR MEMBER DESIGN

GC-01 = 1.0 x DEAD + 1.0 x LIVE
GC-02 = 1.5 x DEAD + 1.5 x LIVE
WX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WX
WX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WX
WX1-03 = 1.5 x DEAD + 1.5 WX
WX1-04 = 1.5 x DEAD - 1.5 WX
WX1-05 = 0.9 x DEAD + 1.5 WX
WX1-06 = 0.9 x DEAD - 1.5 WX
WX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WY
WX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WY
WX2-09 = 1.5 x DEAD + 1.5 WY
WX2-10 = 1.5 x DEAD - 1.5 WY
WX2-11 = 0.9 x DEAD + 1.5 WY
WX2-12 = 0.9 x DEAD - 1.5 WY
EX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQX
EX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQX
EX1-03 = 1.5 x DEAD + 1.5 EQX
EX1-04 = 1.5 x DEAD - 1.5 EQX
EX1-05 = 0.9 x DEAD + 1.5 EQX
EX1-06 = 0.9 x DEAD - 1.5 EQX
EX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQY
EX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQY
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EX2-10 = 1.5 x DEAD - 1.5 EQY
EX2-11 = 0.9 x DEAD + 1.5 EQY
EX2-12 = 0.9 x DEAD - 1.5 EQY

9.0 STABILITY OF STRUCTURE

For the purpose of stability of the structure as a whole against overturning, w,

The restoring moment shall not be less than 1.2 times the maximum over turning moments dueto dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered. The restoring moments due to imposed loads shall be ignored.

The factor of safety against sliding shall not be less than 1.40.

Factor of safety against buoyancy shall not be less than 1.20 ignoring the superimposed loading.

10.0 GEOTECHNICAL DATA & SOIL PARAMETERS

As per the Geotechnical data, the recommended type of foundation is Isolated Foundation.

Depth of the Foundation = 1.50M Depth

11.0 FOUNDATION RECOMMENDATIONS & FOUNDATION SYSTEM

Foundation Type : Isolated Footing.

Depth of Foundation : 1.50M From NGL and SBC=200KN/m^2

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

CASAGRAND PREMIER BUILDER LIMITED

STRUCTURAL DESIGN BASIS REPORT
Type-05

PROJECTTITLE:

Plan showing the proposed Construction of Residential Non-high rise building (Villa No. 1 to 116) consists of Ground Floor + First Floor, Totally 116 D/U, Comprised in Survey Nos. 85/1B, 86/2A, 86/2B, 86/3, 87/2, 102/1B, 103/3A, 103/3B, 105/1, 105/2 and 105/3A of Sonallur Village, Vandalur Taluk, Chengalpet District.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

STRUCTURAL CONSULTANT

GENESYS **CONSULTING ENGINEERS**
No.2, S1 Flat, 1St Street, Kandhan Nagar, Ponniamman Medu, Chennai-600110.
Mobile:9677016079/9600109450, E:Genesys3112022@gmail.com

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11. Foundation Recommendations & Foundation System 10

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

1.0 INTRODUCTION

The basic aim of the structural design is to build a structure, which is safe, fulfilling the intended purpose during its estimated life span, economical in terms of initial and maintenance cost, durable and also maintaining a good aesthetic appearance. A building is considered to be structurally sound, if the individual elements and the building as a whole satisfy the criteria for strength, stability and serviceability and in seismic areas additional criteria for ductility and energy absorption capabilities. The overall building must be strong enough to transfer all loads through the structure to the ground without collapsing or losing structural integrity by rupture of the material at the critical sections, by transformation of the whole or parts into mechanisms or by instability.

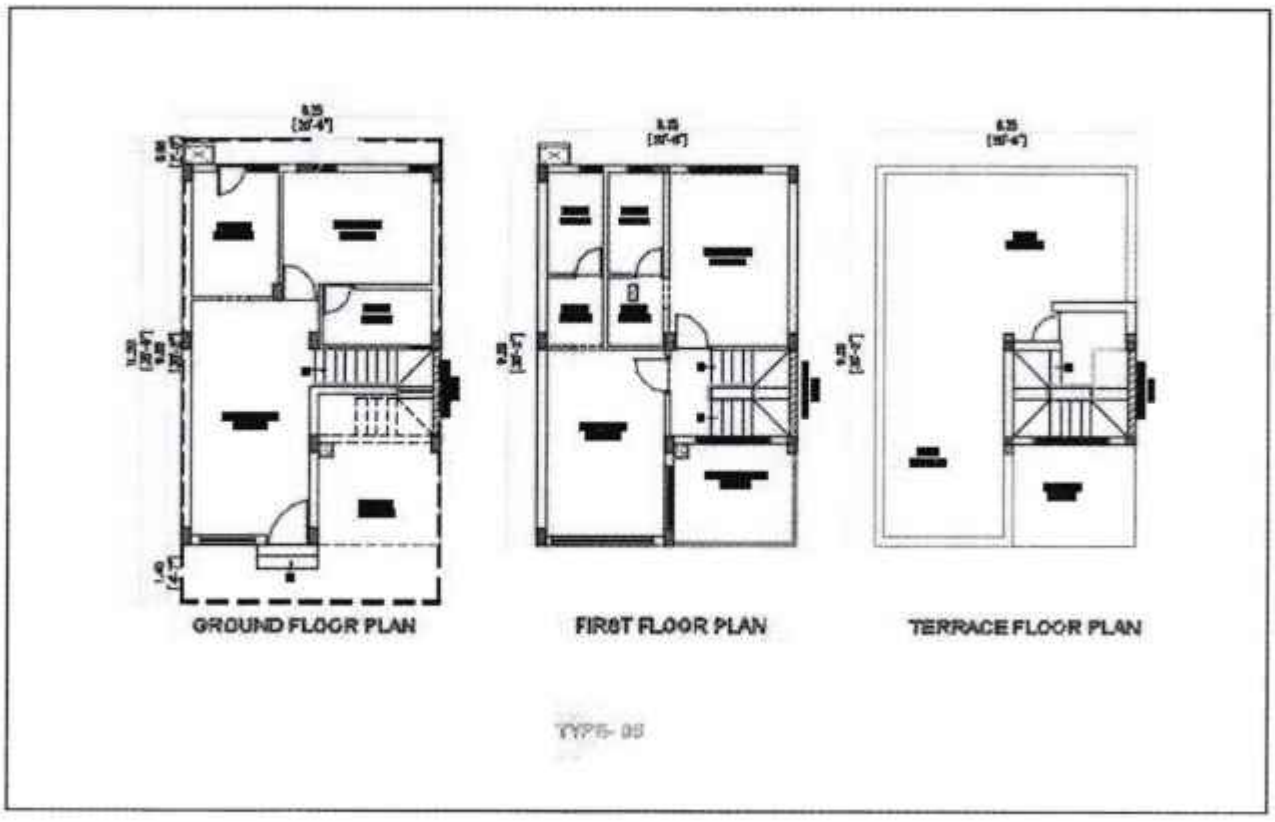
The intent of this document is to identify and record all the pertinent input requirements, analysis &design criteria for structural design of the **Ground+1 Upper floor totally 116 Dwelling building**. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning in delivering the structural scheme of the building. The scheme will becompatible with the architectural theme, satisfy the functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structures.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

2.0 BUILDING DESCRIPTION

Name Of Project	: Villa Buildings For M/s Casagrand Premier Builder Limited
Location	: Sonallur, Chengalpet
Type of Building	: Residential Building(VILLA TYPE)
Building Typology	: Reinforced Cement Concrete Framed Building
Plan Shape	: Regular Shape
Number of Stories	: Ground floor + 1 upper floor.
Position of the Building	: Free Standing
Total Height	: 8.90 from plinth level
Inter Storey Height	: 3.05 m.
Max Width Of Beam	: 200mm
Wall Thickness	: 200/100mm
Floor/Roof structure	: 125/150 mm floor slab
Location of site	: Sonallur, Chengalpet

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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SITE CUM FLOOR PLAN

3.0 STRUCTURAL SYSTEM

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000

Material	: Reinforced Cement Concrete Frame
System	: Special Moment Resisting Frame
Floor System	: One Way/Two way Solid Slab
Foundation System	: Isolated Footing
Material Strengths	: Member Concrete Grade
Columns	: M25
Beams	: M25
Slabs	: M25
Foundation	: M25

Steel type Grade Thermo mechanically Treated Fe 550
Minimum clear cover is to be provided to main steel

For Footing	: Side Cover 50 mm
For Column	: 40mm
For Beam	: 25 mm for side face
	: 25 mm for bottom
For Slab	: 20 mm

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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4.0 LIST OF CODES

- In the analysis, design and detailing of the building, the latest editions of following Indian Standardswill be referred.
- IS 456 – 2000 - Plain and reinforced concrete- code of practice
- IS 1893 – (Part I) – 2016 Criteria for earthquake resistant design of structures.
- IS 875 – (Part –I) – 1987 edition 3.1(1997-12) Code of practice for design loads (other than earthquake) for buildings and structures- Dead loads
- IS 875 – (Part- II) – 1987 - reaffirmed 1997) Code of practice for design loads(other than earthquake) for buildings and structures.- Imposed loads
- IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) forbuildings and structures.- Wind loads
- IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other thanearthquake) for buildings and structures- special loads and load combinations.
- IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- codeof practice.

5.0 MATERIAL OF CONSTRUCTIONS

The building is RCC frame structure with Isolated Footing Foundation, columns, beams and floor slabs beingused as diaphragms in redistribution of lateral forces.

CONCRETE

- The minimum Grade of Concrete in all RCC structural members shall be M25.
- Concrete of Grade M15 shall be used in filling, plum concrete, leveling courses and other non-structural items.
- Density of reinforced concrete is assumed as 25 kN/cum.
- Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 provisions fordurability and strength criteria.

CEMENT

Ordinary Portland Cement of grade 43, grade 53 or higher confirming to IS 8112 and IS 12269 isspecified for concrete grades ranging from M25 to M30

MASONRY

- Masonry works shall be made done with AAC Blocks.

AGGREGATES

The sizes of coarse aggregates conform to IS 383.Nominal maximum size of coarse aggregate shall be20 mm, suitably graded as per the requirement of mix design.

The fine aggregates conform to the specifications of IS 515.

WATER

Mixing Water shall confirm to IS 456: 2000, SP-23 "Handbook for Concrete Design".

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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REINFORCEMENT

High yield strength deformed bars conforming to IS 1786 with fy = 550 N/ sq.mm shall be used.

6.0 LOADING PARAMETERS

Self-Weights

Self-weight of the structural members will be considered on the basis of the following properties.

- Density of reinforced concrete : 25.0 kN/cu.m
- Density of plain concrete /Plumconcrete : 24.0 kN/cu.m
- Density of steel : 78.5 kN/cu.m
- Density of floor finishes / plasters : 20.4 kN/cu.m
- Density of soil : 18.0 kN/cu.m
- Density of Brick Wall : 20.0 kN/cu.m
- Density of Block Wall : 9.0 kN/cu.m
- Density of Solid Block Wall : 18.0 kN/cu.m
- Screeds : 18.0 kN/cu.m
- Cementations water proofing : 2.5 kN/sq.m
- Lift Machine Room load : 15.0 kN/sq.m
- False ceiling : 0.5 kN/sq.m

Dead load (DL):

Dead load including self-weight of various materials & finished items relevant to the design work and shall be considered as per IS: 875 (Part I)-1987. Suspended loads if any such as cable tray, piping & lightening fixtures shall also be considered as dead loads.

Floor Loads		**UDL (kN/sqm)**
125mm THICK Slab	0.125X1X25	3.125
150mm THICK Slab	0.150X1X25	3.75
Wall Loads		**UDL (kN/m)**
200mm THICK WALL(including Plastering)	0.20X(3.05-0.40)X9.0 0.045X(3.05-0.40)X9.0	4.77 1.07
200mm THICK WALL(including Plastering)	0.20X(3.25-0.40)X9.0 0.045X(3.25-0.40)X9.0	5.13 1.15
100mm THICK WALL (including Plastering)	0.10X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.39 1.07
100mm THICK WALL (including Plastering)	0.11X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.82 1.15

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- Floor Finish : 1.5 KN/sq.m
- Water Proofing/Terrace : 3.0 KN/sq.m
- Toilet Filling : 4.0 KN/sq.m
- Staircase Waist Slab : 6.0 KN/sq.m
- Dead load of waist slab = 0.15X1X25 = 3.75
- Dead of load of concrete steps = 0.075X1X25 = 1.875 say 6KN/Sqm
- Dead Load of Beam = 0.2X0.40X25 = 2.0KN/m

Live Loads on floors

Live Load shall be Considered as per IS-875 (part -2)-1987.

Residential Building

- All Rooms and Kitchen 2.0 KN/Sqm
- Toilet and Bath Rooms 2.0KN/Sqm
- Corridors, passages, staircases including tire escapes,balcony and stores 3.0KN/Sqm
- Terrace 1.5 KN/Sqm

Wind Load

Wind Load Shall be considered as per IS-875 (part-3)-2015Basic Wind Speed Shall be Obtained from IS 875 = V_b
Design wind speed at the Height of

$Vz = V_b x K1 x K2 x K3 x K4$

K1 - Probablity Factor = 1.0
K2 - Terraine Roughness and height Factor = 1.01
K3 - Tophography factor = 1.0
K4 - Impartance factor = 1.0

Vz = 50X1.0x1.01x1.0x1.0 = 50.5 M/s

Design Wind pressure

Pz = 0.6Vz^2
Pz = 0.6*50.5^2
Pz = 1530.15 N/sqm =1.53KN/sqm

Seismic Loads

The seismic load calculations will becarried out in accordance with IS 1893(Part 1): 2016.Seismic Zone	III
Importance Factor	1.0
Seismic Zone Factor	0.16
Response reduction Factor	5.00
Fundamental natural period – approx.	0.194

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

Since the structure is a R.C.C. structure an approximate damping value of 5% will be considered. Space frame analysis of the structure will be carried out using response spectrum method all our detailing practicesand provisions are and will be governed by IS: 1893 and IS: 456

Deflection Limit

Deflection limit shall be considered accordance with IS: 456-2000

Control of Deflections

The deflection shall generally be limited to the following

- The final deflection due to all loads including the effects of temperature, creep and shrinkage andmeasured from the as-cast level of the supports of floors, roofs, and all other horizontal members, should not normally exceed span/250.
- The deflection including the effects of temperature, creep and shrinkage occurring after the erection ofpartitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less

Basic values of Span to Effective Depth ratios

The vertical deflection limit may generally be assumed to be satisfied provided that the span depth ratio ornot greater than the value obtained as below

Basic value of span to effective depth ratio for spans up to 10m:

- Cantilever 7
- Simply supported 20
- Continuous 26

For span above 10m

The above value multiply 10/spam in meter
Ks =10/span in meter

Limit on Crack width

Limit on crack with shall be consider as per **IS :456-2000** the width of crack to a maximum limit of **0.3mm formild exposure conditions. 0.2mm** is prescribed for structure exposed to **continues moisture** conditions **And 0.1mm for the structure sever, very sever and extreme exposure** conditions

7.0 ANALYSIS OF FRAME

A Non-multi- storied frame consists of beams and columns whose degree of indeterminacy is very high. The Frame analysis of various members such as beams, columns Using STAAD PRO SOFTWARE requires bending moment, shear force and direct thrust at all sections.
The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members. This data will then be used to verify adequacy of the member sizes adopted and after further iterations arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

8.0 LOAD COMBINATIONS

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

FOR MEMBER DESIGN

GC-01 = 1.0 x DEAD + 1.0 x LIVE
GC-02 = 1.5 x DEAD + 1.5 x LIVE
WX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WX
WX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WX
WX1-03 = 1.5 x DEAD + 1.5 WX
WX1-04 = 1.5 x DEAD - 1.5 WX
WX1-05 = 0.9 x DEAD + 1.5 WX
WX1-06 = 0.9 x DEAD - 1.5 WX
WX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WY
WX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WY
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EX2-12 = 0.9 x DEAD - 1.5 EQY

9.0 STABILITY OF STRUCTURE

For the purpose of stability of the structure as a whole against overturning, w,

The restoring moment shall not be less than 1.2 times the maximum over turning moments dueto dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered.The restoring moments due to imposed loads shall be ignored.

The factor of safety against sliding shall not be less than 1.40.

Factor of safety against buoyancy shall not be less than 1.20 ignoring the superimposed loading.

10.0 GEOTECHNICAL DATA & SOIL PARAMETERS

As per the Geotechnical data, the recommended type of foundation is Isolated Foundation.

Depth of the Foundation = 1.50M Depth

11.0 FOUNDATION RECOMMENDATIONS & FOUNDATION SYSTEM

Foundation Type : Isolated Footing.

Depth of Foundation : 1.50M From NGL and SBC=200KN/m^2

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

CASAGRAND PREMIER BUILDER LIMITED

STRUCTURAL DESIGN BASIS REPORT
Type-06

PROJECT TITLE:

Plan showing the proposed Construction of Residential Non-high rise building (Villa No. 1 to 116) consists of Ground Floor + First Floor, Totally 116 D/U, Comprised in Survey Nos. 85/1B, 86/2A, 86/2B, 86/3, 87/2, 102/1B, 103/3A, 103/3B, 105/1, 105/2 and 105/3A of Sonallur Village, Vandalur Taluk, Chengalpet District

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

STRUCTURAL CONSULTANT

GENESYS **CONSULTING ENGINEERS**

No.2, S1 Flat, 1St Street, Kandhan Nagar, Ponniamman Medu, Chennai-600110.
Mobile:9677016079/9600109450, E:Genesys3112022@gmail.com

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Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

1.0 INTRODUCTION

The basic aim of the structural design is to build a structure, which is safe, fulfilling the intended purpose during its estimated life span, economical in terms of initial and maintenance cost, durable and also maintaining a good aesthetic appearance. A building is considered to be structurally sound, if the individual elements and the building as a whole satisfy the criteria for strength, stability and serviceability and in seismic areas additional criteria for ductility and energy absorption capabilities. The overall building must be strong enough to transfer all loads through the structure to the ground without collapsing or losing structural integrity by rupture of the material at the critical sections, by transformation of the whole or parts into mechanisms or by instability.

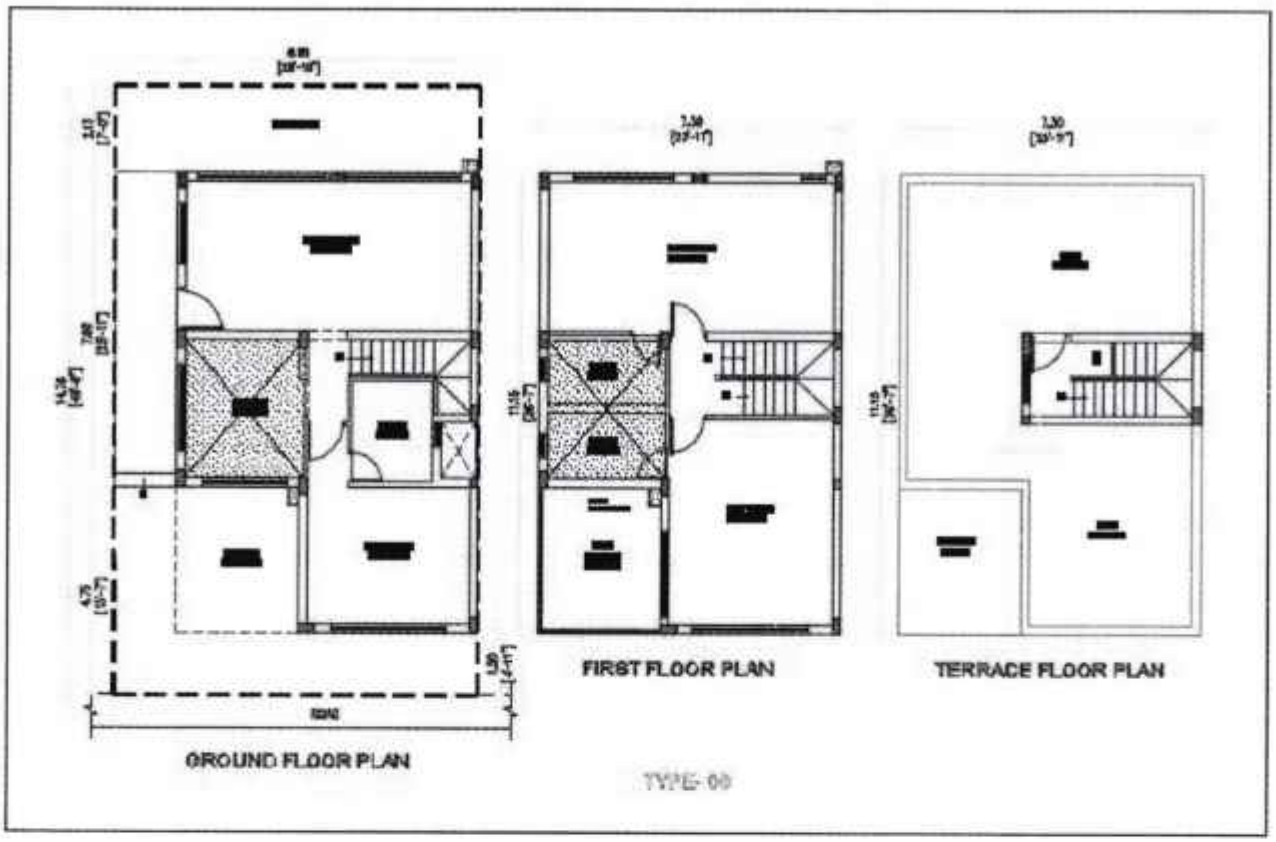
The intent of this document is to identify and record all the pertinent input requirements, analysis &design criteria for structural design of the **Ground+1 Upper floor totally 116 Dwelling building**. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning in delivering the structural scheme of the building. The scheme will becompatible with the architectural theme, satisfy the functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structures.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

2.0 BUILDING DESCRIPTION

Name Of Project	: Villa Buildings For M/s Casagrand Premier Builder Limited
Location	: Sonallur, Chengalpet
Type of Building	: Residential Building(VILLA TYPE)
Building Typology	: Reinforced Cement Concrete Framed Building
Plan Shape	: Regular Shape
Number of Stories	: Ground floor + 1 upper floor.
Position of the Building	: Free Standing
Total Height	: 9.30 from plinth level
Inter Storey Height	: 3.25 m.
Max Width Of Beam	: 200mm
Wall Thickness	: 200/100mm
Floor/Roof structure	: 125/150 mm floor slab
Location of site	: Sonallur, Chengalpet

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004



SITE CUM FLOOR PLAN

3.0 STRUCTURAL SYSTEM

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000

Material	: Reinforced Cement Concrete Frame
System	: Special Moment Resisting Frame
Floor System	: One Way/Two way Solid Slab
Foundation System	: Isolated Footing
Material Strengths	: Member Concrete Grade
Columns	: M25
Beams	: M25
Slabs	: M25
Foundation	: M25

Steel type Grade Thermo mechanically Treated Fe 550
Minimum clear cover is to be provided to main steel

For Footing	: Side Cover 50 mm
For Column	: 40mm
For Beam	: 25 mm for side face
	: 25 mm for bottom
For Slab	: 20 mm

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

4.0 LIST OF CODES

- In the analysis, design and detailing of the building, the latest editions of following Indian Standardswill be referred.
- IS 456 – 2000 - Plain and reinforced concrete- code of practice
- IS 1893 – (Part I) – 2016 Criteria for earthquake resistant design of structures.
- IS 875 – (Part –I) – 1987 edition 3.1(1997-12) Code of practice for design loads (other than earthquake) for buildings and structures- Dead loads
- IS 875 – (Part- II) – 1987 - reaffirmed 1997) Code of practice for design loads(other than earthquake) for buildings and structures.- Imposed loads
- IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) forbuildings and structures.- Wind loads
- IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other thanearthquake) for buildings and structures- special loads and load combinations.
- IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- codeof practice.

5.0 MATERIAL OF CONSTRUCTIONS

The building is RCC frame structure with Isolated Footing Foundation, columns, beams and floor slabs beingused as diaphragms in redistribution of lateral forces.

CONCRETE

- The minimum Grade of Concrete in all RCC structural members shall be M25.
- Concrete of Grade M15 shall be used in filling, plum concrete, leveling courses and other non-structural items.
- Density of reinforced concrete is assumed as 25 kN/cum.
- Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 provisions fordurability and strength criteria.

CEMENT

Ordinary Portland Cement of grade 43, grade 53 or higher confirming to IS 8112 and IS 12269 isspecified for concrete grades ranging from M25 to M30.

MASONRY

- Masonry works shall be made done with AAC Blocks.

AGGREGATES

The sizes of coarse aggregates conform to IS 383.Nominal maximum size of coarse aggregate shall be20 mm, suitably graded as per the requirement of mix design.

The fine aggregates conform to the specifications of IS 515.

WATER

Mixing Water shall confirm to IS 456: 2000, SP-23 "Handbook for Concrete Design".

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

REINFORCEMENT

High yield strength deformed bars conforming to IS 1786 with fy = 550 N/ sq.mm shall be used.

6.0 LOADING PARAMETERS

Self-Weights

Self-weight of the structural members will be considered on the basis of the following properties.

- Density of reinforced concrete : 25.0 kN/cu.m
- Density of plain concrete /Plumconcrete : 24.0 kN/cu.m
- Density of steel : 78.5 kN/cu.m
- Density of floor finishes / plasters : 20.4 kN/cu.m
- Density of soil : 18.0 kN/cu.m
- Density of Brick Wall : 20.0 kN/cu.m
- Density of AAC Block : 9.0 kN/cu.m
- Density of Solid Block Wall : 18.0 kN/cu.m
- Screeds : 18.0 kN/cu.m
- Cementations water proofing : 2.5 kN/sq.m
- Lift Machine Room load : 15.0 kN/sq.m
- False ceiling : 0.5 kN/sq.m

Dead load (DL):

Dead load including self-weight of various materials & finished items relevant to the design work and shall be considered as per IS: 875 (Part I)-1987. Suspended loads if any such as cable tray, piping & lightening fixtures shall also be considered as dead loads.

Floor Loads		**UDL (kN/sqm)**
125mm THICK Slab	0.125X1X25	3.125
150mm THICK Slab	0.150X1X25	3.75
Wall Loads		**UDL (kN/m)**
200mm THICK WALL(including Plastering)	0.20X(3.05-0.40)X9.0 0.045X(3.05-0.40)X9.0	4.77 1.07
200mm THICK WALL(including Plastering)	0.20X(3.25-0.40)X9.0 0.045X(3.25-0.40)X9.0	5.13 1.15
100mm THICK WALL (including Plastering)	0.10X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.39 1.07
100mm THICK WALL (including Plastering)	0.11X(3.25-0.40)X9.0 0.045X(3.05-0.45)X9.0	2.82 1.15

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Structural Engineer Grade - I (SE)
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- Floor Finish : 1.5 KN/sq.m
- Water Proofing/Terrace : 3.0 KN/sq.m
- Toilet Filling : 4.0 KN/sq.m
- Staircase Waist Slab : 6.0 KN/sq.m
- Dead load of waist slab = 0.15X1X25 = 3.75
- Dead of load of concrete steps = 0.075X1X25 = 1.875 say 6KN/Sqm
- Dead Load of Beam = 0.2X0.40X25 = 2.0KN/m

Live Loads on floors

Live Load shall be Considered as per IS-875 (part -2)-1987.

Residential Building

- All Rooms and Kitchen 2.0 KN/Sqm
- Toilet and Bath Rooms 2.0KN/Sqm
- Corridors, passages, staircases including tire escapes,balcony and stores 3.0KN/Sqm
- Terrace 1.5 KN/Sqm

Wind Load

Wind Load Shall be considered as per IS-875 (part-3)-2015Basic Wind Speed Shall be Obtained from IS 875 = V_b
Design wind speed at the Height of

$Vz = V_b xK1xK2xK3xK4$

K1 - Probablity Factor = 1.0
K2 - Terraine Roughness and height Factor = 1.01
K3 - Tophography factor = 1.0
K4 - Impartance factor = 1.0

Vz = 50X1.0x1.01x1.0x1.0 = 50.5 M/s

Design Wind pressure

Pz = 0.6Vz^2
Pz = 0.6*50.5^2
Pz = 1530.15 N/sqm =1.53KN/sqm

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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Seismic Loads

The seismic load calculations will becarried out in accordance with IS 1893(Part 1): 2016.Seismic Zone	III
Importance Factor	1.0
Seismic Zone Factor	0.16
Response reduction Factor	5.00
Fundamental natural period – approx.	0.189

Since the structure is a R.C.C. structure an approximate damping value of 5% will be considered. Space frame analysis of the structure will be carried out using response spectrum method all our detailing practicesand provisions are and will be governed by IS: 1893 and IS: 456

Deflection Limit

Deflection limit shall be considered accordance with IS: 456-2000

Control of Deflections

The deflection shall generally be limited to the following

- The final deflection due to all loads including the effects of temperature, creep and shrinkage andmeasured from the as-cast level of the supports of floors, roofs, and all other horizontal members, should not normally exceed span/250.
- The deflection including the effects of temperature, creep and shrinkage occurring after the erection ofpartitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less

Basic values of Span to Effective Depth ratios

The vertical deflection limit may generally be assumed to be satisfied provided that the span depth ratio ornot greater than the value obtained as below

Basic value of span to effective depth ratio for spans up to 10m:

- Cantilever 7
- Simply supported 20
- Continuous 26

For span above 10m

The above value multiply 10/spam in meter
Ks =10/span in meter

Limit on Crack width

Limit on crack with shall be consider as per **IS :456-2000** the width of crack to a maximum limit of **0.3mm formild exposure conditions. 0.2mm** is prescribed for structure exposed to **continues moisture** conditions **And 0.1mm for the structure sever, very sever and extreme exposure** conditions

7.0 ANALYSIS OF FRAME

A Non-multi- storied frame consists of beams and columns whose degree of indeterminacy is very high. The Frame analysis of various members such as beams, columns Using STAAD PRO SOFTWARE requires bending moment, shear force and direct thrust at all sections.
The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members. This data will then be used to verify adequacy of the member sizes adopted and after further iterations arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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8.0 LOAD COMBINATIONS

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

FOR MEMBER DESIGN

GC-01 = 1.0 x DEAD + 1.0 x LIVE
GC-02 = 1.5 x DEAD + 1.5 x LIVE
WX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WX
WX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WX
WX1-03 = 1.5 x DEAD + 1.5 WX
WX1-04 = 1.5 x DEAD - 1.5 WX
WX1-05 = 0.9 x DEAD + 1.5 WX
WX1-06 = 0.9 x DEAD - 1.5 WX
WX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WY
WX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WY
WX2-09 = 1.5 x DEAD + 1.5 WY
WX2-10 = 1.5 x DEAD - 1.5 WY
WX2-11 = 0.9 x DEAD + 1.5 WY
WX2-12 = 0.9 x DEAD - 1.5 WY
EX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQX
EX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQX
EX1-03 = 1.5 x DEAD + 1.5 EQX
EX1-04 = 1.5 x DEAD - 1.5 EQX
EX1-05 = 0.9 x DEAD + 1.5 EQX
EX1-06 = 0.9 x DEAD - 1.5 EQX
EX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQY
EX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQY
EX2-09 = 1.5 x DEAD + 1.5 EQY
EX2-10 = 1.5 x DEAD - 1.5 EQY
EX2-11 = 0.9 x DEAD + 1.5 EQY
EX2-12 = 0.9 x DEAD - 1.5 EQY

9.0 STABILITY OF STRUCTURE

For the purpose of stability of the structure as a whole against overturning, w,

The restoring moment shall not be less than 1.2 times the maximum over turning moments dueto dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered.The restoring moments due to imposed loads shall be ignored.

The factor of safety against sliding shall not be less than 1.40.

Factor of safety against buoyancy shall not be less than 1.20 ignoring the superimposed loading.

10.0 GEOTECHNICAL DATA & SOIL PARAMETERS

As per the Geotechnical data, the recommended type of foundation is Isolated Foundation.

Depth of the Foundation = 1.50M Depth

11.0 FOUNDATION RECOMMENDATIONS & FOUNDATION SYSTEM

Foundation Type : Isolated Footing.

Depth of Foundation : 1.50M From NGL and SBC=200KN/m^2

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

CASAGRAND PREMIER BUILDER LIMITED

STRUCTURAL DESIGN BASIS REPORT
Type-07

PROJECT TITLE:

Plan showing the proposed Construction of Residential Non-high rise building (Villa No. 1 to 116) consists of Ground Floor + First Floor, Totally 116 D/U, Comprised in Survey Nos. 85/1B, 86/2A, 86/2B, 86/3, 87/2, 102/1B, 103/3A, 103/3B, 105/1, 105/2 and 105/3A of Sonallur Village, Vandalur Taluk, Chengalpet District

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004

STRUCTURAL CONSULTANT

GENESYS **CONSULTING ENGINEERS**

No.2, S1 Flat, 1St Street, Kandhan Nagar, Ponniamman Medu, Chennai-600110.
Mobile:9677016079/9600109450, E:Genesys3112022@gmail.com

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A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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1.0 INTRODUCTION

The basic aim of the structural design is to build a structure, which is safe, fulfilling the intended purpose during its estimated life span, economical in terms of initial and maintenance cost, durable and also maintaining a good aesthetic appearance. A building is considered to be structurally sound, if the individual elements and the building as a whole satisfy the criteria for strength, stability and serviceability and in seismic areas additional criteria for ductility and energy absorption capabilities.The overall building must be strong enough to transfer all loads through the structure to the ground without collapsing or losing structural integrity by rupture of the material at the critical sections, by transformation of the whole or parts into mechanisms or by instability.

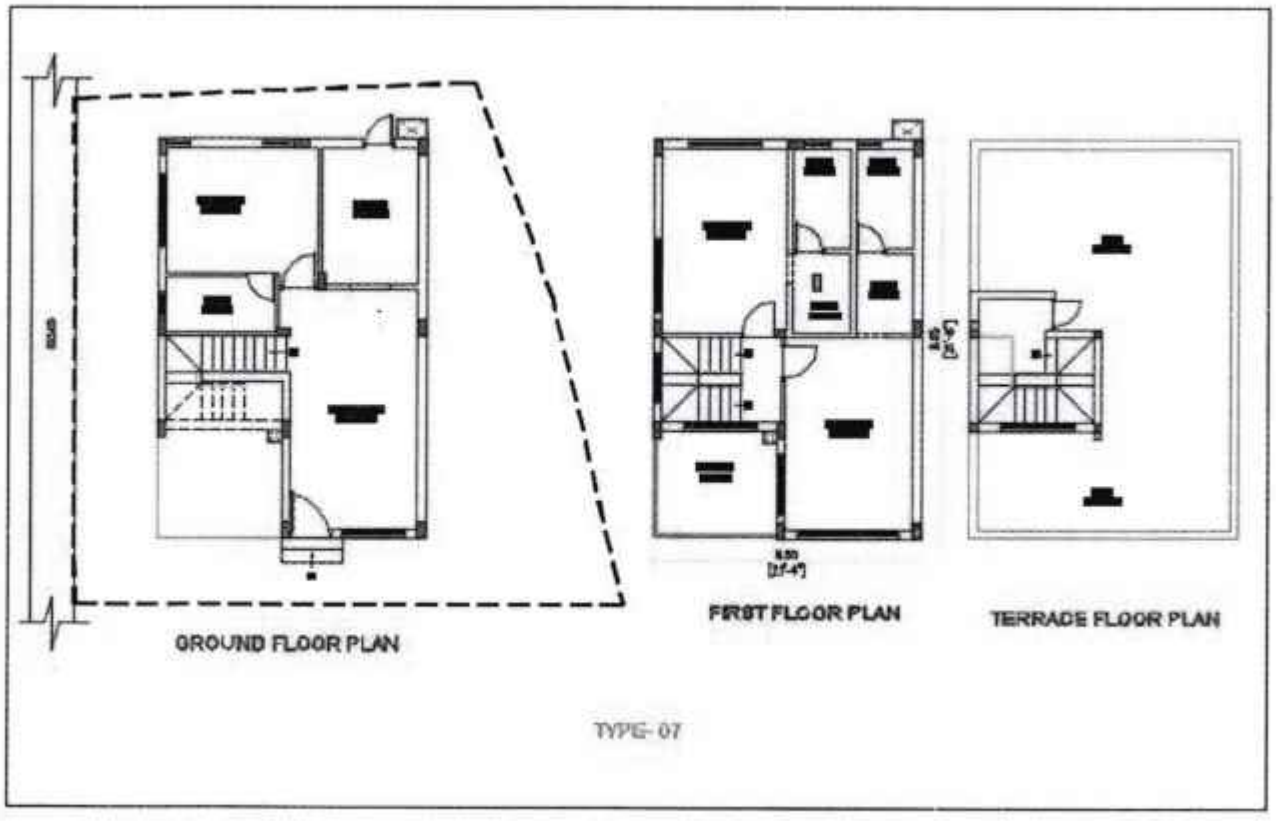
The intent of this document is to identify and record all the pertinent input requirements, analysis &design criteria for structural design of the **Ground+1 Upper floor totally 116 Dwelling building**. It is aimed at formulating the basis of the structural analysis, design & detailing work that the Structural Engineer is planning in delivering the structural scheme of the building. The scheme will becompatible with the architectural theme, satisfy the functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economic structures.

This report covers the minimum design requirement to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

2.0 BUILDING DESCRIPTION

Name Of Project	: Villa Buildings For M/s Casagrand Premier Builder Limited
Location	: Sonallur, Chengalpet
Type of Building	: Residential Building(VILLA TYPE)
Building Typology	: Reinforced Cement Concrete Framed Building
Plan Shape	: Regular Shape
Number of Stories	: Ground floor + 1 upper floor.
Position of the Building	: Free Standing
Total Height	: 8.90 from plinth level
Inter Storey Height	: 3.05 m.
Max Width Of Beam	: 200mm
Wall Thickness	: 200/100mm
Floor/Roof structure	: 125/150 mm floor slab
Location of site	: Sonallur, Chengalpet

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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SITE CUM FLOOR PLAN

3.0 STRUCTURAL SYSTEM

For the design of R.C.C. elements, the Limit State Method will be used as per IS 456-2000

Material	: Reinforced Cement Concrete Frame
System	: Special Moment Resisting Frame
Floor System	: One Way/Two way Solid Slab
Foundation System	: Isolated Footing
Material Strengths	: Member Concrete Grade
Columns	: M25
Beams	: M25
Slabs	: M25
Foundation	: M25

Steel type Grade Thermo mechanically Treated Fe 550
Minimum clear cover is to be provided to main steel

For Footing	: Side Cover 50 mm
For Column	: 40mm
For Beam	: 25 mm for side face
	: 25 mm for bottom
For Slab	: 20 mm

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
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4.0 LIST OF CODES

- In the analysis, design and detailing of the building, the latest editions of following Indian Standardswill be referred.
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- IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) forbuildings and structures.- Wind loads
- IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other thanearthquake) for buildings and structures- special loads and load combinations.
- IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- codeof practice.

5.0 MATERIAL OF CONSTRUCTIONS

The building is RCC frame structure with Isolated Footing Foundation, columns, beams and floor slabs beingused as diaphragms in redistribution of lateral forces.

CONCRETE

- The minimum Grade of Concrete in all RCC structural members shall be M25.
- Concrete of Grade M15 shall be used in filling, plum concrete, leveling courses and other non-structural items.
- Density of reinforced concrete is assumed as 25 kN/cum.
- Minimum cement content, water cement ratio etc. shall conform to IS 456:2000 provisions fordurability and strength criteria.

CEMENT

Ordinary Portland Cement of grade 43, grade 53 or higher confirming to IS 8112 and IS 12269 isspecified for concrete grades ranging from M25 to M30

MASONRY

- Masonry works shall be made done with AAC Blocks.

AGGREGATES

The sizes of coarse aggregates conform to IS 383.Nominal maximum size of coarse aggregate shall be20 mm, suitably graded as per the requirement of mix design.

The fine aggregates conform to the specifications of IS 515.

WATER

Mixing Water shall confirm to IS 456: 2000, SP-23 "Handbook for Concrete Design".

A. MANJUBASHINI M.E.,
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REINFORCEMENT

High yield strength deformed bars conforming to IS 1786 with fy = 550 N/ sq.mm shall be used.

6.0 LOADING PARAMETERS

Self-Weights

Self-weight of the structural members will be considered on the basis of the following properties.

- Density of reinforced concrete : 25.0 kN/cu.m
- Density of plain concrete /Plumconcrete : 24.0 kN/cu.m
- Density of steel : 78.5 kN/cu.m
- Density of floor finishes / plasters : 20.4 kN/cu.m
- Density of soil : 18.0 kN/cu.m
- Density of Brick Wall : 20.0 kN/cu.m
- Density of AAC Block : 9.0 kN/cu.m
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- Lift Machine Room load : 15.0 kN/sq.m
- False ceiling : 0.5 kN/sq.m

Dead load (DL):

Dead load including self-weight of various materials & finished items relevant to the design work and shall be considered as per IS: 875 (Part I)-1987. Suspended loads if any such as cable tray, piping & lightening fixtures shall also be considered as dead loads.

Floor Loads		**UDL (kN/sqm)**
125mm THICK Slab	0.125X1X25	3.125
150mm THICK Slab	0.150X1X25	3.75
Wall Loads		**UDL (kN/m)**
200mm THICK WALL(including Plastering)	0.20X(3.05-0.40)X9.0 0.045X(3.05-0.40)X9.0	4.77 1.07
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A. MANJUBASHINI M.E.,
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- Floor Finish : 1.5 KN/sq.m
- Water Proofing/Terrace : 3.0 KN/sq.m
- Toilet Filling : 4.0 KN/sq.m
- Staircase Waist Slab : 6.0 KN/sq.m
- Dead load of waist slab = 0.15X1X25 = 3.75
- Dead of load of concrete steps = 0.075X1X25 = 1.875 say 6KN/Sqm
- Dead Load of Beam = 0.2X0.40X25 = 2.0KN/m

Live Loads on floors

Live Load shall be Considered as per IS-875 (part -2)-1987.

Residential Building

- All Rooms and Kitchen 2.0 KN/Sqm
- Toilet and Bath Rooms 2.0KN/Sqm
- Corridors, passages, staircases including tire escapes,balcony and stores 3.0KN/Sqm
- Terrace 1.5 KN/Sqm

Wind Load

Wind Load Shall be considered as per IS-875 (part-3)-2015Basic Wind Speed Shall be Obtained from IS 875 = V_b
Design wind speed at the Height of

$Vz = V_b x K1 x K2 x K3 x K4$

K1 - Probablity Factor = 1.0
K2 - Terraine Roughness and height Factor = 1.01
K3 - Tophography factor = 1.0
K4 - Impartance factor = 1.0

Vz = 50X1.0x1.01x1.0x1.0 = 50.5 M/s

Design Wind pressure

Pz = 0.6Vz^2
Pz = 0.6*50.5^2
Pz = 1530.15 N/sqm =1.53KN/sqm

Seismic Loads

The seismic load calculations will becarried out in accordance with IS 1893(Part 1): 2016.Seismic Zone	III
Importance Factor	1.0
Seismic Zone Factor	0.16
Response reduction Factor	5.00
Fundamental natural period – approx.	0.189

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Since the structure is a R.C.C. structure an approximate damping value of 5% will be considered. Space frame analysis of the structure will be carried out using response spectrum method all our detailing practicesand provisions are and will be governed by IS: 1893 and IS: 456

Deflection Limit

Deflection limit shall be considered accordance with IS: 456-2000

Control of Deflections

The deflection shall generally be limited to the following

- The final deflection due to all loads including the effects of temperature, creep and shrinkage andmeasured from the as-cast level of the supports of floors, roofs, and all other horizontal members,should not normally exceed span/250.
- The deflection including the effects of temperature, creep and shrinkage occurring after the erection ofpartitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less

Basic values of Span to Effective Depth ratios

The vertical deflection limit may generally be assumed to be satisfied provided that the span depth ratio ornot greater than the value obtained as below

Basic value of span to effective depth ratio for spans up to 10m:

- Cantilever 7
- Simply supported 20
- Continuous 26

For span above 10m

The above value multiply 10/spam in meter
Ks =10/span in meter

Limit on Crack width

Limit on crack with shall be consider as per **IS :456-2000** the width of crack to a maximum limit of **0.3mm formild exposure conditions. 0.2mm** is prescribed for structure exposed to **continues moisture** conditions **And 0.1mm for the structure sever, very sever and extreme exposure** conditions

7.0 ANALYSIS OF FRAME

A Non-multi- storied frame consists of beams and columns whose degree of indeterminacy is very high. The Frame analysis of various members such as beams, columns Using STAAD PRO SOFTWARE requires bending moment, shear force and direct thrust at all sections.
The computer analysis will evaluate individual internal member forces, reactions at foundation level and deflection pattern of the entire structure and in the individual members. This data will then be used to verify adequacy of the member sizes adopted and after further iterations arrive at the most appropriate design of the structural members. Some re-runs of the analysis program might be required for arriving at the optimum structural space frame characteristics that satisfy the strength and stability criteria in all respects.

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8.0 LOAD COMBINATIONS

The results obtained from the computer analysis in the form of member forces and reactions will be used for design the structural members. Following load combinations of the member forces will be considered for arriving at the design forces.

FOR MEMBER DESIGN

GC-01 = 1.0 x DEAD + 1.0 x LIVE
GC-02 = 1.5 x DEAD + 1.5 x LIVE
WX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WX
WX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WX
WX1-03 = 1.5 x DEAD + 1.5 WX
WX1-04 = 1.5 x DEAD - 1.5 WX
WX1-05 = 0.9 x DEAD + 1.5 WX
WX1-06 = 0.9 x DEAD - 1.5 WX
WX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 WY
WX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 WY
WX2-09 = 1.5 x DEAD + 1.5 WY
WX2-10 = 1.5 x DEAD - 1.5 WY
WX2-11 = 0.9 x DEAD + 1.5 WY
WX2-12 = 0.9 x DEAD - 1.5 WY
EX1-01 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQX
EX1-02 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQX
EX1-03 = 1.5 x DEAD + 1.5 EQX
EX1-04 = 1.5 x DEAD - 1.5 EQX
EX1-05 = 0.9 x DEAD + 1.5 EQX
EX1-06 = 0.9 x DEAD - 1.5 EQX
EX2-07 = 1.2 x DEAD + 1.2 x LIVE + 1.2 EQY
EX2-08 = 1.2 x DEAD + 1.2 x LIVE - 1.2 EQY
EX2-09 = 1.5 x DEAD + 1.5 EQY
EX2-10 = 1.5 x DEAD - 1.5 EQY
EX2-11 = 0.9 x DEAD + 1.5 EQY
EX2-12 = 0.9 x DEAD - 1.5 EQY

9.0 STABILITY OF STRUCTURE

For the purpose of stability of the structure as a whole against overturning, w,

The restoring moment shall not be less than 1.2 times the maximum over turning moments dueto dead load plus 1.4 times the maximum overturning moments due to imposed loads. In case where dead load provides the restoring moments only 0.9 times in dead load shall be considered. The restoring moments due to imposed loads shall be ignored.

The factor of safety against sliding shall not be less than 1.40.

Factor of safety against buoyancy shall not be less than 1.20 ignoring the superimposed loading.

10.0 GEOTECHNICAL DATA & SOIL PARAMETERS

As per the Geotechnical data, the recommended type of foundation is Isolated Foundation.

Depth of the Foundation = 1.50M Depth

11.0 FOUNDATION RECOMMENDATIONS & FOUNDATION SYSTEM

Foundation Type : Isolated Footing.

Depth of Foundation : 1.50M From NGL and SBC=200KN/m^2

A. MANJUBASHINI M.E.,
Structural Engineer Grade - I (SE)
DTCP Reg.No: CGLDIST /SE/GR-I/2023/10/004



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3/350/2 Mettukuppam,
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