# DESIGNING OF G+2 RESIDENTIAL BUILDING

K.Naresh[1], J.Abhinav Kumar[2], M. Vivek Kumar[3], M. Manasa[4]

Assistant Professor, Vaagdevi College of Engineering, India[1]

Student, Department of Civil Engineering, Vaagdevi College of Engineering, India[2,3,4]

## ABSTRACT

The design planning is a piece of urban advancement it incorporates planning of private houses, business edifices, administration streets, essential wellbeing focuses, school...& different courtesies sewerage framework for entire format (incorporates treatment, sewer line, storm water channels), water appropriation framework. This undertaking incorporates design& estimation of private structure in plot of format planned.Designing includes recognizing the heaps which follow up on a structure and the powers and stresses which emerge inside that structure because of those heaps, perform examination to get minutes and shear powers on various components of the structure and after that plan the structure for extreme burdens and minutes. The heaps can act naturally - weight of the structures, other dead loads, live loads, moving (wheel) loads, wind load, seismic tremor load, load from temperature change and so on. Estimation incorporates finding the amounts of materials required for the development of the structure and prerequisites of work and so forth., at long last deciding the general expense of the structure Before execution of work

***Keywords :—*** CAD,STAADPRO.

## I. INTRODUCTION

The format planning is a piece of urban advancement it incorporates planning of private houses, business edifices, administration streets, essential wellbeing focuses, school..& different civilities sewerage framework for entire design (incorporates treatment, sewer line, storm water channels), water dispersion framework. This undertaking incorporates planning of plots and streets in the format in that plot structure of private structure (G+2).and its estimation.

### 1.1 PROBLEM IN HAND

Presently multi day's the urban improvement assumes a significant job being developed of nation. the number of inhabitants in Indian towns and urban areas is developing quickly .so there is an extraordinary interest for the essential requirements for individuals .in that lodging is one of the fundamental need .these necessity prompts development of land due to the development of land number of townships, designs, roads are creating in creating towns and urban areas, For making framework to the general population.

### 1.2 OBJECTIVE

- To make framework to the general population..
- To meet the necessities of individuals like water supply, roads.etc.
- To gain salary for the administration. Prompts nation's improvement packs

### 1.3 LAYOUT DETAILS

#### 1.31 SOIL PROFILE AT THE SITE

According to nearby enquiry and test pits the profile of soil is Up to 2m there is silty sand(SM) from 2 to 6 there is all around Graded rock (GW) is exceptionally hard soil &below that there is

Laterite soil and SDR (delicate crumbled soil)..the soil at theB ite is great and the bearing limit of soil runs between 25t/sq.m to 35t/sq.m.so the disengaged balance is all that anyone could need for a G+2 building.

#### 1.32 GROUND WATER TABLE SUBTLETIES

The Ground water may accessible at a profundity of 25 ft at the area in stormy season so there is no issue of ascent of G.W.T at the structure.

**1.33 AREA OF LAYOUT**

The area of format estimated between the limits is 14.403 section of land

**1.34 EXISTING STATE OF FORMAT**

The format there is very nearly a leveled surface and the design highlights are as appeared in the photos..

**1.35 LEVEL OF THE DESIGN:**

+16.956 above mean ocean level

Fig 1 Building Site to be proposed near Vaagdevi engineering college

**1.4 PLANNING OF LAYOUT**

The design is planned as in complete area of land is 14.403 sections of land in that the land saved for open purposes and for water works is 14% that is 2.016 section of land's proposed streets area is 31.11% that is 4.408 sections of land. The principle administration interfacing street is 40ft street and staying all other administration streets are 33ft.the residual site area is separated into plots of size 40ft x 60ft plots the all out number of plots are 143 no's

The plot no's 100,101,102,103,119,120,121,122,137 are proposed for park. What's more, outstanding plots are proposed for G+2 private structures..

**1.41 PLOT PLANNING**

Plots of size 40ftx60ft is planned for a G+2 unit The complete plot area is=2400sq.ft (223sq.m).

The adjoining street width is 33 ftAccording to G.OM.MS.NO 67 for Minor GramaPanchayats

**1.42PERMISSIBLE TALLNESS AND DIFFICULTY NECESSITIES**

The base open spaces/mishaps (open to sky) and tallness limitations will be as per the following for considering the structure authorizations in Minor Gram Panchayats.

I. Stature Permissible: 9 meters or G+2 floors in Gram Khantam and 13 meters or G+3 floors tallness in income review number areas

ii. Difficulties:

In Gram Khantam:

Front difficulty or building line: 1.50 meters

Back misfortune: 1.00 meters

Side set back=1.5m… AS PER G.O.MS 67 Deducting misfortune area

Net Plot area=1562.28sq.ft(145.14sq.m) in that net plot area we need to plan a G+2 assembling and need to structure it.

**1.43 PLANNING OF DEVELOPED AREA**

Every one of the Rooms in the Plan Plotted Are As Per Norms of

National Building Code

(N.B.C-2005)

**1.5 NATIONAL BUILDING CODE PROVISIONS (NBC)**

**1.51 CLASSIFICATION OF STRUCTURE**

- •Occupancy arrangement
- •Group-A: Residential
- •Group – B: Educational
- •Group - E: Business… and so on.

**1.52 ROOM ESTIMATE PREREQUISITES**

•The area of livable room will not be under 9.5m2, least width of 2.4 m

•The area of a kitchen where separate feasting area is Provided, will be at the very least 5.0 m2 with a min width of 1.8 m.

•The area of a restroom will not be under 1.8 m with a base width of 1.2 m.

In this undertaking every one of the rooms in the structure are planned according to N.B.C 2005

**1.53 OPEN SPACE**

The open spaces inside and around a structure is fundamental to provide food for the lighting and ventilation necessities of the rooms. On account of structure adjoining lanes in the front back (or) sides, the open spaces gave will be adequate to the future enlarging of such boulevards.

**1.54 PROVISION OF LIFTS**

It will be made for structure more than 15m tallness.

**1.55 FIRE ZONES**

It will be structured as pursues

Flame zone 1

Flame zone 3

**1.56 EXIT PREREQUISITES**

All ways out will be free of impediment.

Firefighting hardware will suit found and unmistakably stamped.

1.57 Ventilation

- Proper ventilation widows ought to have least area 1/8 of the floor area of a room.
- Aggregate area of the entryways and windows ought not be 1/4 of the floor area of the room.
- Widows ought to be given 60to90 cm above floor level.
- Area of every ventilator ought not be under 3sq.m.
- 1.58 Fire identifying and leaving framework
- Manually worked fire alerts.
- Sound perceptible to all withdraws.
- Easily worked from the phone switch board.

Auxiliary examination and plan

The auxiliary examination and configuration is completed physically and by utilizing staad.pro programming In manual investigation basic examination is done by substitute edge method and plan of structure is as indicated by the codal arrangements IS456- 2000,sp-16,sp-34,is 875 section 1,2,3 estimation of expense is according to most recent rates of SSR( standard timetable of rates)- 2014-2018

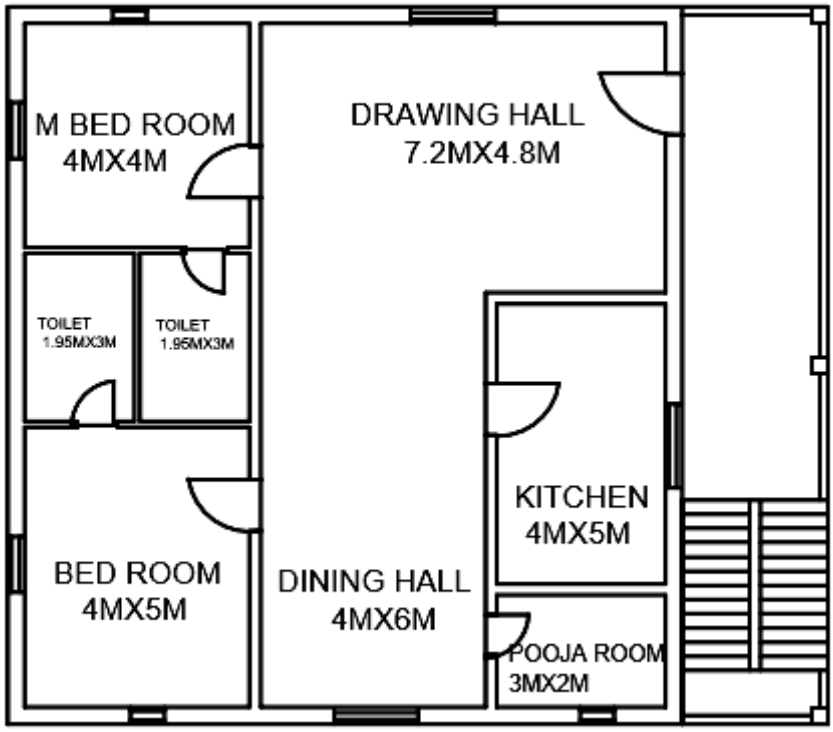


Fig 2 CAD plan of residential building

## II. THE ANALYSIS OF FRAMED STRUCTURE

### 2.1 MANUAL METHODS

There are many methods available to analyze a structure. Some of these are

1.Slope Deflection Method

2.Moment Distribution Method

3.Kani's Method

### 2.11 Need for examination

In all structure every single component like pillars, segments ought to be broke down for greatest twisting minute and shear power and with this minutes components as to be planned. The investigation must be done to get a structure, which is fundamentally protected just as, conservative.

### 2.12 MOMENT CONVEYANCE METHOD (SOLID CROSS METHOD)

The basic framework is first decreased to its artistically determinate from in this method. This is practiced by accepting every one of the joints to be completely controlled. The end snapshots of the considerable number of individuals are registered for this state of the structure. The joints are permitted to divert in a steady progression by discharging there progressively. Tough cross method gives a rich and brisk methodology to investigate persistent bar. The method can likewise be connected to outlines with a couple of extra calculations.

### 2.13 SUBSTITUTE CASING METHOD

The method of examination for this confined structure is by substitute casing method. By taking little part of the edge called substituting outline, the minutes can be determined. The minutes helped from floor to floor through segments are little contrasted and pillar minutes; along these lines, the minutes in a single floor negligibly affect the snapshots of the floor above and beneath. Subsequently the investigation of these multi storeyed casings is completed by taking one floor at once. Each floor is taken with segments above and beneath fixed at the far closures and minutes and shears are determined in shafts and it gives estimated results as just two cycles dispersion are done.

### 2.14 CRITERIA FOR ANALYSIS FOR STRUCTURAL MEMBERS

The examination for this structure was performed by Substitute Frame Method since the most ordinarily utilized method for the investigation of vertical burden is the Substitute edge method. In substitute casing method, the outcomes can be gotten acceptably from the plan perspective, which is additionally suggested for every single reasonable reason according to code IS 456 – 2000.

A substitute casing method comprise of a little segment of a multi-story, multi narrows outline by and large including the floor bars, with the segments above and beneath the floor thought to be fixed In minute Distribution method, the investigation is extensive and troublesome

**III. SPEIFICATIONS**

**3.11DESIGN SPECIFICATIONS**

Basic structure is conveyed according to the accompanying R.C.C components: according to IS456-2000 and SP16-1978

Reinforcement and Bar Bending Scheduling: As Per Sp-34 Detailing of structure administrations: according to SP-24

**3.12 OTHER SPECIFICATIONS Clear spread to fortification bar**

Pillars 25mm to 30mm

Segments - 40mm

Sections 20mm

Establishments 50mm

Relieving: Curing will be accomplished for 28 days

Compaction: Thorough compaction will be done to abstain from honeycombing

W/C proportion: For 1:2:4mix-0.45

For 1:1.5:3mix-0.40

Admixtures: Addition of "super plasticizers" to concrete while getting ready is prescribed

Advancement length: Anchorage/lap length: 55xds where ds is the measurement of the bar

Reduction of bars: Development length will be kept up for all diminished bars from purpose of hypothetical decrease

Lapping of sections bars will be amazed lapping will be done at the mid length of the segment

For Lateral ties (of bar or section) 1350 snare ought to be given

Expulsion of formwork: For slabs and pillars formwork will not be expelled before 21 days of laying solid Beam-segment joints:

All the bar bars must go in the middle of segment bars at joints

In the joint C type rings whenever shut stirrups are not given.

Appropriate compaction of joints will be guaranteed in the joints

Bars forgot: the section bars that are forgotten for future extension must be given anti-corrosive coating and then ought to be loaded up with concrete.

**3.2DESIGN OF BEAMS**

**3.22TYPES OF BEAMS ON THE BASIS OF THEIR REINFORCEMENTS SINGLY STRENGTHENED PILLARS**

Doubly strengthened pillars

Flanged bars

**3.24 DESIGN PROCEDURE**

Extreme minute on the beam=Mu

Broadness of the beam=b

Profundity of the beam=D

Viable profundity of the beam=d

Discover Mu/bd2

Discover area of pressure steel and likewise pressure steel whenever required from SP16 tables 1-4 and 45 - 56

Extreme shear power acting=VU

Discover the Shear Capacity of the shaft from SP16 (Tables 61-63) Note: check for diversion must be finished

In generally we need to structure 2 comparable light emissions traverses let the shafts are B1 and B2

**3.25DESIGN OF BEAM – B1**

If there should arise an occurrence of surrounded pillars the area at mid range is tube structured as bar and at help it must be planned as independently or doubly fortified bars

Characteristic strength of concretet, $F_{CK}$=20n/mm2

Evaluation of steel FY=415 N/mm2(HYSD bars)

Accept Percentage of Steel Is =P%

From (Charts 63 and 64 of Sp-16) Find Uni-Axial Moment Capacity Of Column In Both X and Y Direction = Mux1 and Muy1

Discover Capacity of Column in Pure Axial Compression=Puz Obtain α Value Also

Check For (Mux/Mux1) α + ( Muy/Muy1) α< 1.0 Then Provide horizontal ties according to Is456-2000

**3.4 DEISIGN OF FOOTINGS:**

**3.41 FOOTING:**

Balance/Foundation is the base most segment of a structure which lies well underneath the ground level. The establishment accommodated a R.C.C Column is known as a Footing Types of Footings

1.Isolated segment balance

2.Combined balance for segments

3.Strap - balance for segments

4.Raft balance (tangle)

5.Spread balance for walls

At the point when separate footings are accommodated every section they are called confined footings

They are essentially arranged on the state of balance

a) Square balance

b) Rectangular balance

c) Circular balance

Confined footings might be of uniform thickness (or) Stepped (or) Varying thickness

| | **Reinforcement at supports** | | **Reinforcement at midspan** | | **Shear reinforcement (vertical stirrups) Asv** | | |
|---|---|---|---|---|---|---|---|
| **Beams** | **Tension steel(Ast)** | **Compression steel (Asc)** | **Tension steel (Ast)** | **Compression steel (Asc)** | **At supports** | **At mid span** | **Deflection control** |
| B1=400X230 | 4-bars of 16# in 2 layers | Nil | 4-bars of 16# at bottom | Nil | 2-legged 8mm Stirrups at 225mmc/c | 2-legged 8mm stirrups at 225mmc/c | safe |
| B2=300X230 | 6-bars of 16# in at top | 4-bars of 8# in at bottom | 6-bars of 16# at bottom | Nil | 2-legged 6mm stirrups at 110mmc/c | 2-legged 6mm stirrups at 200mmc/c | safe |

**3.3 DESIGN OF COLUMNS**

**3.32 DESIGN PROCEDURE**

Sections Subjected To Bi-Axial Bending

Extreme Load on Column =Pu

Extreme Moments in X and Y Direction= Mux &Muy

In our structure as the great soil is found at shallow profundity by examining the dirt profile the segregated balance is all that anyone could need at that area

| **No** | **Positi on** | **Pu (lo ad) KN** | **Mu x (KN m)** | **Mu y (KN m)** | **Section** mm x mm | **P%** | **Ast mm2** | **Di a of tie** | **Pitch mm** |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Colum ns | 96 3 | 31.4 83 | 10.2 37 | 300x30 0 | 1.8 | 8- 18 # | 18 ϕ | 200 |

**3.42 DESIGN METHOD OF CONFINED BALANCE: SAFE BEARING LIMIT OF SOIL: SBC WORKING BURDEN ON FOOTING=P**

Area of the balance required =1.1xP/SBC Size of the balance Af=AxB Determine upward soil pressure=qu

Discover the bowing minute in both directions= Mx& My Find the Depth Required From Max B.M Consideration Calculate Reinforcement Required In both the Directions according to IS 456-2000

Check for one way shear and two way shear and punching shear pressure

Check for advancement length is likewise be done according to IS 456

In this task the footings are suited in a channel of 2.2m x2.2m x1.5m for inward segments and 1.7m x1.7m x 1.5m

**3.43 DESIGN OF FOOTINGS Data:**

Burden on column=805.74kN

Size of column=300mm x300mm

Safe bearing limit of soil=200kN/m2 Grade of concrete(fck)=20 N/mm2 Grade of steel fy=415N/mm2

For rectangular section affordable structure of balance is acquired if the projection of balance from the essence of the segment in the two bearings is same .the plan is like that of square balance for square segment same support is given in the two headings

Size of the balance

Burden from the column=805.74kN

Self load of the balance =10% of the heaviness of the column=805.74/10=80.574 kN

Complete burden on the column=805.74+80.574=886.314kN

Area of the balance required=1.1×workingload/SBCofthesoil =1.1×886.314/200=4.87m2

Area of the square footing(A)=4.87m²

Area of the balance provided(A)=B× =2.2×2.2=4.84m²

Provide 12mm dia bars of 15 numbers with 150mm c/c dividing

τU N/mm2<τV N/mm2hence balance is protected againstpunching shear pressure, two way shear

**3.5 SLABS**

Slabs are basic individuals having little thickness when contrasted with its other two measurements (i.e., length and width)

Slabs convey the heaps by bowing activity in at least one headings and exchange to the backings

In view of the proportion between longer range to shorter range, slabs are characterized .

Characterization of sections

**3.51 One Way Slabs**

Twisting happens along the shorter range bearing and redirects one way onlyMain fortification will be given in shorter range heading just Distribution support will be given longer way to produce into results of temperature stresses

**3.52 Two Way Slabs**

Twisting happens along both the bearings and diverts in two ways (like saucer) Main support will be given in both the headings

Lx = shorter range Ly = longer range Ly/Lx> 2 one way piece Ly/Lx< 2 two way slab

If there should arise an occurrence of surrounded structures the slab boards carry on as a two way controlled pieces and limited one way sections

**3.53 DESIGN PROCEDURES**

**3.54 DESIGN OF TWO WAY SLAB:**

Take a gander at the edge state of the slab.

Let lx&ly be the ranges in x, y bearings

Absolute working burdens on the slab=W

Find Ly/Lx proportion

Acquire minute coefficientsax &ay from IS456

Discover extreme minutes in both x and y headings at backings just as mid range utilizing the recipe M=a w l2

Discover area of steel according to IS456 Check for avoidance may likewise done

In this undertaking the sections boards are given underneath

**3.55 DESIGN OF ONE WAY SLAB:**

Minute on the slab=M

Profundity of Slab=D

Viable profundity of slab=d

Discover M/bd2 where b=1000mm

From IS 456 find area of main steel and distribution steel

| b | Type | Main Ast along x-direction | Main Ast along y-direction | Distribution steel | Ast in edge strip | Torsion steel | Deflection control |
|---|---|---|---|---|---|---|---|
| S1 | 1- way | 12mm bars@ 150mm c/c | Nil | 12mm bars@ 300mm c/c | no | no | safe |
| S2 | 1- way | 12mm bars@ 150mm c/c | Nil | 12mm bars@ 300mm c/c | no | no | safe |

### 3.6 DESIGN OF DOG-LEGGED STAIR CASE

Design load $w_u$ =1.5×9.5=14.25kN/$m^2$
provide overall 170mm with effective depth 150mm
Using 8mm bars area of each bar =50$mm^2$
No.of bars in the width of 1.2m of stair = (273.46/50)×1.2=6.56~7 bars
Provide 8mm bars@90mm c/c
**Distribution Reinforcement**: Provide 8mm bars@ 145mm c/c

### 3.8 DESIGN OF PLINTH BEAMS

Plinth beams are provided below walls i.e. at above foundation (at the floor level)They are to be designed as singly (or) doubly reinforced beams it is subjected to wall loads above it

### 3.8.1DESIGN OF PLINTH BEAM-P1

Depth of the beam is restricted to D=500mm
Effective depth=d=470mm
Width of the beam b=230mm
Effective span=7.2+0.23+0.23=7.67m

**1. Loads:**
Factored load=1.5*14.458=21.683 kN/m
**Tension reinforecemet :**
Provide 4-bars of 20# in at bottom Ast provided =1256.64
$mm^2$
**Compression reinforcement**:
Provide 2-bars of 12# at top is provided =226.2 $mm^2$
**Design of shear reinforcement:**
Provide 2-legged 6mm stirrups at 215mmc/c throughout span

## IV. ANALYSIS AND DESIGN OF G+2 RESIDENTIAL BUILDING USING STAAD–PRO V8I

### 4.1 INTRODUCTON

STAAD-v8i is comprehensive structural software that addresses all aspects of structural engineering model development, analysis, design, verification and visualization.
It is based on the principles of "Concurrent Engineering". We can build the model, verify it graphically, Perform analysis/design, review the results, sort/search the data to create a report all with in the same graph based environment. Main options available are
STAADv8i- analysis and design
STAADv8i- graphical input generator
STAAD-POST- graphical post processing
STAAD-INTDES- interactive design of structural component
In addition we have on line manual access and file management

#### 4.1.1 Input generator

The STAAD-v8i input file can be created through a text editor or STAAD-PRE input generator facility. Any text editor can be used to create adata file. The input generation facility creates the input file through an interactive menu driven graphics oriented procedure. The following types of structures SPACE
FLOOR

#### 4.1.2 Unit system

The user is allowed to give input data to almost all commonly used engineering unit systems including MKS, SI and FPS systems. In the input file the user may change units as many times as required. In the output rotations are given in radians.

#### 4.1.3 For Concrete

STAADv8i has the capabilities of performing concrete design. It will calculate reinforcement needed for any concrete section. All concrete design calculated are based on Limit State Design method of IS 456-2000. The following types of section for concrete beams can be designed.
For Beams-Prismatic (Rectangular, square, L shape)
For columns-Prismatic (Rectangular, square, and circular)

#### 4.1.4Material properties

The material constant are young's modulus of elasticity(E), Density(DEN), poisson's Ratio(POISS), Coefficient of Thermal expansion (ALPHA) and beta angle (BETA) or coordinates of any reference point(REF).

**4.15Supports**

STAAD-v8i allows specification of support that is parallel as well as inclined to global axes. Support are specified as pinned, fixed,

4.16loads

1. Joint Load
2. Member Load
3. Area load
4. Priestess member load
5. Temperature/ strain load
6. Support displacement

STAAD-v8i is equipped with built in algorithm to generate moving loads, lateral seismic load wind load.

## V. CONCLUSION

Finally we conclude that by planning thelayouts, we can preserve the open spacesWe can provide infrastructural facilities to people. It makes wealth to government in the form of taxesit leads to urban development

**GENERAL**

A general methodology for analysing a building by both

1.Manual methods,

2.STAAD Pro was presented.

Utilizing the above outcomes we can pick better method for examination and to plan any sort of structure.

From the past investigation we are at last finished up and can go for STAAD Pro examination for high raised structure For private and low raised structures we can go for manual methods taking most extreme stacked halfway edge.

## REFERENCE


1) Estimation and costing in Civil Engineering, B.N.Dutta.
2) Pabba Mounika, Maroju Navya and Syed Viqar Malik. "Design of Residential Building and Analysis with STAAD Pro." International Journal for Scientific Research and Development 3.11 (2015): 33-39.
3) Construction managment: **"Preliminary Cost Estimate**and Scheduling" of MIT's Civil and Environmental Engineering Building.
4) Goutam Mondal and Sudhir K Jain,Design of non-structural elements for buildings: A review of codal provisions (Indian Concrete Journal)
5) IS 456:2000: Code of practice for plain and reinforced concrete
6) SP 16 code of practice.
7) Advanced design of reinforced concrete structures(IS456-2000), N.Krishna Raj
8) Design of reinforced concrete structures, S.Ramamurtham .